Essays on Asymmetric Federalism

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Chapter 1

Introduction

1.1 Research problem

The growing research on fiscal and political federalism in economics (as well as rational choice political science) basically shares two main assumptions regarding federal institutions: it takes democratic and symmetric federations as the reference point. *Democracy* means that the decision making is based on elections and/or referenda, which effectively constraint the actions of politicians. *Symmetry* means that the "degree of devolution" for all regions is identical. In particular, if both federal and regional budgets are funded by a common split tax, the de-jure retention rate is identical for all states. It goes without saying that there is a multitude of models looking at *economic* asymmetry between regions: most federations include states or regions with significantly different economic potential, population and territory, obviously influencing both their comparative economic performance and their behavior in the federal bargaining.[1] However, the economic asymmetry does not (necessarily) provide an identity mapping into the asymmetric devolution in terms of formal institutions and informal policy making (what I refer to as "asymmetric federation" in this paper): this issue requires careful analysis. Although these assumptions are helpful to derive valuable insights in the development of federations, it is obvious that they do not cover the variety of institutional and political environments existing

[1] For example, in Argentina four industrially dominant provinces and the federal district of Buenos Aires account for 78% of the nation's industrial production and 70% of the population. In Australia New South Wales includes 35% of the population, whereas Tasmania accounts for less than 3%. In Germany the largest Land North Rhine Westphalia accounts for 21% of the population of the federative republic, whereas the city-state of Bremen includes less than 1%. In India Uttar Pradesh includes 16% of the whole population, and Sikkim less than 0.1%. The largest U.S. state California accounts for 11% of the population, and the smallest state Wyoming includes less than 1% of the population. The largest Brazilian state Sao Paulo is more than 100 times as large in terms of population, as the smallest one (Roraima). Yukon includes less than 0.1% of the Canada's population and Ontario 38%. Even in Austria, which is significantly smaller, than other federations mentioned above, the largest Land of Vienna is about 30 times as large in terms of population, as the smallest one (Burgenland).

in federal systems.

First, it is safe to claim that the fiscal capacity of individual regions (i.e. the resources they keep to implement their economic policy) is heterogeneous in virtually all federations. However, this difference can simply be an outcome of the *free discretion* of regional governments over their own tax rates and bases (as in the U.S.), of the application of *identical rules* to regions with *different endowment* (for example, if there are several split taxes with different de-jure retention rates, and regions have different endowments in terms of tax bases, unavoidably the overall share of tax revenue kept by individual regions will be unequal) or of the *redistribution* of the common pool of resources at the federal level through transfers. However, another reason for the differences in fiscal capacity (which I focus on in this paper) is that the *rules* applied to individual regions are *different*. This form of asymmetric federalism (as it is usually referred to in political science) is typical for a wide variety of countries.

For example, the developing Spanish federalism is asymmetric per construction: the autonomous regions (communidad autonoma) were not established by the constitution, but the latter institutionalized a procedure, which could be used for their creation, as well as for "accepting" responsibilities. Specifically, the retention rates for shared taxes are not identical over the communities; two of them enjoy special "foral regime" with higher fiscal independence. The same is true for the British devolution: the degree of autonomy of Wales and Scotland is set separately, as well as the (possible) autonomy of England (McGregor and Swales, 2003). Federal entities in Belgium and Canada enjoy partly different rights: Canada is a prominent example of unilateral concessions to a particular region of the federation in order to maintain the unity of the federal state (Quebec). India originally included four types of states depending on their historical origin (British rule, former principalities etc.) and currently still has specific regulations for ethnic minorities (Rao and Singh, 2004). At the moment let me put aside the question why this particular form of federalism appears at all: although the results of bargaining over varying retention rates may be identical to that of bargaining over transfers when retention rates are identical, there are countries where regions obviously prefer the former to the latter. In this paper the existence of asymmetries is assumed as given. More importantly, it seems to be the core of the "autonomy" arrangements in unitary states, when individual regions receive special status and higher autonomy in economic decision-making (in political science often referred to as "federacies").[2]

Second, although there have been important changes over the last decade,

[2]An incomplete list of this arrangements includes Alan Islands in Finland, five special regions (Sicily, Sardinia, South Tyrol, Friuli-Venezia Giulia, Valle d'Acosta) in Italy, Zanzibar in Tanzania, the Atlantic Cost in Nicaragua, Corsica in France, Minadanao in Philippines, Gagauszia in Moldova, West Papua in Indonesia, Bougainvillea in Papua New Guinea, Greenland and Faeroes in Denmark, Madeira and Azores in Portugal, Jersey and Man in the UK, Xianggang in China, Crimea in Ukraine or Karakaplpakstan in Uzbekistan.

the modern political economics (including economics of decentralization) is still to an important extent the economics of democracies. However, the political regime is yet another reasonable "candidate" for influencing the degree of decentralization. Although, as it will be discussed below, there is some research dealing with effects of the democratization on the process of devolution, there is still at least one neglected area: *internal* political differences between different levels of government in a federation. Regional differentiation of the level and the type of democracy is quite typical for federations in developing and transition countries. The first source of the variation is the (relative) weakness of the federal center, often unable to control the development of regional political institutions and therefore limit the diversity of regional political equilibria (McMann, 2006). The second source is the need to compromise with regional elites in the process of democratic transition, leading to "pockets" of democracy or autocracy. In several cases the very ability to carry out the democratic transition may be associated with an "implicit contract" with the regional elites, maintaining their autocratic rule. Finally, economic and ethnic differences among regions lead to a strong differentiation of the bargaining power of individual actors; in a world where these actors bargain not only within rules, but foremost about rules, it leads to the differentiation of political institutions.

This trend has been observed in different parts of the world. In Latin America Brazil, Argentina and Mexico included regions with different political systems (Gibson, 2004): for example, the transition from the dictatorship of the Institutional-Revolutionary Party (PRI) in Mexico started with the development of individual democratic regions; however, even after the democratization occurred on the federal level several regional leaders maintained their quasi-authoritarian power. In India regional governments were able not only to change the specifics of regional political systems, but also to establish significantly different economic systems.[3] The traditional channels of control of regional governments through the constitutional court, the federal legislature or the national political culture are much weaker in these countries, than in the developed world. However, one should not necessarily be looking for developing countries and weak democracies to find examples of different political systems in one federal structure. Quite a few of the U.S. states in the early 20s century were controlled by powerful political machines eliminating any free competition at the elections; the dominance of the Democratic party in the U.S. South was based on various voting restrictions (like literacy tests), introduced to undermine the electoral basis of the opposition (see Besley et al., 2007, for a survey of anecdotal evidence). The 'subnational authoriatrianism' has also been reported in Spain and Southern Italy.

On the contrary, autocratic states sometimes include regions with a higher level of democratization. The traditional monarchies of Central and Eastern Europe

[3]For example, in West Bengal, where the Communist Party maintained the power monopoly for decades (Chen and Sil, 2007).

in the 19s century partly included regions significantly more successful in terms of the democratic development. A good example is the special status of Finland in the Russian Empire. The territory maintained its own parliament (though no publicly elected legislature existed in Russia) and a legal system, which was quite developed even as opposed to other European countries of that period (for example, Finland was among the first territories in the world to provide women voting rights). Autocracies sometimes allow limited political competition on the local level (like China, which has recently introduced free elections on the village level, see Thurston, 1998), maintaining absolute control over political developments on the federal or central level. The reasons why a non-democratic center credibly commits (and maintains the commitment) to allow free elections on the regional or local level can differ and include some sorts of political experiments or outcomes of internal power struggles and external pressure. However, systems with more advanced democratization on provincial level sometimes result from a slow overall democratization process, like in Mexico; in this case, however, they are likely to be less stable (Diaz-Cayeros, 2003).

Finally, formal pure non-democratic federations seem to be a relatively rare phenomenon in the modern world (an example is probably the United Arab Emirates), since a non-democracy has difficulties in maintaining rule of law necessary to establish clear separation of powers between the federal and the regional level. However, in a broad sense, non-democratic political system with independent regional and central elites and a relative balance of power between them determining the distribution of the fiscal revenue are often present in large countries, if the political control of the center is not absolute. Latin America experienced a significant move towards decentralization under authoritarian leaders (Eaton, 2006), and so does China today.

The existence of asymmetric and / or non-democratic federations and the quality of policy making and governance in these structures is per se an interesting question for political economics. What is, however, even more important is that asymmetric federations often provide unique laboratories to test a multitude of general questions of public and political economics in an intranational setting. It is well known that the international samples of countries suffer from important problems: quality of data may often be incompatible, there is a selection bias and / or small-sample problem etc. Hence, using the intranational variation of the parameter of interest may become an interesting alternative, especially because country knowledge may make specific strategies of identification (unavailable in general settings) useful. This thesis attempts to apply the asymmetric federalism case in two main frameworks.

First, it looks at the problem of the **endogenous decentralization** - a field growing extensively over the last decade (Lockwood, 2006). Unlike the traditional implicitly or explicitly normative fiscal federalism, the endogenous decentralization approach does not deal with the optimal centralization and the power allocation between the center and the regions, but rather studies the (in-

ternal) processes within a federal system that lead to a specific allocation of decision powers or fiscal revenue. Basically, it comes down to a (supposedly) simple empirical question: why are some countries more (de)centralized than the others? Unlike the dominant literature on endogenous decentralization, using either international setting (Pryor, 1968; Oates, 1972; Kee, 1977; Pommerehne, 1977; Bahl and Nath, 1986; Wasylenko, 1987; Patsouratis, 1990; Vaubel, 1996, 2009; Panizza, 1999; Cerniglia, 2003; Garret and Rodden, 2003; Diaz-Cayeros, 2004; Stegarescu, 2006; Arzaghi and Henderson, 2006; Letelier, 2005; Treisman, 2006) or internal decentralization within regions (mostly in the U.S. and Switzerland, cf. Pryor, 1967; Litvack, Oates, 1970; Giertz, 1976, 1983; Mullen, 1980; Wallis and Oates, 1988; Baker, 2000; Feld et al., 2008), the first three papers of this thesis specifically use the setting of an asymmetric federation to study the determinants of decentralization. Second, the existence of the subnational variation of political regimes provides an interesting field for research on the **comparative performance of democracies and autocracies**. Although the "democracy-and-growth" studies include literally hundreds of papers and thousands of regressions (Doucouliagos and Ulubasoglu, 2008), virtually all of them, once again, restrict their attention to comparing performance of different countries (or of individual countries over time). Here, once again, looking at panels of regions might be an advantage, as it is discussed in this thesis.

1.2 Structure of the thesis

This thesis is comprised of four papers. The first three deal with the problem of endogenous decentralization in asymmetric federations, including those with variation of political regimes. To start with, the first paper (*Chapter 2*) considers the problem from a broad perspective. Using the data from the Russian Federation in 1995-1999, it looks at three measures of devolution: fiscal, regulatory and constitutional decentralization, and attempts to find out their interrelation and their driving factors. Basically, there are two main findings from the chapter. First, three aspects of decentralization (although evolving simultaneously and influenced by interacting (or even identical) agents) do not seem to be correlated. Second, the set of determinants of the decentralization, for which the zero effect could be rejected, is also different: while for the fiscal decentralization bargaining power and preferences seem to play the crucial role, regulatory decentralization is influenced by bargaining rules and path dependence factors. The sets of outliers for different dimensions of decentralization also differ.

This result challenges the traditional approach to empirical studies of decentralization, which take a variety of post-constitutional indicators as proxies for allocation of authorities. Hence, it becomes important to study the factors influencing the divergence of de-jure power and de-facto control over resources. Therefore in the next step (*Chapter 3*) the thesis looks at a specific mechanism of fiscal decentralization in an asymmetric federal structure. Once again, I use the

data for the Russian Federation (for 1995-1999 and 2000-2006) to test different hypotheses regarding the strategic tax collection behavior as a driving force of the fiscal decentralization. In a centralized federation where regional and federal budgets are financed by taxes (mostly) determined by the federal parliament, regions, if they are able to control their tax authorities, have incentives to manipulate the tax collection and tax auditing effort for various reasons. If there is a huge tax avoidance (and therefore the tax collection measures are limited and unable to cover all taxpayers), one of the outcomes of the strategic tax collection may be shifts of the retention rates; thus even centralized federations become subject to the de-facto devolution. The chapter indeed finds evidence of the strategic tax collection as factor of the fiscal decentralization in Russia.

Both *Chapters 2* and *3* included a measure of democracy in individual regions among covariates; however, it did not produce significant and robust results. Therefore *Chapter 4* looks at the problem from a theoretical perspective: it constructs a very simple model of an asymmetric federation, where regional and federal governments may have (potentially different) democratic and non-democratic political regimes, and looks at the properties of mapping from economic and political fundamentals (heterogeneity, size of regions, secession costs, political regimes) into retention rates in a setting allowing for secession. There are three main results to be reported. First, as expected (and as demonstrated in the previous chapters for the Russian case) regions with a large territory, low secession costs and a high "preference distance" from the federal government have larger retention rates. Second, the degree of decentralization in a pure democracy (where both regional and federal governments are democratic) is higher, than in a pure non-democracy only for specific conditions on preference distance / information flows. Finally, hybrid regimes (where federal and regional governments have different political systems) are more centralized, than pure non-democracies.

While *Chapters 2* and *3* had the problem of endogenous decentralization in an *asymmetric* federation in focus, and *Chapter 4* looked at *asymmetric* federation with *various level of democracy*, *Chapter 5* specifically concentrates on the sub-national variation of democracy in order to study the "democracy-and-growth" nexus. Looking at a sample of Russian regions in 2000-2004, it uses various techniques to regress the annual growth rates on the degree of democracy and the size of bureaucratic apparatus in individual regions. The main finding is that the democracy has a robust U-shape impact on economic growth: hybrid regimes perform significantly worse than both democracies and autocracies.[4] The findings for bureaucracy are less robust: in cross-sections and panel data settings without region fixed effects, the bureaucracy increase seems to hamper economic growth; the result vanishes for estimations with region fixed effects. Finally, the chapter reports some results on the interaction of democracy and

[4]It should be noted that I use different definitions of a hybrid regime in chapters 4 (a country with different political regimes on different levels of government) and 5 (a region which combines features of democracies and non-democracies in the regional political system).

size of bureaucracy.

Individual specific results of the chapters are summarizes in the respective conclusions; however, there at the end of the thesis I discuss some general results which could be obtained from both theoretical and empirical discussion.

1.3 Institutional details on the Russian federalism

1.3.1 Asymmetric federalism: Russian style

As shown above, there are three empirical papers and one theoretical contribution in this thesis. For all three empirical chapters the source of data is a sample of Russian regions for different periods; the theoretical model is also interesting in turms of explaining the Russian devolution (although naturally not limited to this particular case). Hence, it seems appropriate to provide some basic information on the functioning of the Russian fiscal and political federalism in the *Introduction*, since this information might be relevant for all further chapters of the thesis.

Russia of the 1990s is in fact a good example of an asymmetric federation and of high variation of political regimes within one country. The basic elements of asymmetry were already inherited from the Soviet period: the post-Soviet Russia includes 89 regions (their number changed over time, see also *Figure 1.1*) with partly different status. While 21 territories are called "ethnic republics" and exhibit a variety of elements of statehood, other regions (oblast or krai) have evolved from traditional administrative territorial units[5] or (autonomous okrug) are even subordinate to other regions. The Soviet fiscal system (which still exists in several former Soviet republics like Uzbekistan) was de-jure asymmetric *par excellence*: each year the central government set individual retention rates for individual regions and individual taxes (with tax rates and bases set on the federal level). In the early 1990s this formal structure was filled with the real bargaining; the retention rates for individual taxes / regions changes on quarterly or half-year basis. The negotiations were basically implemented by the federal government and a coalition of ethnic republics with more credible threat of (at least, partial) secession than that of administrative units. The Federal Treaty of 1992, which acted as the predecessor of the current constitution, granted special privileges to one particular type of subnational jurisdictions - the national republics (Ross, 2000:406).

In 1993-1994, this initial pure bargaining structure experienced two major changes. The first was an increasing level of the *formal centralization*. When the president managed to consolidate power on the federal level after the dissolution of

[5] Yevreiskaia autonomous oblast has a similar status, although formally belongs to national units of the Federation.

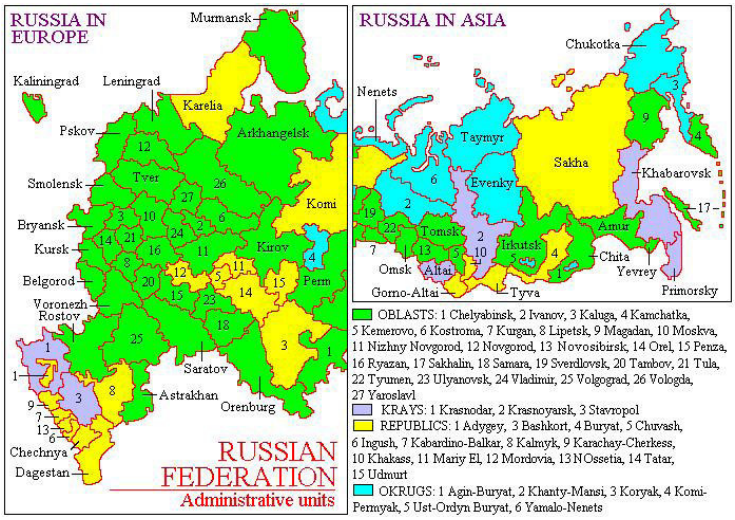

Figure 1.1: Map of Russia

the old parliament (Supreme Council) in autumn 1993, the situation changed; the new constitution of 1993 accompanied by the introduction of several basic acts on inter-budgetary relations in 1994 established the *de jure* assignment of responsibilities and of tax revenues between different levels of government. On the one hand, the constitution proclaimed an identical status of all "subjects of the Federation" (the official designation of all regions regardless of their status). However, previous norms, as well as the informal bargaining processes granted the national republics special privileges. On the other hand, the new Russian federalism was based on a high degree of centralization of tax authorities. The *exclusive list of taxes* was set by the federal parliament, originally in the Act on the Fundamentals of the Tax System, and after 1999 in the Tax Code. There was one notable exception from this regulation: the Presidential Decree No. 2268 signed on December 22, 1993, allowed the regional and local authorities to introduce their own taxes. However, though several regions used these possibilities, most taxes introduced by the regions did not even cover their administrative expenses (although they still influenced the economic processes as they were used to manipulate the competition between businesses to support privileged business groups, see East-West Institute, 2001). In 1996 the Decree was abolished, and although some regions continued using their "own" taxes, their influence on tax revenue was fairly low. The federal government also set the rules for calculating the *tax base* for all taxes. Consequently, there is only *one unified tax collection system in Russia*; all taxes are administered by the federal government.[6] In a similar way, Russia became a highly centralized federation in terms of the regulation of economic and social activities: major standards

[6]Some details on Russian tax system are described in *Appendix A*.

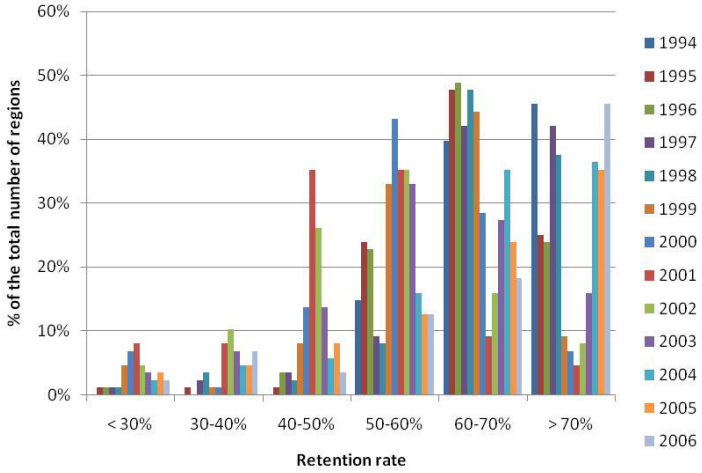

Figure 1.2: Distribution of regions according to the retention rates.
Source: Goskomstat, Ministry of Finance, Federal Tax Service, Federal Treasury, Freinkman, Treisman and Titov, 1999

in most areas were set on the federal level, while the regional governments had only limited ability to modify them.

Under the fiscal constitution described above *de jure* the only source of fiscal asymmetries in the tax revenue could be the differences in the tax base endowments (any changes of federal legislation, like new tax rates or new taxes simultaneously hit all regions). Indeed, this *de jure* highly centralized federal structure was implemented in an extremely heterogeneous country. Different regions of Russia are characterized by different resource endowments and industrial capacities, different population specifics and different access to transportation infrastructure and markets. The asymmetries in tax revenue distribution have been enormous. In the period between 1994 and 2006 the share of taxes received by the center from different regions varied from practically zero (Sakha in 1994 and 1995) to more than 95% (Kalmykia in 2005 and Voronezh in 2005). *Figure 1.2* presents the distribution of Russian regions according to their share in the tax revenue from their territory. The question is, however, whether the tax base composition is the only factor driving the heterogeneity.

Therefore in order to explain the fiscal asymmetries in Russia the second change of the Russian federalism should be considered: *the increasing bilateral and unilateral activity of regions* circumventing the formally highly centralized federal law. Partly this activity took place within the framework of direct bilateral bargaining between federal and regional governments, leading to the establishment of formal power-sharing treaties which are often referred to as elements of an

asymmetric federation (Stoner-Weiss, 1998; Filippov, Ordeshook and Shvetsova, 2004, Chapter 4). The process was to a certain extent induced by the Federal Treaty: as two republics refused to sign the Treaty (Tatarstan and Chechnia), and two of them (Bashkortostan and Sakha) insisted on special clauses with larger economic rights, the way was open for the establishment of a bilateral treaties system beyond the constitutional level. In 1994 Tatarstan and the federal center signed a special agreement with a broader scope of authorities of the regional government, which included both re-allocation of tax income from several taxes from the federal to the regional budget and the right to set breakdown of distribution of other taxed on a bargaining basis.

By the end of 1996 about 26 power sharing agreements with different regions were in power, and to June 1998 their number reached 46 (i.e. more than a half of the Russian regions). In addition more than 500 subordinate treaties between different governmental bodies were put into action (cf. Obydenkova, 2008). What is, however, very important is that at this stage the bargaining between the federal government and the coalition of republics was replaced by bilateral bargaining between the federation and the individual territories (Filippov et al., 2004). The spread of power sharing agreements seems to suggest the existence of domino effect; however, in reality the degree of autonomy incorporated in individual acts varied significantly (Martinez-Vazquez, 2002); a large majority of regions did not really aspire higher autonomy, preferring to benefit from the bandwagon effects (Gel'man, 2006).On the other hand, federal law (parliamentary acts and presidential decrees) was used to give additional authorities to regions.[7]

More important is the *unilateral* activity of regions leading to devolution. Its most prominent form was "the war of laws" (introduction of regional legislation running contrary to the federal one). While it does not automatically translate in fiscal asymmetries, it certainly influenced the structure of Russian regulatory federalism: as a result, Russian regions obtained significantly different degree of autonomy, resulting into substantial differences of regional legal regimes and economic policies (Polishchuk, 2001). Moreover, the unilateral devolution in fiscal area included decisions to prevent the local tax authorities from transferring the tax revenue to the federal government – a kind of "tax separatism".

The negotiated bilateral treaties, wars of laws and unilateral concessions certainly had an impact on the developing asymmetric federalism. However, it would be by far too simplistic to reduce the observed *fiscal* asymmetries exclusively to this feature. Although the significant differences between the federal and the local regulation existed until the early 2000s (Chang, 2005), the possibilities for the regions to manipulate the transfer of tax revenue to the federal

[7]The earliest decrees were set in 1992 and covered regions like Tyumen, Karelia (granted the right to use 90% of federal taxes collected on its territory in 1992-1994 for funding of its development fund) or Ingushetia (since 1994 businesses registered in this republic did not pay federal taxes).

government went down relatively quickly. While in 1993 about 30 regions declared plans to "withhold" the federal share in the tax revenue, not a single one really implemented them. In 1996 St. Petersburg was the only region withholding 20% of the land tax revenue. There were only few attempts of open "budgetary separatism" in the 1990s. After the crisis of 1998 several regions announced the decision to block the federal portion of the tax revenue, and the parliament of Kalmykia (one of the national republics in the Southern part of Russia) decided to stop payments to the federal budget, but quick and severe actions of the federal center (e.g. the Ministry of Finance stopped funding any federal programs on the Kalmykian territory) resulted in the abolition of this regulation. Moreover, the major advantages obtained by the regions in bilateral treaties were of non-fiscal nature – control over oil and gas exploration in Tatarstan and Bashkortostan (Tatneft, the Tatarstan's oil company, became one of the largest in Russia) or for the diamond industry in Sakha (the ALROSA holding). The first two treaties with Tatarstan and Bashkortostan allowed these republics to receive all royalties from the natural resources instead of the federal center. However, Sakha, the third region, was only able to enforce the special privileged regime to use part of the federal taxes collected on its territory for the funding of federal programs, i.e. a limitation was put rather on the expenditure than the revenue side of the budget. The later treaties either did not include any fiscal arrangements or were mostly based on the Sakha scheme. Some of them (e.g. Sverdlovsk) set a clear right of the regions to stop transferring taxes, if the federation does not follow its expenditures obligations. Hence, the search for further fiscal mechanisms of asymmetric devolution becomes important.

The political asymmetry in Russia went down in the 2000s under the new administration of Vladimir Putin. One of the first acts of the new president was to regain control over the federal political structures in regions (what was called "strengthening the vertical of power"): in 2000 seven new federal districts were established in which presidential representatives (mostly with a background in the military or security service) obtained the right to oversee the selection and placement of personnel in the local branches of federal authorities (Ross, 2003). Furthermore, the regional governors lost a significant part of their influence because of institutional changes (like the reform of the upper chamber of the Russian parliament, the Federal Council, or the right of the president to remove a governor from his office; see Hyde, 2001) accompanied by a strong public support for the new president. Meanwhile the degree of asymmetry between regions in tax distribution remained significant: Magadan was able to get about 98% of the whole tax revenue in 2003 and may be compared with the most "secessionist" republics of the early 1990s. Indeed, the standard deviation of retention rates increased significantly in the last six years (*Figure 1.3*). Therefore even the Putin period seems to be interesting from the point of view of this paper.

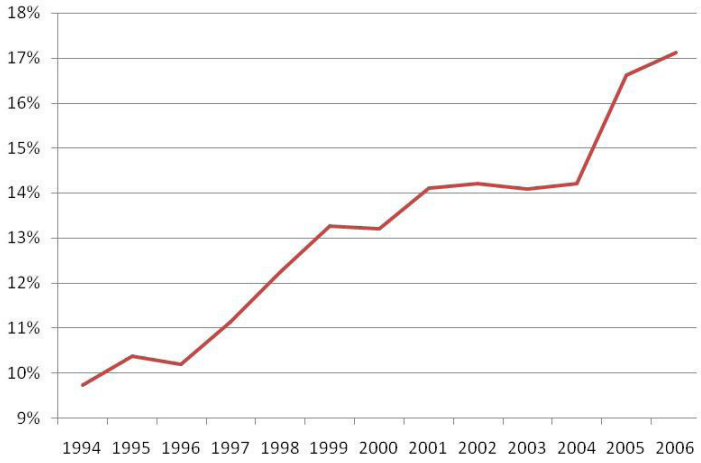

Figure 1.3: Standard deviation of the region's share in the tax revenue from its territory.
Source: Goskomstat, Ministry of Finance, Federal Tax Service, Federal Treasury, Freinkman, Treisman and Titov, 1999

1.3.2 Variation of political regimes in Russian regions

As discussed above,the variation of retention rates (and, as I will show in what follows, other decentralization indicators) makes the Russian asymmetric federalism a reasonable laboratory for studying endogenous decentralization and its mechanisms. However, Russia is also a clear case of variation of subnational political regimes. One could probably claim that the first differences in the structure of political systems in Russian regions occurred even before the transition started: in the Soviet Union several national republics were able to establish a de-facto higher autonomy in exchange for loyalty to the central government, which, however, did not intervene in the local political process. The collapse of the Soviet Union initiated a complex set of bargaining processes between the federal government and the regions and of internal conflicts within regions. And, as already mentioned, the first set of bargaining processes established the structure of asymmetric federalism, where regions achieved different degree of political autonomy, and a relatively weak federal center. Therefore - the second set of bargaining processes - individual regions received the opportunity to design their own political system independently as an outcome of internal power struggles. From mid-1990s all regional governors were elected by a popular vote (although several regions practiced direct elections even earlier, in spite of direct restrictions of the federal center). It increased the autonomy of regional political systems, but did not guarantee their democratic nature: regional elections could be easily manipulated by the authorities. Both formal and informal rules of elections also became subject to the bargaining process. Factors like

ethnic and economic legacies of the Soviet period, specifics of regional leadership and particular effects of economic transition for individual regions seem to have a profound impact on the paths of formation of political systems (Hale, 2003). Further factors like political culture, initial economic development and proximity to the EU could also have influenced the diversity of political systems in Russia (Obydenkova, 2007). The resulting differences often resembled those between independent states rather than regions of one country (Gel'man, 2008)

Gel'man (1999) provides a comprehensive review of the factors and driving forces of the development of regional political regimes. He basically confronts four scenarios of transition. In several regions a dominant actor was able to establish a near-monopoly and therefore create a quasi-authoritarian system similar to those of Central Asian countries or Belarus.[8] Other regions provide examples of an elite settlement based on a compromise of main conflicting groups over the crucial aspects of policy (Nizhniy Novgorod), while the competition between clans remained an important factor of regional politics (Sharafutdinova, 2007). Yet another outcome suggests that conflicting regional elites develop institutions to avoid the "winners takes all" outcomes (Udmurtia). The range of different political systems in Russia varied from the pluralist democracies (St. Petersburg) to autocracies and even "warlordism" (Primorski krai, see Kirkow, 1995). Regional elites maintained different degree of control over the media and over regional economies (which could also be used as an additional power source if present or weaken the incumbents if absent).[9]

To conclude, the formation of political systems in the Russian regions throughout the 1990s has been an outcome of the competition and conflict between several centers of influence: governor, regional legislature, heads of largest municipalities (e.g. capital of the region) and federal bureaucrats. Towards 1999-2000 these conflicts diminished significantly, and a political equilibrium was achieved (Turovskiy, 2003). It does not imply, that the incumbents could always win the elections (although there seems to be a trend to lower turnover of

[8]The most well-known examples of these groups are regions where the old Soviet elites maintained their dominance behind the new ideological facade. For example, in Tatarstan the leadership of the local Communist party was successful in shifting its power first to the Supreme Soviet (regional parliament), and then to the office of the regional president Mintimer Shaimiev, which than created a successful political machine dominating both regional and federal elections. In Bashkortostan the collapse of the Comunist party power caused competition between the Supreme Soviet and the regional government, ending up in the formation of a stable autocracy following that of Tatarstan. In other regions, like Mordovia or Mariy El, regional elites failed to consolidate their power in spite of attempts to catch up with Tatarstan (Matsuzato, 2004). On the other hand, in Kalmykia the newcomer Kirsan Ilyumzhinov successfully challenged the existing regional elites, only to establish his own version of regional authoritarianism with strict control over political processes and economic assets in the region.

[9]The variety of political systems reflected itself in the variety of formal institutions (although Russian politics diversity is much higher than that of formal structures): from presidential republics to parliamentary systems (Udmurtia, Khakassia) and more complex organizations with a governing council comprised of representatives of different ethnic groups (Dagestan) (Kozlov and Popov, 1999:185-194).

governors starting with 1999, see Nureev and Shulgin, 2006; Titkov, 2007), but rather means, that the structure of veto players and of the formal and informal rules governing the way (and the possibility) of power transition was set. The main factors influencing the political development of Russian regions in the 2000s became the activity of the federal center, trying to limit the degree of regional autonomy. Several measures of the federal sector (e.g. the introduction of the new federal act regulating regional elections in 2002, see Konitzer and Wegren, 2006) could indeed influence the political systems in different regions (though the ability of the federal center really determine the electoral outcomes remained relatively weak, see Chebankova, 2005). In fact, throughout this period the federal government focused rather on establishing control over the regional elites than on intervening in their internal politics.[10] However, these shocks either uniformly impacted all regions, or, more important, did not depend on economic performance of the regions.[11] Hence, regions still remained politically diverse, and their political systems were mostly inherited from the struggles of the 1990s (for details see Gel'man, 2008). Once again, there seems to be enough space for studying the theoretical problems discussed above in this empirical setting.

[10] Although some notable exceptions, like St. Petersburg, should also be mentioned.

[11] The Moscow Carnegie Center reported an index of democratization for individual Russian regions for the periods of 1991-2001 and 2000-2004 (which will be discussed in greater detail in the chapter 5). A simple correlation between the change of the democracy index of Carnegie Center from the 1990s to 2000s (difference between the new and the old index) and the gross regional product (GRP) per capita in 2000 yields insignificant correlation index of 0.256; the correlation between average growth rates and the change of democracy index is even smaller (-.0622). Moreover, the correlation between the old and the new index is 89 percent, suggesting a high persistence in the political organization of the regions. Nikolai Petrov (2005), who was responsible for the project of the democratization index for Russian regions implemented by Carnegie Center, notes that although there have been several changes between 1991-2001 and 2000-2004, they are mostly of "symbolic" nature.

Chapter 2

Constitutions, Regulations, and Taxes: Contradictions of Different Aspects of Decentralization

2.1 Introduction

One of the main problems for the empirical literature on decentralization, its driving forces and economic impacts, is that the decentralization is really difficult to measure. The traditional indicators like retention rates or subnational share of public expenditures have all been discussed and thoroughly criticized. There are at least two aspects able to cause trouble while brining the theory on fiscal federalism to the data. First, it is crucial to distinguish among the constitutional and the post-constitutional stages of decentralization. Allocation of authorities as specified in the fundamental acts of the federation does not necessarily map into the allocation of de-facto authorities and, even more, of fiscal flows. Second, at the post-constitutional level there is always a gap between the fiscal and the regulatory decentralization; since both aspects are crucially important for the performance of federations, any empirical approach ignoring one of them is likely to face problems while identifying the ceteris paribus effect of the devolution.[1] The aim of this chapter is to explicitly confront different concepts of decentralization using a single dataset. The objective is rather positive than normative: first, I try to establish a correlation between different aspects of decentralization, and second, look at the driving forces determining

[1] In this chapter (as well as throughout the thesis) I use the terms "devolution" and "decentralization" as synonyms, what is probably slightly sloppy if one looks at precise definitions applied in political science, but is reasonable for a study of an asymmetrically decentralized country.

the decentralization outcomes. From this point of view the chapter is also an exercise in empirical endogenous decentralization studies.

It is difficult to find a reasonable empirical playground for comparing dimensions of the decentralization, mostly because the decentralization beyond simple allocation of revenues and expenditures is very hard to measure. As already mentioned, this chapter takes advantage of the process of asymmetric devolution in the Russian Federation in the 1990s, and uses Russia as the laboratory for comparing different aspects of decentralization. Given the combination of high formal centralization in Russia with significant de-facto asymmetry, I use three proxies to measure the degree of devolution achieved by individual regions. First, a more traditional indicator of tax retention rates is applied to measure the degree of the *fiscal decentralization.* Second, I use the data of the Federal Register to obtain the share and the number of regional acts directly contradicting federal law, thus accounting for the *regulatory decentralization* on the post-constitutional level. Finally, I construct an index to obtain the degree of autonomy incorporated in regional constitutions (using their version as of in late 1990s), therefore measuring the *constitutional decentralization.*

The main finding of the chapter is that the fiscal decentralization, post-constitutional regulatory decentralization and decentralization incorporated in constitutions seem to be virtually unrelated to each other; moreover, different factors identified in the theory are at work for different aspects of decentralization. It is necessary to point out that it does not follow unambiguously from the theoretical reasoning that different dimensions of devolution should be correlated. On the one hand, different preferences and rents in different policy areas are likely to result in different levels of decentralization. On the other hand, correlation is likely to occur as a consequence of bargaining, where different aspects of decentralization become subject to package deals and therefore the outcomes turn out to be interdependent. The results of this paper, nevertheless, are relevant, first, because our knowledge of interrelation of dimensions of decentralization is extremely limited (and hence it is difficult to confront any theoretical result with reality), and second, because of somewhat simplistic treatment of decentralization in many empirical papers using just one "true" measure of decentralization. The latter could be justified if the dimensions of decentralization are correlated - so, an empirical investigation seems to be of interest.

The chapter is organized as follows. In the next section I discuss the problem of measuring the degree of decentralization in the literature. The third section presents different dimensions of decentralization and looks at their correlation. The fourth section focuses on determinants of endogenous decentralization in Russia and the econometric problems of the analysis. The fifth section reports the main results with respect to the driving forces of decentralization, and the last section concludes.

2.2 Measuring the degree of decentralization

Since decentralization seems to be one of the main concepts for economic and political reforms in both developing and developed countries, there exists a multitude of intersecting and diverging theoretical and empirical concepts for measuring decentralization, often applied as "proxies" for one another (Sharma, 2006). To start with, the main problem of the literature is actually not the choice between the "centralized" and the "decentralized" government, but rather between the *political,* or *constitutional* (which in turn may refer to the autonomy of decision-making, autonomous appointment of governments and their ability to participate in federal decision-making), and the *administrative* (which mostly refers to the construction of public administration, i.e. deconcentration of bureaucracy) decentralization (Hutchcroft, 2001; Ali, 2002; Schneider, 2003). For a large country (in terms of population or territory) the administrative decentralization is unavoidable and undisputable simply because of technical reasons of governability. Hence, the question for the optimal degree of decentralization usually refers to the decision-making autonomy of regional governments (although a world with agency problems and power asymmetries administrative decentralization may "turn into" the political autonomy of regional governments through the informal migration of authority).

A further distinction should be made, as already noticed, between the (already defined) *constitutional* decentralization and the *post-constitutional* decentralization. The post-constitutional decentralization reflects the *outcomes* of the political process, once the constitutional rules are set, rather than the rules themselves. The distinction is particularly simple in the fiscal matters: the constitutional decentralization implies the right of regions to independently decide on revenues and expenditures of their budgets; the post-constitutional decentralization, however, means just the allocation of funds between center and regions. In countries like Germany regions receive a substantial portion of the tax revenue, but have virtually no right to decide on the bases and the rates for taxes (which are then federal or joint responsibility). In what follows *fiscal decentralization* refers exclusively to these post-constitutional outcomes (as it is the case in almost all empirical studies, though not all of them acknowledge it). The situation is slightly more complicated, if one looks at the regulations. The constitutional decentralization, once again, means the allocation of decision-making rights on standards and norms for the economic activity. However, this allocation may be different from the "real" significance of regional and federal regulations for economic agents. For example, it is possible that one of the parties (either center or states) is more active in filling their "regulatory niche" with acts and norms, than the other. Once again, *regulatory decentralization* in this paper refers to the post-constitutional "relative importance" of the federal and the regional law for economic agents. Obviously, it is a vague concept, which I will, however, operationalize in what follows.

This chapter therefore looks at three concepts of decentralization: constitu-

tional and two post-constitutional (regulatory and fiscal[2]) dimensions of devolution. The literature often attempts to combine the constitutional and the post-constitutional analysis constructing a measure incorporating both (more simply accessible) outcomes of regulation and (more problematic) allocation of authorities; it may, however, be reasonable, if possible, to look at these issues separately. The constitutional level is usually more stable, than the post-constitutional outcomes, although in the developing countries it may also become quite volatile and even determined by individual personnel decisions (and then the same post-constitutional allocation survives a sequence of changing constitutional rules). The list of the post-constitutional dimensions may be expanded to include further aspects of governance (say, the allocation of personnel between levels of political system, cf. Treisman, 2002); however, even measuring three main dimensions of devolution is a non-trivial task.

The literature on *fiscal decentralization* usually relies on indicators like share of subnational (tax) revenues and / or expenditures, which are, in spite of common usage, also very often criticized both because of measurement problems (impact of tax and non-tax revenues, spatial allocation of federal expenditures, influence of interbudgetary transfers) and especially because they ignore the degree of autonomy (i.e. constitutional decentralization) in the decision-making with respect to fiscal matters (Ebel and Yilmaz, 2002). Hence, there have been a number of attempts to correct the data incorporating the degree of fiscal autonomy in the analysis (Stegarescu, 2005). The *regulatory* decentralization is obviously much harder to measure, since the variety of policy aspects to be considered may be huge. On the other hand, it is also more difficult to come to data for the international analysis, and the intranational variation may be insufficient. Hence, scholars usually focus on specific aspects of regulation providing a suitable basis for the analysis. For example, Strumpf and Oberholzer-Gee (2002) test the impact of preference heterogeneity on decentralization by studying the liquor control rules in the U.S. municipalities. Traub and Sigman (2007) examine the "voluntary decentralization" in the area of several health and safety laws in the United States.

The *constitutional* decentralization has been subject to a great variety of studies. The most popular approach is to construct an index, incorporating several aspects of decentralization as well as may be several outcome measures. Marks et al. (2008) provide a comprehensive review of these indices (as well as construct their own one). An alternative could be to measure the actual policy interconnection between different levels of government. Sheng (2007) studies the biographies of party secretaries in China to understand the logic of political decentralization, and Landry (2004) looks at the tenure duration and promotion patterns of local officials as response to formal decentralization. Finally, special political situations may provide source for analysis of constitutional decentral-

[2]The concepts may be similar to fiscal and regulatory interjurisdictional competition (Oates, 2002).

ization. For example, Hennessey (2008) discusses a specific experiment of home rule establishment for American municipalities.

In spite of the obvious importance of the topic, the literature explicitly comparing different dimensions of decentralization is very small (Treisman, 2002; Schneider, 2003; Blume and Voigt, 2008) and focuses only on international comparisons. A related analysis is done by Liu (2007), who performs a cluster analysis of different dimensions of decentralization in order to identify the typical combinations empirically observed, and Falleti (2004) in a case study of Latin American countries, who investigates the dynamic interaction of different aspects of decentralization. Finally, Treisman (2002) and Blume and Voigt (2008) look at the correlation of different forms of decentralization and socioeconomic and political country characteristics, including country size, ethnic division, colonial origin, economic development and level of democracy. However, data compatibility across nations adds an additional dimension to the measurement problem. Hence it is reasonable to look at different dimensions of decentralization and their origin using the *intra-national* variation of decentralization, which, however, to my knowledge have never been considered empirically before.

Once the subnational variation in taken into account, a further distinction should be made. First, one can focus on the decentralization *within* subnational units, if they are different enough. For example, Feld et al. (2008) perform an analysis of fiscal decentralization *within* the cantons of Switzerland, using the extreme heterogeneity of their financial constitutions. Second, however, one can benefit from existence of asymmetric federations and look at the variation of degree of devolution achieved by *each region* versus the central government. This chapter, as discussed, follows the second path.

2.3 Dimensions of decentralization in Russia

2.3.1 Measuring decentralization in Russia

As already mentioned, this paper looks at three dimensions of decentralization in Russia. The *fiscal decentralization* is measured by the traditional variable of tax retention rate (share of regional government in the overall tax revenue collected from its territory). Although the data is published by the Federal Statistical Authority (Goskomstat) on the annual basis, in order to ensure compatibility with other data, which are available only in a cross-section, I take the average over 1995-1999 (with 1995 being the first year after the reform of the federalism in 1994, establishing the existing system of interbudgetary relations in Russia, and 1999 being the last year of the Yeltsin's presidency before the re-centralization attempts under Putin started). The panel data opportunities for this dimension of decentralization are explored in the next chapter.

A unique advantage of the Russian dataset is that one can use a specific mea-

sure for the *regulatory decentralization* encompassing multiple dimensions of economic regulation. As already mentioned, the regional legislation in the late Yeltsin period included a large number of significant contradictions to the federal law. Although the federal law existed, regional courts and regional police, captured by the local governments, usually enforced the local law – so, the federal acts simply did not matter for economic agents. After the start of the Putin's presidency, one of the first steps of the new government was to revise the regional law in order to ensure the predominance of the federal legislation. As part of this effort, the Ministry of Justice established the so-called Federal Register (*federal'nyi registr*), or catalogue of regional acts (both of the legislatures and of executive bodies, but incorporating legal norms) in power at that moment. The acts included in the Register should pass an examination by the expert commission established by the Ministry of Justice, which determines their compatibility with the federal law. As a result, a statement is published, which is then included in the file in the Federal Register as well. The acts contradicting federal law should be abolished or changed; however the file in the Register remains, even if the act is not valid any more. Although originally the Register was unable to cover all regional acts (a revision process certainly takes time), after several years one can be sure that most acts passed by the regions were included in the Register.

I use the Register statistics as published by the Ministry of Justice on December 31, 2006 and calculate two indicators. First, I take *the share of acts, which were assessed as contradicting the federal law, in the total number of acts for which an expert opinion is present* (which is, as one should mention, smaller, than the overall number of acts included in the Register), as indicator of the degree of regulatory devolution achieved by a particular region. In order to understand this variable, one should recall, that *de-jure* the Russian Federation has been an extremely centralized political entity in terms of regulatory authorities, mostly vested in the central government. However, due to its weakness regions basically received the option to "re-design" the federal law simply by making their own acts. Hence, if the share of these acts is high, the regions have "re-designed" the federal legislation to a greater extent and the central regulations matters less for economic agents. In theory, higher decentralization implies that the regional government makes *different* law than the federal one (of course, in certain settings both governments produce identical policies – but then the debate on decentralization is economically meaningless). If the share of contradicting acts is high, it means that the regional policies are really different (and, in particular, "more different" than for the regions with low share) from the federal standards, and hence, regions achieved substantial degree of devolution.

This measure may, however, face two problems. First, it may be too small because of the acts passed after 2001 in the Putin's period (when the war of laws was reduced significantly) and included in the Register. A solution were to take an earlier date for the Register; but in this case one runs into a problem of

potentially neglected "old" acts, which may be still under revision. Second, it is possible that the acts are more likely to be passed in general if the region is willing to violate the federal law: if it does not desire it, it just remains silent over a certain area of regulation, which is then covered by the federal acts. Hence, I also use the *total number of acts* contradicting the federal law as a proxy for the regulatory decentralization. As shown below, both values are significantly correlated, but it is still necessary to look at both to establish the robustness of the results.

The devolution at the constitutional level in Russia is, as usually, a relatively tricky part for an empirical study. There is a certain literature addressing this problem by examining the reasons for establishment and for the duration of power-sharing agreements (Dusseault et al., 2005; Söderlund, 2006; Obydenkova, 2008). Obviously, the existence of a power-sharing agreement may be treated as an indicator for higher constitutional devolution. However, there is no research looking at the content of the treaties.[3] This chapter does apply a different measure of constitutional decentralization, looking directly at the content of the *regional constitutions.* In the Soviet times, all union and autonomous republics already obtained a constitution, mostly built according to the same scheme. After the collapse of the USSR, most republics adopted new constitutions. Moreover, other regions (without the status of republics) also passed their articles (*ustav*). The constitutions were quite similar in terms of guarantees and rights declared to their citizens (and hence, there is no variation in their socio-economic content, unlike in case of, say, OECD constitutions, see Ben-Bassat and Dahan, 2008), with may be the only exception of the agricultural land private property. However, they varied quite substantially in terms of the design of political system and also the distribution of power between the federal government and the region. It is particularly true for the constitutions of 20 republics,[4] since articles of other regions were more homogenous (although also partly incompatible with the federal law). I use six main dimensions of divergence in term of center-region relations for the republican constitutions (as they were valid in 1999) in order to construct the index. The dimensions include (see also Bartsiz, 2001):

- property on the the natural resources (regions, in spite of the federal regulation, declare natural resources – mostly mineral – their possession or take over the right to regulate the resources access regime);
- international agreements (regions, in spite of the federal regulation, declare their right to sign the international agreements with other countries independently from the Russian Federation);

[3] Although, as discussed in the Introduction, the content of the treaties was not identical (Martinez-Vazquez, 2002), the degree of autonomy can be reasonably approximated by the duration of the agreement. As already mentioned, in the earlier treaties the powers of regions were mostly larger, as specified in later treaties, when the very procedure and structure of a treaty was standardized (Boltenkova, 1998; Kurnyshov, 1998; Solnick, 2002).

[4] There are 21 republics in the Russian Federation, but Chechnya is excluded from analysis given the lack of somehow reliable data.

- state of emergency (the region takes over the right to declare the state of emergency, or restricts the right of the federation to declare the state of emergency on its territory);
- restrictions on regional branches of federal government (this feature applies basically to one region, Dagestan, which restricts the right of federal agencies to establish their local branches on its territory by requiring a special agreement);
- restrictions on validity of federal acts (the region requires federal acts to be ratified by the regional legislature; declares its right to (temporary) put federal law out of action; declares the priority of regional law at least in the area of shared responsibility of the federation and the region and / or reserves the right to take over the federal responsibilities if the federation does not implement them) and
- special regime of interbudgetary relations (Bashkortostan and Sakha reserve their right to determine the share of the federation in the over tax revenue from the region; Tyva maintains its own customs service).

Naturally, many of these provisions have never been implemented in practice. But it is exactly what this chapter intends to test: is there any relation between "higher autonomy" declared in the constitution and the outcomes of the decentralization process as measured by the fiscal and regulatory decentralization? I construct the index as follows: the region with respective provision receives 1, otherwise 0. Hence, the index may vary from 6 (all provisions contradicting federal law implemented) to 0 (no provisions implemented). The components of the index are reported in the *Appendix B.1.*

Obviously, all three indicators applied in this chapter are far from being perfect. The problem of the fiscal decentralization is that formal indicators of tax structure do not cover a high variety of financial flows between the center and the regions and between the regions and the economic actors (e.g. non-monetary transactions, barter, and redistribution of property rights, see Eckardt, 2002). Even despite the relatively high centralization in the field of taxation, regional governments still have sufficient additional powers via related business groups and banks etc (Rosefielde and Vennikova, 2004). Moreover, the use of parafiscal funds was quite common in the 1990s.[5] Put it differently, tax retention rates may have little in common with the actual ability to produce public goods. The indicator of regulatory decentralization may be distorted by the fact, that federal controllers of the Ministry of Justice were not entirely impartial in terms of

[5]For example, in Kalmykia, one of the Russian republics in the Southern region, companies after registration paid a special "registration fee" to a so-called "Fund of Presidential Programs". Even in the modern Russia, where the degree of federal control over these schemes is significantly higher, regional governments have enough opportunities to let the businesses "voluntary" pay for some regional projects, creating an additional tax, which is not covered by official statistics.

Table 2.1: Correlation of different aspects of decentralization

	Fiscal	Regulatory (share)	Regulatory (number)	Constitutional
Fiscal	1			
Regulatory (share)	-0.020 (0.852)	1		
Regulatory (number)	0.071 (0.513)	0.686*** (0.000)	1	
Constitutional	0.170 (0.475)	0.087 (0.715)	0.084 (0.724)	1

Notes: numbers in parenthesis are p-values. *** significant at 1% level.

allocating their effort among regions (though a relatively late data of the Federal Register status employed here should guarantee that all regions have had enough time to be thoroughly controlled) and the decisions on compatibility with the federal law. Finally, the constitutions discussed rarely address directly the issues of fiscal and regulatory decentralization; the index applied is rather an indirect measure. Nevertheless, the status of the data is still better than in most other cases, and hence one can at least try to establish statistical regularities in terms of interrelation between different aspects of decentralization.

2.3.2 Interrelation of dimensions of decentralization

The first problem to be considered in the framework of this chapter is whether different dimensions of decentralization are related to each other. *Table 2.1* reports simple pairwise correlations between four indicators used in this chapter. First of all, one can see that there is virtually no correlation between different aspects of decentralization. The same holds if other control variables are taken into account. Hence, one can conclude, that different aspects of decentralization process in one country, based on interaction of identical agents with (obviously) identical preferences, result into different outcomes.

However, the absence of correlation is to a certain extent an outcome of outliers – individual regions with strong deviation from the common trend. For example, excluding Ingushetia, Kalmykia, Altai Republic and Taimyr from the sample, one obtains significant positive correlation between fiscal and regulatory (share) decentralization (see *Figures 2.1* and *2.2*).[6] For the regulatory decentralization measured by the *number* of negative conclusions of the experts of the Ministry of Justice, the result is robust to outliers, and it is obviously difficult to carry out this analysis for constitutional decentralization, which is an

[6]Three regions mentioned belong to the so-called "tax havens", i.e. regions pursuing an internal offshore strategy in order to attract capital, partly due to abovementioned special regulations. Taimyr is a difficult case from the point of view of the fiscal decentralization; the tax revenue is strongly dependent upon the activity of the largest company, *Norilski Nikel,* which has actively implemented tax optimization schemes (for example, in 2000 and 2001 the activity of this company from the point of view of VAT optimization effectively led to *negative* tax revenue of the regional budget).

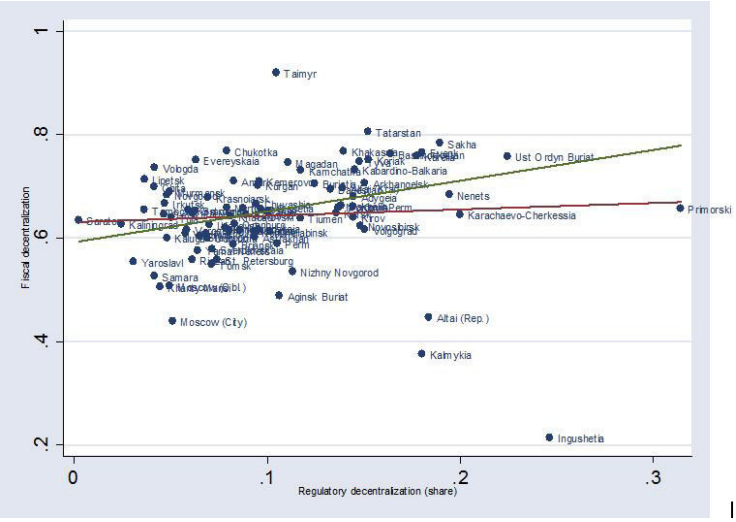

Figure 2.1: Correlation of decentralization indices; red line - total sample, green line - excluding four outliers

ordered variable. Nevertheless, even if it is the outliers which drive the absence of decentralization, it still does not change the fact, that different aspects of the decentralization process follow different paths.

2.4 Endogenous decentralization in Russia: data and empirical strategy

2.4.1 Factors of decentralization

Although so far I have focused on measuring decentralization in Russia, the aim of this exercise is to empirically identify the factors determining the degree of devolution achieved by individual regions according to different dimensions. From this point of view it is necessary to identify the variables able to serve as proxies for the main theoretical factors of devolution. Simplifying a lot, one could probably distinguish among five main hypotheses regarding the process of decentralization. First, the decentralization depends upon the trade-off between preference heterogeneity (or other forms of heterogeneity, which may be easier to measure, like income) and benefits from centralized public goods provision and insurance (Alesina and Spolaore, 2003). For an asymmetric federation it basically implies that regions with higher "preference distance" from the rest of the country are likely to be more decentralized. Second, the federations design specific redistribution schemes between regions, which may influence the resulting demand for decentralization (on both rule and policy level) (Buchanan and Faith, 1987). Third, the decentralization may result from the rules (both

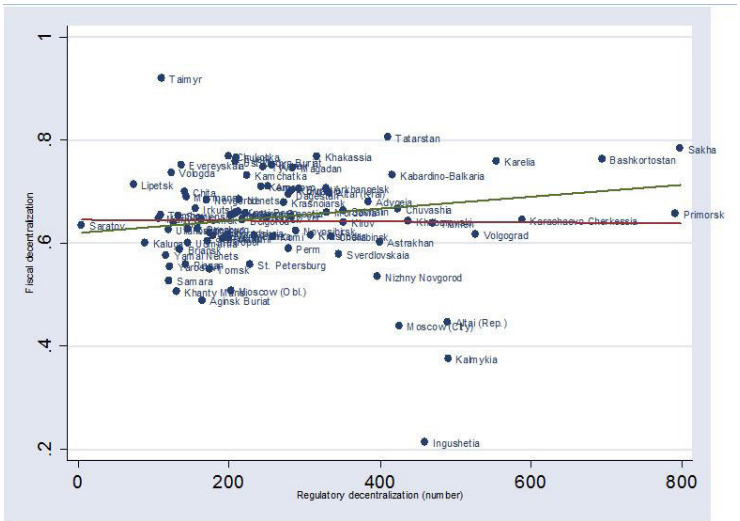

Figure 2.2: Correlation of decentralization indices; red line - total sample, green line - excluding four outliers

written and unwritten) regulating the bargaining process between the federal government and the regions and from the relative bargaining power of the parties (Filippov et al., 2004). Fourth, the political system (dictatorship vs. democracy; parliament vs. referendum; presidential vs. parliamentary republic) can be important for determining the structure of the decentralization (Feld et al., 2010; see also *Chapter 4*). Fifth, the outcome of decentralization may be impacted by interest groups on federal and regional level (Ruta, 2007). One should, however, not forget that the decentralization may simply result from the persistence in policies and politics, and hence, be outcome of the path dependence. Thus it is necessary for find variables to measure all factors mentioned above in the particular case of the Russian asymmetric federalism:

Bargaining power: First, it is reasonable to assume that bargaining power is related to the region's economic endowment. I apply four indicators to measure these factors: territory, population, average income per capita and share of oil and gas extraction (particularly important for Russia). The choice of variables seems to be relatively straightforward given the economic structure of Russia and availability of data. Second, the bargaining power could come from the region's ability to secede, which seems to play an important role in the design of the Russian federalism in the 1990s (Dombrovsky, 2006). This effect is captured by two variables: dummy for border region and geographical distance between regional capital and Moscow. Third, one more variable in this selection may be share of urban population (higher bargaining power of metropolitan areas), which, however, may also reflect preference heterogeneity.

Bargaining rules: The main problem for measuring this indicator is that Russia at least formally is characterized by a uniform political system. Nevertheless, I use the following proxies: (1) formal status of the region – dummy for republics and dummy for autonomous okrugs; (2) dummy for power-sharing agreements (though this variable is particularly problematic due to the endogeneity problem - power-sharing agreements are both result and consequences of bargaining) and (3) degree of tensions between the federal center and the region: I use the MFK Renaissance and the Russian Union of Industrialists and Entrepreneurs RUIE indices of tensions to account for this effect.[7]

Preferences: In a semi-authoritarian country like Russia in the 1990s the impact of public preferences may be significant, but should not be over-estimated. Gel'man and Popova (2003) describe the differences of preferences in terms of "market for symbolic goods", where regional governments act as the "supply side" and play the crucial role. I use three variables to measure potential differences in preferences: (1) the preference difference may result from the ethnic composition of the region, which is measured by the share of ethnically Russian population[8] and (2) the "distance" of the average income per capita in the region from the average over the whole Russian Federation.

Political institutions: Since Russian regions are characterized by a wide variety of political arrangements, it is also reasonable to look at specifics of regional politics. I look at two indicators: (1) the level of democratization, estimated by an index of Carnegie Center, which I will discuss in details in *Chapter 5* and (2) the power concentration within the office of the the regional governors (there are three indices available for the Yeltsin period: Jarocinska (2004), RUIE and Urban Institute (UI)).

Redistribution: The most obvious way to capture this effect is to include a measure of the federal transfers in the regressions, although one, once again, may run into significant endogeneity problem.

Lobbying is measured by the index of regulatory capture, developed by Slinko, Yakovlev and Zhuravskaya (2005). Since the lobbying activity in Russia is mostly intransparent, it is hardly possible to cover it with other variables.

[7] It may seem to be strange to include bargaining rules in the analysis, if one recalls that in Russia unilateral devolution often implied direct violations of federal law. However, even in these cases, the desire of regions to ignore federal legislation depends on the "costs" and the "benefits" of autonomy, which, in turn, may be functions of bargaining rules. Or, stated otherwise, rules of the higher order explain why actors ignore or follow rules of the lower order.

[8] For the Russian Federation this indicator makes more sense than, say, religion or language. First, in Russia the ethnic identification is very important, partly because it was enforced through the government for the last eight decades – from the establishment of national republics by the Communist Party to the requirements to put ethnic origin (nacional'nost) in passports abolished only recently. Second, religious and linguistic self-identification is usually highly correlated with ethnicity (of course, there are deeper differences like more or less "active" participation in the religious affairs, or degree of command of a language, but they are also much more problematic to measure).

Path dependence could be most simply measured by the status of the region (for the period of the mature Russian federalism after adoption of the constitution in 1993). Hence, significant results for dummy republic and dummy autonomous region have a double interpretation in terms of rules of bargaining and path dependence. However, for this study I use a specific indicator of declarations of regional elites (based on event count by Dowley (1998) for the early 1990s[9]). The declarations of the first year of independence seem to be a good proxy for the orientation of the regional elites, which could be preserved in the future.

The variables of bargaining power, bargaining rules and preferences are expected to have a positive sign, i.e. increase the degree of devolution; the variables of redistribution, on the contrary, should have a negative sign, decreasing the desire of the region to achieve higher autonomy. It is difficult to make predictions for political institutions and lobbying, since the literature is inconclusive. Moreover, the path dependence variable is likely to have a positive sign, since the active declarations of regions in the early 1990s could in fact map into higher devolution. Details on the data are reported in *Appendix B.1.*

One can immediately see that this broad selection of variables faces three problems: multicollinearity, endogeneity and measurement error. On the one hand, many of the variables are highly correlated with each other, partly by construction (i.e. tension indices include the existence of power-sharing agreements; power indices include natural resources etc.). The problem of collinearity is especially important for the income per capita and distance from the average income per capita (although one should notice, that the second is not a linear transformation of the first; so, collinearity is not perfect). It is also acute for dummies republic / autonomous region and the share of Russians (since the autonomous territories are in fact per construction of the Soviet territorial design regions where the share of Russians is usually smaller).

The endogeneity problem is always present in research on endogenous decentralization. For Russia the situation is ambiguous. On the one hand, one can disregard several "traditional" dimensions of endogeneity like the mobility of population (as a factor influencing both ethnic composition and population size), partly because of short time horizon of the analysis, but partly because of the Russian specifics (like low population migration). However, there are also dimensions where endogeneity may become of greater importance; in particular, it is true for "bargaining rules" variables like power sharing treaties and fiscal transfers. The decision to establish a power sharing treaty (usually resulting from a long bargaining period) and the decision to manipulate federal

[9]This variable does *not* represent the *current* power and aspirations of governor, first, because of the time lag, and second, because of the shift to less public political environment in the second half of the 1990s (as opposed to the early period of Russian post-Communist evolution).

law / introduce a regional constitution with strong degree of devolution could be made simultaneously; retention rates obviously depend on federal transfers, if one takes the effect on tax effort into account. Finally, the problem may be even greater because of time-invariant dependent variables, which prevent me from exploiting the time variation of controls. In several cases (constitutional decentralization, existence of power-sharing agreement) I just "fixed" a particular moment in time, when the variables were measured, what is, of course, a huge simplification, which is unavoidable given the quality of data.

Finally, measurement errors are particularly important for what one may call "expert opinion" variables: democratization, tensions, lobbying, declarations of regional elites, but also power sharing treaties (the point is that in Russia the existence and the structure of treaties were often not disclosed or only partly disclosed; so, the variable capturing only the "main" treaties may simply lose too much information). One should notice, that the "expert opinion" variables are particularly problematic from the point of view of the endogeneity and multicollinearity problems as well.

2.4.2 Econometric strategy

I attempt to partly fix these problems by using the following procedure. In the first step I estimate the "basic" specification, which does not include "expert opinion" variables. Since most decentralization indicators do not vary over time, I estimate a cross-section for 88 Russian regions (i.e. all regions including Chechnya) and average time-varying variables over 1995-1999. The choice of the period is, as already mentioned, straightforward: the reforms of 1994 established the basic structure of the modern Russian federalism, and in 2000 the reforms of Putin significantly reduced the ability of regions for asymmetric devolution (for example, the regional legislation and constitutions were standardized according to the federal law).

For the fiscal decentralization and the share of negative conclusions to all conclusions as indicator of the regulatory decentralization the simple OLS could be applied. The number of negative conclusions is a count variable, and hence a Poisson or a negative binomial model should be applied. Because the data are characterized by overdispersion, I estimate the negative binomial model (although I have also estimated the Poisson model and did not find any significant differences). Finally, constitutional decentralization is measured by a discrete ordered variable. A usual approach to estimate is the ordered logit. In order to solve the multicollinearity problem, I estimate two "basic" specifications for each dimension of decentralization: with distance from average income and with average income per capita. I also exclude the share of Russians at this stage, since it is highly collinear with the dummy republic, in all six regressions.[10] In

[10]It is an interesting question whether it makes more sense to include the share of Russians or dummies autonomous okrug and republic in the analysis. From the theoretical point of view the share of Russians is easier to explain, because the link to the preference heterogeneity is

the regressions for the constitutional decentralization the share of Russians is still included to control for potential effect of ethnic heterogeneity *within the sample* of national republics, which, as I will show, is indeed significant.[11] For the fiscal decentralization I also include two variables measuring the structure of the tax base, since the composition of tax revenue may as well have an impact on the outcome (as it is discussed in the next chapter): the volume of retail trade and net profits of the enterprises.

The next step aims to look at the measurement error and multicollinearity problems more closely. First, I re-estimate the regressions by varying the sets of controls and also by adding the "expert opinion" variables one by one. In this case I am rather interested in the robust results, which keep constant over different specifications, than in the analysis of each individual specification. Second, as a "limiting case" for this analysis I take a completely agnostic view on the validity of variables and theories and perform an extreme bounds analysis. Obviously, for the extremely small sample of constitutional decentralization these experiments are limited in terms of selection of variables simultaneously included in regressions; it is inevitable, but, of course, means that I may have lost the "precisely correct" specification in my estimates.

The third step of the analysis finally focuses on the endogeneity problem. It is important to notice, that an unambiguous solution of this issue is hardly possible in the framework of this study. First of all, there is no clear set of "hypothesis-driven" variables extended by a set of controls. In fact, almost all variables I use (with the exception of tax base variables for fiscal decentralization) are driven by hypotheses. Hence, however, one requires a large list of instruments to achieve at least exact identification in the first stage - a task certainly beyond any reasonable research exercise. Moreover, cross-sectional data with relatively small sample exacerbate the problem of low efficiency of IV estimator. Hence, what I am doing in what follows is in fact only a partial solution: I restrict my attention to results, which remain robust at the second step of the econometric strategy; therefore I ignore the problem of endogenous controls (the usual way to deal with this issue – exclusion of potential endogenous controls and analysis of robustness of results with and without them – is per construction performed at the second step). As I will show, most of the "suspicious" variables actually turn out to be insignificant, thus "resolving" me from the endogeneity problem, so, part of the problem disappears "by default", although the cautious

obvious. However, for the Russian Federation it seems more suitable to focus on institutional variables. First, the effect of ethnic composition of the population on policies in the short run automatically goes *through the specifics of political institutions* - in this case, republican status. Second, since Russia is a semi-autocracy at best, public preferences may be less important than the preferences of political elites – and for the latter republican status is very important (cf. Obydenkova, 2008). Finally, since the status of a republic was usually granted by the Soviet government (all current republics were either republics or autonomous oblast in the RSFSR), it is not subject to reverse causality problem.

[11] I have also estimated respective specification for other dimensions of decentralization, but did not find any significant results for the share of Russians.

interpretation of the results is necessary. There are also cases when two-stage estimation techniques are required. Of course, in this situation the results are based on "hope" that the omitted variable bias through the exclusion of endogenous controls and the bias from reverse causality from endogenous controls do not run in the same direction (and hence the results become not robust in these two settings). Hence, the results of this paper in terms of endogeneity analysis should be treated with great caution.

2.5 Endogeous decentralization in Russia: results

2.5.1 Basic results

As the first step in the analysis I consider the "basic" specifications without "expert opinion" variables". The results are reported in *Table 2.2*. As usually, for the OLS specifications I check the distribution of residuals using the Jarque-Bera test; if it is significant, I estimate regression after exclusion of outliers until the test becomes insignificant. A reasonable interpretation is possible only for results, which are robust to this modification. However, the omission of outliers has virtually no effect on the outcomes of the estimations.

There are several results interesting from the point of view of the theoretical predictions. The *fiscal decentralization* (specifications (1) and (2)) seems to be particularly driven by the bargaining factors; especially regions with large territory and large distance from Moscow are likely to have higher retention rates. Interestingly enough, though the income per capita is insignificant, the distance from average income has a significant negative impact on the degree of devolution in fiscal area. This is a surprising result, since it means that regions with higher preference distance are likely to have lower retention rates. One possible interpretation could be that not only the size of the distance, but also its sign matters: relatively poor and relatively rich regions have different expectations towards federation. However, replacing the measure of distance by the simple difference between average income in the federation and the regional income yields insignificant results. Hence both too large and too poor regions accept lower retention rates. It is obvious that for poor regions lower retention rates may be associated with expectation of higher redistribution through the federation.[12] It is however more problematic for rich regions. Yet another explanation could be the desire of the federal government to control rich regions and to limit their autonomy – logic similar to the appointment policy of Chinese government (see Sheng, 2007).

[12] Although fiscal transfers are not significant in the specification in this chapter, they are in a panel data setting discussed in *Chapter 3*.

Table 2.2: Factors of decentralization, 1995-1999, dep. var.: regulatory, fiscal and constitutional decentralization

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) Negative binomial	(6) Negative binomial	(7) Ordered logit	(8) Ordered logit
	Fiscal	Fiscal	Regulatory (share)	Regulatory (share)	Regulatory (number)	Regulatory (number)	Constitutional	Constitutional
Territory	**0.051****	**0.051*****	0.002	0	0.129	0.119	8.957	6.247
	(0.020)	**-0.017**	(0.012)	(0.012)	(0.085)	(0.086)	(8.482)	(9.804)
Population	-0.01	-0.014	0.005	0.005	**0.140*****	**0.140*****	1.378	2.044
	(0.011)	(0.010)	(0.003)	(0.003)	**(0.035)**	**(0.035)**	(0.867)	(1.775)
Oil and gas	0.015	0.159	0.042	0.041	0.46	0.442	95.876	124.153
	(0.180)	(0.132)	(0.04)	(0.036)	(0.307)	(0.286)	(143.094)	(172.252)
Income per capita	-0.042		-0.019		-0.087		1.84	
	(0.043)		(0.012)		(0.091)		(6.492)	
Distance from average income		**-0.102****		-0.019		-0.082		13.23
		(0.046)		(0.013)		(0.094)		(19.367)
Dummy autonomous okrug	0.09	**0.123***	**0.043***	0.039	-0.188	-0.213		
	(0.071)	**(0.066)**	**(0.025)**	(0.025)	(0.199)	(0.201)		
Dummy republic	0.028	0.038	**0.053*****	**0.053*****	**0.581*****	**0.579*****		
	(0.030)	(0.027)	**(0.012)**	**(0.012)**	**(0.120)**	**(0.121)**		
Distance from Moscow	**0.010****	**0.009****	**0.006***	**0.006***	**0.057****	**0.053****	0.837	1.364
	(0.005)	**(0.004)**	**(0.004)**	**(0.003)**	**(0.023)**	**(0.022)**	(0.726)	(1.754)
Dummy border region	0.024	0.024	0.006	0.006	0.065	0.066	-1.857	-2.453
	(0.022)	(0.021)	(0.010)	(0.010)	(0.103)	(0.102)	(2.694)	(4.226)
Share of Russians							**-13.396****	-10.592
							(6.583)	(7.801)
Urbanization	1.134	1.312	-0.636	**-0.765***	-2.44	-3.175	**212.057***	281.125
	(1.109)	(1.062)	(0.472)	**(0.454)**	(4.135)	(4.038)	**(113.072)**	(185.913)
Fiscal transfers	-0.14	-0.106	-0.003	0.009	0.154	0.205	**17.297***	21.011
	(0.104)	(0.104)	(0.039)	(0.040)	(0.415)	(0.429)	**(9.758)**	(19.225)
Retail trade	0	0.001						
	(0.001)	(0.001)						
Net profit	-0.004	**-0.004****						
	(0.003)	**(0.002)**						
Constant	0.597***	0.583***	0.116***	0.117***	5.173***	5.185***		
	(0.083)	(0.086)	(0.036)	(0.037)	(0.368)	(0.382)		
Observations	**88**	**88**	**88**	**88**	**88**	**88**	**20**	**20**
Pseudo R^2					**0.037**	**0.037**	**0.49**	**0.503**
R^2	**0.277**	**0.321**	**0.407**	**0.404**				
F-stat	**10.57*****	**9.90*****	**7.53*****	**8.10*****				
Wald Chi-stat					**90.61*****	**91.28*****	**26.08*****	**36.63*****
J.-B. test	**195.3*****	**134.3*****	**56.37*****	**63.15*****				
LR proportional odds test							**32.28**	**31.44**

Notes: numbers in parenthesis are standard errors. * significant at 10% level, ** significant at 5% level, *** significant at 1% level. Robust standard errors applied. For the analysis of outliers see Appendix B.2.

