# Taxation and Welfare Policy in Globalizing Economies

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# Contents

# Chapter 1

# General Introduction

Over the last decades, the world has experienced a period of intensifying economic, political, and social integration which we use to call globalization.[1] According to Dreher (2006), worldwide economic integration has increased by 58 per cent between 1970 and 2009, and political and social integration by 75 and 44 per cent, respectively. This development has been accompanied by many advantages: Consumption possibilities have been extended, both in terms of quantity and differentiation of products. People can travel and migrate more easily, exchanging ideas, making new friends, living where they feel most comfortable. Capital can flow to regions which had previously no profound access to financing investment projects.

Every medal, however, has two sides. There is ample evidence in the literature on the economics of taxation that the ability of governments to impose taxes decreases in the mobility of the tax base. As a result, it may become more difficult for governments to raise sufficient revenues as economies integrate internationally. At the same time, citizens' demand for government-provided insurance against labor market risks due to economic integration may rise (Rodrik 1998). These two developments make it more difficult for governments to respond to citizens' demand for welfare policies while maintaining sustainable budgets.

In the three chapters of this thesis, I analyze the effect of international economic integration on public finances in three steps: First, I investigate how information about globalization affects citizens' demand for welfare policies (Chapter 2). Second, I estimate to which extent economic integration limits the ability of governments to impose taxes on an increasingly mobile labor force (Chapter 3). Finally, I theoretically model the effect of economic integration on the effectiveness of welfare policies (Chapter 4, joint with Eckhard Janeba). The first two chapters are empirical work, whereas the final one presents a theoretical model. Although all chapters follow a common theme, each of them is written such that it can be read independently.

[1] Compare Keohane and Nye (2000) for a precise definition of the term *globalization* and Williamson (1998) for a historical perspective on the topic.

In Chapter 2, I quantify the role of media in the formation of support for unemployment insurance. Theory suggests that individuals who feel threatened by globalization demand compensatory policies. Using a novel method of quantitative text analysis, I derive measures on the attitude to globalization for all major British newspapers between 2001 and 2005. Results of regressing individual demand for unemployment insurance on my measure of globalization-specific newspaper positions show a consistent, sizable, and significant effect. This effect is in line with theoretical predictions and is robust to the inclusion of various controls such as trade effects and to accounting for biases resulting from self-selection of readers into newspapers with similar policy attitudes.

Within the thesis, this chapter plays the role of providing a framework for analyzing the effect of information about globalization on citizens' demand for welfare policy. The main theoretical argument for such an effect comes from the compensation hypothesis literature (Cameron 1978; Rodrik 1998) which states that a increasing exposure to (perceived) income risks due to globalization increases demand for compensatory policies. Given limited government resources, it is important to understand how this demand is formed and on which particular social groups changes in demand concentrate.

This chapter contributes to understanding these mechanisms by analyzing the effects of media consumption on the formation of voters' demand for compensatory policies. This is a novel approach as it combines two lines of literature which have developed separately so far. On the one hand, there is a literature analyzing the effect of globalization on individual demand for welfare policies. This literature has so far focussed on direct trade effects (e.g. Burgoon 2001; Cusack et al. 2006; Rehm 2009; Walter 2010). On the other hand, there is a recent line of research highlighting the impact of media reporting on individual behavior as well as on aggregate policy outcomes.[2] As these papers reveal considerable effects of media reporting, there is good reason to investigate whether media reporting about economic globalization affects individual demand for compensating welfare policies. Thus, the first main contribution of this chapter is to give us a far more comprehensive understanding of how globalization is going to shape size and scope of welfare systems.

The second main contribution of this chapter is that it accounts explicitly for the precise policy position of the media consumed by individuals using a topic-specific measure rather than often used newspaper dummies or indicators of media availability. The topic-specific measure allows to refrain from making (often implicit) assumptions about the policy content of media. However, this requires constructing reliable and replicable measures of media content. Thus, the third main contribution of this chapter consists in constructing such measures for the attitude of British newspapers towards globalization. To collect the data, I use a method for quantitative text analysis invented by Laver et al. (2003). Their statistical algorithm allows to create objective and time-variant measures

[2]Prat and Strömberg (2011) provide a comprehensive survey of this literature.

for topic-specific policy positions. Applying this method to all newspaper articles about globalization in ten major British newspapers between 2001 and 2005, I find that the general policy orientation of a newspaper is an imperfect indicator for the position of a newspaper towards globalization. Finally, this chapter is the first one to control explicitly for the endogeneity of media consumption. The endogeneity of the newspaper choice is problematic when individuals choose to read newspapers which meet their prior opinion on an issue, creating a severe reverse causality problem. Thus, I instrument for the individual newspaper choice by regional readership characteristics. I find that endogeneity is an issue for the estimation and that traditional approaches overestimate the true effect.

To estimate the effect of newspaper reporting on policy attitudes, I merge my data on newspaper reporting with individual level survey data from the British Social Attitudes Survey (BSAS). The BSAS is one of very few surveys including questions on newspaper readership behavior. It allows me both to link newspaper readership to an individual and to control for economic effects of globalization. In my empirical estimations, I find evidence for an independent effect of media reporting on individual demand for welfare policy. This effect is economically significant: Moving from the most globalization-sceptical newspaper (The Star in 2002) to the most globalization supporting one (The Express in 2005) reduces the likelihood to favor an expansion of unemployment benefits by about 11 percent in the baseline regression. The effect of being a supporter of the Labour Party rather than non-partisan, e.g., is of comparable magnitude. These estimates are robust to the inclusion of individual socio-demographics, trade controls, and accounting for self-selection into readership. Hence, media reporting on globalization plays a considerable role in the formation of demand for welfare policies and thus needs to be taken into account when investigating how globalization is going to shape welfare systems.

In Chapter 3, I estimate the effect of increasing labor mobility on personal income tax schedules. I combine rich data on effective personal income tax levels in a panel of OECD countries for the period 1986-2005 with a new Index of Potential Labor Mobility. This index allows to tackle issues of reverse causality and potentially confounding effects from strategic competition. Estimates show that increasing labor mobility accounts for a considerable part of lower tax burdens. Furthermore, the reduction is found to be constant across brackets of taxable income.

In developed countries, personal income taxation is far more important for government revenues than taxes on capital income. Nonetheless, the literature on tax competition has so far emphasized competition in capital taxes, supported by the widespread notion that labor was immobile between countries. However, there is quite some empirical evidence that labor, and in particular high-skilled labor, is far from being immobile: Defoort (2006) estimates that on average between five per cent (below college education) and ten per cent (at least college education) of world population have emigrated to one of

the six main receiving countries (Australia, Canada, France, Germany, the UK, and the US) since the mid 70s. Furthermore, there is an increasing number of preferential tax treatments for foreign high-skilled workers (e.g. in Denmark or Singapore), which are explicitly designed to attract internationally mobile high-skilled labor. The fact that tax policy makers are aware of labor mobility and its effects on domestic tax bases is mirrored by recent theoretical research by Simula and Trannoy (2010) who show that even modest increases in the international mobility of the high-skilled can have considerable effects on the optimal personal income tax schedule.

Thus, it is worthwhile to quantitatively assess the role of increasing labor mobility for domestic personal income taxation. This chapter provides estimates of the effect of (an) increasing (threat of) emigration on the level and the shape of personal income tax schedules in 26 OECD countries between 1986 and 2005. Thereby, the chapter makes two main contributions: First, I account for heterogenous effects of mobility on taxes paid by high and low-income earners. This allows to account both for changes in the level and the shape of the tax schedule due to increased labor mobility. Second, I construct a new Index of Potential Labor Mobility. This index contains yearly information on 26 OECD countries between 1986 and 2005 and is based on country-pair specific information. In comparison to observed labor flows, this index has several advantages: First, it allows to cope with reverse causality which can arise as taxation is known to induce individual migration decisions (Abramitzky 2009; Kleven et al. 2011). Reverse causality can be dealt with when using this index as it is based on indicators which are not under the control of current tax policy. The second advantage of the index is that it allows to account for the effects of strategic competition in personal income taxation. Third, the index links the empirical analysis closer to existing theory, e.g. the model by Simula and Trannoy (2010).

The descriptives of the index show some interesting features: First, potential labor mobility is not very high, with values averaging at about seven per cent of its theoretical maximal value. Second, potential mobility has increased considerably over the last two decades, particularly after the fall of the iron curtain. Third, countries in Scandinavia and Southern Europe known for high levels of taxation show relatively low levels of potential mobility, whereas low tax "anglo-saxon" countries have relatively mobile populations.

The main empirical result of this chapter is the following one: Increasing potential labor mobility lowers the tax burden on labor income. However, there is no robust evidence for heterogeneity across brackets of taxable income. The estimated effect is of considerable size: The German workforce experienced the largest increase in potential labor mobility during the period 1986 to 2005. This increase led to a reduction of the average tax burden for incomes of about 100,000 Euros per year in 2005[3] by at least five percentage points, depending on specification. The estimates are robust to the inclusion

[3]Four times average GDP per capita.

of economic and political controls, for indirect effects via the revenue or expenditure side of the budget, and for alternative specifications of the index. Furthermore, I show that my index measures a distinct aspect of economic integration and that measures of observed emigration are prone to severe reverse causality.

In Chapter 4 (co-authored with Eckhard Janeba) we contribute to the understanding of how international economic integration interacts with government policies in shaping individual decisions about education and labor market participation. Individuals are heterogenous in their skills and trade occurs between sectors characterized by oligopolistic competition. Within this setting, individuals decide on their type of education and on labor market participation subject to the degree of international integration as well as education subsidies and basic assistance provided by the government. We show that economic integration reduces the ability of governments to influence these decisions. However, governments can reinforce their influence by either fostering competition in the differentiated goods sector or by coordinating education subsidies internationally.

Despite the considerable impact of economic integration on economic conditions, our knowledge about its role for individual decisions about education and labor market participation is still quite limited. There are at least two reasons for exploring this relationship in more depth: First, decisions about education and labor market participation are important determinants of economic well-being, both at the individual and the aggregate level. It is thus important to understand how external income risk and goods market integration shape individual decisions at these two margins. Second, many governments are interested in increasing participation in these two areas. To target investment into activation programmes efficiently, it is necessary to understand why and how economic integration changes decisions about education and labor market participation decisions. Furthermore, we need to understand whether economic integration alters the effectiveness of existing programmes, that is whether governments need to adjust spending for activation programmes to reach the same goal as before.

Thus this chapter follows several objectives: First, we provide a model which allows to study the effects of falling trade costs on both education and labor market participation decisions at the same time. Second, we explicitly allow for government policies to affect these decisions. Third, we study how trade integration changes the effectiveness of these policies.

To analyze these issues we construct a model of international trade in which individuals endogenously choose their education and labor market participation. These decisions are made under uncertainty about the realization of a economy-wide productivity shock and thus uncertainty about wages. Furthermore, these two decisions are subject to economic integration and incentives provided by the governments. Therefore, the size and skill composition of the labor forces are endogenously determined.

Risk plays an important role in our model. Individuals know the distribution of productivity when making their education decisions and its realization when they decide whether to work or not. Risk generates unemployment among individuals with basic education which is decreasing in realized productivity. This way of modeling allows to replicate that productivity risk is not equally important for all individuals and that unemployment is more prevalent among the low-skilled.

There are two countries in our model, each consisting of two sectors: In sector 1 firms produce competitively a numeraire consumption good. In a second sector a continuum of varieties are produced in an oligopolistic market with a fixed number of firms (relaxed later). The only input in production is labor and firms compete in quantities. Due to oligopolistic competition it is worthwhile for firms in both countries to export to the other market (reciprocal dumping) unless iceberg trade costs are too high. Individuals are heterogeneous in their initial ability. Wages per unit of labor are stochastic due to an economy-wide shock. Individuals can first decide on their level of education and then on whether to work or to receive some basic assistance. Governments influence both decisions by subsidizing education and providing basic assistance transfers which are both financed through head taxes. These transfers are at the heart of the mechanism driving our results on labor market participation. The amount of money paid to an unemployed is a fixed share of the expenditures on differentiated goods made by the employed and is thus tied to a real consumption basket. This reflects the fact that policymakers in most developed countries have some minimal standard of living in mind when setting these transfers.

Our approach is complementary to the standard way of modeling the relationship between trade and education as well as labor markets. Both the classical trade theory as well as the recent trade literature[4] treat the effective amount of labor as given and develop the resulting trade patterns. We take the opposite way and ask what kind of skill distribution and labor market participation result from a certain degree of trade integration and its interaction with government policies.

We use the framework of our model to analyze the effect of changes in education subsidies and trade integration on education and labor market participation decisions. In our baseline model with a fixed number of firms, we show that subsidies for higher education increase the mass of individuals opting for advanced education. Higher taxes needed to finance these subsidies reduce incentives to educate and to work for all other individuals. These results do not depend on international integration.

We then extend this baseline specification by endogenizing the number of firms. In this modified setting each firm needs to employ a certain amount of workers with advanced education. This way education subsidies increase competition in the differentiated goods sector, lower prices, and thereby reduce the relative value of the basic transfer fixed in real terms. As a result, more individuals participate in both types of education and

[4]Compare e.g. Melitz (2003), Yeaple (2005), Chaney (2008), or Neary (2009)

more people work. Furthermore, a given education subsidy increases education and labor market participation the more the (i) higher education subsidies abroad, (ii) the lower trade integration, i.e. the higher the influence of the policy on the own price, and (iii) the more the number of firms increases in response to more skilled labor. These results already entail some policy implications: Economic integration reduces the effectiveness of education subsidies in increasing education and labor market participation. Governments can counter this deterioration either by unilaterally fostering competition in the goods market or by multilaterally coordinating education subsidies.

In the next step, we extend the analysis in two ways: First, we allow home and foreign to be asymmetric in population size. We can show that smaller countries are more effective in increasing education and labor market participation. Second, we generalize the basic transfer to cover more than needed to buy the full basket of differentiated goods. All results derived before are qualitatively robust to these alternative settings. In a final analysis, we endogenize the education subsidy via a median voter model. The subsidy chosen by the median voter heavily depends on the skill distribution in the economy. Two results, however, hold for general distributions: The chosen subsidy increases in economic integration and in the foreign subsidy. These results suggest that the subsidy chosen by the median voter allows for multilateral policy coordination and counters the lower effectiveness of subsidies in integrating economies.

# Chapter 2

# Does *Fleet Street* Shape Politics? Estimating the Effect of Newspaper Reporting about Globalization on the Support for Unemployment Insurance

## 2.1 Introduction

Globalization has been one of the predominant forces in shaping the global economy over the last decades.[1] With falling transportation costs, reduced barriers to trade, and rapidly growing access to the internet and other communication devices, global economic integration can be expected to intensify even further in the years to come. Although trade theorists seem to agree that economic integration and resulting specialization is overall beneficial,[2] this view is not shared by the entire public sphere. Increasing exposure to (perceived) income risks due to globalization triggers demand for compensating welfare policies as propagated by the compensation hypothesis (cf. Cameron 1978; Rodrik 1998). However, governments may find it hard to finance these welfare policies since economic integration also imposes limits on their ability to levy taxes on capital or mobile high-income earners. Understanding to which extent deepening economic globalization affects the demand for welfare policies and on which particular social groups these changes in demand concentrate is thus an essential prerequisite for assessing the sustainability of welfare systems.

This chapter contributes to understanding these mechanisms by analyzing the effects of media consumption on the formation of voters' demand for compensatory policies. This combination is a novel approach since these two lines of literature have developed

[1] Throughout this dissertation, I use the terms globalization and (international) economic integration interchangeably, cf. Rodrik (2000), unless explicitly stated otherwise.

[2] Compare Newbery and Stiglitz (1984) for a dissenting position.

separately so far. On the one hand, the literature on how globalization affects individual demand for welfare policies has mostly focussed on the channels suggested by classical trade theory (e.g. Burgoon 2001; Cusack et al. 2006; Rehm 2009) and more recently also on firm-level trade effects (Walter 2010). All these papers rest on the implicit assumption that individuals are able to quantify the effect of globalization on their incomes when having trade theories and trade statistics at hand.

On the other hand, there is a recent line of research highlighting the impact of media reporting on individual behavior as well as on aggregate policy outcomes. Gentzkow and Shapiro (2004), e.g., study in a seminal paper how media reporting affects individuals' views on the US and on 9/11. La Ferrara et al. (2012) stress the importance of media consumption for fertility decisions. At the aggregate political level, Strömberg (2004) shows an impact of radio access on public spending in US regions and DellaVigna and Kaplan (2007) estimate the effect of FoxNews on Republican vote shares.[3] These papers reveal considerable effects of media reporting on both individual opinions and aggregate policy outcomes in a variety of settings. Therefore, there is good reason to expect media reporting on economic globalization to affect individual demand for compensating welfare policies. If this turns out to be the case, this gives us a far more comprehensive understanding of how globalization is going to shape size and scope of welfare systems.

Accounting explicitly for the policy position of the media consumed by individuals is the second main contribution of this chapter. Most of the papers mentioned above look at rather crude measures for media consumption, such as newspaper dummies, media availability, or the coverage frequency of a certain topic.[4] When using such measures, the effect of the exposure to media on political outcomes is unclear from a theoretical perspective, since the precise position of a media outlet is unknown. Often, implicit assumptions on relative positions of media outlets are made. Such assumptions seem to be justified when we are concerned with broad left-right effects. However, such assumptions are far less convincing in settings with several media outlets, several time periods, or topics rarely covered in the media.

The third main contribution of this chapter consists in the construction of reliable and replicable measures for the stance of British newspapers towards globalization. The necessity to collect this data is a direct consequence of the previous argument. To collect the data, I rely on a method of quantitative text analysis propagated by Laver et al. (2003) and used by political scientists to analyze the political positions of party manifestoes and political speeches.[5] The statistical algorithm implemented by Laver et al. (2003)

[3]Further related literature is Prat and Strömberg (2005); Knight and Chiang (2011); Gerber et al. (2009); Durante and Knight (2012); Faccini et al. (2009) with a focus on individual opinions and e.g. Gentzkow (2006); Oberholzer-Gee and Waldfogel (2009) with a focus on aggregate political outcomes. Prat and Strömberg (2011) provide a comprehensive survey on this line of literature.