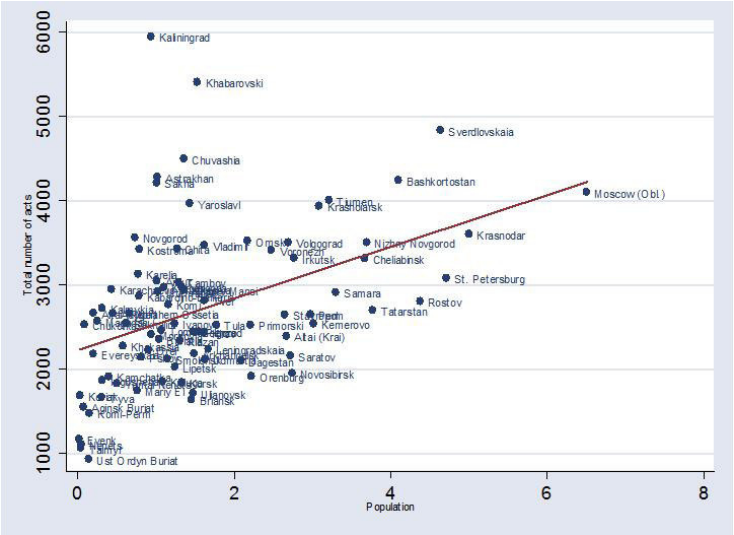

Figure 2.3: Population and total number of acts assessed by the Ministry of Justice in the Federal Register

For the *regulatory decentralization* (specifications (3) and (4)) results for the specification with number and with share of negative conclusions vary slightly. First, one finds a strong and significant effect of the rules of bargaining / path dependence factors: republics are on average able to achieve higher degree of devolution, although I was unable to find any effect of the republic status for fiscal decentralization. Distance from Moscow is also significant and positive, but it is partly non-robust to outliers (for share, but not for number of negative conclusions).[13] Moreover, regions with larger population seem to have higher number of violations; for the share of violations results are non-robust to specification. However, population seems to be highly correlated with number of acts issued and assessed (because, say, large regions issue more acts or the Ministry paid more attention to large regions; see also *Figure 2.3*[14]), so the result can come from this feature.

The estimations for the *constitutional decentralization* (specifications (5) and (6)) are especially problematic because of small sample. It is surprising that one obtains a reasonable statistical significance for this sample at all. Nevertheless, some results should be mentioned. First, in the specification with average

[13]The reason could be the presence of Primorski krai: a territory with a very specific "warlordist" political system may have generated an overproportionally high number of violations of federal law, but may as well be especially "interesting" for federal officials of the early Putin period responsible for the construction of the Federal Register. Nevertheless, estimates without Primorski krai also reveal significant effect of the distance.

[14]The graph excludes City of Moscow as an outlier. However, it has an extremely high number of acts assessed and very high population, thus confirming the correlation.

income per capita urbanization and fiscal transfers seem to have significant and positive effect on devolution; while the first effect once again confirms the theory, the second may in fact indicate the presence of reverse causality in the data: regions with higher autonomy have also received higher "pacifying" transfers. Moreover, share of Russians has a significant and negative impact; unlike other specifications, where it seemed to matter only if the dummy republic was excluded (as I will show in what follows), for constitutional decentralization one finds an additional direct effect even for the sample consisting of republics – regions with lower share of ethnic Russians seem to have higher level of constitutional devolution. These effects, however, vanish if the distance from average income instead of average income is used.

Several robustness tests can be implemented at this stage. First, I estimated all regressions including *both distance from average income and average income per capita*. For the fiscal decentralization distance is still significant and negative, while income is not; for the regulatory (both share and number) and constitutional decentralization both variables are insignificant. Hence, my results are robust to this modification. Second, I account for the fact that dependent variables in specifications (1) – (4) are bounded from above by performing *log-odds transformation* (Log (Variable / (1- Variable)) and re-estimating the regressions. Basically, all results are robust, but urbanization and dummy autonomous region lose significance. Third, since the variables might be determined jointly, I also estimate pairs (1) and (3) and (2) and (4) as *seemingly unrelated regressions* (for other variables using system of equations is unreasonable; it is impossible to use linear- and non-linear models in one system, and reducing all models to linear form guarantees misspecification of at least one equation, and therefore, of the whole system). Once again, the results are robust, with the only exception urbanization for regulatory decentralization in specification with distance from average income.

2.5.2 Modified specifications and expert opinion variables

The next step of my analysis is, as mentioned, to look at the variations of specifications of regressions, and also at potential impact of expert opinion variables. The individual regressions are reported in *Appendix B.2.* I construct all specifications using the same logic. Each of the first three dimensions of decentralization is covered by 28 regressions: 14 with average income per capita and 14 with distance from average income. In each of these six subgroups the first five regressions are modifications of the basic regression, accounting for individual factors of decentralization. The first and the second regressions experiment with probably the most reasonable variables for the Russian devolution: bargaining power and dummy republic / autonomous okrug. Given strong democratic deficits in Russia and potential endogeneity of fiscal transfers, as well as unclear impact of urbanization on power distribution, these variables should be most likely to influence the structure of decentralization. Further regressions explore the role of ethnic heterogeneity. The third regression estimates a specification including

share of Russians, dummy republic and dummy autonomous okrug; the fourth regression drops the dummies. The fifth regression is the "basic specification" reported above. Further nine regressions add the expert opinion variables one by one. Of course, if different expert opinion variables measure the same thing (like different tension indices), I include only one of them (they are also usually highly correlated); otherwise the variable, once included, remains in the specification – so, I basically move towards regressions with larger number of controls. For the constitutional decentralization, since the sample is smaller, I necessarily have to focus on smaller number of specifications with a limited selection of controls.

In order to make the comparison of the outcomes more transparent, I summarize the results in the *Table 2.3.* As in case of the basic regressions, for the residuals from the absolute majority of the OLS regressions the Jarque-Bera test is highly significant, I also control for potential effect of outliers, excluding the observations until Jarque-Bera becomes insignificant. The list of outliers for regulatory and fiscal decentralization differs dramatically: while for the regulatory decentralization the main outliers are City of Moscow (due to its obvious status of the capital and "closeness" to the federal government) and Primorski krai, for the fiscal decentralization the list of outliers mostly includes tax havens in different combinations (see next chapter for a more detailed discussion), several autonomous regions (Taimyr and Aginsk Buryat), as well as two republics Tatarstan and Bashkortostan, which received a special tax regime through the power-sharing agreement. City of Moscow and Republic of Sakha are also listed among the outliers. Difference in the list of outliers may also confirm that the regulatory and the fiscal decentralization were driven by different factors. Moreover, the estimations confirm that the choice of dummy republic / autonomous okrugs over share of Russians was correct. First, if all three variables are included, share of Russians is never significant (although dummy republic may remain significant). Second, if the dummy republic was significant and positive in the initial specification, after it is dropped and replaced by the share of Russians, the latter becomes significant and negative.

However, generally speaking, the results of the analysis of this stage hardly provide new insights explaining decentralization among Russian regions. Most results reported so far are robust to the variation of specifications and inclusion of expert opinion variable. The latter are actually insignificant or not robust to the selection of controls. Negative sign for oil and gas share observed in some specifications may just come from a statistical fluctuation.[15] Expert opinion variables specifications become interesting only for constitutional decentralization (where their robustness is most questionable). The most robust outcome is that republic with larger distance from average income have a higher devolution

[15] One should recall, that in the 1990s oil extraction was controlled by the private business, and even state-owned gas giant Gazprom was virtually outside of the control of the federal government – so, an effect of significant federal pressure through control over businesses is hardly present here.

Table 2.3: Expert opinion variables and different specifications: summary of results

Indicator	Fiscal decentralization	Regulatory decentralization (share)	Regulatory decentralization (number)	Constitutional decentralization (ordered logit)
Territory	++		+	+
Population		(+)	+++	+
Oil and gas	-		+	
Income p.c.		-		-
Distance from average income	- - -	-		++
Dummy autonomous region	(-)	+	-	n.a.
Dummy republic	+	+++	+++	n.a.
Distance from Moscow	++	(++)	+++	+
Dummy border region	+			
Urbanization	(+)	-		+
Fiscal transfers				++
Tensions				
Power sharing agreement				
Democratization	**-**			**+++**
Power				**-**
Declarations				
Regulatory capture				

Notes: three signs mark a variable which has identical significant effect in all specifications. ++ mark variable which has identical significant effect in most in specifications including full sample. + marks variable which significant effect in at least one specification. () indicate that the result is not robust to outliers. Share of Russians not included in the table, since its significant and negative sign crucially depends on presence of dummies republic / autonomous region

index. This is predictable given the hypotheses discussed above. Democracy level has a strong positive impact on the level of declarations. Thus, at least for the constitutional decentralization democracy indeed seems to be a factor supporting the desire for autonomy. However, the small sample for the constitutional decentralization makes the analysis of course problematic. Moreover, while in the basic specifications the likelihood ratio test did not suggest a violation of proportional-odds assumption, this is not the case for specifications with expert opinion variables. The usual way to solve the problem is to estimate the generalized ordered logit regression; however, in a very small sample with four cut-off levels it is extremely problematic. [16]

[16]Nevertheless, I still tried to apply this method for all regressions where proportional-odds assumption might be problematic. Unfortunately, most results are extremely non-robust (and also do not confirm observations for ordered logit). Nevertheless, the results with respect to distance from the average income and fiscal transfers seem to be relatively robust in terms of sign and significance. The only interesting observation is that more variables get significant for higher cut-off levels – though the sign varies from level to level. Small size of the sample does not allow further investigation. Democracy level turns its sign; now it becomes negative and significant. A conservative approach would allow me to claim that there is a relatively stable positive association between fiscal transfers and distance from the average income on the one side and constitutional decentralization on the other; further outcomes are not robust and may be driven by the specification and (violated) proportional-odds assumption.

2.5.3 Extreme bounds analysis

A more formal way to approach the problem of robustness of specifications, which becomes crucial in a small sample environment, is to implement an extreme bounds analysis (EBA). Once again, this method has its merits and demerits. On the one hand, it is a more systematic analysis of effect of specification on estimation outcomes. However, on the other hand, while so far my selection of specifications was at least partly driven by the structure of theories, the EBA simply looks at all possible combinations of regressors. Theoretically, it is possible that the "true" result is reflected just by one specification, which is "lost" in endless combinations of EBA. Hence, it is important to interpret the results of EBA in a conservative fashion: while they are unlikely to give evidence *against* the influence of certain parameters on decentralization, if the covariates survive the EBA, it provides additional argument *in favor* of the influence.

The basic approach to the EBA was developed by Leamer (1978); this chapter applies both most popular versions of extreme bounds analysis used in the literature. The original suggestion (see e.g. Levine and Renelt, 1992) was to estimate the upper and the lower bounds by taking all possible combinations of regressors and to look at the smallest estimate minus two standard errors and at the largest estimate plus two standard errors. If the null is within the interval formed by the upper and the lower bounds, the impact is not robust. Sala-i-Martin (1997) proposes a less extreme version of the approach, considering the entire distribution of the coefficient. In this case the coefficient is robust if the CDF(0) statistics is sufficiently high. Most applications of the EBA in the literature assume some variables to be present in all regressions (mostly because of theoretical results or research traditions) and vary the rest. Unfortunately, the literature on endogenous decentralization is too young to develop similar assumptions. So, I take all possible combinations for all possible variables (from bivariate regression to regression with all possible covariates). Unfortunately, in this setting the multicollinearity can impose very high volatility of coefficients over regressions; however, there is no better theoretically motivated alternative.

The EBA for fiscal and regulatory decentralization is performed for 16 variables: territory, population, share of oil and gas, income per capita, distance from average income, dummy autonomous region and dummy republic, distance from Moscow, urbanization, fiscal transfers, tensions (RUIE), power (Jarocinska), dummy power sharing agreement, democratization, declarations and regulatory capture: so, regressions include from 1 to 16 covariates. I do not perform EBA for constitutional decentralization, given that the sample is extremely small.[17] Of course, for the EBA for each variable I use only regressions including this variable. As a robust result I consider only variables with CDF(0) $> .95$ as in Sala-i-Martin (1997).

[17] However, experiments with EBA for constitutional decentralization were performed, and yielded no robust covariates surviving the extreme bound analysis.

The results are reported in *Table 2.4*. From the point of view of the original Levine and Renelt approach, there is not a single variable with both upper and lower bounds strictly larger (or smaller) zero. This is hardly surprising and quite typical for empirical research. However, the Sala-i-Martin approach yields some robust variables, mostly identical to those reported above.

For the fiscal decentralization I find a robust and positive impact of the size of the territory, of the population and of the distance from Moscow, as well as robust negative impact of distance from the average income and of population. The results fit the previous observations with the only exception of the population, which turns out to have a robust impact because of a multitude of regressions where territory is absent (and population is highly significant and negative). This is to a certain extent an artifact of the extremely agnostic perception of the set of controls applied here.

Nevertheless, the observation is interesting, because it is counterintuitive: it seems that large regions (by population) have smaller bargaining power vis-a-vis the federal center, while large regions (by territory) have larger one. One should be aware of the fact that for the Russian data territory and population are negatively correlated: in Russia large regions in terms of their territorial size are almost always located in the Siberian part of the country and exhibit very small population (not just in terms of density, but also in absolute numbers). One conclusion from this result may be that territory is indeed a strong bargaining instrument in the center-region relations in Russia and population does not really matter - and becomes significant only if territory is dropped and thus the correlation between territory and population influences the results. Since almost all papers in economics define "size of the nation" in terms of population (cf. Alesina and Spolaore, 2003), this result is particularly important: probably, geographical territory is an aspect which is worth thinking about.

For the regulatory decentralization measured by the share of acts I find a robust and positive impact of distance from Moscow and of the dummy republic. These results just confirm the regularities reported above.

For the regulatory decentralization measured by the number of acts the EBA establishes positive and robust impact of population and of dummy republic and distance from Moscow (once again, as above), as well as of territory (again, one may be dealing with statistical artifact similar to that for fiscal decentralization) and declarations. The last result is interesting; it means that active proclamations of secessionist or autonomist desires in the early 1990s effectively led to higher regulatory devolution. Since the declarations variable is measured for the early 1990s, and the majority of the acts were passed in the second half of the 1990s, there is obviously no reverse causality. However, there may be measurement problem: for example, experts of the Ministry may pay more attention to the regions which were likely to challenge federal government in the early 1990s. Declarations are also highly correlated with the dummy republic, so the result

may come from regressions where this variable is absent. Moreover, unlike previous results, the EBA finds a negative and robust effect of dummy autonomous okrug. The interpretation is identical to that for dummy republic: subordinate status of autonomous okrugs as second-level "subjects of the Federation" seem to make them less active in developing the legislation contradicting the federal one. However, the outcome may be driven by regressions, where population is excluded: an autonomous okrugs are extremely small in these terms.

In the *Table 2.5* I estimate the regressions, including only robust variables. The results support the intuition and the outcomes of basic specifications: for regulatory decentralization territory and for fiscal decentralization population turn to be insignificant; declarations and dummy autonomous okrug are insignificant. Excluding Primorski krai from regressions for regulatory decentralization does not change the results.

2.5.4 Endogeneity

The last part of the analysis, finally, directly considers the problem of endogeneity. Although it was expected to generate substantial problems, actually, most variables used in the specifications are either stable over time or time-invariant and therefore unlikely to be subject to reverse causality (territory, population, distance from Moscow naturally, dummy republic or dummy autonomous okrug because they were completely pre-determined by the Soviet territorial organization) or insignificant. Obviously, time-invariance solves the reverse causality problem, but still calls for caution in terms of possible common cause for the covariate and the dependent variable, which may create endogeneity bias. This common cause could be rooted deeply in the historical development, and therefore difficult to control for statistically. One could probably cautiously claim that for the Russian data and five variables mentioned above this problems are less pronounced because the center-region bargaining for autonomy is an extremely recent phenomenon not really rooted in the history (due to the political structural break in Russian development in 1990-1991), but even in this case an unambiguous clarification is difficult. Moreover, as already mentioned, the results which remain robust in most specifications one should also hardly be worrying about the problem of endogenous controls: obviously, exclusion of variables may create an omitted variable problem, but it is unlikely to run in the same direction as the reverse causality.

Therefore one could cautiously conclude that for five variables mentioned the endogeneity problem is probably less likely to influence the estimation results. One should notice that it is impossible to make any claims with respect to the results for which the null hypothesis was actually not rejected or happened to be rejected in a non-robust fashion through different specifications: for this variables endogeneity bias may make me ignore actually existing effects - once again, a reason for caution.

Table 2.4: Extreme bounds analysis of the determinants of decentralization

Variable	Average coefficient	Average standard error	Lower bound	Upper bound	CDF(0) CDF(0)	No. regressions
Fiscal decentralization						
Territory	**0.041**	**0.015**	**-0.02**	**0.149**	**0.997**	**32767**
Population	**-0.015**	**0.006**	**-0.041**	**0.018**	**0.987**	**32767**
Oil and gas	-0.015	0.058	-0.472	0.28	0.601	32767
Average income per capita	0.039	0.044	-0.238	0.39	0.812	32767
Distance from average income per capita	**-0.116**	**0.048**	**-0.501**	**0.205**	**0.992**	**32767**
Dummy autonomous region	-0.029	0.045	-0.313	0.271	0.742	32767
Dummy republic	0.017	0.033	-0.159	0.146	0.698	32767
Distance from Moscow	**0.009**	**0.003**	**-0.006**	**0.028**	**0.998**	**32767**
Urbanization	0.837	1.236	-4.514	5.891	0.751	32767
Fiscal transfers	-0.026	0.09	-0.513	0.356	0.615	32767
Tensions (RUIE)	0.004	0.13	-0.064	0.081	0.62	32767
Power	-0.018	0.019	-0.136	0.092	0.83	32767
Power sharing agreement	0.011	0.017	-0.057	0.085	0.743	32767
Democratization	-0.003	0.002	-0.011	0.007	0.941	32767
Regulatory capture	-0.005	0.053	-0.204	0.171	0.538	32767
Declarations	0.033	0.026	-0.074	0.139	0.9	32767
Regulatory decentralization (share)						
Territory	0.008	0.011	-0.041	0.061	0.762	32767
Population	0.003	0.004	-0.016	0.018	0.76	32767
Oil and gas	0.019	0.032	-0.259	0.16	0.723	32767
Average income per capita	-0.003	0.023	-0.169	0.188	0.559	32767
Distance from average income per capita	-0.008	0.027	-0.253	0.187	0.622	32767
Dummy autonomous region	-0.006	0.021	-0.16	0.115	0.609	32767
Dummy republic	**0.052**	**0.017**	**-0.026**	**0.138**	**0.999**	**32767**
Distance from Moscow	**0.006**	**0.003**	**-0.005**	**0.019**	**0.968**	**32767**
Urbanization	-0.821	0.506	-2.894	2.346	0.946	32767
Fiscal transfers	0.049	0.042	-0.167	0.259	0.878	32767
Tensions (RUIE)	-0.015	0.01	-0.068	0.025	0.927	32767
Power	0.009	0.012	-0.044	0.083	0.78	32767
Power sharing agreement	-0.017	0.012	-0.058	0.017	0.929	32767
Democratization	-0.001	0.001	-0.006	0.004	0.709	32767
Regulatory capture	-0.013	0.039	-0.176	0.114	0.627	32767
Declarations	0.017	0.013	-0.058	0.065	0.904	32767
Regulatory decentralization (number)						
Territory	**0.164**	**0.091**	**-0.256**	**0.636**	**0.965**	**32767**
Population	**0.106**	**0.037**	**-0.084**	**0.255**	**0.998**	**32767**
Oil and gas	0.259	0.343	-1.674	1.609	0.775	32767
Average income per capita	0.012	0.211	-2.046	1.741	0.522	32767
Distance from average income per capita	0.093	0.25	-2.034	2.572	0.645	32767
Dummy autonomous region	**-0.76**	**0.181**	**-2.45**	**0.287**	**0.999**	**32767**
Dummy republic	**0.526**	**0.173**	**-0.401**	**1.268**	**0.999**	**32767**
Distance from Moscow	**0.055**	**0.024**	**-0.044**	**0.173**	**0.989**	**32767**
Urbanization	-4.495	4.574	-31.708	20.473	0.837	32767
Fiscal transfers	0.343	0.448	-2.298	2.641	0.778	32767
Tensions (RUIE)	-0.148	0.097	-0.718	0.237	0.936	32767
Power	0.146	0.12	-0.418	0.965	0.889	32767
Power sharing agreement	-0.05	0.114	-0.411	0.394	0.67	32767
Democratization	0.001	0.01	-0.045	0.042	0.538	32767
Regulatory capture	-0.141	0.402	-1.604	1.258	0.637	32767
Declarations	**0.273**	**0.138**	**-0.401**	**0.846**	**0.977**	**32767**

Notes: all regressions estimated with OLS (fiscal decentralization, regulatory decentralization as share of contradictions) and negative binomial (regulatory decentralization as number of contradictions). All estimates use robust standard errors. Average indicators weighted by the value of log likelihood. CDF(0) calculation approach assuming normal distribution (case 1 by Sala-i-Martin, 1997) is used. Robust variables are marked bold. Retail trade and net profit from are not included in the fiscal decentralization regressions to avoid the multicollinearity.

Table 2.5: Regressions with robust variables according to the EBA, 1995-1999, dep. var.: fiscal and regulatory decentralization

	(EBA1) OLS	(EBA2) OLS	(EBA3) OLS	(EBA4) Negative binomial	(EBA5) Negative binomial
	Fiscal decentralization	Regulatory) decentralization (share)	Regulatory decentralization (share)	Regulatory decentralization (number)	Regulatory decentralization) (number)
Territory	**0.045*** **			0.089	**0.145** **
	(0.015)			(0.081)	**(0.072)**
Population	-0.009			**0.109*** **	**0.098*** **
	(0.007)			**(0.026)**	**(0.024)**
Distance from average income	**-0.048*** **				
	(0.012)				
Distance from Moscow	**0.009*** **	**0.006*** **	**0.005*** **	**0.056*** **	**0.035** **
	(0.003)	**(0.002)**	**(0.001)**	**(0.021)**	**(0.015)**
Dummy republic		**0.055*** **	**0.058*** **	**0.587*** **	**0.617*** **
		(0.011)	**(0.011)**	**(0.167)**	**(0.160)**
Dummy autonomous okrug				-0.214	-0.154
				(0.144)	(0.134)
Declarations				0.044	0.024
				(0.137)	(0.130)
Constant	0.648***	0.073***	0.074***	4.946***	5.031***
	(0.019)	(0.006)	(0.006)	(0.358)	(0.343)
Observations	88	88	87	88	87
R^2	0.229	0.288	0.304		
Pseudo R^2				0.034	0.034
Primorski krai included	Yes	Yes	No	Yes	No

Note: see *Table 2.2*

There are, however, several cases when the endogeneity problem may be driving the robust results. The most troubling cases are distance from the average income for fiscal and constitutional decentralization and fiscal transfers and distance from the average income (both robust results) for constitutional decentralization. In what follows I examine the problem more closely, using the instrumental variables techniques. One should notice, that the chosen instruments are often not unambiguous; hence, the results should be treated with caution.

In case of fiscal decentralization the link between fiscal policy and economic performance in Russian regions is questionable (as I will show in the following chapters), probably indicating that the endogeneity problem may not be crucial. The choice of instruments is not so simple: although virtually all variables are related to growth, all variables may act as proxies for preference distance and thus impact the decentralization. The theory existing so far does not allow us to make a clear choice. My choice of instruments is primarily empirically motivated (and hence should be treated with extreme caution): an instrument I use in this setting is the absolute value of the difference between the mean number of conclusions (positive and negative) in the Federal Register for a region and the number of conclusion for this specific region (denoted as "differences in conclusions" henceforth). The variable is significant in the first stage (the F-value is, however, much smaller than 10 suggesting a weak instrument problem) and insignificant in the second stage.

The instrument used looks like an analogue of the distance of the number of acts (or conclusions) in a particular region from the federal average. Assuming the density of regulation has an impact on economic performance, it is likely to influence distance from average income. In the empirical case of this paper it is also

unlikely to be related to fiscal decentralization, because, as shown above, fiscal decentralization and regulatory decentralization have little in common (though, once again, here my argumentation comes from the empirical observations and is therefore flawed). It is also difficult to come to a conclusion why the number of acts in a region may impact its devolution from the taxation point of view. Moreover, although the degree of devolution may have an impact on the policies of the Ministry of Justice, the latter most certainly does not look at fiscal affairs (which are far outside of its field of responsibility).

In *Table 2.6* I report some specifications for the IV estimator. Although the result yields the expected sign, it is not always significant, partly depending upon specification and choice of controls.

The problem of endogeneity for constitutional decentralization may be more important. There is a substantial literature linking interbudgetary grants to loyalty of Russian regions to the center (Treisman, 1996, 1998; Solanko, 1999; Popov, 2004; Jarocinska, 2004; Dombrovsky, 2006): the question is whether it is the "loyal" or the "secessionist" regions receiving higher amount of funds, but for the purposes of this chapter it is sufficient that the link might exist. Higher declared autonomy may as well have an impact on political process and thus on democratization levels. However, for a sample of 20 observations it is hardly possible to solve the problem. Moreover, IV estimation in models with discrete outcomes can be problematic, since it generally does not provide point identification. Point identification is possible with triangular models, which, however, impose restrictive assumptions (cf. Chesher, 2008). One of the possible ways to at least approach the problem is to apply a two-stage ordered logit model (for specifications where proportional odds assumption was not violated) with Murphy-Topel standard error correction; implementation of this approach for applied research is discussed by Hole (2006). I have experimented with this approach, using as the instrument for distance from average income, as above, differences in conclusions; and for fiscal transfers the average retail trade in the region is applied.[18] Unfortunately, the experiments with different specifications give insignificant results, though the sign remains after the instrumentation. Hence, the effects are likely to be caused by endogeneity.

2.6 Conclusion

Decentralization encompasses multiple aspects with partly sophisticated connection to each other. This chapter tried to look at both interrelation of different aspects of decentralization and the factors of the endogenous devolution using

[18]This instrument may be a good predictor for fiscal transfers, because it is an important indicator for the tax base generated by the regional economy. On the other hand, the variable is unlikely to have any effect on constitutional decentralization; the only way how the variable could have an impact on the decentralization process is through income per capita, which, as already mentioned, turned to be insignificant. In fact, both instruments are highly significant in first-stage OLS regressions and insignificant while added to ordered logit regressions.

Table 2.6: Endogeneity of distance from average income, 1995-1999, dep. var.: fiscal decentralization

	(IV1)	**(IV2)**	**(IV3)**	**(IV4)**
	IV	**IV**	**IV**	**IV**
Territory	0.043**	0.047**	0.052**	0.052**
	(0.017)	(0.018)	(0.024)	(0.022)
Distance from Moscow	0.011***	0.009***	0.007*	0.007**
	(0.003)	(0.003)	(0.004)	(0.003)
Oil and gas	0.046	0.057	0.004	0.005
	(0.124)	(0.132)	(0.521)	(0.396)
Distance from average income	**-0.066***	**-0.088***	**-0.02**	**-0.02**
	(0.039)	**(0.050)**	**(0.181)**	**(0.148)**
Dummy republic		0.01	0.002	0.002
		(0.033)	(0.043)	(0.037)
Dummy autonomous okrug		0.067	0.027	0.027
		(0.044)	(0.118)	(0.087)
Retail trade			0	0
			(0.002)	(0.002)
Net profit			-0.003	-0.003
			(0.004)	(0.003)
Population				0
				(0.017)
Constant	0.635***	0.639***	0.628***	0.628***
	(0.019)	(0.018)	(0.030)	(0.051)
Observations	88	88	88	88
Pseudo R^2	0.209	0.229	0.236	0.236
F-stat	11.20***	7.28***	12.81***	19.71***
First stage: t-stat for external instrument	4.55***	3.98***	1.63	2.13**

Note: see *Table 2.2.*Instrument is difference in conclusions for distance from average income

the example of the Russian Federation. In an asymmetric setting with weak rule of law and public hierarchy different forms of devolution became subject of bargaining between the federal government and the regions. However, identical agents seem to generate completely different outcomes for different components of the decentralization process. In particular, I looked at the decentralization at the rules level, i.e. allocation of authorities set by regional constitutions, as well as at the decentralization at the outcomes level, i.e. split of tax revenue and the regulation authority. Indeed, constitutional and both post-constitutional level forms of decentralization are not correlated to each other. It is important to notice, that the chapter does not attempt to reveal a "true" or "correct" measure of decentralization: all three dimensions may be relevant depending upon the particular policy and research question – one should just carefully identify what one is looking for.

Moreover, different aspects of decentralization are driven by different sets of factors. While fiscal decentralization is influenced by some bargaining power (territory, distance from Moscow) and preference (distance from the average income) parameters, regulatory decentralization is heavily determined by the bargaining rules and / or path dependence (status of the republic). Distance from Moscow seems to be the only variable influencing both dimensions of decentralization. Generally speaking, geography (distance from Moscow, territory of the regions) appears to be a very strong factor influencing the endogenous decentralization. Since Russia is a relatively well developed country (and does not have the "classical" problems of developing world, where certain parts of the territory may be simply cut off from the central administration), this result is especially interesting. Finally, the sets of outliers for regulatory and fiscal decentralization differ completely. Constitutional decentralization seems to be related to parameters like distance from the average income and fiscal transfers; however, estimations are extremely problematic due to small sample, proportional-odds assumption and endogeneity and do not seem to be robust in the extreme bounds analysis.

There are a number of limitations for the study from the point of view of the generalization of results. First, all indicators have limited ability to measure the underlying decentralization concepts. Second, the contradiction between unilateral and bilateral devolution and formally highly symmetric design of the Russian federalism may influence the results. Third, I am considering a relatively short time period in an unstable institutional, economic and political environment. For example, the data includes the period of economic crisis in 1998, which had a profound impact on the behavior of all bargaining parties. Finally, this chapter has only limited ability to resolve the endogeneity problem (as usually); hence, the results should be treated rather like correlations than causal links. Nevertheless, it still provides additional evidence in favor of the suspicion that different aspects of decentralization are really different from each other in terms of determinants and outcomes, what may be quite important for the empirical studies of the factors and impact of decentralization.

The result of the chapter is certainly intriguing from the point of view of the standard empirical analysis of decentralization: it shows that post-constitutional and constitutional indicators do not necessarily correlate. One could probably claim that the constitutional indicator I use does not explicitly include data for the allocation of fiscal and regulatory authorities. However, the problem is actually even broader: from the constitutional point of view Russia should not experience *any* systematic asymmetry for budgets and regulations (with the only exception of that caused by differences in tax bases). And, while regulatory decentralization may be probably explained by the weakness of the central government unable to control regional jurisdictions, fiscal decentralization, given the technical aspects of tax collection in Russia, is particularly surprising. So, the question becomes whether the retention rates simply "mismeasure" the true allocation of authorities (and hence are just a statistical coincidence), or they do represent some systematic differences in economic policies. The very fact that the retention rates are correlated with a set of theoretically predicted variables suggests that the second claim is true; but it is still necessary to understand which factors actually drive the post-constitutional redistribution of fiscal flows. The next chapter presents some evidence regarding one of these mechanisms, based on manipulations with tax auditing and tax collection.

Chapter 3

Strategic Tax Collection and Fiscal Decentralization: The Case of Russia[1]

3.1 Introduction

Economic analyses of decentralization usually focus on formal rules determining the allocation of public revenue, expenditure or fiscal responsibilities. The empirical indicators of decentralization are treated as (noisy) measures of allocation of power by law. It happens though that the de-facto distribution of fiscal resources deviates substantially from what is set in the legal norms. The real issue is not simply to measure fiscal decentralization, but to distinguish between de-facto and de-jure fiscal decentralization and understand the reasons for the emergence of the gap. These reasons have however not been explored in the literature. In this chapter we look at one particular channel of distribution of fiscal resources, which is present in centralized federations with administrative powers of the sub-federal jurisdictions (administrative federalism) in which the federal government sets tax rates and bases, and the rules of tax collection. In this framework de-facto fiscal decentralization is defined as an increase of the tax retention rate, i.e. the share of tax revenue generated from a certain territory obtained by the regional government; and in this sense decentralization can vary among different regions. Then regional governments can manipulate tax auditing and tax collection such that de-facto shifts in fiscal decentralization occur.

Specifically, there is no reason to believe that regions (if they control tax collection activi-ties) are equally thorough to enforce tax laws, when a larger share of

[1]The chapter was written together with Lars P. Feld; hence the use of pronoun "we" throughout the chapter

tax revenue collected is attri-buted to the federal government, as compared to taxes, which mostly benefit regional budgets. One particular result of "selective application" of legal procedures is the emergence of tax arrears, which can be defined as the "uncollected" portion of taxes (see below for a more detailed definition). It is possible to hypothesize that tax arrears would mostly accumulate on the expense of the federal center, i.e. taxes with a higher regional share are more actively collected than those mostly attributed to the center. Obviously, this behaviour would result in de-facto fiscal decen-tralization (in contrast to de-jure decentralization). The federal center can also be interested in the "hidden" re-centralization through strategic tax collection without changing the formal rules of the game. In this sense the behaviour of the tax authorities is strategic, i.e. distribution of effort between different taxes is not random, but rationally determined through the interaction of the regional/ federal governments and the tax administrators.

To the best of our knowledge, this chapter is the first to empirically investigate strategic tax collection as a tool for de-facto fiscal decentralization (as well as one of the first to address the issue of strategic tax collection at all). We test conjectures on strategic tax collection empirically using data of the Russian Federation, which is an interesting case for such an analysis due to sig-nificant shadow economy and tax avoidance which form the basis for selective tax auditing and collection, and unilateral evolution in the 1990s and recentralization in the 2000s that provide for a laboratory to study the impact of shifts of relative bargaining power between government levels. The downside of studying Russia consists in potential difficulties in modelling Russian fed-eralism econometrically. On the one hand, Russia has been an extremely asymmetric country both in terms of constitutional, political, economic and fiscal structures. This suggests a potential impact of influential cases on the estimation results. On the other hand, the transition from Yel-tsin to Putin poses additional modelling problems, for example the timing of changes. We employ a variety of estimation techniques to account for these challenges. Given the available data, we focus on strategic tax collection, i.e. manipulation of efforts by tax authorities after "uncovering" the hidden part of the tax base that is supposed to be collected, and disregard strategic tax audit-ing, i.e. manipulation of efforts to "uncover" the hidden part of the tax base in the first place.

The chapter contributes to two strands of the literature. First, there has been relatively small and mostly theoretical research on determinants of strategic tax collection and tax auditing by regional governments in centralized federations (Cremer and Gahvari, 2000; Cai and Treisman, 2004; Stẅhase and Traxler, 2005). The claim that some regional governments are relatively lax in their tax auditing as compared to others has been made for Germany (Baretti, Huber and Lichtblau, 2002), Belgium (Cremer and Gahvari, 2000) and Spain (Estreller-More, 2005). Naturally, this issue becomes more important in developing and transition economies, since a deficit of the rule of law provides for additional opportunities for regional governments and enterprises to collude. However,

the empirical research on strategic tax collection is still very limited, especially because it is difficult to come up with a reasonable proxy for tax collection and auditing activity. The Russian Federation provides us with this proxy, which is certainly imperfect, but at least makes the empirical research in the field generally possible. Several papers use this advantage in different micro- and macro-level settings (Treisman, 1998; Ponomareva and Zhuravskaya, 2004; Slinko et al., 2005; Yakovlev, 2006), but the link between strategic tax collection and fiscal de-centralization has not been explored so far.[2] Moreover, unlike the existing research on the Russian federalism, our data set covers the period between 1995 and 2006, and therefore does not only include the first term of Yeltsin's presidency, but also his second term and a significant part of Putin's first and second terms. To our knowledge, this chapter is thus also one of the first attempts to empirically studying the changes in Russian fiscal federalism under Putin in the 2000s.

Secondly, the chapter contributes to the literature on positive analysis of factors of decentralization, as it has been described in the Introduction to the dissertation. It does so by considering the impact of strategic tax collection on fiscal decentralization, but also by looking at other determinants of decentralization in Russia, which yield a number of interesting insights. The chapter is organized as follows: section 2 describes the basic logic of strategic tax collection in centralized federations with different allocations of de facto bargaining power between levels of government. It also clarifies the concepts of tax auditing and tax collection as they are used in this chapter. Section 3 shows why Russia is a good laboratory for studying this effect. Section 4 describes the data, and the section 5 discusses the econometric methodology. Sections 6 and 7 present our findings and discusses their potential implications. The last section offers some conclusions.

[2]In that respect this chapter is complementary to Treisman (2003) who discusses the influence of decentralization on tax arrears of Russian regions in the period of 1994-1997. According to his results, regions with larger en-terprises have higher tax arrears, the election of a Communist governor is positively correlated with tax arrears, and territories in which the share of regional government increased most in the previous year had lower tax arrears. In contrast to our analysis, he considers the tax arrears as an outcome of preceding fiscal decentralization. The idea is that observing its retention rate the regional governments make the decision on tax auditing and collection efforts. Though probably applicable for the early period of development of the Russian Federation, this approach seems to be less reliable if we consider its later political-economic structure based on administrative federalism. In a centralized federation, de jure retention rates are identical for all regions (as it is the case for Russia); differences in retention rates (fiscal asymmetries) arise from differences in economic structure predetermining the tax base and the activity of tax collection agencies, i.e. tax auditing and tax collection. This line of causality is also of greater scientific importance, it is applicable not just to Russia, but is a general issue of centralized federations.

3.2 Tax auditing and tax collection in a centralized federation

We start with considering a general (and unavoidably simplified) setting, which should then be adapted for the institutional specifics of the Russian case. The existing literature on strategic tax auditing (see e.g. Stöwhase and Traxler, 2005) models the auditing effort as a probability p of detection of tax evasion (which is a *choice variable* for the tax authority given that the tax rate is exogenous). For our purposes we transform the concept as follows. Assume that there exists a population of firms in the economy with overall real profit π^R (instead of profit one could consider any other tax base); however, the officially *declared* profit, which should be used as the tax base, is $\pi^D < \pi^R$. The government does not take the declarations of firms for granted and implements *tax auditing* measures in order to find out real profit. Then on average, assuming the detection probability p, the uncovered profit of the firms after tax auditing is $\pi^D + (\pi^R - \pi^D)$p. For any $p < 1$ (i.e. when the auditing is imperfect) the detected profit after tax auditing is smaller, than real profit.

However, it would be too simple to assume, that the government is indeed able to tax the detected profit. The results of tax auditing are usually subject to lawsuits and further execution procedures by law-enforcement agencies, i.e. to *tax collection* activity. Loopholes in tax laws in developing or transition countries and extreme complexity of the tax system in many developed countries provide for large opportunities to challenge the results of tax auditing. However, the decision of the court heavily depends upon the effort invested in preparing the case by the prosecutor, i.e. the tax authority. Moreover, in a developing or transition economy with poor rule of law the enforcement procedure is also non-trivial and requires additional investments. So, there is yet another choice variable for the tax authority: the probability of collecting the detected tax (say, r). Then the tax base used for calculating the taxes due is in fact $\pi^D+(\pi^R–\pi^D)$pr, while the difference between this tax base and the detected tax base (1–r)p$(\pi^R–\pi^D)$ represents the *uncollected tax arrears.* The structure of the tax base is represented in *Figure 3.1.* Naturally, the situation can be much more sophisticated, if time delays and fines are taken into account.

In order to describe the application of tax collection and auditing in a federation we consider a simple principal-agent framework, where a local tax authority (agent) acts on behalf of two principals: the federal and the local (regional) governments (as both gain from tax collection). The results of the agent's activity depend upon his effort and the environmental characteristics. Agent's utility is derived from potential benefits provided by the principals (e.g. direct (formal and informal payments), non-monetary benefits, career advancements etc.). Obviously, negative benefits (punishments) are possible. On the other hand, an agent's activity is constrained by his resources, which could be used for tax auditing and collecting effort, i.e. tax service (given its resources) is

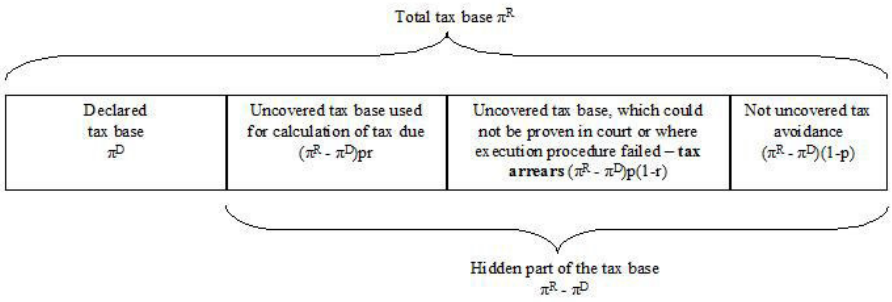

Figure 3.1: Tax base after tax collection and tax auditing activities

unable to collect the total taxes due anyway. We assume that the resources for tax auditing and collection are exogenous. Moreover, the agent can choose between allocating effort in auditing and collection of "federal" or "regional" taxes (or taxes with a higher share of the federal or the regional governments). However, this allocation decision is only partly observable by the principals, whose monitoring capacity is unequal. Hence, the principals cannot completely distinguish between the results of the agent's activity caused by environmental characteristics or by allocation of his effort. Each principal maximizes his own tax revenue regardless of the revenue of the other principal (of course, in the real world federation may care for regional tax collection - then, however, we simply do not find the effect in the empirical application). The agent's benefits depend upon the principal's assessment of the agent's efforts for collecting taxes attributed to this principal regardless of total tax auditing and collecting effort. Note that there is no incentive for the agent to reduce her overall effort, since it only reduces the benefits; so, the decision variable is the allocation of tax collecting activity.

This setting gives rise to at least two alternative scenarios (which correspond to two phases of development of the Russian federalism). In the *region-centered* environment the regional government has a double advantage over the federal center: first, it has better instruments to observe both effort and environmental conditions and, second, it has a relative advantage in bargaining power. Hence, the benefits from the regional government are higher than those provided by the federal government (and potential punishment also exceeds that of the federal center), as regional governments can effectively "protect" the agent from potential federal punishment, and its resources for punishment and the benefits for the agent exceed those of the federal center. Moreover, the agent's ability to "cheat" is higher with respect to the federal center than with respect to the region. Thus, it is more likely that the agent directs his efforts in a way to better satisfy the requirements of the local than the federal principal. Assume further that different agents in different regions face different tax collection constraints (because of economic heterogeneity of regions); however, the federal center is

"equally weak" vis-à-vis different regions.

Since the tax revenue potentially originating from the tax base generated by the economy is not fully collected by the tax authorities, enterprises form tax arrears (both formally claimed by the tax collection service and successfully "hidden" from the state, i.e. (1–r)p(π^R–π^D) and (1–p)(π^R–π^D)). Then, strategic tax collection and auditing influence the distribution of tax arrears: tax arrears are larger for taxes, which are less thoroughly collected (given similar tax bases). From this point of view one can claim that under the conditions described above tax arrears for regional taxes are smaller than those for federal taxes (note, that in a setting with joint taxes the distinction is less strict; one can rather argue, that taxes are more or less attractive for the federal or regional governments). If tax arrears accumulate to the detriment of federal taxes, the ratio of federal taxes to total taxes collected goes down (since both the numerator and the denominator are equally affected), resulting in effective fiscal decentralization (as defined above). Ceteris paribus, *regions with higher tax arrears therefore achieve higher fiscal decentralization.* Obviously, bargaining power of the federal center also varies differently in center-region relations. Hence, for the sake of the empirical analysis, one has to control for potential political variables influencing the ability and the willingness of the regions to bargain with the federal center in order to establish the ceteris paribus condition (i.e. the price of decentralization as defined by Congleton et al., 2003).

The second (*federation-centered*) scenario implies a shift of the bargaining power balance to the federal center and an increase of its monitoring abilities. Hence, the incentives for the agent are reversed: it can derive higher utility (from benefits and avoiding punishments) from directing tax collection and auditing effort into federal taxes. Note, that there are no changes of agent's or principals' utility functions in this setting: we assume only changes of monitoring capacity and bargaining power. The shifts of strategic tax auditing and collection behavior result from actions of the agent facing constraints of limited ability to collect taxes in general, while the principal's action has only an indirect impact (from bargaining over "protecting" the agent from the punishment by another principal). The logic is exactly reverse to that of the region-centered case: tax arrears are mostly accumulated on costs of regional governments; in the ratio of federal tax revenue to total tax revenue the increase of tax arrears affects the denominator much stronger than the numerator, and *the regions with higher tax arrears achieve lower fiscal decentralization.*

A simple model can be helpful to understand this reasoning. Consider a region in a federation, where two taxes with strictly separate tax bases are collected. Denote the *contested* tax bases as T_L for the local (regional) tax and T_C for the central (federal) tax (i.e. the portion of the overall tax bases for taxes $L$and Cclaimed by the tax authority, but rejected by the taxpayer) and the *declared* and *uncontested* tax bases as T_L^U and T_C^U respectively (i.e. the portion of the overall tax base which is accepted by both taxpayer and tax authority). There-

fore $T_i = (\pi_i^R - \pi_i^D)p_i$ and $T_i^U = \pi_i^D$, where $i \in \{L; C\}$. We disregard the tax auditing activity and focus on tax collection (in fact, both tax auditing and tax collection run in the same direction, so this simplification is possible). The tax rates of both taxes for the tax bases are constant and exogenous τ (the equal tax rates are without loss of generality). The coefficients α_C and α_L measure the monitoring capacity *and* bargaining power of respective governments (which, in fact, run in the same direction in our story); $e_L$and e_C denotes the tax collection effort of the tax authority to collect the regional and the federal tax respectively, so that tax arrears $a(.)$ are functions of respective efforts. We focus on strategic tax collection: so, both principals and the agent know the tax base. There is no effort necessary for collecting the uncontested tax base. Tax arrears are defined as a share of the tax base, so that the collected tax for the government i is $(1-\alpha(e_i))T_i = (\pi_i^R-\pi_i^D)p_i r_i$ and $a(e_i) = 1–r_i$. The overall tax collection effort in the region is constrained by a certain level E, so that $e_C + e_L = E$. Therefore the problem for the tax collection authority can be written as follows:

$$\max_{e_L;e_C} e_L^{\alpha_L} + e_C^{\alpha_C} - c(e_L; e_C) \tag{3.1}$$

s.t.

$$e_L + e_C = E \tag{3.2}$$

$$e_C \leq E \tag{3.3}$$

$$e_L \leq E \tag{3.4}$$

where $c(.)$ denotes the cost of tax collection, which is increasing and strictly concave in both arguments (the functional form of influence of alphas on the function is without loss of generality: any increasing function of respective e and alpha would suffice; in a similar way, $c(.)$ is simply a differentiable continuous function, which may as well be a function of the sum of e_C and e_L). The reason for the construction of the objective function is that the principals (federal and regional governments) provide benefits/ punishments according to the efforts of the tax authority for "their" own tax. The last two restrictions ensure that there is no need to increase tax collection efforts beyond a certain threshold (simply speaking, when the tax base is completely collected). We assume that at least one of these conditions is binding: otherwise there is a certain tax base, which the tax collection authority is not able to collect at all. Obviously, the problem has a corner solution: for $\alpha_L > \alpha_C$ the tax collection authority invests its efforts only in regional tax collection, and vice versa. Only if the respective tax collection is complete (one of the last two conditions is binding), the authority proceeds with investing in tax collection of the weaker government. The share of the regional government in overall tax collection is then denoted by:

$$s = \frac{T_L^U + (1 - \alpha(e_L))T_L}{T_L^U + T_C^U + (1 - \alpha(e_L))T_L + (1 - \alpha(e_C))T_C} \tag{3.5}$$

Consider four regions, which are denoted *A, B, C* and *D*. All regions have identical tax bases for both taxes, and therefore T_L, T_C, E_L and E_C are the same.

Regions A and C have identical (large) overall tax arrears $a(e_L)T_L + a(e_C)T_C$, and regions B and D have identical (small) tax arrears, so that tax arrears of A are larger than of B. A and B have higher bargaining power vis-à-vis the federal center and $\alpha_L > \alpha_C$, and for regions C and D the opposite holds. Therefore, differences in tax arrears between A and B and C and D arise through the overall restriction on tax effort E (which is larger by the second region in each pair). Considering regions A and B (the region-centered scenario) it is straightforward that they both collect the total regional tax and form federal tax arrears: then A has larger federal tax arrears than B, and both have identical (zero) regional tax arrears (this is of course an extreme simplification of reality, where regional tax arrears can arise even in spite of effort invested by the respective government – from the empirical point of view one can look at it as the "noise" in the data); hence $s^A > s^B$ (where the superscript denotes the respective region), On the contrary, for C and D (the federation-centered case) both regions have identical (zero) federal tax arrears and C has larger regional tax arrears than D. Then $s^D > s^C$.

As we show in the next section, these two statements give rise to two hypotheses we can test. In fact, one could say that in a federation-centered case a region with huge tax arrears is extremely centralized, and in a region-centered case the same region with the same tax arrears is extremely decentralized. However, any empirical specification has to control for differences in tax bases and in bargaining power. Obviously, the retention rate *per se* is of secondary importance, since the government is looking at the absolute size of its budget. It is hence important to notice that the "fiscal decentralization" as defined in this section is just a *by-product* of the decisions of governments, motivated by the desire to increase their overall *fiscal revenue*, which can, however, be used in an empirical study to identify the behavior of interest.

3.3 Strategic tax collection and Russian fiscal federalism

The ideal playground for studying the strategic tax collection problems should, as it follows from our previous discussion, have two main features: *high centralization of formal fiscal authorities* (but possible decentralization of tax administration) and low *external constraints* E making manipulation with tax collection effort attractive. In what follows we will try to show that the Russian federalism indeed meets these two criteria.[3] With respect to the first characteristic, it suffices to refer to the discussion of the asymmetric fiscal federalism in Russia in the *Introduction* to the thesis to see the major research puzzle: highly centralized fiscal federalism is combined with enormous degree of fiscal asymmetry in terms of retention rates. Further subsections deal with other components required to

[3] In what follows we refer only to the revenue side of the fiscal structure. The expenditures side, which has been more decentralized, is outside the scope of this chapter.

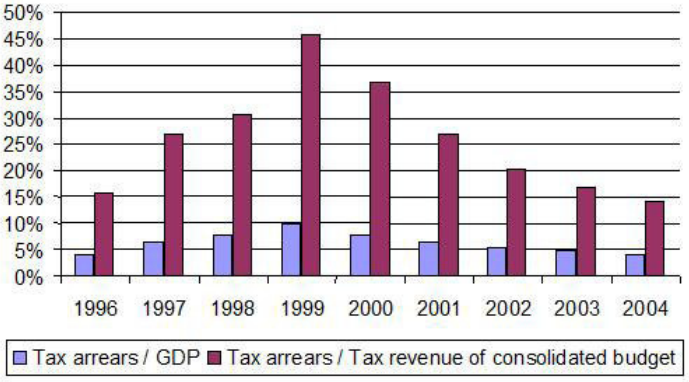

Figure 3.2: Tax arrears in the Russian Federation (as of December 31 of respective year).
Source: Goskomstat

justify the use of Russian sample for studying strategic tax collection.

3.3.1 Manipulation of tax collection effort

Throughout the last two decades the tax collection in Russia remains a difficult task. First, Russia experienced increasing tax evasion in the first ten years of transition resulting from a deficit of current financial assets and the so-called "mutual arrears networks" (unsettled claims of enterprises persisting for years) of the early 1990s, of low tax morale and of a legitimacy deficit of the state as well as inefficient enforcement (see e.g. Yakovlev, 1999, Wintrobe, 2001 or Alm et al., 2006). In 2002-2003 the share of the shadow economy accounted for 48.7% of Russian GDP (Schneider, 2005). After 2000, a consolidation of government (with increasing pressure of tax authorities and state-loyal decisions of courts), internationalization of Russian businesses requiring an increase in transparency (Yakovlev, 2005) and advancements in tax reform (Jones Luong and Weinthal, 2004) seem to have made evasion less attractive. Moreover, the tax burden was weakened by the introduction of the flat tax on personal income. Although empirical studies on its effect are inconclusive (Ivanova, Keen and Klemm, 2005), it appears that it mainly affected tax revenue because it has facilitated tax collection and thus reduced the extent of tax evasion. After a permanent increase of tax arrears as a share of GDP or budget tax revenue, this indicator seems to go down since 1999 (*Figure 3.2*). Nevertheless, tax evasion remained an important problem for the Russian economy. Even in 2003-2004 it exceeded 40% of taxes paid when considering the so-called "spacemen schemes" (which include the creation of a short-life firm) of an average firm only (Mironov, 2006).

In the world of huge tax evasion, tax collection authority is obviously unable

to track any hidden source of revenue. However, not only the tax audit was problematic; tax collection has also not been an easy task because of huge enforcement problems enforcement problems for the tax administration (Shleifer and Treisman, 2000). In fact, in the 1990s companies often voluntarily declared tax arrears (i.e. claimed but unpaid portion of taxes), since the general deficit of liquidity and the virtually absent bankruptcy law allowed them to operate even without paying the taxes, which they recognized. The latter became subject of various "mutual recognition" schemes, i.e. joint cancellation of fiscal claim of the government to the enterprise (for the regional portion of taxes) and of government's debt to the enterprise (e.g. for goods and services), often providing substantial gains to (mostly regional) bureaucrats and politicians, not only in form of individual payments, but also through re-allocation of control over attractive assets and financial flows for themselves and their privileged companies or electoral support (Treisman, 1998a; Kuznetsova et al., 2002).

On first sight, this setting seems to be a violation of the basic model described in the previous section; however, in fact it just shifts the problem of tax collector on a different level. Instead of finding out the "hidden" tax base the issue is to force the enterprises to comply with a specific scheme of settlement for tax debt allowing the government to receive certain gains from the taxpayer. Once again, in an environment where liquidity deficit is omnipresent, the tax collector has to allocate its effort to force the taxpayer to comply with a settlement scheme preferred by a certain principal. In fact, the only difference is that as a result of strategic tax collection preferred principal receives not the fiscal revenue, but other benefits, while the arrears disappear through mutual recognition. The other principal remains with her own tax arrears. Obviously, in this environment *tax audit* is irrelevant, but *tax collection* is still a problem. Moreover, the recognition schemes were often an outcome of bargaining. Pappe (2000) suggests that governmental agencies were likely to lose in a confrontation with private businesses during the period studied (including tax matters); however, if consolidated, they were able to succeed in any conflict. Thus, the efforts with respect to negotiations over concerted action of different agencies could be also manipulated, heavily affecting results.

Though the issue of claims settlement became less important since the liquidity crisis went down, the "traditional" problem of "finding out" the "true" tax base also remained a huge issue for the Russian tax collecting authorities throughout the last two decades (under both Yeltsin and Putin). In this setting, strategic tax collection also played an important role. As mentioned above, one of the channels of strategic tax collection is the allocation of efforts in lawsuits. In Russia, a lawsuit in taxation matters has not just been a formal step, as one probably would expect given the low degree of judicial independence in Russia: Russian tax authorities are notorious for a relatively low success rate in the court. This is true not only for the period of the "weak state" under Yeltsin, but also (contrary to the common belief) under Putin. According to the data provided by the federal tax authority itself, in 2001-2005 72% of all disputes

were settled in favor of the taxpayers. Moreover, even weighting by the size of the claim, the rate of success of taxpayers in 2001-2003 exceeds 60% (and reaches 80% in 2002), though it decreases to less than 50% in 2004 and 32% in 2005.[4] In a random selection of 160 deals in transfer pricing matters in 2002-2004 tax authorities lost about 84%, mostly because of lacking evidence and bad documental backing of deals (Rodionov, 2005). The officials are often not thorough enough while preparing the documents for the court. This effort is, however, crucial for the outcome of the legal procedure. Hence, manipulating this effort in an environment of large tax avoidance, tax authorities can pursue the goals of strategic tax collection.[5] Notice, that although *individual* claims of the tax authority might as well be erroneous (or used as a source of rent-seeking of uncontrolled bureaucrats), in *aggregate* in an economy with huge tax avoidance they are likely to be correct.

To conclude, there are reasons to believe that the Russian federalism meets two main requirements for studying strategic tax collection. However, these requirements are sufficient to expect the presence of strategic tax collection, but not enough to predict the potential main beneficiary of the strategic tax collection (and therefore identify the federation-centered and region-centered designs, necessary to formulate empirical hypotheses). This is what we will attempt in the following subsection.

3.3.2 Informal practices and tax collection under Yeltsin and Putin

The discussion of the fiscal federalism in Russia under Yeltsin makes it reasonable to look for instruments which are able to establish a link between economic heterogeneity and political asymmetry to fiscal asymmetry. From this point of view the *de jure* structure of the tax system should be confronted with the *de facto* organization of tax collection and distribution in Russia. Technically speaking, the federal tax administration collects all tax payments from individuals and legal entities on an account in the Federal Treasury (*Kaznacheistvo*) that are then distributed between different governments and governmental entities. That means that all regional governments just receive their portion of tax revenue from the federal tax service (Lavrov, 2005). The federal tax service

[4] By the way, this difference also supports our idea of strategic tax collection: obviously, tax authorities seem to put more effort in disputes with larger prize to win.

[5] The fact that tax authorities often address taxpayers with claims which they cannot justify is acknowledged by the high-ranking officials of the Ministry of Finance (see e.g. the interview of Ilya Trunin, head of the Department of Tax Policy, to polit.ru, 2008, January 17). Often the tax administrators are guided by a formal or informal plan, setting their goals to the "overall tax collection", and therefore have clear incentives to set higher claims, given their effort to collect them cannot be monitored completely. Even an unjustified claim is not "completely lost" for the tax authority. The taxpayer also compares the expenses of a legal process to defend her rights (involving substantial costs) and the benefits; in case of a smaller claim the decision could be just to "pay and forget". However, the costs for a taxpayer depend on the efforts the tax administrators put into their claim.

does formally not rely on regional administrations from the point of view of tax collection or enforcement, nor does it require any cooperation from the regional governments. There are also no regional law enforcement agencies (several attempts to introduce a "municipal militia" were crushed by the federal center) and no regional courts.

However, the real bureaucracy of the federal tax service does not operate as smoothly as prescribed by the law. The main reasons for that are typical for the Russian bureaucracy in general (and, actually, for most bureaucracies of developing and transition countries): low qualification of public officials, often abuses of power by public officials, high corruption etc. In this imperfect world regions could use a variety of strategies to shift revenue in favor of their budgets, e.g. "monetary surrogates" and non-cash tax collection, extra-budgetary financial establishments with quasi-mandatory contributions of private entities etc. Some of these institutions flourished in the 1990s, while others managed to survive in the 2000s, and have been well studied in the literature (e.g. Genkin, 2000, Lavrov et al., 2001, Gaddy and Ickes, 2002). We focus on one particular strategy, which could drive the development of the retention rates, i.e. the "capture" of local tax administrations by the regional governments. Regional politicians and bureaucrats were able to develop personal relations with the officials of tax services, who, because of absent territorial rotation, stayed in their offices for years. Given the bad federal financing of the public service, regions could provide additional benefits for the employees of regional tax collection authorities (e.g. housing assistance). Finally, although formally tax administrators were completely autonomous, in reality the cooperation of regional governments was quite helpful or even necessary to deal with large taxpayers with significant political capital which became an issue of bargaining between governments and agencies (Enikolopov et al., 2002; Dabla-Norris et al., 2000). This environment facilitated the emergence of tax arrears.

Of course, it would be farfetched to claim that all regional tax authorities were successfully "captured" by the regional governments: in fact, conflicts between regional governments and federal branches were also present. However, capture seems to be an important factor determining the behavior of a great number of local tax collecting agencies. Moreover, the use of different strategies may be complementary. For example, the abovementioned "mutual recognitions" for regional portions of tax arrears seem to have significantly exceeded those for federal portions of tax arrears, thus, once again, reproducing the de-facto fiscal decentralization result (see Schetnaya Palata, 2000); in order to facilitate mutual recognition schemes (and to get benefits from them) governments used quasi-money, extra-budgetary funds etc. However, the support of tax authority is of course key to any endeavor dealing with taxes calculated according to the law. Anyway, the environment observed in the Russian Federation in the 1990s resembles the region-centered setting described in section 2; therefore the following hypothesis could be formulated.

Hypothesis 1: In the 1990s (under Yeltsin's presidency) regions with *higher* tax arrears are more likely to exhibit ceteris paribus *higher* fiscal decentralization in terms of tax revenue attributed to the federal center.

As already mentioned, political changes under the administration of Putin seem to reduce the willingness and the ability to manipulate taxation in favor of the regions. Nevertheless, the tax avoidance remained huge, and there is also no evidence that the quality of bureaucracy in Russia increased. Given the shifts of bargaining power between the federal center and the regions one could thus expect that the strategic tax collection behavior changes in line with the second (federation-centered) setting, giving rise to the following hypothesis:

Hypothesis 2: In the 2000s (under Putin's presidency) regions with *higher* tax arrears are more likely to exhibit ceteris paribus *lower* fiscal decentralization in terms of tax revenue attributed to the federal center.

In fact, the measures of the federal center to improve monitoring and control over regional branches of federal ministries seems to set incentives necessary for the local tax authorities. Consider the most obvious way of providing incentives for the local officials: personnel policy. Unfortunately, there is no empirical evidence with respect to personnel changes in the regional tax authorities. However, there is some anecdotal evidence from other regional branches of federal law enforcing agencies, that the federal government started an active personnel restructuring since 2001 in order to ensure higher loyalty of regional authorities to the federal center and to break the informal connections between local governments and local branches of federal agencies. For example, in 2001 the Federal Ministry of Internal Affairs (which is also responsible for the police in Russia) changed the heads of its regional branches in 7 regions; in 2002 it were 13 regions, in 2003 25 regions and in 2004 22 regions. Most successors of the heads of regional police offices were not appointed from the regional staff, like it used to be the case in the 1990s; mostly they came from other regions or from the federal bodies of the Ministry (Voronov, 2005, see also Petrov, 2009, for discussion of other federal agencies). It is likely, that other local branches of federal ministries expected similar changes (which were only partly reported by the press). But even if there were no direct changes in the tax collection service since 2000, the very experience of other ministries and services could have a strong impact on the behavior of regional authorities.

However, the principal-agent framework presented above does not provide any arguments regarding strategic tax collection under increasing centralization, typical for Putin's presidency. On the contrary, since the influence of regional authorities went down, there seem to be no reasons for continuing strategic tax collection; the federal government, regaining control over regional tax authorities, could implement its aims through formal legislation (and indeed, the tax reforms since 2000 partly aimed at increasing the share of tax collection attributed to the federal government). An alternative point of view is offered

by the discussion of the semi-authoritarian regime in Russia, mostly originating from political sciences. The main idea of the approach is to differentiate between "classical" authoritarianism, in which the central government is able to enforce its objectives against other political groups via direct pressure, and the "hybrid regime", or "semi-authoritarianism", in which the central government enforces its aims through indirect or hidden channels, imitating the "formal" democratic framework of developed countries (Olcott and Ottaway, 1999; Levitsky and Way, 2002; Furman, 2007). Technically, one assumes the additional constraints for the federal center to change the institutional environment in its favor.

This "imitation" results from a variety of reasons. First, unlike "classical" authoritarian regimes, semi-authoritarian governments have a vested interest in the integration in the international community and hence in complying with the rules of democratic societies (at least formally). Second, it can follow from a relatively weak power concentration (as compared to "classical" authoritarianism"), which makes the use of "indirect channels of control" inevitable. The idea is that of the "blackmail state" described by Darden (2001): the federal government is interested in semi-illicit activities of regions to obtain an additional instrument of control. Formal redistribution of tax revenue between the center and the regions could be politically undesirable after certain thresholds are passed; so, the federal center may also be interested in strategic tax auditing as a "hidden" instrument to ensure the re-centralization goals while formally complying with the "rules of conduct" established for democratic federations in the international community. Hence, the semi-authoritarian approach also provides some background for *Hypothesis 2*.

3.4 Data

Our analysis covers the period of 1995-2006 (12 years), which includes practically the whole history of Russian federalism – from the period of "regional feudalism" in the mid 1990s to the current "vertical of power" under President Putin. The analysis covers all regions of the Russian Federation excluding nine autonomous okrugs[6] and the Chechen Republic for which no reliable data are available. Thus, we observe 79 regions annually.[7] Following the discussion above, we estimate the influence of tax arrears (as explanatory variable and

[6] One autonomous okrug (Chukotka) is not part of another member of the Federation; therefore Goskomstat provides statistical data for this region in full scale, and it could be included in our research.

[7] We are forced to exclude Kalmykia in 2006, since in this year it reported negative revenue of the federal govern-ment from its territory (because of the VAT repayment). This is not the first time in the history of the Russian fe-deralism a region reports negative tax collection: in the early 2000s Taimyr autonomous okrug (not part of the sample) reported negative fiscal revenue of the regional government due to tax optimization by Norilsli Nikel, its largest taxpayer. Moreover, for Kurgan and Tula in 2005 retention rates larger of 100% were obtained; the data seems to come from statistical artifacts of comparing information of different sources and hence were also excluded.

proxy for tax collection efforts) on the distribution of tax revenue between the center and the regions, controlling for alternative factors. From *Hypotheses 1* and 2 we expect a positive sign of tax arrears in the regressions with fiscal decentralization as dependent variable in Yeltsin's governing period and a negative sign in the Putin period.

The empirical regression estimated is specified as follows:

$$SHARE = \alpha_0 + \alpha_1\ ARREARS + \alpha_2 TAX\_STRUCTURE + \alpha_3\ LEGAL\_CONTROLS + \alpha_4 POLITICAL\_CONTROLS + \epsilon.$$

where

- *SHARE* denotes the share of regional government in the overall tax revenue of the region (retention rate);
- *ARREARS* denote the tax arrears;
- *TAX_STRUCTURE* denotes the control variables associated with different tax structures in different regions;
- *LEGAL_CONTROLS* denote the control variables due to the legal structure of the federal organization in Russia and
- *POLITICAL_CONTROLS* denote the control variables due to political asymmetry of bargaining power and of preferences in Russia.

In what follows, we discuss the variables of the regression in greater detail.

SHARE: This indicator is obtained by dividing the revenue of the regional government from taxation originating from a certain region by the overall tax revenue from its territory. We use the "consolidated" regional government including both government of the region and local governments.[8] A higher share represents less centralization as defined above.[9]

ARREARS: An advantage of the Russian dataset is that there are data available on tax arrears for most of the regions and at least from 1995 onwards as reported by the federal statistical authority. The reported tax arrears in Russia include (1) tax obligations, which are claimed by the tax authorities, but were not paid

[8]Throughout the chapter the *consolidated regional budget* comprises the overall budget of the region and all subordinated jurisdictions (municipalities). Since Russian regions are highly centralized and municipalities depend on the regional governments in their essential tasks, this is a reasonable indicator to use.

[9]Since the variable is bounded between zero and one, it is sometimes suggested to perform a log-odds transformation (log (SHARE/(1-SHARE)) to obtain the independent variable. We have used it for robustness checks and did not find any significant differences in the results of the estimations.

by the taxpayer (nedoimka), (2) restructured tax liabilities (e.g. when the payment of taxes was officially delayed), (3) tax liabilities not collected in due time because of the bankruptcy of the taxpayer, (4) tax liabilities, currently under collection by the court executives (bailiffs) and (5) liabilities from stopped tax collection activities. This measure has certain advantages and disadvantages. For example, it can also be influenced by events like bankruptcy of large taxpayers or "wrong" claims of tax authorities, which could be later suspended by the court. One should be aware that the measure is not an indicator of the shadow economy and therefore does not measure the overall economic activity, which is "ignored" (consciously or not) by the tax authorities and therefore does not represent the *tax auditing* activity. However, it seems to be a good proxy for *tax collection* activity as defined above.

The problem is unfortunately that, on the one hand, increasing tax arrears may indicate less severe tax *collection* activities, but may on the other hand result from more intensive tax *auditing*. The reasons are straightforward: tax due identified by the tax collection authority is first registered as tax arrears and later (often after a decision of a court) "transformed" into real tax payments. The main question is therefore whether tax collection or tax auditing activity is really relevant for the Russian federalism. The arguments above do not discriminate between these two processes. However, as already mentioned, in the liquidity crisis environment under Yeltsin it was the tax collection, and not the tax auditing issue, which dictated the fiscal process; under Putin tax collection remained a non-trivial activity and therefore still constituted a significant issue. Thus, our approach to the interpretation seems to be justified. Finally, in section 3.7 we deal with alternative explanatory variables, which are, unfortunately, available only for a short time period, and also provide some tentative evidence in favor of our interpretation of tax arrears.

Tax arrears used in the study accumulate for all taxes due to all levels of government of the Russian Federation (i.e. include both "regional" and "federal" taxes, as defined by the Russian tax law). The reason is the existence of joint taxation which in fact forms the main revenue source for regional governments. As already mentioned, any joint tax can be more or less attractive for regional governments (or for the federal center) assuming different distribution of tax revenue: therefore the tax collection effort could vary. It is probably helpful to assume that different taxes are more or less attractive for different levels of government *as opposed to each other* rather than to use a dichotomy of "attractive" or "not attractive" forms of taxation. The indicator used in regressions is therefore tax arrears per unit of gross regional product (the normalization is needed to account for significant differences in terms of size of regions in Russia).[10] We square this indicator in order to account for non-linearity in the relation

[10] A disadvantage of this proxy for tax collection effort is that we had to exclude nine Russian regions (the so-called "autonomous okrugs" which are officially both members of the federation and parts of other larger regions), for which GRP data are only available until 2000, for the aims of consistency of annual cross-sections.

between tax arrears and decentralization.[11] Indeed, the strategic tax collection activity is non-trivial for tax authorities and associated with additional effort for *organizing strategic tax collection*. Since this effort at least partly has the character of fixed costs (or, at least, is decreasing with experience because of learning effects), it seems to be reasonable, that only if tax arrears become very large, the officials start really thinking about strategic tax collection; the increase of tax arrears over-proportionally increases the incentives to engage in this activity if high levels of tax arrears relative to the regional economy are reached. For the panel data specifications we include two tax arrears indicators: under Yeltsin and under Putin. Both are equal to tax arrears per unit of GRP for the periods of administration of the respective president and zero otherwise. So, we consider as an independent variable an interaction term between a time effect and tax arrears.

TAX_STRUCTURE: We include two variables accounting for economic differences among the regions. By including controls we, first, capture other factors leading to asymmetries between regions in the tax split between the regional and the federal budget. Mostly, they cover economic asymmetries or differences in tax base endowments. Their major effect is that they influence the ability of regions to collect different types of taxes. Under equal rules for distribution of tax revenue from a region, great disproportions in the structure of tax revenue effectively allow regional governments to have a different share in the tax revenue of their territory. We control for variables roughly representing two sources of taxation: the *flow of economic activity* (average income per capita) and the *stock of economic assets* (capital funds).

LEGAL_CONTROLS: Another group of controls represents formal factors leading to differences in tax sharing. From this point of view we include a dummy variable for Tatarstan and Bashkortostan. As mentioned above, these two regions were the first to enter the direct bilateral bargaining with the federal center in the early 1990s and to sign separate power-sharing agreements, which allowed these republics to receive all excises and rental payments for the natural resources instead of the federal center (Lavrov, 2005). Therefore it is reasonable to assume, that these two regions have a significantly different share of taxes attributed to their budgets. There are reasons to claim that the effect for these two territories differed substantially under Yeltsin and under Putin; hence, the regressions actually include two dummies: for these two republics in 1995-1999 (Yeltsin) and 2000-2006 (Putin).

POLITICAL_CONTROLS: Finally, we include control variables capturing political bargaining power and preferences of the regional elite vis-à-vis the federal

[11] Estimations without squaring tax arrears yield almost the same results: the effect for Yeltsin survives and for Putin there are even more significant and negative outcomes (since Kalmykia becomes more influential). Specifications with linear and squared term are hard to justify theoretically, and, once performed, yield highly non-robust outcomes with mostly insignificant coefficients.

center. Naturally, these factors are partly captured by the tax arrears structure. It has also been demonstrated by previous empirical studies cited above, that political bargaining power plays a role. However, even if the other regions apart from Tatarstan and Bashkortostan cannot directly influence the distribution of tax revenue, they still have an opportunity to bargain with the federal center in order to set taxes split in a particular way, which favors particular jurisdictions given their endowment with a tax base. Therefore bargaining over policies regarding the *whole federation* becomes an instrument of *selective* support of different regions. There is some anecdotal evidence that strategically acting governments influence the federal decisions on the distribution of overall taxes (for the whole Russian Federation) to their advantage (see Petkov and Shklyar, 1999). Also, preferences account for a desire of regional elites to invest more heavily in the bargaining process. From this point of view we estimate all regressions with and without political variables, in order to check the robustness of results (but only regressions with political variables are reported in the chapter).

The list of these controls is very similar to the previous chapter, but there are several small modifications. Political variables, generally speaking, include two main groups: differences in bargaining power and in political preferences. The following bargaining factors are considered:

1. Economic potential of the region: territory, population and share of oil and gas extraction in the region (due to importance of these resources for Russia). The variables of economic potential (especially oil and gas share) represent both political bargaining power and differences in the structure of tax bases and therefore have a double role in our model.

2. Formal status of the region. As mentioned, national republics are often argued to enjoy special privileges as compared to other units of the federation (Filippov and Shvetsova, 1999); that is why we include a dummy for republics in our regressions.

3. The ability of the region to secede (which is higher for border regions, for regions with higher distance from the capital and for regions with lower share of ethnically Russians). We include two variables to capture this effect: a dummy for border regions and the geographical distance between regional capitals and Moscow.

4. Over- (or under-)representation of the region in the lower chamber of the Russian parliament. Since 1993 the Russian parliament consists of two chambers: the Council of Federation, which includes one representative of the region's legislature and one representative of the region's governor administration, and the State Duma, which consists of 450 deputies, 225 elected by a system of proportional representation and 225 elected in single member districts. The mal-apportionment in the State Duma is of greater interest, since the mal-apportionment in the Council of Federation is basically covered by the popula-

tion variable among the controls (for influence of mal-apportionment on political decisions see Samuels and Snyder, 2001).

5. Power concentration within the office of the regional governor or president and conflict potential with the center. The most common way to measure power is to discuss electoral statistics (share of governor in the latest elections or years in office). The conflict potential with the center is often measured by the partisan status of the governor (e.g. Communist governors in the 1990s or support of pro-presidential parties *Nash Dom Rossiya, Edinstvo* and *Edinaya Rossiya* in the elections of 1995, 1999 and 2003). Other indicators and expert opinion could be applied. They all are questionable to a certain extent: In Russia, cheating and administrative manipulation of elections make their results less meaningful for analysis. The Communist governors used to establish excellent contacts with the center after their elections and expert opinion is always subjective. Nevertheless, in this chapter we reduce the variety of possible indicators to the power index of Jarocinska (2004), partly including other indicators discussed above.[12]

6. Dependence upon federal transfers. High centralization of tax revenue resulted in a relatively high dependence of many regions from the central transfers to fulfill even their basic responsibilities. Once again, there is a *de jure* dimension of federal grants (which officially followed a predetermined scheme) and *de facto* dimension (for example, political reasoning behind the grants distribution). The transfers are likely to influence both the size of tax arrears (since they act, to a certain extent, as a substitute for regions' own tax revenue) and the degree of decentralization (through the regions' bargaining position over general rules of tax collection); hence, in order to avoid the omitted common cause problem, we have to control for the impact of transfers. The issue of transfers is interesting, as it represents a trade-off for the regions: to pay more taxes and (probably) to receive higher compensation in form of transfers or to pay little taxes and lose a claim for financial support from the center. In a real world setting with asymmetric information it is possible that a region uses both strategies or switches from one strategy to another. Regions with a relatively high bargaining power can succeed in both strategies. We include the share of fiscal transfers in total expenditures of regional governments to account for this effect. Obviously, the timing of events should represent an important feature from this point of view: if transfers are distributed before tax collection effort is made, there should be no effect on tax collection. However, from the empirical point of view this issue seems to be relatively intransparent. Governments collect taxes throughout the year (partly on quarterly basis), and hence, there is no

[12]The index is calculated for 1995-2000; there is no information after 2000 available. Since there have been a num-ber of significant political changes in Russia after this period, we include, once again, two variables: Power (1995-2000) is equal to the actual variable in these years and zero otherwise; Power (2001-2006) is equal to the power index in 2000 for the years 2001-2006 and zero otherwise. The interpretation of the respective coefficients, even if they are similar, ought to be different: the latter rather reflects the path-dependent effect of power asymmetries in the 1990s persistent even after Putin's recentralization.

clear "timing" vis-à-vis transfer decisions. Moreover, the relations between regional and federal governments could be analyzed as a repeated game for which expectations should play an important role.[13]

The simplest way to measure the heterogeneity in political preferences is to consider the ethnic composition of a region (share of non-Russian population) as well as other socio-demographic indicators. In this study we included the urbanization indicator, which proved to be significant in other empirical papers on endogenous centralization.[14] Moreover, there are significant differences in the democratization levels of different Russian regions which also account for heterogeneity of preferences (but also for peculiarities of regional political process). We use the Carnegie Endowment index of democratization, which covers all regions in our analysis and varies over time. Some bargaining indicators (like average income per capita) also may be considered as a proxy for heterogeneous preferences. A detailed description of all variables and the summary statistics are provided in *Appendix C.1.*

3.5 Econometric strategy

As mentioned above, economic and political asymmetry of Russian federalism and the transition from Yeltsin to Putin during the period of observation create a series of econometric problems. Therefore we use a four-stage research strategy.

First, in order to get a general "impression" on the specifics of the data, we estimate individual annual cross section regressions by OLS. An advantage of the Russian Federation is that the high number of regions renders this approach statistically feasible. Already at this stage, as well as in the case of panel data regressions, we perform a simple outlier control as an additional robustness analysis ensuring normal distribution of residuals in order to make correct inference in a still small sample. Yet we do not take annual cross-sections as the main

[13] One should finally notice that a yet additional parameter of the fiscal system able to influence the logic of our study is public debt. From the point of view of public debt, Russian regions and municipalities received loans and issued bonds of different types (Danielyants and Potanina, 2007); moreover, in the 1990s it has been common practice for governments in Russia to delay wages and salaries for public employees and officials, as well as other payments indefinitely. Tax arrears partly include delayed tax payments; that is why public debt decisions can be (voluntarily or involuntarily) determined by the problems of tax administration. However, this relation does not pose any problem for our empirical analysis given the aim of this chapter. Another direction of causality (public debt influences the quality of tax administration) is less reasonable: it is hardly possible to imagine a government relying on debt if tax revenue is available (even if one ignores all budgetary principles, it is illogical, since tax revenue is "cheaper"). There is still one aspect of the debt problems which is relevant: if the payments to tax administrations are delayed, it will influence the quality of their work. However, there is no data available to measure these delays for individual regional tax administrations over the period of our sample.

[14] Although this indicator may also represent a higher bargaining power of metropolitan areas.

source of inference in our analysis; therefore the results are reported only in the appendix.

Second, we address the problem of unobserved heterogeneity (both region-specific and time-specific) and run panel-data regressions with Newey-West corrected standard errors. We estimate pooled cross-sections-time series models as well as one way and two way fixed effects regressions (time and cross-section). Regional fixed effects are helpful, as they account for unobserved heterogeneity among regions, which seems to be very strong given the extremely asymmetric spatial structure of the Russian economy and the political constitution of Russian federalism; pooled cross-sections and one way time fixed effects allow the direct inclusion of institutional variables (which often do not vary across time) into our model. Pooled OLS includes a dummy for all years when Vladimir Putin was in office, so that one can directly observe the changes induced by the transition of power. Under Putin the development of tax arrears and the distribution of tax revenue may be driven not only by strategic tax collection, but also by tax reform described above. One can consider it an omitted variables problem: the increase of both tax arrears and the share of taxes attributed to the federal center are driven by a third variable (tax reform and intensification of overall tax collection activity). Time FE and the Putin dummy are instrumental to cope with this problem.

In order to form separate variables for the Yeltsin and Putin tax arrears (as considered above) and the dummy variable for Putin's presidency we count the year 2000 as the first year when Putin was already in office. Indeed, Putin became acting president on December 31, 1999. The first shift in the structure of federalism was in May 2000, as the president appointed his representatives to the newly established "federal districts" in order to control local governors. Moreover, the year 2000 was associated with a rapid change of informal rules of the game; combined with expectations of further centralization by regional officials, one could expect the changes in strategic tax collection behavior already in 2000. However, since Putin's rise to power was extremely quick and completely unexpected for both population and local elites (in fact, in 1999 most influential governors counted on the alternative candidate, former prime minister Yevgeniy Primakov), one should not expect any changes in tax collection due to shifts in expectations in 1999, and hence, it is reasonable to attribute this year to the "Yeltsin period".

Third, as mentioned above, the asymmetric character of Russian federalism is likely to cause problems of outliers. In particular, this outcome seems to be plausible for the Putin period, since the standard deviation of both fiscal decentralization indicator (*Figure 1.3* above) and tax arrears (*Figure 3.3*) increased significantly. The latter trend can be attributed to increases of tax arrears in a small group of regions, particularly in Kalmykia, where tax arrears exceeded the size of its GRP or were nearly equal to it. Kalmykia did not show up as outlier in the previous analysis based on large error terms; however, an extreme

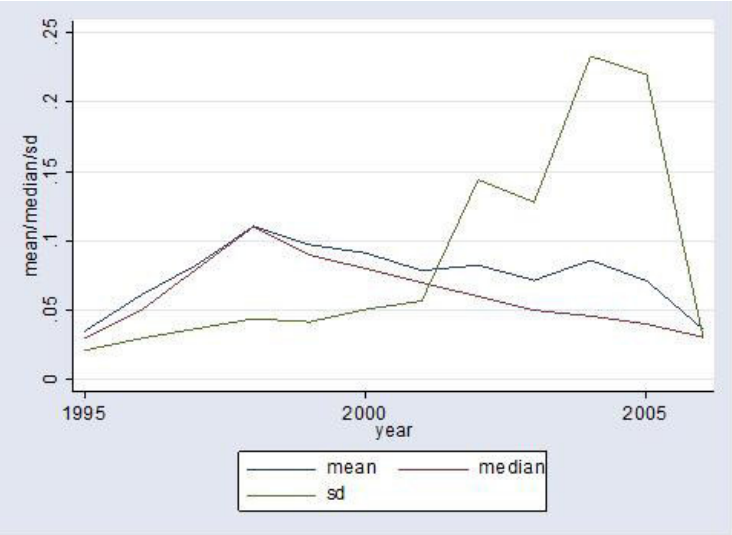

Figure 3.3: Statistics for tax arrears per unit of GRP in the sample of the paper. Source: Goskomstat

size of the variable for this observation can still influence the outcomes of the analysis. The reduction of standard deviation in 2006 is due to the already discussed exclusion of Kalmykia from the sample.

Generally speaking, the situation in Kalmykia confirms the explanation presented above. During the 1990s this region functioned as a kind of "internal tax haven": extremely loyal policies of the local tax authorities combined with the reduction of a region's share in tax rates and privileged treatment of companies with the majority of operations outside the region made it attractive for a huge variety of firms, including several large oil giants, which used Kalmykia for their transfer pricing design. On the other hand, the region had one of the strongest authoritarian regimes in post-Soviet Russia even compatible to that of post-Soviet Central Asian republics (see Gel'man, 1999). The government of the Republic dominated its economic structure. Kalmykia used to be not only one of the strongest, but also one of the most eccentric regimes, often directly opposing the federal government or declaring its region an "independent state" within the Russian Federation. That is why after Putin's rise to power Kalmykian president Iliumdzinov had to have more fears than his counterparts in other Russian regions. Kalmykia was also partly subject to business-government struggles of the mid-2000s, associated with tax auditing of the largest Russian oil companies like Yukos or Sibneft, previously using the Kalmykian offshore. The problem of outliers requires careful econometric modeling.

The previous steps already included outlier control based on tests on normality

of residuals. In the third stage, however, we explicitly address this issue using two main instruments. First, we estimate least absolute deviation (median) regressions with bootstrapped standard errors, which are known to be more robust to samples with significant outliers. Second, we repeat all estimations performed in the steps one through three excluding observations with very large values of tax arrears and with known atypical tax policies. In particular, we exclude three regions: Kalmykia, as well as Ingushetia and Altai Republic. Both latter regions are well-known for using the described "tax haven strategy" based on the special status obtained (unlike most other tax havens) through presidential decrees to create a more favorable tax regime for companies incorporated in this jurisdictions (partly only for specific large taxpayers associated with influential multiregional business groups or privileged companies owned by the representatives of the regional elite). We have experimented with excluding further tax havens (Mordovia), but the results do not change; in fact, virtually all results are obtained immediately after excluding Kalmykia. These estimations for a reduced sample often differ substantially from the estimations for full sample.[15]

The need to exclude outliers even in a region fixed effects specification is supported by highly significant Chow test: for both two-way FE and region FE the joint significance test for the variables additionally included in the regression and constructed by interacting all covariates with a dummy for these three regions (but excluding the fixed effect itself) is significant at any reasonable level (and equal to 21.44 and 40.97 respectively). Hence, the effect of these three outliers is not captured completely by the intercept changes (implied by region fixed effects); there seems to be a strong effect on the slope.

Fourth, we address the potential endogeneity bias due to a reverse causality problem (fiscal decentralization may influence tax collection behavior). There are theoretical reasons which make reverse causality questionable though. It is not clear whether the bargaining and economic power of the region depend upon the tax distribution or (as it is assumed by the empirical model) vice versa. Theoretically, there are some reasons to believe that this problem is less relevant for Russia. First, economic policies of Russian regions have been mostly inefficient, and their economic success is mostly limited to agglomeration effects or natural resources. Ahrend (2005) finds significant effects of fiscal policy on economic performance which, however, vanish in his TSLS regressions. There is some evidence from principal component analysis that fiscal policy can be important for regional economic development reported by Mau and Yanovsky (2002). However, Kolomak (2007) finds that investors are less sensitive to the size or duration of tax exemptions, when implemented, than to the very existence of the investment law, and that the sub-federal tax exemptions are unable

[15]The choice of outliers in the paper so far has been motivated by the specifics of the regions. One can take a more formal approach and simply use a trimmed sample: we do it by excluding all regions which fall in 1st and 99th percentiles of the respective year. We still obtain, for region and two way fixed effects, robust significantly posi-tive effects of Yeltsin tax arrears (for median and least squares) and non-significant Putin tax arrears.

to block an unfavorable industrial specialization and low development of infrastructure.

Second, since this chapter deals with *asymmetric distribution of tax revenue* and not with *differences in overall tax revenue,* even effective tax policy does not necessarily lead to biased results. There is no consistent point of view in theory as to whether the federal center or the regions carry out more efficient economic policies; and in Russia with its huge regional variety both variants could be present. Therefore it is difficult to establish a clear backward causal link between tax distribution and economic asymmetry. Nevertheless, Desai et al. (2005) show, that there is a positive relation between some specific indicators of economic performance of the regions and the retention of taxes.

Finally, endogeneity may arise if regions increase their tax administration effort only if they are provided sufficient fiscal incentives in form of high retention rates (see Weingast, 2007). However, first, this logic is more applicable for tax auditing rather than for tax collection. Second, one should understand, that in Russia retention rates represent *outcomes* of interaction rather than *rules of the game* (which, as mentioned, require equal treatment of all regions). In fact, one can be certain that the decision-makers in regional governments and tax collection authorities simply do not *know* the retention rates (these values are never reported and were calculated in a number of English-language publications obviously seldom consulted for regional governors). What they do observe (and manipulate) is their *overall fiscal revenue*; decentralization is just an *ex-post* result of the strategic tax collection and not its goal.

Nevertheless, in order to check for robustness of our results to potential endogeneity we use two procedures. First, we estimate all regressions with lagged variables (i.e. distribution of tax revenue in year t is explained by variables of the year t-1). These estimations are helpful as tax collection of the current year is partly calculated on the basis of past year's revenues, which can be captured by our additional analysis. However, according to our understanding of Russian fiscal system, taxes are usually collected throughout the year rather than next year (even for income tax collected by tax agents). Hence, in a rapidly changing environment this specification may seriously miss true interaction of political and economic variables.

The second approach is based on the instrumental variables estimator. We use retail sales and net profits as instruments for both tax arrears under Putin and under Yeltsin. Indeed, these variables may indicate the performance of local enterprises, important for tax arrears formation. As these variables prove to be largely insignificant in the panel and cross section OLS regressions and as there are theoretical arguments that these variables influence tax arrears, they may serve as (weak) instruments when no other, more suggestive instruments are available. Using additional instruments suggested by Treisman's (2003) specification (share of agriculture and share of dominant enterprises) those turn out

to be much weaker as instruments. In particular, the Hansen J test statistics largely indicate over-identification. Unfortunately the quality of instruments is much better for the Yeltsin than for the Putin tax arrears.

3.6 Results

3.6.1 Strategic tax collection

The results of the four-stage strategy are reported in *Tables 3.1-3.4* for panel data and in *Appendix C.2* for annual cross-sections. Panel data analysis (OLS) and annual cross-sections yield different results. In annual cross-sections we do not find any significant impact of the tax manipulation in the Russian Federation on the decentralization until 2000. Since 2000 we find strongly significant evidence of influence of tax arrears on the distribution of taxes, and the sign of the coefficient is negative in each cross-section, consistent with *Hypothesis 2*. However, the pooled cross-sections (both with and without year dummies or Putin dummy) indicate a non-significant (although negative) sign of tax arrears under Putin. This effect, however, vanishes in panel data if region fixed effects are introduced. Given high complexity of time- and region-specific factors influencing the strategic tax collection patterns, it is a sign of warning. This might indicate an existence of a time trend in some other variables correlated with the tax arrears and hence creating multicollinearity problem and calls to caution in interpreting the results. Tax arrears for the Yeltsin period have the positive sign predicted by *Hypothesis 1*, but are, however, mostly insignificant.

The Jarque-Bera test for all panel data and annual cross-section regressions is significant, such that the hypothesis of normal distribution of residuals must be rejected. This requires us to test on the robustness of the regression results to outliers. While the estimations for Putin period are mostly robust to this procedure, tax arrears for the Yeltsin period hold their sign after the exclusion of outliers and even become significant in all panel data specifications *(Appendix C.2, Table C.4; Appendix C.3, Table C.5*). Hence, provided the outliers are excluded, both hypotheses find some support. In order to check the robustness of the results we exclude all political variables (given their relatively "vague" nature, causing the threat of measurement errors) and control the restricted regressions for the normality of residuals. Generally, this analysis does not change our results (*Appendix C.3, Table C.6*) and even yield significant negative coefficients for Putin tax arrears in pooled OLS (indicating that our suggestion of possible multicollinearity might be right). A further robustness check is to estimate regressions for Yeltsin and Putin periods independently (i.e. assuming that slopes of coefficients and intercepts are different for the two regimes). We find no significant influences of tax arrears for the Yeltsin period (with an unstable and only partly theory-consistent sign, see *Appendix C.4, Table C.8*) and non-robust impact of Putin tax arrears (see *Appendix C.4, Table C.10*).

As already mentioned, however, the estimation results seem to be heavily influenced by outliers. The results of the outlier-robust median regressions are striking: we find support for *Hypothesis 1* – a positive and significant impact of Yeltsin tax arrears on the retention rates – in almost all specifications for the full sample (*Tables 3.1-3.4*), and also for most specifications in estimations for Yeltsin period (*Appendix C.4, Table C.9*). Putin tax arrears are insignificant and non-robust in terms of sign (*Tables 3.1-3.4* and *Appendix C.4, Table C.11*). Moreover, after excluding three outliers with abnormal fiscal policies and/ or extraordinarily large tax arrears – Kalmykia, Ingushetia and Altai Republic – we find convincing support for *Hypothesis 1* regardless of the specification, estimation method and sample (all years or only for the Yeltsin period). The results for Putin tax arrears are not robust in terms of sign and mostly insignificant. Hence, we find strong evidence that, controlling for outliers, regional governments under Yeltsin were able to manipulate tax arrears in a way leading to de-facto fiscal decentralization. The results for Putin period, if present, are driven by several outliers and are not robust to the model specification.

Finally, we use several approaches to account for a potential endogeneity problem. The lagged variables specification basically does not support *Hypothesis 1*: Yeltsin tax arrears are mostly non-robust. The same is true for *Hypothesis 2*. We caution however, that, as already noticed, given the institutional design of the Russian fiscal federalism the lagged approach is not the most reliable one, and hence, consider the results of these regressions as less convincing. *Table 3.4* reports TSLS estimations for two-way fixed effects specification. For both specifications with and without outliers we once again find significant and positive impact of Yeltsin tax arrears on the retention rates. Since the instruments for Putin tax arrears are very weak, we also perform the TSLS estimation skipping this variable, and the results do not change (yielding significance at 5% level in full sample and at 1% level excluding three outliers). Finally, fiscal transfers, being used as one of the control variables, are clearly endogenous. Hence, we have also estimated all specifications and models without fiscal transfers and, once again, did not find any significant differences.

3.6.2 Determinants of retention rates

Although our main aim is to test the strategic tax collection hypothesis in the Russian sample, our results may also be instructive in terms of the analysis of factors driving the differentiation of retention rates in Russian regions and thus contribute to the understanding of positive determinants of fiscal decentralization. From this point of view they are complementary to the results reported in *Chapter 2*. The results of the panel data analysis partly follow the predicted pattern: higher bargaining potential and/or higher heterogeneity as compared to the Russian average lead to higher decentralization.

As expected, the dummy for Tatarstan and Bashkortostan for the Yeltsin period has a positive sign and is significant in all specifications. In the annual

cross-sections we find that the republics of Tatarstan and Bashkortostan have a significantly lower share of taxes attributed to the center than the rest of the members of the Federation until 2000 (when the centralization effort of Vladimir Putin started). They seem to have lost their significant impact on tax collection even before the formal abolition of power sharing treaties in 2002. Even more, for 2004 we find a negative and significant effect: it looks like the Putin's government specifically focused on reducing the fiscal autonomy of these two regions. Similarly, it is significant in the Yeltsin regressions in *Appendix C.4*, but insignificant in the Putin regressions estimated by OLS and negative and significant for some median specifications. In the panel data estimation the dummy republic is significant and has a positive sign in the majority of regressions, representing a higher bargaining power of republics and/or path dependency effects. The dummy for border regions is also almost always significant and positive, indicating higher bargaining power of potential secessionist territories (or relative underdevelopment of the region requiring special treatment). Territory is highly significant and positive, supporting the idea, that territory was used as a bargaining argument in Russia. The effects of population are partly significant, but the sign varies from specification to specification; it is negative without region fixed effects and positive and significant with region fixed effects. The latter sign seems also to be more in line with the hypotheses, while the former might come from the effects of interaction between territory and population.

However, we do not find any robust influence of the indices of power and democracy on tax distribution (the result is sensitive to the specification of the model because of multicollinearity problems, inevitable for an artificially constructed index).[16] It is possible to interpret this result as indicating a very low transparency of tax relations between the Russian regions and the federal center. A surprising result is, that regions with a higher share of Russian population were associated with a higher share of taxes remaining in the region (as already noted, this effect was probably achieved through the significance and the sign of the coefficient in the early 2000s). To a certain extent it contradicts the common wisdom that the national republics were more secessionist and interested in decentralization than Russian regions. Indeed, the dummy republic already captured potential secessionist tensions. Nevertheless, the result is still unexpected.

There are several explanations for this. First, regions may be more interested in federal transfers than in taxes. It is true for both more powerful regions (which gain from redistribution on the federal level) and heterogeneous poor regions with large populations. Indeed, the model contains a significant positive effect of fiscal transfers on tax distribution in favor of regions, which does not hold after excluding outliers. Second, the treatment of the city of Moscow with a

[16] Power variable is in fact partly negative and significant, and the results seems to appear more often for the 2001-2006 then for the 1995-2000 variable; hence, shadow of the past, as in case of Tatarstan and Bashkortostan, may support central government's desire to reduce the retention rates for formerly powerful agents (or reflect higher stability of power relations than often perceived).

relatively low share of tax revenue attributed to its government and excellent indicators may influence the regressions. However, Moscow is not an outlier (from the point of view of residuals), and so should not influence the robustness of regressions. Third, it is possible, that higher power and higher heterogeneity cause an opposite effect: the federal government is even more likely to put pressure on these regions. For example, a possible interpretation of the results is that the centralization pressure from the center in the early 2000s was higher for national than for Russian regions (as the latter were perceived as a larger threat for the unity of Russia). The federal center seems to be more active in suppressing wealthy regions than poor territories still depending on tax transfers. This policy could include both, specific measures for individual territories or a general design of the tax system. In fact, in the annual cross-sections the share of Russians also has a positive sign; the significant results concentrate in the 2000s (yet separate regressions in *Appendix C.4* discussed below show that the variable is significant for both Yeltsin and Putin periods).

The dummy for Putin's office period is highly significant and negative for all models in which it is included: it shows once again the centralization trend in the Russian federalism under Putin. Moreover, controlling for time series fixed effects or the Putin dummy does not change the results suggesting that the omitted variables problem due to the Putin tax reform does not affect our regressions. The tax structure variables were mostly unstable or even insignificant, thus supporting the extremely high importance of political factors for tax assignment, which seems to be present in the 2000s. However, a surprising result is that separate regressions for Yeltsin and Putin periods yield basically the same determinants of retention rates (with the exception of legal status dummy for Tatarstan and Bashkortostan). It may indicate that we need to re-evaluate the common perception of crucial changes in the regions-federation nexus under Putin vis-à-vis the Yeltsin period. Under Putin fiscal transfers and democracy seem to play a more important role. The former have positive sign (indicating that the same regions receive higher portion of federal grants and enjoy higher retention rates), but is, as mentioned, virtually impossible to interpret due to the endogeneity. The democracy variable is significant and negative in median regressions, but not significant in OLS.

Let us once again return to the comparison of this *Chapter* and the previous one. On the one hand, as mentioned, there are no differences in terms of *significant* results: distance from Moscow seems to be a strong predictor for fiscal decentralization - and sets of outliers. Controlling for a significant variable of tax arrears does not change the results. There are, however, some changes regarding the impact of dummy republic / share of Russians and dummy border region; introducing additional variation over time and increasing the number of observations makes them significant. From this point of view panel data setting actually decreases the divergence between regulatory and fiscal decentralization in terms of the set of driving factors. However, it is unclear whether a comparison of panel data and cross-sectional set ups is meaningful; assuming there were

a way to get variation of regulatory decentralization over time (what is not the case from the point of view of data at hand), one could probably obtain different results for regulatory indicators as well. Finally, there is an even stronger divergence between panel data fiscal decentralization results and constitutional decentralization results: while in the latter share of Russians is increasing the degree of devolution even for the subsample of republics, in the former it effectively decreases the degree of devolution (controlling for the dummy republic). Hence, the existence of a gap between constitutional and post-constitutional results is confirmed (although different aspects of post-constitutional decentralization seem to be closer to each other).

Table 3.1: Panel data regressions (no fixed effects), 1995-2006, dep. var.: retention rate

	(1) OLS	(2) OLS	(3) Median	(4) Median	(5) OLS	(6) OLS	(7) Median	(8) Median
Tax arrears squared (Putin)	-0.048	-0.045	-0.038	-0.036	-0.417	-0.079	-1.702	-0.52
	(0.032)	(0.031)	(0.298)	(0.290)	(0.594)	(0.449)	(1.450)	(1.090)
Tax arrears squared (Yeltsin)	1.391	0.361	**1.952*** **	**1.232** **	**2.501*** **	**1.665*** **	**2.174*** **	**1.305** **
	(0.998)	(1.056)	**(0.541)**	**(0.550)**	**(0.486)**	**(0.480)**	**(0.558)**	**(0.545)**
Dummy Putin		**-0.075*** **		**-0.079*** **		**-0.061*** **		**-0.073*** **
		(0.017)		**(0.012)**		**(0.014)**		**(0.016)**
Tax structure								
Average income per capita	**0.014*** **	**0.015*** **	**0.019*** **	**0.021*** **	**0.013*** **	**0.014*** **	**0.019*** **	**0.024*** **
	(0.004)	**(0.004)**	**(0.004)**	**(0.004)**	**(0.004)**	**(0.004)**	**(0.004)**	**(0.004)**
Capital funds	**-0.069*** **	**-0.073*** **	**-0.082*** **	**-0.094*** **	**-0.052** **	**-0.055*** **	**-0.076*** **	**-0.103*** **
	(0.019)	**(0.020)**	**(0.023)**	**(0.024)**	**(0.021)**	**(0.021)**	**(0.026)**	**(0.027)**
Legal factors								
Dummy Tatarstan and Bashkortostan (Putin)	-0.003	0.009	-0.037	-0.025	-0.026	-0.017	-0.061	-0.037
	(0.044)	(0.047)	(0.035)	(0.040)	(0.043)	(0.046)	(0.039)	(0.040)
Dummy Tatarstan and Bashkortostan (Yeltsin)	**0.230*** **	**0.236*** **	**0.178*** **	**0.180*** **	**0.186*** **	**0.191*** **	**0.143*** **	**0.172*** **
	(0.033)	**(0.032)**	**(0.036)**	**(0.035)**	**(0.031)**	**(0.030)**	**(0.037)**	**(0.035)**
Political variables								
Territory	**0.036*** **	**0.036*** **	**0.023***	**0.026** **	**0.020***	**0.020***	0.007	0.017
	(0.012)	**(0.012)**	**(0.013)**	**(0.013)**	**(0.012)**	**(0.011)**	(0.012)	(0.012)
Population	-0.004	-0.004	-0.006	-0.005	-0.007	-0.007	-0.006	-0.005
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Oil and gas share	-0.028	-0.02	-0.053	-0.015	-0.056	-0.05	-0.017	0.01
	(0.057)	(0.056)	(0.066)	(0.071)	(0.062)	(0.061)	(0.076)	(0.075)
Dummy border region	**0.027** **	**0.026** **	**0.027*** **	**0.028*** **	0.014	0.013	**0.015***	**0.019** **
	(0.011)	**(0.011)**	**(0.009)**	**(0.008)**	(0.010)	(0.010)	**(0.009)**	**(0.008)**
Distance from Moscow	**0.007*** **	**0.007*** **	**0.005*** **	**0.005** **	**0.008*** **	**0.008*** **	**0.007*** **	**0.005*** **
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**	**(0.002)**	**(0.002)**	**(0.002)**	**(0.002)**
Dummy republic	**0.076*** **	**0.075** **	**0.064** **	**0.061*** **	**0.079*** **	**0.078*** **	**0.081*** **	**0.072*** **
	(0.029)	**(0.029)**	**(0.025)**	**(0.022)**	**(0.027)**	**(0.027)**	**(0.023)**	**(0.023)**
Overrepresentation in State Duma	-0.013	-0.014	-0.008	-0.006	-0.007	-0.008	0.001	-0.001
	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)
Power (2001-2006)	**-0.029*** **	**-0.025*** **	**-0.017** **	-0.011	**-0.022** **	**-0.019** **	**-0.013***	-0.005
	(0.009)	**(0.009)**	**(0.007)**	(0.007)	**(0.009)**	**(0.009)**	**(0.007)**	(0.007)
Power (1995-2000)	**-0.021** **	**-0.024*** **	-0.006	-0.008	-0.014	**-0.016***	-0.004	-0.001
	(0.009)	**(0.009)**	(0.007)	(0.007)	(0.009)	**(0.009)**	(0.007)	(0.007)
Fiscal transfers	**0.128** **	**0.143*** **	0.051	**0.094** **	**0.085** **	**0.099** **	0.008	**0.083***
	(0.052)	**(0.051)**	(0.046)	**(0.045)**	**(0.04)**	**(0.039)**	(0.045)	**(0.045)**
Democratization	-0.001	-0.001	-0.001	-0.001	-0.001	0	**-0.002** **	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	**(0.001)**	(0.001)
Share of Russians	**0.191*** **	**0.192*** **	**0.135*** **	**0.152*** **	**0.161*** **	**0.162*** **	**0.142*** **	**0.150*** **
	(0.065)	**(0.064)**	**(0.052)**	**(0.045)**	**(0.048)**	**(0.047)**	**(0.044)**	**(0.040)**
Urbanization	**1.755** **	**1.802** **	0.322	0.246	-0.392	-0.355	-0.715	-0.614
	(0.728)	**(0.709)**	(0.557)	(0.459)	(0.586)	(0.570)	(0.502)	(0.472)
Constant	0.459***	0.488***	0.525***	0.526***	0.586***	0.608***	0.598***	0.541***
	(0.105)	(0.103)	(0.083)	(0.076)	(0.081)	(0.080)	(0.076)	(0.069)
Outliers included	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**
No. obs.	**945**	**945**	**945**	**945**	**910**	**910**	**910**	**910**
R^2	**0.493**	**0.263**			**0.267**	**0.53**		
Pseudo R^2			**0.165**	**0.183**			**0.19**	**0.205**
F-test	**21.49*** **	**20.76*** **			**19.72*** **	**19.92*** **		
Jarque Bera	**234.7*** **	**235.3*** **			**390.0*** **	**429.0*** **		

Notes: numbers in parenthesis are robust Newey/West standard errors for first-order autocorrelation (for OLS) and Bootstrapped standard errors (bootstraps n = 1000) for median regressions; ***, **, * indicate significance at the 1, 5, 10 % levels respectively. Significant results are marked bold.

While for the panel data the set of outliers could be hardly interpreted, the changes in the group of outliers throughout annual cross-sections (*Appendix C.2, Table C.4*) allow for some interesting conclusions. The number of outliers increased in the late 1990s-early 2000 and then went down again; it is the highest in 1998 (the year of the Russian financial crisis) and 2001 (when Putin's reforms were in discussion). This indicates an unstable situation in the Russian Federation in the "transition period" from Yeltsin to Putin, when regions partly carried out "atypical" economic policies, which cannot be captured by our modeling. Most outliers did not fit the general pattern for the Russian Federation exactly in these years when these regions were more active in carrying out the already mentioned "tax haven strategy" (Ingushetia in the early 1990s, Mordovia in the early 2000s, Altai Republic throughout the period), i.e. used legal possibilities provided by the presidential decrees or loopholes in the legislation to create a more favorable tax regime for companies incorporated in this jurisdictions (partly only for specific large taxpayers associated with influential multiregional business groups or privileged companies owned by the representatives of the regional elite). Unfortunately, absence of transparent and consequent information makes an *ex ante* control for this strategy in empirical research practically impossible.

3.7 Number of tax audits and tax arrears

Previously we have mentioned that the size of tax arrears as proxy for strategic tax collection has certain disadvantages. In particular, it may be difficult to disentangle the effects of strategic tax auditing and strategic tax collection on arrears; furthermore, strategic tax auditing might as well be of great interest for research. Recently Russian tax authority started reporting an alternative indicator, which may be used to complement our study: the *number of tax audits* performed by the tax collector in a given period. Unfortunately, the results are unavailable for the Yeltsin and early Putin period and cannot substitute our previous study; however, we can use the new variable to perform a robustness check. Basically, "tax audit" in these statistics means an auditing event when the executives of the tax collection office visit the taxpayer's premises and control the accounts and records. Tax audits may be performed by both individuals and legal entities and are concluded with a statement by the tax collection office confirming the correctness of records or indicating violations of the tax law. It goes without saying that the number of tax audits is a good proxy for *tax auditing activity.*

We have collected the data on the number of tax audits reported by local tax offices in Russia for the year 2006. Unfortunately, the data are available only for a subsample including 68 regions. However, even this approach may yield some interesting results. *Table 3.5* reports the estimation results for the year 2006, including various measures of tax collection activity. We use the same set of controls as in the previous exercise with the only exception of measures

Table 3.2: Panel data regressions (time fixed effects), 1995-2006, dep. var.: retention rate

	(10) OLS	(11) Median	(12) OLS	(13) Median
Tax arrears squared (Putin)	**-0.063****	-0.061	0.054	-0.135
	(0.026)	(0.138)	(0.319)	(0.558)
Tax arrears squared (Yeltsin)	-0.29	1.026	**1.080***	**1.267***
	(1.115)	(0.748)	**(0.579)**	**(0.726)**
Tax structure				
Average income per capita	-0.006	-0.002	-0.004	-0.003
	(0.005)	(0.005)	(0.005)	(0.005)
Capital funds	-0.026	-0.044	-0.015	-0.034
	(0.024)	(0.037)	(0.025)	(0.037)
Legal factors				
Dummy Tatarstan and Bashkortostan (Putin)	-0.006	-0.056	-0.025	-0.062
	(0.055)	(0.054)	(0.053)	(0.055)
Dummy Tatarstan and Bashkortostan (Yeltsin)	**0.221*****	**0.182*****	**0.182*****	**0.156*****
	(0.033)	**(0.035)**	**(0.029)**	**(0.035)**
Political variables				
Territory	**0.048*****	**0.029*****	**0.032*****	**0.017***
	(0.010)	**(0.011)**	**(0.009)**	**(0.010)**
Population	-0.003	0.001	-0.005	-0.003
	(0.005)	(0.005)	(0.004)	(0.005)
Oil and gas share	-0.062	0.023	-0.088	0.036
	(0.064)	(0.094)	(0.066)	(0.108)
Dummy border region	**0.027*****	**0.023*****	0.015	**0.015****
	(0.010)	**(0.007)**	(0.009)	**(0.007)**
Distance from Moscow	**0.008*****	**0.007*****	**0.008*****	**0.008*****
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**
Dummy republic	**0.085*****	**0.087*****	**0.084*****	**0.091*****
	(0.027)	**(0.019)**	**(0.025)**	**(0.019)**
Overrepresentation in State Duma	-0.002	0.005	0.001	**0.008***
	(0.006)	(0.006)	(0.007)	**(0.005)**
Power (2001-2006)	**-0.031*****	**-0.018***	**-0.028****	-0.01
	(0.012)	**(0.010)**	**(0.012)**	(0.010)
Power (1995-2000)	**-0.013***	-0.008	-0.003	-0.001
	(0.008)	(0.006)	(0.007)	(0.006)
Fiscal transfers	**0.163*****	**0.123*****	**0.131*****	**0.080****
	(0.052)	**(0.035)**	**(0.041)**	**(0.034)**
Democratization	-0.001	**-0.002****	-0.001	**-0.002***
	(0.001)	**(0.001)**	(0.001)	**(0.001)**
Share of Russians	**0.197*****	**0.178*****	**0.164*****	**0.176*****
	(0.059)	**(0.039)**	**(0.043)**	**(0.036)**
Urbanization	**2.972*****	**1.357*****	0.762	0.193
	(0.704)	**(0.460)**	(0.568)	(0.450)
Constant	0.536***	0.603***	0.666***	0.636***
	(0.121)	(0.092)	(0.100)	(0.087)
Outliers included	**Yes**	**Yes**	**No**	**No**
No. obs.	**945**	**945**	**910**	**910**
R^2	**0.468**		**0.414**	
Pseudo R^2		**0.287**		**0.312**
F-test	**19.46*****		**24.84*****	
Jarque Bera	**396.0*****		**916.3*****	

Notes: see *Table 3.1.* Coefficients for time and region FE are not reported. Some controls are dropped due to time invariance.

Table 3.3: Panel data regressions (region fixed effects), 1995-2006, dep. var.: retention rate

	(14) **FE**	**(15)** **Median**	**(16)** **FE**	**(17)** **Median**
Tax arrears squared (Putin)	0.041	0.041	-0.37	-1.073
	(0.028)	(0.250)	(0.446)	(1.502)
Tax arrears squared (Yeltsin)	**3.705*** **	**4.578*** **	**4.131*** **	**4.460*** **
	(0.760)	**(0.831)**	**(0.735)**	**(0.998)**
Tax structure				
Average income per capita	**0.012*** **	**0.017*** **	**0.012*** **	**0.017*** **
	(0.003)	**(0.003)**	**(0.002)**	**(0.003)**
Capital funds	**-0.086*** **	**-0.123*** **	**-0.073*** **	**-0.121*** **
	(0.021)	**(0.030)**	**(0.021)**	**(0.035)**
Political variables				
Population	**0.094*** **	**0.106** **	**0.056***	0.062
	(0.036)	**(0.046)**	**(0.032)**	(0.047)
Oil and gas share	4.204	5.907	1.401	4.686
	(4.840)	(7.801)	(4.666)	(7.218)
Overrepresentation in State Duma	-0.018	-0.011	-0.014	0.006
	(0.016)	(0.024)	(0.014)	(0.019)
Fiscal transfers	-0.069	**-0.167*** **	**-0.231*** **	**-0.243*** **
	(0.069)	**(0.059)**	**(0.051)**	**(0.055)**
Democratization	**-0.006*** **	**-0.008*** **	**-0.006** **	**-0.007*** **
	(0.002)	**(0.003)**	**(0.002)**	**(0.002)**
Urbanization	0.432	4.288	4.959	**7.861***
	(4.155)	(4.702)	(3.846)	**(4.419)**
Constant	**0.742** **	-0.626	-0.337	-0.619
	(0.327)	(0.620)	(0.297)	(0.605)
Outliers included	**Yes**	**Yes**	**No**	**No**
No. obs.	**945**	**945**	**910**	**910**
Pseudo R^2		**0.332**		**0.338**
F-test	**11.27*** **		**12.62*** **	
Jarque Bera	**240.5*** **		**236.9*** **	

Notes: see *Table 3.1.* Coefficients for time and region FE are not reported. Some controls are dropped due to time invariance.

Table 3.4: Panel data regressions (two-way fixed effects), 1995-2006, dep. var.: retention rate

	(18) FE	(19) Median	(20) TSLS	(21) FE	(22) Median	(23) TSLS
Tax arrears squared (Putin)	0.015	0.028	-0.172	0.289	-0.049	-10.529
	(0.020)	(0.087)	(0.875)	(0.255)	(0.529)	(16.172)
Tax arrears squared (Yeltsin)	1.028	**1.666****	**53.811***	**1.677***	**1.666****	**48.676****
	(0.803)	**(0.739)**	**(31.48)**	**(0.862)**	**(0.784)**	**(20.087)**
Tax structure						
Average income per capita	-0.007	-0.001	**0.028***	-0.004	0	**0.036***
	(0.005)	(0.005)	**(0.017)**	(0.005)	(0.005)	**(0.019)**
Capital funds	**-0.060*****	**-0.067***	**-0.072****	**-0.056****	**-0.072***	-0.054
	(0.022)	**(0.037)**	**(0.036)**	**(0.023)**	**(0.038)**	(0.044)
Political variables						
Population	**0.153*****	**0.097****	-0.163	**0.113*****	**0.097****	-0.24
	(0.040)	**(0.041)**	(0.180)	**(0.034)**	**(0.042)**	(0.210)
Oil and gas share	7.341	5.285	-13.994	4.723	5.047	-12.575
	(5.091)	(8.386)	(16.909)	(4.902)	(8.525)	(9.577)
Overrepresentation in State Duma	-0.008	0.005	0.046	-0.007	0.005	0.049
	(0.012)	(0.016)	(0.037)	(0.011)	(0.015)	(0.034)
Fiscal transfers	-0.008	0.005	0.046	-0.007	0.005	0.049
	(0.012)	(0.016)	(0.037)	(0.011)	(0.015)	(0.034)
Democratization	0	0	0.012	-0.001	0	0.002
	(0.002)	(0.002)	(0.018)	(0.002)	(0.002)	(0.007)
Urbanization	0.033	2.473	8.03	3.451	5.341	5.211
	(4.102)	(3.720)	(23.884)	(3.940)	(3.895)	(10.336)
Constant	0.329	-0.439	0.627	-0.625	-0.747	1.733
	(0.303)	(0.522)	(2.086)	(0.493)	(0.540)	(1.664)
Outliers included	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**
No. obs.	**945**	**945**	**942**	**910**	**910**	**907**
Pseudo R^2		**0.477**			**0.476**	
F-test	**18.19*****		**6.10*****		**18.86*****	**4.11*****
Jarque Bera	**854.5*****				**1266*****	
F-test first stage (Putin)		**2.15**				**3.68****
F-test first stage (Yeltsin)		**3.88****				**5.68*****

Notes: see *Tables 3.1 and 3.2*. For TSLS robust Huber/White standard errors are applied.

of power and democracy (which, as discussed, are obviously outdated for the second term of Putin administration).

We obtain the measures of tax collection and auditing by dividing tax arrears and number of tax audits by GRP and squaring the result, as in the previous parts of the chapter. Obviously, tax arrears have a *significant and negative impact* on the retention rate. The number of audits is positive, but insignificant. The most interesting part of the exercise, however, is regression (27). We simultaneously include the variable of tax collection (tax arrears) and tax auditing (number of tax audits) activity in the regression. In this case one can interpret the coefficient of tax arrears as *an impact of tax arrears on the retention rate conditional on tax auditing effort of the regional government.* We still find a negative and significant effect, supporting our conjecture that tax collection *per se* has a significant impact on the de-facto fiscal decentralization. Of course, one cannot immediately conclude from the estimation for 2006 that the same effect was present in the whole sample; however, this is at least certain evidence in our favor, especially because, as mentioned above, the problem of disentangling tax collection and tax auditing is more important for Putin, and not for the Yeltsin period.

Obviously a single cross-section is not sufficient to provide convincing evidence. Moreover, small sample problems preclude solving a variety of potential problems, including endogeneity. However, as an additional experiment we estimate all regressions from *Table 3.5* excluding fiscal transfers (which are highly significant and potentially endogenous). The results in terms of tax arrears do not change, but also the number of tax audits in regressions (26) and (27) becomes significant and *positive.* On the one hand, the results still support our hypotheses with respect to strategic tax collection. On the other hand, in terms of strategic tax auditing, the regional tax authorities seem to act in favor of the regional budget. Once again, it may suggest that the power shift in the structure of Russian fiscal federalism was not as decisive, as it may seem: however, the issue certainly requires special investigation.

3.8 Conclusion

The aim of this chapter is to test whether the strategic manipulations of tax arrears could be used when a central government does not have sufficient information and monitoring capacities for a regional influence on tax collection, and regions are able to focus their tax auditing and collection efforts on taxes mostly benefiting their budgets, in order to reallocate fiscal resources in favour of the regions. Moreover, we have tested, whether federal governments have an incentive to manipulate tax collection in their favour. In order to conduct these tests, we analyze the case of the Russian Federation. Thus, we have tried to understand whether strategic tax collection matters in general, and particularly for fiscal decentralization.

Table 3.5: Cross-section regression, 2006, dep. var.: retention rate

	(24) OLS	(25) OLS	(26) OLS	(27) OLS
Tax arrears squared		**-2.438*** **		**-2.770*** **
		(0.700)		**(0.821)**
Number of audits squared			37.003	49.782
			(36.808)	(37.432)
Tax structure				
Average income per capita	**-0.021****	**-0.022*** **	**-0.015***	**-0.018****
	(0.009)	**(0.008)**	**(0.009)**	**(0.008)**
Capital funds	**0.093***	**0.108****	0.077	**0.101***
	(0.053)	**(0.051)**	(0.058)	**(0.055)**
Political variables				
Territory	0.032	0.033	0.033	0.036
	(0.028)	(0.027)	(0.029)	(0.028)
Population	-0.018	-0.023	-0.011	-0.02
	(0.023)	(0.023)	(0.027)	(0.027)
Oil and gas share	**-0.864****	**-0.965*** **	**-0.723***	**-0.882****
	(0.345)	**(0.332)**	**(0.371)**	**(0.359)**
Distance from Moscow	**0.018*** **	**0.020*** **	**0.018****	**0.020*** **
	(0.007)	**(0.007)**	**(0.007)**	**(0.007)**
Dummy border region	0.03	0.035	0.028	0.035
	(0.037)	(0.038)	(0.038)	(0.038)
Dummy republic	0.14	0.131	**0.218****	**0.205****
	(0.091)	(0.092)	**(0.084)**	**(0.085)**
Overrepresentation in State Duma	-0.015	**-0.015***	-0.014	-0.013
	(0.010)	**(0.009)**	(0.010)	(0.009)
Fiscal transfers	**0.611*** **	**0.606*** **	**0.669*** **	**0.646*** **
	(0.192)	**(0.191)**	**(0.189)**	**(0.186)**
Share of Russians	**0.498****	**0.486****	**0.686*** **	**0.681*** **
	(0.207)	**(0.206)**	**(0.204)**	**(0.203)**
Urbanization	**6.174*** **	**6.183*** **	**5.030****	**5.103****
	(2.277)	**(2.3)**	**(2.199)**	**(2.236)**
Constant	-0.218	-0.191	-0.386	-0.363
	(0.300)	(0.299)	(0.310)	(0.312)
Observations	78	78	67	67
R^2	0.487	0.499	0.528	0.544
F-test	28.61***	28.60***	34.46***	36.47***
Jarque Bera	3.44	3.525	3.23	3.273

Notes: numbers in parenthesis are robust Huber/White standard errors; *** significant at 1% level; ** significant at 5% level; * significant at 10% level. Significant results are marked bold.

Generally speaking, our results partly confirm the intuition behind this chapter: there is evidence that tax arrears are used strategically to manipulate distribution of taxes between the fed-eral center and the regions. Our estimation strategy, however, yields heterogeneous results. We show that under Yeltsin the regions do use strategic tax collection to reallocate the tax revenue in their favour. These results also survive the TSLS regressions in order to check for endogeneity and various fixed effects specifications. Only the annual cross-sections provide evidence in favour of the second conjecture that the federal government was likely to use its power for tax arrears manipulation when it became strong. These results, however, seem to be partly driven by a small number of regions with extraordinarily high levels of per capita tax arrears.

Finally, given the data availability, we provide a short discussion of potential effects of tax auditing on fiscal decentralization. According to our estimates from the second term of Putin tax arrears have a negative impact on the revenue split even controlling for the tax auditing activity; the latter, however, depending upon the specification, has a positive and partially significant effect on the retention rates.

To conclude, this chapter was able to show at least one particular mechanism of decentralization, which exists "beyond" the framework of formal constitutional rules and creates strong differences between de-jure and de-facto devolution. The fiscal decentralization is not limited to written norms: both constitution of a highly centralized federation and power-sharing treaties of an asymmetrically decentralized structure are not sufficient to explain the variation of retention rates in the Russian context. The studies of fiscal federalism have been well aware of the fact, that ex-post distribution of funds and, hence, ability of governments to influence economic processes, is often significantly different, than the ex-ante rules of decentralization, since the governments may implement some transfer scheme. However, this chapter shows, that even if the transfers are not considered, there may be some systematic differences between allocation of fiscal resources and legal rules, which are driven by strategic behavior of the governments. Or, even ignoring the interaction *after* the initial allocation of fiscal resources (decentralization in the narrow sense), one still finds a systematic gap between de-jure and de-facto states, which is not simply a result of using bad proxies for a given institutional framework.

This chapter, however, reveals an additional problem. Even moving from cross-section to panel data does not yield any robust results in terms of influence of democracy on fiscal decentralization. Democratization is, however, often claimed to be causally interrelated with decentralization. The case of Spanish asymmetric federalism, or of restoration of federalism in Germany after World War 2, or even of the establishment of the Russian Federation after the collapse of the totalitarian rule, are just several examples of decentralization processes triggered by democratization. There are of course examples when federalism

and decentralization do not go hand in hand (like in China). Anyway, it seems that the interrelation between democracy and decentralization might be even more complex, than one often claims. The next chapter looks at this problem in greater detail.

Chapter 4

Devolution in (Non-)Democracies

4.1 Introduction

The lack of research on asymmetric and non-democratic federations is present in both empirical and theoretical literature. This chapter provides a very simple model of endogenous decentralization in a politically asymmetric country with various political regimes on different levels of government. The only source of revenue for the government is a unique split tax, but the retention rates may differ for regions with different economic fundamentals (secession costs, population, effects of public goods). Political systems (democracy and non-democracy) can vary separately at the federal *and* regional levels. The chapter defines decentralization as decentralization of (tax) revenue; expenditure decentralization is not considered.[1] The decentralization problem is one-dimensional: the federal government and the region decide only on the *distribution* of the fiscal revenue produced by the regional population, but not on the *size of the public sector.*[2] The main idea is to establish a causal link from the characteristics of the region (political system, size, effects of regional public goods, secession costs) and of the federal government (political regime) to the split of tax revenue. The economic and political differences between regions are *exogenous*, while the split of tax revenue is endogenous.

From this point of view, the chapter is related to several strands of literature dealing with endogenous decentralization.

[1] This approach makes sense: in asymmetric federations the revenue decentralization (retention rates) can be easily measured, while analysis of expenditure decentralization implies assessing allocation of federal spending over the territory, what is virtually never possible.

[2] This simplification is without loss of generality: as it will follow from the model, the results in terms of distribution of revenue between governments are valid regardless of the government share in output.

- The recent "second generation fiscal federalism" approach empathizes the impact of democratization on economic policy in developing federations. For example, Diaz-Cayeros et al. (2006) and Weingast (2007) describe the problem of the "tragic brilliance" when the federal center uses decentralization to fight its competitors in more democratic regions. Yet this literature still does not model explicitly the endogeneity of the federal design: the democratization (or de-democratization) process spreading over the country usually imposes the new round of bargaining over the degree of fiscal decentralization and allocation of authorities.[3]

- There is a extremely small literature dealing with formal modeling of asymmetric decentralization.[4] Congleton, Kyriacou and Bacaria (2003) and Congleton (2006) look at decentralization process as an issue of bargaining between the federal government and an *individual* region. Their main argument is that the differences in degree of decentralization (for example, retention rates), are a function of a "decentralization price" (or "costs of autonomy") a region is willing to pay. The model presented below to a certain extent disentangles the concept of decentralization price looking at individual factors influencing it.[5]

- There exists a huge formal literature dealing with causes of secession. Starting with the seminal work of Buchanan and Faith (1987) on secession, the incomplete list of contributions to the studies of secession in economics includes Bordignon and Brusco (2001), Le Breton and Weber (2003) and Olofsgad (2003). Several papers look at the influence of political systems on secession.[6] However, these studies, first, do not account for *differences in political systems within a country*, what is the main focus

[3]Myerson (2006) and Inman and Rubinfeld (2006) provide two models introducing the extension of political franchise process in a federal country. However, both contributions are rather concerned with the degree of democratization and stability of constitution, than with the distribution of fiscal revenue, which is the focus of this chapter.

[4]Although there are several papers look at how differences in economic fundamentals of regions in a federation influence the process *symmetric* decentralization, cf. Bolton and Roland, 1997, Ellingsen, 1998 or Goyal and Staal, 2004.

[5]Moreover, Abbink and Brandts (2005) in their mostly experimental paper develop a framework where two regions (a dominant and a subordinate) bargain about their relative autonomy; however, their aim is not to *predict* the relevant grade of autonomy, but rather to show whether the bargaining is successful or leads to a political conflict (secession). Their paper includes strictly democratic jurisdictions. Finally, since the results of asymmetric devolution in the sense used in this chapter can be identical to the outcomes of redistribution through transfers, it is possible that the literature predicting asymmetries in division of federal pool of resources (e.g. Wärneryd, 1998) actually may be helpful in deriving predictions for asymmetries in de-jure retention rates.

[6]Alesina and Spolaore (2003) explore this issue in models of the size of nation, showing that the equilibrium size of nations in a non-democratic world is larger, than in a democratic one. Arzaghi and Henderson (2005) develop a model of internal exit of a region and solve it under perfect democracy and imperfect democracy (Leviathan government) conditions. While under perfect democracy secession is promoted by income and population growth, relative income and population growth in the secessionist region, lower costs of government for this region and higher spatial decay of federal public services, imperfect democracy adds greater degree of democratic culture in the secessionist region, than in the country in general.

of our analysis. Second, this chapter is interested not in secession *per se*, but in the equilibrium (varying) degree of decentralization in the shadow of secession.

The three main findings of this chapter can be summarized as follows: (i) For all political regimes (including different combinations of subnational and federal regimes) regions with small population, high secession costs and low relative effectiveness of regional public goods in terms of productivity enhancement for private production contribute higher share of fiscal revenue to the federal budget; (ii) Democracies are more decentralized, than non-democracies, only if relative effectiveness of regional public goods is small enough and secession costs are high enough and (iii) Democratization at one level of political system, with persistent authoritarianism on the other, leads to higher centralization under broad parameter combinations. The first result provides clear testable implications for possible determinants of asymmetry in federations, which - at least at the level of anecdotal evidence - seem to be plausible, as I will show in what follows. The second result is important from the point of view of better understanding the partially contradicting empirical evidence on decentralization and democratization and, even more, the difference between federations and international alliances. Finally, the last result also challenges the common expectations of "decentralizing" effect of democratization, thus being relevant for both empirical findings and policy advice.

The chapter is organized as follows. The next section sets up the model; the third section solves it and reports the main results. The fourth section provides a discussion of the results from the point of view of the existing empirical evidence. The fifths section checks the robustness of the results relaxing a number of assumptions, and the last section concludes.

4.2 Model

4.2.1 Basics

The model sets up a relatively simple world, which, however, still allows some relevant conclusions. Basically, it is similar to the world of vertical tax competition: two governments (a federal and a regional) rely on the same tax base as the only source of revenue. However, while in the vertical tax competition models all governments are allowed to set their own tax rates, in this model governments simply try to split the revenue for a given tax rate. The revenue received by the government is used to finance the public goods provision, which, in turn, enhance productivity of the population (and hence, increase the tax base). The difference between the tax revenue and the public goods spending may be used to finance luxury goods; however, the optimization problem the government has to solve depends upon the political regime (and will be specified below). The distribution of tax revenue is an outcome of bargaining between federal and regional governments "in shadow" of secession: the federal government offers

the retention rate, which is then either accepted by the region, or rejected: in the last case regional government declares independence and has to suffer under additional costs. As I will show below, the model is driven by **three trade-offs**, which generate the main results. In what follows I systematically present the economics and the politics of the model.

4.2.2 Economy

The economy of the country includes three main groups of agents:

1. **Farmers:** The country has a population of agents of mass 1, which are identical from the point of view of their productivity and endowment. Each agent is endowed with one unit of a resource (land, L), which is used to produce consumption goods $Y = Y(L)$ and pay taxes to the government.

2. **Local bureaucrats:** The bureaucrats may be employed by the government, which then uses them to produce public goods in exchange for wages. I assume that there are no constraints on the number of employed bureaucrats, however, the costs of hiring additional officials are increasing quadratically.

3. **Government:** As mentioned, the government collects taxes from farmers and pays the bureaucrats. The difference between the tax revenue and the costs of bureaucracy can be used to purchase luxury goods G abroad.[7] The price of goods G is normalized to unity.[8]

The public goods in this model are, specifically, productivity-enhancing public *inputs* rather than public consumption goods.[9] The technology for production of consumer goods is

$$Y = 2((1-\beta)f + \beta r)L \tag{4.1}$$

where f and r are the federal and the regional public goods, and β is an exogenous parameter determining the relative effectiveness of federal and regional public goods supply in the respective region with $\beta \in (0.5, 1)$. Hence, the model assumes that the local public goods are "better suited" to fit the specifics of the regional population, which increases its productivity. There are once again two interpretations for this effect (and I do not differentiate between them): advantages of regional government in information acquisition and preference distance.[10]

[7] Since I assume a small country, it is a price-taker on the market for luxury goods.

[8] Introducing any further rules for market of G, including non-linear increase in prices, is without loss of generality.

[9] For example, construction of roads or public education may per se produce no additional utility to the public, but make individuals more productive. There is non-rivalry in consumption of public goods among farmers.

[10] First, regional government may have advantage in information acquisition (an idea which could be traced back to Hayek); the regional public goods are "better" for the public, because their "producer" had better idea about public's preferences. Second, β may be related to a

The government then charges a proportional tax, so that the revenue of the farmers is given by

$$C = (1 - \tau)Y \tag{4.2}$$

where τ is an exogenous tax rate. Without loss of generality and to simplify the notation, set $\tau = .5$. Since all farmers are identical, there is no trade between them; each agent simply consumes what is left after the taxes.[11] The utility function of the agents is as usually $U(C)$ with $U'(C) > 0$. Hence, the utility of farmers is increasing in Y for given τ, and therefore, is also increasing in both f and r: larger output of public goods makes farmers happy. The tax revenue of the government is then split between the federal and the regional government, so that the federation receives $t\tau Y$ and the region $(1 - t)\tau Y$, where t is the "tax split rate" (share of the tax revenue attributed to the federal government). The country consists of two regions $i = P, A$; each region has its own government in addition to the federal government. I denote the regional governments with the subscript A and P and the federal government with the subscript F respectively. The population of the region P is equal to $d_P = d$, region A is populated by individuals of mass $d_A = 1 - d$. For each region the tax rate τ is identical; however, t_A and t_P are set individually. As I will show in what follows, the model can be easily generalized to a case of n regions; in fact, it simply requires the proper interpretation of results. The technology of public goods provision is *identical* for regional regions and the federation; differences in β_i reflect differences in the effects of public goods on economic performance.[12]

The provision of public goods for specific regions requires the services of local bureaucrats. I assume, however, that the costs of the government associated with public goods provision are quadratic. This assumption (which can be encountered quite often in the literature, see e.g. Gradstein, 2004, for a similar model) can be justified by existence of corruption costs. Perotti (1993), Bolton and Roland (1997) and Bearse et al. (2000) discuss a revenue collection technology with a revenue tax τ and a quadratic loss function due to corruption or evasion. One could assume that similar reasons are driving the structure

larger "distance" between the region and the rest of the federation in terms of preferences or any other specifics. Think about linguistic differences: if the public services are provided in a foreign language (e.g. language of the federal government), they are by far less useful for the population; the time costs and effort to study a new language just to be able to consume public services reduces the effort which could be invested in production and therefore the overall productivity. If a region is really different from the rest of the federation, it is likely that the federal government will face greater problems while adjusting the public goods output to its needs. One can of course interpret this assumption in a way that the differences between regions result in preference differences; is reasonable, but empirically not always true.

[11] Or, equivalently, also purchase luxury goods abroad as bureaucrats and government do.

[12] One may probably ask why the federation exists in the model world of this chapter in the first place. On the one hand, empirically federations are not always outcome of efficiency maximizing behavior - on the contrary, countries experiencing devolution were often brought together by military power, history or mere luck in the past. On the other hand, this chapter may also be considered as an approach to the issue of stability of federations, which are not necessarily efficient.

of costs for public goods provision: public goods provision is a huge source of rent appropriation and corruption as well as the revenue collection, which could lead to additional costs. Or, stated otherwise, bureaucrats can simply "steal" more for large projects of public goods provision. The revenue of the bureaucrats is spent for luxury goods abroad. There are alternative justifications for quadratic costs. For example, in many developing countries bureaucrats require training abroad to perform their duties; however, it is much more costly to hire an internationally educated expert for work in distant provinces, than for work in the capital. Countries like India, China or Russia are excellent examples of the problem. While in the reality costs of provision of public goods in distant areas decrease while country's development level goes up, I abstract from this dynamic effects, concentrating on a static case. Anyway, I assume that each additional bureaucrat is more expensive than the previous one for the government. Denoting the salary of $i-th$ bureaucrat s_i (the salary is increasing for $i \to \infty$ by construction), the problem of a bureaucrat is $\max U_b(G)$ s.t. $G \leq s_i$ with $U_b'(.) > 0$. The bureaucrats do not pay taxes (and do not vote at elections, what becomes important in the next section).

In order to produce public goods in region A or P only local bureaucracy is required, and there are no spillovers.[13] Hence the federal government has to optimize the provision of public goods for each region separately and independently of other region(s); therefore it is possible to assume that federal government produces two types of public goods: f_A and f_P for each region separately (for the aims of notation). The budget constraint for the federal government can be written as

$$\tau \sum_{i \in \{A;P\}} t_i Y_i \geq \sum_{i \in \{A;P\}} \frac{f_i^2}{2} \tag{4.3}$$

or, equivalently

$$\sum_{i \in \{A;P\}} d_i t_i ((1-\beta_i) f_i + \beta_i r_i) \geq \sum_{i \in \{A;P\}} \frac{f_i^2}{2} \tag{4.4}$$

and for the regional government, analogously, one can obtain

$$(1-t_i) d_i ((1-\beta_i) f_i + \beta_i r_i) \geq \frac{r_i^2}{2} \tag{4.5}$$

There is no borrowing, and there are no transfers between budgets. The difference between public goods costs and revenue can be spent for luxury goods consumed by the government, which are also purchased at the international market for a constant price of 1; however, as mentioned, the problem of government is different for democracy and non-democracy, as I will discuss in what follows.

[13] This is a restrictive assumption, which I partly relax in the last section; it is motivated by both technical tractability of the model and the empirical cases, which I have in mind, as I will show in the discussion

4.2.3 Politics

Political regime. The behavior of the governments on federal and regional level depends on the specifics of the political system, which, as mentioned, may be democratic or non-democratic. While the budget constraint is the same for both regimes, the objective functions are different.[14] In a non-democracy the elites are free to maximize their utility (which is increasing in production of luxury goods). The problem of the government is then similar to that of bureaucrats: denoting the utility of the government $U_G(G)$ the problem is $\max U_G(G)$ s.t. budget constraints specified above. In what follows I will talk about "net revenue" or "profit" of the government and hence denote it as π. In this case they face the McGuire-Olson (1996) type problem: on the one hand, increasing public goods provision they improve the productivity of their population (and, hence, the size of the pie increases), but on the other hand, they have to pay overproportionally higher costs for each additional unit of public goods (so that their share of the pie decreases). Hence, the federal government, if non-democratic, faces the problem:

$$\max_{f_A, f_P} \pi_F = \sum_{i \in \{A;P\}} (d_i t_i ((1-\beta_i) f_i + \beta_i r_i) - \frac{f_i^2}{2}) \;\; s.t. \;\; \pi_F \geq 0 \tag{4.6}$$

The regional government, if non-democratic, faces the problem:

$$\max_{r_i} \pi_{Ri} = (1-t_i) d_i ((1-\beta_i) f_i + \beta_i r_i) - \frac{r_i^2}{2} \;\; s.t. \;\; \pi_{Ri} \geq 0 \tag{4.7}$$

In a democracy the government is controlled by the electorate (i.e. farmers), and not by the elites. As already shown, population prefers larger provision of public goods (in order to increase the production and ceteris paribus the consumption of private goods). I assume, that the population can perfectly distinguish between different sources of public goods supply (federal and regional governments).[15] Hence, people take into the account only the specific public

[14] There is currently a growing literature on modeling non-democracies, which of course includes many different assumptions as to what (non-)democracy means exactly (cf. Besley and Kudamatsu, 2008). In this chapter I follow the framework of Inman and Rubinfeld (2006) Assume as above that the government spends part of its fiscal revenue on public goods and the rest on luxury goods (once again, being a price-taker and normalizing price of luxury goods to one; the results of Zubrikas (2008) to a certain extent can be interpreted as exploration of what happens if the outside market adjusts its price to the actions of the dictator). The idea is that the population prefers higher public goods provision and disregards luxury goods, while the elites get utility only from luxury goods but not (at least, directly) from public goods. This is a reasonable assumption if one considers the developing countries: elites have much better access to private goods, acting as "substitutes" for poor public good protection (say, private security agencies, universities, medical facilities etc.), as well as are able to move abroad to consume services provided by other countries: receive medical services from foreign cliniques (or hire foreign specialists), educate their children in foreign schools and universities etc. On the other hand, the population is significantly less mobile, and its income is too low to purchase the substitutes of public goods.

[15] This is a less realistic assumption, yet we are going to maintain it for the aims of simplicity at this stage of analysis. Otherwise a problem of commitment in the negotiations between

goods output of a region (or the federation) while voting at regional (or federal) elections. Elections take place in each jurisdiction separately; the federal government has to obtain majority in both jurisdictions in order to be re-elected.[16] Obviously, the electoral success depends upon the provision of public goods attributed to a particular jurisdiction. It is straightforward to assume that in this environment the surviving government produces the maximal possible amount of public goods given the budget is still balanced. In this case the utility function of the government is $U_G(f_i)$ for federal and $U_G(r_i)$ for regional governments, with $U'_G(.) > 0$ and the budget constraints specified above. It means that the governments in a democracy solve the following problem:

$$\max f_i \quad s.t. \quad d_i t_i((1-\beta_i)f_i + \beta_i r_i) - \frac{f_i^2}{2} = 0 \quad for \quad i = A, P \tag{4.8}$$

$$\max r_i \quad s.t. \quad (1-t_i)d_i((1-\beta_i)f_i + \beta_i r_i) - \frac{r_i^2}{2} = 0 \tag{4.9}$$

Devolution game. Let me now specifically describe how the devolution game works. In the region A the government can decide on the production of regional public goods, but has no discretion over the tax split (A refers here to administrative decentralization). In the region P the regional government, once again, can freely decide on production of regional public goods, but can bargain with the federal government over the retention rate in the way specified below (and hence P refers to political decentralization, cf. Treisman, 2007). The *decentralization* in this chapter is defined as a pair $\{t_A; t_P\}$, where t_i should be referred to as the *tax split rate*. The devolution game has the following timing:

1. The federal government proposes $t_P \in [0; 1]$ to the government of the region P and sets unilaterally t_A.

2. The government of the region P accepts or rejects the proposed t_P. If the tax split rate is accepted, the revenue of the federal and the regional governments is determined as described above. Otherwise the regional government *secedes*: in this case the federal government does not receive any revenue from its territory and solves the respective problem only for region A, and the regional government receives the whole revenue from its territory, does not receive any benefit from the federal public goods provision (i.e. $f_1 = 0$ in the respective problem), but has to suffer under secession costs $C > 0$. Therefore its revenue is determined by the

the federation and the region becomes crucial (one government can be interested to "shift the blame" to its counterpart), and it requires a more careful modeling of dynamics than used in this chapter.

[16] This assumption is not restrictive in a world without cross-regional spillovers: otherwise the federal government will just produce enough public goods in the larger region to get re-elected, and in the second region act as a non-democracy.

expression:

$$\pi_{RP} = d_P \tau \beta_P r_P - \frac{r_P^2}{2} - C.^{17} \tag{4.10}$$

A special case when the federal government proposes $t_P = 0$ and the region accepts it should be referred to as a *de-facto secession*. Materially it corresponds to the situation, when region still remains part of the federal system, but does not receive any public goods from the federation and does not pay taxes, while there is no secession costs C imposed on it.

3. All governments determine the provision of public goods given the tax split rates and
4. Payoffs are realized.[18]

Although, as I will show, in equilibrium the tax split rates t_A and t_P are independent of each other given the absence of spillovers, they may be interesting for the comparison of the political and administrative decentralization.

Summary: The structure of the model can be simply visualized by the *Figure 4.1.* Now all three trade-offs can be identified. First, as already mentioned, non-democracies have to optimize their spending for public goods to obtain maximum net revenue. Second, however, regardless of the political regime, central government, while choosing the offer to the region (even regardless of the possibility of secession), faces yet another trade-off: since regional public inputs are "better" in terms of increasing productivity, a smaller tax split rate increases the size of the pie for redistribution; however, at the same time smaller tax split rate reduces the share of the pie federal government receives (to produce public goods and luxury goods). Third, the regional government has to confront the secession costs with the need to pay part of the revenue to the federal government (with "worse" public goods). The results are mostly determined by the influence of parameters (C, d_i and β_i) and political regimes on the way these three trade-offs are solved.

4.3 Devolution in different political regimes

4.3.1 Solution of the model

To start with, the problem is "separable" in two problems for pairs "region A - federation" and "region P - federation". More formally, first,

[17] Although in the model i assume that the difference between A and P is their *right* to seced, this is equivalent to saying that A has too high secession costs (in extreme case, equal to ∞) and then the equilibrium behavior is the same.

[18] This game tree may seem inconsistent, since farmers use public goods (produces at stage 3 for generating output at stage 1; however, the model is mostly static, and the production of public and private goods is assumed to be almost simultaneous. Stated otherwise, the model restricts attention to "steady states" where in each period production of private and public goods is balanced off.