[4]The coverage frequency is a crude measure for the so-called *first-level agenda-setting*. According to the theory of *first-level agenda-setting*, more exposure to media leads to the formation of *any* opinion.

[5]The first paper in economics that goes this way is Gentzkow and Shapiro (2010). Using methods

in their wordscores-routine creates objective and time-variant measures for topic-specific policy positions by comparing word frequencies in the dataset with those in so-called reference texts. These measures can be targeted to specific policy issues and thus go far beyond crude left-right categorizations. Applying this method to all newspaper articles on globalization in 10 major British newspapers between 2001 and 2005, I find strong support for my initial assertion that the general policy slant of a newspaper is not a good indicator for the position of a newspaper towards globalization since these two measures are neither highly correlated nor are newspapers' positions stable over time.

Being the first paper to control explicitly for the endogeneity of media consumption is the fourth main contribution of this chapter. Most prior research, though in principle aware of the issue, has not tackled this point so far. However, when individuals choose to read newspapers which perfectly meet their prior opinion on an issue, most of the correlation is caused by reverse causality. Since such selection is most likely at work, it is important to control for it and to quantify the effect. In this chapter, I thus instrument for the individual newspaper choice by regional readership characteristics. As it turns out in the empirical investigations, endogeneity is an issue in the data. Interestingly, the quantitative impact of endogeneity is by far larger when measuring the newspaper position in the traditional way by newspaper dummies than when using the new data collected for this chapter. This result lends additional relevance to my research strategy.

The analysis requires linking individuals to the content of media information they consume. This is non-trivial in practice since hardly any survey on media consumption behavior collects the data on the socio-economic background of respondents which is necessary to control for economic effects of globalization. Due to the highly concentrated newspaper market in the UK, however, large-scale surveys such as the British Social Attitudes Survey (BSAS) include questions on newspaper readership behavior. I use this exceptional data set both to link newspaper readership to an individual and to control for economic effects of globalization at the individual level. Due to limitations in the availability of newspaper data and major economic control variables, I have to restrict the time-span of the investigation to the period 2001 to 2005.

Linking the measures for newspaper content to individuals in the BSAS dataset, I find evidence for the existence of an impact of media reporting on individual demand for unemployment insurance. This effect is economically significant: Moving from the most globalization-sceptical newspaper (The Star in 2002) to the most globalization supporting one (The Express in 2005) reduces the likelihood to favor an expansion of unemployment benefits by about 11 percent in the baseline regression. The inclusion of both individual socio-demographics and controls for trade effects does hardly affect this magnitude. Fur-

of quantitative text analysis in the vein of Laver et al. (2003) they estimate measures for the overall left-right orientation of 433 US newspapers in 2005.

thermore, coefficients are slightly smaller (by one percentage point) when accounting for self-selection into readership, but remain both statistically and economically significant. The effect of being a supporter of the Labour Party rather than non-partisan, e.g., is of comparable magnitude. Hence, the effects of media on the formation of demand for compensating policies need to be taken into account when investigating how globalization is going to shape welfare systems.

The chapter proceeds as follows: In the next section, I discuss why we can expect reporting on economic globalization to have an effect on individual demand for welfare policies. In the third section, I present the data used in the empirical investigations, give a brief introduction into methods for quantitative text analysis, and explain how the text measures used in this chapter are derived. Section four presents and discusses the empirical findings. The final section summarizes results and highlights its implications.

## 2.2 Theoretical Framework

### 2.2.1 The Role of Media in Shaping Policy Attitudes

Communication scientists distinguish two channels through which mass media influences individual opinions.[6] The first one is labeled *first-level agenda-setting* (cf. McCombs and Shaw 1972). This channel relates to the frequency of reporting on a certain issue. The underlying theoretical argument is that more frequent reporting leads individuals to reflect more intensely on a certain issue and thereby induces them to form an opinion. Put differently, the more often media reports on a certain issue, the lower the likelihood to find an individual without *any* opinion on that topic. However, according to this theory, the reporting frequency has no effect on *which* opinion is formed.[7]

The role of media in the formation of specific opinions in known as *second-level agenda-setting* (Lopez-Escobar et al. 1998; Golan and Wanta 2001). This part of the theory postulates that consumption of media transmits attribute salience to the reader, i.e. media content shapes the way a reader thinks or feels about a certain issue.

In this chapter, I want to test whether media consumption affects individual support for unemployment insurance, i.e. I am interested in which opinion readers form. Therefore, my analysis is more closely related to *second-level agenda-setting* and I have to use a measure of the relevant newspaper *content* in the empirical analysis.

[6] See Protess and McCombs, eds (1991) for a broad survey.

[7] Testing this theory requires to check whether reporting intensity has an effect on the likelihood to form any opinion. The BSAS data does indeed allow respondents to state that they have no opinion on whether unemployment benefits should be increased or decreased. However, none of the undecided reads a newspaper, making it impossible to test this theory with present data. See Gerber et al. (2009) and Oberholzer-Gee and Waldfogel (2009) for implicit tests of this theory.

In addition to these theoretical arguments, there is a wide range of empirical articles showing that media has an impact on individual actions and beliefs. Gentzkow and Shapiro (2004) show that the access to a TV network (AlJazeera or CNN) shapes the view of individuals on 9/11 in Arab countries. DellaVigna and Kaplan (2007) use random variation in the availability of Fox News to estimate the effect of exposure to Fox News on vote shares of Republican Candidates. La Ferrara et al. (2012) focus on rather long-lasting effects of media consumption: Using random variation in access to a TV station in Brazil, they show that changes in the family size in telenovelas have an impact on fertility decisions.

A further important issue is whether media reports in an unbiased way. If media reports in an unbiased way, then *a priori* we cannot make a clear statement on whether media has an effect on demand for compensation *in addition* to the effects described by trade theories: Media reporting might just serve as a perfect substitute for calculating the labor market effects according to economic theory. This concern is of particular relevance in settings without random variation in newspaper access such as the one used in this chapter.

From a theoretical point of view, an independent additional effect of media seems to be plausible for several reasons: First, media has an incentive to over-report on bad news ("bad news is good news"), intensified by the fact that losers are often more visible than winners.[8] Second, media reporting might be plainly biased to meet readers priors.[9] Third, consumers of mass media are far too heterogeneous to allow the media outlet to give accurate and precise information on the economic prospects for every single individual among them – mass media requires generalizations and simplifications.

There is some literature providing empirical evidence on biased reporting of newspapers. Puglisi (2011) uses data on how often The New York Times reported on issues either "owned" by Democrats or Republicans between 1946 and 1997 and finds evidence of a more favorable reporting on topics "owned" by Democrats if the presidential incumbent is a Democrat. Using data on 140 US newspapers endorsing either the Democratic or the Republican presidential candidate, Larcinese et al. (2011) find that a similar pattern applies to articles on economic issues in the period 1996 to 2005.

In summary, there is evidence that media reporting is able to influence individual policy attitudes in general. In the empirical analysis, I have to establish that this general relationship also holds true for the relationship between media reporting on economic globalization and individual demand for social welfare policies. Second, I have to test

[8] In some circumstances, media might overreport on those who gain, e.g. on corporate gains due to exports. However, this does not affect the validity of this argument since it only changes the sign of the bias.

[9] This argument has been derived in theoretical models by Mullainathan and Shleifer (2005) and Gentzkow and Shapiro (2006). An early paper presenting empirical evidence on this matter is Lord et al. (1979)

whether newspapers serve as a perfect proxy for economic effects, or whether there is an independent effect of newspaper content. In the former case, the estimated effect of newspaper content decreases considerably once I control for direct trade effects. If newspaper reporting contains different or additional information, however, coefficients stay much more stable.

### 2.2.2 Globalization and Demand for Welfare Policies

Testing whether newspaper content has an impact on individual attitudes in addition to pure economic effects requires accounting for these economic effects. Therefore, I discuss in this section alternative factors changing individual attitudes towards the provision of unemployment insurance with a focus on the labor market effects of economic integration.

In general, the objective of welfare policies such as unemployment insurance is either to redistribute income, to provide insurance, or a mixture of both. To understand how globalization influences individual attitudes towards these policies one therefore has to think about the impact of economic integration on both the level and the volatility of incomes.

A first line of argumentation focusses on the redistributive role of welfare policies. In addition to socio-demographic characteristics (compare e.g. Alesina and Giuliano (2010)), income expectations are found to play a major role in the formation of demand for redistribution.[10]. The role of income expectations is of importance since both classical trade theories such as Heckscher-Ohlin or Ricardo-Viner models and more recent models in the fashion of Yeaple (2005) entail relatively clear-cut predictions on who can expect to gain and who to lose when economic integration intensifies: Income gains and losses are distributed along education levels as well as sectoral and occupational affiliation. Since these cleavages are quite sticky at the individual level, forward-looking rational individuals are able to calculate the impact of economic integration on their future incomes and therefore to adjust the attitude towards redistribution appropriately.

Another line of argumentation deals with the effect of economic integration on the demand for publicly provided insurance. These arguments are based on the literature on the so-called compensation hypothesis (Rodrik 1997, 1998). An important assumption in these papers is that economic globalization does not only affect long-term income movements but also the volatility of earnings in the short-run. In this case, risk-averse individuals facing income volatility demand insurance against uncertain income levels. However, economic integration allows to diversify risks.[11] At the same time, it fosters a more specialized economic structure and facilitates the transmission of foreign shocks into the domestic economy. Since these effects push the volatility of earnings in opposite

[10] This argument has been modeled theoretically by Benabou and Ok (2001) and tested empirically by Alesina and La Ferrara (2005).

[11] Cf. Rodrik (1998, p.1021).

direction, the overall volatility-reducing effect of economic integration needs to be assessed empirically. In a related paper, Kim (2007) is able to show that external risk as measured by the volatility of terms of trade, net trades volumes, and exchange rates increases the volatility of domestic variables such as per capita and aggregate values of income, consumption, and investment in a panel of 175 countries between 1950 and 2002.

Another source of risk is created by the potential to offshore jobs. Blinder (2009) analyzes the offshorability of jobs using detailed US labor market data for 950 different occupations in 2004. He shows that there are sizeable differences in the potential to offshore jobs and that highly offshorable jobs were *ceteris paribus* paying significantly lower wages even though the potential offshoring had not yet materialized. In a related study, Senses (2010) uses US plant-level data between 1972 and 2001 to investigate the relationship between the offshorability of occupations and the elasticity of labor demand. She finds evidence for a positive relationship between the offshorability and the elasticity of the corresponding labor demand implying an increased income risk in offshorable occupations.

On a micro-level, several aspects of both lines of argumentation have been tested to date (e.g. Burgoon 2001; Cusack et al. 2006; Rehm 2009). Walter (2010) tests the entire chain of the compensation hypothesis empirically using Swiss data from the 2007 wave of the World Values Survey. She shows that individuals who are either negatively affected by international economic integration according to the predictions of both Heckscher-Ohlin and Ricardo-Viner models or who work in highly offshorable occupations are more likely to express feelings of job insecurity. Second, this perceived insecurity translates into a higher demand for governmental activity in the economy and in a higher propensity to vote for left-wing parties.

This evidence suggests that the labor market effects of economic integration have an influence on individuals' demand for unemployment insurance: Individuals exposed to deteriorating labor market prospects increase their demand for compensatory policies. To disentangle these economic effects of integration from the effects of newspaper reporting I therefore have to control for the individual labor market effects of economic integration according to these theories.

## 2.3 Methods and Data

### 2.3.1 Measuring Newspaper Reporting: Quantitative Text Analysis

Assessing the impact of media reporting on individual decisions requires the measurement of newspapers' positions towards globalization. Applying a method of quantitative text analysis allows to generate time-varying topic-specific measures of newspaper positions.

Similar methods have been used in political science for some time to quantify political positions of texts. The quantitative analysis of texts is based on the so-called salience theory, which assumes that parties do not compete by directly opposing each other on the same issue but by stressing different policy positions in their manifestoes.

The method used in this chapter to infer policy positions from newspaper articles is the so-called *Wordscores* method proposed by Laver et al. (2003).[12] It treats the frequency at which words occur in a text as unit of information. Using word frequencies from texts with known policy position, so-called reference texts, each word gets assigned a parameter value, the wordscore. The values of the wordscore are chosen to maximize the likelihood that the sum of all products of wordscores and word frequencies meets the known policy positions of the reference texts (textscores). The set of wordscores derived for every single word is then applied to the word frequencies of the texts to be analyzed –so-called virgin texts– to predict their policy positions.[13] An example for how the algorithm works is provided in Appendix A.2.2.

This method has two major advantages compared to previously used methods of hand-coding: First, it is less time-consuming. Second, it is more objective since scores obtained via hand-coding rely on decisions made by the coder.[14] On the downside, this method does not allow to analyze and compare texts in different languages. This caveat, however, is of no importance in the context of this chapter.

I apply the Wordscores method to all articles on economic globalization that have been published in major British newspapers in the years 2001 to 2005.[15] In order to increase the reliability of the obtained textscores, I carefully choose the articles included in the dataset and diligently remove all spelling mistakes and every annotation added by the provider of the articles from the texts.[16] As reference texts I choose all election manifestoes of the three major British parties in the years 1992-2005.[17] Due to the work done by the Comparative Manifesto Project (Budge et al. 2001; Klingemann et al. 2006), we have reliable information on the location of these manifestos on a uni-dimensional scale measuring the parties' stance towards free trade. The party attitude towards free trade is the one among all categories in the CMP dataset which comes closest to the standard notion of economic integration. The positions of the party manifestoes are displayed in Table 2.1:

The matrices containing the frequencies of words in the texts are called word-count

[12] See Lowe (2008) and Martin and Vanberg (2008) for further information on the Wordscores procedure.

[13] To get an intuition, the reader may want to think of the first step as a maximum likelihood estimation with the textscore of the reference text on the left hand side, and the word frequencies on the right-hand side. The second step then corresponds to an out-of-sample prediction.

[14] There are quite stringent guidelines on which groups of words have to be coded in which way, so called dictionaries, involved in this process. However, some discretion of the human coder is necessarily present.

[15] All newspapers are listed in Table 2.2.

[16] More details on the precise procedure are given in Appendix A.2.1.

[17] These are provided by Pennings and Keman (no date)

Table 2.1: Position of Election Manifestoes on Free Trade

| | 1992 | 1997 | 2001 | 2005 |
|---|---|---|---|---|
| Conservative Party | 0.30 | -0.55 | -0.55 | 0.00 |
| Labour Party | -0.20 | -0.72 | -0.60 | 0.00 |
| Liberal Democrats | 0.00 | 0.12 | -0.17 | -0.10 |

matrices. When constructing the word-count matrices, Wordscores allows to choose either single words or groups of words as unit of analysis. Since compound words are quite rare in the English language, I perform the analysis treating groups of either two (bigrams) or three words (trigrams) as unit. Resulting textscores for both bigrams and trigrams are presented in Table 2.2. These textscores constitute the main explanatory variable in my empirical analysis.

Table 2.2: Textscores from Wordscores Procedure

| | | Textscores | | | | |
|---|---|---|---|---|---|---|
| Newspaper | *MondoTimes* | 2001 | 2002 | 2003 | 2004 | 2005 |
| Express | Conservative | -0.16 | -0.16 | -0.26 | 0.10 | 0.62 |
| Mail | Conservative | -0.29 | 0.06 | 0.03 | 0.34 | 0.05 |
| Mirror | Leans left | -0.25 | 0.29 | 0.44 | 0.20 | -0.39 |
| Star | Leans right | 0.43 | -0.61 | 0.06 | -0.02 | 0.05 |
| Sun | Leans right | -0.26 | 0.09 | -0.14 | 0.47 | 0.28 |
| Telegraph | Leans right | -0.30 | -0.07 | -0.15 | 0.19 | 0.21 |
| Guardian | Leans left | -0.41 | -0.29 | -0.06 | 0.02 | 0.04 |
| Independent | Leans left | 0.07 | 0.14 | -0.43 | 0.12 | -0.54 |
| Times | Leans right | -0.26 | 0.03 | 0.35 | -0.13 | -0.30 |
| Record | Leans left | -0.39 | 0.30 | 0.44 | 0.03 | -0.31 |

Transformed textscores derived jointly from bigrams and trigrams using Wordscores-method from Laver et al. (2003). *MondoTimes* is a time-invariant measure of the overall political slant of a newspaper.

The values of the textscores need to be interpreted in comparison to the positions of the reference texts in Table 2.1. To give an example, the Express is almost as globalization sceptic in 2001 (textscore: -0.16) as the Liberal Democrats in their election manifesto (-0.17), whereas the Record (-0.39) is quite in the middle between the positions of the Liberal Democrats (-0.17) and the Conservative Party (-0.55) in 2001.

Between 2001 and 2004, newspapers move on average by almost two standard deviations to more globalization-endorsing positions. In 2004 the British labor market has been opened to workers from new Eastern European member states of the European Union. This policy change led to public concerns about adverse labor market effects. These concerns are reflected in the drop in average enthusiasm for globalization in newspapers in 2005.

Looking a single newspapers over time, it catches the eye that up-market newspapers report in a comparatively stable and globalization-sceptic way, whereas low-market papers have a more affirmative view on globalization, although reporting is far less stable over

time. Although these differences are not statistically significant, the results on the stability of reporting are not unexpected.

There are two aspects to keep in mind: First, the position towards globalization is not related to the general political orientation of a newspaper. Second, reporting of newspapers is not stable over time. These findings support my initial assertion that time-invariant measures of general political slant or newspaper dummies do not fully capture the newspaper content an individual is exposed to. This problem is aggravated the longer the time horizon of the study and the less important the topic for general newspaper orientation.

### 2.3.2 Survey Data

The other main source for the data I use in this chapter is the British Social Attitudes Survey (BSAS). The BSAS contains representative repeated cross-sections of the British population (approximately 3500 adult respondents each) and has been conducted by the National Centre for Social Research on an annual basis since 1983. A wide range of information concerning social attitudes, beliefs, and values is provided for each respondent. Furthermore, standard socio-economic information on each participant has been collected.