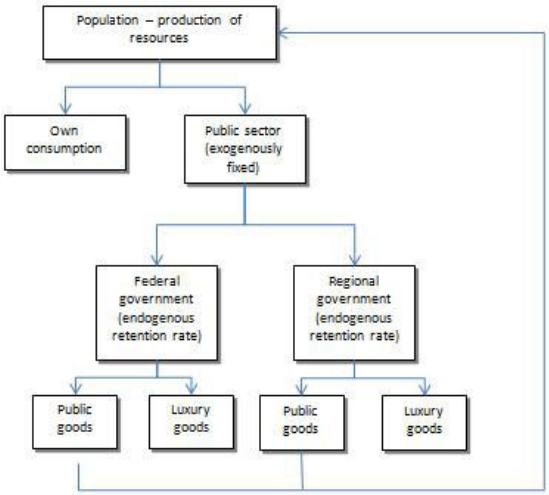

Figure 4.1: Logic of the model

Lemma 1 (independence property): For the non-democratic federal government, tax split rates t_A and t_P are in equilibrium independent of each other.

Proof: See Appendix

The intuition for this fact (which is instrumental in terms of solving the model) is straightforward. The only source of interdependence (if there are no direct spillovers and there are two public goods f_A and f_P) is the cross-subsidization of regions: for example, tax revenue of region A is used to finance public goods in region P and vice versa. The key for the independence property is that federal public goods are functions of tax split rates of respective regions only: f_A depends on t_A, but not t_P. Intuitively, by cross-subsidizing the government removes part of its resources from one region to produce additional revenue in another region; however, the government receives only a fraction of this additional revenue, which depends on the tax split rate. The *Lemma 1* shows that this additional revenue is smaller than the lost revenue from the other region.

For the case of *democratic* federal government, the situation is more complex. By cross-subsidizing public goods, the federal government necessarily reduces public goods provision in one of the regions. As notices, I assume that the federal government has to win the elections in both regions. Hence, allowing cross-subsidization for democratic federal governments I make the model unstable: opposition can always challenge the incumbent in at least one region,

requesting additional funds from another region. In order to avoid this problem, I assume that there is no cross-subsidization also in the case of democratic federal government.

For the model with two regions eight combinations of political regimes are possible. But since there are no spillovers, one can focus on four combinations for a pair "federation - region". By construction of the model, the public goods output is uniquely determined by the set of parameters and the tax split rate. In particular, for the non-democratic federal and non-democratic regional governments (regardless of political systems of other jurisdictions) the output of public goods for a region i given t_i is $f_i = (1-\beta_i)t_i d_i$ and $r_i = \beta_i(1-t_i)d_i$. If the federal government is democratic, the output of public goods f_i for a democratic region i is determined by the equations (4.3) and (4.4). Basically, they imply that it is necessary to choose the larger root of the quadratic equations as the size of the public goods provision. Hence the provision of public goods by the federation and the region i can be derived from the system of equations

$$d_i t_i((1-\beta_i)f_i + \beta_i r_i) - \frac{f_i^2}{2} = 0; \tag{4.11}$$

$$(1-t_i)d_i((1-\beta_i)f_i + \beta_i r_i) - \frac{r_i^2}{2} = 0 \tag{4.12}$$

If one considers the larger roots of quadratic equations, the provision of public goods by the federal government is given by

$$f_i = 2d_i((1-\beta_i)t_i + \beta_i\sqrt{t_i(1-t_i)}) \tag{4.13}$$

and for the regional government

$$r_i = 2d_i((1-t_i)\beta_i + \beta_i\sqrt{t_i(1-t_i)}) \tag{4.14}$$

The solution always exists for t_i and β_i satisfying the assumptions described above.[19] If the regional government is non-democratic, the federal government's choice of public goods provision is

$$f_i = d_i(t_i(1-\beta_i) + \sqrt{t_i(t_i - 2\beta_i t_i - \beta_i^2(t_i-2))}) \tag{4.15}$$

Once again, the solution always exists for β_i and d. Finally, if the federal government is non-democratic and the region is democratic, the region produces[20]

$$r_i = d_i(\beta_i(1-t_i) + \sqrt{(1-t_i)(2t_i - 4\beta_i t_i + \beta_i^2(1+t_i))}) \tag{4.16}$$

In both hybrid regimes the public goods output of the democratic agent is a sum of the non-democratic public goods output and an additional term, which

[19] One can notice that the ratio of squared output of public goods is proportional to ratio of shares of tax revenue: $\frac{f_i^2}{r_i^2} = \frac{t_i}{1-t_i}$.

[20] For the given assumptions on β_i and t_i the expression under the root sign in both (4.15) and (4.16) is non-negative.

reflects the need of democracies to produce more public goods. To conclude, one can reduce the model to an one-dimensional problem of choosing the tax split rate.

In what follows let me first identify the possible equilibria in the model. In order to do that, let me first introduce two definitions:

Definition 1: Federal optimum is a tax split rate solving the problem (4.6) if federal government is non-democratic and problem (4.8) if federal government is democratic. If the solutions of respective problems are larger 1, federal optimum is assumed to be equal to 1; if they are smaller 0, federal optimum is assumed to be equal to 0.

Hence, federal optimum is a tax split rate for which the federal government maximizes its net revenue for non-democracies and maximizes its public goods output for democracies.

Definition 2: Equalizing tax split rate is a tax split rate for which regional government is indifferent between secession and staying in federation.

Hence, equalizing tax split rate for non-democratic regional government is a tax split rate for which net revenue of the regional government under secession (expression (4.10)) and while staying in federation (expression (4.7)) are identical. If the regional government is democratic, the equalizing tax split rate is given by identical output of regional public goods in case of secession and while staying in the federation. The tiebreaking rule for the decisions of regional government is than that if secession and non-secession are equally attractive non-secession is preferred (what seems to be a completely realistic and probably even too weak assumption - non-secession is often preferred even if it is costly as opposed to secession). The democratic federal government is assumed to prefer non-secession as well.[21] Then it is straightforward to show that

Lemma 2: In equilibrium, if it exists, (i) t_A is the federal optimum and (ii) t_P is either the federal optimum, or the equalizing tax split rate, depending upon the set of parameters C, β_P and d_P.

Proof: See Appendix

In order to get the intuition for the Lemma, notice, that this chapter presents

[21] It may be less plausible, because, unlike the non-democratic case, both secession and non-secession generate equal revenue to the federation (which is zero), and, given the electoral system assumed, the motivation of the federation is not clear enough. However, the assumption seems still to be reasonable given the experience of central government behavior in the secession cases.

a one-period model, and the re-negotiations are impossible.[22] So, the region cannot exercise a credible threat that it will not accept a tax split, which guarantees larger net revenue (for non-democracy) or larger public goods output (for democracy) than in case of secession. The result restricts the attention for all further analysis to the properties of the federal optimum (as function of parameters) for region A. For region P it is required to look at the properties of both federal optimum and equalizing tax split rate, as well as possible choice of one of these equilibria depending upon the set of parameters. That is what I am going to do in the next two subsections. Notice, however, that I still did not make any claims regarding to existence of the equilibria: this should, once again, be investigated in what follows.

4.3.2 Asymmetric federations

To start with, consider the problem of *asymmetric* federalism specified in the motivation, i.e. how fundamentals map into the tax split rate. The main results of the model can be summarizes in the following statement:

Proposition 1: For any combination of political regimes, i.e. democratic federal and regional governments; non-democratic federal and regional governments; democratic federal and non-democratic regional governments; and non-democratic federal and democratic regional governments, (i) there exists a tax split rate $t_p > 0$ such that the regional government (weakly) prefers non-secession and federal government (weakly) prefers offering this tax split rate rather than any tax split rate under which region P secedes; (ii) the federal optimum and equilibrium tax split rate A is strictly positive, decreasing in β_i and independent of C and d_i; (iii) the federal optimum and the equilibrium tax split rates in both regions for pairs where both regimes are identical is strictly smaller 1; (iv) the tax split rates $t_A \leq t_P$ if regions A and P have identical political regimes and $\beta_A = \beta_P$ and (v) the equilibrium tax split rate P is decreasing in β_P, weakly decreasing in d_P and increasing in C.

Proof: See Appendix.

The first claim of the proposition provides, first of all, the existence result; secession or de-facto secession never happens regardless of political system. The federal government can always find a reasonable equalizing tax split rate, which is non-negative (i.e. without any transfers) and guarantees the stability of the federation. Second claim is intuitively straightforward: if the federal government produces relatively less efficient public inputs, the "size of the pie" considerations outweight that of the "share of the pie", and the federal optimum decreases. Obviously, federal optimum is independent of secession costs and, given all individuals are identical, from the size of the population. The third

[22] This is, by the way, a quite realistic approach to secessions; the situations when regions after successful secession returned to the federation by other means than crude force are extremely rare.

statement demonstrates that in pure non-democracies and pure democracies the trade-off is resolved in a way that the federal government never prefers complete centralization. It is however not true for hybrid regimes, where the corner solution may be chosen (which will be discussed in greater detail in the next section). The fourth result shows an intuitively straightforward fact: the secession option leads to ceteris paribus smaller or equal tax split rate, than in the region without secession. Interestingly, the size of the jurisdictions does not matter.

In the last part the proposition claims that for the region P in the equilibrium increasing effectiveness of the regional public goods vis-a-vis the federal once (larger information advantage / preference distance) leads to higher fiscal decentralization; if secession costs are high, the federal government is able to appropriate a higher portion of tax revenue; finally, large regions are likely to hold a higher share of their tax revenue. Now the results with respect to C and d are interrelated. It is intuitively clear that lower secession costs increase the region's "safe zone" where it can reject the federal offers. The effect of d on t_P is driven by the fact, that C is independent of the size of the jurisdiction (it seems to be reasonable: there is no reasons to assume, that larger jurisdictions encounter larger costs of secession; on the contrary, a quite reasonable assumption is that large jurisdictions can better survive the secession, especially in a protectionist world economy, where national borders matter, and therefore secession is associated with loss of market access, but also from the point of view of their potential to survive in military conflicts). The modeling implicitly assumed that for large jurisdictions *the per capita costs of secession* C/d go down.

In fact, there is more in part (v) than just description of factors driving the devolution of region P. It is straightforward to generalize the model to a case of n P-regions with different C, d and β. In this case part (v) describes how the differences in degree of devolution achieved by individual regions in this federation will be explained by their fundamentals, and hence, generates testable predictions for this case - assuming, of course, that there are no policy spillovers between regions.

In the *Figures 4.2* and *4.3* I simulate the path of the optimal tax split rate t_P for different β_P, C and d values in pure non-democracy. One can see that the equilibrium tax split rates for larger d and smaller C are higher, and the tax split rate decreases in β_P Notice, that some of graphs exhibit a kink, resulting from the switch from the equilibrium with t_P federal optimum to t_P equalizing tax split rate; however, if C and / or d are high and / or small enough, either only federal optimum, or the equalizing tax split rate are realized. Moreover, one can obviously see, that for $\beta_P \to .5$ the federal optimum is converging towards 1, and for $\beta_P \to 1$ towards .5

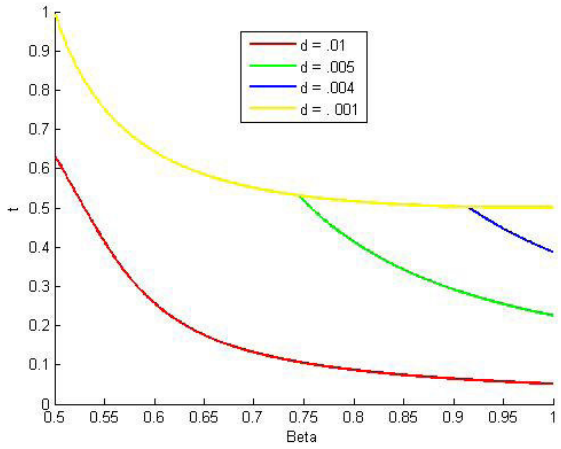

Figure 4.2: Equilibrium tax split rate in a pure non-democracy for different d, $C = .0005$

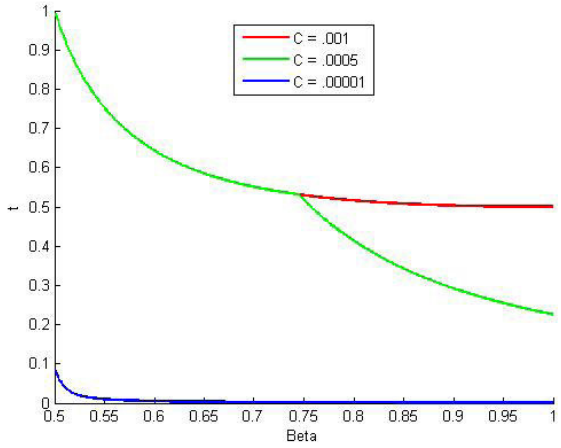

Figure 4.3: Equilibrium tax split rate in a pure non-democracy for different C, $d = .5$

4.3.3 Political regimes and decentralization

In the next step consider the differences in the patterns of devolution between different combinations of political regimes. I take the pure non-democracy as the reference point, as it may be reasonable for the study of developing countries (which almost always evolve in a shadow of (more or less) recent authoritarian past or are autocratic). First compare the pure non-democracy and the pure-democracy case. *Proposition 2* summarizes the main results for the federal optimum (and equilibrium tax split for region A).

Proposition 2: There exists $\hat{\beta}_i$ such that for all $\beta_i < \hat{\beta}_i$ federal government prefers higher decentralization in a democracy than in a non democracy and for all $\beta_i > \hat{\beta}_i$ vice versa.

Proof: See Appendix.

This result indicates that if the relative productivity-enhancing effect of the public goods produced by the federal government is strong enough (i.e. β is small), the non-democracies turn out to be more centralized than democracies if the secession option is absent. On the contrary, if regional public goods have a much stronger relative productivity-enhancing effect, democracies prefer acquiring a higher share of revenue generated by the region: competition on the federal level drives the federal politics towards overproduction of federal public goods on costs of the regional budget. Basically, this result relates the differences in the degree of fiscal decentralization between two pure regimes to the quality of information acquisition at different levels of political system or to the preference distance.

Now consider region P. Does a pure democracy always achieve a higher decentralization level than a pure non-democracy? Different constellations are possible. I report some simulated results in *Figures 4.4, 4.5, 4.6 and 4.7*. The non-democracy can be strictly less centralized, than a democracy (*Figure 4.4*), more centralized than a democracy for β_P small enough (*Figure 4.5*) large enough and small enough (*Figure 4.6*) or vice versa (*Figure 4.7*). Analytically, however, one can show that

Proposition 3: There exist $\hat{C}$ and $\hat{\beta_P}$ such that for all $C > \hat{C}$, $\beta_P < \hat{\beta_P}$ holding simultaneously the pure democracy is strictly more decentralized than pure non-democracy.

Proof: See Appendix.

Hence, federations with very high secession costs and similar productivity-enhancing effects of public goods of the federal and regional government are likely to become more decentralized if democratization occurs. The result is straightforward: for low secession costs region P can achieve higher decentral-

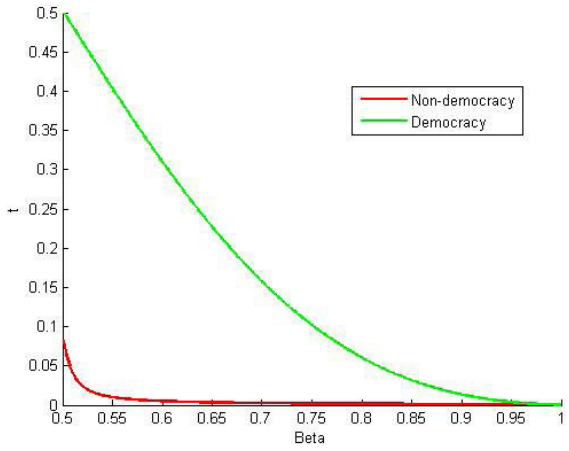

Figure 4.4: Equilibrium tax split rate in a pure non-democracy and a pure democracy, $C = .001$, $d = 1$

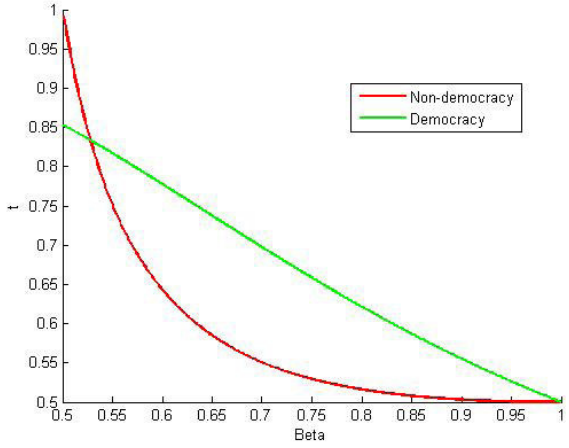

Figure 4.5: Equilibrium tax split rate in a pure non-democracy and a pure democracy, $C = .5$, $d = .5$

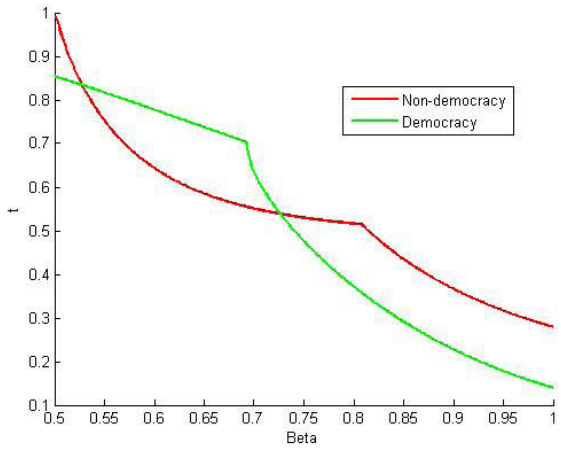

Figure 4.6: Equilibrium tax split rate in a pure non-democracy and a pure democracy, $C = .06$, $d = .5$

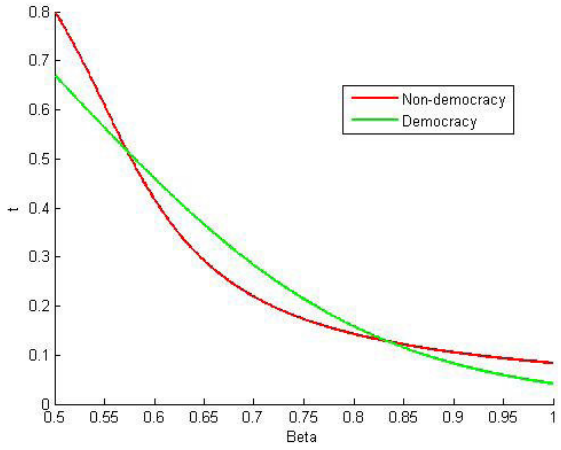

Figure 4.7: Equilibrium tax split rate in a pure non-democracy and a pure democracy, $C = .002$, $d = .5$

ization regardless of the preferences of the federal government simply by forcing the equalizing tax split rate, and hence, one needs an additional condition to that of *Proposition 2.*

In the hybrid regimes the region and the federation have *different* political systems: either a democratic federation interacts with a non-democratic region or vice versa. Once again, it is possible to obtain more structure for federal optimum (which is independent from all parameters but β), claiming that

Proposition 4: (i) Federal optimum is strictly higher in any hybrid regime than in a pure non-democracy; (ii) there exists a threshold $\hat{\beta}_i$ such that for all $\beta_i < \hat{\beta}_i$ the federal optimum is higher in a the hybrid with democratic federal government than in a pure democracy, and for all $\beta_i > \hat{\beta}_i$ the opposite holds.

Proof: See Appendix

Although the result is the same for both democratic federations with non-democratic regions and non-democratic federations with democratic regions, the intuition behind the proposition is different. From the point of view of a democratic federation a non-democratic region is characterized by underprovision of public goods (since the fiscal revenue is at least partly spend for luxury goods). Hence, it makes sense to "take away" a higher share of tax revenue from the region. From the point of view of a non-democratic federation the situation is exactly the opposite: a democratic region is characterized by overprovision of public goods. Knowing that, the autocrat can allow herself to extract a higher share of revenue from the region without ruining the productivity. *Figure 4.8* summarizes the simulation of the equilibrium tax split rates for two pure regimes and the hybrid regime with democratic federation.

The results for the equilibrium tax split rate in P are slightly different depending upon which type of asymmetry is considered, as follows from the next statement.

Proposition 5: Equilibrium tax split rate in region P (i) is strictly higher in a hybrid regime with democratic federation, than in a pure non-democracy and (ii) is strictly higher in a hybrid regime with non-democratic federation for β_P large enough and d large enough.

The results obtained in this section actually suggest several predictions. First, if a pure non-democracy starts democratizing on the federal level, while regions still remain autocratic, it is likely to cause stronger centralization. On the other hand, if democratization accelerates at the regional level, the decentralization may be observed if region is small enough and preference distance / information disadvantage of the federation is low enough (so that the federal government is unable to gain a lot from the region producing larger amount of public goods). Otherwise the federal government will just capture higher share of rents, in-

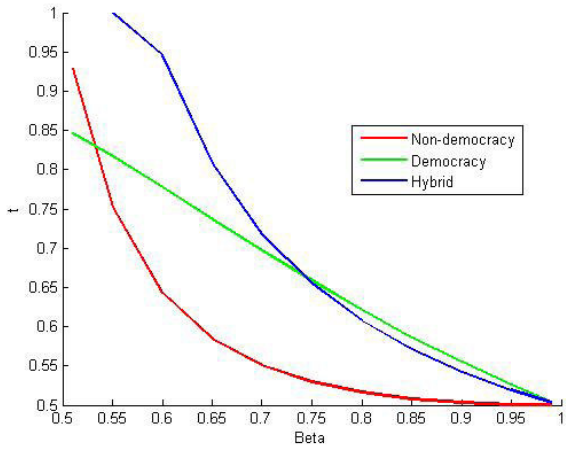

Figure 4.8: Federal optimum for a pure democracy, pure non-democracy and hybrid regime with democratic federation

creased through democratization.

4.4 Discussion

4.4.1 Validity of assumptions

Before proceeding to discussion of results and relating it to empirical evidence, it might be necessary to clearly select the cases where the limitations of the model are less important. Probably, the most restrictive assumption made by constructing the model is the absence of spillovers between regions. It implies that, first, it is possible to make a clear distinction between A-regions and P-regions (and the federal government bargains unilaterally with each political entity), and second, that there are no linkages between regions through private goods markets and migration (reacting to the differences in public goods provision between regions). However, considering the experience of asymmetric federal arrangements, one can see that these assumptions are in fact not as restrictive as one could believe. On the one hand, there are indeed countries where the negotiations with potential secessionists turn into a federation-wide bargaining: for example, Canadian provinces have shown a fast reaction to the new demands of Quebec; in Sudan and Nigeria attempts to construct asymmetric federations resulted in similar tensions (which were, however, resolved by far less peaceful methods than in Canada). However, in most cases separatism is limited to a small number of regions with distinct historical, ethnic or cultural specifics, and hence, only these regions can use secession as a credible threat (as it is implied by this model). The abundance of federacies is therefore not surprising: the central government usually does not need to make concessions to a wide vari-

ety of regions.[23] On the other hand, the economic linkages between territories, which seem to be straightforward in developed countries, are very often weak in developing federations with high costs of mobility and virtually absent market integration.

A good example of the logic of this model is the Russian system, as it is described in the *Introduction*. First, as already mentioned, in the early 1990s the negotiations were basically implemented by the federal government and the coalition of republics. Interestingly enough, several oblast attempted to raise their status in negotiations by proclaiming themselves republics: however, federal government, mostly tolerant to all kinds of demands and claims of republics, demonstrated a fast and strong reaction in this case, preventing the formation of new republics. After the coalition of republics was broken and the period of bilateral negotiations started, the subset of regions aiming to receive higher retention rate and degree of autonomy was still limited to a relatively stable group (though not identical to the group of ethnic republics). In terms of the model, the distinction between A-regions and P-regions seems to be robust for both separate periods. Second, Russia of the 1990s with it large geographical distances, enormous costs of internal transportation, underdeveloped institutions, very low degree of interregional market integration (Glushchenko, 2002) and still existing administrative barriers for migration is also a good case for very weak private market linkages between regions, thus justifying another assumption of the model.

So, the assumptions of the model are, though restrictive, not entirely unrealistic. From this point of view I will attempt to discuss three main groups of results obtained in the model. Given the lack of valid econometric evidence, the discussion will mostly focus on anecdotal cases, and hence, simply aims to "get a feeling" of relation between data and reality, as well as to demonstrate the relevance of results, without attempting to replace rigorous empirical research.

4.4.2 Result 1: Asymmetric federations

To start with, consider the main results for asymmetric federations: regions with higher β, lower C and higher d seem to exhibit higher degree of devolution. In this case the outcomes of the model are first, intuitively clear, and second, closely related to the evidence:

- As already said above, most autonomous regions in federacies appear as attempts to deal with ethnic and linguistic differences or with overseas regions; therefore the existence of a distance between preferences of the

[23] One more interesting case is the Spanish example: in an environment where provinces were able to select the desired level of decentralization, many decided to "take over" a lower share of responsibilities and rights from the central government, while others moved towards stronger autonomy. Hence, the distinction between A-regions and P-regions may also result from behavior of regional politicians, and the devolution does not necessarily result into a domino effect.

region and the rest of the federation seems to be at hand. On the other hand, it is very difficult to find examples of secessions where *no* linguistic, ethnic or religious differences are present, and therefore the very bargaining "in shadow of secession" is applied to the regions where these differences exist.

- The ability of regions with lower costs of secession to obtain higher portion of the tax pie in the negotiations seems also plausible. However, in several cases the situation is more complex: the potential of secession may result in *increasing* central control to avoid formation of strong and independent regional elites or to limit their access to resources (China's actions with respect to more advanced Eastern provinces are a good example, see Sheng, 2007). It implies that the central government attempts to "manipulate" C, which, in fact, is partly a function of the past actions of the governments on both levels, what is obviously not captured in a static model like presented in this chapter. Nevertheless, the attempts to manipulate the capacity to secede seem to be valid only until a certain threshold; after this threshold the central government is forced to start bargaining with strong regional elites. The experience of Russian Empire and USSR in dealing with emerging Ukrainian nation in the last two century is a good example for these processes (see Miller, 2000).

- The last piece of evidence: the ability of large regions to obtain higher share of the pie - is probably the most controversial. For example, my result is different from Wärneryd (1998), who predicts that smaller regions get an overproportionally large share of federal grants; the reason is that the driving force of asymmetry by Wärneryd is the effort allocated in conflict in Tullock contest framework, while in this chapter it is the differences in per capita costs of secession. Hence, large regions are characterized not (only) by stronger internal redistribution struggles, but (also) by larger self-sustaining capacity. One should, however, be cautions with the empirical definition of this "size of the region": it may as well be the size of the territory, and not of population (if one assumes that larger territory is ceteris paribus associated with larger resources, so that the per capita costs of secession are still small).[24]

From the point of view of more rigorous econometric evidence, *Chapter 3* of this thesis reports for the bilateral bargaining stage of the development of the Russian Federation in 1995-2000 that regions with higher secession opportunities (border regions and regions with high geographical distance from the capital) and large regions in terms of territory obtained a significantly higher share of the tax revenue generated from its territory. Although the overall revenue of the

[24]Yet another empirically established reason for overproportionally large share of grants obtained by small jurisdictions is the malapportionment: their representation in decision-making bodies on the supranational or central level is usually higher than their share in the population. This argument seems to be of greater relevance for democracies than for non-democracies, although similar forces could be at work there.

federation from large regions is definitively larger, than from the smaller ones, the relative retention rate is also larger for large territorial units. To conclude, this first set of results seems to be consistent with what little evidence we have on asymmetric federations.

4.4.3 Result 2: Pure political regimes

The second observation the model was able to generate is related to the degree of devolution of pure non-democracies as opposed to pure democracies: pure non-democracies are more centralized, than pure democracies, only if C is large enough and β is small enough. This prediction seems to differ substantially from the claim usually made in the literature. The intuition probably shared by the majority of observers and formalized by Alesina and Spolaore (2003) is that *democratic countries experience higher decentralization.* The empirical results of several studies confirm this statement (Panizza, 1999; Diaz-Cayeros, 2004; Arzaghi and Henderson, 2005; Landry, 2005), while others do not find any clear effect of duration and degree of democracy on decentralization (Treisman, 2006).[25]

However, it is possible to show that more careful interpretation is at least partly able to resolve this differences. Consider first the effect of β on differences between democracies and non-democracies. Recall, that β may be interpreted the "information advantage" of regional governments over federation. From that point of view one can actually expect β to be *connected* to the political regime: non-democracies have well-known problems of communication, which may even increase if the number of levels of hierarchy increases, while in democracies β should be close to .5. Given the inherent communication problems in non-democracies, it is likely that exactly the existing democratic regimes belong to the small-β group: hence, the empirical results observed in democratic countries without political decentralization can be driven by this fact. Or, stated otherwise, higher decentralization observed empirically can result not directly from the democratic decision-making, but from the information procession technology *combined with* decision-making.[26] For the purpose of interpretation one can also relate C and political regime. It seems plausible that costs of secession increase in more integrated economies. On the one hand, democracies exhibit higher degree of internal economic integration than non-democracies (which, for example, use internal barriers to extract additional rents or impose restrictions on movement of people between regions). But, on the other hand, a non-democracy can use much more severe measures to "deal" with a separatist region, which are excluded from the toolbox of a democracy. So, the interpretation is less evident.

[25] It goes without saying that several autocratic unitary states call themselves federations, although in fact the regions do not possess any autonomy (at least based on the provisions of the constitution). The Soviet Union is a good example of this pseudo-federal structures.

[26] Note, that the claim regarding the interrelation of β and political regime is needed only for the *interpretation* of the results, and *not* to derive any predictions in the model.

However, differences in terms of C may be instrumental to resolve yet another problem, which is hidden in the discussion of influence of political regimes on decentralization. It is at least to a certain extent useful to compare the decentralization within federations to the regional economic integration, which could be conceptualized as a process of centralizing at least some of political authorities of countries.[27] The surprising thing is that for regional integration the consensus regarding the relation between democracy and decentralization is different: Mansfield et al. (2002) show empirically that democracies are more likely to form an FTA than the non-democracies (moreover, see Hillman, 2005). It looks like identical political regimes produce different predictions for decentralization on different arenas. The results obtained in this chapter may at least partly explain this contradiction between two literatures. If C is an indicator of internal integration, then it is hardly disputable that the degree of economic interdependence in federations is higher, than in international alliances. Hence, the difference between the degree of centralization in unions and federations may just reflect the secession costs.

To conclude, this group of results also seems to be consistent with the empirical evidence, if one notices, that β and C are correlated with political regimes. It also implies, that to establish a clear link between political regimes and decentralization controls for preference distance, information advantage and costs of secession become important and should be implemented in empirical research. Moreover, the result extends the intuition towards accommodating the differences between international alliances and federations, and therefore may be instrumental in constructing a more general approach to multi-jurisdictional interactions.

4.4.4 Result 3: Hybrid regimes

The third group of results is related to, probably, the most important innovation of this chapter, which allows for different types of political regimes at different levels of a single federal state. The chapter claims that under broad set of parameters democratization at one level of political system results in stronger centralization. Obviously, this result is particularly difficult to test. First, the research on subnational variation of political regimes is still limited. Second, the stage of partial democratization (at one particular level of government) is often relatively short and does not allow for clear observations. Third, it is often very difficult to compare the political regimes in regions and on the federal level even verbally, yet alone obtain quantitative data. Nevertheless, if one considers the existing empirical evidence more carefully, there may be

[27] Of course, the policies subject to (de)centralization debate in international unions and federations are different, as are the institutional settings in even most advanced unions and less centralized federations; moreover, the reference point of the bargaining in case of devolution and in case of integration is not the same (although one should notice, that virtually all endogenous decentralization models - unlike that presented in this chapter - assume the integration rather than devolution perspective). The comparison of federalism and international alliances is not rare in the international relations literature, see Rector, 2009.

some relations to the results of this chapter. On the one hand, for the case of non-democratic federation with partial democratization in regions, this chapter may simply provide another story for the "tragic brilliance": non-democratic central governments often reduce transfers to more democratic regions (where opposition is victorious). As already mentioned, transfer allocation may act as substitute for retention rate renegotiations in symmetric federations. The original idea of "tragic brilliance" is that the central governments aims to "punish" regions for "deviating" from its control. This chapter, however, provides an additional explanation: increasing provision of public goods under democracy makes redistribution of rents in favor of the federal government for more "democratic" territories attractive. In the real world both motives may be present.

The case of democratic federations with non-democratic regions (where my evidence is in fact even more robust) may be once again discussed using the example of the Russian Federation. I have already mentioned the significant variation of subnational political regimes in Russia in the 1990s; in the ethnic republics the regimes emerged and stabilized relatively early (in the first half of the 1990s) as opposed to the whole sample of Russian regions. More importantly, the federal political scene was (although probably far from Western democratic standards) still more democratic, than several regions, where governors and presidents maintained an uncontested political monopoly (partly resulting from the old party rule). In the early 1990s the coalition of republics mostly aimed to increase its independence from the center (also receiving higher share of tax revenue). However, under the bilateral bargaining (which is also more applicable for the analysis because of more stable politics in regions) the situation changed dramatically. Although some relatively non-democratic regions (like Tatarstan and Bashkortostan) received high portion of revenues, most strict non-democracies among ethnic republics (mostly located in Northern Caucasus) in fact seemed to prefer *low* retention rates, exchanged for federal support (which, in fact, has an effect similar to public goods provision in my model). On the other hand, relatively more *democratic* republics (like Karelia at the Finnish border) seem to obtain higher share of tax revenue (also through special Presidential decrees). On the one hand, most regions in Northern Caucasus are relatively small in terms of population and territory; but on the other hand, they are also characterized by an extremely large "preference distance" from other regions (resulting from substantial cultural, ethnic and religious differences and a very high portion of non-Russian population, even as opposed to other republics) and very bad quality of information obtained by the federal government (this problem seems to plague this region even under the more autocratic Putin regime).

For the sample of 20 ethnic republics (excluding Chechnya) the positive correlation between level of democracy (measured by an index of Carnegie Center) and the retention rates for 1995-1999 (period of bilateral bargaining) is statistically significant (see also *Figure 4.9*). Naturally, this observation should not be mistaken for econometric evidence; it requires further careful testing and

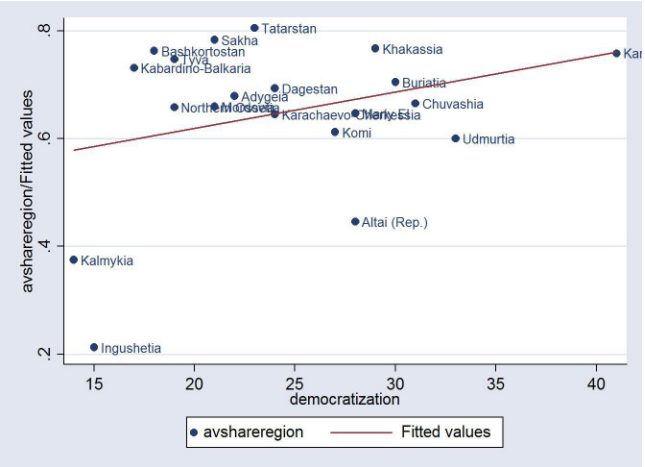

Figure 4.9: Average retention rates 1995-1999 vs. index of democracy, Carnegie Center

investigation. Moreover, the results are not robust to outliers: in particular, if simultaneously regions with very large level of democracy (Karelia) and regions with large distance to regression line (Kalmykia and Ingushetia) are removed, the slope becomes negative - although removing either Karelia or Kalmykia and Ingushetia does not cause any changes. However, it may provide at least some basic ideas regarding the effect in question.

4.5 Extensions

After establishing the main results, the aim of this section is to provide some intuition for what happens when some further assumptions are relaxed. It may also account for a specific constellations in the center-region bargaining. My discussion will partly be informal, simply to get a feeling as to how the model reacts on changes in parameters and extensions in bargaining process.

4.5.1 Transfers

The model so far ignored at least one important instrument, which may be used by the government. It may be possible to replace the public goods provision by direct "cash" transfers from the federal government's share to the regional budgets. The existence of this channel is not unambiguous and are restricted to societies with efficient redistribution systems. However, it is an important option, which should be carefully discussed. To start with, it is clear that a non-democracy never makes transfers to the population in this model in equilibrium (because then there is always an incentive to deviate). Hence, I concentrate on democratic governments. Consider first the hybrid regimes. By paying transfer, government reduces the provision of public goods and, hence, the output

of private goods, but, on the other hand, increases the share of public goods received by the farmers. The problem of determining transfer is very similar to endogenizing tax rate τ; however, the distinction is that τ simultaneously influences two budgets (federal and regional government), while transfer is relevant only for one budget. Denote m_i the transfer rate, i.e. share of government's revenue transferred to the population as a transfer. In this case if transfers are allowed, what is equivalent to saying that the government's share of tax revenue is $(1-m_i)d_it_i[(1-\beta_i)f_i+\beta_i r_i]$ for federal government (for regional government simply replace t_i by $1-t_i$). Hence, in order to determine the public goods output for given transfer one can simply replace d_i in the problem of the main model by $(1-m_i)d_i$.

To conclude, for hybrid regime with non-democratic region the problem of determining the transfer is given by

$$\max_{m_i}(1+m_it_i)[d_i(1-\beta_i)(1-m_i)((1-\beta_i)t_i+\beta_i\sqrt{t_i(t_i-2\beta_it_i-\beta_i^2(t_i-2))})+\beta_i^2(1-t_i)d_i] \tag{4.17}$$

where $m_i \in [0;1]$. i.e. the federal government maximizes the revenue of the farmer; the farmer loses some revenue due to the smaller provision of public goods, but receives a fixed transfer. Solving the problem, one obtains the optimal transfer, which looks like

$$m_i = \frac{(1-\beta_i)\Xi_F(t_i-1)+t_i\Psi_F}{2t_i(1-\beta_i)\Xi_F} \tag{4.18}$$

where $\Xi_F=(1-\beta_i)t_i+\beta_i\sqrt{t_i(t_i-2\beta_it_i-\beta_i^2(t_i-2))}$ and $\Psi_F=\beta_i^2(1-t_i)$. The solution does not depend on the size of the region, is increasing in β_i for any t_i and decreasing in t_i for any β_i (that means, that governments with "worse" public goods should pay larger transfers). For small β_i, regardless of degree of centralization, transfer is zero; however, there exist no β_i such that for any t_i transfer is equal to 1 - at least for complete centralization $t_i=1$ transfer is zero. It is clear: if regional government does not produce any public goods, federal government is forced to produce some, because otherwise the output of private goods is (by construction of technology) zero - and, for zero pie, even the largest share is still zero. Now consider the behavior of the regional government. If the transfer is zero, the problem does not change; so, the results of the basic model are valid if transfers are allowed at least for regions where federal government is relatively inefficient. On the other hand, if transfer is non-zero, for regional government it simply implies smaller production of federal public goods; in this case the equalizing tax split rate goes down (even more; if, for some values of parameters, $m_i=1$, the regional government prefers secession if $t_i>0$: indeed, any tax revenue received by the federal government is returned to the people and not used to produce public goods, which is what the regional government benefits from). However, if the share of the federal government goes down, the optimal transfer increases. Hence, one can conclude, that for β_i large enough allowing for transfers results in decentralization of tax revenue as opposed to case without transfers. If $\beta_i \to 1$, de-facto secession is achieved (if one maintains the assumption that secession is never preferred by the federal government).[28]

[28] Unfortunately, it means that I cannot maintain my results for comparison of political regimes after introducing transfers: as noticed, for small β_i the results are identical to that

Now consider the hybrid regime with the regional democratic government. In this case the problem can be written as

$$\max_{m_i}(1+m_i(1-t_i))[d_i\beta_i(1-m_i)((1-t_i)\beta_i+\beta_i\sqrt{(1-t_i)(2t_i-4\beta_i t_i+\beta_i^2(1+t_i))})+(1-\beta_i)^2 t_i d_i] \tag{4.19}$$

which gives

$$m_i=\frac{-\beta_i t_i \Xi_R+(1-t_i)\Psi_R}{2(1-t_i)\beta_i\Xi_R} \tag{4.20}$$

where $\Xi_R=(1-t_i)\beta_i+\beta_i\sqrt{(1-t_i)(2t_i-4\beta_i t_i+\beta_i^2(1+t_i))}$ and $\Psi_R=(1-\beta_i)^2 t_i$. The transfer is equal to 0 for any t_i and β_i (it is predictable, since region is by definition more efficient, than the federation, and hence, the problem is equivalent to that of the main model. Hence, introducing transfers in hybrid regimes with democratic regions does not change the results.

Finally, consider the case of pure democracy. Now both regional and federal governments can pay transfers (which I will denote m_i^R and m_i^F respectively). Consider first the regional government. The problem of the regional government for given federal transfer can be written as

$$\max_{m_i^R} 2d_i(1+m_i^R(1-t_i)+m_i^F t_i)[\Xi_D(1-m_i^F)(1-\beta_i)+\Psi_D\beta_i(1-m_i^R)] \tag{4.21}$$

where $\Xi_D=(1-\beta_i)t_i+\beta_i\sqrt{t_i(1-t_i)}$ and $\Psi_D=(1-t_i)\beta_i+\beta_i\sqrt{t_i(1-t_i)}$. The solution is

$$m_i^R=\frac{(1-t_i)(1-\beta_i)(1-m_i^F)\Xi_D-\beta_i t_i(1+m_i^F)\Psi_D}{2(1-t_i)\beta_i\Psi_D} \tag{4.22}$$

It is clear that the transfer of the region is decreasing in the federal transfer - since the latter also reduces the total output of public goods, which should then be substituted by the region. Consider the case the federation sets its transfers to zero. In this case regional government pays non-negative transfers for any β_i and d_i. The transfer is increasing in t_i (so that lower fiscal capacity of regional government makes it may higher transfers) and decreases in β_i (so that lower quality of federal public goods makes transfers less attractive - since more regional public goods are needed to guarantee output). The problem of the federal government can be obtained by simply solving the same problem for m_i^F and yields symmetric expression

$$m_i^F=\frac{(1-\beta_i)(t_i-1)(1+m_i^R)\Xi_D+\beta_i t_i(1-m_i^R)\Psi_D}{2t_i(1-\beta_i)\Xi_D} \tag{4.23}$$

of the basic model - so that the hybrid is more centralized, than pure non-democracy, but for large β_i de-facto secession is possible, which means higher decentralization, than in pure non-democracy. The result is, however, of some empirical interest. If the democratic federal government starts heavy redistribution programs in a world with very bad information transmission from regions, non-democratic regions may force de-facto secession, effectively undermining the federal redistribution programs as well - since the federal budget goes down.

which implies that for the case of zero transfer at the regional level federal government pays transfer equal to its total revenue. However, the transfer of federal government is once again decreasing in regional transfer; nevertheless, even if the regional transfer rate is 1, federation still pays some non-zero transfer for any combination of β_i and t_i.

One can see that transfers of federal and regional governments are substitutes. The federal government always pays transfers, while the regional government pays transfers only if the federal government's transfers are small enough. For the purpose of this chapter one should conclude that the output of public goods of both governments under democracy is smaller, than under non-democracy. In particular, if federal government is inefficient enough ($\beta_i \to 1$), $m_i^F \to 1$ and $f_i \to 0$. In this case regional government requests equalizing tax split rate approaching de-facto secession. Unfortunately, further conclusions are impossible and depend on parameter values.

4.5.2 Regional autocrats and federal elections

A problem typical for many hybrid regimes with non-democratic regional government is that the regional autocrat can act as a kind of "manager for electoral pool", i.e. determine the outcomes of federal elections. For example, in Russia the federal parliamentary elections 1999 seemed to be heavily influenced by the positions of the regional governors, which mostly directly or indirectly supported the main competing parties *Otechestvo* and *Edinstvo*. The question is therefore how the tax split rate could react on the ability of the regional government to control federal elections.

As demonstrated above, in a hybrid political system with non-democratic region there may exist a non-zero regional optimum if federation is productive enough. In order to obtain support of the regional government, the federal government sets the tax split rate to be exactly equal to regional optimum. Therefore if the regional government is able to manipulate the outcome of federal elections and the productivity-enhancing effect of the public goods of the federation is small enough, it leads to a de-facto secession as defined above (note, that it is the first time the chapter encounters this outcome). Once again, the result is intuitively clear: regional government able to have an influence on the federation in turn of the federal elections is able to obtain higher autonomy without paying costs of secession. This is also what one could observe in the countries where such manipulation took place: the federal government had to "repay" to its loyal regions either through transfers or concessions in tax collection. However, if the federation has sufficiently good public goods, the equilibrium is still different from zero.

4.5.3 Tinpots and totalitarians

The assumptions on the dictatorial behavior I made so far mostly fit that for a tinpot dictator (Wintrobe, 2000), who is focusing on rent maximization. However, an extension to a totalitarian dictator is obvious. The problem of a totalitarian has the same constraint, as of a democratic system (i.e. regional budget should be balanced off), but the region maximizes the tax split rate (t_i for the federation and $1 - t_i$ for the region), and not the public goods provision, i.e.

$$\max t_i \quad s.t. \quad d_i t_i((1-\beta_i)f_i + \beta_i r_i) - \frac{f_i^2}{2} = 0 \quad for \quad i = A, P \tag{4.24}$$

$$\min t_P \quad s.t. \quad (1-t_i)d((1-\beta_i)f_i + \beta_i r_i) - \frac{r_i^2}{2} = 0 \tag{4.25}$$

Obviously, it is reasonable to consider this extension only for the region P and the federation. In case of the tax split ratio between the federation and the region A the former just sets $t_A = 1$ and chooses the public goods provision accordingly. If the federation is a totalitarian and region 1 is either a tinpot, or a democracy, the following happens: the federal optimum is now equal to 1; it is accepted by the governments if their revenue under secession is strictly negative (i.e. C is sufficiently high). Otherwise the federal government has to propose an equalizing tax split rate (which is still larger zero - a tax split rate in case of secession). If the region is governed by a non-democratic tinpot, it produces $r_P = d(1-t_P)\beta$. For simplicity, I assume that in case there are multiple solutions for f_P, r_P the larger root is chosen. But in this case the equalizing tax split rate is identical to that of hybrid regime with democratic federal government. The federal optimum does not depend on β_P, C and d, and the equalizing tax split rate is decreasing in β_P and d and increasing in C (as already shown for the hybrid regime). Therefore one can claim that the tax split demonstrates the usual properties discussed above (weakly decreasing in d, weakly increasing in C and decreasing in β_P). Moreover, one can easily show that the equilibrium tax split rate is larger than for a hybrid regime with democratic federal government: the federal optimum with a totalitarian federal government is weakly larger, than for the hybrid regime; the equalizing tax split rate is identical; hence, for all cases when in both regimes equalizing tax split rate is chosen, for both regimes federal optimum is chosen and for totalitarian federation federal optimum and for hybrid regime equalizing tax split rate is chosen the result is obvious. In case the regime with totalitarian federation has the equalizing tax split rate as an equilibrium, and the hybrid regime chooses federal optimum, the result still holds: otherwise the totalitarian federation would propose a tax rate identical to the federal optimum in a hybrid regime, and it would be accepted. Therefore *the totalitarian federation with a tinpot region exhibits a higher centralization, than the democratic federation with a tinpot region* and obviously *than the pure non-democracy*. If the region is governed by a democracy, the equalizing tax split rate is identical to a pure democracy case. Hence, one can conclude that the *the totalitarian federation with a democratic region exhibits a weakly higher centralization than the pure democracy*, but no conclusions for the comparison

to pure non-democracy are still possible.

If the region is a totalitarian dictatorship and the federation is either democratic or tinpot dictatorship, the region strictly prefers zero tax split rate in any case it can produce any public goods under secession. Hence, if C is small enough, the only equilibrium is the de-facto secession. If C is large enough, the region cannot produce under secession and accepts any offer of the federation. Hence, *the federation with a totalitarian region and non-totalitarian federal government is weakly less centralized than the regime with a tinpot region and non-totalitarian government*. Finally, if both governments are totalitarian, if the region can produce any public goods under secession, the only equilibrium tax split rate is zero. If the region is unable to produce any public goods under secession, it is equal to 1. Hence, the system with two totalitarians is either completely centralized or completely decentralized.

4.5.4 Negative secession costs

The assumption of positive secession costs can also be relaxed: it is quite possible to imagine a case when a secession in fact generates additional utility for the regional elites. For example, in presence of a vivid nationalism and significant ethnic differences the independence *per se* can become attractive, whether it generates further rents or not. The discussion is very similar to the idea of "ego-rents" in elections literature. The simplest way to model it is to allow for $C \leq 0$. If the absolute value of negative secession costs is high enough, the region never accepts any offer from the federal government and the secession happens. Otherwise the equalizing tax split rates and the set of parameters where the federal optimum is accepted go down for all regimes. However, there are no differences from the point of view of dependence of the new equilibrium from β_P or d.

4.5.5 Fixed costs of public goods provision

To relax the restrictions resulting from the quadratic costs assumption, it may be reasonable to assume that there exists a fixed costs component in the public goods provision. For the democracy the existence of fixed costs does not change anything (assuming the costs are not prohibitive and the provision of public goods is generally possible), though they shift the equilibrium value of public goods output. However, in case of non-democracy, where the objective is not the output, but the net revenue, the existence of positive fixed costs may make withdrawing from public goods provision more attractive than producing any public goods at all. Fixed costs for the region change the results of the chapter only if they are prohibitive, since regions produce public goods both after secession and without secession. In case of the fixed costs for the federation, however, it is possible that the federal government *prefers secession* if it is the only way to avoid losses due to high fixed costs.

4.5.6 Region as a Stackelberg leader

So far I assumed that the federal government is the Stackelberg leader in the model. This is a reasonable assumption in many devolution scenarios, but it also happens quite often that the federal government is in fact the *Stackelberg follower*, forced to deal with separatist or autonomist desires of the regional elites. It implies, that the regional government proposes a tax split rate to the federation, which can either accept or reject it. While rejecting, it "forces the region to seced": it stops the production of the public good and imposes sanctions causing costs of C. I consider the problem only for t_P, since it hardly seems to be reasonable for the region A per construction. Assume moreover that C is not prohibitively high; otherwise the regional government proposes the equalizing tax splits identified in the previous sections of the chapter.

As already noticed, in the pure non-democracy the regional government always prefers t_P equal to zero. However, in this case the federation is indifferent between rejecting and accepting the tax split rate. If the federation rejects the tax split rate, the region has to pay secession costs. Hence, it is going to offer t_P positive, but closed to zero. In this case the federation cannot reject it any more, since it is not indifferent. Hence, the outcome of decentralization is an infinitely small tax split rate. In a pure democracy the production of regional public goods is increasing in t_P; hence, by the same logic, the region proposes $t_P = 0$, but the federation can impose secession costs. Hence, the region proposes an infinitely small tax split rate, which is than accepted by the federation. In a hybrid regime with democratic region the production of regional public goods is decreasing in t_P, and the same logic applies. In a hybrid regime with non-democratic region the optimum for the region may be different from zero; in this special case region proposes its optimum and the federation accepts. To conclude, the outcome of the devolution game leads to a strictly lower centralization in all settings (with the possible exception of hybrid with non-democratic region), but still does not allow for secession equilibrium or de-facto secession, like in case of totalitarian governments. The intuition is straightforward - the totalitarian government is ready to sacrifice its revenue or provision of public goods for lower t_P, while the region acting as a Stackelberg leader in "normal" regimes is not.

4.5.7 Small β

The next assumption to be relaxed is that regarding the β. Although arguments of information advantage and preference distance seem to be reasonable to justify the assumptions made in this chapter, it is certainly possible to imagine a federation, where the regional government is less informed about the situation in its territory than the federal center. However, assuming $\beta < .5$ makes the model to a great extent trivial, since it takes away at least one of the trade-offs, which were driving the results so far. For $\beta < .5$ the federal government has no incentive to decentralize in order to increase the "size of the pie"; the federal optimum for all regimes is achieved at $t = 1$. Hence, the region A is

always completely centralized. Obviously, regardless of β and political regime, the regional government never accepts complete centralization, except for the case it is unable to produce public goods under secession given very high C. It means that in region P is either completely centralized, or, if independence is feasible, remains part of the federation with t_P equalizing tax split rate, which is determined by the already specified conditions. Obviously, for this specific case any political regime can be only weakly less centralized, than the others: if secession costs are high enough, in any regime federation is completely centralized. Consider the case when the equilibrium tax split rate is the equalizing one. Evaluating equalizing tax split rate of a pure non-democracy for $\beta_P = .5$ yields $\sqrt{C}/d$. One can claim that if this ratio is large enough, non-democracies have higher equilibrium tax split rate at $\beta_P = .5$ than democracies. Using the monotonicity of tax split rates one can claim that if (i) ratio of C and d is small enough, (ii) $\beta_P < .5$ is large enough and (iii) secession is feasible under both regimes, democracy is more decentralized than non-democracy.

4.5.8 Migration

So far I have avoided any form of interregional spillovers mostly for the reason of tractability. This section will at least partly relax this very strict assumption, introducing the movement of population between regions. Assume that people can migrate from one region to another *after* the tax split rates are determined and declared (public knowledge), but *before* decisions on provision of public goods are made, regardless of whether secession happened or not. This timing describes individuals as not completely myopic (and thus able to make inference from the center-regions bargaining on future economic policies), but is also helpful from the technical point of view, since under this condition the provision of public goods is still set uniquely and the only way for the governments to manipulate the migration flows is to change the tax split rate. People migrate to the region where they can obtain higher utility. People migrate to regions with large post-tax output C_i. C_i is a function of Y_i, and hence, of public goods provision (assuming the land is free and each new migrant still receives one unit of it).[29] Assume that both regions are identical in terms of $d = .5$ and also β. Thus one avoids agglomeration effects when people move from small region to a large region (notice, that public goods output is a function of d, and since f and r denote pure public goods with non-rivalry in consumption, additional population increases both *total output* (through changing d and r / f) and *output per capita* (through changing r and f)). Migration goes always from A to P or vice versa; hence, even if people take into account that their migration decision will change the population size of the region and the public goods output, it will just increase the *absolute value* of the migration flow, but not its direction.

[29] I abstract from possible effects of migration on price of land; basically, this section deals with a world of "Wild West" migration where individuals move freely to other territories. For the approach of modeling migration used in this extension, however, the "costs" of this simplification are very low: one can in fact claim that potentially scarce land will simply influence the shape of θ, which I do not specify.

For the purpose of our analysis it is irrelevant, and hence migration from A to P is described by a function $\theta(t_P - t_A)$, where $\theta(.) \in (-1.1)$. If $\theta(.) < 0$, there is a population outflow from A to P, but the share of migrants is always smaller than the original population of the region. The population of A after migration is $.5(1 + \theta(.))$, and of P, respectively, $.5(1 - \theta(.))$. $\theta(.)$ is continuous and differentiable; its *absolute value* is increasing in the function's argument (and hence, finding out the direction of migration, one can exactly claim whether function is increasing or decreasing).

First look at the case of pure democracy (all three jurisdictions are democratic). For any $\beta > .5$ k is too small if the federal optimum is chosen as opposed to the case with higher devolution; hence, people always migrate from A to P. The federal government increase change t_P (since it would lead to secession). Evaluating the first derivative of the public goods output in A at t^* federal optimum gives

$$-\theta'(.)((1-\beta)t+\beta\sqrt{t^*(1-t^*)})+(1+\theta(.))\left(1-\beta+\frac{\beta(1-2t^*)}{2\sqrt{t^*(1-t^*)}}\right)<0 \quad (4.26)$$

and hence for any t_P federation selects t_A smaller than the federal optimum with zero migration. It means that *migration enforces decentralization in A*. Without specifying $\theta(.)$, it is impossible to make exact claims about the new equilibrium (and even prove its existence), and t_P can also be smaller in equilibrium with migration than without migration. It is straightforward, however, that $t_A = 0; t_P = 0$ is never an equilibrium, since the federal government has incentive to deviate from it. However, if the equilibrium exists, it would imply $t_A < t^*$.

For the case of pure non-democracy (all three jurisdictions are non-democratic) the direction of migration is still the same from A to P. However, while in case of pure democracy the federal government cared about public goods output in each region (because of the assumption of elections), now it maximizes the overall net revenue from both regions. In this case federation prefers lower migration only for *intermediate* β, while for too large and too small β migration is in fact increasing the revenues (or additional revenues from P outweigh the losses from A). Assuming that β is in the range where migration is costly, the condition for the new equilibrium to imply $t_A < t^*$ (if the equilibrium exists) is

$$\frac{R_P}{R_A}\frac{1-\theta(.)}{1+\theta(.)}_{t=t^*} < 1 \quad (4.27)$$

where R_P, R_A - per capita revenue of the federation from the respective regions. (0,0), once again is never an equilibrium.

4.6 Conclusion

The aim of the chapter was to identify how economic and political characteristics of regions and federation may influence the decentralization outcome in a framework of an asymmetric federalism. There are several main results which could be obtained from the chapter. First, if secession is an option, regions with higher secession costs, smaller population and smaller productivity-enhancing effect of regional public goods (which may be related to information advantages, preference heterogeneity or simply efficiency of public administration) systematically pay higher share of the tax revenue collected on their territory to the federal government. Moreover, option for secession leads to higher decentralization for two regions with identical effectiveness of public goods, regardless of their size, but assuming they have identical political regimes. Both results seem to be intuitively reasonable and well related to the (quite limited) empirical evidence in the field.

Second, different political regimes have a specific impact on decentralization. It is impossible to claim that pure democracies are strictly more decentralized than pure non-democracies; however, it is true for β small enough and secession costs large enough (or no secession option). If the differences in the size of β are caused by the quality of information acquisition by different levels of government, it is likely that exactly democracies with smaller problems of information transmission may have smaller β. That may explain the higher decentralization observed in several democracies. However, if the size of β is driven by preferences, this explanation hardly applies. Similarly, it is difficult to clearly establish the relation between C and political regimes: while in democracies high C may reflect high market integration, in non-democracies high C results from repressions against secessionists. Hybrid regimes are always more centralized than pure non-democracies, if there is no secession option. If secession is possible, hybrids with non-democratic regions are more centralized, than pure non-democracies, but for hybrids with non-democratic federations no clear conclusion may be made, the result depends on β and d. Basically, it means that the democratization at the federal level leads to increasing centralization of taxation, and at the regional level has ambiguous effects. One should notice that this claim covers only *revenue* centralization.

Finally, the chapter relaxes a number of assumptions to understand the robustness of the model. Probably, the most interesting conclusion is that introducing migration supports devolution in region A in democracies, but not necessarily in non-democracies. Hence, the model predicts a very specific form of competition for mobile factors of production in a world with exogenous public sector: in this case the adjustments are made not by changing tax pressure, but by redistributing tax revenue between levels of government, i.e. through fiscal decentralization. Further extensions include positive gains from secession, fixed costs of public goods provision, changed timing of events (regions as Stackelberg leaders), as well as varieties of non-democracies (tinpots and totalitarians) and

non-democratic regions controlling federal elections on their territory.

The model, nevertheless, still leaves the dimension of *credibility* and *time-consistency* out of discussion. For example, the exogenous secession costs actually depend on endogenous investments in internal conflict made by governments at both levels. It is questionable whether the federal government (democratic or non-democratic) can indeed "keep its promises" in terms of secession costs or tax split rates, once they are set. The fact that autocracies have hard time making credible commitments is well-known (cf. Myerson, 2008); however, the ability of democracies to provide commitment (also in terms of tax splits or secession costs) is not unambiguous - one can actually claim, that due to the abundance of veto players in a democracy this political system is more likely to credibly commit, but less likely to make any commitment at all. On the other hand, this chapter does not model the interaction between households or businesses and governments in an autocracy, as most of the literature does - the goal is to understand how individual autocratic *governments* interact with each other. And it is quite possible to argue, that the ability of autocratic agencies to make commitments to other autocratic agencies is at least in several regimes relatively high: for example, the whole Soviet economy after 1960 was based on bargaining between individual territorial and industrial agencies, which were able to follow their (informal!) contracts. The "autocratic peace" hypothesis basically assumes that non-democracies can make commitments to similar non-democracies (Weart, 2000; Peceny et al., 2002). Anyway, this issue is let aside in this model. Finally, the chapter ignores the interaction between constitutional choice (secession clause) and post-constitutional bargaining over tax revenue. Nevertheless, even with these caveats the results of the chapter provide at least some insights into the logic of devolution in asymmetric federations.

The results of this chapter confirm the basic intuition that the complexity of democratization process leads to ambiguous results in terms of decentralization. However, from this point of view an additional question becomes important. I have listed a substantial number of case studies showing that there may exist a high variation of democracy within one federation. The model assumes that differences in political regimes influence the bargaining process between governments. However, it is at least equally important to understand, whether the differences in regimes have also a direct impact on economic performance in individual regions. This question can also be re-phrased as follows: are differences in *political* regimes, which seem to be *politically* relevant, of any *economic* importance? If the latter is true, it becomes an additional argument supporting my claim that the intranational differences in political systems have to be taken into account. The next chapter looks at this problem in greater detail.

Chapter 5

Democracy, Size of Bureaucracy, and Economic Growth: Evidence from Russian Regions

5.1 Introduction

As I have already mentioned in the *Introduction*, the huge literature on impact of political regimes on economic growth mostly explores the international variation of the level of democratization; these data are usually subject to a number of well-known problems of compatibility, causing self-selection and measurement error biases. However, political systems vary not only internationally, but also within individual countries (especially federations), where the data are often more compatible (i.e. because they are collected by a single statistical authority). Developing and transition countries often demonstrate the co-existence of significantly different political systems in different regions of the same country. This chapter takes advantage of this fact, studying the impact of political regimes on economic growth in different regions of the Russian Federation.

Russia seems to be an appropriate field for the analysis of intra-national differences of political institutions. First, the Russian Federation consists of a large number of regions, making statistical analysis technically possible. Second, and more important, the variation of political systems across Russian regions, as already discussed, seems to be enormous. Third, there is also a significant variation in the economic performance of Russian regions, contributing to large economic asymmetries in the structure of the Russian federalism. However, the Russian Federation as a "laboratory" for study of economic growth and political systems has also specific problems. The political decisions at the regional

level (both constitutional and post-constitutional) are subject not only to the bargaining process and institutions of the *regional* political system, but also to the influence of the center. Therefore it is necessary to restrict attention to a period of relative stability on the federal arena. That is why I focus on the time frame between 2000 and 2004. The year 2000 marks the final transition of power from Boris Yeltsin to Vladimir Putin, thus establishing a completely new power structure in Russia and opening the way for a number of political reforms of the federal system. In September 2004 Vladimir Putin abolished the free elections of governors, therefore changing dramatically the specifics of regional politics.[1] Finally, unlike the 1990s, which is probably the period most empirical research on Russian regions is devoted to, the period studied in this chapter was characterized by stable economic growth in the Russian Federation.

One of the main controversies over the political determinants of economic growth confronts two dimensions of the organization of the government. On the one hand, growth can be driven by the **political system**, i.e. degree of democracy. However, the recent literature on economic governance (Ahrens, 2006) challenges this view by considering the **quality of public administration** the relevant factor for economic growth. While the first line of the literature claims, that the organization and the efficiency of bureaucracy depend upon the development of democratic institutions, the second argues, that the crucial issue is how the public bureaucracy is organized; any political regime can become both source of good and bad governance. This chapter attempts to contribute to this discussion by directly considering these two dimensions of the public policy. On the one hand, it finds that democracy has a non-linear impact on economic growth: regions with intermediate level of democracy seem to have worse performance than more developed democratic and autocratic regions. This conclusion is in line with the recent theoretical literature on "non-linearity of effects of democracy", though to my knowledge it is the first empirical evidence with respect to economic growth. On the other hand, the size of bureaucracy has a negative impact on economic growth. Moreover, there is evidence of the interaction between the size of bureaucratic apparatus and political regime as factors of economic growth.

There are extremely few studies exploring the links between democracy and / or size of bureaucracy and economic growth using the variation of political regimes in subnational units. Hiskey (2005) looks at the economic recovery in Mexico and finds an inverse U-shape relation between the level of democracy and economic growth. Brown et al. (2009) focus on the interregional differences in size of bureaucracy in Russia in 1995-2004 to explore the effects of size of bureaucracy on the outcome of privatization. They find, that larger bureaucracies are associated with better post-privatization environment and hence with higher performance of the firms (measured using the microlevel data). On the

[1] Since the decision was announced after the terrorist attack in Beslan and motivated by the needs of national security, it is unlikely that the actors anticipated that change, adjusting their behavior accordingly.

other hand, Dininio and Orttung (2005) report that increase of bureaucracy size in Russian regions is associated with higher corruption. This chapter may thus be considered as complementary to Brown et al. and Dininio and Orttung, looking at a different dimension of the relation between bureaucracy and growth. Moreover, there is some related literature addressing the impact of the *direct* democracy on economic performance. While for the "overall" democracy the best laboratory are developing and transition countries like Russia, the laboratory for direct democracy studies is Switzerland: Swiss cantons vary significantly in terms of introduction of direct democratic institutions. The Swiss data were used by Feld and Savoiz (1997).[2]

The chapter is structured as follows. The next section surveys the existing literature and empirical findings in the field and relates this work to other studies of economic growth of Russian regions. The third section presents the model and the data. The fourth section provides the main results. In the following section I discuss possible robustness checks. Finally, the last section concludes.

5.2 Literature

The relation between democracy and economic growth belongs to the most controversial fields of political economics. The consensus seems to be that there is an inconclusive relationship between democracy and growth, depending upon the specifics of channels observed, regions and countries.[3] This fact opens the way to two lines of research. The first approach looks at the *varieties of non-democracies and democracies*, searching for the possible non-linearity of growth along the continuum of political regimes from autocracy to democracy. The existing literature mostly considers two types of potential non-linearities of impact of democracy on economic growth, though more sophisticated relations resulting from detailed studies of autocracies (Besley and Kudamatsu, 2008) and democracies (Persson and Tabellini, 2006) are possible (however, less applicable for the sample of this chapter).[4]

The first line of research, originating from Barro's (1996) work, predicts an **"inverted U-shaped"** reaction of growth on democracy, i.e. movement from

[2]Further related literature includes Feld and Kirchgässner (2000), who survey a broader literature dealing with the impact of direct democracy in Switzerland on economic and policy variables. Santerre (1986) considers the potential efficiency gains of direct democracies on local level using an indirect test based on Tiebout migration assumptions. Moreover, Frey, Kucher and Stutzer (2001) and Matsusaka (2007, 2007a) examine several possible links between direct democracy and the functioning of bureaucracy, which are, however, not directly related to the research question of this chapter: they look at the influence of direct democracy on the financial benefits received by public officials and the organization of the executive branch.

[3]Although the recent meta-regression analysis literature challenges this result, replacing it by "no direct impact" and "significant indirect impact" of democracy on economic growth, see Doucouliagos and Ulubasoglu, 2008.

[4]John von Neumann once referred to the term "non-linear function" as equivalent to "non-elephant animals" (Page, 2006:90).

authoritarianism to democracy first encourages economic growth, but after a certain threshold hampers it. Barro (1996:14) himself explains the inverted U-shape by the fact that "in the worst dictatorship, an increase in political rights might be growth-enhancing because of the benefit from limitations on governmental power. But in places that have already achieved a moderate amount of democracy, a further increase in political rights might impair growth because of the intensified concern with income redistribution". Thus the "moderate" democracy appears to be the optimal choice in the trade-off between governmental rent-seeking and public desire for redistribution.[5] In a similar way Plumper and Martin (2003) consider the impact of political participation on growth. In a semi-democracy as opposed to a pure autocracy, government is unable to use rents as an instrument to achieve political support anymore due to larger selectorate. Thus the rent-seeking goes down. However, in a democracy the government tends to overinvest in the provision of public goods and therefore reduces growth rates. Barro (1996), Comeau (2003) and Plumper and Martin (2003) also provide empirical evidence in favor of the "inverted U-shaped" relation between economic growth and democracy (and the latter chapter also demonstrates a "U-shaped relation" between democracy and public share of GDP), though this effect was rejected for productivity growth (Faust, 2007); Murphy et al. (2005) give some evidence in favor of "inverted U-shaped" relation between democracy and economic reforms for the post-Soviet countries.

The opposite approach suggests that the non-linearity takes the form of the **"direct U-curve"** , i.e. exactly the "hybrids" or "weak democracies" perform worse, than pure autocracies and pure democracies. This point of view is obviously motivated by the case of rapid growth in several autocracies (like China) and well-being of Western developed democracies, opposite to the instability and crises of intermediate political forms. One can basically use three arguments in favor of this hypothesis.

First, Acemoglu and Robinson (2006) relate the potential U-shaped effect to the desire of the government to implement economic reforms, which differs for different regimes. Economic reforms in democracies may appear as a result of electoral competition, restricting the ability of the government to ignore economic problems; in autocracies reforms are pursued to improve economic situation and therefore increase the rents. However, in hybrids the public pressure to implement reforms is lower, and the threat of power loss from changes of economic institutions and therefore redistribution of wealth and bargaining power is significant, so, the reforms are postponed.

The second argument assumes that in a hybrid regime the government is rather limited in its ability to use direct coercion (which is at least one of the foun-

[5]This argument could be compared to the idea of the "institutional possibility frontier" (Djankov et al., 2003), which describes a political regime as a trade-off between "costs of dictatorship" and "cost of anarchy", where a moderate democracy could also be a preferred solution (depending upon the distance of the institutional possibility frontier from the origin).

dations of a pure autocracy), however, is still able to manipulate economic institutions to eliminate the threat of development of potential alternative power centers. In this case weak economic institutions could become an instrument of "taking hostages", i.e. making any business activity dependent on the loyalty to the ruling group and reducing economic autonomy of potential political actors, thus maintaining control over politics (McMann, 2006). For example, if the taxation system is intransparent and overwhelming, the only way to remain economically competitive is to pursue aggressive tax avoidance. For this purpose a company requires support from the public agencies , which can use their power to "blackmail" businesses in order to extract rents, but, what is especially important, to prevent any support of opposition (Darden, 2001; Barsukova, 2006).[6] "The blood of the regime" in this case is not repressions, but corruption (Mau et al., 2007:100). Acemoglu et al. (2004) show that inefficient regimes based on bribes can be quite persistent. However, low-quality economic institutions as substitutes for direct violence have a negative effect on economic growth.

Finally, semi-democracies, like democracies, are characterized by a large number of (vaguely speaking) veto players, originating from both formal system and (more importantly) informal power relations in the society.[7] Therefore they share with democracies the problem of slow decision making and reform deadlocks if consensus is impossible. A strong autocrat can ignore the constraints present for his weaker counterpart. On the other hand, relations between veto players in semi-democracy (unlike pure democracy) are intransparent, hence, generating problems typical for autocracies with weak formal institutions. So, the semi-democratic system combines the weaknesses of both democracies and non-democracies rather than uniting their advantages.[8]

There has been no direct evidence of U-shape effects of democracy on economic growth reported on the international level.[9] However, as already mentioned, on

[6]The experience of government-business relations in the shadow of *Yukos* in Russia is a good example of this "blackmail" tactics.

[7]Although there are democracies with a low number of veto players, like the Westminster system, emergence of alternative power centers (and increase of the number of veto players) seems to be a quite logical element of any democratization.

[8]A somehow similar approach of "U-shaped" reaction of growth on institutional system comes from the sociological literature on varieties of capitalism. It claims, that the regimes "at the corners" of distribution can achieve higher growth rates because of their comparative institutional advantages, than mixed regimes with inconsistent institutions (Amable, 2004). This literature, however, does not address political systems.

[9]However, the empirical studies suggest that semi-democracies are characterized by lower quality of institutions (Leonida et al., 2007), higher political uncertainty and investment risk (Kenyon, Naoi, 2007), higher probability of civil conflicts and disorder (Hegre et al., 2001, Vreeland, 2003, Gleditch et al., 2007), lower quality of bureaucracy (Bäck and Hadenius, 2008) and higher corruption (Rock, 2007), than both democracies and autocracies. Moreover, these regimes have short duration due to political instability (Gates et al., 2006). The impact of veto player structure is more ambiguous. Henisz and Mansfield (2006) argue that smaller number of veto players is more likely to increase trade protectionism under bad macroeconomic conditions, but the impact of the number of veto players *per se* is lower in non-democracies (so, even

the intra-national level it is the U-shaped hypothesis which has been confirmed empirically for the Mexican case.