Despite the absence of a panel structure, the BSAS data set is particularly valuable for this study due to the rich set of variables on media consumption habits. The media variable I use in this chapter provides information on the newspaper read by the respondent. This readership indicator allows to link newspapers' positions on economic integration to the individual level data of the BSAS. Since this question has been asked in every wave of the survey, I can look at a lot of time periods allowing me to exploit both variation within newspapers over time and between newspapers.

In addition, the data set contains a wide range of questions related to the desired scope of various governmental social welfare programs including a question which specifically deals with respondent's opinion on the size of unemployment insurance:

> *Opinions differ about the level of benefits for unemployed people. Which of these two statements comes closest to your own view? Benefits for unemployed people are too low and cause hardship or, benefits for unemployed people are too high and discourage them from finding jobs?*

Agreement with the first statement is coded as one, the second one as zero. In this study, the answer to this question is used as dependent variable.

The main source of unemployment insurance in the UK is the so-called "Jobseeker's Allowance" (JSA). This assistance is paid to all unemployed individuals who are actively seeking for a new job. The height of payments depends on age and marital status, but not on former income. The only exception to this rule is that claimant's assets do not reduce payments if he has been paying National Insurance Contributions for at least two

years prior to claiming JSA (contribution-based JSA). Payments amount to roughly GBP 300 per month for a single claimant. Although the JSA system has been permanently adapted to changing social and economic circumstances, there were no significant reforms in the period covered in this study.[18] Clearly, participants in the BSAS have different incentives to favor a more generous system of unemployment insurance or not. These incentives are related to factors influencing the expected return of this insurance such as employment status, income, educational background, or occupation. Furthermore, non-economic factors like the political orientation may play a role. What is important in the context of this investigation is that the data of the BSAS allows to control for all these factors. Elements such as time caps on eligibility over the whole life-time of a claimant are not part of the JSA.

## 2.4 Empirical Results

Based on the previous discussion of determinants of attitudes towards unemployment insurance, estimation equations take in general the following form:[19]

$$insurance_{ijkt} = \alpha + \beta \cdot newspaperposition_{jt} + \boldsymbol{trade}'_{\boldsymbol{it}}\boldsymbol{\gamma} + \boldsymbol{x}'_{\boldsymbol{it}}\boldsymbol{\delta} + \boldsymbol{m}'_{\boldsymbol{kt}}\boldsymbol{\eta} + \nu_j + \mu_t + \epsilon_{ijkt}$$

where *insurance* is the attitude towards unemployment insurance, *newspaperposition* measures the policy slant of a newspaper, $\boldsymbol{trade}$ is a vector of various measures of the economic impact of globalization, and $\boldsymbol{x}$ represents a vector of individual level control variables. $\boldsymbol{m}$ is a vector of macroeconomic conditions, and $\mu_t$ and $\nu_j$ are time- and newspaper fixed effects, respectively. Finally, $\epsilon$ is the error term. Subindex $i$ denotes an individual, subindex $j$ a newspaper, subindex $k$ a region within the UK, and subindex $t$ a year. Naturally, out of all parameters $\beta, \gamma, \delta$, and $\eta$ the focus of interest is on the parameter value of $\beta$, i.e. the impact of newspaper reporting. Since the main explanatory variable $newspaperposition_{jt}$ varies only at the newspaper level, I cluster standard errors at the newspaper level.

### 2.4.1 Baseline Results

To show that newspaper reporting affects the demand for unemployment insurance, I present the first regression results in Table 2.3. The primary aim of these regressions is to reveal the general pattern of how reporting influences policy demand.

The first column displays results from a linear probability regression of the binary dependent variable on the main variable of interest, the measure for newspaper's policy

[18] Compare also https://www.gov.uk/jobseekers-allowance/overview

[19] Row vectors in bold letters.

Table 2.3: Baseline Regressions

| | Dep. Var.: Extend unemployment benefits? | | | | | | |
|---|---|---|---|---|---|---|---|
| | (2.3.1) | (2.3.2) | (2.3.3) | (2.3.4) | (2.3.5) | (2.3.6) | (2.3.7) |
| newspaper position | -0.258** | -0.213** | -0.219** | -0.157*** | -0.163* | -0.081** | -0.090*** |
| | (0.091) | (0.079) | (0.088) | (0.028) | (0.082) | (0.032) | (0.031) |
| Newspaper FE | | yes | | | | yes | yes |
| Macro Controls | | | yes | | yes | yes | yes |
| Year FE | | | | yes | yes | yes | yes |
| $R^2_{adj.}$ | 0.020 | 0.068 | 0.042 | 0.031 | 0.047 | 0.090 | 0.073 |
| Obs. | 7458 | 7458 | 7458 | 7458 | 7458 | 7458 | 7458 |

Dependent variable is binary with higher values indicating demand for higher unemployment benefits. Linear probability models in all regressions, except for regression (2.3.7). Marginal effects of probit estimation reported in regression (2.3.7). Clustered standard errors in parentheses u. Clustering at newspaper level. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

position. As predicted in the theory section, the two variables are negatively and significantly correlated. A one standard-deviation increase in *newspaperposition* (i.e. a more pro-globalization stance) is associated with a drop in the propensity to favor more unemployment insurance by almost 14 percent. However, since the range of observed values of *newspaperposition* is not the same for all newspapers[20] one can object that this result is driven by *newspaperposition* being related to the newspaper read. Thus, I add a set of newspaper fixed effects to the regression. Coefficients hardly change at all, although the fit increases considerably. Other candidates for omitted variable biases are regional economic conditions[21] and year fixed effects. They have to be included in the regression if differences in labor market conditions over space or time affect both the demand for unemployment insurance and the way newspapers report on globalization. In this case, coefficients overestimate the true effect if macroeconomic controls are omitted. Results in regressions three to six suggest that such effects are at work. The impact of national variation across years is more pronounced than the one across regions within one year. Moreover, the size of the coefficient for *newspaperposition* drops more when including year fixed effects than with regional fixed effects. This is not surprising given the profound spatial integration of the British economy, and the at least national dimension of business cycles. Furthermore, year dummies also capture the effects of special media attention to globalization in certain years. As shown in Figure A.2 in the appendix, such media attention is apparently far from being perfectly correlated with the economic importance of globalization.

So far, I have used the linear probability estimation method. Though in principle appropriate, one can argue this method to be inferior to non-linear ones such as probit

[20] Compare Table 2.2.

[21] These include: regional GDP per capita, the growth rate of regional real GDP, some indicators for the importance of high-skilled jobs in the regional economy, the regional unemployment rate, and some indicators for the socio-demographic composition, including long-term political preferences. For more details, see Table A.4 in the appendix.

in the presence of a binary dependent variable.[22] Thus, I re-estimate the last regression using the probit estimator. As shown in regression (2.3.7), estimates hardly change.

In summary, this first set of regressions lends support to the main hypothesis of this chapter: Being exposed to more positive media coverage of globalization reduces demand for compensatory policies. However, two major aspects raised in the theory section have not been dealt with so far: First, the choice of the newspaper might just reflect some underlying socio-demographic characteristics such as age, income, or political orientation which are known to affect welfare state attitudes as well. Second, the effect for *newspaperposition* can be expected to vanish if information from the media is a perfect substitute for knowledge about income effects predicted by trade theory. These two aspects will be explored in more depth in the next set of regressions.

### 2.4.2 Individual and Trade Controls

Factors such as age, gender, income, or political orientation have been identified to be major determinants of demand for social insurance programs (Alesina and Giuliano 2010). Furthermore, these variables influence which newspaper an individual reads, i.e. which value *newspaperposition* takes at the individual level. Thus, including a wide set of socio-demographic controls is vital for corroborating my previous results. In column 2 of Table 2.4, I add indicators for age categories, educational degrees, income categories, gender, ethnic origin, labor force status, and political orientation to the set of explanatory variables.

As a result, the coefficient for media content slightly decreases in size. This is the expected result when individual characteristics affect the both newspaper choice and the policy attitude of an individual. However, the magnitude of the coefficient in previous regressions is apparently not driven by the omission of these control variables. Compared to the results of the previous literature, all control variables show the expected sign and are of reasonable size.

The second major concern deals with the exclusion of trade variables. As discussed in the theory section, it cannot be ruled out that reporting of newspapers on globalization is just a perfect substitute for knowing the income effects of globalization according to trade theory. If this were the case, we could expect the coefficient for *newspaperposition* to decrease considerably when controlling for trade effects. The more stable this coefficient, the more additional information do newspapers contain.

Thus, I add a variable capturing the Heckscher-Ohlin effects of trade in regression (2.4.3). The variable is constructed by interacting real trade flows with non-OECD countries with a dummy for above-average educational attainment.[23] Theory predicts the

[22] See Angrist and Pischke (2009, p.102) for a comparison of both methods

[23] See section A.1.2 in the appendix for a more detailed description of this variable and the other trade

Table 2.4: Regressions with Individual and Trade Controls

| | Dep. Var.: Extend unemployment benefits? | | | | | | |
|---|---|---|---|---|---|---|---|
| | (2.4.1) | (2.4.2) | (2.4.3) | (2.4.4) | (2.4.5) | (2.4.6) | (2.4.7) |
| newspaper position | -0.100*** | -0.095** | -0.096** | -0.096** | -0.093** | -0.096** | -0.096** |
| | (0.038) | (0.045) | (0.045) | (0.045) | (0.045) | (0.045) | (0.045) |
| *Trade controls* | | | | | | | |
| Heckscher-Ohlin | | | -2.741 | | | | -2.920 |
| | | | (2.305) | | | | (2.242) |
| Ricardo-Viner adv. | | | | 0.379*** | | | 0.353*** |
| | | | | (0.081) | | | (0.085) |
| Ricardo-Viner disadv. | | | | 0.426*** | | | 0.400*** |
| | | | | (0.090) | | | (0.095) |
| middle offshorability | | | | | -0.024* | | -0.027* |
| | | | | | (0.014) | | (0.014) |
| high offshorability | | | | | -0.022 | | -0.024 |
| | | | | | (0.019) | | (0.020) |
| (low-skilled) x (firm size) | | | | | | -0.074** | -0.065* |
| | | | | | | (0.036) | (0.034) |
| (medium-skilled) x (firm size) | | | | | | -0.078** | -0.069** |
| | | | | | | (0.031) | (0.029) |
| (high-skilled) x (firm size) | | | | | | -0.112*** | -0.104*** |
| | | | | | | (0.041) | (0.038) |
| firm size | | | | | | 0.078** | 0.068** |
| | | | | | | (0.033) | (0.032) |
| *Individual controls* | | | | | | | |
| female | | -0.036 | -0.036 | -0.035 | -0.038 | -0.036 | -0.036 |
| | | (0.025) | (0.026) | (0.025) | (0.025) | (0.026) | (0.025) |
| non-european | | -0.097 | -0.096 | -0.096 | -0.097 | -0.094 | -0.093 |
| | | (0.069) | (0.069) | (0.069) | (0.070) | (0.069) | (0.069) |
| unemployed | | 0.264*** | 0.265*** | 0.268*** | 0.263*** | 0.269*** | 0.272*** |
| | | (0.066) | (0.066) | (0.063) | (0.066) | (0.060) | (0.058) |
| out of laborforce | | 0.126*** | 0.126*** | 0.125*** | 0.126*** | 0.126*** | 0.126*** |
| | | (0.039) | (0.039) | (0.039) | (0.039) | (0.039) | (0.038) |
| labour | | 0.086** | 0.086** | 0.085** | 0.087** | 0.087** | 0.086** |
| | | (0.039) | (0.039) | (0.039) | (0.039) | (0.039) | (0.040) |
| libdem | | -0.008 | -0.007 | -0.011 | -0.008 | -0.006 | -0.007 |
| | | (0.031) | (0.031) | (0.031) | (0.031) | (0.031) | (0.030) |
| conservative | | -0.137*** | -0.137*** | -0.138*** | -0.135*** | -0.136*** | -0.135*** |
| | | (0.031) | (0.031) | (0.031) | (0.031) | (0.030) | (0.031) |
| Age categories | | yes | yes | yes | yes | yes | yes |
| Education cat. | | yes | yes | yes | yes | yes | yes |
| Income cat. | | yes | yes | yes | yes | yes | yes |
| Newspaper FE | yes | yes | yes | yes | yes | yes | yes |
| Macro Controls | yes | yes | yes | yes | yes | yes | yes |
| Year FE | yes | yes | yes | yes | yes | yes | yes |
| Clustered SE | yes | yes | yes | yes | yes | yes | yes |
| $R^2_{pseudo}$ | 0.074 | 0.133 | 0.133 | 0.134 | 0.134 | 0.135 | 0.137 |
| Obs. | 5834 | 5834 | 5834 | 5834 | 5834 | 5834 | 5834 |

Dependent variable is binary with higher values indicating demand for higher unemployment benefits. Marginal effects of probit estimation reported in all columns. Clustering at newspaper level. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

coefficient to have a negative sign since qualified labor is the abundant factor in industrialized countries and thus benefits from intensifying trade relations. The coefficient shows the expected sign in the regressions, although it is not significant at conventional levels. More importantly, the coefficient for the newspaper-content variable is virtually unaffected.

In regression (2.4.4), I test for the implications of the Ricardo-Viner model by adding dummies for being employed in industries with a revealed comparative advantage or disadvantage.[24] The coefficients show a lower demand for compensatory policies if individuals work in sectors favored by trade, although the difference is not statistically significant.[25] Again, both the coefficient for the textscore as well as the socio-demographic controls hardly change.

Indicators for the offshorability of an individual's occupation are included in regression (2.4.5).[26] According to theory, individuals demand higher protection against labor market risk when facing a greater risk of having their job being offshored, i.e. all coefficients should be positive and increasing in offshorability. The predicted ordering is indeed present in the estimates, although the signs are not correct. There are two explanations for this finding. The first one is the way in which the omitted category is constructed. Blinder (2009) lists only those occupations he estimates to be offshorable, assuming that all other occupations are not offshorable. First, this is difficult to transfer to countries using another occupational coding than the US. Second, the degree of offshorability need not always be the same as in 2004.[27] Both factors lead to a possibly imprecise composition of the control group.[28] Turning to results for other variables, the coefficients for the main variables of interest continue to show the same pattern as before.

The more recent trade literature emphasizes the role of firms in international economic exchanges.[29] The results of this literature suggest that intensifying international trade deteriorates employment prospects and wages in particular for workers of intermediate skill levels, whereas individuals with high ability can expect to improve along these two dimensions. Furthermore, this literature demonstrates that larger firms are more active in international economic exchange. To capture this effect, I include indicators for high, middle, and low education into the regression and interact them with a measure for the size of the workplace, i.e. the number of employees at the workplace of the respondent. The interaction terms are the coefficients of interest. From theory, we can expect pos-

indicators.

[24] Compare AppendixA.1.2 for a description of the indicator variables.

[25] Both coefficients show a positive sign, what is due to the fact that the omitted category is made up of all respondents not employed in an exporting industry, including service and public sector employees.

[26] The highest category in Blinder's dataset, "offshore4", consists of very few and specialized occupations which are not present in my dataset.

[27] See Section A.1.2 for a description of the variable.

[28] As a side remark, Geishecker (2008) shows that employment risk of German workers due to offshorability varies considerably by job duration. In this analysis, I cannot account for this effect.

[29] Compare e.g. Yeaple (2005); Helpman (2010)

itive effects for medium-skilled respondents (i.e. higher demand for compensation) and a negative one for the high-skilled. However, the effects for medium-skilled respondents show a negative sign and are significant. This result casts doubts on whether the chosen empirical adaption of the theory might be too stylized to sufficiently explain real world labor market observations. However, there are to date no better rationalizations of these effects available. Coefficients on the variable measuring newspaper impact as well as other controls remain quite stable in terms of size and significance.

In the final regression I simultaneously test for all four trade effects. Both in terms of signs and magnitude as well as significance no remarkable changes occur with respect to previous regressions.

In summary, these results lend empirical support to the assertion that effects of newspaper reporting exist *in addition* to real trade effects. However, I cannot assess whether newspapers report in a deliberately biased way or whether the heterogeneity of readers does not allow them to transmit accurate information on individual labor market effects of globalization.

### 2.4.3 Self-selection into Reading a Specific Newspaper

A natural reason to be cautious about previous results is related to the non-random allocation of individuals into newspaper readership. If readers choose their newspaper according to how it reports on globalization,[30] then we face a problem of reverse causality since policy attitudes influence the newspaper content an individual is exposed to.[31] In this case, media content just re-enforces prior beliefs instead of shaping opinions:[32] The unadjusted coefficient for newspaper position overstates the true effect. In the past, the literature has mostly neglected this effect. Nonetheless, this issue ought to be dealt with appropriately. The standard way to tackle problems of reverse causality is to instrument for the potentially endogenous explanatory variable.

In this chapter, I choose regional readership shares as instruments for individual newspaper readership decisions. These measures can be expected to have an impact on individual choices, i.e. they are valid instruments, since they relate to differences in regional availability and tastes. However, one might fear that these effects are not strong enough, leading to a weak instrument problem. First-stage results presented in the appendix show that this concern is not of major relevance. It is a bit more subtle to argue that the instruments satisfy the exclusion restriction, i.e. that they do not affect *individual* demand

[30] Durante and Knight (2012) document content-based self-selection for Italian TV consumption during Berlusconi's government.

[31] It is possible that newspapers change reporting to cater to prior beliefs of its readership. Though a different problem in economic theory, the resulting econometric problems are the same, since the cross-sectional nature of my data does not allow me to trace individuals over time.

[32] Compare the theoretical models of Mullainathan and Shleifer (2005) and Gentzkow and Shapiro (2006).

for unemployment policies directly. An apparent concern is related to Tiebout sorting. If individuals deliberately move to regions where more people with the same opinion on unemployment insurance are living, and if these people tend to read the same newspaper as the mover does, then this IV strategy might be problematic. This concern seems to be particularly relevant at the level of neighborhoods or small towns. Regions inhabited by millions of people, however, are less likely to be homogenous enough to impair the validity of the instrument chosen.