The second approach to the puzzle of "ambiguous effects of democracy on growth" either disregards democracy as a relevant factor for economic performance and looks for other dimensions of political-economic systems able to have a profound impact on growth or condition the effect of democracy on other parameters like rule of law, regime duration etc. Clearly, the number of these alternatives may be very large; however, for sure the impact of political regime on economic performance depends on the **quality and size of bureaucracy**. The relations between politicians and bureaucrats can be crucial for understanding the predatory or market-enhancing behavior of the governments in emerging economies (Dixit, 2006). There is a huge literature dealing with the size of public sector and government expenditures and its impact on economic growth; however, this aspect represents only a fraction of potential influence of bureaucracy on economic process - it may be even more important to study the impact of bureaucracy through regulation and quality of public administration, and the size of bureaucracy could be an interesting dimension from this point of view. The size of bureaucracy matters, first, because of *direct costs for sustaining the bureaucratic machine*, second, as a proxy for *capacity and / or power of bureaucracy*, and third, as a proxy for *competition inside the bureaucracy*. The first dimension is relatively straightforward: large bureaucracies are more expensive to sustain. From the point of view of the second dimension, two perspectives may be distinguished. A public choice perspective in the line of William Niskanen and Ludwig von Mises, which has recently been developed in the "grabbing hand" literature (Frye and Shleifer, 1997), would suggest that the increase of discretionary power of agencies is used for the rent-seeking and budget maximization and therefore decreases the economic performance. Hence, countries or regions with large bureaucracies should exhibit lower growth rates. However, a "Weberian" approach to "rational bureaucracy" able to enhance economic growth (or the "helping hand" view of bureaucrats involved in promoting economic activity) has also a long history in social sciences. From this point of view large bureaucracy could rather improve the quality of public services and therefore foster economic growth. [10] Finally, the effects of the size of bureaucracy may differ depending upon its structure: co-existence of many com-

large number of veto players may be irrelevant for politics in countries close to non-democratic pole). Moreover, Frye and Mansfield (2003) demonstrate that in the post-Socialist world autocracies with higher number of veto players (fragmented regimes, i.e. "semi-autocracies") are more likely to liberalize foreign trade, while consolidated autocracies are characterized by protectionist trade policy. This result rather provides evidence for the "inverted U-shape" hypothesis.

[10] This argument is non-negligible in countries with poor protection of property rights and bad governance. For example, a typical excuse of Russian agencies explaining the poor quality of services (like long waiting time) is the lack of personnel. In fact, the literature on Russian bureaucracy has shown both lack of its Weberian properties (Frye and Zhuravskaya, 2000; Brym and Gimpelson, 2004) and its relatively small size given the level of development of Russia (Brym and Gimpelson, 2004).

peting agencies may provide additional incentives, while subdivision of public functions between many agencies acting as complement may lead to increasing bribes (Shleifer and Vishny, 1993).

As mentioned, empirical literature dealing with the problem is, to my knowledge, surprisingly small. Two papers dealing with Russia were already mentioned in the introduction. Moreover Okten (2001) for a sample of countries shows that increase of number of regulators adversely affects private investment decisions. Kochetkova and Nureev (2005) provide a correlation analysis of the relation between the number of deputy prime ministers and macroeconomic indicators in Russia (which per construction lets potential causality out of the considerations). Further studies work with different indicators of quality of bureaucracy. Ayal and Karras (1996) construct a "bureaucracy inefficiency ratio" measuring the relation between the share of public employment in the overall employment and the share of government in the GDP for an international sample. Rauch and Evans (1999) apply an indicator of "Weberian" properties of the bureaucratic machine in a sample of countries country. Finally, there is a related large literature dealing with the "quality of governance" and "quality of institutions" indicators of different sort (Hyden et al., 2003) and not with its size.

Therefore the chapter basically aims to discriminate among two contradicting approaches to the impact of democracy and bureaucracy on economic performance. On the one hand, regions with both high and low level of democracy can perform **better** or **worse**, than regions with average level of democracy. On the other hand, increase of the size of bureaucracy can be associated with **lower** growth rates (public choice bureaucracy) or **higher** growth rates (Weberian bureaucracy). Finally, it is possible to expect some interaction between the democratic development and the size of bureaucracy. One could assume, that a high developed democracy (or a strong autocracy, or both) is able to control the rent-seeking activities of the bureaucrats - via the pressure of public opinion or threat of repressions.[11] On the other hand, some of the "inverse U-shape literature" (dealing with state capacity and corruption) explicitly builds upon a U-shaped relation between democracy and quality of bureaucracy. On the other hand, the quality of bureaucracy could change the impact of particular political system on economic growth.[12] This chapter does not aim to establish the exact

[11] Andrews and Montinola (2004) show that the increasing number of veto players (often associated with democracy) increases the quality of the rule of law (a parameter also encompassing the functioning of political system). In a theoretical model, Dixit (2008) claims that authoritarian rulers are likely to end up in a less efficient equilibrium attempting to solve the principal-agent problem with the bureaucrats, than democratic regimes because the former are less interested in giving up rents. Moreover, different regimes are likely to hire different bureaucrats - a result somewhat similar to Egorov and Sonin (2006), who, however, empathize the power struggle aspect of the problem.

[12] For example, Polterovich and Popov (2007) differentiate between democracies with high rule of law and democracies with low rule of law, which could significantly underperform autocracies. The development of the bureaucratic machine and hence its limited capacity could have similar effects.

causal link in the interplay of democracy and bureaucracy, but rather is looking for the conditional impact of these two characteristics of regional governments on economic growth.

The heterogeneity of growth among Russian regions has already been subject to a number of studies, which, however, mostly do not consider the impact of political factors on growth.[13] There are only few exceptions. Ahrend (2005) explicitly addresses political determinants of growth in a panel of Russian regions from 1990 to 1998, applying a variety of variables, including political orientation of the governor or outcomes of presidential and parliamentary elections, and does not find any significant impact of politics on economic growth. It should be noted, however, that this chapter applies the variables characterizing the current political situation rather than formal and informal political institutions (although given the short experience of Russian post-Communist regime the distinction is vague). Moreover, the period of early 1990s was characterized by significant political shifts in regions, also because of instability and changes on the federal level, which have been less pronounced in the early 2000s. Desai et al. (2005) in a cross-section setting consider the impact of institutions on recovery of Russian regions and other variables characterizing the success of reforms; their focus is, however, the interaction between the region and the federation and not internal political structures of the region. Vainberg and Rybnikova (2006) study a cross-section of averaged indicators for Russian regions using as dependent variables indices of quality of life, quality of social sphere, welfare and of population and find either insignificant or negative impact of democratization on economic and social performance. However, they focus on levels, and not on growth rates and the construction of indices may also be subject to criticism. Finally, Mau and Yanovskiy (2002) evaluate the impact of institutions on economic performance using principal component analysis and claim, that variables of political freedom (like independence of media) have a positive impact; however, the methodology of study is quite different from the standard regression analysis in economics. To conclude, there is still place for studying the impact of political regimes on economic performance in Russian regions.[14]

[13]Solanko (2006), Libman (2006), Lugovoy et al. (2007), Buccellato (2007), Lavrovskyi and Shiltsin (2007), Kolomak (2008) and Ledyaeva and Linden (2008), among others, focus on the issue of σ- and β-convergence in Russia (for different periods) in cross-section and panel data frameworks; Mikheeva (1999) looks at the β-convergence factors of interregional differentiation of income and production in the 1990s. Van Selm (1998), Popov (2000) and Berkowitz and DeJong (2003) study the differentiation of economic decline of Russian regions in the 1990s; while the first paper does not establish any impact of economic policies on growth and attributes it only to industrial structure, the second does find a significant and positive impact of the "state capacity" (but not reforms) on recovery, and the third shows that reform progress (in particular, price liberalization) leads to economic growth. In addition, Berkowitz and DeJong (2005) find a positive impact of the size of entrepreneurial activity on economic growth. Mikheeva (2004) focuses on a short period of 1999-2001, examining only the economic determinants of growth.

[14]There is a number of papers dealing with other aspects of institutional environment in Russian regions. For example, Slinko, Yakovlev and Zhuravskaya (2005) examine the impact

5.3 Model and data

This chapter considers the period of five years (2000-2004). The choice of the period, as already mentioned, is motivated by both coverage of the previous studies (mostly focusing on the 1990s, and not on the Putin age) and the need to consider a relatively stable political environment on the federal and regional level. The 1990s witnessed very strong differentiation of political development paths of Russian regions and significant internal political struggle with different outcomes. Statistical evidence suggests, that since mid 2005 the reforms of federal system reduced the impact of regional institutional differences on economic performance (Yanovskiy et al., 2007). A short period of study and a short life of post-Soviet Russian political system in general provide an additional feature, which may be perceived as both advantage and disadvantage. It is unlikely that the political regime could have indirect impact on economic growth, say, by affecting the accumulation of human capital or long-term political stability, which seem to be quite important in international panels (Tavares and Wacziarg, 2001).[15] It is an advantage, because it makes the modeling of the processes much simpler. But on the demerit side it leads to questions concerning the ability to generalize results to settings with long evolution of political regimes. The sample includes 79 regions, i.e. all regions of Russia excluding and the so-called autonomous okrugs and Chechnya because of lack of information. As it is usually done in the growth regressions, I average all dependent and independent variables over 5 years and estimate a cross-section.[16]

The basic dependent variable is the gross regional product growth rate reported by the federal statistical authority Goskomstat. All data are inflation-corrected. The explanatory variable measuring democracy is the index developed by Moscow Carnegie Center and based on expert opinion. Since I am interested in non-linearity of effects of democracy on economic growth, the regression includes both democracy index and squared democracy index. Size of bureaucracy is measured by the logarithm of share of public officials in the population of respective region, once again reported by the Russian federal statistics.

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of state capture on economic performance on the microlevel. Brock (2005) reports that there is no evidence of impact of corruption on economic growth in the 1990s. This chapter is to a certain extent complementary to these studies, since it looks at yet another institutional dimension of growth.

[15] It is possible to question whether the link between growth and political system originated even in the Soviet period. As already mentioned, several territories enjoyed a higher de-facto autonomy in the USSR and were able to successfully ensure the continuation of local regimes. The centrally planned Soviet economy does not seem, however, to provide opportunity for regional regimes to influence significantly the economic development; all decisions were made at the central level. Nevertheless, the central planning in the Soviet Union is also sometimes interpreted as an outcome of bargaining, where influential local elites could in fact achieve their economic goals through the central agencies. Anyway, there is definitively not enough data to identify the regime differences (if any) in the Soviet period, and the discussion definitively goes well beyond the scope of this chapter.

[16] As an additional robustness check, I also estimate the panel where each observation represents an individual region in a particular year. The results are briefly discussed below, but not reported - although could be provided on request

The **democracy index** reported by the Carnegie Center is based on a survey of a panel of experts carried out for each year and region in the period 2000-2004; the reported indicator is the average for the period. The experts are requested to evaluate each region by a 5-point-scale (with 5 being the highest indicator) for the following ten dimensions:

- Regional political organization: real balance of power between the executive and the legislative, elections / appointments of crucial political actors, independence of courts and police, protection of citizen rights;
- Openness of regional political life: transparency of regional politics and its involvement in the overall national politics;
- Freedom of elections at all levels (national, regional, local);
- Political pluralism: existence of stable political parties, representation of parties in regional legislatures;
- Independence of the media
- Corruption: this indicator, however, refers mostly to the state capture in a broader sense, i.e. interconnections between political and business elites and their interventions in the political decision-making;
- Economic liberalization: once again, the indicator does not really reflect the common usage of the term, but rather refers to the specific directed interventions of regional administration, ignoring property rights of influential players (e.g. potential opposition);
- Civil society: NGOs, referenda, freedom of public political activity;
- Elites: existence of a mechanism of leader changes through elections, existence of multiple political elites;
- Freedom of local municipalities vis-a-vis their dependence from the regional government.

The sum of these ten indicators yields the final index. Basically, most variables indeed cover different dimensions of what one would refer to as a democracy in a broader sense: freedom of elections, multiple political parties, balance of powers. The most questionable dimensions are corruption and economic liberalization, even though they are used in a specific definition different from what one usually applies. However, it is still reasonable to argue, that they reflect an important dimension of the regional political regimes. The "economic liberalization" as defined in the index mostly applies to the usage of economic pressure by regional elites in order to control (potential) opposition rather than the casual property rights protection; economic instruments of control may be even more important in a world where the ability to change formal legislature are still limited (McMann, 2006). Thum and Choi (2010) show that the politically connected firms may form a basis for stability of authoritarian regimes, substituting for repressions. The "corruption" dimension, as well, refers to the co-existence and symbiosis of regional elites and large business groups, effectively able to control

regional political landscape, rather than the usual administrative corruption. But more importantly, second, excluding these two dimensions from the index still yields an indicator, which is highly correlated with the original one (99.01 per cent) and is completely irrelevant for the results of this study. Hence, in this chapter I apply the original index.

As I have already noticed, in this chapter I have decided to pursue an average cross-section estimation instead of panel data. It it is done in agreement with standard techniques in growth econometrics, which aim to eliminate the effects of a business cycle. In addition, it is necessary to notice that the application of the index poses additional problems for panel data analysis. Unfortunately, one cannot be sure that in different years definition of "high democracy" and "low democracy" used by experts was exactly the same. Hence, the variation across time in the index may be simply due to different expectations and perceptions of experts, and not because there are true changes in the level of democracy. Anyway, using this index provides an additional argument in favor of focusing on cross-sections and not on time series.

The **size of bureaucracy** reported by Goskomstat includes public officials at all governmental agencies, as well as their supporting stuff. It does not include positions like university or high school teachers, which do not count as civil service according to the Russian law. However, it does include civilian personnel of the Ministry of Defense, Ministry of Interior Affairs (responsible for police) and Federal Security Service. Officially the civil service in Russia is divided in two categories B and C (the latter accounts for about 99 per cent of all civil servants) (see Gimpel'son, 2003, for details). The group A refers to highest elected and appointed officials (like ministers and governors) and is not included in the civil service. The civil service as it is used in this chapter, however, covers all three branches of power (though most of the bureaucrats are obviously employed in the executive). It is reasonable because, as already mentioned, the very costs of sustaining the bureaucracy may be relevant for growth; moreover, bureaucrats assisting the judges and parliament members may indeed have a significant impact (e.g. controlling the access of third parties). The data also includes municipal service (the regional and the federal level are treated as "civil service"). The inclusion of technical and auxiliary personnel may overestimate the number of bureaucrats, but is still reasonable since it also influences the costs of bureaucracy

Hence, the baseline regression estimated is the following

$$GROWTH_i = \beta_0 + \beta_1 DEMOC_i + \beta_2 DEMOC_i^2 + \beta_3 LOGBUR_i + \beta_n CONTROLS_i + \epsilon_i \quad (*)$$

where $GROWTH$ is the growth index, $DEMOC$ the democracy index, $LOGBUR$ the size of bureaucracy and $CONTROLS$ the set of control variables. In order to identify the ceteris paribus effect of democracy and size of bureaucracy on economic outcomes I apply the following set of controls (conventionally used in

the studies of economic growth):

- Initial level of the GRP per capita in the year 2000; this approach also allows for obtaining some hints regarding potentail conditional β-convergence in the sample (although the limited time period forces me to interpret the results for convergence with great caution);
- Openness to trade measured as share of exports plus imports in the gross regional product;
- Share of foreign direct investments in gross regional product;
- Oil and gas extraction in the region; in order to obtain a unified measure gas and oil are calculated in coal equivalent (1.2 for 1 squared meter of natural gas and 1.4 for 1 kg of oil);
- Share of fixed capital investments in gross regional product (i.e., measure of both external and internal investment activity);
- Share of population with university education (according to the Russian census 2002);[17]
- Quality of health system (number of doctors per capita);
- Sereneness of climate, measured by the long-term average mid-January temperature (Celsius), which has been identified as a significant problem for economic growth in Russia (see Mikhailova, 2005).

All variables excluding the education indicator are reported by Goskomstat of Russia in its databank on *Regions of Russia*. The data for regions comprising autonomous okrugs also include these okrugs. The summary statistics and the detailed description of variables are reported in *Appendix E.1*.

A typical problem of the analysis of federations is that the data contain outliers driving the results. It is in particular relevant for Russia because of huge economic and political asymmetries in the country. Unsurprisingly Mikheeva (2004) finds the dummies for geographic location of the regions to be highly significant in the growth regressions. I have not used this approach, since it partly hides the factors driving differences *between* parts of the country (and one should not forget, that there are important geographical specifics of the spread of political regimes as well. However, I have added three dummy variables for the regions which seem to have the most specific pattern of economic development in Russia: Chukotka, Kalmykia and Ingushetia. Chukotka is an autonomous district with a special status in the Far East (at the American border), Ingushetia (as well as Kalmykia) is a republic in the Southern part of Russia. Chukotka, a very poor and very remote region, during the 2000s was governed by Roman Abramovich, one of the wealthiest persons in Russia, and is often claimed to have benefited significantly from his investments, as well as to have been used in the tax optimization schemes. In fact, it demonstrated an

[17] Since Russia is a country where the absolute majority of population is covered by primary (and even secondary) education, the schooling indicators usually used for developing countries is not applicable for this chapter.

overproportionally high growth for its limited resource endowment. Ingushetia is a direct neighbor of Chechnya with huge shadow economy, partly influenced by the war (the same is true for another region, Dagestan, which, however, does not influence the results). Ingushetia continued receiving substantial federal aid during the period. More importantly, Ingushetia has been used as a tax heaven for numerous tax optimization schemes in the 1990s.[18] The same is true for Kalmykia, which became even more important from this point of view in the late 1990s-early 2000s, when large Russian corporations actively used Kalmykia to reduce taxation. In fact, Kalmykia has been characterized by anomalous behavior of fiscal policy and economic performance, driven by the development of individual large taxpayers. *Table 5.1* summarizes the Cook's distance for the three regions (based on a regression with democracy, squared democracy and bureaucracy without dummies). In the cross-section setting Chukotka is a clear outlier with Cook's distance larger 1..[19]

Table 5.1: Cook's distance for individual regions

Region	**Cross-section**	**Panel**
Chukotka	1.046	0.236
Kalmykia	0.087	1.500
Ingushetia	0.080	0.084
Moscow City	0.255	0.024

Notes: Cook's distance obtained for regression including all controls, democracy, democracy squared and bureaucracy. For panel data the largest Cook's distance observed in individual year is reported

Finally, I also estimate all regression while adding a dummy for the City of Moscow. First, the capital of Russia is well-known to demonstrate an exceptional economic performance (Kolossov and O'Loughlin, 2004). Second, the size of bureaucracy in Moscow may be influenced by the status of the federal capital (although empirically the share of bureaucrats in the population of the city does not seem to be too high). Basically, inclusion of the dummy for Moscow City does not cause major changes to the results, with few exceptions. Dummy Moscow is usually significant and positive. However, including or excluding the City of Moscow matters a lot if the model is "fine-tuned" for the impact of population changes, as I will discuss below. Exclusion of dummies for Chukotka, Kalmykia and Ingushetia makes the results significantly less robust to specification (in terms of significance, but not size), suggesting that these three regions severely differ from the rest of the Russian Federation - as I will once again discuss in what follows.

I estimate the regression (*) with both democracy and bureaucracy simulta-

[18] Chukotka and Ingushetia have been reported as outliers for other studies as well, see e.g. Lugovoi et al., 2007.

[19] I also include Cook's distance for the panel data robunstness test In the panel data setting the outlier is Kalmykia.

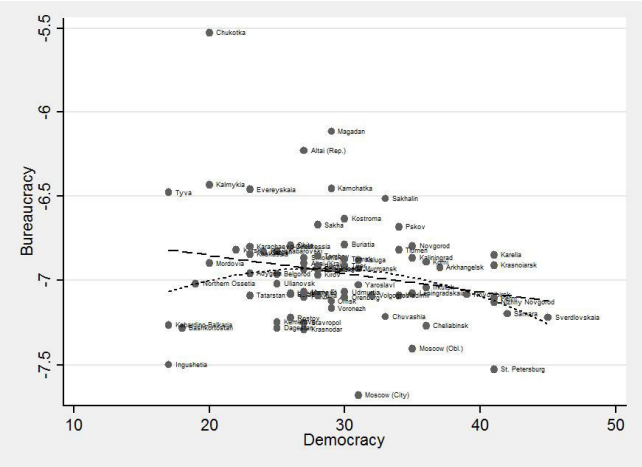

Figure 5.1: Interdependence between democracy and average size of bureaucracy; linear trend for all regions, non-linear trend excluding Chukotka and Kalmykia

neously and with either democracy or bureaucracy. Unfortunately, both approaches are subject to problems: on the one hand, democracy (and democracy squared) are highly (and significantly) correlated to bureaucracy may interact. Indeed, democracy and bureaucracy are significantly correlated to each other. Controlling for Kalmykia and Chukotka through inclusion of dummy variables, one also finds a significant non-linear effect of democracy on bureaucracy (see *Figure 5.1*). Therefore there may be a multicollinearity problem. Even worse, there can be a causal relation between democracy and bureaucracy (which is, nevertheless worth considering *per se*). This gives rise to two possibilities: if both democracy and growth are determined by bureaucracy, the conditioning on bureaucracy is necessary, since otherwise spurious correlation is possible (omitted variable problem). If democracy determines both bureaucracy and growth, on the contrary, one should not condition, since bureaucracy will block part of the total effect, which I am interested in (Pearl, 2000). In order to avoid strong assumptions, I provide both estimates whenever possible, and the results practically do not change. Section 5 of this chapter also proposes an alternative estimation approach for a system of equations.

5.4 Results

5.4.1 Basic results

The *Table 5.2* reports the main estimation results. Basically, all estimations demonstrate a conditional β-convergence among Russian regions since the sign of the coefficient for the initial level of gross regional product is negative (what

is, however, consistent with results of previous literature). I also find significant positive influence of education and economic openness on the economic growth. Health system, climate, investments and FDI are insignificant, though the sign of most coefficients excluding health, fits the expectations. Oil and gas extraction has also a significantly positive impact on economic growth in most specifications, what is hardly surprising given the resource-based growth model implemented in Russia in the 2000s. Moreover, as expected, dummy Ingushetia and Chukotka are significant; Ingushetia demonstrates an on average lower growth than the rest of the Russian Federation, while Chukotka performs extraordinary good for its low resource endowment. Though the variable of democracy in regression (2) is insignificant, inclusion of democracy and squared democracy in regression (3) shows a highly significant non-linear relation between democracy and economic growth. Hence, the results of the regression confirm the "direct U-curve" hypothesis: regions with intermediate degree of democracy perform worse than high and low democracy regions. The minimum of the parabola is achieved for democracy score of about 30, corresponding to regions like Orenburg, Tver, Kostroma, Tomsk or Buryatiya. To provide some intuition regarding the economic significance of the results, take one region with a very low level of democracy (and no oil extraction) and generate counterfactual predictions regarding the economic growth. For example, Tyva (democracy rating 17 - the lowest observed value) has actual growth of 6.36 per cent and predicted growth for actual values of democracy of 6.70 per cent. Increasing democracy level to 45 (the highest observed level in our sample) yields growth rates of 6.82 per cent (i.e. change of plus 0.12 per cent points), which are virtually identical to the original predictions. However, if one sets the democracy level at 30 (around the extremum of the parabola), the growth rates predictions go down to 5.08 per cent; 2 pp of economic growth are lost through *incomplete* democratization. This is a very strong effect from the point of view of typical results of growth regressions.

The results of regression (4) also indicate strong and significantly negative impact of the size of bureaucracy on the economic growth. It can be interpreted as both high costs of bureaucracy and massive interventions of bureaucrats in the economic processes following the "public choice" rather than "Weberian" approach. In fact, the increase of the share of bureaucracy by *one per cent* reduces the growth rates by more than *3 pp.*[20] Finally, in regression (5) democracy and bureaucracy are significant, while democracy squared loses its significance. It may, however, be related to the described multicollinearity problem, as well as the interaction between these two dimensions of political system. Since the Jarque-Bera test is significant, one can reject the hypothesis of normal dis-

[20]This interpretation is rather helpful as opposed to the increase of the share of bureaucracy by 1 pp, which could be obtained by including share of bureaucracy instead of log of this value in the regression; the reason is that in most Russian regions the size of bureaucracy is significantly below 1 per cent of the population - so, the increase of bureaucracy by 1 pp indicates an incredible growth of bureaucratic apparatus, which is hardly relevant for any discussion.

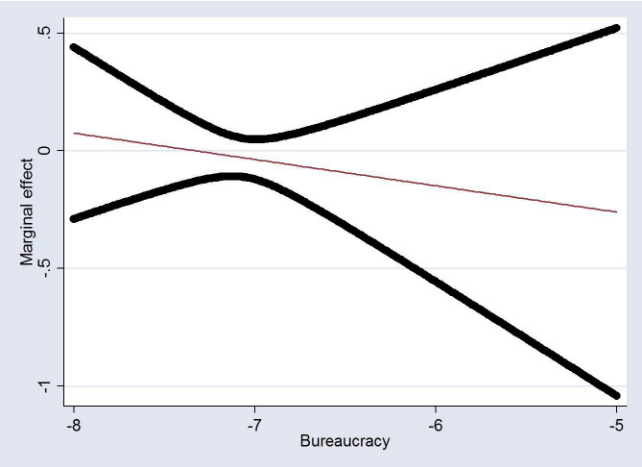

Figure 5.2: Marginal effects of democracy on growth conditional on bureaucracy size, cross-section, specification (6)

tribution of outliers. Thus I exclude outliers until Jarque-Bera test becomes significant, and then re-estimate the regressions and look at the stability of the results. There are no changes in the specifications (1) - (4), though in specification (5) the results are not robust.

Regression (6) and (7) approach the problem of interaction between democracy and bureaucracy. The interaction term (product of democracy and bureaucracy) included in the regressions is insignificant, although negative. However, the joint significance tests in most specifications still reject the null; hence, one cannot exclude the existence of an interaction. In fact, the significance of the effect may vary for *different* levels of bureaucracy, see e.g. *Figure 5.2*. Moreover, the approach used cannot differentiate between reaction of effects of democracy on an increase of the size of the bureaucratic machine and the reaction of the size of bureaucracy on the democratic progress. These problems are considered in the specification in *Table 5.3*. The basic idea is to compare the impact of bureaucracy on economic growth for different quartiles of distribution of democracy over the sample and the impact of democracy (accounting for both linear and non-linear effects) for different quartiles of the size of bureaucracy in the sample. In particular, for regression (8) I calculate four indicators for bureaucracy, which are equal to the log share of bureaucracy if the region is in respective quartile of the distribution of democracy and zero otherwise. In regressions (9) and (10) the indicators are equal to the index of democracy (squared index of democracy) if the region is in the respective quartile of the distribution of the size of bureaucracy and zero otherwise.

First of all, one can see that the indicators of bureaucracy for all quartiles are

Table 5.2: Effects of democracy and size of bureaucracy on average growth rate, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.060***	-0.060***	-0.057**	-0.064***	-0.059***	-0.058**	-0.058**
	(-2.74)	(-2.68)	(-2.46)	(-3.09)	(-2.77)	(-2.59)	(-2.48)
Oil and gas	0.009**	0.009**	0.008**	0.009***	0.009***	0.009***	0.009**
	(2.61)	(2.58)	(2.43)	(3.04)	(2.83)	(2.74)	(2.46)
Education	30.557***	30.570***	29.498***	23.575**	22.603**	21.002*	21.741**
	(3.15)	(3.16)	(3.01)	(2.31)	(2.23)	(1.98)	(2.09)
Openness	31.983	31.816	32.665*	35.227**	39.182**	38.749**	39.508**
	(1.64)	(1.60)	(1.68)	(2.07)	(2.17)	(2.20)	(2.16)
FDI	0.095	0.095	0.100	0.160	0.168	0.171	0.169
	(0.91)	(0.89)	(0.94)	(1.46)	(1.45)	(1.51)	(1.46)
Investments	0.007	0.007	0.008	0.008	0.008	0.008	0.008
	(1.28)	(1.26)	(1.31)	(1.43)	(1.43)	(1.42)	(1.43)
Health	-0.010	-0.010	-0.011	-0.015	-0.014	-0.014	-0.014
	(-0.27)	(-0.27)	(-0.29)	(-0.42)	(-0.40)	(-0.38)	(-0.39)
Temperature	-0.009	-0.009	-0.006	-0.060	-0.057	-0.055	-0.054
	(-0.25)	(-0.25)	(-0.18)	(-1.45)	(-1.36)	(-1.24)	(-1.21)
Dummy Chukotka	12.951***	12.969***	12.120**	16.980***	15.910***	15.294***	15.250**
	(8.44)	(8.65)	(7.81)	(6.54)	(5.72)	(3.61)	(3.63)
Dummy Kalmykia	0.490	0.501	-0.357	2.540	1.618	1.694	1.332
	(0.22)	(0.22)	(-0.15)	(1.02)	(0.60)	(0.56)	(0.43)
Dummy Ingushetia	-2.486**	-2.470*	-3.808**	-4.278***	-5.595***	-5.268**	-5.595***
	(-2.14)	(-1.96)	(-2.65)	(-3.08)	(-3.46)	(-2.08)	(-2.65)
Democracy		0.001	-0.532**		-0.437*	-0.820	-0.781
		(0.03)	(-2.15)		(-1.74)	(-0.60)	(-0.59)
Democracy squared			0.009**		0.007		0.006
			(2.09)		(1.59)		(1.51)
Bureaucracy				-3.353**	-3.300**	-0.329	-1.823
				(-2.19)	(-2.01)	(-0.05)	(-0.30)
Democracy * Bureaucracy						-0.112	-0.052
						(-0.58)	(-0.28)
Constant	1.508	1.474	9.410**	-21.084**	-13.964	1.285	-3.759
	(0.96)	(0.79)	(2.39)	(-2.03)	(-1.11)	(0.03)	(-0.09)
R^2	0.441	0.441	0.460	0.491	0.505	0.496	0.505
N	79	79	79	79	79	79	79
F (democracy, democracy squared)			2.36		1.82		1.27
F (democracy, democracy squared, bureaucracy)					3.41**		3.57**
F (democracy, bureaucracy democracy * bureaucracy						2.32*	
F (democracy, democracy squared, bureaucracy, democracy * bureaucracy							2.69*
J.-B. test	20.07***	20.00***	32.04***	14.4***	22.63***	17.78***	23.71***

Notes: Numbers in parenthesis are t-values. Robust Huber/White standard errors are applied. *** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level. F-tests test the joint significance of the specified variables. Outliers are Arkhangelsk and Dagestan in all regressions, as well as Omsk in regression (4). After exclusion of outliers *Bureaucracy* in regression (5) becomes insignificant, but maintains its sign; *Democracy squared* becomes significant and maintains its sign.

significant and negative; there is no statistically significant difference between the coefficients for individual quartiles. Hence, from this estimation approach one can conclude, that increasing bureaucracy hampers economic growth regardless the level of development of political democracy; both "good" democracies, semi-democracies and autocracies are equally bad in controlling the bureaucratic machine in Russia. While looking at the indicators of democracy, the situation is quite different. If one does not account for non-linear effects (regression (9)), all indices of democracy are insignificant, excluding that for the IV quartile of the size of bureaucracy (the result is, however, not robust after exclusion of outliers), though all indices are negative. However, coefficient for the II quartile is significantly smaller (p-value: 0.057) than for the I quartile; coefficient for the IV quartile is significantly smaller (p-value: 0.067) than for the III quartile. So, one possible interpretation could be that increasing democracy has a negative impact on economic growth for regions with relatively large bureaucracy. Russian bureaucracy seems to be able to use the higher democratization in its favor, while there is no impact for low level of democracy.

The effect, however, vanishes if non-linearity (regression (10)) is introduced. Basically, all coefficients match the predictions of public choice few on bureaucracy, with the only exception of the coefficient for squared democracy for the IV quartile; however, most coefficients are insignificant. There is a significant difference between the coefficients of democracy of the I and the II quartiles (p-value: 0.022) and III and IV quartile (p-value: 0.017). However, the sign of the difference for quartiles I-II could not be established (neither the hypothesis that the coefficient for the I quartile is larger, than for the II one, nor the contrary could be rejected at any reasonable confidence level). On the contrary, for quartile IV the indicator of democracy is significantly larger than for quartile III (p-value: 0.034). Therefore the interaction may be even more complex. For squared democracy coefficients of the I and the II quartiles (p-value: 0.017) and the III and the IV quartile (p-value: 0.069), are significantly different. Moreover, although individual t-tests do not reject the null in the last two specifications, the joint significance F-test rejects the null, indicating the existence of impact of democracy on growth. Controlling for democracy and democracy squared in bureaucracy regressions does not change the result, though the outcomes become not robust after exclusion of outliers. Controlling for bureaucracy in democracy regressions also does not have any important impact on the estimations.

5.4.2 Endogeneity

A general problem of the democracy and growth studies is the existence of reverse causality (Sunde, 2006). As usually, "the only motor of history is endogeneity" (Przeworski, 2004:168). It is difficult to claim whether the problem of endogeneity is as acute in the specific sample of Russian regions as usually: the political systems of the regions seem to be mostly inherited from the 1990s, and there is no systematic impact on economic growth on regime change (from both internal political forces and the federation), as discussed above. In a sim-

Table 5.3: Interaction of democracy and size of bureaucracy, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	(8)	(9)	(10)	(11)	(12)	(13)
	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.062***	-0.059***	-0.055**	-0.061**	-0.063***	-0.057**
	(-2.77)	(-2.80)	(-2.41)	(-2.55)	(-3.11)	(-2.59)
Oil and gas	0.009***	0.010***	0.011***	0.009**	0.010***	0.011***
	(2.69)	(2.91)	(3.01)	(2.52)	(3.08)	(3.09)
Education	22.109**	28.317***	25.653***	22.855**	24.374**	22.805**
	(2.10)	(2.77)	(2.85)	(2.05)	(2.26)	(2.35)
Openness	40.010*	33.331*	30.597	40.390**	36.957*	33.256
	(2.00)	(1.71)	(1.52)	(2.02)	(1.88)	(1.64)
FDI	0.172	0.166	0.234*	0.173	0.192	0.254**
	(1.44)	(1.41)	(1.99)	(1.38)	(1.51)	(2.07)
Investments	0.008	0.009	0.006	0.009	0.008	0.006
	(1.50)	(1.35)	(0.96)	(1.57)	(1.18)	(0.87)
Health	-0.010	-0.023	-0.009	-0.018	-0.019	-0.008
	(-0.28)	(-0.59)	(-0.26)	(-0.45)	(-0.48)	(-0.21)
Temperature	-0.065	-0.055	-0.003	-0.059	-0.067	-0.012
	(-1.40)	(-1.33)	(-0.07)	(-1.21)	(-1.56)	(-0.24)
Dummy Chukotka	16.543***	12.643***	12.060***	15.9628**	16.030***	14.475***
	(5.88)	(8.51)	(6.55)	(5.60)	(4.55)	(4.11)
Dummy Kalmykia	2.075	1.070	-0.039	1.451	2.367	0.756
	(0.84)	(0.45)	(-0.01)	(0.55)	(0.82)	(0.25)
Dummy Ingushetia	-5.016***	-3.747**	-4.633***	-5.836***	-4.719***	-5.266***
	(-3.01)	(-2.52)	(-2.95)	(-3.34)	(-2.84)	(-2.92)
Bureaucracy (Democracy: I quartile)	-3.718**			-3.344*		
	(-2.18)			(-1.85)		
Bureaucracy (Democracy: II quartile)	-3.616**			-3.348*		
	(-2.16)			(-1.91)		
Bureaucracy (Democracy: III quartile)	-3.608**			-3.371*		
	(-2.11)			(-1.89)		
Bureaucracy (Democracy: IV quartile)	-3.601**			-3.311*		
	(-2.16)			(-1.87)		
Democracy (Bureaucracy: I quartile)		-0.011	-0.185		-0.028	-0.225
		(-0.27)	(-0.45)		(-0.66)	(-0.52)
Democracy (Bureaucracy: II quartile)		-0.046	-0.535		-0.050	-0.535
		(-0.80)	(-1.49)		(-0.85)	(-1.45)
Democracy (Bureaucracy: III quartile)		-0.045	-0.408		-0.035	-0.400
		(-0.82)	(-1.21)		(-0.62)	(-1.18)
Democracy (Bureaucracy: IV quartile)		-0.095*	-0.141		-0.061	-0.108
		(-1.69)	(-0.36)		(-1.06)	(-0.28)
Democracy squared (Bureaucracy: I quartile)			0.002			0.002
			(0.23)			(0.31)
Democracy squared (Bureaucracy: II quartile)			0.012*			0.012*
			(1.80)			(1.73)
Democracy squared (Bureaucracy: III quartile)			0.008			0.007
			(1.26)			(1.24)
Democracy squared (Bureaucracy: IV quartile)			-0.003			-0.003
			(-0.36)			(-0.42)
Democracy				-0.513		
				(-1.13)		
Democracy squared				0.008		
				(1.22)		
Bureaucracy					-2.721	-2.057
					(-1.19)	(-0.85)
Constant	-23.204**	2.987	7.565	-13.348	-15.532	-6.307
	(-2.01)	(1.25)	(1.48)	(-0.85)	(-0.99)	(-0.41)
R^2	0.499	0.491	0.554	0.506	0.502	0.559
N	79	79	79	79	79	79
F (bureaucracy for all quartiles of democracy)	1.53			0.99		
F (democracy for all quartiles of bureaucracy)		1.49	3.14**		0.48	2.99**
F (democracy squared for all quartiles of bureaucracy)			3.11**			2.92**
F (democracy and democracy squared for all quartiles of bureaucracy)			2.58**			2.37**
F (bureaucracy for all quartiles of democracy, democracy, democracy squared)				1.90*		
F (democracy for all quartiles of bureaucracy, bureaucracy)					1.32	
F (democracy and democracy squared for all quartiles of bureaucracy, bureaucracy)						2.59**
J.-B. test	19.12***	11.76***	7.64**	23.33***	12.02***	9.673***

Notes: see *Table 5.2.* After exclusion of outliers *Democracy (Bureaucracy: IV quartile)* in regression (9) loses significance, but maintains its sign; all variables for *Bureaucracy* in regression (11) lose their significance, but maintain their sign. Outliers are Omsk and Dagestan in regressions (9)-(13) and Dagestan and Arkhangelsk in regression (8).

ilar way, regression results make endogeneity of bureaucracy questionable: it is difficult to come up with an explanation for a government to *reduce* the size of bureaucracy if the growth is accelerating; it could happen if some kind of a "New Deal" style policy with huge public projects implemented, and after the initial investments in the public projects paid off (i.e. the growth went up), the necessary political infrastructure was reduced.[21] However, even in the case of such public interventions abolished after the problem was solved agencies are quite often able to survive, even if their initial function is lost; a much more likely case is, however, that the bureaucracy expands if the growth goes up and the opportunities for budget maximization increase. Nevertheless, to rule out the possibility of biased results, in this section I try to account for endogeneity using the instrumental variables approach.

An additional advantage of intranational analysis is that it may provide opportunity for identification strategy, based on specifics of particular country and impossible in general. It is also true for the choice for instrumental variables. As instruments I used share of ethnically Russian population in the region (according to the latest census) and distance from Moscow for democracy and democracy squared; squared distance from Moscow for bureaucracy and distance from Moscow and share of Russians for the interaction term (in different specifications). The share of Russians is an important characteristic for the development of political systems of regions. First, the ethnic composition of the population may be relevant from the point of view of political culture and distribution of power in the regional elite, which are crucial for the democratization process (Matsuzato, 2004). Second, regions with high share of non-Russian population (mostly republics) were often relatively more successful in restricting federal influence on their internal political process. On the other hand, the ethnic composition is usually quite stable and is unlikely to change fast, reacting on differences in economic growth. There have been migration flows in Russia with a certain impact on ethnic structure (in particular, in Northern Caucasus), but in this case economic growth does not seem to be the main driving force (unlike the *level* of economic development or ethnic controversies). A more difficult question is whether the share of Russians per se can have an impact on economic growth. Basically, three issues should be considered. First, there is empirical literature estimating the impact of ethnic *fractionalization* on economic growth, surveyed by Alesina and La Ferrara (2005). However, low share of Russians is not identical to the ethnic fractionalization: in fact, regions with both high and low share of Russians may be ethnically homogenous; regions with low share of Russians may be homogenous (like Ingushetia) or extremely heterogeneous (like Dagestan). Moreover, the ethnic fractionalization either influences the development through political system (e.g. public goods provision) or has an impact on long-term economic performance rather than short-term

[21] One should differentiate between the increase of professional bureaucracy (which I am studying in this chapter) and of mass employment in public sector or mass party membership in non-democracies (Schnytzer and Sustersic, 1998), where the increase as a countercyclical measure is possible.

growth levels examined in this chapter. Second, share of Russians may have an impact on current growth through initial GRP level: regions with Russian majority may be more developed and hence, have lower growth rates. In fact, they may be more developed *because* of Russian majority, since the large migration flows of the Soviet time were strongly associated with transferring experts and specialists to the regions in need for development. However, there is no correlation between initial GRP level and share of Russians. In a similar way, higher share of Russians may indicate higher share of population with better education, providing yet another channel of impact of the instrument on the dependent variable - but, once again, there is no significant correlation between the education variable and the share of Russians.

Third, regions with foremost non-Russian population may receive more (or less) fiscal transfers from the center or obtain higher (or lower) tax retention rates, influencing the economic performance. In response to the last potential criticism three issues should be mentioned. First, this chapter focuses on "Putin period" of the development of the Russian federalism, when the bargaining power of regions and their ability to receive additional grants or higher retention rates went down significantly. Second, the effect of grants and retention rates is unclear: given low effectiveness of Russian economic policy and low quality of public administration, the ability of the redistribution of revenue between levels of government and transfers to generate growth is questionable. The literature is quite inconclusive, but it seems that GRP growth is even negatively affected by federal transfers (Lugovoi et al., 2007), which also can act as a disincentive for public investments (Matheson, 2005). Berkowitz and DeJong (2002) claim that the federal transfers were insignificant in their growth regressions and hence were omitted, though they explain it by quality of data. This chapter, as shown below, also does not find any significant impact of public expenditures on economic growth. For retention rates Desai et al. (2005) find a positive effect on recovery, and retention rates under Putin are significantly higher for regions with higher Russian population. However, third, the efficiency of public expenditures (Hauner, 2007) and bargaining process between the regions and the federation obviously depend upon the structure of political system. So, in fact, share of Russians seems to influence the size of transfers / retention rates and their effect on economic growth, however, because it influences political processes and, therefore, political regime. Unsurprisingly, adding average retention rate to regression (5) (which already controls for political systems specifics) does not yield any significant results.[22] However, the problem from the point of view of the instruments is present if they have another channel of impact on the dependent variable rather than through the instrumented covariate. Is does not seem to be the problem in this setting.

[22]Surely, the situation could be different if there were an acute danger of popular uprising or civil disorder; however, the only region where this problem may actually be present is Chechnya, which is anyway excluded from the sample. Although the terrorist activity seemed to spread over the whole North Caucasus region towards the second term of Putin, once again, it was heavily influenced by political systems rather than by pure ethnic factor.

The distance from Moscow may have an impact on regional political development through two channels. First, it is a proxy for secession ability of the region, which therefore also reduces the ability of federation to interfere with its internal affairs. Second, distance my simply increase the costs of direct federal intervention per se. Third, it reflects differences in preferences, which could result in differences in political culture as well. Since it is a geographical variable, it is obviously independent from growth. It is however not sufficient to state that: geographical variables may become bad instruments for economic performance, if they have an influence on growth per se (Durlauf et al., 2005). Basically, there are two factors which should be considered in this framework. First, regions close to Moscow may benefit from the positive effects of Moscow agglomeration. Second, they may receive higher benefits from federal budget. Fidrmuc (2003) uses distance from Brussels in an analogous study of economic growth in transition countries of the CEE. Berkowitz and DeJong (2005) and Solanko (2006) include distance from Moscow in their regressions, but it turns out to be insignificant. It is possible to claim, however, that in Russian case both channels are irrelevant. There are very limited spillovers from the Moscow agglomeration (besides its immediate suburbs in the Moscow region) (Balackii and Gusev, 2007). Large distances and low mobility of population also prevent negative New Economic Geography concentration effects around large agglomeration. As for the grants issue, the previously discussed arguments for share of Russians apply. Moreover, there is no evidence that geographical distance from Moscow has boosted secessionist tensions; on the contrary, Far East has been always quite supportive of nationalist parties in federal elections.

Hence, it is possible to use the distance from Moscow and share of Russians as instruments for democracy and democracy squared. Statistically they are significant in first-stage regressions (but F-statistics is still lower than 10) and insignificant once included in the growth regression. The results of the TSLS estimates are reported in *Table 5.4* and confirm the OLS estimations presented in the previous subsections. Finally, one should be aware, that the OLS is biased if one includes endogenous controls. This problem always exists in growth regressions; it is very simple to come up with a reasoning why a socioeconomic variable could be caused by growth and could cause growth. In several cases it is possible to rule the endogeneity out due to the short time period considered; for example, education seems to be heavily influenced by the Soviet past (in fact, one should recall, that in the 2000s Russia moved to a nearly full coverage of the high school graduates by the university education). The situation with openness, FDI and investments is much more complicated: it is quite possible to assume, that trade flows and inward investment activity specifically focus on regions with high growth rates. One possible approach to eliminating potential effects could be to estimate regressions without potentially endogenous controls (see specification (I4) - (I6)), which still provides the same results. Obviously in this case on faces an omitted variable bias. However, if the results are robust for both specifications, one could assume, that it is unlikely that both biases

(due to endogeneity and to omitted variables) lead to the same results.

Table 5.4: Effects of democracy and size of bureaucracy on average growth rate, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	**(I1)**	**(I2)**	**(I3)**	**(I4)**	**(I5)**	**(I6)**
	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS
Initial GRP	-0.061**	-0.066*	-0.071***	-0.001	-0.024	-0.008
	(-2.17)	(-1.71)	(-3.30)	(-0.06)	(-0.88)	(-0.58)
Oil and gas	0.009**	0.009*	0.011***			
	(2.30)	(1.79)	(3.58)			
Education	30.588***	27.339*	12.666			
	(3.24)	(1.68)	(0.91)			
Openness	31.582	8.820	40.295*			
	(1.38)	(0.36)	(1.91)			
FDI	0.094	0.085	0.262**			
	(0.89)	(0.69)	(2.19)			
Investments	0.007	0.010	0.009			
	(1.26)	(1.51)	(1.46)			
Health	-0.010	-0.027	-0.023			
	(-0.28)	(-0.61)	(-0.59)			
Temperature	-0.009	-0.002	-0.140*			
	(-0.25)	(-0.04)	(-1.86)			
Dummy Chukotka	12.994***	11.614***	23.275***	11.373***	11.020***	19.760***
	(4.99)	(3.79)	(5.15)	(5.50)	(3.65)	(4.54)
Dummy Kalmykia	0.517	-1.903	5.742*	3.307**	1.914	6.874***
	(0.18)	(-0.54)	(1.84)	(2.11)	(0.74)	(4.07)
Dummy Ingushetia	-2.448	-6.542*	-7.077**	-0.938	-6.642	-2.503
	(-0.92)	(-1.73)	(-2.89)	(-0.48)	(-1.37)	(-1.56)
Democracy	0.003	-2.439*		-0.104	-4.206*	
	(0.02)	(-1.71)		(-0.62)	(-1.69)	
Democracy squared		0.043*			0.075*	
		(1.73)			(1.69)	
Bureaucracy			-8.593**			-5.006*
			(-2.28)			(-1.68)
Constant	1.427	35.568*	-56.381**	9.645**	63.627*	-28.049
	(0.27)	(1.73)	(-2.17)	(2.05)	(1.87)	(-1.35)
R^2	0.441	0.266	0.368	0.195	0.084	0.322
N	79	79	79	79	79	79
F (democracy, democracy squared)		1.60		1.43		
F (first-stage instruments, democracy)	7.84***	7.84***		8.02***	8.02***	
F (first-stage instruments, democracy squared)		6.28***			5.99***	
F (first-stage instruments, bureaucracy)			11.71***			26.24***

Notes: see *Table 5.2*. Instruments are distance to Moscow and share of Russians in regressions (I1), (I2), (I4) and (I5) squared distance to Moscow in regressions (I3) and (I6). First-stage regressions for unrestricted specifications (I1)-(I3) are reported in the Appendix

5.5 Extensions and robustness

5.5.1 Alternative measures of democracy and bureaucracy

A systematic problem of any quantitative research dealing with political and institutional variables is the quality of indicators. Hence it is reasonable to consider potential alternative measures of democracy and bureaucracy and to check for robustness and/or alternative explanations of the results.

Application of democracy indicators for cross-national studies already demonstrates potential problems associated with this issue (Munck and Verlikulen, 2002). The first set of alternative indicators is given by construction of the data. Since the index of democracy is composed of several elements, it is probably reasonable to look at individual components of index in order to identify the potential effects. Unfortunately, most of them are highly collinear and the sample is relatively small, therefore I report estimations including each one dimension of democracy from the index in *Table 5.5*. The idea is not really to find out ceteris paribus effects, but rather to understand which components of the index trigger the results observed in the chapter. Since each of the dimensions of democracy has a significantly smaller variation, than the overall index, it is not surprising that many components are insignificant. All of them maintain the expected sign though (with the only exception of civil society). Significant results are obtained for the variables of freedom of elections, freedom of the media, structure of elites and freedom of local municipalities. With two first variables being the main traditionally recognized dimensions of democracy, it gives additional reassurance that the results actually measure the impact of democracy on growth.

Moreover, there are two alternative measures provided by the Institute of Public Expertise (*Institut Obshchestvennaya Ekspertiza*) and represent the freedom of elections and the freedom of press. A clear disadvantage of the first indicator is that it covers not only the early 2000s, which are analyzed in this chapter, but also the development of the 1990s, which, as mentioned above, has been substantially less stable. The freedom of the press is measured only for one year; one should be aware of the fact, that media freedom was among the first parameters to change under the new administration of Vladimir Putin. The outcomes of the regressions are presented in *Table 5.6*. The indicator of free press confirms the results with respect to the non-linearity of the democracy effect (though the joint significance test cannot reject the null). However, from the indicator of free elections one could obtain a negative impact of democracy on growth; in non-linear specification both covariates become insignificant. Theoretically both indicators correspond to certain elements of democracy: so, it is reasonable to provide a regression where both variables are present as covariates;[23] both free press squared, free elections and free elections squared are insignificant, obviously because of the collinearity problem (nevertheless, joint significance test rejects the null). Controlling for bureaucracy does not change the result, moreover, one obtains significant results for the joint significance test as well.

[23]It is not reasonable to regress the growth rate on the Carnegie index of democracy and one (or both) of Institute of Public Expertise indices simultaneously: Carnegie index is designed to cover a broader range of aspects of democracy

Table 5.5: Effects of components of democracy index on average growth rate, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	Openness	Election	Pluralism	Media	Liberalization	Civil society	Political organization	Elites	Corruption	Municipalities
Initial GRP	-0.058**	-0.059***	-0.063***	-0.057**	-0.061**	-0.063**	-0.060**	-0.056**	-0.057**	-0.064***
	(0.023)	(0.022)	(0.023)	(0.023)	(0.025)	(0.024)	(0.023)	(0.021)	(0.023)	(0.022)
Oil and gas	0.008**	0.009**	0.009***	0.008**	0.009**	0.009**	0.009**	0.008**	0.008**	0.009**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Education	30.029***	29.706***	30.547***	27.667***	30.678***	30.748***	28.650***	28.934***	28.422***	27.507**
	(10.039)	(9.411)	(9.672)	(9.794)	(9.682)	(10.152)	(10.210)	(9.845)	(9.351)	(10.746)
Openness	32.563	36.279*	27.342	36.803*	30.776	27.821	30.347	34.428*	32.897	33.262*
	(21.353)	(20.299)	(20.461)	(19.106)	(18.618)	(19.435)	(21.683)	(19.313)	(20.530)	(18.514)
FDI	0.096	0.128	0.098	0.116	0.089	0.091	0.097	0.097	0.097	0.121
	(0.112)	(0.115)	(0.108)	(0.109)	(0.110)	(0.105)	(0.107)	(0.102)	(0.107)	(0.105)
Investments	0.007	0.006	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Health	-0.009	-0.006	-0.011	-0.002	-0.010	-0.019	-0.013	-0.008	-0.010	0.006
	(0.038)	(0.037)	(0.038)	(0.037)	(0.037)	(0.038)	(0.039)	(0.037)	(0.039)	(0.039)
Temperature	-0.002	-0.015	-0.009	-0.008	-0.010	-0.012	-0.009	-0.003	-0.012	-0.012
	(0.038)	(0.035)	(0.035)	(0.034)	(0.037)	(0.038)	(0.036)	(0.035)	(0.035)	(0.036)
Dummy Chukotka	12.751***	10.797***	11.343***	12.286***	12.900***	13.413***	12.622***	13.044***	12.861***	12.760***
	(1.556)	(1.629)	(2.236)	(1.614)	(1.765)	(1.566)	(1.630)	(1.533)	(1.583)	(1.550)
Dummy Kalmykia	0.527	0.581	-0.030	0.047	0.417	0.690	0.115	0.266	0.109	-0.860
	(2.311)	(2.376)	(2.407)	(2.427)	(2.515)	(2.328)	(2.373)	(2.156)	(2.415)	(2.336)
Dummy Ingushetia	-2.712**	-2.815**	-2.716**	-4.314**	-2.797	-2.383*	-2.813**	-2.489**	-2.780**	-3.747**
	(1.283)	(1.283)	(1.225)	(1.629)	(1.988)	(1.227)	(1.327)	(1.125)	(1.325)	(1.500)
Democracy	-1.129	-3.213**	-2.728	-2.920**	-0.638	0.037	-2.148	-2.662**	-0.911	-3.297**
	(1.644)	(1.274)	(2.231)	(1.437)	(1.764)	(2.225)	(2.414)	(1.270)	(2.700)	(1.531)
Democracy squared	0.161	0.481**	0.461	0.438*	0.111	0.059	0.346	0.466**	0.089	0.583**
	(0.260)	(0.199)	(0.363)	(0.222)	(0.256)	(0.339)	(0.379)	(0.231)	(0.398)	(0.255)
Constant	3.418	6.574**	5.341	5.880**	2.324	1.319	5.099	4.986**	3.485	5.830**
	(3.197)	(2.791)	(3.577)	(2.801)	(3.015)	(3.754)	(4.413)	(2.221)	(4.945)	(2.516)
No. obs	79	79	79	79	79	79	79	79	79	79
R^2	0.443	0.461	0.453	0.461	0.442	0.450	0.446	0.462	0.449	0.471
J.-B. test	24.1***	24.34***	26.59***	33.02***	20.35***	16.85***	24.06***	27.26***	15.30***	18.25***

Notes: Numbers in parenthesis are standard errors. Robust Huber/White standard errors are applied. *** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level. Outliers are Arkhangelsk, Dagestan and Omsk for all regressions, as well as Kamchatka for "Media". There are no changes in terms of sign and significance for democracy and democracy squared variables.

For the size of bureaucracy several modifications (*Table 5.7*) are possible. First, though this chapter basically focuses on non-fiscal effects of democracy, I have used the share of public expenditures in the GRP and the bureaucracy inefficiency ratio (Ayal and Karras, 1996) as covariates. The problem with the share of public expenditures is that in a federation one can easily account for expenditures on the *regional* level, but faces great difficulties with attributing the *federal* expenditures to particular regions[24], although the latter are obviously important for economic development. In a federation with heavy fiscal asymmetries like Russia the spatial distribution of federal expenditures can also vary a lot, so, the information utilized in the regression is incomplete. The bureaucracy inefficiency ratio is an index, where the numerator is the share of bureaucrats in population, and the denominator - the share of public expenditures in the GRP. The idea is that a larger bureaucratic apparatus can be necessary to manage larger public expenditures. Of course, given that the data accounts only from expenditures of regional budgets, I use the public officials of regional and municipal level to calculate this index. Second, it is reasonable to consider not only the overall impact of bureaucracy on economic growth, but to differentiate between the levels of bureaucracy. I regress economic growth on the log of the share of *local* bureaucracy (that of the executive agencies of regional and municipal level) and of the *local federal* bureaucracy, i.e. local branches of the federal agencies, which are particularly important in the modern Russia (Leksin, 2007).

As the *Table 5.7* shows, both public expenditures and inefficient bureaucracy are not significant.[25] It can both indicate the measurement problems and confirm the idea that the size of bureaucracy measures the non-fiscal effects of the bureaucratization on growth. Obviously, both variables differ substantially from the size of bureaucracy (staff) applied above from the point of view of their economic impact. Hence, I have also estimated regressions where the size of bureaucracy is also included, and do not find any differences in the results. This is actually a good sign for the choice of instruments discussed in the previous section. The existing literature provides some evidence that public expenditures in Russia could be even negatively correlated with growth (Sharipova, 2001), which is, however, based only on correlation analysis. While local federal bureaucracy has a negative impact on growth, the local bureaucracy is insignificant. However, F-test rejects the hypothesis that both variables are simultaneously equal to zero. Controlling for democracy does not change the results (*Table 5.8*).

[24] East-West Institute (2001) provides a discussion of this problem for the Russian Federation.

[25] Obviously, my analysis ignores the potential interaction between expenditures and business cycle, see e.g. Akhmetov and Zhuravskaya (2004) and Kwon and Spilimbergo (2005).

Table 5.6: Alternative measures of democracy, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	**(14)**	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**
	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.056**	-0.056**	-0.061***	-0.071***	-0.070***	-0.074***
	(-2.62)	(-2.51)	(-2.83)	(-3.39)	(-3.12)	(-3.87)
Oil and gas	0.008**	0.008**	0.009***	0.010***	0.010***	0.011***
	(2.46)	(2.42)	(2.69)	(3.21)	(3.00)	(3.78)
Education	25.079***	24.882***	30.348***	22.049**	15.298*	13.689
	(2.86)	(2.85)	(3.11)	(2.32)	(1.83)	(1.39)
Openness	45.238**	45.152**	31.074	36.906*	48.334**	44.893***
	(2.29)	(2.30)	(1.63)	(1.91)	(2.52)	(2.67)
FDI	0.111	0.108	0.091	0.081	0.079	0.172
	(1.04)	(1.04)	(0.85)	(0.76)	(0.75)	(1.50)
Investments	0.007	0.007	0.007	0.009	0.009	0.010*
	(1.26)	(1.29)	(1.28)	(1.54)	(1.61)	(1.73)
Health	0.009	0.009	-0.011	-0.005	0.014	-0.006
	(0.25)	(0.27)	(-0.29)	(-0.13)	(0.42)	(-0.18)
Temperature	-0.017	-0.015	-0.011	-0.017	-0.026	-0.070*
	(-0.51)	(-0.48)	(-0.29)	(-0.49)	(-0.82)	(-1.75)
Dummy Chukotka	11.707***	11.769***	13.091***	12.019***	11.184***	15.940***
	(8.54)	(8.02)	(8.65)	(7.30)	(7.06)	(6.67)
Dummy Kalmykia	-0.025	-0.024	0.582	-0.481	-0.827	1.363
	(-0.01)	(-0.01)	(0.26)	(-0.20)	(-0.35)	(0.56)
Dummy Ingushetia	-2.607**	-2.601**				
	(-2.12)	(-2.11)				
Free elections	-0.291*	-0.093			0.049	
	(-1.71)	(-0.10)			(0.05)	
Free elections squared		-0.035			-0.068	
		(-0.20)			(-0.39)	
Free press			0.861	-31.811*	-28.217	-39.700**
			(0.29)	(-1.78)	(-1.64)	(-2.20)
Free press squared				48.181*	46.538*	54.991**
				(1.90)	(1.92)	(2.24)
Bureaucracy						-3.833**
						(-2.43)
Constant	2.036	1.807	1.298	7.455*	6.871**	-16.701
	(1.36)	(1.03)	(0.70)	(1.99)	(2.00)	(-1.66)
R^2	0.486	0.487	0.441	0.461	0.514	0.520
N	78	78	78	78	77	78
F (free elections, free elections squared)		3.162		1.49		
F (free press, free press squared)				1.93	2.90**	2.50*
F (free press, free press squared, free elections, free elections squared)					1.83	
F(free press, free press squared, bureaucracy)						3.79**
J.-B. test	13.1***	13.01***	19.66***	27.09***	21.28***	18.57***

Notes: see *Table 5.2*. Results do not change after exclusion of outliers. Outliers are Omsk in all regressions, as well as Dagestan in regressions (16), (17) and (18).

Table 5.7: Public sector and economic growth, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	**(20)**	**(21)**	**(22)**	**(23)**	**(24)**	**(25)**	**(26)**
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.059**	-0.055**	-0.060***	-0.067***	-0.068***	-0.051**	-0.062***
	(-2.29)	(-2.35)	(-2.74)	(-3.39)	(-3.37)	(-2.39)	(-2.76)
Oil and gas share	0.008**	0.008**	0.009***	0.009***	0.009***	0.008**	0.009***
	(2.29)	(2.51)	(2.74)	(3.19)	(3.16)	(2.62)	(2.94)
Education	30.014***	26.114**	24.896**	26.061**	27.148**	15.020	21.847**
	(3.15)	(2.60)	(2.44)	(2.60)	(2.64)	(1.40)	(2.08)
Openness	32.500*	33.760*	29.720	43.649**	45.363**	41.893***	35.906**
	(1.77)	(1.78)	(1.62)	(2.52)	(2.39)	(2.77)	(2.19)
FDI	0.095	0.111	0.103	0.206*	0.214*	0.193*	0.165
	(0.91)	(1.08)	(1.00)	(1.79)	(1.79)	(1.81)	(1.54)
Investments	0.007	0.008	0.009	0.006	0.006	0.007	0.008
	(1.27)	(1.29)	(1.58)	(1.09)	(0.91)	(1.33)	(1.42)
Health	-0.009	-0.007	-0.020	-0.003	0.000	-0.004	-0.014
	(-0.24)	(-0.19)	(-0.53)	(-0.08)	(0.01)	(-0.11)	(-0.39)
Temperature	-0.005	-0.004	-0.035	-0.059	-0.057	-0.042	-0.057
	(-0.11)	(-0.10)	(-1.00)	(-1.48)	(-1.42)	(-0.94)	(-1.22)
Dummy Chukotka	12.561***	12.947***	15.438***	17.041***	16.765***	14.746***	16.872***
	(4.62)	(8.36)	(6.29)	(7.72)	(6.94)	(5.57)	(6.41)
Dummy Kalmykia	0.348	0.297	1.103	3.282	3.384	1.982	2.403
	(0.14)	(0.13)	(0.49)	(1.29)	(1.30)	(0.79)	(0.92)
Dummy Ingushetia	-2.958	-3.199*	-3.847**	-3.961***	-3.738**	-9.861**	-4.537**
	(-0.97)	(-1.92)	(-2.54)	(-3.20)	(-2.52)	(-2.50)	(-2.62)
Public expenditures	0.773					7.870	
	(0.18)					(1.65)	
Inefficient bureaucracy		-37.065					-15.953
		(-0.77)					(-0.33)
Local bureaucracy			-2.174		0.581		
			(-1.52)		(0.39)		
Local federal bureaucracy				-3.361***	-3.681***		
				(-2.99)	(-3.00)		
Bureaucracy						-4.806***	-3.265**
						(-2.83)	(-2.05)
Constant	1.384	2.909	-9.320	-17.786***	-16.724**	-32.127***	-19.885*
	(0.84)	(1.06)	(-1.29)	(-2.69)	(-2.20)	(-2.72)	(-1.73)
R^2	0.441	0.446	0.462	0.511	0.512	0.516	0.492
N	79	79	79	79	79	79	79
F (local bureaucracy, local federal bureaucracy)					5.14***		
F (public expenditures, bureaucracy)						4.01**	
F (inefficient bureaucracy, bureaucracy)							2.49*
J.-B. test	19.85***	17.03***	14.58***	15.71***	19.19***	10.29***	13.12***

Notes: see *Table 5.2*. After exclusion of outliers *Public expenditures* in regression (20) change the sign (but are still insignificant) and *Bureaucracy* in regression (26) loses significance, but maintains its sign. Outliers are Dagestan and Omsk in all regressions, as well as Arkhangelsk in regression (24).

Table 5.8: Public sector and economic growth (controlling for democracy), 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	(27)	(28)	(29)	(30)	(31)	(32)	(33)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.058**	-0.055**	-0.056**	-0.063***	-0.065***	-0.051**	-0.060***
	(-2.24)	(-2.27)	(-2.47)	(-3.03)	(-3.09)	(-2.37)	(-2.67)
Oil and gas	0.008**	0.008**	0.008**	0.009***	0.009***	0.008**	0.009***
	(2.26)	(2.40)	(2.52)	(2.96)	(2.93)	(2.59)	(2.80)
Education	29.964***	27.466**	24.848**	25.267**	27.605***	15.949	23.306**
	(3.04)	(2.61)	(2.46)	(2.53)	(2.75)	(1.40)	(2.19)
Openness	32.691	33.006*	32.490*	45.283**	47.925**	41.324**	39.133**
	(1.66)	(1.72)	(1.72)	(2.47)	(2.48)	(2.48)	(2.16)
FDI	0.100	0.107	0.108	0.208*	0.224*	0.188	0.166
	(0.92)	(1.01)	(1.01)	(1.74)	(1.83)	(1.67)	(1.46)
Investments	0.008	0.008	0.009	0.007	0.005	0.008	0.008
	(1.34)	(1.31)	(1.56)	(1.12)	(0.86)	(1.33)	(1.41)
Health	-0.012	-0.010	-0.018	-0.003	0.003	-0.005	-0.015
	(-0.34)	(-0.26)	(-0.49)	(-0.09)	(0.08)	(-0.15)	(-0.42)
Temperature	-0.010	-0.004	-0.029	-0.055	-0.049	-0.042	-0.058
	(-0.20)	(-0.11)	(-0.80)	(-1.39)	(-1.27)	(-0.88)	(-1.24)
Dummy Chukotka	12.427***	12.232***	14.227***	16.059***	15.404***	14.554***	15.915***
	(4.35)	(7.27)	(5.13)	(6.80)	(5.75)	(5.14)	(5.68)
Dummy Kalmykia	-0.278	-0.351	0.246	2.394	2.531	1.638	1.641
	(-0.11)	(-0.15)	(0.10)	(0.88)	(0.92)	(0.62)	(0.59)
Dummy Ingushetia	-3.429	-4.004**	-4.799***	-5.108***	-4.689***	-9.607**	-5.541***
	(-1.03)	(-2.42)	(-2.84)	(-3.50)	(-2.81)	(-2.16)	(-3.20)
Public expenditures	-0.769					6.839	
	(-0.13)					(1.04)	
Inefficient bureaucracy		-17.953					6.988
		(-0.31)					(0.12)
Local bureaucracy			-1.833		1.255		
			(-1.16)		(0.80)		
Local federal bureaucracy				-3.234***	-3.880***		
				(-2.76)	(-3.22)		
Democracy	-0.554*	-0.487	-0.412	-0.438*	-0.502*	-0.213	-0.453
	(-1.82)	(-1.59)	(-1.46)	(-1.76)	(-1.81)	(-0.59)	(-1.51)
Democracy squared	0.009*	0.008	0.006	0.007*	0.008*	0.003	0.007
	(1.87)	(1.60)	(1.35)	(1.71)	(1.77)	(0.61)	(1.43)
Bureaucracy						-4.500**	-3.342*
						(-2.25)	(-1.96)
Constant	9.890*	9.371**	-1.354	-10.426	-7.020	-26.730	-14.247
	(1.84)	(2.31)	(-0.13)	(-1.22)	(-0.67)	(-1.49)	(-1.10)
R^2	0.460	0.461	0.473	0.523	0.527	0.519	0.505
N	79	79	79	79	79	79	79
F (local bureaucracy, local federal bureaucracy)					5.34***		
F (public expenditures, bureaucracy)						3.65*	
F (inefficient bureaucracy, bureaucracy)							1.98
F (public expenditures, democracy, democracy squared)	1.58						
F (inefficient bureaucracy, democracy, democracy squared)		1.61					
F (local bureaucracy, democracy, democracy squared)			2.10				
F (local federal bureaucracy, democracy, democracy squared)				4.35***			
F (local bureaucracy, local federal bureaucracy, democracy, democracy squared)					4.14***		
F (public expenditures, democracy, democracy squared, bureaucracy)						2.94**	
F (inefficient bureaucracy, democracy, democracy squared, bureaucracy)							2.56**
J.-B. test	33.26***	28.49***	24.25***	27.48***	31.16***	13.28***	23.87***

Notes: see *Table 5.2*. After exclusion of outliers *Inefficient bureaucracy* in regression (28) changes its sign, but is still insignificant. Outliers are Dagestan and Omsk in all regressions, as well as Arkhangelsk in regressions (30), (31) and (33)

5.5.2 Spatial interdependence

It is clear that regional growth could exhibit spatial interdependence, which I have ignored so far. It can result, from example, from the interdependence of economic processes in spatially close regions or from deviation of spatial economic activity units from administrative regions of Russia.[26] In order to consider these effects I apply the standard spatial econometrics toolbox. Basically, it assumes that the regression (*) should be modified as follows to obtain a spatial lag model:

$$GROWTH_i = \beta_0 + \beta_1 DEMOC_i + \beta_2 DEMOC_i^2 + \beta_3 LOGBUR_i + \beta_n CONTROLS_i + \rho \sum_{j \in N^j} w_{ij} GROWTH_j + \epsilon_i \ (**)$$

where N^j denotes the set of neighboring regions, and w_{ij} come from the weighting matrix W. In this specification ρ is the spatial correlation coefficient, measuring the spatial interdependence, or the impact of neighbor regions' performance on economic performance of the observed region. In the model I apply the most obvious way to determine the neighbors based on existence of common borders across the regions. Given the problem of endogeneity in the specification above, I apply the maximum likelihood estimator as described by Anselin (1988). Moreover, suggests that in the presence of possible spatial correlation in error term due to common unobserved shocks (i.e. $\epsilon = \lambda W \epsilon + v$), it is necessary to estimate the LM-tests for non-zero ρ and zero λ, and if one cannot reject these hypotheses, apply the spatial lag model (see also Brueckner, 1998:452)). Otherwise both spatial lag and spatial error models are estimated. The results of the estimations are reported in *Table 5.9*. It does not show any significant spatial effect (in both lag and error models) and mostly confirms the results of the previous estimations.

Robust regressions: As already mentioned, the outliers may have a significant impact on the regressions outcomes. Hence, it may be reasonable to check the robustness of results given the outlier problem. I report the results of robust regressions (re-weighted least squares) in *Table 5.10*. The predictions with respect to democracy hold for robust regressions. The bureaucracy is significant, if the democracy variables are included.

[26] The simplest way to look at spatial effects is to introduce dummies for large territories (the so-called "federal districts"). A problem is of course that the democracy is also clustered; for example non-democratic regions are more often observed in Northern Caucasus. Moreover, the small size of the sample restricts the number of controls one may introduce. However, I have also estimated which include six dummy variables for federal districts - South, Volga, Northern Caucasus, Siberia, Far East and North-West (to avoid dummy variable trap no dummy for Central Federal District is included). Though none of the dummy variables is significant, democracy loses significance in this specification, likely because of multicollinearity problem. Bureaucracy is not affected by inclusion of dummies for federal okrugs and is significant and negative regardless as whether controlling for democracy or not (although it is not robust after exclusion of outliers in this specification, which are, as previously, Dagestan, Omsk and Arkhangelsk).