Nevertheless, one can object that curing the problem of reverse causality has been paid with an omitted variable bias: There may exist other factors which both affect regional readership characteristics and individual policy preferences at the same time. Think e.g. of a region with an industry declining due to international competition. First, inhabitants of this region may want to read a newspaper with a more compassionate stance towards the workers in this industry. Second, this decline may bolster demand for compensatory policies. One can control for such effects by including a rich set of regional control variables which capture the economic situation and persistent political preferences in this area. This is the approach taken in this chapter. Note that the factors which potentially affect both variables are those macroeconomic indicators already included in the regressions before.

The lowest regional level at which the BSAS consistently provides information on the location of respondents are the so-called Government Office Regions. For each of these 11 regions I derive yearly regional readership shares for all newspapers in the sample from the BSAS data, exploiting the regional representativeness of the BSAS data set.[33] This set of readership shares serves as instrument in the first stage.

Formally, the estimation procedure looks as follows: In the first stage, the newspaper read is predicted via a set of regressions with a vector for the newspaper read on the left hand side. This column vector contains zeros for all newspapers not read by individual i in time t and exactly one "one"-entry for the newspaper read. $\text{NEWSPAPERSHARES}_{\boldsymbol{kt}}$ represents the matrix of instruments:[34]

$$\boldsymbol{newspaper}_{\boldsymbol{ijkt}} = \boldsymbol{\alpha} + \text{NEWSPAPERSHARES}_{\boldsymbol{kt}}\boldsymbol{\beta} + \text{TRADE}_{\boldsymbol{it}}\boldsymbol{\gamma} + \text{X}_{\boldsymbol{it}}\boldsymbol{\delta} + \text{M}_{\boldsymbol{kt}}\boldsymbol{\eta} + \boldsymbol{\nu}_{\boldsymbol{j}} + \boldsymbol{\mu}_{\boldsymbol{t}} + \boldsymbol{\epsilon}_{\boldsymbol{ijkt}}$$

On the right-hand side of the equation, all rows within each vector or matrix contain the same values.
In the second stage, predicted values from the first stage are multiplied with a vector of

[33] These readership shares are derived using the much larger original raw data-set, reducing the risk that aggregation of too few individual data might drive first-stage results.

[34] Matrices are denoted in capital letters. Coefficients are not restricted to take the same value in both stages.

textscores:

$$\begin{aligned} insurance_{ijkt} = \quad & \alpha \quad + \beta \cdot \boldsymbol{newspaperposition'_t} \cdot \widehat{\boldsymbol{newspaper}}_{\boldsymbol{ijkt}} \\ & + \quad \boldsymbol{trade'_{it}\gamma} + \boldsymbol{x'_{it}\delta} + \boldsymbol{m'_{kt}\eta} + \nu_j + \mu_t + \epsilon_{ijkt} \end{aligned}$$

Table 2.5: Second-stage IV estimates

| | Dep. Var.: Extend unemployment benefits? | | | | | | |
|---|---|---|---|---|---|---|---|
| | (2.5.1) | (2.5.2) | (2.5.3) | (2.5.4) | (2.5.5) | (2.5.6) | (2.5.7) |
| newspaper position | -0.083** | -0.079** | -0.087** | -0.079** | -0.079** | -0.091*** | -0.089** |
| | (0.037) | (0.033) | (0.036) | (0.033) | (0.033) | (0.034) | (0.039) |
| *Trade controls* | | | | | | | |
| Heckscher-Ohlin | | | -2.987 | | | | -3.208 |
| | | | (2.572) | | | | (2.522) |
| Ricardo-Viner adv. | | | | 0.377*** | | | 0.346*** |
| | | | | (0.084) | | | (0.089) |
| Ricardo-Viner disadv. | | | | 0.423*** | | | 0.391*** |
| | | | | (0.092) | | | (0.099) |
| middle offshorability | | | | | -0.026* | | -0.029** |
| | | | | | (0.014) | | (0.015) |
| high offshorability | | | | | -0.024 | | -0.025 |
| | | | | | (0.019) | | (0.020) |
| (low-skilled) x (firm size) | | | | | | -0.088** | -0.080** |
| | | | | | | (0.037) | (0.036) |
| (medium-skilled) x (firm size) | | | | | | -0.092*** | -0.085*** |
| | | | | | | (0.032) | (0.031) |
| (high-skilled) x (firm size) | | | | | | -0.125*** | -0.119*** |
| | | | | | | (0.042) | (0.040) |
| firm size | | | | | | 0.092*** | 0.083** |
| | | | | | | (0.034) | (0.033) |
| *Individual controls* | | | | | | | |
| female | | -0.036 | -0.036 | -0.035 | -0.038 | -0.036 | -0.037 |
| | | (0.025) | (0.025) | (0.025) | (0.024) | (0.026) | (0.025) |
| non-european | | -0.098 | -0.097 | -0.097 | -0.099 | -0.096 | -0.094 |
| | | (0.070) | (0.070) | (0.070) | (0.070) | (0.069) | (0.070) |
| unemployed | | 0.262*** | 0.263*** | 0.266*** | 0.261*** | 0.267*** | 0.270*** |
| | | (0.065) | (0.066) | (0.063) | (0.065) | (0.059) | (0.058) |
| out of laborforce | | 0.127*** | 0.128*** | 0.127*** | 0.128*** | 0.128*** | 0.128*** |
| | | (0.039) | (0.039) | (0.039) | (0.039) | (0.039) | (0.038) |
| labour | | 0.084** | 0.083** | 0.082** | 0.084** | 0.084** | 0.083** |
| | | (0.038) | (0.038) | (0.038) | (0.038) | (0.038) | (0.039) |
| libdem | | -0.009 | -0.008 | -0.012 | -0.009 | -0.007 | -0.008 |
| | | (0.031) | (0.031) | (0.030) | (0.030) | (0.031) | (0.030) |
| conservative | | -0.138*** | -0.138*** | -0.139*** | -0.136*** | -0.138*** | -0.137*** |
| | | (0.030) | (0.030) | (0.030) | (0.030) | (0.030) | (0.031) |
| Age categories | | yes | yes | yes | yes | yes | yes |
| Education cat. | | yes | yes | yes | yes | yes | yes |
| Income cat. | | yes | yes | yes | yes | yes | yes |
| Newspaper FE | yes | yes | yes | yes | yes | yes | yes |
| Macro Controls | yes | yes | yes | yes | yes | yes | yes |
| Year FE | yes | yes | yes | yes | yes | yes | yes |
| Clustered SE | yes | yes | yes | yes | yes | yes | yes |
| $R^2_{pseudo}$ | 0.073 | 0.133 | 0.133 | 0.134 | 0.133 | 0.135 | 0.137 |
| Obs. | 5834 | 5834 | 5834 | 5834 | 5834 | 5834 | 5834 |

Dependent variable is binary with higher values indicating demand for higher unemployment benefits. Marginal effects of probit estimation reported in all columns. Second-stage effects reported. Clustering at newspaper level. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

Results of first-stage regressions are shown in Tables A.6 and A.7 in the appendix. The regional readership ratio of a newspaper significantly increases the likelihood for a

respondent to read the same newspaper.[35] The value of the F-statistic from the test on the joint significance of all instruments is never below 60 and in most cases far above. Furthermore, the effects are of sizeable magnitude, reducing the risk of a too weak relation even further. Other controls are in general of expected sign and reasonable magnitude.

The second stage follows the same structure as the regressions presented in in Table 2.4, with the sole difference being that I replace textscores from actually read newspapers by those from the predicted ones. Several results displayed in Table 2.5 catch the eye: First, coefficients for control variables are hardly affected by this change. Second, the coefficients for newspaper content decrease slightly in size, gain in significance, and show by and large the same pattern across regressions as before. These changes are as expected when selection into newspapers is an issue and when reporting on globalization is positively correlated with the general political stance of a newspaper.

In summary, the results of this set of regressions show that reverse causality is an issue when estimating the effects of media content on individual policy attitudes. Accounting for self-selection into newspapers reduces the size of estimated effects, although they remain economically significant. The small reduction can be rationalized by the relatively low importance of globalization for the general policy slant of a newspaper.

### 2.4.4 Self-selection into Reading any Newspaper

In the previous section, I have shown that the size of coefficients is affected, but not primarily driven by self-selection into reading a specific newspaper. However, this analysis is conditional on the fact that respondents read a newspaper. The number of readers has decreased considerably during the period under investigation, i.e. between 2001 and 2005.[36] This process can cause an additional bias, namely self-selection into readership in general. If the decision to read any newspaper is determined by interest in newspaper reporting on globalization, then the effect of media content on individual attitudes which I estimate is systematically larger than the effect in a random sample of the overall population.

To assess the empirical relevance of this concern, I check whether my measure of newspaper reporting on globalization has an effect on the decision to read any newspaper. To that end, I estimate an equation similar to the first-stage of the IV-estimation in the previous section, replacing the set of dummies for reading a specific newspaper by a dummy for reading any newspaper. Since there are necessarily also non-readers in this sample, I can no longer assign policy positions of specific newspapers to the individual observation. As an alternative, I generate yearly averages of newspaper policy positions, both un-weighted and weighted by readership shares in the sample. Since both measures

[35] Depending on the newspaper, the first stage correctly predicts the actual readership in 50 to 80 per cent of all cases.

[36] Compare Figure A.1 in the appendix.

vary only across years,[37] I cluster the standard errors at the year-level. In neither of the two regressions, the newspaper content measure turns out to be significant.[38] However, regressions have been performed with six clusters only, what is not sufficient to rely on asymptotic properties of the estimator. Therefore, I re-run regressions with heteroskedasticity robust errors. In this case, asymptotics are met although I grossly underestimate the true size of standard errors. Even in this extreme case, the relevant coefficients are not significant at any conventional level. Taken together, these results provide no support for an effect of my newspaper content measure on the decision whether to read a newspaper. Reporting on globalization is apparently no source of self-selection into general newspaper readership.

### 2.4.5 Robustness Checks

**Time Structure of Effects** A first concern deserving further exploration deals with the time structure of effects. In all previous regressions I have implicitly assumed that newspaper content instantaneously affects individual policy attitudes. However, in reality it takes some time to process information and to update prior beliefs. Ideally, one would like to trace individuals over time and check how long it takes until they process newspaper information by adopting their attitude towards unemployment insurance. Unfortunately, the individual-level data available is a repeated cross-section, not a panel, making this strategy unviable. Thus, the best strategy in this context is to check whether the newspaper content of the previous period has an effect on the aggregate demand for unemployment insurance. Results are shown in Table A.5 in the appendix. Since the lag structure does not allow to include observations from year 2001, I re-estimate the last regression from Table 2.5 on the reduced sample. Lagged values of the newspaper variables do not have any effect on reader's policy attitude in any specification. Thus, it is not restrictive to focus on contemporaneous effects.

**Effects of Other Media: Internet Usage** In principle, the theoretical arguments made above apply to all kinds of media and mass information. The massive decline in newspaper readership during the last twenty years potentially challenges my estimation strategy since readers can obtain different information through other channels. If other media outlets report in the same way as the newspaper read, e.g. because of common ownership or because some media outlets simply "follow" others, then my estimates are biased upwards and vice versa. Unfortunately, I cannot control for the content of other media since methods like quantitative text analysis are not available for radio and TV and associated with prohibitively high costs for internet blogs and alike. The best proxy

[37] Thus I can no longer use year dummies. Since both the population readership share and the average policy stance exhibit time trends, I add a linear trend to control for this effect.

[38] Results available on request.

available in the BSAS data is information on whether other media is consumed.

Thus, as a further robustness check I control for whether the usage of alternative media sources affects the strength of the newspaper-content effect. The BSAS dataset allows to control for the access of a household to an internet connection in a given year.[39] The fourth regression in Table A.5 includes both a dummy for internet access and an interaction with newspaper content. Both the coefficients for the direct as well as the indirect effect of internet usage turn out to be insignificant. Thus, results do not support that internet usage has an impact on how strongly newspaper reporting affects policy attitudes.

**Small Number of Clusters: Wild Bootstrap** In the previous regressions I have used clustered standard errors to account for the main explanatory variable taking the same value for every individual reading the same newspaper. However, clustering is not optimal either since asymptotic properties of the estimator rely on the number of clusters which is only ten in this case.[40] Cameron et al. (2008) argue that the standard adjustment procedure for clustered standard errors does not correctly state the true size of standard errors when there are only few clusters. Instead, they propose the use of a wild bootstrap procedure as described in their paper. Standard errors and coefficients for "newspaperposition" derived by wild bootstrapping are slightly smaller than those presented before. Significance and qualitative results are not affected.[41]

**Correlation of Reporting on Globalization with Reporting on Labor Markets and Unemployment** One further concern can be the following one: What if reporting on globalization has no own effect on attitudes towards unemployment insurance but rather serves as a proxy for reporting on labor market conditions itself. Let us for a moment assume that this concern is valid. In this case, the proxy can be either of good or of bad quality. In the good case, the correlation between reporting on economic integration and on labor markets is highly positive. For this to hold true, it is necessary that either a lot of articles on globalization also report on labor markets or that the number of articles on globalization develops proportionally to the number of articles on labor market issues. Figures A.3 and A.4 show that neither the first nor the second condition is supported by the data. Alternatively, the proxy may be weak. In this case, however, the "true" effect of reporting on labor markets has to be extremely large and at least comparable to the effect of individual employment status.

A similar reasoning applies to reporting about unemployment and unemployment insurance: There is a risk that reporting on international economic integration might just be a proxy for reporting on unemployment. To address this concern, I follow the same

[39] Questions regarding TV consumption have been replaced by those on the internet in 1999.
[40] Compare e.g. Angrist and Pischke (2009, p.319) and Cameron and Trivedi (2009, p.829).
[41] Precise results available on request.

strategy as above and find that more than 90 per cent of all articles on globalization do not mention unemployment or unemployment insurance. Furthermore, the correlation between the number of articles on economic integration and those on unemployment is at about 0.51. These results suggest that reporting on unemployment cannot account for a substantial part of the effects estimated above.

### 2.4.6 Alternative Measure of Media Consumption

Previous research on media effects has tested the effect of media consumption on reader's policy attitudes using binary information for the consumption of media in general or of specific media outlets. From a theoretical point of view, there are two major reasons why the results from these approaches differ from mine: First, available measures of newspaper slant are in most cases not tailored to a specific policy, in my case to international economic integration. Second, even when being solely interested in the general policy stance of a newspaper, available measures such as the Mondo Times Scores are in most cases not time-varying.[42] As I have shown in Table 2.2, positions of newspapers on specific topics vary over time and cannot be perfectly mapped into their general policy slant. In the following estimations, I demonstrate the advantage of using topic-specific measures rather than standard binary information of media consumption. I re-estimate regressions (2.4.1), (2.4.2), (2.4.7), and (2.5.7), replacing the measure of globalization-specific newspaper positions by a set of newspaper dummies. Results for this exercise are shown in Table 2.6.

In the baseline regression, newspaper dummies are in general highly significant and of considerable size. When including individual socio-demographic characteristics in the second regression, the magnitude of newspaper coefficients decreases considerably. Thus, selection into newspaper readership is apparently related to these characteristics. However, as the results in the third column show, direct labor market effects of international trade are virtually orthogonal to the newspaper read. In the fourth regression, I replace the dummies for the newspaper read by the predicted readership from the first stage. Except for one case, all effects vanish completely. Apparently, most of the correlation between newspaper dummies and reader's support for unemployment insurance is driven by self-selection of readers into specific newspapers: Readers self-select into reading a specific newspaper according to its general political stance, which is in turn highly correlated with reporting on important policy domains such as unemployment insurance. Calculating measures of newspaper positions on topics which are less focal for self-selection allows to identify causal effects of media content on policy attitudes even in non-experimental settings.

[42] Compare www.mondonewspapers.com

Table 2.6: Alternative Measure of Media Consumption: Newspaper Dummies

| | Dep. Var.: Extend unemployment benefits? | | | |
|---|---|---|---|---|
| | (2.6.1) | (2.6.2) | (2.6.3) | (2.6.4) |
| Mail | -0.010*** | -0.020*** | -0.020*** | -0.019 |
| | (0.002) | (0.004) | (0.004) | (0.151) |
| Mirror | 0.136*** | 0.035*** | 0.032*** | -0.077 |
| | (0.002) | (0.010) | (0.009) | (0.146) |
| Star | 0.113*** | -0.001 | -0.005 | |
| | (0.006) | (0.018) | (0.017) | |
| Sun | 0.115*** | 0.035*** | 0.030** | -0.063 |
| | (0.003) | (0.013) | (0.012) | (0.154) |
| Telegraph | 0.067*** | 0.101*** | 0.101*** | -0.094 |
| | (0.004) | (0.012) | (0.012) | (0.161) |
| Guardian | 0.454*** | 0.362*** | 0.367*** | 0.024 |
| | (0.004) | (0.023) | (0.023) | (0.125) |
| Times | 0.180*** | 0.134*** | 0.142*** | 0.198* |
| | (0.005) | (0.020) | (0.021) | (0.118) |
| Record | 0.120*** | 0.005 | -0.001 | -0.142 |
| | (0.027) | (0.034) | (0.033) | (0.134) |
| *Trade controls* | | | | |
| Heckscher-Ohlin | | | -2.821 | -4.833* |
| | | | (2.416) | (2.913) |
| Ricardo-Viner adv. | | | 0.353*** | 0.293*** |
| | | | (0.088) | (0.101) |
| Ricardo-Viner disadv. | | | 0.399*** | 0.333*** |
| | | | (0.099) | (0.110) |
| middle offshorability | | | -0.029** | -0.031* |
| | | | (0.014) | (0.017) |
| high offshorability | | | -0.026 | -0.027 |
| | | | (0.020) | (0.018) |
| (low-skilled) x (firm size) | | | -0.064* | -0.047 |
| | | | (0.034) | (0.032) |
| (medium-skilled) x (firm size) | | | -0.068** | -0.053* |
| | | | (0.029) | (0.031) |
| (high-skilled) x (firm size) | | | -0.103*** | -0.091*** |
| | | | (0.038) | (0.031) |
| firm size | | | 0.068** | 0.051 |
| | | | (0.031) | (0.031) |
| *Individual controls* | | | | |
| female | | -0.036 | -0.037 | -0.049* |
| | | (0.025) | (0.025) | (0.028) |
| non-european | | -0.098 | -0.094 | -0.099 |
| | | (0.070) | (0.069) | (0.063) |
| unemployed | | 0.263*** | 0.271*** | 0.286*** |
| | | (0.065) | (0.058) | (0.058) |
| out of laborforce | | 0.128*** | 0.128*** | 0.130*** |
| | | (0.039) | (0.038) | (0.035) |
| labour | | 0.085** | 0.085** | 0.105*** |
| | | (0.039) | (0.039) | (0.038) |
| libdem | | -0.009 | -0.008 | 0.002 |
| | | (0.031) | (0.030) | (0.033) |
| conservative | | -0.137*** | -0.135*** | -0.157*** |
| | | (0.030) | (0.031) | (0.029) |
| Age categories | | yes | yes | yes |
| Education cat. | | yes | yes | yes |
| Income cat. | | yes | yes | yes |
| Macro Controls | yes | yes | yes | yes |
| Year FE | yes | yes | yes | yes |
| Clustered SE | yes | yes | yes | yes |
| IV | | | | yes |
| $R^2_{pseudo}$ | 0.073 | 0.132 | 0.136 | 0.119 |
| Obs. | 5834 | 5834 | 5834 | 5834 |

Dependent variable is binary with higher values indicating demand for higher unemployment benefits. Marginal effects of probit estimation reported in all columns. Clustering at newspaper level. *Express* is omitted newspaper. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

## 2.5 Conclusion

In this chapter I estimate the effect of newspaper reporting about economic globalization on individuals' support for unemployment insurance. I use British data covering the years 2001 to 2005 which mostly stems from two data sources: First, self-collected data on the reporting of ten major British newspapers about economic globalization. This data is derived using a novel method of quantitative text analysis and provides reliable and replicable information on the policy positions of newspapers based on the frequency of word occurrences in newspaper articles. The second major source is the British Social Attitudes Survey, a large-scale socio-economic data sets which allows to link individuals to the newspaper they read.