Table 5.9: Spatial model, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected)

Variable	**(S1)**	**(S2)**	**(S3)**	**(S4)**
	ML (lag)	ML (lag)	ML (lag)	ML (error)
Initial GRP	-0.059***	-0.064***	-0.059***	-0.059
	(-2.82)	(-3.30)	(-3.06)	(-1.45)
Oil and gas	0.008***	0.009***	0.008***	0.008
	(2.76)	(3.36)	(3.22)	(0.80)
Education	26.490***	20.494**	19.724**	22.356*
	(2.95)	(2.16)	(2.10)	(1.71)
Openness	67.885	53.333	58.679	50.513
	(1.59)	(1.26)	(1.31)	(1.14)
FDI	0.126	0.184*	0.190*	0.160
	(1.24)	(1.72)	(1.71)	(1.61)
Investments	0.007	0.008	0.008	0.008
	(1.45)	(1.55)	(1.57)	(1.60)
Health	-0.015	-0.019	-0.018	-0.022
	(-0.45)	(-0.61)	(-0.58)	(-0.49)
Temperature	-0.009	-0.061*	-0.057	-0.049
	(-0.29)	(-1.65)	(-1.55)	(-0.85)
Dummy Chukotka	13.082***	17.796***	16.671***	16.992***
	(6.85)	(6.50)	(5.73)	(7.09)
Dummy Kalmykia	-0.967	1.954	1.050	1.531
	(-0.48)	(0.85)	(0.44)	(0.32)
Dummy Ingushetia	-5.206***	-5.124***	-6.440***	-4.769***
	(-3.00)	(-2.98)	(-3.29)	(-2.69)
Democracy	-0.512**		-0.425*	
	(-2.19)		(-1.84)	
Democracy squared	0.008**		0.006*	
	(2.10)		(1.67)	
Bureaucracy		-3.208**	-3.151**	- 2.975
		(-2.18)	(-2.07)	(-1.46)
Constant	8.538**	-20.672**	-13.674	-18.113
	(2.13)	(-2.08)	(-1.17)	(-1.17)
ρ	0.155	0.170	0.161	
	(0.77)	(0.90)	(0.85)	
λ				0.139
				(0.20)
Variance ratio	0.463	0.489	0.503	0.467
Robust LM-test no spatial lag dependence	0.596	3.646**	3.360*	3.646**
	(0.440)	(0.056)	(0.067)	(0.056)
Robust LM-test no spatial error dependence	0.202	2.757*	2.539	2.757*
	(0.653)	(0.097)	(0.111)	(0.097)
N	78	78	78	78

Notes: see *Table 5.2*. For the LM-test for spatial lag and error dependence numbers in parenthesis are p-values.

Table 5.10: Effects of democracy and size of bureaucracy on average growth rate, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), robust regressions

Variable	**(R1)**	**(R^2)**	**(R3)**	**(R4)**	**(R5)**
	RWLS	RWLS	RWLS	RWLS	RWLS
Initial GRP	-0.055***	-0.051**	-0.047**	-0.062***	-0.051**
	(-2.86)	(-2.60)	(-2.47)	(-3.17)	(-2.62)
Oil and gas	0.051	0.050	0.044	0.044	0.039
	(1.50)	(1.47)	(1.35)	(1.24)	(1.13)
Education	36.776***	37.519***	35.568***	30.945***	30.945***
	(3.70)	(3.82)	(3.71)	(2.91)	(2.99)
Openness	27.499	28.434	29.422	32.644	35.181*
	(1.39)	(1.40)	(1.49)	(1.62)	(1.72)
FDI	0.100	0.106	0.096	0.157	0.142
	(0.68)	(0.72)	(0.67)	(1.02)	(0.96)
Investments	0.007	0.007	0.008	0.007	0.008
	(1.29)	(1.24)	(1.55)	(1.34)	(1.58)
Health	-0.031	-0.031	-0.034	-0.030	-0.033
	(-0.91)	(-0.92)	(-1.05)	(-0.86)	(-0.99)
Temperature	-0.027	-0.026	-0.022	-0.058	-0.046
	(-0.70)	(-0.71)	(-0.60)	(-1.34)	(-1.09)
Dummy Chukotka					
Dummy Kalmykia		1.377			
		(0.46)			
Dummy Ingushetia	-2.275	-2.414	-3.930		
	(-0.96)	(-1.00)	(-1.60)		
Democracy		-0.023	-0.607*		-0.569*
		(-0.50)	(-1.96)		(-1.78)
Democracy squared			0.010*		0.009*
			(1.93)		(1.70)
Bureaucracy				-2.390*	-1.924
				(-1.88)	(-1.51)
Constant	0.867	1.320	9.935*	-15.1036*	-3.392
	(0.48)	(0.63)	(1.99)	(-1.72)	(-0.33)
R^2	0.301	0.341	0.354	0.337	0.374
N	76	77	76	75	75
F (democracy, democracy squared)			1.92		1.65
F (democracy, democracy squared, bureaucracy)					2.01

Notes: Numbers in parenthesis are t-values. *** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level.

5.5.3 Simultaneous equations

Given a complex nature of interaction between variables in the model (in particular, between democracy, bureaucracy and growth) an additional approach, which should be considered, is to estimate a system of equations simultaneously. That is what we provide in this section, using the 3SLS estimation technique (where constant is excluded from instruments). Obviously, this approach does not solve the potential endogeneity problem, but is interesting because of possible interrelations between two explanatory variables. I estimate four equations:

- The growth equation (*) with bureaucracy and democracy, described above;
- The democracy equation, where the level of democracy depends upon bureaucracy, growth rate as well as additional controls listed below and
- The bureaucracy equation, where the size of bureaucracy depends upon democracy, squared democracy, growth rate and additional controls

There are *four* endogenous variables which are instrumented in the first stage: democracy, democracy squared, bucreaucracy and growth rate (in addition, I have also estimated a specification with four regressions, where the fourth one is that for democracy squared with the same covariates, as the equation for democracy - it unsurprisingly does not change the results). Additional controls for the democracy equation include (1) level of urbanization (share of urban population); (2) share of ethnic Russian population in the region; (3) education and (4) distance from Moscow. Additional controls for the bureaucracy equation include (1) size of the territory, (2) population, (3) urbanization (these three variables are likely to represent the size of the region and the "difficulty" to provide public services), (4) share of ethnic Russians, (5) distance from Moscow as well as (6) share of public expenditures (which calls for a larger bureaucracy). So, regressions for democracy and bureaucracy also include the instruments used in the 2SLS regressions. All regressions are cross-sections with averaged data.

The results of the estimations are reported in *Table 5.11*. First, the basic results obtained in the previous sections remain unchanged: one still gets the U-shaped relation between democracy and growth. Bureaucracy is significant and maintains the negative sign. In the democracy regression one finds a significantly positive impact of urbanization on democratic development. Share of Russians is also significant and positive. Finally, bureaucracy is not significant, as well as the level of education and GRP growth rates (the last fact confirms the intuition that the endogeneity should not be a problem). In the bureaucracy equation we find some weak evidence of inverse U-shape relation between democracy and bureaucracy, reported in *Figure 5.1*, but only the squared term is significant. Regions with larger territory and smaller population seem to have larger bureaucracies. It could indicate, that in Russia the share of bureaucracy does not increase even proportionally to the population size (and there can be at least some truth in the claims of Russian bureaucrats to face a "overwhelming burden of demand for public services" or reflect the existence of returns to scale in public bureaucracy). On the other hand, the result for territory and population

may come from lower population density in Russian regions with large territory. There is a significant positive relation between economic growth and the size of bureaucracy (which, as discussed above, could be expected). Finally, share of Russians is significant and positive.

5.5.4 Is population driving the results?

The discussion of simultaneous equations outcome raises an additional question, which should be addressed. It is possible that both size of bureaucracy *and* economic growth are driven by the population size. First, it should be noted that the study of impact of population size on economic growth for countries yields extremely heterogeneous results.[27] Moreover, there may exist an identification problem: it is possible that population has impact on growth exactly *because* it influences the "bureaucratic load". Nevertheless, I have estimated the basic specifications including average population as an additional covariate in growth regressions. Simply including population results in vanishing effects of democracy and size of bureaucracy in cross-sections. However, this result at least partly is determined by the impact of City of Moscow with extreme growth rates and enormous population (Moscow with its more than 10 mln. citizens is the largest region in Russia in terms of population). Controlling for this effect with a dummy makes population insignificant in all specifications; the effects of democracy become significant, but bureaucracy is still insignificant. In the IV regressions the results with respect to democracy and bureaucracy do not change regardless of controlling for Moscow or including average population as an additional covariate.[28]

A further problem which should be mentioned is that it is often recommended to look at the *GDP per employed person*.[29] The latter specification has better theoretical motivation, but for a short-term growth model (like presented in this chapter) the effects should be negligible. Nevertheless, I re-calculate the GDP per employed person measure and re-estimate the regressions. In cross-section specifications bureaucracy sign and significance do not change. Democracy and democracy squared maintain their sign and significance if one controls for the City of Moscow with a dummy.[30] Once again, the population dynamics and the

[27] In this case factors like remoteness or restriction of cross-border trade and factor flows absent in a intranational comparison case are important, cf. e.g. Brandi, 2004

[28] In panel data regressions (time FE) democracy is always significant regardless of whether population is included or not. Bureaucracy is insignificant, but controlling for Moscow reestablishes the significance.

[29] Estimating regressions of this chapter for *growth rates of GRP per capita* (i.e. dividing growth rate of GRP by the growth rate of the population) without including population in the list of covariates has no effects on significance and sign of coefficients in regressions in cross-section.

[30] In the specification with bureaucracy *and* democracy all three variables have the expected sign and are significant.

Table 5.11: System of equations, 2000-2004, 3SLS

Variable	**Dep. var.: Index of GRP**	**Dep.var.: Democracy**	**Dep. var.: Bureaucracy**
Initial GRP	-0.034		
	(-1.52)		
Oil and gas	0.006*		
	(1.74)		
Education	21.790*	11.649	
	(1.81)	(0.62)	
Openness	49.719**		
	(2.12)		
FDI	0.144		
	(0.92)		
Investments	0.010*		
	(1.72)		
Health	-0.020		
	(-0.64)		
Temperature	-0.046		
	(-1.19)		
Dummy Chukotka	12.197***		
	(3.98)		
Dummy Kalmykia	-0.034		
	(-0.01)		
Dummy Ingushetia	-10.314***		
	(-3.21)		
Urbanization		159.899***	9.435**
		(2.56)	(2.68)
Share of Russians		7.195**	0.749***
		(2.49)	(4.00)
Distance from Moscow		-0.257	0.008
		(-1.20)	(0.61)
Public expenditures			0.465
			(1.38)
Territory			0.191***
			(2.67)
Population			-0.000***
			(-5.24)
Democracy	-1.331***		0.005
	(-3.00)		(0.16)
Democracy squared	0.020***		-0.001*
	(2.99)		(-1.98)
Bureaucracy	-2.062*	-1.135	
	(-1.70)	(-0.98)	
GRP growth rate		-0.029	0.046***
		(-0.10)	(3.08)
Constant	7.997**	3.403	-7.720***
	(2.49)	(-2.08)	(22.54)
N	79	79	79
Chi-sq	73.91***	48.55***	131.93***

Note: *** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level. Numbers in parenthesis are z-values. Constant excluded from the list of instruments. Democracy squared is also an endogenous variable

employment dynamics of this city seem to be relevant (it is sufficient to say that Moscow is one of the few regions in Russia with high population growth (due to migration) and was able to reduce unemployment to a virtually zero level during the 2000s).[31] One should, however, notice that the quality of unemployment statistics in Russia is extremely poor (due to huge shadow economy) and hence considering much better population statistics may actually help avoiding measurement bias.

5.5.5 Panel data

Application of yearly data in growth panel regressions, especially if the time dimension is short, is problematic. Moreover, it is much more difficult to find reasonable instruments for a panel; therefore endogeneity bias may have a significant impact on the results. Therefore the results of the panel data approach may be considered only as an additional robustness check to the main results, obtained through the cross-sections with averaged data. Basically, I used the following estimation techniques in order to check the main results

- Time fixed effects with both democracy and bureaucracy variables;
- Region fixed effects and two-way fixed effects with bureaucracy variable (since democracy does not vary over time) and possibly an interaction variable;
- Random fixed effects with both democracy and bureaucracy variables;[32]
- Besley and Coate (2003: 1195) type of estimator to check for democracy impact on growth with region fixed effects.[33]

Basically, there are two findings to be reported. As for democracy, if the outliers are excluded panel data estimations confirm the non-linear effects reported in the previous parts of the chapter. For bureaucracy, unfortunately, situation is more difficult: if region fixed effects are included, the observed effect for bureaucracy disappears. Most of the bureaucracy variables are insignificant. However, the interaction term between bureaucracy and democracy is significant and *positive.*The most interesting observation is the positive and significant interaction term: it looks like expansion of bureaucracy has a Weberian effect in relatively democratic regions. So, while a cross-section, regions with large bureaucracy lose growth if their democracy level increases, in the panel region FE specification regions with high democracy could gain additional growth if their bureaucracy is larger. *Figure 5.3* reports the marginal effect of bureaucracy

[31] Similarly, the effects in panel data (time FE) are robust if City of Moscow dummy is included.

[32] The Hausman-Wu test is does not reject the null for the majority of specifications, hence, RE estimator is consistent and efficient. However, the result depends upon the specification.

[33] Besley and Case (2003) argue, that a simple pooled OLS estimation in this framework imposes too strong assumptions, which are likely to be violated. The approach I use is the following: estimate a "standard" FE model (in their case a two-way fixed effects), save the estimated fixed effects and regress them as a cross-section on the institutional parameter (democracy and democracy squared).

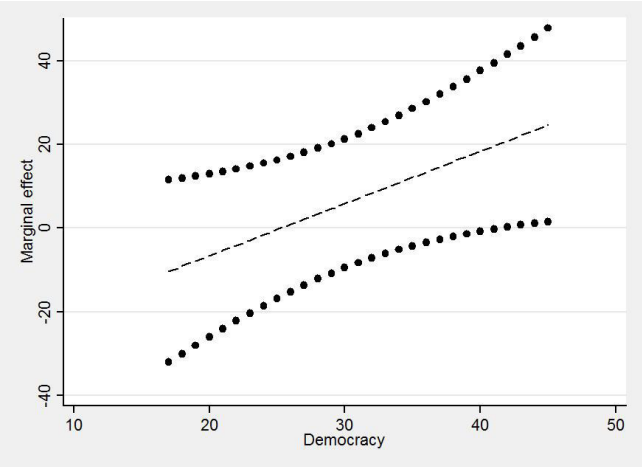

Figure 5.3: Marginal effects of bureaucracy on growth conditional on democracy level, two-way FE with an interaction term

on economic growth conditional on democracy for two-way FE specification. It is obvious, that the effect is increasing and becomes significant for large democracy levels.

5.5.6 Including outliers

In addition to the main estimations, I also estimate almost all regression including three outliers. The results are reported in *Appendix E3.* In the basic specification I still find the non-linear effect of democracy, which is also present if controlling for bureaucracy. On the other hand, bureaucracy is not significant. The interaction term is highly significant and negative, providing more robust empirical support to the claims made above. Finally, in the IV estimations the results are insignificant. Basically, including outliers does not seem to influence a lot the democracy results (with the exception of IV estimations, which may be due to the statistical properties of instruments in this larger sample), but has a strong impact on bureaucracy (which is not surprising given what I have reported for panel data). The existence of the regional specifics may be related to the fact that all three regions use the offshore strategy (already discussed in the previous chapters).

5.6 Conclusion

The chapter considers the impact of political institutions, in particular level of democracy and size of bureaucracy, on economic growth, using the sample of Russian regions in 2000-2004. Basically, it finds that democracy has a non-linear effect on growth. Regions with low democracy level and with high democracy

level outperform regions with intermediate level of democratic development. Thus it provides evidence for the growing literature on potential problems of hybrid political regimes. Interestingly, this is exactly what the only other paper dealing with subnational variation of democracy could establish for Mexico (Hiskey, 2005) - probably, confirming the need to examine the subnational democratization more closely.

The results with respect to bureaucracy are more ambiguous. I find that increasing share of bureaucracy is harmful for economic growth. It is true for both federal and local bureaucracy and does not depend on the level of democratization. Hence, it confirms the "grabbing hand" view on Russian bureaucracy. Moreover, there is some evidence that regions with large bureaucracy demonstrate worse performance for higher democracy levels. This result holds for cross-section specifications. After inclusion of the fixed effects, bureaucracy variable per se becomes insignificant; however, one can show that regions with high level of democracy are characterized by efficient "Weberian" bureaucracy. It is important not to overemphasize this result: the panel data in the setting of this chapter is very problematic (growth regressions usually work with average growth rates for at least five years).

It is interesting to confront this result with two previously mentioned empirical statements about Russian regions: larger bureaucracy seems to improve the quality of regulation and post-privatization performance of enterprises (Brown et al., 2009) and to increase corruption (Dininio and Orttung, 2005). While the second observation is completely in line with my results, the first poses an interesting contradiction. One can expect, that the source of the problem is not the quality of data: both my results and that of Brown et al. are based on the official statistics of Goskomstat (though from different levels of aggregation). A crucial issue different time period of analysis - and in this case Putin bureaucracy could have a different effect than the Yeltsin bureaucracy - once again, the reasons for this difference are extremely interesting. Moreover, there are interesting questions concerning the interaction of productivity growth (the main variable for Brown et al.) and GDP growth, which may be non-trivial in a resource-driven economy like Russia. Even more interesting feature is that Brown et al. find a strong positive relation between bureaucracy and quality of regulation for the 2000s. In this case it raises questions as to whether the quality of regulation and economic growth were related in the Russian regions? It most certainly deserves further investigation.

Three caveats are required. First, caution is required with respect to generalization of the obtained results can be generalized to make conclusions with respect to the overall development. Krieckhaus (2006) shows that regional political context for democracy matters a long for its impact on economic growth, and Mainwaring and Perez-Linan (2004) conclude the same for the democracy diffusion influenced by income per capita. For a study of intranational variance of political regimes, one could probably expect an even stronger country-specificity.

One could probably claim, that it is especially true for the bureaucracy results, since they for sure build upon the overall organization of Russian bureaucracy (including the "soft" factors like culture), which can be quite different in other regions. However, exactly given this regional specifics the coinciding results of this chapter and of Hiskey (2005) are especially interesting. Second, definitively, the distribution of democracy in Russian regions is "skewed". One can find outright autocracies and even semi-totalitarian regimes like Kalmykia in Russia, but there are no developed Western-type democracies. Most regions turned out to be more or less "soft" authoritarian regimes controlled by the governors (Turovskiy, 2009). Thus this chapter may be - in a surprising way - complementary to the studies of direct democracy (Feld and Savoiz, 1997), which deal with countries "skewed" on the other side of democracy spectrum (from "good" to "very good" democracies). Finally, short time period may make it difficult to distinguish between growth and business cycle effects. Although considering short-term growth has certain advantages (ignoring the indirect effects of democracy), it is also possible that my results indicate not worse economic performance of hybrids in general, but their lower ability to generate economic growth during the upward part of the business cycle. "Pure" political regimes then may be able to better cope with arising opportunities. However, this result is of certain interest for economic research as well.

Chapter 6

Conclusion

This thesis attempted to study selected problems related to economics of non-democracies and economics of endogenous decentralization in federations in an empirical and theoretical context of an asymmetric federal structure. Both problems of decentralization and democratization are of great importance, not only from the scientific point of view, but also in the policy advice for economic and institutional reforms in developing and transition countries. Therefore it seems to be necessary to present some general conclusions regarding both branches of the literature, which determined the choice of research agenda for this thesis.

The standard approach to research on decentralization in economics seems to be straightforward. On the one hand, the theoretical literature explores the determinants and the effects of constitutional decentralization, i.e. allocation of authorities between governments on different levels. On the other hand, the empirical research applies a number of (imperfect) proxies - most notably, share of subnational fiscal revenues or expenditures - to test the predictions of the theory (*Figure 6.1*). It means, certainly, that there exists a gap between what is defined as decentralization in theory and what is used to measure decentralization in empirical work, especially if the intergovernmental relations in the federation are more complex. One aspect of this complexity is of course the well-studied intergovernmental fiscal transfers issue; however, there may be further forces at work, which make even the pure decentralization indicators (before transfers) problematic. In particular, the problem is present if the fiscal flows are attributed to regional budgets, but determined by the federal government (centralized instead of decentralized federation) and / or federal government delegates its authorities to be implemented by regional bureaucracy (cooperative instead of dual federation). Although U.S. is an example of dual decentralized federations (and seemingly inspired a lion's share of research in this area), most European federations are at least either centralized or cooperative (and often combine both features).

One possible reaction to the problem is to perceive the imperfection of em-

pirical proxies as a measurement error: in this case the problem can be reduced to finding better quantitative indicators, which account for "real" authorities of regional governments (*Figure 6.2*). In this case the "traditional" retention rates and shares of subnational revenue and expenditures simply do not measure the intended aspect of the economic reality.

The results of this thesis, however, show that the relation between the empirics and the theory may be even more complex: the gap is not simply a result of measurement errors, but reflects the existence of the "post-constitutional" redistribution of de-facto authorities and (even more importantly) ability to influence economic processes, reflected in control over (fiscal) resources (*Figure 6.3*). Hence, the correct understanding of federal dynamics requires a detailed analysis of all three aspects: (a) formal constitution, (b) resulting allocation of resources and (c) the reasons for discrepancies between (a) and (b); a process which Jenna Bednar (2008) describes as "migration of authorities" in a federation. *Both* formal and informal aspects matter in terms of economic performance, but are not independent from each other.

The first paper of this thesis shows that the post-constitutional decentralization may differ significantly from what is written in federal and even regional constitutions; however, the design of formal constitution is crucial for the *mechanisms* generating these differences, as the second paper demonstrates using the example of strategic tax collection. It is the centralized Russian state which generates an environment for the particular form of fiscal decentralization (through manipulation of tax collection effort or "war of laws"), which is in turn relevant for economic behavior.

The second group of results of this paper is related to the interaction between democracy and federalism. Once again, the relation between democracy and economic performance, as well as other institutional characteristics of economy is a standard field of investigation in both theoretical and empirical literature. This thesis aims to show, that the discussion in economics so far missed at least one important aspect of this problem (which has been, however, studied in political science to a certain extent): democratization in federations does never influence both center and regions simultaneously. A more likely scenario is that some regions turn into an "oasis of democracy" or an area of the "subnational authoritarianism". Although this finding is (as noticed) not really new for social sciences, the thesis attempted to demonstrate that these differences in political regimes are relevant for economic performance. The third paper of the thesis in a theoretical framework showed how differences in regimes may influence decentralization process (which, in turn, sets the described complex machinery in motion to generate economic results). The fourth paper looked directly at the influence of subnational democracy on economic growth, as well as at the interaction between democracy and size of the bureaucratic staff, and provided strong evidence for economically significant effects.

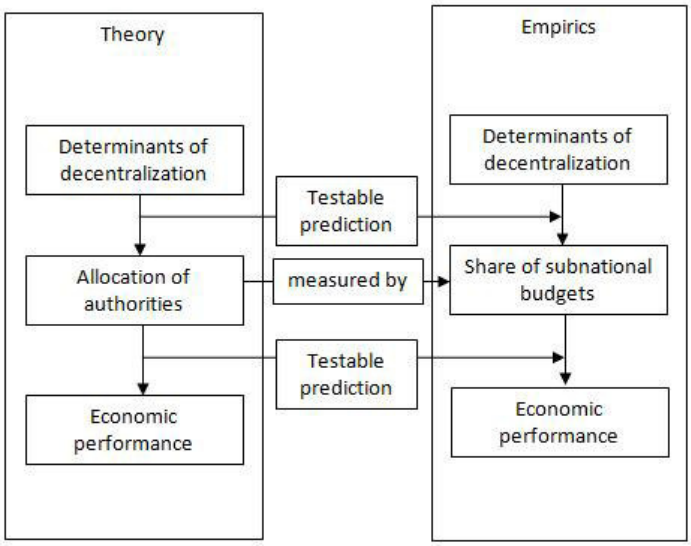

Figure 6.1: Standard approach of fiscal federalism

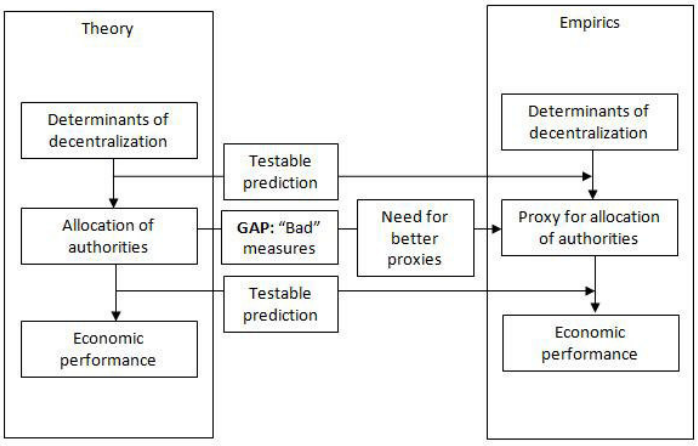

Figure 6.2: Measurement problem by empirical tests of theoretical predictions

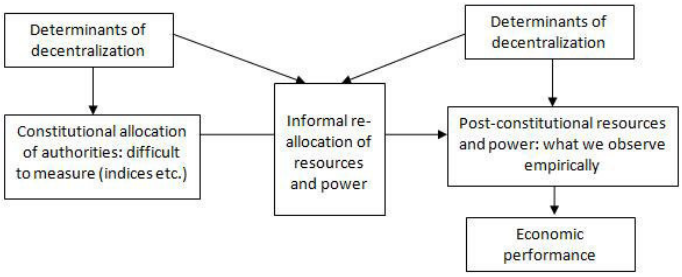

Figure 6.3: Gap between constitutional and post-constitutional decentralization: results of this thesis

From this point of view, moreover, it is possible to notice the third general contribution of the thesis. It demonstrated that the asymmetric federalism (with individual degree of autonomy for each region) and subnational variation of political regimes are able to provide a good empirical playground for studying general processes, so far discussed only in international cross-country settings. Therefore focusing on intranational variation may support the theoretical conclusions with better data and plausible identification strategies. There is, of course, the problem of external validity to be mentioned; however, the surprising similarity of studies dealing with Mexico and Russia in terms of the "democracy-and-growth" nexus shows that in spite of all differences between federations, studying their regions may be helpful from the point of view of testing more general predictions of the theory.

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Appendix A

Appendix to Chapter 1

A.1 Russian tax system

- The tax system comprises *federal, regional* and *local* taxes. The most important taxes (*profit tax, VAT, personal income tax, excises on alcohol, tobacco etc., rental payments for natural resources,* and *single social tax*, which replaced the contributions to public health, pension and unemployment insurance and was imposed on wages and paid by employers[1]) are *federal taxes.* These taxes should be imposed in all regions of the Russian Federation. However, the revenue from several of these taxes (profit tax, personal income tax, several excises, payments for natural resources, and, until Putin's tax reform, VAT) are divided between different levels of government; the share of the federal center can even become equal to zero – but the tax is still legally a *federal* one, because it is set by the federal center. The *tax rates* for the federal taxes are set by the federal government with only one exception: for the profit tax the federal government does not set the tax rate, but the *maximal* tax rate, and the regions can reduce it by several percentage points. Moreover, until 2000 regions had the right to grant exemptions from their portions of federal taxes, and there were some presidential decrees establishing special tax regime for individual regions (like Ingushetia in 1994 or Karelia in 1992-1994). These options were used in two ways. Many regions implemented specific tax regimes for individual business groups with strong ties to the regional government (Yankovsky, 2001); the impact of these regimes is, however, quantitatively completely opaque (it would require the knowledge of individual tax bases for hundreds of enterprises). Few regions used the opportunity to lower federal tax rates at a larger scope, and became "internal tax heavens".

[1] We list only the main taxes, although the Russian fiscal system included a variety of minor taxes. The overall description of the tax system is rather stylized than exact; nevertheless, it is hardly possible to provide a detailed overview of the turbulent changes in the Russian taxation for nearly a decade.

- The *division of tax revenue* from the federal taxes was originally set in federal acts on individual taxes, which were consequently replaced by chapters of the Tax Code. For several taxes (VAT, income tax) the division was changed in annual budget acts (the so-called "regulating taxes"), which were passed by the federal parliament. However, the proportions are identical for all regions of Russia, with the only exception of Tatarstan and Bashkortostan. The distribution of tax revenue and tax rates was quite volatile: for example, for the *personal income tax* the regions received 100% in 1994; 90% in 1995-1996, once again 100% in 1997-1999, 84% in 2000, 99% in 2001 and 100% in 2003 and 2004. The tax rate moved from a progression system to the flat tax of 13%. For the *VAT* the regions received 25% until the first quarter of 1999, 15% from the second quarter of 1999 to 2000, and 0% afterwards; the overall tax rate was lowered from 28% in the early 1990s (before the start of our sample) to 20%, and once again to 18% in 2004. For the *corporate profit tax* the federal government until the first quarter of 1999 applied a tax rate of 13%, from the second quarter of 1999 to 2001 of 11%, from 2002 to 2004 7.5%, and from 2004 6%. The overall tax rate for the corporate profit tax was 35% until 2002 and 24% afterwards, so the difference was attributed to the regions. However, regions had the right to manipulate only part of "their" tax rate: from 2001 on they could reduce it only by 5 percent points.
- *Regional* and *local* taxes are set by the regions (which still may only "choose" from the predetermined list of the federal government), which may also choose the tax rate (within the range set by the federal government). This group includes, however, mostly property taxes (*land tax, personal and corporate real estate taxes*). The specifics of the Russian economy make these taxes unimportant (in fact, for the personal real estate tax the costs of administration systematically exceed its tax revenue). First, the structure of property rights for real estate and land is very vague and provides for many options for tax avoidance. Second, the valuation of many objects is far below their market value and based on outdated norms, partly inherited from the Soviet past. The tax rates are small: those of the real estate tax for individuals varied from 0.1 to 2% (depending on the value of the real estate object) and for organizations it changed over time from 2% to 2.2% (maximum rate determined by the federal government). Most regions used the maximum tax rate,[2] but granted countless exceptions. Another regional tax used from 1999 to 2003 was the *sales tax* of 5%, which was, however, introduced by practically all regions and did not form any source of regional heterogeneity.
- Finally, the royalties for natural resources formed an important base for regional tax revenue until Putin's tax reform 2001. During this period the regional consolidated budget received 60% for extraction of hydrocarbon

[2]In fact, in an environment of strategic tax collection this behavior is no surprise: it is reasonable to set its "own" tax rate to the maximum and try to manipulate the tax collection effort for the taxes mostly attributed to the other level of government.

raw materials and 75% for other minerals. After the tax reform under Putin the taxation of natural resources was redistributed towards the federal center.

Appendix B

Appendix to Chapter 2

B.1 Data

Table B.1: Construction of the index of constitutional devolution

Region	Natural resources	International agreements	State of emergency	Branches of federal agencies	Restrictions on federal law	Interbudgetary relations	Index
Adygeia	X		X		X		3
Altai (Rep.)	X						1
Bashkortostan	X	X	X			X	4
Buryatia	X	X	X				3
Chuvashia	X		X				2
Dagestan	X	X	X	X	X		5
Ingushetia	X	X	X		X		4
Kabardino-Balkaria	X				X		2
Kalmykia	X				X		2
Karachaevo-Cherkessia	X						1
Karelia	X		X				2
Khakassia			X				1
Komi		X	X		X		3
Mariy El		X			X		2
Mordovia		X					1
Northern Ossetia	X	X	X		X		4
Sakha	X	X	X		X	X	5
Tatarstan	X	X	X		X		4
Tyva	X	X	X		X	X	5
Udmurtia	X		X				2

Table B.2: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Declarations	88	2.821	0.498	1.6	4.33
Democratization	88	27.568	6.238	14	45
Distance	88	2.639	2.925	0	12.866
Distance from average income	88	0.466	0.492	0.244	3.191
Dummy autonomous okrug	88	0.102	0.305	0	1
Dummy border region	88	0.386	0.49	0	1
Dummy republic	88	0.227	0.421	0	1
Fiscal transfers	88	0.235	0.179	0.008	0.749
Income per capita	88	0.908	0.649	0.258	4.056
Net profit	88	3.036	7.264	-1.532	42.082
Number of negative conclusions	88	267.33	152.317	5	798
Oil and gas	88	0.02	0.103	0	0.786
Population	88	1.685	1.507	0.02	8.546
Power (RUIE)	88	2.341	0.676	1	3
Power (UI)	81	2.136	0.833	1	3
Power sharing agreement	88	0.523	0.502	0	1
Regional constitutions	20	2.8	1.399	1	5
Regulatory capture	73	0	0.137	-0.306	0.416
Retail trade	88	11.418	28.628	0.089	265.258
Share of negative conclusions	88	0.102	0.055	0.002	0.314
Share of Russians	88	0.746	0.238	0.012	0.966
Tax retention rate	88	0.643	0.096	0.213	0.92
Tension (MFK)	88	3.33	1.46	1	5
Tension (RUIE)	88	2.17	0.834	1	3
Territory	88	0.233	0.46	0	3.103
Urbanization	88	0.067	0.016	0.019	0.1

Table B.3: Description of variables

Variable	Description	Period	Source
Bargaining power (RUIE)	Index of bargaining power of the region vis-a-vis the federation, ranging from 1 to 3, higher value indicates higher bargaining power	1996	Russian Union of Industrialists and Entrepreneurs
Bargaining power (UI)	Index of bargaining power of the region vis-a-vis the federal center, ranging from 1 to 3, higher value indicates higher bargaining power. Components of index: violations of federal law by regional legislation, natural resources, vote against federal policies at national elections	1996	Institute of Urban Economics
Declarations	Index of declarations of regional elites in 1991-1995, based on count of events, e.g. statements of sovereignty of the region, requests to reallocate power in the federation etc. Higher value of index represents a greater support of decentralization	1995	Dowley, 1998
Democratization	Index of democratization of the region, estimated by the experts of the Carnegie Center in Moscow. The higher value of index represents a higher level of democracy.	1991-2001	Carnegie Center and Independent Institute for Social Policy
Distance from Moscow	Distance between the capital of the region and Moscow, thousands of km, 0 for Moscow and Moscow oblast, identical for St. Petersburg and St. Petersburg oblast	NA	Goskomstat
Distance of the average income per capita	Absolute value (Average income per capita in the Russian Federation - Average income per capita in the region)	1995-1999	Goskomstat
Dummy autonomous okrug	1 if the region has the status of an autonomous okrug but Chukotka (which is not part of any other region), 0 otherwise	NA	Own estimation
Dummy border region	1 if the region has a border to any state outside the Russian Federation, 0 otherwise	NA	Own estimation
Dummy power sharing agreement	1 if there was a power sharing agreement in 1999, 0 otherwise	1999	Garant, own estimation
Dummy republic	1 if the region has the status of a republic, 0 otherwise	NA	Own estimation
Income per capita	Average income per capita of the region, thousands of RUR	1995-1999;	Goskomstat
Net profit	Net profit (profit - loss) of all region's organizations, bln. RUR	1995-1999	Goskomstat
Number of negative conclusions	Number of acts assessed as contradicting the federal legislation	2006	Ministry of Justice
Oil and gas share	(Share of oil extraction in the region in the total oil extraction in Russia + Share of the gas extraction in the region to the total gas extraction in Russia) / 2	1995-1999	Goskomstat
Population	Population of the region, mln. people	1995-2003, 2006	Goskomstat
Power (Jarocinska)	Index of power of regional governors, based on data like years in office, share on regional elections, control of parliament etc. The higher value of index represents a higher influence of regional governor	1995-2000	Jarocinska, 2004
Regional constitutions	Index of autonomy incorporated in regional constitutions (see Table B.11)	1999	Own estimation, based on data from Garant
Retail trade	Average total retail trade revenue (current prices), bln. RUR	1995-1999	Goskomstat
Share of fiscal transfers	Average fiscal transfers from other budgets over total expenditures of the region's consolidated budget	1995-1999	Until 1997: Freinkman, Treisman and Titov, 1999; since 1998: Ministry of Finance
Share of negative conclusions	Number of acts assessed as contradicting the federal legislation over total number of acts assessed as either contradicting or conforming the federal legislation	2006	Ministry of Justice
Share of Russians	Share of ethnic Russians in the region's population	2002	Russia's Census, 2002
State capture	Index of regulatory capture: residual average preferential treatment concentration after controlling for the number of preferential treatments 1995-2000. The higher value of index represents a higher capture degree.	2000	Slinko, Yakovlev and Zhuravskaya, 2005
Tax retention rate	Average tax revenue of the consolidated regional budget executed over total tax collection on the territory of the region	1995-1999 Treisman and Titov, 1999, since	Until 1997: Freinkman, 1998: Ministry of Finance (for budget data), State Tax Service and Goskomstat (for tax collection data)
Tensions (MFK)	Index of tensions between the federal and the regional governments, ranging from 1 to 5, higher value indicates higher level of tensions. Components of index: number of critical statements of governors against the president, electoral support of the president in the region and existence of power-sharing agreement	1997	MFK Renaissance
Tensions (RUIE)	Index of tensions between the federal and the regional governments, ranging from 1 to 3, higher value indicates higher level of tensions	1996	Russian Union of Industrialists and Entrepreneurs
Territory	Territory of the region, mln. sq. km, 0 for Moscow and St. Petersburg	NA	Goskomstat
Urbanization	Average share of urban population, % / 1000	1995-1999	Goskomstat

Notes: All Goskomstat (Russian statistical authority) data are provided on the annual basis in the regular publication Regions of Russia. In 1998 the Russian ruble was denominated; therefore all indicators for previous years were divided by 1000.

B.2 Factors of decentralization, robustness to specification

Table B.4: Factors of fiscal decentralization, 1995-1999, dep. var.: retention rate, income per capita among the covariates

	(B1) OLS	(B2) OLS	(B3) OLS	(B4) OLS	(B5) OLS	(B6) OLS	(B7) OLS
Territory	**0.062*** **	**0.051** **	**0.058*** **	**0.049*** **	**0.051** **	**0.046** **	**0.051** **
	(0.022)	**(0.021)**	**(0.022)**	**(0.018)**	**(0.020)**	**(0.021)**	**(0.020)**
Population	0	0.002	-0.002	-0.002	-0.01	-0.01	-0.01
	(0.013)	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Oil and gas	-0.126	-0.107	0.014	-0.093	0.015	0.029	0.015
	(0.209)	(0.185)	(0.193)	(0.167)	(0.180)	(0.178)	(0.181)
Income p.c.	0.021	0.012	-0.034	0.013	-0.042	-0.036	-0.042
	(0.033)	(0.035)	(0.043)	(0.028)	(0.043)	(0.044)	(0.044)
Dummy autonomous okrug	0.017	0.022	0.134		0.09	0.077	0.089
	(0.046)	(0.048)	(0.084)		(0.071)	(0.072)	(0.071)
Dummy republic	-0.001	0.003	0.088*		0.028	0.025	0.028
	(0.034)	(0.034)	(0.052)		(0.030)	(0.031)	(0.031)
Retail trade	-0.001	-0.001	0	-0.001	0	0	0
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Net profit	-0.003	-0.002	-0.003	-0.002	-0.004	-0.003	-0.004
	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Distance		0.006	**0.008** **	**0.006***	**0.010** **	**0.010** **	**0.010** **
		(0.003)	**(0.004)**	**(0.004)**	**(0.005)**	**(0.005)**	**(0.005)**
Dummy border region		0.018	0.027	0.015	0.024	0.021	0.024
		(0.023)	(0.020)	(0.022)	(0.022)	(0.023)	(0.022)
Share of Russians			0.156	0.042			
			(0.137)	(0.079)			
Urbanization			1.457		1.134	0.941	1.123
			(1.227)		(1.109)	(1.130)	(1.110)
Fiscal transfers					-0.14	-0.135	-0.141
					(0.104)	(0.104)	(0.106)
Tensions (RUIE)							0.001
							(0.008)
Power sharing agreement						0.017	
						(0.019)	
Constant	0.626***	0.607***	0.391***	0.585***	0.597***	0.601***	0.597***
	(0.036)	(0.034)	(0.147)	(0.076)	(0.083)	(0.084)	(0.084)
Observations	88	88	88	88	88	88	88
R^2	0.197	0.229	0.296	0.236	0.277	0.283	0.277
F-stat	20.59***	20.35***	11.72***	19.14***	10.57***	9.68***	9.62***
J.-B. test	166.1***	240.3***	80.05***	143.9***	195.3***	174.0***	194.5***

Notes: see *Table 2.2*. Outliers are Ingushetia, Kalmykia and City of Moscow in all regressions; Sakha in regressions (B1)-(B9), (B11)-(B12); Altai Republic in regressions (B1) - (B4), (B6) - (B8); Aginsk Buryat autonomous okrug in regressions (B2) - (B9), (B11)-(B12); Taimyr autonomous okrug in regressions (B2) -(B4), (B6) - (B8); Tatarstan in regressions (B2) - (B4), (B7); Bashkortostan in regression (B4), (B7). After exclusion of outliers dummy republic loses significance in regression (B3), but maintains the sign.

Table B.5: Factors of fiscal decentralization, 1995-1999, dep. var.: retention rate, income per capita among the covariates (cont 'd)

	(B8) OLS	(B9) OLS	(B10) OLS	(B11) OLS	(B12) OLS	(B13) OLS	(B14) OLS
Territory	**0.051****	**0.055****	0.013	**0.049****	**0.047****	0.01	0.009
	(0.020)	**(0.0230)**	(0.019)	**(0.021)**	**(0.021)**	(0.018)	(0.019)
Population	-0.01	-0.008	0	-0.009	-0.009	-0.006	-0.004
	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.009)	(0.008)
Oil and gas	0.016	0.023	**-0.636*****	-0.003	-0.003	-0.257	**-0.283***
	(0.180)	(0.186)	**(0.229)**	(0.181)	(0.186)	(0.160)	**(0.157)**
Income p.c.	-0.042	-0.043	0.06	-0.041	-0.039	0.033	0.05
	(0.043)	(0.044)	(0.047)	(0.044)	(0.044)	(0.044)	(0.045)
Dummy autonomous okrug	0.09	0.093	0.038	0.09	0.076	**-0.300*****	**-0.345*****
	(0.071)	(0.070)	(0.078)	(0.071)	(0.075)	**(0.105)**	**(0.107)**
Dummy republic	0.028	0.034	0.032	0.027	0.008	**0.055****	0.026
	(0.031)	(0.027)	(0.027)	(0.028)	(0.037)	**(0.021)**	(0.042)
Retail trade	0	0	**-0.002***	0	0	**-0.002****	**-0.002****
	(0.001)	(0.001)	**(0.001)**	(0.001)	(0.001)	**(0.001)**	**(0.001)**
Net profit	-0.004	-0.003	0	-0.003	-0.003	0.004	0.004
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.004)	(0.004)
Distance	**0.010****	**0.011****	0.006	**0.011****	**0.010****	0.002	0.002
	(0.005)	**(0.005)**	(0.004)	**(0.005)**	**(0.005)**	(0.004)	(0.004)
Dummy border region	0.024	0.019	0.019	0.022	0.021	**0.032****	**0.031***
	(0.021)	(0.022)	(0.021)	(0.022)	(0.022)	**(0.016)**	**(0.016)**
Urbanization	1.117	1.479	0.324	1.36	1.12	1.992	1.669
	(1.128)	(1.101)	(1.034)	(1.135)	(1.265)	(1.415)	(1.538)
Fiscal transfers	-0.142	-0.157	-0.107	-0.16	-0.156	-0.035	-0.035
	(0.106)	(0.110)	(0.106)	(0.110)	(0.111)	(0.073)	(0.080)
Tensions (MFK)	0.001						
	(0.007)						
Democratization		-0.001	-0.001	-0.002	-0.001	**-0.005*****	**-0.005*****
		(0.002)	(0.002)	(0.002)	(0.002)	**(0.002)**	**(0.002)**
Power (Jarocinska)		-0.019					-0.013
		(0.013)					(0.012)
Power (UI)			-0.003				
			(0.008)				
Power (RUIE)				-0.009			
				(0.012)			
Declarations					0.017		0.032
					(0.032)		(0.031)
Regulatory capture						-0.074	-0.081
						(0.055	-0.053)
Constant	0.595***	0.736***	0.613***	0.656***	0.600***	0.626***	0.641***
	(0.084)	(0.103)	(0.100)	(0.093)	(0.096)	(0.077)	(0.121)
Observations	88	88	81	88	88	73	73
R^2	0.277	0.293	0.279	0.286	0.284	0.543	0.565
F-stat	9.55***	11.36***	14.79***	11.39***	10.45***	-	-
J.-B. test	190.5***	211.8***	351.0***	213.6***	249.2***	0.123	0.157

Table B.6: Factors of fiscal decentralization, 1995-1999, dep. var.: retention rate, distance from average income per capita among the covariates

	(B15) OLS	(B16) OLS	(B17) OLS	(B18) OLS	(B19) OLS	(B20) OLS	(B21) OLS
Territory	**0.078*** **	**0.059*** **	**0.057*** **	**0.053*** **	**0.051*** **	**0.048*** **	**0.051*** **
	(0.019)	**(0.018)**	**(0.016)**	**(0.017)**	**(0.017)**	**(0.018)**	**(0.017)**
Population	-0.008	-0.005	-0.008	-0.008	-0.014	-0.015	-0.014
	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Oil and gas	0.094	0.114	0.152	0.061	0.159	0.17	0.159
	(0.109)	(0.113)	(0.136)	(0.097)	(0.132)	(0.135)	(0.133)
Distance from average income	**-0.062***	**-0.068***	**-0.093** **	**-0.038***	**-0.102** **	**-0.098** **	**-0.102** **
	(0.035)	**(0.035)**	**(0.042)**	**(0.020)**	**(0.046)**	**(0.045)**	**(0.046)**
Dummy autonomous okrug	0.06	0.06	**0.157** **		**0.123***	**0.114***	**0.123***
	(0.053)	(0.052)	**(0.078)**		**(0.066)**	**(0.065)**	**(0.066)**
Dummy republic	0	0.006	0.085		0.038	0.035	0.038
	(0.034)	(0.034)	(0.051)		(0.027)	(0.028)	(0.028)
Retail trade	0.001	0.001	0.001	0	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Net profit	**-0.004** **	**-0.003***	**-0.004***	**-0.002**	**-0.004** **	**-0.004** **	**-0.004** **
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**	**(0.002)**	**(0.002)**	**(0.002)**
Distance from Moscow		**0.007** **	**0.008** **	**0.008** **	**0.009** **	**0.009** **	**0.009** **
		(0.003)	**(0.004)**	**(0.003)**	**(0.004)**	**(0.004)**	**(0.004)**
Dummy border region		0.015	0.027	0.008	0.024	0.022	0.024
		(0.023)	(0.020)	(0.023)	(0.021)	(0.022)	(0.021)
Share of Russians			0.124	0.036			
			(0.130)	(0.080)			
Urbanization			1.588		1.312	1.204	1.313
			(1.008)		(1.062)	(1.057)	(1.060)
Fiscal transfers					-0.106	-0.105	-0.106
					(0.104)	(0.105)	(0.106)
Tensions (RUIE)							0
							(0.008)
Power sharing agreement						0.012	
						(0.017)	
Constant	0.664***	0.638***	0.421***	0.614***	0.583***	0.586***	0.583***
	(0.021)	(0.024)	(0.137)	(0.070)	(0.086)	(0.087)	(0.087)
Observations	88	88	88	88	88	88	88
R^2	0.215	0.256	0.333	0.244	0.321	0.324	0.321
F-stat	22.07***	19.94***	9.74***	18.83***	9.90***	9.19***	9.11***
J.-B. test	176.3***	246.0***	66.34***	163.1***	134.3***	125.6***	134.3***

Notes: see *Table 2.2*. Outliers are Moscow City, Ingushetia, Kalmykia, Aginsk Buryat autonomous okrug in all regressions; Altai Republic in (B15)-(B23), (B25)-(B26); Tatarstan in (B15), (B18)-(B19), (B21); Sakha in (B16), (B18)-(B26); Taimyr in (B16), (B18)-(B23), (B25)-(B26), Bashkortostan in (B21). After exclusion of outliers net profit in (B15) - (B16), (B19)-(B20), (B22)-(B23), (B25)-(B26) loses significance, but maintains its sign; dummy autonomous region in (B17), (B19)-(B23), (B25) loses significance, but maintains its sign, urbanization in (B23) loses significance, but maintains its sign.

Table B.7: Factors of fiscal decentralization, 1995-1999, dep. var.: retention rate, distance from average income per capita among the covariates (cont'd)

	(B22) OLS	(B23) OLS	(B24) OLS	(B25) OLS	(B26) OLS	(B27) OLS	(B28) OLS
Territory	**0.051*** **	**0.055*** **	0.03	**0.048*** **	**0.048** **	0.01	0.011
	(0.017)	**(0.019)**	(0.022)	**(0.017)**	**(0.018)**	(0.017)	(0.017)
Population	-0.014	-0.013	-0.01	-0.014	-0.014	-0.005	-0.004
	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)
Oil and gas	0.159	0.182	-0.142	0.15	0.153	-0.271	-0.277
	(0.131)	(0.138)	(0.465)	(0.128)	(0.141)	(0.184)	(0.178)
Distance from average income	**-0.102** **	**-0.110** **	-0.037	**-0.107** **	**-0.106** **	0.056	0.066
	(0.046)	**(0.046)**	(0.095)	**(0.046)**	**(0.049)**	(0.076)	(0.072)
Dummy autonomous okrug	**0.123***	**0.131***	0.07	**0.126***	0.12	**-0.341** **	**-0.366** **
	(0.066)	**(0.067)**	(0.075)	**(0.067)**	(0.073)	**(0.160)**	**(0.152)**
Dummy republic	0.038	**0.045***	0.033	0.037	0.027	**0.054** **	0.022
	(0.028)	**(0.025)**	(0.026)	(0.026)	(0.041)	**(0.022)**	(0.043)
Retail trade	0.001	0.001	0	0.001	0.001	**-0.002***	**-0.002***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	**(0.001)**	**(0.001)**
Net profit	**-0.004** **	**-0.004***	-0.002	**-0.004***	**-0.004** **	0.004	0.004
	(0.002)	**(0.002)**	(0.005)	**(0.002)**	**(0.002)**	(0.004)	(0.004)
Distance from Moscow	**0.009** **	**0.010** **	**0.009** **	**0.009** **	**0.009** **	0.003	0.003
	(0.004)	**(0.004)**	**(0.004)**	**(0.004)**	**(0.004)**	(0.003)	(0.004)
Dummy border region	0.024	0.018	0.017	0.021	0.021	**0.032***	**0.031***
	(0.021)	(0.021)	(0.022)	(0.021)	(0.021)	**(0.017)**	**(0.016)**
Urbanization	1.315	**1.800***	0.832	1.652	1.525	**2.099***	1.851
	(1.067)	**(1.033)**	(0.975)	(1.059)	(1.185)	**(1.227)**	(1.329)
Fiscal transfers	-0.106	-0.129	-0.128	-0.132	-0.128	-0.061	-0.067
	(0.106)	(0.111)	(0.110)	(0.110)	(0.112)	(0.075)	(0.080)
Tensions (MFK)	0						
	(0.006)						
Democratization		-0.002	-0.001	-0.002	-0.002	**-0.005** **	**-0.005** **
		(0.002)	(0.002)	(0.002)	(0.002)	**(0.002)**	**(0.002)**
Power (Jarocinska)		-0.021					-0.01
		(0.013)					(0.012)
Power (UI)			-0.003				
			(0.008)				
Power (RUIE)				-0.008			
				(0.011)			
Declarations					0.008		0.033
					(0.035)		(0.031)
Regulatory capture						-0.07	-0.073
						(0.057)	(0.054)
Constant	0.583***	0.746***	0.634***	0.651***	0.613***	0.619***	0.616***
	(0.087)	(0.106)	(0.098)	(0.093)	(0.096)	(0.077)	(0.124)
Observations	88	88	81	88	88	73	73
R^2	0.321	0.345	0.266	0.334	0.331	0.544	0.562
F-stat	9.37***	9.92***	12.9***	9.81***	9.30***	-	-
J.-B. test	134.6***	153.7***	315.3***	160.8***	182.0***	0.358	0.1198

Table B.8: Factors of regulatory decentralization, 1995-1999, dep. var.: share of negative conclusions to all conclusions on regional acts in the Federal Register, income per capita among the covariates

	(B29) OLS	(B30) OLS	(B31) OLS	(B32) OLS	(B33) OLS	(B34) OLS	(B35) OLS
Territory	**0.018***	0.003	0.002	0.002	0.002	0.008	0.003
	(0.009)	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)	(0.01)
Population	0	0.005	0.005	0.001	0.005	0.007	0.006
	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)
Oil and gas	-0.006	0.048	0.044	0.036	0.042	0.017	0.05
	(0.049)	(0.043)	(0.041)	(0.043)	(0.04)	(0.041)	(0.041)
Income per capita	**-0.019****	**-0.028*****	-0.019	**-0.021****	-0.019	-0.023	-0.016
	(0.009)	**(0.010)**	(0.012)	**(0.010)**	(0.012)	(0.014)	(0.011)
Dummy autonomous okrug	**0.064*****	**0.063*****	0.045		**0.043***	**0.056***	**0.045***
	(0.019)	**(0.020)**	(0.029)		**(0.025)**	**(0.029)**	**(0.025)**
Dummy republic	**0.056*****	**0.060*****	**0.056*****		**0.053*****	**0.056*****	**0.056*****
	(0.012)	**(0.011)**	**(0.021)**		**(0.012)**	**(0.011)**	**(0.013)**
Distance from Moscow		**0.007****	**0.006***	**0.006***	**0.006***	**0.006***	**0.007***
		(0.003)	**(0.004)**	**(0.003)**	**(0.004)**	**(0.003)**	**(0.004)**
Dummy border region		0.007	0.006	-0.001	0.006	0.009	0.006
		(0.010)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)
Share of Russians			0.009	**-0.096*****			
			(0.043)	**(0.023)**			
Urbanization			-0.641		-0.636	-0.426	-0.491
			(0.424)		(0.472)	(0.524)	(0.501)
Fiscal transfers					-0.003	-0.006	0.01
					(0.039)	(0.041)	(0.036)
Tension (RUIE)							-0.011
							(0.007)
Power sharing agreement						-0.02	
						-0.013	
Constant	0.096***	0.077***	0.108**	0.174***	0.116***	0.110***	0.123***
	(0.009)	(0.011)	(0.052)	(0.023)	(0.036)	(0.038)	(0.035)
Observations	88	88	88	88	88	88	88
R^2	0.295	0.394	0.407	0.327	0.407	0.432	0.431
F-stat	6.74***	7.35***	7.75***	5.95***	7.53***	6.65***	7.35***
J.-B. test	161.7***	35.94***	55.91***	31.36***	56.37***	32.7***	34.41***

Notes: see *Table 2.2*. Outliers are Primorski krai in all regressions and City of Moscow in regressions (B29)-(B37) and (B39)-(B40). After exclusion of outliers distance from Moscow in regressions (B31) (p=0.102), (B37), (B39) (p=0.102); (B40) becomes insignificant but maintains the sign; dummy autonomous okrug in regression (B39) becomes insignificant (p=0.102) but maintains the sign.

Table B.9: Factors of regulatory decentralization, 1995-1999, dep. var.: share of negative conclusions to all conclusions on regional acts in the Federal Register, income per capita among the covariates (cont'd)

	(B36) OLS	(B37) OLS	(B38) OLS	(B39) OLS	(B40) OLS	(B41) OLS	(B42) OLS
Territory	0.004	0.003	0.002	0.002	0.002	-0.003	0.001
	(0.009)	(0.011)	(0.010)	(0.012)	(0.012)	(0.012)	(0.010)
Population	0.005	0.006	0.004	0.005	0.005	0.004	0.006
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Oil and gas	0.05	0.048	-0.067	0.041	0.042	**0.057****	**0.084****
	(0.042)	(0.045)	(0.097)	(0.042)	(0.044)	**(0.026)**	**(0.033)**
Income p.c.	-0.017	-0.019	-0.013	-0.018	-0.019	-0.009	-0.01
	(0.011)	(0.013)	(0.015)	(0.013)	(0.013)	(0.013)	(0.013)
Dummy autonomous okrug	0.042	0.044	**0.074****	**0.043***	0.042	-0.026	-0.016
	(0.026)	(0.026)	**(0.037)**	**(0.026)**	(0.027)	(0.022)	(0.024)
Dummy republic	**0.056*****	**0.055*****	**0.060*****	**0.053*****	**0.052****	**0.059*****	**0.086*****
	(0.013)	**(0.014)**	**(0.013)**	**(0.012)**	**(0.020)**	**(0.013)**	**(0.025)**
Distance from Moscow	**0.007***	**0.007***	0.006	**0.007***	**0.006***	**0.008***	**0.009***
	(0.004)	**(0.004)**	(0.004)	**(0.004)**	**(0.004)**	**(0.004)**	**(0.005)**
Dummy border region	0.004	0.005	0.011	0.006	0.005	0.009	0.008
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)
Urbanization	-0.54	-0.56	-0.077	-0.588	-0.605	-0.394	-0.138
	(0.501)	(0.573)	(0.703)	(0.548)	(0.573)	(0.528)	(0.606)
Fiscal transfers	0.005	-0.006	-0.014	-0.008	-0.006	-0.012	-0.018
	(0.038)	(0.041)	(0.039)	(0.041)	(0.041)	(0.042)	(0.047)
Tensions (MFK)	-0.006						
	(0.004)						
Democratization		0	-0.001	0	0	0	0
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Power (Jarocinska)		-0.005					-0.013
		(0.008)					(0.010)
Power (UI)			-0.009				
			(0.007)				
Power (RUIE)				-0.003			
				(0.007)			
Declarations					0.001		-0.018
					(0.015)		(0.018)
Regulatory capture						-0.027	-0.027
						(0.039)	(0.040)
Constant	0.126***	0.148**	0.112***	0.131***	0.121**	0.091**	0.190**
	(0.036)	(0.063)	(0.040)	(0.043)	(0.048)	(0.038)	(0.085)
Observations	88	88	81	88	88	73	73
R^2	0.43	0.409	0.433	0.409	0.407	0.375	0.402
F-stat	7.72***	6.29***	6.97***	6.25***	6.27***	-	-
J.-B. test	32.28***	48.23***	36.48***	56.56***	52.7***	51.78***	37.7***

Table B.10: Factors of regulatory decentralization, 1995-1999, dep. var.: share of negative conclusions to all conclusions on regional acts in the Federal Register, distance from average income per capita among the covariates

	(B43) OLS	(B44) OLS	(B45) OLS	(B46) OLS	(B47) OLS	(B48) OLS	(B49) OLS
Territory	0.013	-0.002	-0.001	-0.001	0	0.005	0.002
	(0.008)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)
Population	0	0.004	0.005	0	0.005	0.007	0.006*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
Oil and gas	-0.004	0.032	0.039	0.024	0.041	0.016	0.051
	(0.050)	(0.047)	(0.037)	(0.039)	(0.036)	(0.037)	(0.037)
Distance from average income	**-0.023***	**-0.028****	-0.018	**-0.022****	-0.019	-0.023	-0.017
	(0.011)	**(0.012)**	(0.012)	**(0.009)**	(0.013)	(0.014)	(0.012)
Dummy autonomous okrug	**0.066*****	**0.065*****	0.039		0.039	0.052*	0.043*
	(0.019)	**(0.021)**	(0.028)		(0.025)	(0.027)	(0.025)
Dummy republic	**0.060*****	**0.065*****	0.054***		**0.053*****	**0.056*****	**0.056*****
	(0.012)	**(0.011)**	(0.020)		**(0.012)**	**(0.011)**	**(0.012)**
Distance from Moscow		**0.006***	**0.006***	**0.005***	**0.006***	0.005	**0.006***
		(0.003)	**(0.003)**	**(0.003)**	**(0.003)**	(0.003)	**(0.003)**
Dummy border region		0.009	0.007	0.001	0.006	0.01	0.007
		(0.010)	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)
Share of Russians			0.001	**-0.105*****			
			(0.042)	**(0.023)**			
Urbanization			**-0.829****		**-0.765***	-0.589	-0.588
			(0.377)		**(0.454)**	(0.485)	(0.478)
Fiscal transfers					0.009	0.009	0.021
					(0.040)	(0.043)	(0.038)
Tensions (RUIE)							-0.011
							(0.007)
Power sharing agreement						-0.019	
						(0.013)	
Constant	0.090***	0.068***	0.122**	0.176***	0.117***	0.111***	0.123***
	(0.009)	(0.01)	(0.049)	(0.023)	(0.037)	(0.039)	(0.036)
Observations	88	88	88	88	88	88	88
R^2	0.29	0.373	0.403	0.317	0.404	0.428	0.43
F-stat	7.47***	6.98***	8.14***	6.04***	8.10***	6.86***	7.72***
J.-B. test	144.2***	31.36***	62.2***	30.75***	63.15***	39.89***	37.79***

Notes: see *Table 2.2*. Outliers are City of Moscow for regressions (B43)-(B51) and (B53)-(B54) and Primorski krai for all regressions. After exclusion of outliers distance from Moscow in regression (B45)-(B47), (B49), (B50), (B53) loses significance, but maintains the sign; population in regression (B49) loses significance, but maintains its sign.

Table B.11: Factors of regulatory decentralization, 1995-1999, dep. var.: share of negative conclusions to all conclusions on regional acts in the Federal Register, distance from average income per capita among the covariates (cont'd)

	(B50) OLS	(B51) OLS	(B52) OLS	(B53) OLS	(B54) OLS	(B55) OLS	(B56) OLS
Territory	0.002	0.001	0.001	0	0	-0.004	0.001
	(0.010)	(0.011)	(0.011)	(0.013)	(0.013)	(0.012)	(0.010)
Population	0.005	0.006	0.004	0.005	0.005	0.004	0.006
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Oil and gas	0.052	0.049	-0.07	0.041	0.041	**0.055****	**0.086****
	(0.038)	(0.042)	(0.107)	(0.038)	(0.040)	**(0.025)**	**(0.033)**
Distance from average income	-0.019	-0.02	-0.01	-0.019	-0.02	-0.01	-0.014
	(0.012)	(0.014)	(0.016)	(0.014)	(0.014)	(0.014)	(0.015)
Dummy autonomous okrug	0.04	0.041	**0.068***	0.04	0.039	-0.025	-0.01
	(0.025)	(0.026)	**(0.034)**	(0.026)	(0.028)	(0.023)	(0.027)
Dummy republic	**0.057*****	**0.055*****	**0.060*****	**0.053*****	**0.051****	**0.059*****	**0.087*****
	(0.013)	**(0.013)**	**(0.013)**	**(0.012)**	**(0.021)**	**(0.012)**	**(0.025)**
Distance from Moscow	**0.006***	0.006	0.005	**0.006***	0.006	**0.007***	**0.009****
	(0.003)	(0.004)	(0.004)	**(0.003)**	(0.003)	**(0.004)**	**(0.004)**
Dummy border region	0.004	0.005	0.011	0.006	0.006	0.009	0.008
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Urbanization	-0.63	-0.671	-0.221	-0.702	-0.733	-0.45	-0.153
	(0.478)	(0.548)	(0.654)	(0.517)	(0.551)	(0.493)	(0.576)
Fiscal transfers	0.018	0.006	-0.007	0.004	0.006	-0.007	-0.01
	(0.039)	(0.041)	(0.041)	(0.041)	(0.040)	(0.043)	(0.046)
Tensions (MFK)	-0.006						
	(0.004)						
Democratization		0	-0.001	0	0	0	0
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Power (Jarocinska)		-0.005					-0.013
		(0.009)					(0.010)
Power (UI)			-0.01				
			(0.007)				
Power (RUIE)				-0.003			
				(0.007)			
Declarations					0.002		-0.018
					(0.016)		(0.019)
Regulatory capture						-0.029	-0.028
						(0.039)	(0.040)
Constant	0.125***	0.152**	0.116***	0.133***	0.121**	0.093**	0.194**
	(0.038)	(0.064)	(0.040)	(0.044)	(0.049)	(0.038)	(0.086)
Observations	88	88	81	88	88	73	73
R^2	0.43	0.407	0.43	0.406	0.405	0.374	0.403
F-stat	7.89***	6.82***	7.83***	6.77***	6.78***	-	-
J.-B. test	34.38***	52.86***	40.13***	62.35***	58.21***	52.59***	36.3***

Table B.12: Factors of regulatory decentralization, 1995-1999, dep. var.: number of negative conclusions on regional acts in the Federal Register, income per capita among the covariates

	(B57) Negative binomial	(B58) Negative binomial	(B59) Negative binomial	(B60) Negative binomial	(B61) Negative binomial	(B62) Negative binomial	(B63) Negative binomial
Territory	**0.247*** **	0.119	0.116	**0.204** **	0.129	**0.156***	**0.139***
	(0.083)	(0.080)	(0.079)	**(0.103)**	(0.085)	**(0.087)**	**(0.074)**
Population	**0.086*** **	**0.134*** **	**0.136*** **	**0.132*** **	**0.140*** **	**0.150*** **	**0.140*** **
	(0.029)	**(0.033)**	**(0.033)**	**(0.038)**	**(0.035)**	**(0.041)**	**(0.034)**
Oil and gas	0.04	0.473	0.453	0.079	0.46	0.358	0.517
	(0.370)	(0.330)	(0.321)	(0.431)	(0.307)	(0.314)	(0.315)
Income p.c.	-0.041	**-0.133***	-0.084	**-0.179***	-0.087	-0.105	-0.067
	(0.073)	**(0.078)**	(0.093)	**(0.101)**	(0.091)	(0.099)	(0.088)
Dummy autonomous okrug	-0.104	-0.081	-0.191		-0.188	-0.138	-0.175
	(0.127)	(0.138)	(0.237)		(0.199)	(0.211)	(0.195)
Dummy republic	**0.570*** **	**0.632*** **	**0.596*** **		**0.581*** **	**0.586*** **	**0.605*** **
	(0.112)	**(0.109)**	**(0.210)**		**(0.120)**	**(0.118)**	**(0.125)**
Distance from Moscow		**0.061*** **	**0.059*** **	**0.041***	**0.057** **	**0.055** **	**0.055*** **
		(0.021)	**(0.022)**	**(0.025)**	**(0.023)**	**(0.022)**	**(0.021)**
Dummy border region		0.071	0.066	0.11	0.065	0.074	0.064
		(0.102)	(0.104)	(0.119)	(0.103)	(0.102)	(0.102)
Share of Russians			0.027	**-0.848*** **			
			(0.343)	**(0.197)**			
Urbanization			-3.531		-2.44	-1.509	-1.361
			(3.199)		(4.135)	(4.289)	(4.196)
Fiscal transfers					0.154	0.179	0.259
					(0.415)	(0.422)	(0.395)
Tensions (RUIE)							-0.082
							(0.064)
Power sharing agreement						-0.087	
						(0.109)	
Constant	5.259***	5.066***	5.258***	5.919***	5.173***	5.138***	5.230***
	(0.094)	(0.110)	(0.411)	(0.183)	(0.368)	(0.371)	(0.356)
Observations	88	88	88	88	88	88	88
Pseudo R^2	0.026	0.036	0.037	0.024	0.037	0.037	0.039
Wald Chi-stat	73.63***	87.12***	91.55***	46.41***	90.61***	89.66***	101.29***
Goodness of the fit	4565.166***	3986.862***	3941.261***	4856.018***	3937.14***	3876.313***	3803.926***

Notes: see *Table 2.2.* Goodness of the fit is the statistics showing the overdispersion in Poisson regressions

Table B.13: Factors of regulatory decentralization, 1995-1999, dep. var.: number of negative conclusions on regional acts in the Federal Register, income per capita among the covariates (cont'd)

	(B64) Negative binomial	(B65) Negative binomial	(B66) Negative binomial	(B67) Negative binomial	(B68) Negative binomial	(B69) Negative binomial	(B70) Negative binomial
Territory	**0.142****	**0.142***	**0.136***	0.134	0.122	0.105	0.122
	(0.072)	**(0.084)**	**(0.077)**	(0.091)	(0.091)	(0.094)	(0.079)
Population	**0.136*****	**0.141*****	**0.115*****	**0.140*****	**0.135*****	**0.126*****	**0.125*****
	(0.034)	**(0.035)**	**(0.034)**	**(0.035)**	**(0.036)**	**(0.041)**	**(0.039)**
Oil and gas	0.521	0.49	-0.863	0.444	0.389	**0.558*****	**0.608***
	(0.327)	(0.346)	(0.640)	(0.305)	(0.327)	**(0.214)**	**(0.319)**
Income p.c.	-0.067	-0.073	0.008	-0.071	-0.058	-0.003	0.025
	(0.089)	(0.095)	(0.099)	(0.095)	(0.100)	(0.117)	(0.113)
Dummy autonomous okrug	-0.203	-0.191	0.008	-0.195	-0.276	**-0.602****	**-0.694****
	(0.202)	(0.200)	(0.221)	(0.198)	(0.237)	**(0.263)**	**(0.282)**
Dummy republic	**0.610*****	**0.608*****	**0.659*****	**0.596*****	**0.489****	**0.653*****	**0.625****
	(0.127)	**(0.140)**	**(0.129)**	**(0.123)**	**(0.213)**	**(0.124)**	**(0.265)**
Distance from Moscow	**0.055*****	**0.058****	**0.052****	**0.057****	**0.056****	**0.066****	**0.070****
	(0.021)	**(0.025)**	**(0.023)**	**(0.024)**	**(0.024)**	**(0.028)**	**(0.030)**
Dummy border region	0.045	0.07	0.131	0.077	0.074	0.109	0.098
	(0.110)	(0.108)	(0.104)	(0.099)	(0.101)	(0.110)	(0.119)
Urbanization	-1.901	-3.305	0.28	-3.433	-4.731	-2.518	-2.829
	(4.176)	(4.344)	(5.043)	(4.303)	(4.670)	(4.878)	(5.039)
Fiscal transfers	0.218	0.256	0.107	0.25	0.237	0.177	0.122
	(0.403)	(0.449)	(0.435)	(0.448)	(0.436)	(0.551)	(0.540)
Tensions (MFK)	-0.047						
	(0.036)						
Democratization		0.008	0.003	0.007	0.008	0.008	0.01
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Power (Jarocinska)		-0.03					-0.097
		(0.094)					(0.105)
Power (UI)			-0.067				
			(0.065)				
Power (RUIE)				-0.019			
				(0.074)			
Declarations					0.093		0.077
					(0.161)		(0.201)
Regulatory capture						-0.166	-0.212
						(0.350)	(0.341)
Constant	5.267***	5.158***	4.952***	5.039***	4.843***	4.849***	5.272***
	(0.376)	(0.687)	(0.408)	(0.459)	(0.499)	(0.464)	(0.908)
Observations	88	88	81	88	88	73	73
Pseudo R^2	0.039	0.038	0.039	0.037	0.038	0.038	0.039
Wald Chi-stat	106.5***	85.08***	336.20***	84.79***	87.44***	-	-
Goodness of the fit	3804.677***	3925.622***	3345.643***	3932.684***	3920.009***	3350.097***	3282.421***

Table B.14: Factors of regulatory decentralization, 1995-1999, dep. var.: number of negative conclusions on regional acts in the Federal Register, distance from average income per capita among the covariates