I obtain the following empirical results: First, the more pro-globalization the reporting of a newspaper, the lower the support for unemployment insurance among its readers. This result confirms theoretical predictions derived from the compensation hypothesis and theories of media effects. The effect is of economic relevance: Moving from the most globalization-sceptical newspaper (The Star in 2002) to the most globalization supporting one (The Express in 2005) reduces the likelihood to favor an expansion of unemployment benefits by about 11 percent.

Second, the size of the effect is hardly affected by the inclusion of various trade controls. Individuals can obtain information on how globalization affects their economic situation via two channels: They can read newspapers (or consume other media) and they can directly estimate the effects using trade statistics and trade theories. If newspaper reporting served as a proxy for economic effects according to trade theories, then we would expect to see the coefficient on newspaper slant declining considerably when including trade controls. However, this is not the case. Apparently, the picture of economic globalization drawn by newspapers is not identical with pure economic effects of integration according to trade theories.

Third, individuals self-select into newspapers with a policy position similar to their own. Controlling for this effect in a set of IV regressions yields slightly smaller coefficients. However, the small magnitude of this change can be explained by the relative unimportance of globalization for the general policy stance of a newspaper and thus for the self-selection of readers. When accounting for self-selection in regressions with indicators for the readership itself, the effects of newspaper dummies vanish almost completely.

These results entail several implications: First, one should be careful in choosing the appropriate measure for newspaper influence. In the absence of (natural) experiments or good instrumentation strategies, estimates can be considerably affected by self-selection. Second, quantitative text analysis is a reliable way to generate measures of media positions. This is of particular relevance when investigating the impact of reporting on a very narrow policy outcome. Third, the way media reports on globalization has a considerable

effect on the formation of individual demand for compensation policies and thus the shape and structure of welfare systems. Understanding the links between economic globalization and compensation policies thus requires accounting for this effect.

# Chapter 3

# How does Economic Integration Change Personal Income Taxation? Evidence from a New Index of Potential Labor Mobility

## 3.1 Introduction

In OECD countries, personal income taxation accounts for roughly 35-40 per cent of government revenues, whereas taxes on capital income collect only about 10-15 per cent of total revenues.[1] Despite the apparent importance of personal income taxation, the literature on tax competition has so far mostly focussed on competition in capital taxation. This focus has been supported by the widespread notion that labor was virtually immobile between countries (Wilson 1999). However, a rapidly growing literature on international migration has shown that labor, and in particular high-skilled labor, is far from being immobile: Defoort (2006) estimates that on average between five per cent (below college education) and ten per cent (at least college education) of world population have emigrated to one of the six main receiving countries (Australia, Canada, France, Germany, the UK, and the US) since the mid 70s. Furthermore, recent theoretical research by Simula and Trannoy (2010) shows that even modest increases in the international mobility of high-skilled can have considerable effects on the optimal personal income tax schedule. The increasing number of preferential tax treatments for foreign high-skilled (e.g. in Denmark or Singapore), which are explicitly designed to increase the international mobility of high-skilled labor, highlight that tax policy makers are aware of labor mobility and its effects on domestic tax bases. Thus, it is worthwhile to quantitatively assess the effect of increasing

[1] Excluding social security contributions. OECD averages 1986-2005 from OECD.stat Government Revenue Statistics.

labor mobility on domestic personal income taxation.

This chapter provides estimates of the effect of (an) increasing (threat of) emigration on the level and the shape of personal income tax schedules in 26 OECD countries between 1986 and 2005. Estimating these effects, the chapter makes two main contributions:

First, I account for heterogenous effects of mobility on taxes payed by high and low-income earners. Since international mobility is quite heterogenous across skill and thus income groups, the effect of increased labor mobility may not only affect the level but also the shape of the tax schedule. More precisely, a flattening of the schedule is to be expected if skilled labor is most mobile, potentially involving higher tax levels at the bottom of the income distribution. I can capture this effect by using rich data on the shape of personal income tax systems which includes information on average and marginal tax rates at various points of the income distribution. This approach allows to account for heterogenous effects at different points of the tax schedule.

Second, I construct a new Index of *Potential* Labor Mobility, containing yearly information on 26 OECD countries, 1986-2005. The index is based on country-pair specific information and contains both push factors (i.e. factors influencing an individual's decision to leave its current country of residence) and pull factors (i.e. factors influencing an individual's decision to settle in a specific country). Compared to using observed labor flows, this index has several advantages: The first advantage is the ability to cope with reverse causality. Taxation is known to have an impact on individual migration decisions (Abramitzky 2009; Kleven et al. 2011). This concern is of major relevance as the sign of the estimates changes with the direction of causality: Higher taxation increases emigration, but more emigration lowers the optimal tax level. Using the Index of Potential Labor Mobility helps to disentangle these two channels: In addition to economic criteria, the index is based on indicators which are not under the control of current tax policy, such as cultural and geographical proximity, family values, or the ability to speak foreign languages. Therefore, reverse causality is hardly an issue when using this index. Second, the index allows to account for the effects of strategic competition in personal income taxation. As in the well-documented case of capital taxation, policy makers may react to increasing potential mobility of workers by adjusting tax systems such that no labor flows occur. Since the Index of Potential Labor Mobility represents the economic concept on which policy makers base their decisions, it allows to address this channel as well. The third advantage of the index is that it allows to link the empirical analysis closer to the theory. Existing theoretical models of the effect of labor mobility on income taxation (e.g. Simula and Trannoy (2010)) represent changes in the mobility of labor by variations in the cost incurred when relocating. My Index of Potential Labor Mobility is an indicator for the net costs associated with migration and thus the empirical counterpart of the core parameter in these models.

The descriptives of the index show some interesting features: First, potential labor

mobility is quite low, with values averaging at about seven per cent of its theoretical maximal value. This highlights the scope of the topic to gain in policy relevance. Second, potential mobility has increased considerably over the last two decades, particularly after the fall of the iron curtain. Third, cross-country differences are more pronounced than variation over time.[2] Finally, countries in Scandinavia and Southern Europe known for high levels of taxation show relatively low levels of potential mobility, whereas low tax "anglo-saxon" countries have relatively mobile populations. Taken together, these stylized facts hint at a growing importance of labor mobility and a connection with tax issues.

The results of the empirical tests are in line with the main hypothesis of this chapter: Increasing potential labor mobility lowers the tax burden on labor income. However, there is no robust evidence on heterogeneity across brackets of taxable income. The estimated effect is of considerable size: The German workforce experienced the largest increase in potential labor mobility during the period 1986 to 2005. This increase led to a reduction of the average tax burden for incomes of about 100,000 Euros per year in 2005[3] by at least five percentage points, depending on specification. The general patterns of the effects are robust to the inclusion of a variety of economic and political controls, accounting for indirect effects through the general budget or "spill-overs" from capital taxation, and for an alternative specification of the index. Furthermore, I show that the effect of the index on personal income taxation cannot be replicated when using standard measures of economic integration. Measures of actual emigration are prone to severe reverse causality.

This chapter is structured in the following way: In the next section, I discuss mostly theoretical literature on the relationship between economic integration and personal income taxation to derive hypotheses on how integration can be expected to change the shape of personal income tax schedules. Furthermore, I present arguments in favor of using measures of potential labor mobility instead of actual factor flows. Afterwards, I present the data I use in the empirical investigations. Most notably, I give a detailed overview of the construction on the index, its components, and the rationale for including these components. The third section is concluded by presenting descriptive statistics of the index. The fourth section presents and discusses the results of regressing the tax indicators on my Index of Potential Labor Mobility in a variety of specifications and robustness checks. In the fifth section, I re-estimate the regressions of the fourth section using an alternative version of the index which uses weights estimated from migration data. Finally, I conclude.

[2] This is true even when abstracting from time-invariant components of the index.

[3] Four times average GDP per capita.

## 3.2 Theory

This section serves two main purposes: First, I argue why international economic integration, and in particular labor mobility, is an empirically relevant determinant of the level and shape of personal income tax schedules. Second, I discuss two measures of labor mobility, namely observed mobility and potential mobility, and argue why potential labor mobility is a more appropriate explanatory variable, both from an economic and a statistical point of view.

### 3.2.1 The Role of Economic Integration in Shaping Income Taxation

Economic integration can affect the system of personal income taxation through various channels. This study focusses on a particular direct channel, namely how increased mobility of labor changes the optimal income tax schedule. However, there are also other channels present, which I briefly discuss at the end of this section.

To provide a theoretical framework for the empirical analysis, I briefly review the approach taken by Simula and Trannoy (2010)[4] who model the optimal tax schedule as outcome of a mechanism design problem.[5] In a nutshell, they extend the classical Mirrlees (1971)-framework and allow for intensifying economic integration to shift individuals' constraints for the participation in national tax systems inwards.

In their model, Simula and Trannoy (2010) study the optimal nonlinear income tax schedule in a Mirrleesian economy which is populated by a continuum of individuals who can emigrate to a foreign country with a given tax and redistribution policy. A key assumption of the model is that the attractiveness of the outside option increases in individual productivity. The government is assumed to maximize the net income of the worst-off individual, taking both domestic labor supply and emigration incentives into account.

The emigration incentives are represented by a migration or participation constraint in an otherwise standard mechanism design problem. This participation constraint for an individual of productivity $\theta$ is given by

$$R(\theta) = V_H(\theta) + c(\theta) - V_F(\theta).$$

Individuals are assumed to emigrate if and only if $R(\theta) < 0$, that is when the indirect utility in foreign exceeds the sum of the home indirect utility and the cost of migration.

[4] Compare Simula and Trannoy (2011) for a somewhat more general version of Simula and Trannoy (2010).

[5] Compare Salanié (2011) for an extensive treatment of optimal taxation and Saez et al. (2012) for a survey on the literature on the elasticity of taxable income.

All three terms are assumed to increase in productivity $\theta$. This participation constraint already provides some structure for the empirical approach to labor migration: It has to consist of measures for (i) economic opportunities at home (called push-factors by migration scholars), (ii) economic opportunities abroad (pull-factors), and (iii) some cost of migration.

While solving the tax design problem described above, Simula and Trannoy (2010) make several assumptions on the shape of the tax schedule, disutility of labor, and costs of migration. However, independent of these assumptions, one important result prevails: Individuals pay taxes that are the lower the more credibly the can threat to emigrate (c.p.).

Docquier and Marfouk (2005) document that observed international mobility of highly-skilled individuals is considerably larger than the mobility of low-skilled workers.[6] Simula and Trannoy (2010) explicitly look at the tax schedule in this case[7] and derive that individuals with higher productivity can face lower (marginal) tax rates than individuals with lower productivity if the possibility of migration increases in skills. That is, the progressivity of income taxation can be expected to decrease in countries with an internationally mobile workforce.

**Hypothesis 1** The higher the (potential) mobility of a country's labor force, the lower the personal income tax rates it faces (level effect). The tax schedule will become less progressive when (potential) mobility is increasing in taxable income (shape effect).

In addition to this direct channel of labor mobility, there are also more indirect ones through which economic integration affects personal income taxation. First, economic integration has an effect on capital mobility and thereby capital income taxation.[8] Reductions in the taxation of capital income spill over to the taxation of personal income since personal income can be partially reclassified as capital income, particularly at higher incomes. Thus, policy makers who aim at discouraging such "arbitrage" have to adjust personal income taxation in response to capital tax competition. Furthermore, capital taxation affects the capital stock in an economy. If the availability of capital affects the level and distribution of labor incomes, then the optimally chosen tax schedule is again a function of capital taxation.

Second, economic integration affects governments budgets, e.g. as a result of capital tax competition. When the previously optimal mix of tax instruments is no longer generating sufficient tax revenues, governments may be forced to raise additional revenues by shifting a higher burden to less mobile tax bases such as labor income (cf. Hines and

[6] Abramitzky et al. (2012) document that a reverse pattern in the era of mass migration before World War I and discuss some explanations for the subsequent reversal.

[7] Assuming that the correlation between skill level and income is sufficiently strong.

[8] See Wilson (1999) for a survey on this literature.

Summers 2009). Furthermore, economic integration may raise expenditure requirements (cf. Rodrik 1998), which in turn may be met by adjustments in personal income taxation.

Third, economic integration implies an intensified exchange of goods and services and potentially offshoring of jobs. The effects of integration on labor market outcomes have been a well-studied phenomenon for some time.[9] More recently, heterogenous effects across the income distribution ("job market polarization" according to Autor et al. (2006)) have received growing attention in the wake of research combining trade models à la Melitz with labor market matching models.[10] These combined models show that economic integration increases incomes at the extremes of the income distribution, but erode those of the middle class. A policy maker who is concerned about the distribution of disposable incomes should thus adjust the shape of the tax schedule accordingly.

Since these indirect channels are not at the core of this chapter, I restrict myself to controlling for them without scrutinizing every chain of these arguments in detail.

### 3.2.2 Observed Labor Mobility vs. Potential Labor Mobility

In this chapter, I analyze the link between the mobility of labor and the level and shape of personal income tax systems. A rather straightforward approach is to use observed labor mobility as main explanatory variable. However, in this case the issue of reverse causality potentially arises since it is well possible that the degree to which governments seize individual income, e.g to achieve redistributive aims, has an effect on individual migration decisions. Using data on Israeli kibbutzim, Abramitzky (Abramitzky 2008, 2009) shows that an exogenous increase in the extent of redistribution (i.e. an increase in taxation/contributions, given that kibbutzim aim at equalizing consumption levels) induces highly skilled individuals to leave, i.e. emigrate, and low-skilled to arrive, i.e. immigrate. Kleven et al. (2011) use a Danish scheme according to which highly-skilled non-natives pay lower income taxes for the first three years of their stay. They demonstrate that a significant share of them leaves the country as soon as this preferential treatment expires.[11] These results suggest that taxation affects location decisions. Therefore, using actual labor flows as regressor can be expected to bias the estimates considerably upwards.

As a first empirical test for the validity of these concerns, I regress the top marginal tax rate on two indicators for observed labor mobility, namely the rates of skilled and total emigration as a measure of realized factor flows. Results are presented in Table 3.1.

In this rather reduced regression, both regressors have a statistically significant and positive effect on the top marginal tax rate. At first sight, this seems to imply that *observed* labor mobility leads to higher tax rates. However, in the light of reverse causality

[9] Compare Cahuc and Zylberberg (2004, pp.582) for a survey on classic approaches to that topic.

[10] Compare e.g. Helpman et al. (2010a), Helpman et al. (2010b), and Helpman et al. (2011).

[11] When the tax scheme expires, the top marginal tax rate applied to immigrants' incomes more than doubles.

Table 3.1: Partial Correlations with Index

| | Dep. Var.: | |
|---|---|---|
| | Top Marginal Tax Rate | |
| skilled emigration | 1.62*** | |
| | (0.31) | |
| all emigration | | 2.23*** |
| | | (0.57) |
| Cons | 0.31*** | 0.33*** |
| | (0.02) | (0.03) |
| Country FE | yes | yes |
| Year FE | yes | yes |
| $R^2_{overall}$ | 0.01 | 0.01 |
| F-stat | 68.16 | 65.02 |
| Obs. | 307 | 307 |

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

these results have a rather different interpretation: Higher taxation induces emigration decisions. This first result is in line with the theoretical prediction and highlights the need to cope with reverse causality.

Employing an index of potential labor mobility helps in tackling reverse causality. In addition to economic criteria, the index is based on indicators which are not under the control of current tax policy, such as cultural and geographical proximity, family values, or the ability to speak foreign languages. The index approximates migration decisions by relating the economic and social benefits from moving to the costs associated with this action.

**Hypothesis 2** Estimates using observed labor flows are upward biased, potentially reversing the sign of the effect. Thus, it is necessary to use a measure of potential labor mobility instead of observed mobility.

Using potential rather than actual labor flows as an explanatory variable has several several further advantages: The index allows to account for the effects of strategic competition in personal income taxation. Strategic competition is well-documented in the case of capital taxation: Policy makers react to increasing potential mobility of capital by adjusting tax systems such that no capital flows occur. Suppose that strategic competition is also relevant in the area of personal income taxation. Regressing income tax indicators on observed labor flows then yields insignificant estimates, although labor mobility is causally affecting personal income taxation. This problem can be tackled with my Index of Potential Labor Mobility since it represents the economic concept on which policy makers base their decisions to adjust income taxation in the case of strategic competition.

Furthermore, the index allows to link the empirical analysis closer to existing theory. In most theoretical models of the effect of labor mobility on income taxation (e.g. Sim-

ula and Trannoy (2010)), individuals incur a cost when relocating from one country to another. Economic integration is then represented by reducing this cost. Although my Index of Potential Labor Mobility does not measure the monetary costs of migration, it nonetheless represents a trade-off between expected labor market success abroad and the current economic situation at home. It is therefore an indicator for the economic net cost associated with migration and thus the empirical counterpart of the core parameter in these models.

## 3.3 Data

### 3.3.1 Index of Potential Labor Mobility

Developing a measure for the potential mobility of labor is one of the main contributions of this chapter. This index captures the value of the outside option, i.e. to start working in a country other than the current country of residence. The more valuable this outside option, the more credible is the threat of labor to migrate and thus the more responsive policy makers need to be to prevent an erosion of a country's tax base.

#### Determinants of Migration Decisions

The empirical literature on the determinants of migration has identified several economic and non-economic factors as relevant for this decision. These can be grouped into push factors (i.e. effects which make staying in the home country less attractive) and pull factors (i.e. effects which make a particular country attractive as host). Ortega and Peri (2012) collect data on annual migration flows between 120 sending countries and 15 OECD destinations 1980-2006. Using this data, they show that income per capita and immigration policies in the destination are major determinants of migration flows. Grogger and Hanson (2011) look at global migration to OECD countries and show that emigrants select into host countries depending on the wage premium paid for their human capital. Mayda (2010) uses panel data on bilateral migration flows to identify major drivers of inflows into 14 OECD countries 1980-1995. The main determinants of labor flows are found to be economic opportunities in the host country, geographical distance, and a young labor force in source countries. Mitchell et al. (2011) conduct a similar analysis for inflows into the UK. They confirm a significant explanatory power of economic conditions. In addition, they can explain roughly a quarter of overall flows by former colonial ties and existing emigrant networks.[12] Findings by Beine et al. (2011) confirm the importance of networks: Using data on migration from almost all countries to 30 OECD countries in 1990 and 2000, they conclude that the existence of immigrant communities

[12] Mitchell et al. (2011) provide a rather detailed and concise discussion of potential reason for migration.

in a potential host makes migration considerably more likely. Bartz and Fuchs-Schündeln (2012) show that language borders are a major obstacle to flows of labor within the European Union. Two other papers focus on the interaction between economic and social factors in determining the value of migration: Using US-(Lewis 2011) and Canadian data (Goldmann et al. 2011), these papers show that the ability to communicate in the predominant language in a labor market (English, but also French and Spanish) is crucial for the returns to immigrants' human capital. Results of all these papers stress the importance of economic and social integration into host societies for migration decisions.

### Construction of the Index

Based on the findings of the empirical literature, I focus on four components when measuring the attractiveness of migrating to potential host countries: The first two measures how attractive it is for an individual to migrate to a specific other country by accounting for the economic prosperity and openness to immigration of host countries. The third part measures the geographical and cultural proximity of source and host country. The fourth component relates to characteristics of the national workforce affecting the likelihood to migrate, given opportunities in other countries.

The first block deals with the economic situation in the potential host country. Here, the wage level in the potential host country, the growth rate of host's economy, and whether the economic and legal conditions of host's labor market allow to absorb new entrants play a role.[13] Second, the openness of a potential host country for new immigrants plays a role. Issues such as impediments to acquiring a staying and working permit are a major determinant of migration. However, comparable measures of legal openness are hard to generate. Thus I focus on a set of measures to approximate openness to immigration such as attitudes to immigration, the share of English speakers and and the share of foreign born in the population (as a measure of past openness).[14] Third, cultural and geographical proximity are included. Cultural proximity captures the cost of integration into a new social environment. Factors such as a common language, a common legal system, or a large number of immigrants from the source country (immigrant network) can be expected to lower the costs associated with integration. Geographical proximity is measured by the distance between source and host country and a common border.

Even when there are several host countries which are attractive for potential immigrants, international labor mobility requires labor to be willing to leave its current country of residence. Therefore, the overall index adds to the measure for the attractiveness of potential hosts a second measure for the general mobility of a nation's workforce. First,

[13] A further important economic determinant of mobility can be the portability of social security claims. However, assessing the corresponding bilateral legal rules quantitatively is quite challenging, not at the core of this chapter, and thus left for further research.

[14] In a robustness check, I replace these proxies by a direct measure of legal barriers to immigration.

it consists of a measure for the share of non-native workers and English-speakers, both of which can be expected to exhibit an above-average (return) mobility. Second, I add information on the strength of family ties[15] and the number of children which reduce the level of mobility.[16] Third, I use the same proxies for labor market conditions as used to describe host countries.

Expressed in formal terms, the index measuring the potential mobility of labor in country i at time t is constructed in the following way:

$$\begin{aligned} PLM_{it} &= \max_j \left[\text{attractiveness}_{jit} \cdot \text{workforce}_{it}\right] \\ &= \max_j \left[\text{econ condition}_{jt} \cdot \text{openness}_{jt} \cdot \text{proximity}_{ijt} \cdot \text{workforce}_{it}\right] \end{aligned} \tag{3.1}$$

with j denoting all countries but i.

Although all components are indexed by t, some indicators like the one for on cultural and geographic proximity show very little time variation, if any. Similarly, most variation in the sub-indices on openness to immigration and the mobility of the workforce is cross-sectional. Therefore, most variation in the index over time stems from changes in the economic conditions of host and source countries.

Concerning the construction of the index, I would like to draw attention to the fact that the sub-categories of the index are linked multiplicatively, whereas the components within each sub-category are combined in an additive way.[17] Combining components within sub-categories in an additive way reflects the view that these components are substitutes: Higher wages may compensate for higher unemployment in a host country or a common border for a different language. The multiplicative structure of the overall index, however, mirrors a complementary view on the sub-categories: Good economic conditions in and proximity of a potential host are of little worth if this country is not open to immigration, and vice versa.

Each component is restricted to take a value between zero and one for each potential host country. In some cases (shares, rates, binary indicators) this is naturally given. In other cases (e.g. growth rates and hourly wages) this is achieved by dividing all entries by the largest value in the overall sample. Every sub-category contains at least one component that takes strictly positive values. Therefore, the value for each *host-origin pair* is restricted to the domain (0,1]. The same holds true for the index itself by construction. Choosing the value of the most attractive host-origin pair as index value for a origin in a given year reflects that individuals can only migrate to one other place at a

[15] Using Italian data, Alesina et al. (2011) show that individuals with strong family ties are less mobile, even within a country.

[16] The strength of family ties and the number of children can also foster emigration when parts of the family are already abroad and those left home are interested in a family reunion. Although a relevant channel, I do not include it in my index, since it is hard to imagine why such family reunions should affect domestic tax policy.

[17] Definitions, sources, and weights for all components are listed in Table B.1.

time. Thus, only the best alternative counts and values of countries which are dominated by the best one are irrelevant for an individual's decision.

Reading the description of the composition of this index, one immediate concern comes to mind, namely whether the criteria mentioned before apply to all kinds of potential emigrants. Academic researchers or managers of large companies, for example, may base their location decisions on rather different criteria. Franzoni et al. (2012) conduct a survey among more than 17,000 emigrant researchers asking them for their reasons to migrate. The reasons cited as being most important were quite specific to the academic world (e.g. "better availability of research funds") but still fit into the broad categories defined above.[18] Furthermore, even if reasons to migrate of these special groups were quite different from others, one should keep in mind that these groups are too small to affect the whole income tax schedule. As Kleven et al. (2011) document for foreign researchers and high income earners in Denmark and Kleven et al. (forthcoming) for the taxation of European football players, such groups are more likely to be targeted by preferential tax arrangements rather than a change in the entire income tax system. Thus, the criteria introduced above seem to be of sufficient relevance for describing mobility patterns affecting the shape and structure of national income tax systems

### Descriptive Statistics for the Index

The index covers 26 OECD countries[19] between 1986 and 2005. Due to lacking information on some components of the index, there is no value of the index for some countries prior to 1994.[20] Thus, there are in total 502 entries in the index. These entries take values between virtually zero and roughly 0.13, averaging at 0.057. To put these values into perspective, one should remember that by construction the index is bound by zero and one. This comparison highlights that labor, although not immobile, is far less mobile than capital.[21] On the other hand, however, the variation in labor mobility between OECD countries is more pronounced than variation in capital mobility in the same group of countries.

When looking at the development of the index over time in Figure 3.1, one features catches the eye: There is a general upwards trend in potential labor mobility, which accelerates after 2000. Furthermore, variation in potential mobility decreased after the fall of the Iron Curtain but widened again over the last 5 years of the sample period.

To identify the drivers of this development, it is worthwhile to have a look at the

[18] See also Gibson and McKenzie (2011) who use panel data on very high-skilled individuals from New Zealand, Papua New Guinea, and Tonga to study determinants of migration and return decisions.

[19] Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom, United States

[20] See Table B.2 for the detailed data of the index.

[21] Lane and Milesi-Ferretti (2007) estimate that, on average, non-domestic portfolio equity and FDI constitute between 25 and 45 percent of total assets in industrial countries, 1985-2004. Although not directly comparable to my index, these figures illustrate the high international mobility of capital.

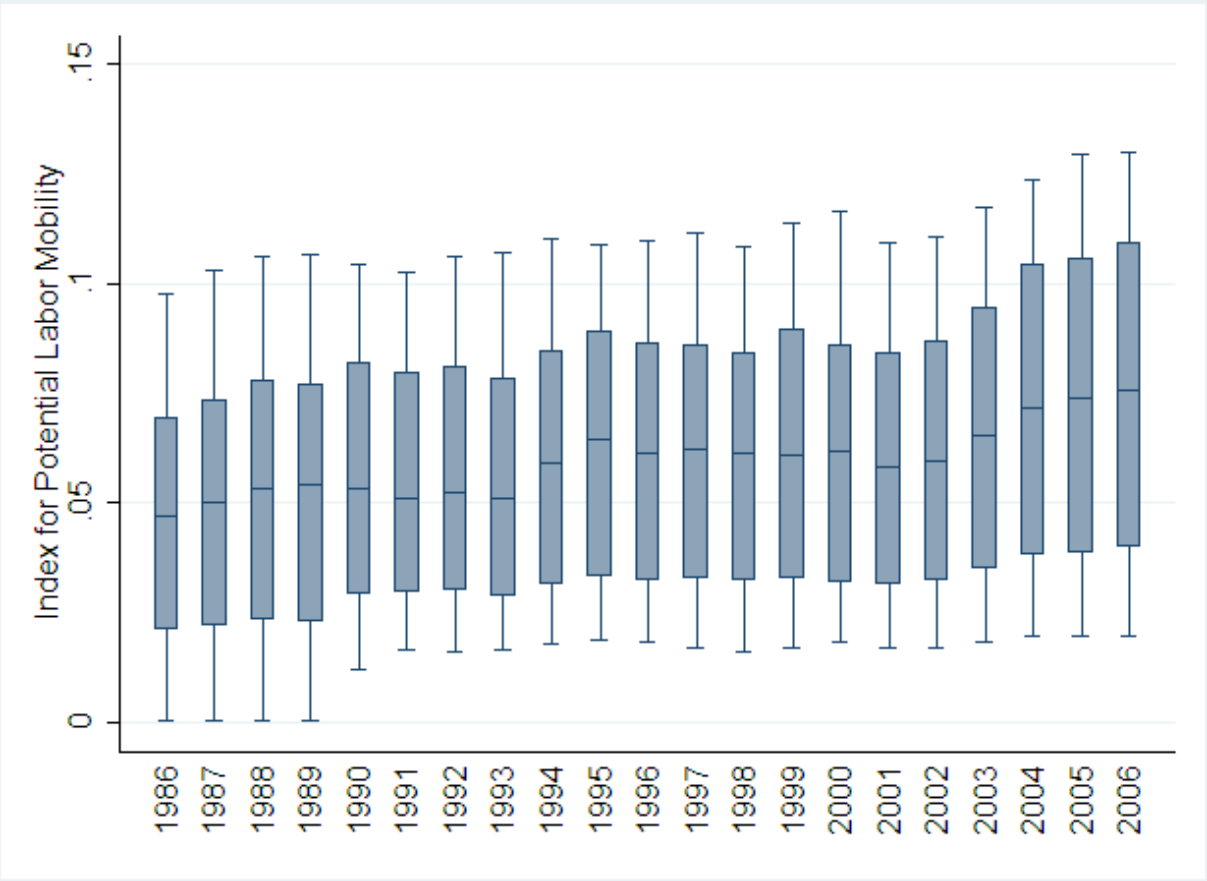


Figure 3.1: Median, 75% range, and 95% range for Index of Potential Labor Mobility, yearly averages across countries between 1986 and 2006, restricted to countries with observations in all years; Source: Own calculations based on own index

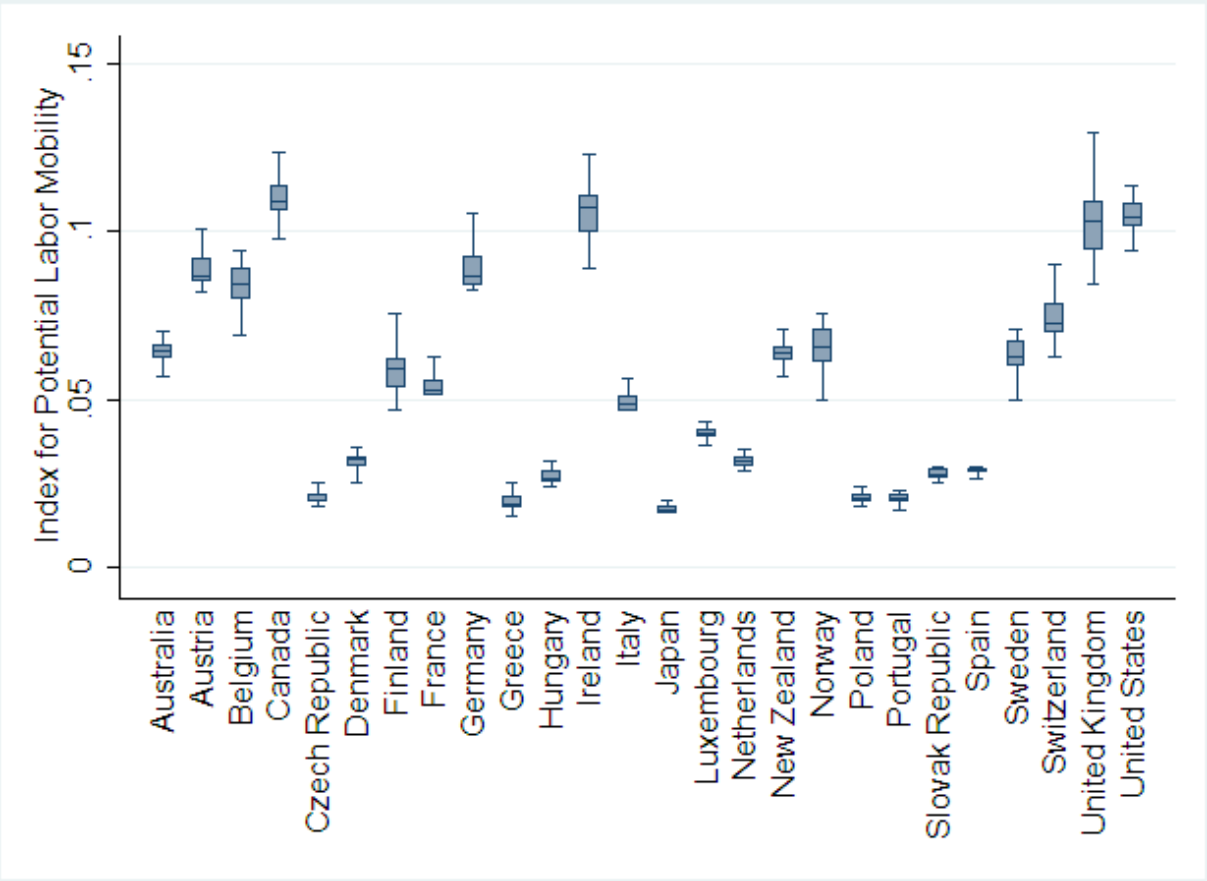


Figure 3.2: Median, 75% range, and 95% range for Index of Potential Labor Mobility, by source country 1986 - 2006; Source: Own calculations based on own index

values of single countries in Figure 3.2. There are two main observations to be made when looking at the raw data: First, variation across countries seems to be far more pronounced than variation within countries. Second, one can broadly classify countries into high (index $> 0.1$), middle, and low (index $< 0.05$) mobility ones. Low mobility countries are mostly found in Southern Europe (Greece, Italy, Portugal, and Spain) and Eastern Europe (Czech Republic, Hungary, Poland, and the Slovak Republic). On the other hand, most mobile countries belong to the "anglo-saxon" group (Canada, Ireland, the UK, and the US) which is known for lower tax burdens. These stylized facts lend some first tentative support to my initial assertion that potential labor mobility has an effect on the taxation of labor incomes.

Figure 3.3 presents some graphical illustration of the relevance of the four sub components of the index for the final value of the index. The four graphs show the values of the sub-indices for the country pairs which enter the index. The relatively high values for each subindex show that the low values for the overall index are mainly driven by its multiplicative composition. Furthermore, the most attractive potential host seems to offer quite attractive economic conditions (index values typically between 0.6 and 0.8) but the low mobility of the home labor force drives down the whole index (values around 0.4). Values for the sub-index on proximity look clustered, reflecting that the effects of common languages and a common border dominate factors such as the inverse geographical distance.