	(B71) Negative binomial	(B72) Negative binomial	(B73) Negative binomial	(B74) Negative binomial	(B75) Negative binomial	(B76) Negative binomial	(B77) Negative binomial
Territory	**0.238*** **	0.096	0.103	**0.175***	0.119	0.143	**0.132***
	(0.076)	(0.08)	(0.081)	**(0.105)**	(0.086)	(0.088)	**(0.075)**
Population	**0.087*** **	**0.124*** **	**0.133*** **	**0.128*** **	**0.140*** **	**0.149*** **	**0.140*** **
	(0.029)	**(0.032)**	**(0.032)**	**(0.035)**	**(0.035)**	**(0.041)**	**(0.034)**
Oil and gas	0.066	0.376	0.408	0.049	0.442	0.343	**0.514***
	(0.359)	(0.338)	(0.300)	(0.397)	(0.286)	(0.294)	**(0.299)**
Distance from average income	-0.062	-0.111	-0.066	**-0.209***	-0.082	-0.099	-0.068
	(0.096)	(0.092)	(0.092)	**(0.110)**	(0.094)	(0.101)	(0.093)
Dummy autonomous okrug	-0.09	-0.087	-0.236		-0.213	-0.169	-0.187
	(0.128)	(0.147)	(0.224)		(0.201)	(0.207)	(0.195)
Dummy republic	**0.582*** **	**0.651*** **	**0.578*** **		**0.579*** **	**0.583*** **	**0.605*** **
	(0.111)	**(0.109)**	**(0.205)**		**(0.121)**	**(0.119)**	**(0.126)**
Distance		**0.056*** **	**0.056*** **	0.036	**0.053** **	**0.051** **	**0.052*** **
		(0.020)	**(0.021)**	(0.023)	**(0.022)**	**(0.021)**	**(0.020)**
Dummy border region		0.082	0.067	0.115	0.066	0.075	0.065
		(0.101)	(0.103)	(0.112)	(0.102)	(0.101)	(0.102)
Share of Russians			-0.007	**-0.938*** **			
			(0.339)	**(0.199)**			
Urbanization			-4.545		-3.175	-2.418	-1.804
			(2.814)		(4.038)	(4.108)	(4.101)
Fiscal transfers					0.205	0.239	0.306
					(0.429)	(0.440)	(0.408)
Tensions (RUIE)							-0.084
							(0.064)
Power sharing agreement						-0.083	
						(0.108)	
Constant	5.247***	5.027***	5.332***	5.950***	5.185***	5.153***	5.233***
	(0.090)	(0.105)	(0.386)	(0.186)	(0.382)	(0.384)	(0.366)
Observations	88	88	88	88	88	88	88
Pseudo R^2	0.026	0.036	0.037	0.024	0.037	0.037	0.038
Wald Chi-stat	71.21***	83.57***	92.76***	47.43***	91.28***	90.15***	102.04***
Goodness of the fit	4565.822***	4015.856***	3944.694***	4869.309***	3939.985***	3883.001***	3803.945***

Note: see *Table 2.2*

Table B.15: Factors of regulatory decentralization, 1995-1999, dep. var.: number of negative conclusions on regional acts in the Federal Register, distance from average income per capita among the covariates (cont'd)

	(B78) Negative binomial	(B79) Negative binomial	(B80) Negative binomial	(B81) Negative binomial	(B82) Negative binomial	(B83) Negative binomial	(B84) Negative binomial
Territory	**0.137***	0.134	**0.130***	0.125	0.114	0.092	0.115
	(0.072)	(0.085)	**(0.076)**	(0.093)	(0.092)	(0.093)	(0.076)
Population	**0.138*****	**0.140*****	**0.109*****	**0.138*****	**0.132*****	**0.117*****	**0.118*****
	(0.034)	**(0.035)**	**(0.035)**	**(0.035)**	**(0.036)**	**(0.042)**	**(0.040)**
Oil and gas	**0.534***	0.463	-1.113	0.409	0.345	**0.506*****	**0.563***
	(0.314)	(0.338)	(0.712)	(0.294)	(0.315)	**(0.194)**	**(0.320)**
Distance from average income	-0.077	-0.059	0.059	-0.055	-0.038	0.066	0.081
	(0.094)	(0.102)	(0.106)	(0.103)	(0.107)	(0.119)	(0.115)
Dummy autonomous okrug	-0.208	-0.218	-0.014	-0.225	-0.313	**-0.728*****	**-0.796*****
	(0.200)	(0.203)	(0.209)	(0.201)	(0.241)	**(0.260)**	**(0.277)**
Dummy republic	**0.612*****	**0.605*****	**0.655*****	**0.592*****	**0.475****	**0.646*****	**0.607****
	(0.129)	**(0.141)**	**(0.129)**	**(0.123)**	**(0.216)**	**(0.124)**	**(0.267)**
Distance from Moscow	**0.053*****	**0.055****	**0.052****	**0.054****	**0.054****	**0.067****	**0.072****
	(0.020)	**(0.024)**	**(0.022)**	**(0.022)**	**(0.022)**	**(0.028)**	**(0.030)**
Dummy border region	0.045	0.072	0.134	0.079	0.076	0.112	0.1
	(0.109)	(0.107)	(0.104)	(0.099)	(0.100)	(0.109)	(0.119)
Urbanization	-2.213	-4.037	-0.244	-4.197	-5.554	-3.501	-3.498
	(4.068)	(4.238)	(4.765)	(4.183)	(4.500)	(4.638)	(4.691)
Fiscal transfers	0.274	0.286	0.048	0.277	0.253	0.093	0.048
	(0.416)	(0.455)	(0.452)	(0.453)	(0.441)	(0.570)	(0.548)
Tensions (MFK)	-0.049						
	(0.036)						
Democratization		0.008	0.004	0.007	0.008	0.009	0.011
		(0.009)	(0.010)	(0.009)	(0.009)	(0.009)	(0.010)
Power (Jarocinska)		-0.032					-0.095
		(0.095)					(0.104)
Power (UI)			-0.068				
			(0.065)				
Power (RUIE)				-0.02			
				(0.075)			
Declarations					0.102		0.088
					(0.163)		(0.202)
Regulatory capture						-0.17	-0.212
						(0.350)	(0.339)
Constant	5.262***	5.194***	4.983***	5.069***	4.855***	4.902***	5.278***
	(0.383)	(0.695)	(0.408)	(0.470)	(0.504)	(0.461)	(0.895)
Observations	88	88	81	88	88	73	73
Pseudo R^2	0.039	0.037	0.039	0.037	0.038	0.038	0.039
Wald Chi-stat	107.46***	85.65***	351.77***	85.04***	87.71***	-	-
Goodness of the fit	3805.283***	3927.816***	3333.526***	3934.713***	3919.845***	3342.792***	3279.356***

Table B.16: Factors of constitutional decentralization, 1995-1999, dep. var.: constitutional decentralization index, income per capita among the covariates

	(B85) Ordered logit	(B86) Ordered logit	(B87) Ordered logit	(B88) Ordered logit	(B89) Ordered logit	(B90) Ordered logit	(B91) Ordered logit	(B92) Ordered logit	(B93) Ordered logit	(B94) Ordered logit	(B95) Ordered logit
Territory	8.281	9.384	10.187	**12.158***	16.755	10.333	21.257	**14.187****	4.605	**17.190***	8.957
	(5.135)	(6.673)	(7.507)	**(7.07)**	(12.564)	(9.933)	(15.817)	**(6.744)**	(25.413)	**(10.112)**	(8.482)
Population	0.648	0.713	0.622	1.551	1.622	1.48	3.065	1.471	1.433	**2.204****	1.378
	(0.689)	(0.624)	(0.748)	(1.377)	(1.168)	(1.480)	(3.995)	(0.933)	(1.335)	**(1.013)**	(0.867)
Oil and gas	17.247	8.272	11.529	62.7	76.132	65.326	28.244	-10.751	84.904	-71.597	95.876
	(61.866)	(57.017)	(61.054)	(47.665)	(51.753)	(54.473)	(113.903)	(141.264)	(133.434)	(90.346)	(143.094)
Income p.c.	-4.141	**-4.329***	-5.259	-3.477	-6.617	-3.555	0.364	-13.825	0.688	0.978	1.84
	(2.564)	**(2.527)**	(3.839)	(5.883)	(9.024)	(6.292)	(9.303)	(14.134)	(8.427)	(6.223)	(6.492)
Distance from Moscow		-0.133	-0.112	-0.158	-0.203	-0.071	-0.575	0.338	0.216	-0.549	0.837
		(0.556)	(0.578)	(0.708)	(0.690)	(0.886)	(1.305)	(0.821)	(1.312)	(0.732)	(0.726)
Dummy border region		1.131	1.086	-0.353	-0.517	-0.52	-0.535	-0.217	-0.726	0.757	-1.857
		(1.046)	(1.070)	(1.385)	(1.239)	(1.829)	(0.979)	(1.625)	(3.771)	(1.454)	(2.694)
Urbanization			18.536	**145.978****	**207.130***	**138.781***	**146.054****	300.506	42.781	**171.271****	**212.057***
			(62.558)	**(71.089)**	**(121.873)**	**(77.381)**	**(61.731)**	(224.012)	(180.545)	**(86.229)**	**(113.072)**
Fiscal transfers				**16.065****	**16.985****	14.232	29.196	**17.956*****	13.475	**25.494*****	**17.297***
				(8.051)	**(7.098)**	(10.058)	(28.223)	**(6.069)**	(10.047)	**(6.740)**	**(9.758)**
Share of Russians											**-13.396****
											(6.583)
Power sharing agreement					-1.503						
					(2.091)						
Tension (RUIE)						0.561					
						(1.557)					
Tension (MFK)							-1.331				
							(1.938)				
Democratization								0.048	0.017	-0.164	
								(0.079)	(0.228)	(0.134)	
Declarations										**6.946****	
										(2.782)	
Power (UI)									0.501		
									(3.579)		
Power (Jarocinska)								4.759			
								(6.315)			
Observations	20	20	20	20	20	20	20	20	18	20	20
Pseudo R^2	0.163	0.188	0.19	0.319	0.335	0.323	0.363	0.37	0.316	0.423	0.49
Wald Chi-stat	10.59**	31.65***	43.69***	24.57***	31.70***	22.50***	40.93***	57.56***	33.80***	63.10***	26.08***
LR test proportional odds	15.91	30.71**	28.56	44.36***	43.09**	43.92**	42.92**	40.45*	38.75	36.62	32.28

Note: see *Table 2.2.* Likelihood ratio test is significant if proportional odds assumption is violated

Table B.17: Factors of constitutional decentralization, 1995-1999, dep. var.: constitutional decentralization index, distance from average income per capita among the covariates

	(B96) Ordered logit	(B97) Ordered logit	(B98) Ordered logit	(B99) Ordered logit	(B100) Ordered logit	(B101) Ordered logit	(B102) Ordered logit	(B103) Ordered logit	(B104) Ordered logit	(B105) Ordered logit	(B106) Ordered logit
Territory	2.675	-0.561	-3.09	-0.961	0.522	-4.347	3.329	**-11.624****	-6.804	10.765	6.247
	(2.840)	(2.467)	(4.326)	(6.754)	(6.342)	(15.447)	(26.100)	**(5.736)**	(12.859)	(13.285)	(9.804)
Population	1.364	**1.608***	**1.703****	**3.512****	**4.297****	**3.392****	3.714	**7.005****	**4.180***	**3.949****	2.044
	(0.840)	**(0.842)**	**(0.801)**	**(1.529)**	**(2.011)**	**(1.724)**	(2.402)	**(3.298)**	**(2.217)**	**(1.571)**	(1.775)
Oil and gas	-33.382	-1.196	-3.859	75.503	57.761	86.567	70.237	41.409	133.747	-5.602	124.153
	(48.850)	(48.476)	(47.236)	(89.689)	(78.973)	(132.735)	(101.261)	(113.211)	(180.434)	(81.622)	(172.252)
Distance from average income	**9.746***	**14.663****	**19.264*****	**29.503****	**31.743*****	**30.951***	27.002	**53.494****	**37.430***	**32.142*****	13.23
	(5.790)	**(6.284)**	**(7.329)**	**(12.553)**	**(10.138)**	**(18.338)**	(16.808)	**(23.743)**	**(19.114)**	**(11.225)**	(19.367)
Distance from Moscow		0.677	1.022	1.441	**1.478***	1.664	1.194	**2.889*****	1.993	1.038	1.364
		(0.480)	(0.876)	(1.115)	**(0.786)**	(1.883)	(1.972)	**(0.929)**	(1.679)	(0.717)	(1.754)
Dummy border region		0.76	0.528	-1.615	-1.724	-1.899	-1.626	**-3.314***	-2.887	-1.074	-2.453
		(1.128)	(1.340)	(2.217)	(1.457)	(3.342)	(2.234)	**-2.004**	-4.672	-1.222	(4.226)
Urbanization			46.169	**284.313****	**342.852****	**278.198****	**282.662****	**502.178****	279.68	**409.681*****	281.125
			(68.056)	**(113.121)**	**(145.456)**	**(135.311)**	**(116.715)**	**(207.717)**	(191.121)	**(138.63)**	(185.913)
Fiscal transfers				**24.312****	**27.934****	21.757	27.255	**48.128****	**28.862***	**39.671*****	21.011
				(11.014)	**(11.886)**	(13.583)	(22.604)	**(22.447)**	**(17.103)**	**(13.113)**	(19.225)
Share of Russians											-10.592
											(7.801)
Power sharing agreement					-1.493	0.75					
					(1.846)	(2.104)					
Tension (RUIE)							-0.332				
							(1.833)				
Tension (MFK)								0.299	0.182	-0.117	
								(0.218)	(0.151)	(0.249)	
Democratization										**8.674****	
										(4.141)	
Declarations									0.907		
									(2.350)		
Power (UI)								2.972			
								(1.965)			
Power (Jarocinska)						-4.347	3.329	-11.624**	-6.804	10.765	
						(15.447)	(26.100)	(5.736)	(12.859)	(13.285)	
Observations	20	20	20	20	20	20	20	20	18	20	20
Pseudo R^2	0.175	0.237	0.249	0.431	0.446	0.436	0.433	0.477	0.43	0.542	0.503
Wald Chi-stat	4.36	12.07*	12.27*	36.46***	50.51***	51.99***	45.13***	29.53***	22.48**	38.90***	36.63***
LR test proportional odds	23.61**	30.36**	29.97*	37.17**	35.98	36.32	37.20*	34.25	32.4	29.35	31.44

Note: see *Table 2.2*

Appendix C

Appendix to Chapter 3

C.1 Data

Table C.1: Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Average income per capita	945	3.05	3.27	0.12	29.8
Capital funds	945	0.3	0.52	0	6.46
Democratization	945	28.59	6.25	14	45
Distance from Moscow	945	2.37	2.74	0	11.88
Dummy border region	945	0.43	0.5	0	1
Dummy Putin	945	0.58	0.49	0	1
Dummy republic	945	0.25	0.43	0	1
Dummy Tatarstan and Bashkortostan (Yeltsin)	945	0.01	0.1	0	1
Dummy Tatarstan and Bashkortostan (Putin)	945	0.01	0.12	0	1
Fiscal transfers	945	0.25	0.19	-0.03	1.11
Net profit	945	18.29	115.06	-78.59	2797.69
Number of audits per unit of GRP squared	67	0	0	0	0
Oil and gas share	945	0.01	0.09	0	0.8
Overrepresentation in the State Duma	945	1.26	1.26	0.22	12.54
Population	945	1.83	1.54	0.05	10.44
Power (1995-2000)	945	3.51	3.53	0	8.5
Power (2001-2006)	945	3.49	3.53	0	8.5
Retail trade	942	41.86	119.27	0.1	1817.77
Retention rate	945	0.61	0.14	0.05	1
Share of Russians	945	0.77	0.24	0.01	0.97
Tax arrears squared	945	0.02	0.2	0	4.27
Tax arrears squared (Putin)	945	0.02	0.2	0	4.27
Tax arrears squared (Yeltsin)	945	0	0.01	0	0.06
Territory	945	0.22	0.47	0	3.1
Urbanization	945	0.07	0.01	0.02	0.1

Table C.2: Description of variables

Variable	Description	Period	Source
Average income per capita	Average income per capita of the region, thousands of RUR	1995-2006	Goskomstat
Capital funds	Value of tangible assets of all enterprises, bln. RUR	1995-2006	Goskomstat
Democratization	Index of democratization of the region, estimated by the experts of the Carnegie Center in Moscow. The higher value of index represents a higher democratization level	1995-2006	Carnegie Center and Independent Institute for Social Policy
Distance from Moscow	Distance between the capital of the region and Moscow, thousands of km, 0 for Moscow and Moscow oblast, identical for St. Petersburg and St. Petersburg oblast	NA	Goskomstat
Dummy border region	1 if the region has a border to any state outside the Russian Federation, 0 otherwise	NA	Own estimation
Dummy Putin	1 if Putin was president or acting president, 0 otherwise	NA	Own estimation
Dummy republic	1 if the region has the status of a republic, 0 otherwise	NA	Own estimation
Dummy Tatarstan and Bashkortostan (Yeltsin)	1 for Tatarstan or Bashkortostan in 1995-1999, 0 otherwise	NA	Own estimation
Dummy Tatarstan and Bashkortostan (Putin)	1 for Tatarstan or Bashkortostan in 2000-2006, 0 otherwise	NA	Own estimation
Net profit	Net profit (profit - loss) of all region's organizations, bln. RUR	1995-2006	Goskomstat
Number of audits squared	(Number of audits / GRP (in mln. RUR))^2	2006	Local branches of the State Tax Service
Oil and gas share	(Share of oil extraction in the region in the total oil extraction in Russia + Share of the gas extraction in the region to the total gas extraction in Russia) / 2	1995-2006	Goskomstat
Overrepresentation in the State Duma	Share of seats of the region in the State Duma (calculated on 225 deputies basis) / Share of region in Russian population	1995-2006	Goskomstat, State Duma, own estimation
Population	Population of the region, mln. people	1995-2006	Goskomstat
Power (1995-2000)	Index of power of regional governors, based on data like years in office, share on regional elections, control of parliament etc. The higher value of index represents a higher influence of regional governor. The index is equal to the index of power (time-invariant) in 1995-2000 and 0 otherwise.	1995-2000 (applied for all years)	Jarocinska, 2004
Power (2001-2006)	The variable is equal to the time-invariant index of power (calculated for 1995-2000) in 2001-2006 and zero otherwise	1995-2000 (applied for all years)	Jarocinska, 2004
Retail trade	Total retail trade revenue (current prices), bln. RUR	1995-2006	Goskomstat
Retention rate	Tax revenue of the consolidated regional budget executed / Total tax collection on the territory of the region	1995-2006	Until 1997: Freinkman, Treisman and Titov, 1999; Since 1998: Ministry of Finance and State Treasury (for budget data), State Tax Service and Goskomstat (for tax collection data)
Share of fiscal transfers	Fiscal transfers from other governments / Total expenditures of the region's consolidated budget	1995-2006	Until 1997: Freinkman, Treisman and Titov, 1999 Since 1998: Ministry of Finance and State Treasury
Share of Russians	Share of ethnic Russians in the region's population	2002 (applied for all years)	Russia's Census, 2002
Tax arrears squared	(Total tax arrears / GRP)^2	1995-2006	State Tax Service and Goskomstat
Territory	Territory of the region, mln. sq.km, 0 for Moscow and St. Petersburg	NA	Goskomstat
Urbanization	Share of urban population (in %) / 1000	1995-2006	Goskomstat

Notes: All Goskomstat (Russian statistical authority) data are provided on the annual basis in the regular publication Regions of Russia. In 1998 the Russian ruble was denominated; therefore all indicators for previous years were divided by 1000.

C.2 Annual cross-sections

Table C.3: Regressions for individual annual cross-sections, 1995-2006, dependent variable: retention rate

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Tax arrears squared	-1.692	0.977	0.897	-0.676	-1.646	**-2.031*** **	**-1.209*** **	**-0.180*** **	**-0.279*** **	**-0.043*** **	**-0.034*** **	**-1.878*** **
	(5.355)	(2.395)	(1.788)	(1.458)	(2.085)	**(0.696)**	**(0.394)**	**(0.054)**	**(0.055)**	**(0.013)**	**(0.020)**	**(0.868)**
Tax structure												
Average income per capita	**0.167** **	0.075	-0.001	0.044	0.064*	0.015	0.013	-0.008	-0.01	-0.002	**-0.018*** **	**-0.021*** **
	(0.072)	(0.048)	(0.055)	(0.052)	(0.038)	(0.024)	(0.018)	(0.015)	(0.017)	(0.010)	**(0.011)**	**(0.008)**
Capital funds	**-2.075** **	**-0.646** **	-0.301	**-0.655** **	**-0.919*** **	-0.355	**-0.302***	-0.011	0.002	-0.077	0.091	**0.100***
	(0.901)	**(0.278)**	(0.399)	**(0.318)**	**(0.308)**	(0.237)	**(0.178)**	(0.178)	(0.128)	(0.082)	(0.074)	**(0.056)**
Legal factors												
Dummy Tatarstan and Bashkortostan	**0.232*** **	**0.278*** **	**0.143***	**0.284*** **	**0.361*** **	**0.266*** **	0.055	-0.075	-0.012	**-0.114*** **	-0.127	-0.03
	(0.082)	**(0.087)**	**(0.072)**	**(0.066)**	**(0.075)**	**(0.093)**	(0.108)	(0.081)	(0.058)	**(0.054)**	(0.085)	(0.110)
Political variables												
Territory	**0.084*** **	**0.035***	**0.054*** **	0.04	**0.055*** **	**0.053*** **	**0.040***	**0.042***	**0.048***	**0.071*** **	**0.050***	**0.048*** **
	(0.027)	**(0.017)**	**(0.027)**	(0.027)	**(0.021)**	**(0.026)**	**(0.022)**	**(0.024)**	**(0.025)**	**(0.023)**	**(0.030)**	**(0.024)**
Population	**0.052***	0.026	0.001	0.031	**0.059*** **	0.019	0.033	0.006	0	0.02	-0.02	-0.017
	(0.028)	(0.022)	(0.031)	(0.028)	**(0.026)**	(0.024)	(0.022)	(0.027)	(0.022)	(0.020)	(0.029)	(0.026)
Oil and gas share	**0.781** **	**0.379** **	0.211	**0.351***	**0.396*** **	0.316	**0.725***	-0.087	-0.213	-0.018	**-0.827** **	**-0.871** **
	(0.345)	**(0.156)**	(0.208)	**(0.179)**	**(0.139)**	(0.235)	**(0.422)**	(0.556)	(0.422)	(0.309)	**(0.361)**	**(0.355)**
Dummy border region	0.006	0.018	0.028	0.033	0.02	0.043	0.018	0.028	0.02	0.038	0.025	0.021
	(0.018)	(0.018)	(0.022)	(0.021)	(0.021)	(0.028)	(0.026)	(0.029)	(0.029)	(0.027)	(0.042)	(0.037)
Distance from Moscow	**0.009** **	**0.007***	0.006	0.004	-0.004	0.003	**0.010***	0.007	**0.012***	-0.001	**0.015***	**0.022*** **
	(0.005)	**(0.004)**	(0.006)	(0.004)	(0.006)	(0.005)	**(0.006)**	(0.005)	**(0.006)**	(0.006)	**(0.008)**	**(0.007)**
Dummy republic	**0.090** **	0.068	0.065	0.011	0.066	0.039	0.15	0.138	0.073	0.091	0.038	0.134
	(0.045)	(0.050)	(0.053)	(0.051)	(0.050)	(0.090)	(0.098)	(0.098)	(0.066)	(0.058)	(0.094)	(0.091)
Overrepresentation in State Duma	**-0.031***	0.001	-0.007	-0.005	0.001	0.005	-0.024	-0.014	-0.013	**0.013** **	**0.022** **	-0.012
	(0.017)	(0.016)	(0.018)	(0.019)	(0.024)	(0.020)	(0.014)	(0.013)	(0.017)	**(0.006)**	**(0.010)**	(0.010)
Power	-0.017	-0.015	-0.019	0.004	-0.014	-0.013	-0.002	-0.001	-0.003	**-0.043***	-0.049	**-0.055***
	(0.012)	(0.013)	(0.017)	(0.016)	(0.016)	(0.020)	(0.020)	(0.021)	(0.019)	**(0.0230)**	(0.038)	**(0.031)**
Fiscal transfers	0.192	-0.045	-0.102	-0.035	0.133	0.065	0.202	**0.249***	**0.269***	**0.499** **	0.182	**0.556*** **
	(0.163)	(0.134)	(0.138)	(0.101)	(0.111)	(0.118)	(0.124)	**(0.137)**	**(0.156)**	**(0.199)**	(0.149)	**(0.195)**
Democratization	0.001	0.002	0	-0.001	-0.001	-0.001	-0.002	-0.003	-0.002	-0.002	0	0
	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.002)	(0.004)	(0.003)
Share of Russians	0.17	0.193	0.167	-0.009	**0.243***	0.122	0.263	**0.258***	**0.260** **	**0.197***	0.113	**0.415** **
	(0.160)	(0.166)	(0.145)	(0.121)	**(0.135)**	(0.180)	(0.171)	**(0.135)**	**(0.108)**	**(0.109)**	(0.202)	**(0.192)**
Urbanization	0.237	0.825	1.927	1.853	**3.777***	3.2	**3.609** **	**3.260***	2.739	**4.753*** **	3.519	**6.623*** **
	(0.961)	(0.947)	(1.594)	(2.054)	**(2.255)**	(2.250)	**(1.605)**	**(1.797)**	(1.882)	**(1.509)**	(2.462)	**(2.160)**
Constant	0.476*	0.422*	0.548***	0.544***	0.191	0.312	-0.007	0.085	0.199	0.37	0.646**	0.205
	(0.248)	(0.234)	(0.203)	(0.173)	(0.207)	(0.238)	(0.266)	(0.306)	(0.285)	(0.281)	(0.308)	(0.350)
No. obs.	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	**79**	79	77	78
R^2	**0.533**	**0.403**	**0.335**	**0.43**	**0.486**	**0.367**	**0.421**	**0.424**	**0.508**	0.547	0.342	0.531
F-test	**12.51*** **	**8.40*** **	**13.42*** **	**36.89*** **	**25.51*** **	**8.57*** **	**37.56*** **	**404.10*** **	**36.22*** **	**65.95*** **	**22.73*** **	**35.21*** **
Jarque Bera	**577.3*** **	**404.5*** **	**24.22*** **	**7.066** **	**9.838*** **	**14.18*** **	**81.95*** **	**46.89*** **	**7.465** **	**7.317** **	**137.5*** **	**5.291***

Notes: numbers in parenthesis are robust Huber/White standard errors; *** significant at 1% level; ** significant at 5% level; * significant at 10% level. Significant results are marked bold.

Table C.4: Regressions for individual annual cross-sections after exclusion of outliers (until Jarque Bera test becomes insignificant), 1995-2006, dependent variable: retention rate

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Tax arrears squared	**-5.791***	-0.492	0.623	**1.377****	-2.873	**-3.178*****	**-1.443*****	**-0.233*****	**-0.308*****	**-0.031*****	-0.024	**-1.681****
	(3.190)	(1.940)	(1.490)	**(0.634)**	(1.946)	**(0.560)**	**(0.189)**	**(0.040)**	**(0.051)**	**(0.011)**	(0.018)	**(0.742)**
Tax structure												
Average income per capita	**0.112****	0.034	-0.055	-0.016	0.028	-0.015	-0.008	-0.019	-0.022	0.002	-0.013	**-0.019****
	(0.052)	(0.034)	(0.049)	(0.031)	(0.027)	(0.015)	(0.011)	(0.012)	(0.015)	(0.009)	(0.008)	**(0.007)**
Capital funds	**-1.296****	**-0.424****	0.089	-0.012	**-0.667*****	0.014	-0.103	0.089	0.091	**-0.137***	0.048	0.081
	(0.639)	**(0.207)**	(0.341)	(0.171)	**(0.228)**	(0.136)	(0.112)	(0.153)	(0.112)	**(0.069)**	(0.053)	(0.052)
Legal factors												
Dummy Tatarstan and Bashkortostan	**0.147*****	**0.204*****	0.075	**0.226*****	**0.295*****	**0.166*****	0.015	**-0.156*****	-0.031	**-0.114****	-0.125	-0.032
	(0.034)	**(0.052)**	(0.054)	**(0.038)**	**(0.055)**	**(0.059)**	(0.063)	**(0.053)**	(0.059)	**(0.052)**	(0.081)	(0.108)
Political variables												
Territory	**0.066*****	**0.030****	**0.048****	**0.028**	**0.055*****	**0.036****	**0.054*****	0.038	0.049**	**0.089*****	**0.066****	**0.056****
	(0.015)	**(0.013)**	**(0.023)**	**(0.017)**	**(0.020)**	**(0.014)**	**(0.016)**	(0.025)	(0.019)	**(0.021)**	**(0.025)**	**(0.023)**
Population	0.026	0.008	-0.028	-0.017	0.040**	-0.012	0.015	-0.001	-0.012	**0.039****	-0.004	-0.008
	(0.019)	(0.015)	(0.027)	(0.016)	(0.020)	(0.014)	(0.013)	(0.023)	(0.021)	**(0.015)**	(0.021)	(0.023)
Oil and gas share	**0.500****	0.247**	0	-0.001	**0.276*****	0.002	0.232	-0.383	-0.518	0.213	**-0.621****	**-0.769****
	(0.249)	(0.109)	(0.168)	(0.104)	**(0.103)**	(0.137)	(0.251)	(0.479)	(0.369)	(0.259)	**(0.263)**	**(0.332)**
Dummy border region	0.017	**0.025***	0.024	0.022	0.022	0.022	**0.033***	0.033	0.037	**0.059****	0.046	0.033
	(0.010)	**(0.014)**	(0.020)	(0.014)	(0.020)	(0.017)	**(0.019)**	(0.026)	(0.026)	**(0.024)**	(0.035)	(0.034)
Distance from Moscow	**0.009*****	**0.006***	0.003	0.005	-0.004	0.003	0.005	0.006	**0.013****	-0.003	0.011	**0.020*****
	(0.003)	**(0.003)**	(0.005)	(0.003)	(0.005)	(0.003)	(0.003)	(0.005)	**(0.006)**	(0.005)	(0.007)	**(0.006)**
Dummy republic	**0.049***	0.029	0.041	0.029	0.039	**0.122****	**0.116*****	**0.211*****	0.083	**0.122****	0.061	0.146
	(0.028)	(0.038)	(0.045)	(0.036)	(0.049)	**(0.048)**	**(0.046)**	**(0.070)**	(0.067)	**(0.049)**	(0.085)	(0.088)
Overrepresentation in State Duma	**-0.016***	0.011	0.004	**0.012***	0.013	**0.035*****	**-0.020****	-0.01	-0.008	**0.013****	**0.022****	-0.011
	(0.009)	(0.008)	(0.014)	**(0.007)**	(0.020)	**(0.013)**	**(0.010)**	(0.009)	(0.013)	**(0.006)**	**(0.009)**	(0.010)
Power	**-0.020****	-0.016	-0.011	0.013	-0.013	-0.004	0.011	0.004	-0.004	**-0.048****	**-0.072****	**-0.068****
	(0.009)	(0.012)	(0.015)	(0.013)	(0.016)	(0.016)	(0.015)	(0.019)	(0.018)	**(0.020)**	**(0.029)**	**(0.029)**
Fiscal transfers	0.039	-0.127	-0.041	0.069	0.091	-0.008	**0.233*****	0.133	0.154	**0.667*****	**0.250***	**0.570*****
	(0.060)	(0.076)	(0.111)	(0.061)	(0.086)	(0.075)	**(0.067)**	(0.109)	(0.127)	**(0.141)**	**(0.132)**	**(0.191)**
Democratization	0	0.001	-0.002	0.001	-0.003	-0.002	-0.002	**-0.006****	-0.002	-0.002	0	0
	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	**(0.003)**	(0.003)	(0.002)	(0.003)	(0.003)
Share of Russians	-0.015	0.026	0.054	0.011	0.116	**0.181***	**0.149***	**0.337*****	**0.257****	**0.266*****	0.206	**0.455****
	(0.053)	(0.071)	(0.087)	(0.059)	(0.094)	**(0.097)**	**(0.082)**	**(0.106)**	**(0.107)**	**(0.089)**	(0.179)	**(0.187)**
Urbanization	-0.072	1.11	2.092	-1.357	**4.414****	0.686	**3.280****	2.453	1.447	**5.741*****	3.011	**6.312*****
	(0.874)	(0.740)	(1.724)	(1.066)	**(2.163)**	(1.210)	**(1.303)**	(1.543)	(1.545)	**(1.303)**	(2.417)	**(2.115)**
Constant	0.746***	0.639***	0.670***	0.612***	0.350**	0.456***	0.064	0.185	0.355	0.191	0.694**	0.251
	(0.098)	(0.115)	(0.168)	(0.126)	(0.169)	(0.152)	(0.162)	(0.263)	(0.243)	(0.207)	(0.289)	(0.336)
No. obs.	**78**	**78**	**77**	**75**	**78**	**74**	**73**	**77**	**78**	**76**	**76**	**77**
R^2	**0.718**	**0.519**	**0.363**	**0.726**	**0.503**	**0.601**	**0.688**	**0.575**	**0.548**	**0.69**	**0.471**	**0.578**
F-test	**18.76*****	**14.05*****	**14.94*****	**46.32*****	**100.14*****	**9.80*****	**45.98*****	**263.11*****	**43.36*****	**93.73*****	**31.63*****	**34.49*****
Jarque Bera	**0.385**	**1.177**	**0.678**	**0.535**	**4.436**	**0.011**	**2.264**	**1.416**	**0.643**	**1.076**	**3.217**	**0.789**
Outliers	Ingushetia	Ingushetia	Ingushetia Kalmykia	Altai Rep. Ingushetia Kalmykia Vologda	Ingushetia	Altai Rep. Omsk Mordovia Ingushetia Magadan	Kabardino-Balkaria Khakassia Mordovia Ingushetia Lipetsk Magadan	Magadan Mordovia	Magadan	Lipetsk Novgorod Briansk	Voronezh	Voronezh

Notes: see *Table C.3.*

C.3 Robust regressions and regressions with lagged variable

Table C.5: Robust regressions after exclusion of outliers (until Jarque Bera test becomes insignificant), 1995-2006, dep. var.: retention rate

	(C1) OLS	(C2) OLS	(C3) OLS	(C4) OLS	(C5) OLS	(C6) OLS	(C7) OLS	(C8) OLS	(C9) OLS	(C10) OLS
Tax arrears squared (Putin)	**-0.035*** **	**-0.033*** **	-0.555	-0.194	**-0.064*** **	-0.117	**0.049** **	-0.726	**0.033*** **	-0.08
	(0.007)	**(0.007)**	(0.608)	(0.452)	**(0.005)**	(0.343)	**(0.025)**	(0.520)	**(0.012)**	(0.297)
Tax arrears squared (Yeltsin)	**2.575*** **	**1.719*** **	**2.566*** **	**1.662*** **	**1.121** **	**1.338*** **	**3.772*** **	**3.719*** **	**0.975** **	**1.185***
	(0.426)	**(0.433)**	**(0.433)**	**(0.427)**	**(0.494)**	**(0.499)**	**(0.630)**	**(0.661)**	**(0.452)**	**(0.611)**
Dummy Putin		**-0.069*** **		**-0.067*** **						
		(0.011)		**(0.011)**						
Tax structure										
Average income per capita	**0.021*** **	**0.022*** **	**0.020*** **	**0.021*** **	-0.001	0.002	**0.014*** **	**0.014*** **	0.001	0.001
	(0.003)	**(0.003)**	**(0.003)**	**(0.003)**	(0.003)	(0.003)	**(0.002)**	**(0.002)**	(0.003)	(0.003)
Capital funds	**-0.086*** **	**-0.088*** **	**-0.079*** **	**-0.083*** **	**-0.044** **	**-0.041** **	**-0.089*** **	**-0.085*** **	**-0.080*** **	**-0.085*** **
	(0.014)	**(0.014)**	**(0.015)**	**(0.015)**	**(0.018)**	**(0.020)**	**(0.018)**	**(0.018)**	**(0.017)**	**(0.018)**
Legal factors										
Dummy Tatarstan and Bashkortostan (Putin)	**-0.065***	**-0.061***	**-0.070** **	**-0.062***	**-0.132*** **	**-0.130*** **				
	(0.035)	**(0.037)**	**(0.035)**	**(0.037)**	**(0.035)**	**(0.036)**				
Dummy Tatarstan and Bashkortostan (Yeltsin)	**0.170*** **	**0.171*** **	**0.168*** **	**0.174*** **	**0.146*** **	**0.153*** **				
	(0.028)	**(0.026)**	**(0.029)**	**(0.027)**	**(0.024)**	**(0.025)**				
Political variables										
Territory	**0.024** **	**0.025** **	0.015	0.015	**0.031*** **	**0.025*** **				
	(0.011)	**(0.011)**	(0.011)	(0.010)	**(0.007)**	**(0.007)**				
Population	-0.005	-0.004	-0.004	-0.004	0	-0.002	**0.081** **	**0.067** **	**0.107*** **	**0.105*** **
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	**(0.032)**	**(0.031)**	**(0.025)**	**(0.026)**
Oil and gas share	-0.018	-0.011	-0.009	-0.001	-0.035	-0.046	2.865	1.955	5.255	5.756
	(0.047)	(0.045)	(0.049)	(0.047)	(0.046)	(0.052)	(4.750)	(4.711)	(3.727)	(3.870)
Dummy border region	**0.023*** **	**0.024*** **	**0.017** **	**0.016***	**0.020*** **	**0.016** **				
	(0.009)	**(0.008)**	**(0.008)**	**(0.008)**	**(0.007)**	**(0.007)**				
Distance from Moscow	**0.005*** **	**0.005*** **	**0.006*** **	**0.005*** **	**0.006*** **	**0.006*** **				
	(0.002)	**(0.002)**	**(0.002)**	**(0.002)**	**(0.001)**	**(0.001)**				
Dummy republic	**0.079*** **	**0.082*** **	**0.102*** **	**0.100*** **	**0.096*** **	**0.105*** **				
	(0.022)	**(0.022)**	**(0.021)**	**(0.021)**	**(0.016)**	**(0.016)**				
Overrepresentation in State Duma	-0.007	-0.007	0.004	0.003	**0.008** **	**0.010*** **	0.003	0.005	0.006	0.005
	(0.005)	(0.005)	(0.006)	(0.006)	**(0.003)**	**(0.003)**	(0.007)	(0.006)	(0.004)	(0.004)
Power (2001-2006)	**-0.028*** **	**-0.024*** **	**-0.018** **	**-0.015** **	**-0.022*** **	**-0.017** **				
	(0.007)	**(0.007)**	**(0.007)**	**(0.007)**	**(0.008)**	**(0.008)**				
Power (1995-2000)	**-0.018** **	**-0.021*** **	-0.009	**-0.012***	-0.006	-0.002				
	(0.007)	**(0.007)**	(0.007)	**(0.007)**	(0.006)	(0.006)				
Fiscal transfers	0.053	**0.072** **	**0.060***	**0.076** **	**0.080*** **	**0.083*** **	**-0.182*** **	**-0.231*** **	-0.021	-0.047
	(0.036)	**(0.035)**	**(0.035)**	**(0.034)**	**(0.028)**	**(0.029)**	**(0.041)**	**(0.042)**	(0.027)	(0.028)
Democratization	**-0.002***	**-0.002***	-0.001	-0.001	**-0.002** **	-0.001	**-0.006*** **	**-0.006** **	0	0.001
	(0.001)	**(0.001)**	(0.001)	(0.001)	**(0.001)**	(0.001)	**(0.002)**	**(0.002)**	(0.001)	(0.002)
Share of Russians	**0.138*** **	**0.145*** **	**0.190*** **	**0.190*** **	**0.152*** **	**0.177*** **				
	(0.042)	**(0.042)**	**(0.039)**	**(0.038)**	**(0.030)**	**(0.029)**				
Urbanization	0.266	0.365	**-1.079** **	**-1.044** **	0.636	-0.28	3.173	5.642	1.469	4.206
	(0.570)	(0.547)	**(0.510)**	**(0.491)**	(0.429)	(0.396)	(3.558)	(3.463)	(2.469)	(2.66)
Constant	0.615***	0.633***	0.580***	0.605***	0.700***	0.665***	0.501*	0.344	0.335*	-0.702***
	(0.074)	(0.071)	(0.070)	(0.068)	(0.075)	(0.075)	(0.261)	(0.252)	(0.189)	(0.204)
Region fixed effects	**No**	**No**	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**
Time fixed effects	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**No**	**No**	**Yes**	**Yes**
Kalmykia, Altai Rep. and Ingushetia included	**Yes**	**Yes**	**No**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
Observations	**899**	**895**	**884**	**884**	**875**	**866**	**924**	**901**	**879**	**870**
R^2	**0.363**	**0.394**	**0.392**	**0.413**	**0.61**	**0.613**				
F-test	**27.87*** **	**29.61*** **	**24.70*** **	**25.38*** **	**45.34*** **	**37.91*** **	**13.55*** **	**13.58*** **	**34.84*** **	**69.64*** **
Jarque Bera	**4.442**	**4.275**	**1.463**	**3.965**	**4.548**	**1.044**	**4.294**	**3.276**	**2.083**	**4.447**

Notes for *Table C.5: see tables 3.1 and 3.2.* Outliers include (Moscow = City of Moscow, K.-Balkaria = Kabardino-Balkaria, Bashkort. = Bashkortostan)

(C1)	(C2)	(C3)	(C4)	(C5)	(C6)	(C7)	(C8)	(C9)	(C10)
Evereyskaia 2004	Evereyskaia 2004	Chukotka 2002	Chukotka 2002	Chukotka 2002	Chukotka 2001	Chukotka 2002	Chukotka 2002	Chukotka 2001	Chukotka 2001
Evereyskaia 2005	Evereyskaia 2005	Chukotka 2003	Chukotka 2003	Chukotka 2003	Chukotka 2002	Chukotka 2003	Chukotka 2003	Chukotka 2002	Chukotka 2002
Evereyskaia 2006	Evereyskaia 2006	Chukotka 2006	Chukotka 2006	Chukotka 2006	Chukotka 2003	Chukotka 2006	Chukotka 2006	Chukotka 2003	Chukotka 2003
Chukotka 2002	Chukotka 2002	Magadan 2003	Magadan 2003	Moscow 1998	Chukotka 2006	Omsk 2000	Omsk 2000	Chukotka 2005	Chukotka 2005
Chukotka 2003	Chukotka 2003	Magadan 2004	Magadan 2004	Moscow 2006	Arkhangelsk 2005	Tula 2006	Voronezh 2005	Chukotka 2006	Chukotka 2006
Chukotka 2006	Chukotka 2006	Omsk 2000	Omsk 2000	Arkhangelsk 2005	Arkhangelsk 2006	Voronezh 2005	Altai (Rep.) 1995	Moscow 2006	Moscow 2006
Novgorod 2004	Lipetsk 2004	Riazan 2001	Riazan 2001	Arkhangelsk 2006	Magadan 2001	Altai (Rep.) 1995	Altai (Rep.) 1996	Amur 1996	Arkhangelsk 2005
Novgorod 2005	Magadan 2003	Riazan 2002	Riazan 2002	Lipetsk 2000	Magadan 2002	Altai (Rep.) 1999	Altai (Rep.) 1997	Arkhangelsk 2005	Arkhangelsk 2006
Omsk 2000	Novgorod 2004	Tomsk 2004	Tomsk 2004	Lipetsk 2002	Magadan 2003	Ingushetia 1995	Altai (Rep.) 1998	Arkhangelsk 2006	Cheliabinsk 2005
Riazan 2001	Novgorod 2005	Tomsk 2005	Tomsk 2005	Magadan 2001	Magadan 2004	Ingushetia 1996	Altai (Rep.) 1999	Cheliabinsk 1999	Magadan 1998
Riazan 2002	Novgorod 2006	Tomsk 2006	Tomsk 2006	Magadan 2002	Novgorod 2004	Ingushetia 2001	Altai (Rep.) 2000	Cheliabinsk 2005	Magadan 2003
Tomsk 2004	Omsk 2000	Tula 2004	Tula 2004	Magadan 2003	Novgorod 2005	Ingushetia 2004	Altai (Rep.) 2001	Cheliabinsk 2006	Omsk 2000
Tomsk 2005	Riazan 2001	Tula 2006	Tula 2006	Magadan 2004	Omsk 2000	Ingushetia 2005	Altai (Rep.) 2002	Lipetsk 1995	Omsk 2002
Tomsk 2006	Riazan 2002	Voronezh 2005	Voronezh 2005	Novgorod 2004	Orenburg 2005	Ingushetia 2006	Altai (Rep.) 2003	Magadan 1995	Orenburg 2005
Tula 2004	Tomsk 2004	Voronezh 2006	Voronezh 2006	Novgorod 2005	Orenburg 2006	K.-Balkaria 2006	Altai (Rep.) 2004	Magadan 1998	Orenburg 2006
Tula 2006	Tomsk 2005	Altai (Rep.) 1995	Altai (Rep.) 1995	Novgorod 2006	Riazan 2001	Kalmykia 1995	Altai (Rep.) 2005	Magadan 2003	Tomsk 2004
Vologda 1998	Tomsk 2006	Altai (Rep.) 1996	Altai (Rep.) 1996	Omsk 2000	Tomsk 2004	Mordovia 1998	Altai (Rep.) 2006	Omsk 2000	Tomsk 2005
Voronezh 2005	Tula 2004	Altai (Rep.) 1997	Altai (Rep.) 1997	Orenburg 2005	Tomsk 2005	Mordovia 2000	Ingushetia 1995	Omsk 2002	Tomsk 2006
Voronezh 2006	Tula 2006	Altai (Rep.) 1998	Altai (Rep.) 1998	Orenburg 2006	Tomsk 2006	Mordovia 2001	Ingushetia 1996	Orenburg 2005	Tula 2004
Altai (Rep.) 1998	Vologda 1998	Altai (Rep.) 1999	Altai (Rep.) 1999	Riazan 2001	Tula 2004	Mordovia 2002	Ingushetia 1997	Orenburg 2006	Tula 2006
Altai (Rep.) 1999	Voronezh 2005	Altai (Rep.) 2000	Altai (Rep.) 2000	Tomsk 2004	Tula 2006	Sakha 1995	Ingushetia 1998	Tomsk 1997	Voronezh 2005
Altai (Rep.) 2000	Voronezh 2006	Altai (Rep.) 2001	Altai (Rep.) 2001	Tomsk 2005	Vologda 1998		Ingushetia 1999	Tomsk 2004	Voronezh 2006
Ingushetia 1995	Altai (Rep.) 1998	Altai (Rep.) 2002	Altai (Rep.) 2002	Tomsk 2006	Voronezh 2005		Ingushetia 2000	Tomsk 2005	Altai (Rep.) 1995
Ingushetia 1996	Altai (Rep.) 1999	Altai (Rep.) 2003	Altai (Rep.) 2003	Tula 2006	Voronezh 2006		Ingushetia 2001	Tomsk 2006	Altai (Rep.) 1996
Ingushetia 1997	Altai (Rep.) 2000	Altai (Rep.) 2004	Altai (Rep.) 2004	Vologda 1998	Altai (Rep.) 1995		Ingushetia 2002	Tula 2004	Altai (Rep.) 1997
Ingushetia 1999	Ingushetia 1995	Altai (Rep.) 2005	Altai (Rep.) 2005	Voronezh 2005	Altai (Rep.) 1996		Ingushetia 2003	Tula 2006	Altai (Rep.) 1998
Ingushetia 2000	Ingushetia 1996	Altai (Rep.) 2006	Altai (Rep.) 2006	Voronezh 2006	Altai (Rep.) 1997		Ingushetia 2004	Voronezh 2004	Altai (Rep.) 1999
Ingushetia 2001	Ingushetia 1997	Ingushetia 1995	Ingushetia 1995	Altai (Rep.) 1997	Altai (Rep.) 1998		Ingushetia 2005	Voronezh 2005	Altai (Rep.) 2000
Ingushetia 2006	Ingushetia 1999	Ingushetia 1996	Ingushetia 1996	Altai (Rep.) 1998	Altai (Rep.) 1999		Ingushetia 2006	Voronezh 2006	Altai (Rep.) 2001
K.-Balkaria 2006	Ingushetia 2001	Ingushetia 1997	Ingushetia 1997	Altai (Rep.) 1999	Altai (Rep.) 2000		K.-Balkaria 2006	Altai (Rep.) 1995	Altai (Rep.) 2002
Kalmykia 1998	Ingushetia 2006	Ingushetia 1998	Ingushetia 1998	Altai (Rep.) 2000	Altai (Rep.) 2001		Kalmykia 1995	Altai (Rep.) 1996	Altai (Rep.) 2003
Kalmykia 1999	K.-Balkaria 2006	Ingushetia 1999	Ingushetia 1999	Altai (Rep.) 2001	Altai (Rep.) 2002		Kalmykia 1996	Altai (Rep.) 1998	Altai (Rep.) 2004
Kalmykia 2000	Kalmykia 1997	Ingushetia 2000	Ingushetia 2000	Altai (Rep.) 2005	Altai (Rep.) 2003		Kalmykia 1997	Altai (Rep.) 1999	Altai (Rep.) 2005
Kalmykia 2001	Kalmykia 1998	Ingushetia 2001	Ingushetia 2001	Altai (Rep.) 2006	Altai (Rep.) 2004		Kalmykia 1998	Altai (Rep.) 2000	Altai (Rep.) 2006
Kalmykia 2002	Kalmykia 1999	Ingushetia 2002	Ingushetia 2002	Bashkort. 2000	Altai (Rep.) 2005		Kalmykia 1999	Bashkort. 1998	Ingushetia 1995
Kalmykia 2003	Kalmykia 2000	Ingushetia 2003	Ingushetia 2003	Ingushetia 1995	Altai (Rep.) 2006		Kalmykia 2000	Bashkort. 2005	Ingushetia 1996
Komi 2005	Kalmykia 2001	Ingushetia 2004	Ingushetia 2004	Ingushetia 1996	Bashkort. 2000		Kalmykia 2001	Ingushetia 1995	Ingushetia 1997
Komi 2006	Kalmykia 2002	Ingushetia 2005	Ingushetia 2005	Ingushetia 1997	Ingushetia 1995		Kalmykia 2002	Ingushetia 1996	Ingushetia 1998
Mordovia 2000	Kalmykia 2003	Ingushetia 2006	Ingushetia 2006	Ingushetia 1999	Ingushetia 1996		Kalmykia 2003	Ingushetia 1997	Ingushetia 1999
Mordovia 2001	Komi 2005	K.-Balkaria 2006	K.-Balkaria 2006	Ingushetia 2000	Ingushetia 1997		Kalmykia 2004	Ingushetia 1999	Ingushetia 2000
Mordovia 2002	Komi 2006	Kalmykia 1995	Kalmykia 1995	Ingushetia 2001	Ingushetia 1998		Kalmykia 2005	Ingushetia 2001	Ingushetia 2001
Sakha 1995	Mordovia 2000	Kalmykia 1996	Kalmykia 1996	K.-Balkaria 2001	Ingushetia 1999		Mordovia 2000	Ingushetia 2002	Ingushetia 2002
Tatarstan 2000	Mordovia 2001	Kalmykia 1997	Kalmykia 1997	K.-Balkaria 2006	Ingushetia 2000		Mordovia 2001	Ingushetia 2003	Ingushetia 2003
Tyva 2004	Mordovia 2002	Kalmykia 1998	Kalmykia 1998	Kalmykia 1996	Ingushetia 2001		Mordovia 2002	Ingushetia 2004	Ingushetia 2004
Tyva 2005	N. Ossetia 2005	Kalmykia 1999	Kalmykia 1999	Kalmykia 1997	Ingushetia 2002			Ingushetia 2005	Ingushetia 2005
Udmurtia 2006	Sakha 1995	Kalmykia 2000	Kalmykia 2000	Kalmykia 1998	Ingushetia 2003			Ingushetia 2006	Ingushetia 2006
	Tatarstan 2000	Kalmykia 2001	Kalmykia 2001	Kalmykia 1999	Ingushetia 2004			K.-Balkaria 2001	K.-Balkaria 2001

Tyva 2004	Kalmykia 2002	Kalmykia 2002	Kalmykia 2000	Ingushetia 2005	K.-Balkaria 2005	K.-Balkaria 2005
Tyva 2005	Kalmykia 2003	Kalmykia 2003	Kalmykia 2001	Ingushetia 2006	K.-Balkaria 2006	K.-Balkaria 2006
Udmurtia 2006	Kalmykia 2004	Kalmykia 2004	Kalmykia 2002	K.-Balkaria 2001	Kalmykia 1995	Kalmykia 1995
	Kalmykia 2005	Kalmykia 2005	Kalmykia 2003	K.-Balkaria 2006	Kalmykia 1996	Kalmykia 1996
	Komi 2005	Komi 2005	Karelia 2002	Kalmykia 1995	Khakassia 2001	Kalmykia 1997
	Komi 2006	Komi 2006	Khakassia 2001	Kalmykia 1996	Komi 2005	Kalmykia 1998
	Mordovia 2000	Mordovia 2000	Khakassia 2002	Kalmykia 1997	Komi 2006	Kalmykia 1999
	Mordovia 2001	Mordovia 2001	Komi 2005	Kalmykia 1998	Mordovia 1995	Kalmykia 2000
	Mordovia 2002	Mordovia 2002	Komi 2006	Kalmykia 1999	Mordovia 1998	Kalmykia 2001
	N. Ossetia 2005	N. Ossetia 2005	Mordovia 2000	Kalmykia 2000	Mordovia 2000	Kalmykia 2002
	Sakha 1995	Sakha 1995	Mordovia 2001	Kalmykia 2001	Mordovia 2001	Kalmykia 2003
	Tatarstan 2000	Tatarstan 2000	Mordovia 2002	Kalmykia 2002	Mordovia 2002	Kalmykia 2004
	Tyva 2005	Tyva 2005	Mordovia 2003	Kalmykia 2003	N. Ossetia 2005	Kalmykia 2005
	Udmurtia 2006	Udmurtia 2006	Mordovia 2005	Kalmykia 2004	Sakha 1995	Khakassia 2001
			N. Ossetia 2003	Kalmykia 2005	Tatarstan 2000	Komi 2005
			N. Ossetia 2005	Khakassia 2001	Tatarstan 2005	Komi 2006
			Sakha 1995	Khakassia 2002	Tatarstan 2006	Mordovia 1995
			Tatarstan 2000	Komi 2004	Udmurtia 2005	Mordovia 1998
			Tatarstan 2001	Komi 2005	Udmurtia 2006	Mordovia 2000
			Tyva 2005	Komi 2006		Mordovia 2001
			Udmurtia 2004	Mordovia 2000		Mordovia 2002
			Udmurtia 2005	Mordovia 2001		N. Ossetia 2005
			Udmurtia 2006	Mordovia 2002		Sakha 1995
				Mordovia 2003		Tatarstan 2000
				Mordovia 2005		Tatarstan 2005
				N. Ossetia 2005		Tatarstan 2006
				Sakha 1995		Udmurtia 2005
				Tatarstan 2000		Udmurtia 2006
				Tatarstan 2001		
				Udmurtia 2004		
				Udmurtia 2005		
				Udmurtia 2006		

Table C.6: Robust regressions after exclusion of political variables, 1995-2006, dep. var.: retention rate

	(C11) OLS	(C12) OLS	(C13) OLS	(C14) OLS	(C15) OLS	(C16) OLS	(C17) OLS	(C18) OLS	(C19) OLS	(C20) OLS
Tax arrears squared (Putin)	**-0.084****	**-0.074****	**-0.086*****	0.039	0.027	-0.439	0.019	0.193	-0.474	0.206
	(0.038)	**(0.036)**	**(0.033)**	(0.030)	(0.023)	(0.661)	(0.511)	(0.318)	(0.512)	(0.249)
Tax arrears squared (Yeltsin)	**2.266****	0.217	0.162	**4.305*****	**2.266****	**3.175*****	**1.270*****	**1.286****	**4.783*****	**2.795*****
	(1.028)	(1.123)	(1.264)	**(0.786)**	**(0.904)**	**(0.522)**	**(0.487)**	**(0.587)**	**(0.783)**	**(0.933)**
Dummy Putin		**-0.074*****					**-0.067*****			
		(0.017)					**(0.015)**			
Tax structure										
Average income per capita	**0.010*****	**0.016*****	0.007	**0.009*****	0.004	**0.009*****	**0.014*****	0.006	**0.009*****	0.006
	(0.003)	**(0.004)**	(0.005)	**(0.002)**	(0.004)	**(0.003)**	**(0.004)**	(0.005)	**(0.002)**	(0.004)
Capital funds	**-0.084*****	**-0.095*****	**-0.079*****	**-0.056*****	**-0.044****	**-0.089*****	**-0.098*****	**-0.083*****	**-0.055*****	**-0.046****
	(0.015)	**(0.017)**	**(0.016)**	**(0.020)**	**(0.022)**	**(0.015)**	**(0.017)**	**(0.016)**	**(0.020)**	**(0.022)**
Legal factors										
Dummy Tatarstan and Bashkortostan (Putin)		-0.039	-0.044			**-0.060***	-0.043	-0.049		
	-0.058									
	(0.036)	(0.039)	(0.047)			**(0.035)**	(0.038)	(0.045)		
Dummy Tatarstan and Bashkortostan (Yeltsin)		**0.167*****	**0.163*****			**0.147*****	**0.147*****	**0.143*****		
	0.169***									
	(0.024)	**(0.021)**	**(0.023)**			**(0.024)**	**(0.020)**	**(0.022)**		
Constant	0.601***	0.635***	0.639***	0.201***	0.542***	0.611***	0.641***	0.646***	0.532***	0.528***
	(0.009)	(0.010)	(0.022)	(0.051)	(0.044)	(0.008)	(0.006)	(0.023)	(0.050)	(0.042)
Region fixed effects	**No**	**No**	**No**	**Yes**	**Yes**	**No**	**No**	**No**	**Yes**	**Yes**
Time fixed effects	**No**	**No**	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**	**No**	**Yes**
Kalmykia, Altai Rep. and Ingushetia included	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**	**No**
Observations	**945**	**945**	**945**	**945**	**945**	**910**	**910**	**910**	**910**	**910**
R^2	**0.108**	**0.143**	**0.23**			**0.137**	**0.419**	**0.265**		
F-test	**20.59*****	**25.23*****	**19.81*****	**13.09*****	**17.10*****	**22.59*****	**25.76*****	**22.05*****	**10.57*****	**17.19*****

Notes: see *Tables 3.1 and 3.2*.

Table C.7: Lagged regressions, 1996-2006, dep. var.: retention rate of the period t+1

	(C21) OLS	(C22) OLS	(C23) OLS	(C24) OLS	(C25) OLS	(C26) OLS	(C27) OLS	(C28) OLS	(C29) OLS	(C30) OLS
Tax arrears squared (Putin)	-0.021	-0.016	-0.031	**0.078*** **	**0.057*** **	-1.28	-0.66	-0.442	**-1.312***	-0.3
	(0.031)	(0.029)	(0.026)	**(0.025)**	**(0.017)**	(0.927)	(0.620)	(0.427)	**(0.754)**	(0.348)
Tax arrears squared (Yeltsin)	0.182	-1.5	-0.525	**1.492****	1.238	**1.104***	-0.364	0.874	**1.515****	**1.588***
	(1.032)	(1.070)	(1.173)	**(0.746)**	(0.862)	**(0.594)**	(0.617)	(0.626)	**(0.764)**	**(0.936)**
Dummy Putin		**-0.125*** **					**-0.109*** **			
		(0.017)					**(0.015)**			
Tax structure										
Average income per capita	0.007	**0.011****	-0.006	**0.014*** **	-0.007	0.006	**0.010***	-0.003	**0.013*** **	-0.003
	(0.005)	**(0.005)**	(0.006)	**(0.004)**	(0.007)	(0.005)	**(0.005)**	(0.006)	**(0.004)**	(0.007)
Capital funds	**-0.062****	**-0.071*** **	-0.034	**-0.093*** **	**-0.073*** **	-0.041	**-0.049***	-0.018	**-0.075*** **	**-0.063****
	(0.026)	**(0.026)**	(0.028)	**(0.028)**	**(0.028)**	(0.027)	**(0.028)**	(0.029)	**(0.029)**	**(0.029)**
Legal factors										
Dummy Tatarstan and Bashkortostan (Yeltsin)		**0.269*** **	**0.244*** **			**0.215*** **	**0.227*** **	**0.204*** **		
	0.257* **									
	(0.036)	**(0.036)**	**(0.035)**			**(0.034)**	**(0.032)**	**(0.032)**		
Dummy Tatarstan and Bashkortostan (Putin)		-0.035	-0.04			**-0.080****	-0.058	-0.056		
	-0.060*									
	(0.035)	(0.041)	(0.048)			**(0.033)**	(0.038)	(0.045)		
Political variables										
Territory	**0.037*** **	**0.037*** **	**0.046*** **			**0.021***	**0.020***	**0.029*** **		
	(0.013)	**(0.012)**	**(0.010)**			**(0.012)**	**(0.011)**	**(0.009)**		
Population	-0.004	-0.005	-0.003	**0.091****	**0.141*** **	-0.007	-0.007	-0.006	0.047	**0.097****
	(0.005)	(0.005)	(0.005)	**(0.039)**	**(0.050)**	(0.005)	(0.005)	(0.005)	(0.035)	**(0.043)**
Oil and gas share	-0.06	-0.045	-0.076	4.743	7.732	-0.083	-0.071	-0.1	2.326	5.323
	(0.078)	(0.072)	(0.066)	(5.814)	(6.020)	(0.083)	(0.079)	(0.069)	(5.662)	(5.819)
Dummy border region	**0.029****	**0.027****	**0.028*** **			0.015	0.014	0.015		
	(0.012)	**(0.012)**	**(0.011)**			(0.011)	(0.011)	(0.010)		
Distance from Moscow	**0.007*** **	**0.007*** **	**0.007*** **			**0.009*** **	**0.008*** **	**0.008*** **		
	(0.003)	**(0.003)**	**(0.002)**			**(0.002)**	**(0.002)**	**(0.002)**		
Dummy republic	**0.072****	**0.068****	**0.077*** **			**0.079*** **	**0.076*** **	**0.083*** **		
	(0.031)	**(0.031)**	**(0.029)**			**(0.029)**	**(0.029)**	**(0.027)**		
Overrepresentation in State Duma	-0.009	-0.011	-0.003	-0.018	-0.008	-0.001	-0.003	0.002	-0.012	-0.005
	(0.009)	(0.009)	(0.007)	(0.019)	(0.014)	(0.009)	(0.009)	(0.007)	(0.015)	(0.013)
Power (2001-2006)	**-0.024****	**-0.017***	**-0.036*** **			-0.016	-0.01	**-0.032****		
	(0.010)	**(0.009)**	**(0.014)**			(0.010)	(0.009)	**(0.014)**		
Power (1995-2000)	**-0.025****	**-0.029*** **	-0.012			**-0.017***	**-0.020****	-0.001		
	(0.010)	**(0.009)**	(0.008)			**(0.010)**	**(0.009)**	(0.007)		
Fiscal transfers	**0.116****	**0.147*** **	**0.169*** **	-0.027	0.074	**0.077***	**0.106****	**0.134*** **	**-0.168*** **	-0.054
	(0.056)	**(0.055)**	**(0.055)**	(0.066)	(0.059)	**(0.043)**	**(0.041)**	**(0.041)**	**(0.044)**	(0.039)
Democratization	-0.001	-0.001	-0.001	**-0.006****	0	-0.001	-0.001	0	**-0.005****	0
	(0.001)	(0.001)	(0.001)	**(0.003)**	(0.002)	(0.001)	(0.001)	(0.001)	**(0.002)**	(0.002)
Share of Russians	**0.180*** **	**0.181*** **	**0.191*** **			**0.165*** **	**0.166*** **	**0.177*** **		
	(0.065)	**(0.064)**	**(0.059)**			**(0.052)**	**(0.051)**	**(0.045)**		
Urbanization	**2.371*** **	**2.398*** **	**3.100*** **	3.792	0.415	0.189	0.215	0.702	**8.015***	3.053
	(0.779)	**(0.754)**	**(0.770)**	(4.739)	(4.574)	(0.674)	(0.646)	(0.625)	**(4.595)**	(4.585)
Constant	0.448***	0.490***	0.550***	0.509	0.284	0.561***	0.595***	0.674***	0.242	0.207
	(0.112)	(0.107)	(0.131)	(0.575)	(0.329)	(0.091)	(0.088)	(0.112)	(0.351)	(0.332)
Region fixed effects	**No**	**No**	**No**	**Yes**	**Yes**	**No**	**No**	**No**	**Yes**	**Yes**
Time fixed effects	**No**	**No**	**Yes**	**No**	**Yes**	**No**	**No**	**Yes**	**No**	**Yes**
Kalmykia, Altai Rep. and Ingushetia included	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**	**No**
Observations	**867**	**867**	**867**	**867**	**867**	**834**	**834**	**834**	**834**	**834**
R^2	**0.188**	**0.209**	**0.292**			**0.216**	**0.231**	**0.311**		
F-test	**15.13*** **	**17.45*** **	**19.92*** **	**36.11*** **	**20.67*** **	**14.21*** **	**19.18*** **	**25.05*** **	**10.65*** **	**19.95*** **

Notes: see *Tables 3.1 and 3.2*.

C.4 Separate regressions for Yeltsin and Putin periods

Table C.8: Panel data regressions for Yeltsin period, 1995-1999, dep. var.: retention rate

	(D1) OLS	(D2) OLS	(D3) OLS	(D4) OLS	(D5) OLS	(D6) OLS	(D7) OLS	(D8) OLS
Tax arrears squared (Yeltsin)	0.282	-0.156	0.628	-0.615	**1.362*** **	**1.131** **	**2.488*** **	**1.113** **
	(1.082)	(1.260)	(0.844)	(0.795)	**(0.403)**	**(0.529)**	**(0.511)**	**(0.531)**
Tax structure								
Average income per capita	**-0.030*** **	0.021	**-0.066*** **	0.003	**-0.040*** **	0.006	**-0.058*** **	0.006
	(0.011)	(0.017)	**(0.014)**	(0.018)	**(0.010)**	(0.011)	**(0.013)**	(0.015)
Capital funds	-0.027	**-0.276*** **	**0.155** **	-0.076	0.073	**-0.110***	**0.091** **	**-0.124***
	(0.069)	**(0.096)**	**(0.060)**	(0.087)	(0.052)	**(0.063)**	**(0.045)**	**(0.068)**
Legal factors								
Dummy Tatarstan and Bashkortostan	**0.218*** **	**0.247*** **			**0.145*** **	**0.176*** **		
	(0.044)	**(0.045)**			**(0.024)**	**(0.026)**		
Political variables								
Territory	**0.057*** **	**0.052*** **			**0.038*** **	**0.034*** **		
	(0.014)	**(0.015)**			**(0.011)**	**(0.012)**		
Population	**-0.014** **	-0.001	-0.118	-0.254	**-0.019*** **	**-0.011** **	0.248	0.004
	(0.007)	(0.007)	(0.275)	(0.252)	**(0.005)**	**(0.004)**	(0.232)	(0.212)
Oil and gas share	0.039	**0.135** **	-1.074	-4.588	-0.015	0.048	-1.821	**-5.300***
	(0.048)	**(0.057)**	(3.889)	(3.695)	(0.032)	(0.036)	(3.752)	**(2.955)**
Dummy border region	**0.023** **	**0.023** **			**0.014***	**0.015** **		
	(0.012)	**(0.011)**			**(0.008)**	**(0.007)**		
Distance from Moscow	**0.006** **	**0.006** **			**0.006*** **	**0.005*** **		
	(0.003)	**(0.003)**			**(0.002)**	**(0.002)**		
Dummy republic	**0.068** **	**0.058** **			**0.057*** **	**0.048*** **		
	(0.031)	**(0.029)**			**(0.020)**	**(0.018)**		
Overrepresentation in State Duma	0.001	-0.004	0.007	0.011	**0.014*** **	**0.009***	0.007	0.014
	(0.010)	(0.011)	(0.041)	(0.034)	**(0.005)**	**(0.005)**	(0.035)	(0.029)
Power	**-0.015***	**-0.015***			-0.006	-0.006		
	(0.008)	**(0.008)**			(0.007)	(0.007)		
Fiscal transfers	0.054	0.039	0.085	0.059	0.012	0.011	-0.031	-0.042
	(0.080)	(0.080)	(0.065)	(0.057)	(0.034)	(0.033)	(0.040)	(0.035)
Democratization	0	0	-0.018	-0.003	0	0	-0.015	-0.003
	(0.002)	(0.002)	(0.011)	(0.010)	(0.001)	(0.001)	(0.010)	(0.008)
Share of Russians	**0.160***	0.148			**0.064***	**0.059***		
	(0.094)	(0.091)			**(0.035)**	**(0.032)**		
Urbanization	**2.425** **	**1.774***	-7.467	-7.455	-0.082	-0.722	5.804	4.036
	(0.963)	**(1.010)**	(7.731)	(6.550)	(0.51)	(0.487)	(5.300)	(4.987)
Constant	0.437***	0.409***	2.812***	3.446	0.640***	0.605***	0.588	0.355
	(0.137)	(0.135)	(0.689)	(2.515)	(0.067)	(0.063)	(2.120)	(1.947)
Region FE	**No**	**No**	**Yes**	**Yes**	**No**	**No**	**Yes**	**Yes**
Time FE	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
Outliers included	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**
No. obs.	**395**	**395**	**395**	**395**	**380**	**380**	**380**	**380**
R^2	**0.304**	**0.372**			**0.486**	**0.566**		
F-test	**19.52*** **	**14.72*** **	**54.67*** **	**19.30*** **	**23.83*** **	**28.35*** **	**108.13*** **	**17.78*** **

Notes: see *Tables 3.1 and 3.2.*

Table C.9: Median regressions for Yeltsin period, 1995-1999, dep. var.: retention rate

	(D9) Median	(D10) Median	(D11) Median	(D12) Median	(D13) Median	(D14) Median	(D15) Median	(D16) Median
Tax arrears squared (Yeltsin)	**1.175****	0.763	**1.688***	0.458	**1.400*****	**1.262***	**2.160****	**1.928***
	(0.522)	(0.828)	**(0.865)**	(1.029)	**(0.523)**	**(0.764)**	**(0.893)**	**(0.986)**
Tax structure								
Average income per capita	**-0.041*****	-0.002	**-0.052*****	-0.008	**-0.044*****	-0.001	**-0.052*****	0.009
	(0.012)	(0.017)	**(0.015)**	(0.025)	**(0.012)**	(0.017)	**(0.015)**	(0.025)
Capital funds	0.092	-0.08	0.109	-0.001	**0.111***	-0.05	0.1	-0.087
	(0.058)	(0.097)	(0.071)	(0.104)	**(0.060)**	(0.091)	(0.066)	(0.109)
Legal factors								
Dummy Tatarstan and Bashkortostan	**0.162*****	**0.189*****			**0.157*****	**0.166*****		
	(0.037)	**(0.041)**			**(0.035)**	**(0.039)**		
Political variables								
Territory	**0.030****	0.022			**0.025***	0.015		
	(0.015)	(0.015)			**(0.013)**	(0.012)		
Population	**-0.022*****	**-0.013****	0.118	-0.14	**-0.022*****	**-0.014****	0.175	-0.027
	(0.005)	**(0.006)**	(0.312)	(0.326)	**(0.005)**	**(0.006)**	(0.294)	(0.313)
Oil and gas share	-0.013	0.059	0.996	-2.674	-0.007	0.039	0.68	-4.193
	(0.093)	(0.159)	(7.687)	(6.791)	(0.094)	(0.197)	(7.760)	(6.786)
Dummy border region	**0.020****	**0.018****			**0.014***	0.012		
	(0.008)	**(0.009)**			**(0.007)**	(0.008)		
Distance from Moscow	**0.007*****	**0.006*****			**0.007*****	**0.006*****		
	(0.002)	**(0.002)**			**(0.002)**	**(0.002)**		
Dummy republic	**0.044***	**0.050****			**0.046***	0.037		
	(0.024)	**(0.022)**			**(0.025)**	(0.023)		
Overrepresentation in State Duma	0.01	0.011	-0.056	-0.018	**0.016****	0.012	-0.041	-0.021
	(0.008)	(0.008)	(0.066)	(0.058)	**(0.007)**	(0.007)	(0.066)	(0.056)
Power	-0.008	-0.003			-0.007	0		
	(0.007)	(0.007)			(0.007)	(0.007)		
Fiscal transfers	0.004	-0.007	0.086	0.044	0.01	0.005	0.036	0.005
	(0.053)	(0.049)	(0.064)	(0.060)	(0.046)	(0.046)	(0.067)	(0.053)
Democratization	-0.001	-0.001	-0.013	0.003	-0.001	0	-0.013	0.003
	(0.001)	(0.001)	(0.022)	(0.020)	(0.001)	(0.001)	(0.03)	(0.026)
Share of Russians	0.069	**0.097****			0.046	0.049		
	(0.056)	**(0.049)**			(0.046)	(0.043)		
Urbanization	0.873	0.317	1.8	-2.002	0.084	-0.744	1.507	2.186
	(0.549)	(0.601)	(10.738)	(9.549)	(0.508)	(0.587)	(10.944)	(10.316)
Constant	0.604***	0.531***	1.3	0.977	0.653***	0.593***	-0.712	0.374
	(0.096)	(0.078)	(1.026)	(0.933)	(0.080)	(0.075)	(3.023)	(3.187)
Region FE	**No**	**No**	**Yes**	**Yes**	**No**	**No**	**Yes**	**Yes**
Time FE	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
Outliers included	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**
No. obs.	**395**	**395**	**395**	**395**	**380**	**380**	**380**	**380**
Pseudo R^2	**0.219**	**0.259**	**0.523**	**0.571**	**0.287**	**0.337**	**0.507**	**0.563**

Notes: see *Tables 3.1 and 3.2*.