Another important criterion for assessing the reliability of the Index of Potential Labor Mobility is its correlation with actually observed flows of labor. From a theoretical point of view, one would expect a positive relation between the two measures. For several reasons, however, this relation should not be too strong as well: First, individual decisions about migration are rather complex and more involved that the aggregate measures used for constructing this index. Second, it takes time to realize changes in the fundamentals underlying migration decisions, and additional time to process the new information. Third, when potential migration increases, policy makers can enact measures to counter increasing outflows of labor. Finally, from an econometric point of view, a high correlation might raise doubts on whether the Index of Potential Labor Mobility helps curing the problems of reverse causality discussed above.

In Table 3.2 we look at the correlations between the index and the share of emigrants at various skill levels. The correlation coefficient is strongly positive in all cases, but not too high as to raise concerns on reverse causality. Furthermore, the size of the correlation is increasing in the number of lags. This suggests that it takes time for changes in migration possibilities to translate into actual labor relocations. Thus, the index meets the criteria stated above.

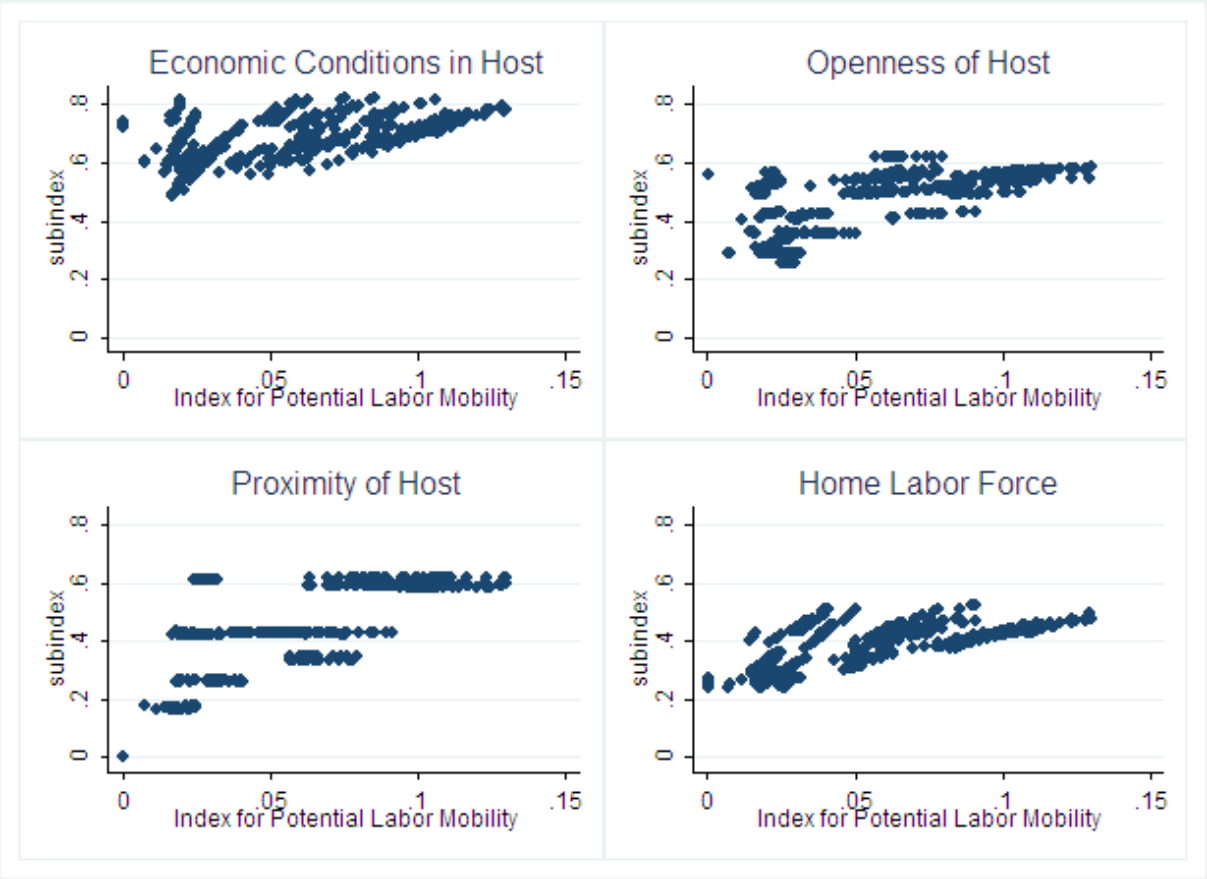


Figure 3.3: Plots of the four subcomponents of the index against the index. Source: Own calculations based on own index

Table 3.2: Correlation between Actual Emigration and Index of Potential Mobility

| | Index of Potential Labor Mobility | | | | | |
|---|---|---|---|---|---|---|
| | (L0) | (L1) | (L2) | (L3) | (L4) | (L5) |
| Skilled Emigration | 0.257 | 0.258 | 0.261 | 0.265 | 0.272 | 0.281 |
| | (339) | (314) | (289) | (264) | (239) | (234) |
| All Emigration | 0.275 | 0.276 | 0.278 | 0.280 | 0.283 | 0.287 |
| | (339) | (314) | (289) | (264) | (239) | (234) |

Number of observations in parenthesis. (L1) denotes the first lag of the index, and so on. Sources: Own index and emigration data from Defoort (2006).

### 3.3.2 Tax System Indicators

The data to describe the shape of countries' personal income tax schedules is taken from Peter et al. (2010). This data set provides information on average and marginal tax rates an individual faces when earning multiples of nominal national GDP per capita. These rates account for tax allowances and deductions, tax credits, and significant local taxes. Since they cannot account for allowances granted on the basis of individual characteristics such as marriage status or the number of children, the tax data represents effective tax rates for single individuals. Furthermore, the data set contains the top marginal tax rate and some descriptive statistics on the progressivity of the tax schedule. It covers more than one hundred countries on a yearly basis between 1981 and 2005.

The main advantage of this data set is that it provides information on various relevant indicators on the taxation of incomes above average GDP per capita which is comparable both across countries and time. On the downside, however, we learn nothing about the taxation of incomes below average GDP per capita. Information on incomes below average GDP is relevant since it covers a considerable part of tax payers, although it is less relevant in terms of corresponding tax revenues. Furthermore, information on tax payments covers only parts of individuals' gross contributions to financing governments (social security payments, e.g., are omitted) and an even smaller part of net contributions, since the data totally abstracts from transfers or public good provision.[22] However, net contributions cannot be calculated without detailed individual level data.

Figure 3.4 shows some descriptive statistics on average tax rates for incomes at multiples of national GDP per capita. Two main features come to mind when looking at the dispersion of average tax rates in Figure 3.4: First, the variation in the tax rates has decreased considerably since the mid 1980s, in particular at higher income levels.[23] Second, there has been a general downward trend in average tax rates at all four tax levels since the mid 1980s, and particularly after 2000. These were also the periods of most pronounced increases in the Index of Potential Labor Mobility.

## 3.4 Empirical Results

### 3.4.1 The Effect of Potential Labor Mobility on Personal Income Taxation

In this section, I test the hypotheses stated above in a first set of regressions. Here, as in the following regressions, I employ five dependent variables: First, the effective average tax rate (EATR) at incomes of average GDP per capita, at twice the average GDP per

[22] The focus on gross contributions is a common feature of empirical papers on (capital) tax competition.
[23] The low tax rates for high income earners are from Chile, Korea, and Mexico.

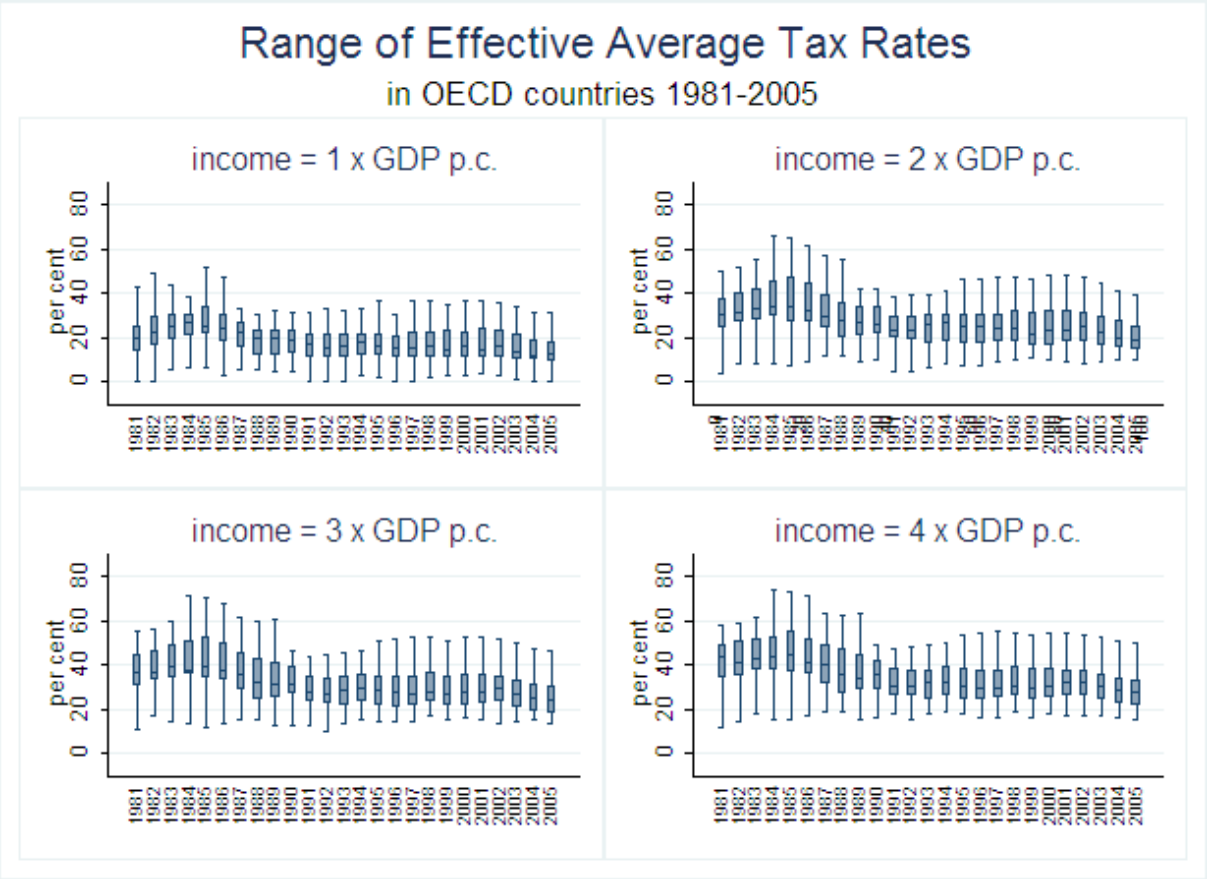


Figure 3.4: Median, 75% range, and 95% range for average tax rates at different income levels; Source: Own calculations based on Peter et al. (2010)

capita, three times and four times. Second, the top marginal tax rate. Although Peter et al. (2010) provides additional information on marginal effective tax rates, I focus on EATRs since the different types of tax rates are relevant in different decision situations: The effective average tax rate is particularly relevant for decisions at the extensive margin, i.e. whether to work at all. The focus of this study is on these tax measures because the decision at the extensive margin corresponds to the migration decision in an international context. The top marginal tax rate is included since it is quite relevant for individuals at the very end of the income distribution and furthermore of particular political interest.

Expressed in formal terms, the regression equation which I estimate subsequently takes the following functional form:

$$tax_{it} = \alpha + \beta IndexLaborMobility_{it} + \gamma X_{it} + \mu_i + \nu_t + \epsilon_{it} \tag{3.2}$$

where i denotes the country and t the year. $tax$ is one of the five tax indicators and $X_{it}$ the set of controls. The set of controls is the same for all tax indicators in a given specification but may vary for all of them across specifications. The main focus of the regressions is on obtaining estimates for $\beta$.

In the first set of regressions, I regress each of these five tax indicators on the Index of Potential Labor Mobility and several political control variables. A first focus on political controls seems reasonable, since tax policy is known to be a major issue in the political arena and driven by many non-economic considerations. The control variables focus on time-varying characteristics of the political system such as the political orientation of the central government, institutional constraints on the government, and the legislative fractionalization. Indicators on constitutional aspects (e.g. presidential system) are not included as they show hardly any variation in my sample and are thus absorbed by country fixed effects.

Results of the regressions are presented in Table 3.3. The estimates for the Index of Potential Labor Mobility support my hypothesis: They are all significantly negative, and the stronger the higher the income at which the estimation is performed.[24] The latter is in line with predictions given that high-income earners are internationally more mobile.

The political controls are in line with expectations: Left governments reduce the tax burden at the lower end of the taxable income distribution (although not statistically significantly) and increase taxes on the rich. Governments operating under more severe institutional and legislative constraints impose lower taxes on their citizens. The latter effect might reflect more institutional inertia.

However, political variables are not the only determinants of tax policy. When setting the tax policy, policy makers also need to account for the state of the economy (economic

[24] As a caveat, one should note that the estimates for the effect of potential labor mobility at different points of the tax schedule are not statistically different.

Table 3.3: Regressions with Political Controls

| | Dependant Variable: | | | | |
|---|---|---|---|---|---|
| | Average effective tax rate at income of | | | | Top marg. tax rate |
| | 1 x GDP p.c. | 2 x GDP p.c. | 3 x GDP p.c. | 4 x GDP p.c. | |
| index of labor mobility | -1.77*** | -2.10*** | -2.21*** | -2.20*** | -2.33*** |
| | (0.28) | (0.30) | (0.31) | (0.31) | (0.37) |
| left government | -0.00 | 0.01 | 0.01** | 0.01** | 0.02*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| institutional constraints | -0.01** | -0.02*** | -0.02*** | -0.02*** | -0.05*** |
| | (0.00) | (0.00) | (0.01) | (0.01) | (0.01) |
| legislative fractionalization | -0.09** | -0.16*** | -0.18*** | -0.19*** | -0.14** |
| | (0.04) | (0.05) | (0.05) | (0.05) | (0.06) |
| constant | 0.38*** | 0.55*** | 0.63*** | 0.68*** | 0.77*** |
| | (0.03) | (0.03) | (0.04) | (0.04) | (0.04) |
| Country FE | yes | yes | yes | yes | yes |
| Year FE | yes | yes | yes | yes | yes |
| $R^2_{adj.}$ | 0.13 | 0.19 | 0.23 | 0.25 | 0.32 |
| F-stat | 22.29 | 31.44 | 37.59 | 40.65 | 55.64 |
| Obs. | 420 | 420 | 420 | 420 | 422 |

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

growth, GDP per capita, unemployment), characteristics of the population (dependency ratio, degree of urbanization, population density), or the economic structure of the economy (capital intensity of production, share of employees in service sector). Thus, I include all these regressors in estimations presented in Table 3.4.[25]

Not surprisingly, the size of the estimated coefficients for the Index of Potential Labor Mobility decrease considerably, but remain significantly negative. Still, the economic size of the coefficient is non-negligible: Germany is the country with the greatest absolute change in mobility (+0.07). This change corresponds to a reduction in the top marginal tax rate of about 5 percentage points, accounting for roughly a third of the reduction in this tax rate observed in the sample period.

Turning to the economic controls, four variables seem to be of particular relevance: Economies with a lower dependency ratio charge their workers lower taxes (i.e. finance a given budget requirement more evenly). Richer economies charge lower taxes on labor, potentially reflecting a more balanced use of various tax instruments. Economies with growth rates above their long-run average levy higher taxes on their workers. With progressive tax schedules, this observation can be rationalized by the effect of the so-called cold progression. Finally, a higher level of unemployment is associated with lower taxes on labor. This observation can be rationalized if contributions to unemployment insurance and taxation of labor incomes are substitutes, i.e. higher financial need of the unemployment insurance system force the policy makers to partly compensate individuals

[25]Two of the economic control variables (GDP growth and unemployment, both in the source country) are also part of the Index of Potential Labor Mobility since they affect both domestic taxation and migration decisions. To counter concerns about collinearity, I re-estimate all regressions in Table 3.4, dropping these two economic controls from the estimations. As a result, the size of my coefficients of interest increases slightly, but qualitative results are unaffected.

Table 3.4: Regressions with Economic and Political Controls

| | Dependant Variable: | | | | |
|---|---|---|---|---|---|
| | Average effective tax rate at income of | | | | Top marg. tax rate |
| | 1 x GDP p.c. | 2 x GDP p.c. | 3 x GDP p.c. | 4 x GDP p.c. | |
| index of labor mobility | -1.17*** | -1.18*** | -1.20*** | -1.06*** | -0.76* |
| | (0.35) | (0.38) | (0.39) | (0.40) | (0.45) |
| left government | -0.01* | 0.00 | 0.01 | 0.01 | 0.02*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| institutional constraints | 0.00 | 0.00 | -0.00 | -0.00 | -0.02** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| legislative fractionalization | -0.05 | -0.10** | -0.12** | -0.13*** | -0.11* |
| | (0.04) | (0.05) | (0.05) | (0.05) | (0.06) |
| real GDP per capita | -0.00*** | -0.00*** | -0.00*** | -0.00*** | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| GDP growth | 0.20** | 0.19** | 0.20** | 0.19** | 0.17* |
| | (0.08) | (0.08) | (0.09) | (0.09) | (0.10) |
| unemployment rate | -0.33*** | -0.44*** | -0.46*** | -0.45*** | -0.05 |
| | (0.11) | (0.12) | (0.13) | (0.13) | (0.15) |
| capital intensity | 0.00 | 0.00 | 0.00 | 0.00 | -0.00 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| employment share of service | -0.07 | -0.02 | -0.04 | -0.09 | -0.79*** |
| | (0.12) | (0.13) | (0.14) | (0.14) | (0.16) |
| population density | 0.00*** | 0.00 | 0.00 | -0.00 | -0.00** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| rural population | -0.00 | -0.00* | -0.00 | -0.00 | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| population aged 15-64 | -0.28 | -0.56** | -0.58** | -0.54* | -0.13 |
| | (0.26) | (0.28) | (0.29) | (0.29) | (0.33) |
| constant | 0.45** | 0.88*** | 1.02*** | 1.09*** | 1.48*** |
| | (0.22) | (0.24) | (0.24) | (0.25) | (0.28) |
| Country FE | yes | yes | yes | yes | yes |
| Year FE | yes | yes | yes | yes | yes |
| $R^2_{adj.}$ | 0.20 | 0.27 | 0.29 | 0.31 | 0.42 |
| F-stat | 11.64 | 15.28 | 17.07 | 18.29 | 27.94 |
| Obs. | 416 | 416 | 416 | 416 | 418 |

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

with lower taxes on labor income.[26]

In general, the regressions presented support to the main hypothesis of this chapter: An increasing ability of an economy's workforce to emigrate to other countries induces governments to lower taxes on labor income in order to counter an erosion of the tax base. However, the adjustments in personal income taxes do not differ across income levels although high-skilled individuals, typically earning higher incomes, are known to be relatively more mobile than low-skilled ones. Thus, there is no evidence for a reduction in the progressivity of the personal income tax schedule.