Table C.10: Panel data regressions for Putin period, 2000-2006, dep. var.: retention rate

	(D17) OLS	(D18) OLS	(D19) OLS	(D20) OLS	(D21) OLS	(D22) OLS	(D23) OLS	(D24) OLS
Tax arrears squared (Putin)	-0.041	**-0.056****	**0.085*****	**0.052*****	0.063	-0.041	**0.711***	0.596
	(0.030)	**(0.023)**	**(0.017)**	**(0.013)**	(0.361)	(0.317)	**(0.417)**	(0.365)
Tax structure								
Average income per capita	**0.017*****	**-0.009***	**0.023*****	-0.011	**0.015*****	-0.008	**0.021*****	-0.007
	(0.004)	**(0.005)**	**(0.004)**	(0.007)	**(0.004)**	(0.005)	**(0.004)**	(0.007)
Capital funds	**-0.080*****	-0.03	**-0.075****	-0.046	**-0.059****	-0.019	**-0.062***	-0.041
	(0.027)	(0.030)	**(0.035)**	(0.034)	**(0.027)**	(0.031)	**(0.034)**	(0.033)
Legal factors								
Dummy Tatarstan and Bashkortostan	-0.011	-0.038			-0.017	-0.038		
	(0.054)	(0.060)			(0.053)	(0.059)		
Political variables								
Territory	0.02	**0.045*****			0.007	**0.031*****		
	(0.013)	**(0.010)**			(0.013)	**(0.010)**		
Population	0.002	0.009	0.028	**0.120*****	-0.001	0.006	0.013	**0.096****
	(0.008)	(0.007)	(0.039)	**(0.045)**	(0.007)	(0.007)	(0.040)	**(0.040)**
Oil and gas share	-0.045	-0.096	2.064	5.411	-0.084	-0.12	0.505	3.899
	(0.102)	(0.132)	(8.268)	(8.678)	(0.113)	(0.137)	(8.140)	(8.513)
Dummy border region	**0.035****	**0.036****			0.018	0.022		
	(0.016)	**(0.015)**			(0.015)	(0.015)		
Distance from Moscow	0.005	**0.008****			**0.008****	**0.009*****		
	(0.004)	**(0.003)**			**(0.003)**	**(0.003)**		
Dummy republic	**0.095****	**0.110*****			**0.113*****	**0.121*****		
	(0.042)	**(0.038)**			**(0.041)**	**(0.038)**		
Overrepresentation in State Duma	**-0.018***	-0.002	-0.016	-0.003	-0.012	0.001	-0.018	-0.006
	(0.010)	(0.007)	(0.016)	(0.010)	(0.010)	(0.007)	(0.015)	(0.010)
Fiscal transfers	**0.229*****	**0.270*****	**-0.202***	-0.031	**0.187*****	**0.247*****	**-0.339*****	-0.142
	(0.063)	**(0.065)**	**(0.112)**	(0.111)	**(0.059)**	**(0.063)**	**(0.094)**	(0.106)
Democratization	-0.002	-0.002	0.002	-0.001	-0.001	-0.001	**-0.009***	0.001
	(0.002)	(0.002)	(0.009)	(0.012)	(0.002)	(0.001)	**(0.005)**	(0.011)
Share of Russians	**0.277*****	**0.275*****			**0.291*****	**0.284*****		
	(0.077)	**(0.067)**			**(0.070)**	**(0.064)**		
Urbanization	**1.749***	**4.017*****	-0.172	-6.228	-0.194	**2.150****	-0.896	-5.94
	(0.940)	**(0.923)**	(4.424)	(4.358)	(0.856)	**(0.877)**	(4.407)	(4.266)
Constant	0.178	0.194*	0.680**	0.851**	0.285***	0.278***	1.221***	0.822**
	(0.114)	(0.111)	(0.305)	(0.396)	(0.103)	(0.106)	(0.178)	(0.385)
Region FE	**No**	**No**	**Yes**	**Yes**	**No**	**No**	**Yes**	**Yes**
Time FE	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
Outliers included	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**
No. obs.	**550**	**550**	**550**	**550**	**530**	**530**	**530**	**530**
R^2	**0.244**	**0.409**			**0.235**	**0.389**		
F-test	**16.42*****	**17.08*****	**15.36*****	**29.91*****	**12.37*****	**18.33*****	**16.42*****	**28.96*****

Notes: see *Tables 3.1 and 3.2*.

Table C.11: Median regressions for Putin period, 2000-2006, dep. var.: retention rate

	(D25) Median	(D26) Median	(D27) Median	(D28) Median	(D29) Median	(D30) Median	(D31) Median	(D32) Median
Tax arrears squared (Putin)	-0.035	-0.061	0.062	0.04	0.289	-0.171	0.275	0.428
	(0.227)	(0.221)	(0.105)	(0.141)	(0.827)	(0.515)	(0.592)	(0.801)
Tax structure								
Average income per capita	**0.026*** **	-0.006	**0.027*** **	**-0.012***	**0.025*** **	-0.003	**0.026*** **	-0.006
	(0.004)	(0.006)	**(0.004)**	**(0.007)**	**(0.004)**	(0.006)	**(0.004)**	(0.007)
Capital funds	**-0.119*** **	**-0.074***	-0.06	-0.012	**-0.112*** **	-0.061	-0.056	-0.025
	(0.025)	**(0.043)**	(0.045)	(0.053)	**(0.028)**	(0.044)	(0.045)	(0.051)
Legal factors								
Dummy Tatarstan and Bashkortostan	-0.072	**-0.111*** **			-0.083	**-0.101***		
	(0.050)	**(0.055)**			(0.057)	**(0.054)**		
Political variables								
Territory	0.009	**0.050*** **			-0.005	**0.045*** **		
	(0.020)	**(0.011)**			(0.020)	**(0.011)**		
Population	0.01	**0.019*** **	-0.001	0.063	0.007	**0.015*** **	0.001	0.058
	(0.007)	**(0.008)**	(0.103)	(0.074)	(0.007)	**(0.007)**	(0.107)	(0.077)
Oil and gas share	0.067	0.044	-5.481	7.257	0.055	-0.021	-3.777	10.72
	(0.274)	(0.233)	(15.24)	(16.246)	(0.296)	(0.339)	(14.845)	(16.976)
Dummy border region	**0.028***	**0.025*** **			0.017	**0.021***		
	(0.015)	**(0.012)**			(0.015)	**(0.011)**		
Distance from Moscow	0.003	0.004			0.004	0.004		
	(0.003)	(0.003)			(0.003)	(0.003)		
Dummy republic	**0.122*** **	**0.132*** **			**0.129*** **	**0.129*** **		
	(0.043)	**(0.025)**			**(0.043)**	**(0.023)**		
Overrepresentation in State Duma	-0.015	0.009	-0.001	0.003	-0.014	0.01	-0.003	0.002
	(0.013)	(0.011)	(0.023)	(0.017)	(0.013)	(0.008)	(0.021)	(0.016)
Fiscal transfers	**0.127***	**0.196*** **	**-0.307*** **	-0.073	0.084	**0.195*** **	**-0.376*** **	-0.088
	(0.068)	**(0.050)**	**(0.078)**	(0.068)	(0.066)	**(0.051)**	**(0.076)**	(0.077)
Democratization	**-0.004*** **	**-0.003*** **	-0.013	0.009	**-0.003*** **	**-0.003*** **	**-0.016*** **	-0.014
	(0.001)	**(0.001)**	(0.011)	(0.009)	**(0.001)**	**(0.001)**	**(0.007)**	(0.012)
Share of Russians	**0.300*** **	**0.243*** **			**0.283*** **	**0.255*** **		
	(0.076)	**(0.046)**			**(0.075)**	**(0.042)**		
Urbanization	-0.137	**2.453*** **	4.763	-2.357	-1.038	**1.497*** **	5.22	-3.354
	(0.845)	**(0.753)**	(5.462)	(4.916)	(0.820)	**(0.638)**	(5.706)	(4.818)
Constant	0.327***	0.377***	0.897***	0.779***	0.409***	0.402***	0.989***	1.386***
	(0.111)	(0.088)	(0.309)	(0.243)	(0.113)	(0.081)	(0.217)	(0.264)
Region FE	**No**	**No**	**Yes**	**Yes**	**No**	**No**	**Yes**	**Yes**
Time FE	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**
Outliers included	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**
No. obs.	**550**	**550**	**550**	**550**	**530**	**530**	**530**	**530**
Pseudo R^2	**0.186**	**0.311**	**0.504**	**0.572**	**0.199**	**0.323**	**0.506**	**0.565**

Notes: see *Tables 3.1 and 3.2.*

Appendix D

Appendix to Chapter 4

D.1 Proofs

Proof of Lemma 1: First consider the case of non-democratic federal government. By differentiating (4.6) with respect to f_A and f_P one can show, that optimal f_A does not depend on t_P and vice versa, i.e. $f_i = (1-\beta_i)t_i d_i$. Given that, from (4.7) and (4.9) follows that r_A does not depend on t_P (and vice versa) either for both democratic and non-democratic regional governments. In this case expression (4.6) can be re-written as

$$\pi_F = \frac{d^2 t_P^2 (1-\beta_P)^2 + (1-d)^2 t_A^2 (1-\beta_A)^2}{2} + d^2(1-t_P)t_P\beta_P^2 + (1-d)^2(1-t_A)t_A\beta_A^2 \quad \text{(D.1)}$$

By differentiating the expression with respect to t_A and t_P it follows that t_A does not depend on t_P and vice versa.

Q.E.D.

Proof of Lemma 2:

To (i): This part is trivial. Assume that for region A the equilibrium is different from federal optimum. Then the federal government has incentive to deviate (and hence either increase the public goods output for democracy or the net revenue for non-democracy) - a contradiction.

To (ii): Consider the following cases for region P. (1) Assume that the revenue of the region (non-democratic) under federal optimum is larger, than in case of secession, or the provision of public goods of the region (democratic) is larger, than in case of secession. Then neither the region nor the federal government deviate from federal optimum, and the equilibrium is federal optimum. (2) Assume that the previous condition does not hold, and the federal government offers any other tax split rate than the equalizing tax split rate. Then two outcomes are possible (a) for region secession is "more attractive" (depending upon the political regime). Then the region secedes. The non-democratic federal government (weakly) prefers non-secession: obviously, in case of secession its revenue from the region P is exactly zero, while if there is no secession, the revenue is non-negative. Democratic federal government is indifferent, and hence, tiebreaking rule is in effect - and hence the federal government deviates from the offer, a contradiction; (b) for region the secession is not attractive, and it remains part of the federation. But, since federal optimum is rejected, it is possible only if the revenue of the federation for non-democracies (public goods provision of the federation for democracies) is not single-peaked. Consider first the case of pure non-democracy. Knowing the public goods output, the revenue of the federation and the regions can be re-written as shown in *Lemma 1.* The objective function is then concave in t_A and t_P, and therefore single-peaked. For case of pure democracy twice differentiating the federal public goods output by t yields

$$-\frac{\beta_P d}{4(t_P(1-t_P))^{\frac{3}{2}}}(1+2t_P-2t_P^2) < 0 \quad \text{(D.2)}$$

for $t_P \neq 0$, and therefore the result also holds. For the federal democratic and regional non-democratic government identical operation yields

$$-\frac{d}{4(t_P^2\gamma + 2t_P\beta^2)^{\frac{3}{2}}}(t_P\gamma(1-2t_P\gamma) + 2\beta_P^2(1-4t_P\gamma)) \quad \text{(D.3)}$$

with $\gamma = 1 - 2\beta_P - \beta_P^2 < 0$, which is also negative, and hence, the concavity can be established. Finally, for the case of non-democratic federal and democratic regional government, the objective function of the federation can be re-written as

$$\max d_i^2[\frac{t_i^2(1-\beta_i)^2}{2} + \beta_i^2 t_i(1-t_i) + \beta_i t_i\sqrt{(1-t_i)(2t_i - 4\beta_i t_i} + \beta_i^2(1+t_i))] \tag{D.4}$$

for $i = A, P$. One can easily see that the problem of the federation is very similar to that in case of pure non-democracy, except for an additional term added. First, notice, that output of public goods by the region is increasing in t_P (it is unavoidable since the regional public goods have stronger productivity enhancing effect). Hence, if region rejects federal optimum, the tax split rates acceptable for the region are smaller, than the federal optimum. Denote $A = \frac{t_i^2(1-\beta_i)^2}{2} + \beta_i^2 t_i(1-t_i)$ and $B = \beta_i t_i\sqrt{(1-t_i)(2t_i - 4\beta_i t_i + \beta_i^2(1+t_i))}$ (A is the component present in pure non-democracies, B is an additional component). For $t_P \leq .5$ both first derivatives of A and B are positive; hence the function is increasing in t_P. Now consider the second derivative of the function. Since the first two terms (A) constitute a concave function, it is sufficient to show that the last term (B) is also a concave function, and then the sum of concave functions with positive coefficients (d_i^2 and $d_i^2\beta_i$ is also concave. The last term B can be re-written as

$$\sqrt{(4\beta_P - \beta_P^2 - 2)t_P^4 + (2 - 4\beta_P)t_P^3 + t_P^2\beta_P^2} \tag{D.5}$$

The squared root is nondecreasing and concave; hence, in order to show that the expression is concave it suffices to prove that the expression under the root is a concave function. Second derivative yields

$$12t_P^2(4\beta_P - \beta_P^2 - 2) + 6t_P(2 - 4\beta_P) + 2\beta_P^2 \tag{D.6}$$

However, the expression changes it sign. One can show that the expression is negative for β_P and t_P small enough and for β_P and t_P large enough. First, it is easy to show that for $t_P = .5$ the expression is negative, therefore the function is concave. First derivatives of A and B are positive for $t_P \leq .5$. Hence, the function is monotonously increasing at $t_P \in [0; .5]$. Now consider $t_P > .5$: for β_P small enough the expression is concave for the whole area $[.5; 1]$, and hence, the maximum is unique. However, for β_P large enough there are areas for $.5 < t_P \leq 1$, such that the concavity cannot be established. In particular, it is true for

$$t_P \geq \frac{3(4 - 2\beta_P) + \sqrt{9(5 - 2\beta_P)^2 - 24\beta_P^2(4\beta_P - \beta_P^2 - 2)}}{12(4\beta_P - \beta_P^2 - 2)} \tag{D.7}$$

This root is located in the area $[0; 1]$ only for β_P large enough. In particular, $\beta_P > .8$. Evaluating first derivative of A at $\beta_P = .8$, one can see, that for t_P satisfying condition (D.7), the expression is negative. Since the maximum of A is decreasing in β_P and by concavity, it can be claimed that if $4\beta_P - \beta_P^2 - 2)t_P^4 + (2 - 4\beta_P)t_P^3 + t_P^2\beta_P^2$ is convex (for t_P and β_P large enough), the expression A is decreasing. Similarly, expression B is decreasing (because expression under the root in (D.5) is decreasing, and squared root of a decreasing function is a decreasing function). Hence, for area where no concavity of B can be established, the function is decreasing. But then the maximum is achieved in the area where function is concave, and therefore single-peakedness can be established. Hence, federal government has incentives to deviate from an equilibrium different than equalizing tax split rate, if the latter is chosen. To conclude, if federal optimum is rejected by the region, the equalizing tax split rate is chosen, and the proof is complete.

Q.E.D.

Proof of Proposition 1:

To (i): The equilibrium tax split rate t_P is either a federal optimum or an equalizing tax split rate. The latter is given by an equalizing condition: the equality of net revenues with and without secession for non-democracies and the equality of public goods provision with and without secession for democracies. In order to prove the claim, one has to show that (a) federal optimum is strictly positive (so, no corner solution $t_P = 0$ is possible) and (b) there exists a tax split rate t_P different from zero such that the net revenue (public goods output) under secession is at least weakly smaller than without secession. First consider the **pure non-democracy**. The problem of the federal government has been formulated in *Lemma 1.* For the regional government, analogously, one can state

$$\pi_{Ri} = \frac{d_i^2\beta_i^2(1-t_i)^2}{2} + d_i^2(1-\beta_i)^2(1-t_i)t_i \tag{D.8}$$

One can immediately notice that the revenue of the federal government from each region and the revenue of each region are strictly positive. Hence, there is no problem with satisfying the non-negativity constraint. Consider the federation problem. The maximum with respect to t_i is achieved

at $\frac{\beta_i^2}{2\beta_i^2-(1-\beta_i)^2}$; the federal optimum is therefore strictly positive (as part (iv) shows, it is decreasing in β_i and for $\beta_i = 1$ the federal optimum is .5, i.e. non-negative). The revenue of the region P in case of secession is $d\beta_P r_P - \frac{r_P}{2} - C$, where $r_P = d\beta_P$ is the optimal provision of public goods. Hence the federal optimum is accepted if

$$\frac{d^2\beta_P^2(1-t_P)^2}{2} + d^2(1-\beta_P)^2(1-t_P)t_P - \frac{d^2\beta_P^2}{2} + C \geq 0 \tag{D.9}$$

This condition is a quadratic inequality, with the coefficient for the quadratic term negative for $\beta_P < \frac{\sqrt{2}}{1+\sqrt{2}}$ and larger or equal to zero otherwise. Consider first the negative coefficient for the quadratic term. For $t_P = 1$ the expression is equal to $\frac{2C}{d^2} - \beta_i^2$, which may be positive as well as negative. For $t_P = 0$ it is strictly positive. If the expression is positive at both bounds of the interval, it is strictly positive in between (given it is an inverse parabola). Otherwise it has one root at the interval, and hence, there at least some t_P for which the inequality holds. In order to hold only for $t_P = 0$, this should be the root; it is however never the case for positive C. If the coefficient by the quadratic term is larger zero, the same applies: either the inequality holds for all t_P (from the real line), or at least for some t_P. Finally, for $\beta_P = \frac{\sqrt{2}}{1+\sqrt{2}}$ the expression is a linear function with a positive root and hence, the inequality holds for at least some t_P, and (b) holds for pure non-democracy.

Now assume the **pure democracy.** The maximum provision of public goods of the federation is achieved for

$$t_i = \frac{1-2\beta_i+2\beta_i^2+(1-\beta_i)\sqrt{1+2\beta_i^2-2\beta_i}}{2-4\beta_i+4\beta_i^2} = .5 + (1-\beta_i)\frac{\sqrt{1+2\beta_i^2-2\beta_i}}{2-4\beta_i+4\beta_i^2} > .5 \tag{D.10}$$

and therefore obviously strictly positive. Now one has to identify the equalizing condition. Consider first the secession case. Than the region produces the maximum amount of public goods satisfying the condition

$$d\beta_P r_P - \frac{r_P^2}{2} - C = 0 \tag{D.11}$$

which is than given by $r_P = \beta_P d + \sqrt{d^2\beta_P^2 - 2C}$. The provision of public goods in the region and in the federation is identified by the following system of equations:

$$d(t_P(1-\beta_P)f_P + \beta_P r_P) - \frac{f_P^2}{2} = 0; \tag{D.12}$$

$$(1-t_P)d((1-\beta_P)f_P + \beta_P r_P) - \frac{r_P^2}{2} = 0. \tag{D.13}$$

The federal optimum is accepted if r_P solving this system is greater or equal $\beta_P d + \sqrt{d^2\beta_P^2 - 2C}$. Otherwise one solves the system substituting r_P for $\beta_P d + \sqrt{d^2\beta_P^2 - 2C}$ and obtains the equalizing tax split rate

$$t_P = \frac{(1-2\beta_P+2\beta_P^2)d + (1-\beta_P)\sqrt{2C+(1-\beta_P)^2d^2} - \beta_P\sqrt{\beta_P^2d^2-2C}}{2d(1-2\beta_P+2\beta_P^2)} \tag{D.14}$$

which exists if $C \leq \frac{\beta_P^2 d^2}{2}$ and is strictly positive. The case when $C > \frac{\beta^2 d^2}{2}$ corresponds to the inability of a democratic government to produce *any* public goods in case of a secession. Then it obviously accepts the federal optimum. Interestingly, the region never accepts federal optimum if it is able to produce public goods under secession. It is straightforward: while the equalizing tax split guarantees the provision of public goods at the secession level, for the federal optimum the provision of public goods is lower, than in case of a secession.

For the case of a **democratic federal government and non-democratic region**, since f_i is a concave function in t_i, federal optimum may be established through the simple first order condition. The closed-form solution to the optimization problem is

$$t_i = \frac{2\beta_i^2 + \beta_i(1-\beta_i)\sqrt{2}}{2(\beta_i^2+2\beta_i-1)} > 0 \tag{D.15}$$

The condition for accepting the federal optimum is that the revenue of the region P exceeds that in case of secession (i.e. $d\beta_P^2/2 - C$). Otherwise the region rejects the federal offer, and the equalizing tax split rate is suggested. As in case of pure democracy, evaluate the equalizing condition at $t_P = 0$ and $t_P = 1$. Obviously, the results are the same as for pure democracy. Moreover, the expression

is continuous at the interval $[0;1]$ (as a combination of continuous functions). Therefore it is either strictly positive for the whole interval, or has at least one root in the interval, which is different from zero (follows from continuity), and the condition (b) holds for this combination of regimes as well.

For the case of a **democratic region and non-democratic federal government**, the problem of the federation has been formulated in *Lemma 2*. The expression is always positive, so, the non-negativity constraint is never binding. Evaluating the first derivative at zero one can show that it is positive (and equal to $2\beta^2$); so, the solution to the problem is positive as well. Now consider the equalizing condition. The region produces $\beta_P d + \sqrt{d^2\beta_P^2 - C}$ in case of secession. If the production under secession is impossible, the region accepts the federal optimum. Otherwise the region accepts the offer of the federal government if the federal offer provides a weakly larger amount of public goods as in case of secession. Otherwise the equalizing condition should be satisfied, which is given by

$$d(1-t_P)(\beta_P(\beta_P d + \sqrt{d^2\beta_P^2 - 2C}) + (1-\beta_P)^2 dt_P) - .5(\beta_P d + \sqrt{d^2\beta_P^2 - 2C})^2 = 0 \tag{D.16}$$

The closed form solution to the problem is

$$\begin{aligned} t_P = \frac{1}{2(1-\beta_P)^2 d^2}(-d(-d + 2\beta_P d + \beta_P\sqrt{\beta_P^2 d^2 - 2C}) + [d^2(-d + 2\beta_P d + \beta_P \\ \sqrt{\beta_P^2 d^2 - 2C})^2 - 4(1-\beta_P)^2 d^2(-.5C - .5\beta_P^2 d^2 - .5\beta_P d_1\sqrt{\beta_P^2 d^2 - 2C})]^{.5}) \end{aligned} \tag{D.17}$$

Evaluating the equalizing condition at $t_P = 0$ yields a positive value and at $t_P = 1$ a negative one. Hence, by continuity, the root is between these two values and is hence positive (and also obviously always exists if provision of public goods under secession is feasible). Thus result (i) could be established for all four combinations of pairs of regimes in a region and the federation.

To (ii): Part (i) derives closed-form solutions for the federal optimum for all regimes but democratic region and non-democratic federation and shows that the federal optimum is non-negative. Moreover, none of the conditions depends on d and C (in case of hybrid with democratic region d obviously cancels out in the FOC). Show that the federal optimum is decreasing in β_i. The first derivatives of the federal optima can be shown to be negative for β_i within the range of parameters considered in the model. For pure non democracy

$$\frac{\partial t_i}{\partial \beta_i} = (-3\beta_i^2 - 2\beta_i + 2)\frac{\beta_i}{(2\beta_i^2 - (1-\beta_i)^2)^2} < 0 \tag{D.18}$$

For pure democracy

$$\frac{\partial t_i}{\partial \beta_i} = -\frac{1}{2\sqrt{1 + 2\beta_i^2 - 2\beta_i}} - \frac{1-\beta_i}{2}\frac{2(2\beta_i - 1)}{(1 + 2\beta_i^2 - 2\beta_i)^{1}.5} < 0 \tag{D.19}$$

For hybrid with democratic federal government

$$\frac{\partial t_i}{\partial \beta_i} = \frac{1}{2(\beta_i^2 + 2\beta_i - 1)^2}((2(2-\sqrt{2})\beta_i + 1)(\beta_i^2 + 2\beta_i - 1) - (2\beta_i + 2)(2\beta_i^2 + \beta_i(1-\beta_i)\sqrt{2})) < 0 \tag{D.20}$$

For the hybrid with democratic region one has to calculate the first order condition, which is given by

$$\begin{aligned} t_i(1-\beta_i)^2 + \beta_i(1-2t_i) + \beta_i\sqrt{(1-t_i)(2t_i - 4\beta_i t_i + \beta_i^2(1+t_i))} + \\ \frac{\beta_i t_i}{2\sqrt{(1-t_i)(2t_i - 4\beta_i t_i + \beta_i^2(1+t_i))}}[2t_i(4\beta_i - \beta_i^2 - 2) + 2 - 4\beta_i] = 0 \end{aligned} \tag{D.21}$$

Evaluate the equation at $t_i = .5$ and see that the expression is positive; hence, one has to consider only $t_i > .5$. For these values from the implicit function theorem follows that t_i is decreasing in β_i. Since the federal optimum and the equilibrium tax split rate A are identical, and the proof is complete.

To (iii): First consider the closed-form federal optima for pure non-democracies and pure democracies derived in part (i) to see that they are strictly smaller 1 (federal optimum is decreasing in β_i; for non-democracy for $\beta_i = .5$ the federal optimum is exactly one, and the condition on β_i is that it is strictly smaller 1; for pure non-democracy for $\beta_i = .5$ it is $.5 + .5\sqrt{.5} < 1$). Hence for federal optima and equilibria in A the result holds. Consider equalizing tax split rates. For non-democracy, as follows from part (i), equalizing tax split rate is strictly positive (if it exists). It

may be equal to 1 if $\beta_P = d\sqrt{\frac{2}{3}C}$, but, since the federal optimum is smaller one, it implies, that the region would accept the federal optimum at this value of β_P. In a similar way, in a democracy the equalizing tax split rate can be equal to 1 only if region is unable to produce public goods under secession. But in this case federal optimum is chosen, and it is smaller 1. So, the proof is complete. However, for other political regimes this result could not be established. For example, for the hybrid with democratic federal government it is straightforward to show that the closed-form solution maximizing the federal problem is larger 1 for small β_i and hence the corner solution is chosen.

To (iv): In region A the equilibrium tax split rate is the federal optimum. If in region P the equilibrium is also the federal optimum and $\beta_A = \beta_P$, the equilibrium tax split rates are identical in both jurisdictions (since they do not depend on d). If in region P equalizing tax split rate is chosen, one can show that it is smaller than the respective federal optimum (which is, as mentioned above, identical for all regions). In case of pure non-democracy it follows from the fact that the net revenue of the region is strictly declining in $t_P \in [0;1]$ (since for $\beta_P > 2-\sqrt{2}$ it is convex with the minimum at $\frac{\beta_P^2-(1-\beta_P)^2}{\beta_P^2-2(1-\beta_P)^2} > 1$, and for $\beta_P < 2-\sqrt{2}$ it is concave with the maximum smaller zero; for $\beta_P = 2-\sqrt{2}$ it is strictly decreasing for any real t_P). For a democracy the region increases its public goods provision in reducing t, because federal public goods are less efficient in terms of productivity increase of the population. This is obviously true for the hybrid with non-democratic government (which produces even less public goods than the democracy), and the proposition holds.

However, if the region is non-democratic and the federation is democratic, one has to take into account the "additional" term in the public goods output of the federation, which actually makes region *prefer* a non-zero level of centralization (the situation is a mirror image of the reasons why the federation prefers a non-zero level of decentralization) if β is small enough. Assume that the equalizing tax split rate actually chosen is larger than the rejected federal optimum. It implies that the revenue of the region was smaller under secession for federal optimum. That means that the federal optimum is smaller than the smallest root of the equalizing condition. The reason for that is that if the region provides a larger portion of its revenue to the federal government, it increases the provision of public goods and hence the tax base, from which the regional government can also benefit. But it implies that there exists a tax split rate for which federal government can produce more public goods than for the federal optimum - contradiction to the definition of federal optimum. Hence, equalizing condition is (weakly) smaller than federal optimum. If region P has the equalizing tax split rate, it is more decentralized, than region A.

To (v): First show, that the equalizing condition is decreasing in β_P, decreasing in C and increasing in d. For the pure non-democracy, by the implicit function theorem

$$\frac{\partial t_P}{\partial \beta_P} = -\frac{2\beta_P(1-t_P)^2 - 2(1-\beta_P)(1-t_P)t_P - 1}{2(1-\beta_P)^2 - 2\beta_P^2(1-t_P) - 4(1-\beta_P)t_P} < 0 \tag{D.22}$$

$$\frac{\partial t_P}{\partial C} = -\frac{2}{2(1-\beta_P)^2 - 2\beta_P^2(1-t_P) - 4(1-\beta_P)t_P} > 0 \tag{D.23}$$

(and the closed-form solution for equalizing tax split rate is $\frac{(1-2\beta_P)d^2+\sqrt{d^2(2(2-4\beta_P+\beta_P^2)C+(1-2\beta_P)^2d^2)}}{d^2(2-4\beta_P+\beta_P^2)}$).

For the hybrid with democratic government denote the equalizing constraint E. Divide both sides of the equation by d^2. Then

$$\begin{aligned}\frac{\partial E}{\partial t_P} = -\beta_P(1-t_P) - (1-\beta_P)[t_P(1-\beta_P) + \sqrt{t_P(t_P - 2\beta_P t_P - \beta_P^2(t_P-2))}] + \\ (1-\beta_P)(1-t_P)[(1-\beta_P) + \frac{t_P - 2\beta_P - \beta_P^2}{\sqrt{t_P(t_P - 2\beta_P t_P - \beta_P^2(t_P-2))}}] < 0\end{aligned} \tag{D.24}$$

(since all terms are smaller zero),

$$\frac{\partial E}{\partial C} = 1/d^2 > 0 \tag{D.25}$$

$$\frac{\partial E}{\partial d} = -2C/d^3 < 0 \tag{D.26}$$

Following the implicit function theorem, one can state, that the equalizing condition is increasing in C and decreasing in d. Finally, consider:

$$\frac{\partial E}{\partial \beta_P} = 2\beta_P t_P(t_P - 2) - (1 - t_P)[t_P(1 - \beta_P) + \sqrt{t_P(t_P - 2\beta_P t_P - \beta_P^2(t_P - 2))}] + (1 - t_P)(1 - \beta_P) [-t_P + \frac{(2 - t_P)t_P\beta_P - t_P^2}{\sqrt{t_P(t_P - 2\beta_P t_P - \beta_P^2(t_P - 2))}}] \tag{D.27}$$

This expression can be both positive and negative. In fact, one can find that the derivative is positive for some $t_P < \check{t_P}$ and negative otherwise. However, if $t_P \to 1$, the expression E is negative. Hence, the larger root of the expression (which is chosen by the federal government) is on the declining part of the curve (if it exists). Hence, for the t_P solving E the first derivative with respect to β_P is negative. Using the implicit function theorem, one can derive that t_P is decreasing in β_P.

For the hybrid regime with the democratic region apply implicit function theorem in the same way. Let the left-hand side of (D.16) be denoted as E. Than

$$\frac{\partial E}{\partial t_P} = -d[\beta_P(\beta_P d + \sqrt{\beta_P^2 d^2 - 2C}) + (1 - \beta_P)^2 dt] + (1 - t)d(1 - \beta_P)^2 d = -d\beta_P\sqrt{\beta_P^2 d^2 - 2C} - d^2\beta_P^2 + d^2(1 - \beta_P)^2(1 - 2t_P) < 0 \tag{D.28}$$

(evaluate the only positive term at $t_P = 0$, when it is maximum, and see that the overall expression is negative),

$$\frac{\partial E}{\partial C} = \frac{1}{\sqrt{\beta_P^2 d^2 - 2C}}[-d(1 - t)\beta_P + d\beta_P + \sqrt{\beta_P^2 d^2 - 2C}] > 0 \tag{D.29}$$

and thus the equalizing tax split rate is increasing in C.

$$\frac{\partial E}{\partial d} = -t_P(2\beta_P^2 d + \beta_P\sqrt{\beta_P^2 d^2 - 2C} + \frac{\beta_P^3 d^2}{\sqrt{\beta_P^2 d^2 - 2C}}) + 2(1 - \beta_P)^2 dt_P(1 - t_P) < 0 \tag{D.30}$$

(evaluate at $t_P = .5$, when the positive term is maximal, and see that the expression is still negative), and hence the equalizing tax split rate is decreasing in d.

$$\frac{\partial E}{\partial \beta_P} = -t_P(2d^2\beta_P + d\sqrt{\beta_P^2 d^2 - 2C} + \frac{d^3\beta_P^2}{\sqrt{\beta_P^2 d^2 - 2C}}) - 2(1 - \beta_P)d^2 t_P < 0 \tag{D.31}$$

and thus the equalizing tax split rate is decreasing in β_P.

For the pure democracy implicit function theorem is not applicable, because the equalizing condition is actually a system of equations. So, one is forced to straightforwardly differentiate the closed-form solution. One can show that

$$\frac{\partial t_P}{\partial C} = \frac{1 - \beta_P}{2d(1 - 2\beta_P + 2\beta_P^2)}[\frac{1}{\sqrt{2C + (1 - \beta_P)^2 d^2}} + \frac{\beta_P}{\sqrt{\beta_P^2 d^2 - 2C}}] > 0 \tag{D.32}$$

(all terms positive) and

$$\frac{\partial t_P}{\partial \beta_P} = \frac{A}{2d(1 - 2\beta_P + 2\beta_P^2)} + B\frac{2\beta_P - 1}{2d^2(1 - 2\beta_P + 2\beta_P^2)^2} < 0. \tag{D.33}$$

where

$$A = -\sqrt{2C + (1 - \beta_P)^2 d^2} - \frac{(1 - \beta_P)^2}{\sqrt{2C + (1 - \beta_P)^2 d^2}} - \sqrt{\beta_P^2 d^2 - 2C} - \frac{\beta_P^2}{\sqrt{\beta_P^2 d^2 - 2C}} \tag{D.34}$$

$$B = (1 - \beta_P)\sqrt{2C + (1 - \beta_P)^2 d^2} - \beta_P\sqrt{\beta_P^2 d^2 - 2C} \tag{D.35}$$

(the only positive term is the first term in B: $\sqrt{2C + (1 - \beta_P)^2 d^2}$, which can be shown to be smaller than the sum of negative terms.

Now the proofs work as follows. Consider a pair $\hat{\beta_P} < \check{\beta_P}$ and distinguish among four cases:

- For both $\hat{\beta_P}$ and $\check{\beta_P}$ the equilibrium is the federal optimum. Than the equilibrium is decreasing in β_P, as demonstrated above and $t_P(\hat{\beta_P}) > t_P(\check{\beta_P})$.
- For both $\hat{\beta_P}$ and $\check{\beta_P}$ the equilibrium is the equalizing tax split rate and $t_P(\hat{\beta_P}) > t_P(\check{\beta_P})$.
- For $\hat{\beta_P}$ the equilibrium is the federal optimum, and for $\check{\beta_P}$ it is the equalizing tax split rate. But then the equalizing tax split rat is smaller than the federal optimum calculated for the same β_P (otherwise the region would prefer federal optimum from results of (iv)), and the federal optimum calculated for $\check{\beta_P}$ is smaller than for $\hat{\beta_P}$. Hence, $t_P(\hat{\beta_P}) > t_P(\check{\beta_P})$.
- For $\hat{\beta_P}$ the equilibrium is the equalizing tax split rate, and for $\check{\beta_P}$ it is the federal optimum. Obviously, the equilibrium is always the smallest value of federal optimum and equalizing tax split rate. At $\hat{\beta_P}$ the equalizing tax split rate was smaller, than the respective federal optimum, at $\check{\beta_P}$ vice versa. Now recall that the equalizing tax split rate is declining in β_P. Therefore for $\check{\beta_P}$ the federal optimum is smaller than some value, which is smaller than the equalizing tax split rate for $\hat{\beta_P}$, and hence $t_P(\check{\beta_P}) > t_P(\hat{\beta_P})$.

In the same way, consider a pair $\hat{C} < \check{C}$. The following combinations are possible:

- If for both $\hat{C}$ and $\check{C}$ the equilibrium tax split rate is the federal optimum, it is constant in C.
- If for both $\hat{C}$ and $\check{C}$ the equilibrium tax split rate is the equalizing tax split rate and therefore $t_P(\hat{C}) < t_P(\check{C})$
- If for $\hat{C}$ the equilibrium is the equalizing tax split rate, and for $\check{C}$ it is the federal optimum, $t_P(\hat{C}) < t_P(\check{C})$ holds by the logic equivalent to that presented above, because the federal optimum for both $\hat{C}$ and βC is identical, and the equalizing tax split rate for $\hat{C}$ is smaller than the federal optimum for the same parameters.
- Finally, the combination when for $\hat{C}$ the equilibrium is the federal optimum, and for $\check{C}$ it is the equalizing tax split rate is impossible; if the region was not able to reject the federal offer under smaller secession costs, it will not be able to do it under larger costs (since its secession revenue / public goods output decreases in C).

Finally, consider a pair $\hat{d} < \check{d}$ and distinguish among the following combinations

- For both $\hat{d}$ and $\check{d}$ the federal optimum is chosen: in this case the equilibrium tax split rate does not change.
- For both $\hat{d}$ and $\check{d}$ the equalizing tax split rate is chosen: in this case the equilibrium tax split rate for $\hat{d}$ is larger than for $\check{d}$.
- For $\hat{d}$ the federal optimum and for $\check{d}$ the equalizing tax split rate are chosen: in this case recall that for any combination of parameters respective equalizing tax split rate is smaller than the federal optimum and that the equalizing tax split rate is decreasing in d, hence the equilibrium tax split rate for $\hat{d}$ is larger than for $\check{d}$.
- For $\hat{d}$ the equalizing tax split rate and for $\check{d}$ the federal optimum is chosen. That would imply that for $\check{d}$ the equalizing tax split rate is larger than the federal optimum, and for $\hat{d}$ vice versa. Bur the federal optimum is constant in d and the equalizing tax split rate is decreasing in d. Therefore there may be only one point of intersection between these functions (or no points of intersection at all), and, since at d the equalizing tax split rate is already smaller than the federal optimum, it may not have yet another point of intersection for larger d, which would be implied by the fact that for $\check{d}$ the federal optimum becomes smaller than the equalizing condition - a contradiction; hence, this combination is impossible.

For pure non-democracy the results for d can be obtained in a simpler way: it is sufficient to multiply both sides of equalizing condition with $2/d^2$. In this case d drops out of all terms except for the last one. Then one can replace $2C/d^2 = \tilde{C}$ and make the proof in full analogy to C. Similarly for the pure democracy it is sufficient to divide both numerator and denominator of the equalizing tax split rate by d and take derivative with respect to $\tilde{C} = 2C/d^2$, which is positive, and therefore the expression is decreasing in d.

Q.E.D.

Proof of Proposition 2: First notice, that both expressions for federal optima under different political regimes are declining in β_i. Moreover, there exists a unique point of interception (since the equation $.5 + \frac{(1-\beta_i)\sqrt{1+2\beta_i^2-2\beta_i}}{2-4\beta_i+4\beta_i^2} = \frac{\beta_i^2}{\beta_i^2+2\beta_i-1}$ has exactly two roots: one root in the interval (0.5;1) and one root equal to 1. Evaluate both expressions for $\beta_i \to .5$. One can show that $\lim_{\beta_i \to .5} 2 - 4\beta_i + 4\beta_i^2 = 1$, while $\lim_{\beta_i \to .5} .5 + \frac{(1-\beta_i)\sqrt{1+2\beta_i^2-2\beta}}{2-4\beta_i+4\beta_i^2} < 1$. Hence, one can conclude, that the federal optimum for non-democracy for $\beta_i \to .5$ is larger in a democracy, while for β_i larger than the unique interception point between two functions it is smaller than in a democracy.

Q.E.D.

Proof of Proposition 3: Assume that C is large enough, so that under both regimes the federal optimum is chosen. Then, applying the result from *Proposition 2*, the proof is complete.

Q.E.D.

Proof of Proposition 4:

To (i): For hybrid regime with democratic federation federal optimum can be written as $\frac{\beta_i^2}{2\beta_i^2-(1-\beta_i)^2}+\frac{\beta_i(1-\beta_i)\sqrt{2}}{2(2\beta_i^2-(1-\beta_i)^2)}$. The first term is the equilibrium tax split rate in a pure non-democracy, and the second is purely negative. So the result holds. For hybrid regime with democratic region it is straightforward that the problem of the federation is strictly larger than the problem of the federation in non-democracy (except for $t_i = 0$ and $t_i = 1$, when both expressions are equal). If for two functions $p(t_i) \geq l(t_i)$ for a certain interval, than $\max p(t_i) \geq \max l(t_i)$. Moreover, one can easily show that the maximum is never achieved at $t_i = 0$ or $t_i = 1$ (because in both cases the revenue of the federation is zero, either because the share of the federal government in the tax revenue is zero, or because the region produces zero public goods). Hence, the proposition holds.

To (ii) The federal optima in pure democracy and hybrid regime can be shown to be strictly declining in β_i. Moreover, they intersect at one point, which is in the interval (0.5;1) (exactly $\frac{4}{7}(4-\sqrt{2})$ (the other point of intersection is 1). It has been shown that the federal optimum for a hybrid regime for $\beta_i \to .5$ is larger than for a pure non-democracy, which, in turn, is larger than for a pure democracy. Given a unique point of intersection and monotonicity in β_i the proof is complete.

Q.E.D.

Proof of Proposition 5:

To (i): it has been shown that the federal optimum in the hybrid regime is larger than in a non-democracy. Now consider the equalizing tax split rate. The federal government produces strictly more public goods in the hybrid regime, than in the non-democracy. Hence the equalizing condition for the hybrid regime can be written as sum of the equalizing condition for the pure non-democracy and an additional positive term (let us call it A). The equalizing condition for the pure non-democracy is decreasing in t_P, as shown above. Assume that the solution for the equalizing condition for the hybrid regime is equal to that for the non-democracy - a contradiction, because it implies $0 + A = 0$ for a strictly positive A. Assume that the solution for the equalizing condition for the hybrid regime is smaller than for the pure non-democracy: but in this case for a smaller t_P the equalizing condition for the pure non-democracy becomes positive (due to its monotonicity in t_P), and A remains positive - a contradiction. Hence, the equalizing tax split rate for the hybrid regime is larger than for the pure non-democracy. Now consider four cases:

- Assume that for certain parameters the equilibrium for both regimes is the federal optimum - than the equilibrium for the hybrid regime is larger, than for the non-democracy.
- Assume that for certain parameters the equilibrium for both regimes is equalizing tax split rate - again, the equilibrium for the hybrid regime is larger, than for the non-democracy.
- Assume that for certain parameters the equilibrium for the non-democracy is the equalizing tax split rate, and for the hybrid regime the federal optimum - than, since any federal optimum is larger or equal to the equalizing tax split rate, the equilibrium for the hybrid regime is larger, than for the non-democracy.
- Finally, assume that for certain parameters the equilibrium for the hybrid regimes the equalizing tax split rate, and for the pure non-democracy the federal optimum. Hence, for these parameters federal optimum in non-democracy is smaller than the equalizing tax split rate in non-democracy. As shown above, the latter is smaller than the equalizing tax split rate in hybrid regime. Hence, the equilibrium for non-democracy is smaller, than for hybrid regime.

To (ii): In order to establish this result, consider the limit of the equalizing tax split rates for $d \to 1, \beta_P \to 1$ (recall that they are monotonously declining in both arguments). For the hybrid regime the limit is equal to .5, for the pure non democracy it is zero (by applying the L'Hospital rule). Now recall the following theorem from analysis: if the limit of the function is equal to, say, a, and a < p, than the function itself is smaller p from a certain point. It completes the proof of this proposition.

Q.E.D.

Appendix E

Appendix to Chapter 5

E.1 Data

Table E.1: Description of variables

Variable	Description	Period	Source
Bureaucracy	Log (Number of public officials / Population (people))	2000-2004	Goskomstat
Democracy	Index of democracy, based on expert expert opinion, higher value represents higher level of democracy	2000-2004 and 1991-2001	Moscow Carnegie Center
Democracy squared	Squared index of democracy Described above	2000-2004 and 1991-2001	Own calculation
Distance from Moscow	Distance from regional capital to Moscow, '000 km, 0 for Moscow and Moscow region, identical for St. Petersburg and St. Petersburg region	NA	Goskomstat
Distance squared	Square of distance from Moscow	NA	Own calculation
Dummy republic	1 for a republic, 0 otherwise	NA	Own calculation
Education	Share of population with university education, percent	2002	Russian Census
FDI	Foreign direct investments ('000 USD) / GRP (mln. RUR)	2000-2004	Goskomstat
Free elections	Index of the freedom of elections, estimated according to number of seats of the pro-Presidential party, number of competitors, distance between the winner and the second competitor, share of votes against all parties, share of votes required to enter the parliament, difference between share of votes and share of seats in the regional legislature, higher value represents higher freedom of elections	1996-2005	Institute of Public Expertise
Free elections squared	Squared index of free elections	1996-2005	Own calculation
Free press	Index of the freedom of the press, estimated according to the freedom of access to information, production of information and distribution of information, higher value represents higher level of press freedom	2000	Institute of Public Expertise
Free press squared	Squared index of free press	2000	Own calculation
GRP growth rate	Growth rate of the gross regional product (in per cent) inflation-corrected	2000-2004	Goskomstat
Health	Doctors per 10.000 people	2000-2004	Goskomstat
Inefficient bureaucracy	Local bureaucracy per capita / Public expenditures as percent of GRP	2000-2004	Own calculation
Initial GRP	Gross regional product per capita, '000 RUR	2000	Goskomstat
Investments	(Fixed capital investments per capita (RUR) / GRP per capita (RUR)) * 1000	2000-2004	Goskomstat
Local bureaucracy	Log (Number of public officials of regional and municipal level / Population (people))	2000-2004	Goskomstat
Local federal bureaucracy	Log (Number of public officials of regional branches of federal agencies / Population (people))	2000-2004	Goskomstat
Oil and gas	Extraction of oil (mln. tons) * 1.4 + Extraction of gas (bln. sq. m) * 1.2	2000-2004	Goskomstat
Openness	(Export + Import) (mln. USD) / GRP (mln. RUR)	2000-2004	Goskomstat
Population	Population of the region, mln., end of the year	2000-2004	Goskomstat
Public expenditures	Public expenditures as per cent of GRP	2000-2004	Goskomstat
Share of Russians	Share of ethnic Russians in the population	2002	Russia's Census, 2002
Temperature	Average long-term mid-January temperature, Celsius	NA	Goskomstat
Territory	Territory of the region, mln. sq. km. 0 for Moscow and St. Petersburg	NA	Goskomstat
Urbanization	Share of urban population (in %) / 1000	2000-2004	Goskomstat

Note: in the cross-section regressions the variables are averaged over 5 years

Table E.2: Summary statistics, cross-section

Variable	Observations	Mean	Std. dev.	Min	Max
Bureaucracy	79	-6.947	0.316	-7.684	-5.528
Democracy	79	29.013	6.289	17	45
Democracy squared	79	880.734	382.246	289	2025
Distance from Moscow	79	2.367	2.748	0	11.876
Distance squared	79	13.062	27.301	0	141.039
Dummy republic	79	0.253	0.438	0	1
Education	79	0.172	0.036	0.112	0.35968
FDI	79	0.543	2.194	0	19.383
Free elections	78	3.122	1.146	1	5
Free elections squared	78	11.042	6.636	1	25
Free press	78	0.343	0.089	0.146	0.629
Free press squared	78	0.126	0.063	0.021	0.396
Growth rate	79	6.781	2.971	-0.280	18.88
Health	79	45.531	10.385	21.62	76.72
Inefficient bureaucracy	79	0.026	0.008	0.004	0.042
Initial GRP	79	32.759	24.413	6.668	176.918
Investments	79	211.244	84.133	97.666	605.868
local bureaucracy	79	-5.309	.323	-6.237	-3.846
Local federal bureaucracy	79	-5.747	.326	-6.312	-4.399
Oil and gas	79	15.987	114.598	0	1019.12
Openness	79	0.014	0.014	0.001	0.109
Population	79	1820.562	1619.616	53.6	10313.8
Public expenditures	79	0.227	0.125	0.133	0.868
Share of Russians	79	0.769	0.238	0.012	0.966
Temperature	79	-11.480	8.446	-35.6	0
Territory	79	0.216	0.470	0	3.103
Urbanization	79	0.069	0.013	0.026	0.1

Table E.3: Summary statistics, panel data

Variable	Variable	Mean	Std. dev.	Min	Max	Observations
Bureaucracy	overall	-6.947	0.322	-7.825	-5.403	N = 395
	between		0.315	-7.684	-5.528	n = 79
	within		0.077	-7.223	-6.769	T = 5
FDI	overall	0.543	2.630	0	35.671	N = 395
	between		2.194	0	19.383	n = 79
	within		1.467	-11.762	16.831	T = 5
Growth rates	overall	6.781	6.865	-22.8	78.7	N = 395
	between		2.971	-0.280	18.88	n = 79
	within		6.197	-26.879	74.621	T = 5
Health	overall	45.531	10.411	20.5	80.3	N = 395
	between		10.385	21.62	76.72	n = 79
	within		1.278	35.771	56.571	T = 5
Inefficient bureaucracy	overall	0.026	0.008	0.002	0.057	N = 395
	between		0.008	0.004	0.042	n = 79
	within		0.003	0.012	0.038	T = 5
Investments	overall	211.244	101.548	78.499	1064.068	N = 395
	between		84.133	97.666	605.868	n = 79
	within		57.492	-128.574	669.444	T = 5
Local bureaucracy	overall	-5.309	0.328	-6.367	-3.755	N = 395
	between		0.323	-6.237	-3.846	n = 79
	within		0.064	-5.788	-4.857	T = 5
Local federal bureaucracy	overall	-5.747	0.342	-6.614	-4.209	N = 395
	between		0.326	-6.312	-4.399	n = 79
	within		0.106	-6.165	-5.471	T = 5
Oil and gas	overall	15.987	114.308	0	1127.334	N = 395
	between		114.598	0	1019.12	n = 79
	within		8.178	-67.847	124.200	T = 5
Openness	overall	0.014	0.020	0.000	0.349	N = 395
	between		0.014	0.001	0.109	n = 79
	within		0.015	-0.053	0.254	T = 5
Public expenditures	overall	0.227	0.135	0.121	1.324	N = 395
	between		0.125	0.133	0.868	n = 79
	within		0.051	0.026	0.683	T = 5

E.2 First-stage regressions

Table E.4: First-stage regressions

Variable	**(I1)**	**(I2)**	**(I2)**	**(I3)**
	Democracy	Democracy	Democracy squared	Bureaucracy
Initial GRP	0.070	0.070	4.027	-0.001
	(1.51)	(1.51)	(1.38)	(-0.67)
Oil and gas	-0.007	-0.007	-0.448	0.000
	(-0.88)	(-0.88)	(-0.84)	(0.95)
Education	10.796	10.796	677.780	-2.405***
	(0.46)	(0.46)	(0.45)	(-2.73)
Openness	90.161*	90.161*	5761.307*	1.447
	(1.84)	(1.84)	(1.85)	(0.79)
FDI	0.356	0.356	24.353	0.001
	(0.90)	(0.90)	(0.97)	(0.04)
Investments	0.005	0.005	0.224	0.000
	(0.42)	(0.42)	(0.27)	(0.18)
Health	0.030	0.030	2.312	-0.002
	(0.37)	(0.37)	(0.45)	(-0.59)
Temperature	-0.204	-0.204	-13.591	-0.007*
	(-1.57)	(-1.57)	(-1.65)	(-1.78)
Dummy Chukotka	-9.705	-9.705	-514.475	1.105***
	(-1.47)	(-1.47)	(-1.22)	(4.41)
Dummy Kalmykia	-6.194	-6.194	-300.328	0.604**
	(-0.85)	(-0.85)	(-0.65)	(2.19)
Dummy Ingushetia	-5.026	-5.026	-218.767	-0.568**
	(-0.82)	(-0.82)	(-0.56)	(-2.58)
Share of Russians	8.228***	8.228***	408.875**	
	(2.77)	(2.77)	(2.17)	
Distance	-0.825**	-0.825**	-54.458**	
	(-2.27)	(-2.27)	(-2.36)	
Distance squared				0.004***
				(3.42)
Constant	14.565***	14.565***	62.963	-6.610***
	(2.79)	(2.79)	(0.19)	(-38.45)
R^2	0.417	0.417	0.364	0.660
F	3.576***	3.576***	2.862**	10.670***
N	79	79	79	79

Notes: Numbers in parenthesis are t-values. *** significant at 1 per cent level, ** significant at 5 per cent level, * significant at 10 per cent level. F-test tests for the overall significance of the variables in the first-stage regression

E.3 Regressions with outliers

Table E.5: Effects of democracy and size of bureaucracy on average growth rate, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), without dummies for outliers

Variable	**(A1)**	**(A2)**	**(A3)**	**(A4)**	**(A5)**	**(A6)**
	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.045*	-0.043*	-0.039	-0.045**	-0.039*	-0.032
	(-1.99)	(-1.76)	(-1.60)	(-2.00)	(-1.67)	(-1.45)
Oil and gas	0.005	0.005	0.005	0.005	0.005	0.005*
	(1.40)	(1.31)	(1.31)	(1.47)	(1.42)	(1.76)
Education	25.180**	24.721**	22.822**	25.371**	23.269**	13.150
	(2.59)	(2.57)	(2.28)	(2.47)	(2.29)	(1.18)
Openness	27.068	30.425*	29.164	27.072	28.968	39.414**
	(1.55)	(1.71)	(1.63)	(1.54)	(1.55)	(2.09)
FDI	-0.056	-0.040	-0.007	-0.055	-0.007	0.120
	(-0.40)	(-0.32)	(-0.06)	(-0.41)	(-0.06)	(1.15)
Investments	0.015**	0.014**	0.013**	0.015**	0.013**	0.010**
	(2.14)	(2.19)	(2.11)	(2.63)	(2.45)	(2.16)
Health	0.017	0.019	0.022	0.017	0.022	0.005
	(0.44)	(0.49)	(0.56)	(0.44)	(0.56)	(0.14)
Temperature	-0.040	-0.037	-0.031	-0.038	-0.028	-0.013
	(-0.86)	(-0.84)	(-0.72)	(-0.89)	(-0.65)	(-0.32)
Democracy		-0.030	-0.587*		-0.592*	-4.165***
		(-0.59)	(-1.92)		(-1.82)	(-2.73)
Democracy squared			0.009*		0.009*	0.004
			(1.90)		(1.77)	(0.89)
Democracy * Bureaucracy						-0.547**
						(-2.57)
Bureaucracy				0.073	0.170	14.003**
				(0.03)	(0.08)	(2.32)
Constant	-0.871	-0.028	8.442*	-0.355	9.686	106.061**
	(-0.39)	(-0.01)	(1.88)	(-0.03)	(0.59)	(2.44)
R^2	0.262	0.265	0.289	0.262	0.290	0.384
N	79	79	79	79	79	79
F (democracy, democracy squared)			1.85		1.70	3.87**
F (democracy, democracy squared bureaucracy)					3.86**	
F (democracy, democracy squared, bureaucracy, democracy * bureaucracy)						3.02**

Notes: see *Table 5.2*

Table E.6: Interaction of democracy and size of bureaucracy, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), without dummies for outliers

Variable	(A7)	(A8)	(A9)	(A10)	(A11)	(A12)
	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.040	-0.039*	-0.034	-0.036	-0.041*	-0.038*
	(-1.63)	(-1.68)	(-1.39)	(-1.37)	(-1.84)	(-1.70)
Oil and gas	0.005	0.006	0.008*	0.004	0.008**	0.009**
	(1.20)	(1.53)	(1.93)	(1.07)	(2.32)	(2.57)
Education	23.430**	21.023*	18.119*	23.439**	28.906***	26.487***
	(2.22)	(1.99)	(1.87)	(2.13)	(2.68)	(2.74)
Openness	28.282	31.347	27.588	26.378	27.293	22.946
	(1.42)	(1.63)	(1.48)	(1.28)	(1.50)	(1.31)
FDI	-0.035	0.020	0.147	-0.023	0.064	0.167
	(-0.26)	(0.16)	(1.15)	(-0.17)	(0.68)	(1.50)
Investments	0.013**	0.016**	0.011*	0.012**	0.013**	0.008
	(2.56)	(2.41)	(1.74)	(2.44)	(2.53)	(1.65)
Health	0.028	0.012	0.023	0.024	-0.006	0.009
	(0.67)	(0.29)	(0.59)	(0.54)	(-0.16)	(0.28)
Temperature	-0.034	-0.080	-0.017	-0.020	-0.054	0.005
	(-0.73)	(-1.62)	(-0.33)	(-0.39)	(-1.25)	(0.12)
Bureaucracy (Democracy: I quartile)	-0.109			0.449		
	(-0.05)			(0.19)		
Bureaucracy (Democracy: II quartile)	-0.003			0.352		
	(-0.00)			(0.15)		
Bureaucracy (Democracy: III quartile)	0.071			0.369		
	(0.03)			(0.16)		
Bureaucracy (Democracy: IV quartile)	-0.017			0.252		
	(-0.01)			(0.11)		
Democracy (Bureaucracy: I quartile)		-0.035	-0.172		-0.002	-0.054
		(-0.72)	(-0.39)		(-0.05)	(-0.13)
Democracy (Bureaucracy: II quartile)		-0.064	-0.462		-0.052	-0.449
		(-1.01)	(-1.17)		(-0.91)	(-1.30)
Democracy (Bureaucracy: III quartile)		-0.078	-0.345		-0.079	-0.349
		(-1.19)	(-0.92)		(-1.36)	(-1.05)
Democracy (Bureaucracy: IV quartile)		-0.119*	0.019		-0.160**	-0.088
		(-1.75)	(0.04)		(-2.19)	(-0.22)
Democracy squared (Bureaucracy: I quartile)			0.002			-0.000
			(0.23)			(-0.04)
Democracy squared (Bureaucracy: II quartile)			0.010			0.011*
			(1.48)			(1.72)
Democracy squared (Bureaucracy: III quartile)			0.006			0.006
			(0.94)			(1.07)
Democracy squared (Bureaucracy: IV quartile)			-0.008			-0.005
			(-0.83)			(-0.59)
Democracy				-0.701		
				(-1.26)		
Democracy squared				0.010		
				(1.25)		
Bureaucracy					3.854	4.307
					(1.41)	(1.43)
Constant	-0.877	1.254	5.134	13.603	28.400	34.872*
	(-0.06)	(0.53)	(0.91)	(0.62)	(1.49)	(1.68)
R^2	0.280	0.319	0.387	0.293	0.365	0.435
N	79	79	79	79	79	79
F (bureaucracy for all quartiles of democracy)	0.52			0.12		
F (democracy for all quartiles of bureaucracy)		1.31	3.49**		0.74	3.40**
F (democracy squared for all quartiles of bureaucracy)			3.54**			2.33**
F (democracy and democracy squared for all quartiles of bureaucracy)			2.08*			3.41***
F (bureaucracy for all quartiles of democracy, democracy, democracy squared)				0.68		
F (democracy for all quartiles of bureaucracy, bureaucracy)					1.56	
F (democracy and democracy squared for all quartiles of bureaucracy, bureaucracy)						2.08**

Notes: see *Table 5.2.*

Table E.7: Effects of democracy and size of bureaucracy on average growth rate, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), without dummies for outliers

Variable	**(AI1)**	**(AI2)**	**(AI3)**
	TSLS	TSLS	TSLS
Initial GRP	-0.043	-0.049	-0.044*
	(-1.49)	(-1.39)	(-1.71)
Oil and gas	0.005	0.006	0.004
	(1.26)	(1.25)	(1.01)
Education	24.808***	20.537	9.124
	(2.65)	(1.38)	(0.55)
Openness	29.791*	3.569	26.721
	(1.69)	(0.12)	(1.10)
FDI	-0.043	-0.013	-0.072
	(-0.31)	(-0.09)	(-0.39)
Investments	0.014*	0.014*	0.023**
	(1.97)	(1.93)	(2.53)
Health	0.019	0.014	0.026
	(0.49)	(0.30)	(0.56)
Temperature	-0.038	-0.027	-0.150
	(-0.79)	(-0.51)	(-1.63)
Democracy	-0.024	-1.945	
	(-0.14)	(-1.47)	
Democracy squared		0.035	
		(1.45)	
Bureaucracy			-6.161
			(-1.28)
Constant	-0.187	26.549	-44.366
	(-0.04)	(1.40)	(-1.34)
R^2	0.265	0.159	0.018
N	79	79	79
F (democracy, democracy squared)		1.09	

Notes: see *Table 5.2*. Instruments are distance to Moscow and share of Russians in regressions (AI1), (AI2) and (AI4), squared distance to Moscow in regression (AI3).

Table E.8: Alternative measures of democracy, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), without dummies for outliers

Variable	**(A13)**	**(A14)**	**(A15)**	**(A16)**	**(A17)**	**(A18)**
	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.042*	-0.041*	-0.046*	-0.061***	-0.060**	-0.061***
	(-1.92)	(-1.80)	(-1.86)	(-2.80)	(-2.59)	(-2.82)
Oil and gas	0.005	0.005	0.005	0.008**	0.008**	0.008**
	(1.39)	(1.40)	(1.34)	(2.34)	(2.23)	(2.36)
Education	17.839*	18.476*	27.102***	15.213	8.649	12.421
	(1.84)	(1.97)	(2.70)	(1.44)	(0.85)	(1.18)
Openness	44.302***	44.482**	31.827*	40.187**	53.108***	42.655**
	(2.70)	(2.64)	(1.82)	(2.26)	(2.89)	(2.36)
FDI	0.002	0.014	-0.049	-0.022	0.004	-0.016
	(0.02)	(0.13)	(-0.39)	(-0.18)	(0.04)	(-0.11)
Investments	0.013**	0.012**	0.015**	0.015**	0.014**	0.016***
	(2.11)	(2.16)	(2.22)	(2.23)	(2.25)	(2.72)
Health	0.041	0.038	0.010	0.019	0.036	0.020
	(1.08)	(1.03)	(0.26)	(0.46)	(0.94)	(0.49)
Temperature	-0.042	-0.045	-0.039	-0.044	-0.056	-0.061
	(-1.00)	(-1.05)	(-0.89)	(-1.04)	(-1.32)	(-1.38)
Free elections	-0.456*	-1.010			-0.666	
	(-1.92)	(-0.84)			(-0.58)	
Free elections squared		0.098			0.035	
		(0.49)			(0.18)	
Free press			-1.853	-47.538**	-38.549**	-51.578**
			(-0.48)	(-2.32)	(-2.15)	(-2.59)
Free press squared				67.956**	59.954**	72.255***
				(2.47)	(2.47)	(2.71)
Bureaucracy						-1.044
						(-0.45)
Constant	0.645	1.306	-0.306	8.786**	8.466**	2.330
	(0.36)	(0.71)	(-0.14)	(2.29)	(2.37)	(0.16)
R^2	0.323	0.325	0.271	0.313	0.372	0.318
N	78	78	78	78	77	78
F (free elections, free elections squared)		1.83		1.91		
F (free press, free press squared)				3,27**	4.11**	3.78**
F (free press, free press squared, free elections, free elections squared)					2.37*	
F(free press, free press squared, bureaucracy)						2.58*

Notes: see *Table 5.2.*

Table E.9: Public sector and economic growth, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), without dummies for outliers

Variable	**(A19)**	**(A20)**	**(A21)**	**(A22)**	**(A23)**	**(A24)**	**(A25)**
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.037	-0.043*	-0.047**	-0.046*	-0.053**	-0.036	-0.042
	(-1.40)	(-1.78)	(-2.19)	(-1.96)	(-2.41)	(-1.45)	(-1.65)
Oil and gas	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	(1.26)	(1.35)	(1.55)	(1.44)	(1.53)	(1.30)	(1.39)
Education	21.277**	22.910**	28.384***	23.840**	30.886***	19.238*	23.176**
	(2.01)	(2.36)	(2.75)	(2.45)	(3.07)	(1.78)	(2.37)
Openness	27.395	27.528	29.073	28.975	40.688**	27.400	27.582
	(1.55)	(1.62)	(1.64)	(1.53)	(2.03)	(1.54)	(1.62)
FDI	-0.007	-0.045	-0.044	-0.051	0.002	-0.003	-0.044
	(-0.07)	(-0.33)	(-0.38)	(-0.33)	(0.02)	(-0.03)	(-0.35)
Investments	0.012**	0.015**	0.013**	0.016**	0.013**	0.013**	0.015**
	(2.38)	(2.11)	(2.57)	(2.52)	(2.58)	(2.59)	(2.58)
Health	0.030	0.019	0.018	0.020	0.032	0.033	0.019
	(0.72)	(0.53)	(0.46)	(0.53)	(0.80)	(0.80)	(0.52)
Temperature	-0.011	-0.037	-0.026	-0.053	-0.044	-0.018	-0.033
	(-0.24)	(-0.76)	(-0.67)	(-1.21)	(-0.96)	(-0.37)	(-0.68)
Public expenditures	3.942					4.412	
	(0.85)					(0.89)	
Inefficient bureaucracy		-16.999					-18.601
		(-0.39)					(-0.38)
Local bureaucracy			0.981		3.249		
			(0.52)		(1.59)		
Local federal bureaucracy				-0.770	-2.818*		
				(-0.43)	(-1.67)		
Bureaucracy						-0.604	0.184
						(-0.29)	(0.08)
Constant	-1.056	-0.217	4.268	-5.569	-1.049	-5.340	1.144
	(-0.49)	(-0.07)	(0.49)	(-0.57)	(-0.10)	(-0.39)	(0.07)
R^2	0.281	0.263	0.268	0.267	0.300	0.283	0.263
N	79	79	79	79	79	79	79
F (local bureaucracy, local federal bureaucracy)					1.87		
F (public expenditures, bureaucracy)						0.40	
F (inefficient bureaucracy, bureaucracy)							0.08

Notes: see *Table 5.2.*

Table E.10: Public sector and economic growth (controlling for democracy), 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), without dummies for outliers

Variable	**(A26)**	**(A27)**	**(A28)**	**(A29)**	**(A30)**	**(A31)**	**(A32)**
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Initial GRP	-0.037	-0.042*	-0.043*	-0.039	-0.050**	-0.037	-0.042
	(-1.38)	(-1.70)	(-1.89)	(-1.59)	(-2.20)	(-1.46)	(-1.65)
Oil and gas	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	(1.27)	(1.35)	(1.54)	(1.36)	(1.56)	(1.34)	(1.42)
Education	21.089*	25.169**	27.610***	21.537**	30.747***	20.484*	25.222**
	(1.92)	(2.54)	(2.77)	(2.19)	(3.22)	(1.84)	(2.51)
Openness	27.140	29.099	30.415*	31.527	43.598**	27.205	29.053
	(1.42)	(1.61)	(1.68)	(1.58)	(2.15)	(1.40)	(1.53)
FDI	0.006	-0.013	0.011	-0.001	0.072	0.007	-0.013
	(0.06)	(-0.11)	(0.11)	(-0.01)	(0.69)	(0.06)	(-0.11)
Investments	0.012**	0.013**	0.011**	0.014**	0.010**	0.012**	0.013**
	(2.28)	(2.11)	(2.18)	(2.47)	(2.09)	(2.45)	(2.45)
Health	0.028	0.020	0.023	0.026	0.041	0.029	0.020
	(0.66)	(0.52)	(0.58)	(0.66)	(0.98)	(0.70)	(0.52)
Temperature	-0.015	-0.033	-0.009	-0.043	-0.027	-0.017	-0.032
	(-0.32)	(-0.72)	(-0.24)	(-1.02)	(-0.65)	(-0.35)	(-0.65)
Public expenditures	2.474					2.652	
	(0.44)					(0.46)	
Inefficient bureaucracy		19.460					19.002
		(0.34)					(0.32)
Local bureaucracy			1.517		4.376**		
			(0.80)		(2.11)		
Local federal bureaucracy				-0.734	-3.362**		
				(-0.42)	(-2.19)		
Democracy	-0.454	-0.643*	-0.686*	-0.573*	-0.809**	-0.440	-0.643*
	(-1.35)	(-1.72)	(-1.96)	(-1.76)	(-2.20)	(-1.24)	(-1.72)
Democracy squared	0.007	0.010*	0.011*	0.009*	0.013**	0.007	0.010*
	(1.38)	(1.72)	(1.93)	(1.73)	(2.22)	(1.26)	(1.69)
Bureaucracy						-0.182	0.041
						(-0.09)	(0.02)
Constant	6.018	8.607*	17.705	3.815	13.962	4.507	8.903
	(1.01)	(1.92)	(1.37)	(0.32)	(1.03)	(0.26)	(0.53)
R^2	0.294	0.291	0.302	0.294	0.346	0.294	0.291
N	79	79	79	79	79	79	79
F (local bureaucracy, local federal bureaucracy)					3.22**		
F (public expenditrues, bureaucracy)						0.10	
F (inefficient bureaucracy, bureaucracy)							0.06
F (public expenditures, democracy, democracy squared)	1.14						
F (inefficient bureaucracy, democracy, democracy squared)		1.27					
F (local bureaucracy, democracy, democracy squared)			1.42				
F (local federal bureaucracy, democracy, democracy squared)				1.41			
F (local bureaucracy, local federal bureaucracy, democracy, democracy squared)					2.18*		
F (public expenditres, democracy, democracy squared, bureaucracy)						0.83	
F (inefficient bureaucracy, democracy, democracy squared, bureaucracy)							1.00

Notes: see *Table 5.2*.

Table E.11: Spatial model, 2000-2004, dep.var.: average GRP growth rate (inflation-corrected), without dummies for outliers

Variable	**(AS1)**	**(AS2)**	**(AS3)**
	ML (lag)	ML (lag)	ML (lag)
Iniial GRP	-0.043**	-0.050**	-0.043**
	(-2.01)	(-2.54)	(-2.14)
Oil and gas	0.006*	0.006**	0.006**
	(1.88)	(2.08)	(2.01)
Education	25.936***	28.081***	26.063***
	(2.92)	(2.69)	(2.66)
Openness	30.469	34.832	30.813
	(0.68)	(0.88)	(0.72)
FDI	-0.023	-0.070	-0.023
	(-0.18)	(-0.49)	(-0.19)
Investments	0.013**	0.015***	0.013***
	(2.30)	(2.75)	(2.67)
Health	0.024	0.019	0.024
	(0.63)	(0.51)	(0.64)
Temperature	-0.027	-0.036	-0.026
	(-0.71)	(-0.88)	(-0.67)
Democracy	-0.592**		-0.593**
	(-2.04)		(-1.99)
Democracy squared	0.009**		0.009*
	(2.00)		(1.92)
Bureaucracy		0.066	0.059
		(0.04)	(0.03)
Constant	8.963*	-0.067	9.382
	(1.88)	(-0.01)	(0.66)
ρ	-0.132	-0.120	-0.131
	(-0.53)	(-0.49)	(-0.54)
Variance ratio	0.282	0.254	0.409
Robust LM-test no spatial lag dependence	0.279	0.730	0.281
	(0.597)	(0.393)	(0.596)
Robust LM-test no spatial error dependence	0.804	1.455	0.789
	(0.370)	(0.228)	(0.374)
N	78	78	78

Notes: see *Table 5.2*. For the LM-test for spatial lag and error dependence numbers in parenthesis are p-values.

Eidesstattliche Erklärung

Hiermit erkläre ich, dass ich die Dissertation selbständig angefertigt und mich anderer als der in ihr angegebenen Hilfsmittel nicht bedient habe, insbesondere, dass aus anderen Schriften Entlehnungen, soweit sie in der Dissertation nicht ausdrücklich als solche gekennzeichnet und mit Quellenangaben versehen sind, nicht stattgefunden haben.

Mannheim, 10. Juni 2009

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Curriculum Vitae

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