This result may seem puzzling at first sight. However, there are at least two arguments to explain it: First, the Index of Potential Labor Mobility is based on aggregate data which best describes *average* incentives to migrate. In principle, the issue of average incentives can be tackled in two ways: First, by splitting the sample into two groups of countries based on whether low-skilled or high-skilled emigration dominates. Second, by constructing separate indices for low-skilled and high-skilled migration where weights are adjusted to reflect the different relevance of sub-indicators for different types of migrants. Both approaches, however, require information on *plans* to migrate which is hard to obtain. Using observed migration data instead would come at the cost of aggravating concerns about reverse causality and impairing dealing with the effects of strategic competition. Thus, using data on average incentives, although not beyond reproach, is the best available approach. The second argument to explain the absence of shape effects is related to different abilities to legally evade personal income taxation. Suppose that high-income earners have more opportunities to reclassify labor income as capital income (e.g. via options) or to have parts of their income paid as fringe benefits. In this case, their net income becomes less sensitive to changes in the schedule of personal income taxes. As a result, it can be worthwhile for high-income earners to lobby for lower capital taxation or a more generous classification of fringe benefits rather than politically costly reductions of tax burdens at the upper end of the personal income tax schedule.

### 3.4.2 Robustness

After having presented the baseline results, I turn to some robustness checks in order to validate my results against potentially confounding effects of other channels. In the first two robustness checks, I turn to the indirect channel through which economic integration might affect taxes on personal income: Either through changes in the general budgetary requirements or via the prevention of arbitrage between capital and personal income taxation. Therefore, I include measures of general government outlays and receipts (Robustness 1) and of revenues from corporate income taxation (Robustness 2) into the previous set of regressions. Estimation results presented in Table 3.5 suggest the relevance

[26] Of course, there are a lot more ways of interpreting results for controls when taking account of reverse causality.

of these additional indirect channels: The size of estimated coefficients decreases slightly. Most importantly, the general pattern remains unchanged, suggesting that the previously measured effects were not driven by the indirect channels. One caveat, however, has to apply here: In these robustness checks, I measure capital and indirect taxation as the shares of their revenues in GDP. Constant shares do not imply that the tax burden imposed on an individual with a given income remains unchanged. One can have, e.g., a revenue neutral shift in the burden of indirect taxes by reducing the set of goods taxed at a lower rate or even exempted from indirect taxes. Similarly, the introduction of dual income taxes can reduce the tax burden of those with high capital incomes. These shifts are accounted for neither in my dependent variable nor in capital tax revenues. Coping with these caveats would require information on individual capital income and consumption baskets across the income distribution, what is both beyond the scope of this chapter.

Another issue of concern relates to the question whether the Index of Potential Labor Mobility measures a distinct feature of economic integration or whether it serves as proxy for general economic integration. Therefore, I test in the third and fourth robustness check whether the inclusion of a broad measure of economic integration (Dreher 2006) affects the estimates for the index, and whether the same pattern of coefficients can be obtained by using actual emigration rates instead of the Index of Potential Labor Mobility. Results in Table 3.5 show that neither of the two concerns is of empirical relevance. Adding the broad measure of economic integration has hardly any effect on the size or the statistical significance of the coefficients.[27] Furthermore, actual emigration measures yield significantly positive estimation coefficients, lending empirical support to my concerns about reverse causality.

In Robustness 5, I look at potential heterogeneity in the effect of potential labor mobility on tax burdens. Using survey data on German members of parliament, Heinemann and Janeba (2011) show that the perception of factor mobility strongly depends on MP's political orientation. Thus, the political orientation of governments can shape its reaction to changes in potential labor mobility. Thus, I add an interaction term between the Index of Potential Mobility and the measure for the political orientation of the government to my estimation. However, this interaction turns out to be insignificant, lending no further support to this hypothesis.

In the sixth robustness check, I replace the index by another measure of potential mobility. This version of the index contains the sum of all values of migrating to potential hosts rather than the maximal value as before. The idea behind this alternative measure is that, in reality, we observe people migrating to a lot of different places. Apparently, there is a heterogenous evaluation of or a heterogeneity in preferences for the situation in other countries. Since policy makers can enact only one single tax code, they need to

[27] Estimates yield the same qualitative results when including the measure by Dreher (2006) alone instead using it together with my index, as in Robustness 3.

Table 3.5: Robustness

| | Dependant Variable: | | | | |
|---|---|---|---|---|---|
| | Average effective tax rate at income of | | | | Top marg. tax rate |
| | 1 x GDP p.c. | 2 x GDP p.c. | 3 x GDP p.c. | 4 x GDP p.c. | |
| | **Robustness 1: Budget Incidence** | | | | |
| index of labor mobility | -1.15*** | -1.14*** | -1.13*** | -0.99** | -0.68 |
| | (0.35) | (0.37) | (0.38) | (0.39) | (0.46) |
| government outlays | -0.15* | -0.16 | -0.21** | -0.23** | -0.44*** |
| | (0.09) | (0.10) | (0.10) | (0.10) | (0.12) |
| government receipts | 0.33*** | 0.45*** | 0.51*** | 0.53*** | 0.31** |
| | (0.10) | (0.11) | (0.11) | (0.11) | (0.13) |
| $R^2_{adj.}$ | 0.22 | 0.29 | 0.33 | 0.35 | 0.40 |
| Obs. | 416 | 416 | 416 | 416 | 418 |
| | **Robustness 2: Other Tax Revenues** | | | | |
| index of labor mobility | -1.14*** | -1.16*** | -1.15*** | -1.01** | -0.76* |
| | (0.36) | (0.39) | (0.40) | (0.40) | (0.45) |
| Corporate Income Tax | 0.00 | 0.00 | 0.00 | 0.00 | 0.01*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Indirect Taxes | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $R^2_{adj.}$ | 0.20 | 0.27 | 0.30 | 0.31 | 0.41 |
| Obs. | 413 | 413 | 413 | 413 | 415 |
| | **Robustness 3: Other Integration Measure** | | | | |
| index of labor mobility | -1.20*** | -1.21*** | -1.22*** | -1.09*** | -0.91** |
| | (0.35) | (0.38) | (0.39) | (0.40) | (0.45) |
| economic globalization | 0.08 | 0.07 | 0.06 | 0.02 | -0.31*** |
| | (0.05) | (0.05) | (0.05) | (0.06) | (0.06) |
| $R^2_{adj.}$ | 0.21 | 0.26 | 0.29 | 0.31 | 0.42 |
| Obs. | 416 | 416 | 416 | 416 | 418 |
| | **Robustness 4: Actual Emigration Flows** | | | | |
| skilled emigration | 0.56** | 0.77*** | 0.83*** | 0.78*** | -0.24 |
| | (0.23) | (0.24) | (0.24) | (0.25) | (0.25) |
| $R^2_{adj.}$ | 0.25 | 0.31 | 0.35 | 0.38 | 0.55 |
| Obs. | 395 | 395 | 395 | 395 | 399 |
| | **Robustness 5: Heterog. Effects for Gov.s with Diff. Pol. Orientation** | | | | |
| index of labor mobility | -1.10*** | -1.14*** | -1.20*** | -1.09*** | -0.85* |
| | (0.36) | (0.39) | (0.40) | (0.41) | (0.48) |
| (index) x (left government) | -0.26 | -0.16 | -0.05 | 0.01 | 0.03 |
| | (0.19) | (0.20) | (0.21) | (0.21) | (0.25) |
| left government | 0.00 | 0.01 | 0.01 | 0.01 | 0.02 |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) |
| $R^2_{adj.}$ | 0.20 | 0.26 | 0.29 | 0.31 | 0.38 |
| Obs. | 416 | 416 | 416 | 416 | 418 |
| | **Robustness 6: Sum of all Hosts in Measure of Potential Labor Mobility** | | | | |
| Sum of Labor Mobility | -0.19** | -0.16* | -0.17* | -0.18* | -0.25** |
| | (0.08) | (0.09) | (0.09) | (0.09) | (0.11) |
| $R^2_{adj.}$ | 0.19 | 0.25 | 0.28 | 0.30 | 0.39 |
| Obs. | 416 | 416 | 416 | 416 | 418 |

Robust standard errors in parentheses. All regressions contain the same set of controls as in Table 3.4. In addition, Robustness 1 controls for government outlays and receipts in per cent of GDP, Robustness 2 for government revenues from corporate income taxation and indirect taxation in per cent of GDP, Robustness 3 for a broad measure on economic globalization, and Robustness 4 for the share of skilled emigrants in countries populations. Robustness 5 includes interaction between index and political orientation of government. Robustness 6 replaces the index of potential labor mobility by the sum of all hosts. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

take account of the attractiveness of a variety of potential host countries. Furthermore, the index can take higher values when the number of countries increases, reflecting that a higher number of countries expands the choice set of a potential migrator. Results of regressions when replacing the maximal value of labor mobility by the sum of values for all hosts are presented in Robustness 6. As it turns out, qualitative results are robust to this alternative specification of the index.

In the seventh robustness check, I use a further alternative specification of the index. In this version of the index, I replace the set of proxies for openness to immigration[28] by a direct measure of legal impediments to immigration. This direct measure is taken from Ortega and Peri (2012), which is, to my knowledge, the only paper providing a quantitative account of immigration laws. They normalize every country to zero in 1980 and increase this score by one if a country's legislation passed a law reducing barriers to immigration, and vice versa. In principle, this is the measure to be directly included in my index. However, I restrict myself to use it merely as robustness check for two reasons: First, it does not account for the effects of the new law, since every change is coded in the same way. Countries score the better, the more they slice legal changes into small laws. Second, it covers only fifteen countries.[29]. That is, I restrict the set of potential host countries even further. The results of robustness check 7 are presented in Table 3.6. The size of the estimated coefficients grows slightly, but the alternative specification of the index does not change the qualitative results.

In robustness check 8, I investigate the third indirect channel from economic integration to personal income taxation: The effects of trade in goods on the distribution of domestic incomes. Unfortunately, data availability limits my ability to test the implications of trade effects, as theories stressing the heterogeneity of firms or workers require more disaggregated data. However, classical models such as Heckscher-Ohlin can be tested in principle. In these tests one should keep in mind, however, that the expected effects concentrate on individuals with low incomes (unskilled labor as scarce factor) which are not covered by the tax data I use. The indicator for the Heckscher-Ohlin effect is constructed by interacting the share of trade with non-OECD countries and the share of the workforce with primary education.[30] Estimation results show that qualitative results are not affected.

In the ninth robustness check, I control for whether the strength of the effect of labor mobility depends on the skill structure of the workforce, as high-skilled individuals are known to be more mobile. To test for this effect, I construct a dummy which takes

[28] Compare Table B.1 in the appendix.

[29] Australia, Belgium, Canada, Denmark, Finland, Germany, Italy, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, United States

[30] Data is taken from OECDstat (trade) and the Key Indicators of the Labour Market (ILO, 7th ed.), resp. The KILM data set starts only in 1988 and does not provide information for every country in my data set for every year.

Table 3.6: Robustness (continued)

| | Dependant Variable: | | | | |
|---|---|---|---|---|---|
| | Average effective tax rate at income of | | | | Top marg. tax rate |
| | 1 x GDP p.c. | 2 x GDP p.c. | 3 x GDP p.c. | 4 x GDP p.c. | |
| | **Robustness 7: Index with Immigration Laws** | | | | |
| index of labor mobility | -0.48*** | -0.33* | -0.38* | -0.40** | -0.78*** |
| | (0.18) | (0.20) | (0.20) | (0.20) | (0.23) |
| $R^2_{adj.}$ | 0.20 | 0.25 | 0.28 | 0.30 | 0.43 |
| Obs. | 416 | 416 | 416 | 416 | 416 |
| | **Robustness 8: Measure of Trade Effects on Wages** | | | | |
| index of labor mobility | -0.35*** | -0.33*** | -0.31*** | -0.29*** | -0.43*** |
| | (0.09) | (0.10) | (0.10) | (0.10) | (0.07) |
| Heckscher-Ohlin Effect | 0.47 | 0.40 | 0.25 | 0.19 | -0.70*** |
| | (0.29) | (0.31) | (0.31) | (0.29) | (0.23) |
| $R^2_{adj.}$ | 0.15 | 0.13 | 0.12 | 0.13 | 0.43 |
| Obs. | 258 | 258 | 258 | 258 | 260 |
| | **Robustness 9: Interaction between Skills of Workforce and Index** | | | | |
| index of labor mobility | -0.36*** | -0.33*** | -0.31*** | -0.28*** | -0.39*** |
| | (0.10) | (0.10) | (0.10) | (0.10) | (0.07) |
| (index) x (dummy high-skill) | -0.02 | 0.02 | 0.02 | -0.02 | -0.12** |
| | (0.07) | (0.07) | (0.07) | (0.07) | (0.05) |
| $R^2_{adj.}$ | 0.12 | 0.15 | 0.16 | 0.19 | 0.49 |
| Obs. | 265 | 265 | 265 | 265 | 267 |
| | **Robustness 10: Seemingly Unrelated Regression (SUR)** | | | | |
| index of labor mobility | -0.24 | -.0.01 | -0.06 | -0.10 | -0.51*** |
| | (0.17) | (0.17) | (0.17) | (0.17) | (0.18) |
| $R^2_{adj.}$ | 0.13 | 0.15 | 0.17 | 0.18 | 0.32 |
| Obs. | 416 | 416 | 416 | 416 | 416 |
| | **Robustness 11: Alternative Index** | | | | |
| low-skilled labor mobility | -0.50 | -1.80 | -1.71 | -1.05 | 4.29** |
| | (1.44) | (1.53) | (1.56) | (1.58) | (1.71) |
| high-skilled labor mobility | 26.20*** | 27.43** | 24.43** | 18.64* | -23.52** |
| | (10.04) | (10.65) | (10.86) | (11.00) | (11.73) |
| $R^2_{adj.}$ | 0.25 | 0.31 | 0.34 | 0.36 | 0.48 |
| Obs. | 418 | 418 | 418 | 418 | 420 |

Robust standard errors in parentheses. All regressions contain the same set of controls as in Table 3.4. Robustness 7 uses a modification of the Index of Potential Labor Mobility with a measure of legal barriers to immigration. Robustness 8 includes a measure of the Heckscher-Ohlin effect. In Robustness 9, an interaction of the index with a dummy indicating an above-median share of individuals with tertiary education in total workforce is added. Robustness 10 uses a SUR estimator. In Robustness 11, the Index of Potential Labor Mobility is replaced by an alternatively constructed index as described in App. B.2. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

the value one if an economy's workforce has an above-median share of workers with tertiary education, and zero otherwise.[31] Then, I interact this dummy with the Index of Potential Labor Mobility. Results presented in Robustness 9 indicate that the estimates for the index itself remain qualitatively unchanged. The interaction term is insignificant, suggesting that the strength of the effect of potential labor mobility on taxes is not moderated by the skill composition of the workforce.

In the next robustness check, I look at the tax policy decision process. Implicitly, I have assumed so far that every effective average tax rate is determined independently. However, policy makers often adjust the whole tax schedule at the same time, having budgetary requirements or equity concerns in the back of their minds. A standard way to tackle the resulting issue of correlated error terms is to employ a seemingly unrelated regressions (SUR) approach. Results using this alternative estimation technique are presented in Robustness 9. As a result, most coefficients of interest become statistically insignificant. This is quite surprising, given that statistical significance was no issue in any of the preceding regressions.

So far, I have imposed exogenous weights on the different components on my Index of Potential Labor Mobility. Although based on existing literature, this rather ad hoc approach can hardly be beyond reproach. To counter concerns about exogenous weights driving my estimation results, I present an alternative version of the index in which weights are obtained by regressing observed migration on the set of explanatory variables described above. The data on observed migration is taken from Docquier et al. (2011). They collect information on stocks of bilateral migration between 194 countries in the years 1990 and 2000. Furthermore, Docquier et al. (2011) distinguish between migrants with college and below-college education.

This approach has several advantages over my previous strategy: First, weights do no longer depend on my opinion on appropriate weighting. Second, since data covers both different skill levels and different years, estimated weights can vary along these two dimensions. Varying weight allow to increase variation over time relative to variation between countries. Furthermore, different weights for different skill groups should facilitate the identification of shape effects.

However, there are also disadvantages associated with the estimation of weights: First, they do not follow a clear economic concept and are thus less closely linked to the theory on determinants of migration. Second, and more important, estimated weights provide a better fit to *observed* mobility, not *potential* mobility. In previous sections, I have argued why these two concepts are different (e.g. because of strategic interaction) and why measures of observed mobility are more prone to issues of reverse causality. Therefore, estimated weights provide additional information and increase the replicability of results

[31] Data based on Table 14a (age groups older than 15 and both sexes) from the Key Indicators of the Labour Market (7th ed.), provided by the International Labor Organisation.

at the price of increasing concerns of reverse causality. Details on the construction of this alternative index and some descriptives can be found in appendix B.2.

These indicators for low-skilled and high-skilled labor mobility are then used to estimate the effect of labor mobility on personal income taxation. Regressions are analogous to the ones in Table 3.4, except for replacing the Index of Potential Labor Mobility by the alternative measures of labor mobility.

Results presented in Robustness 11 show two distinct features: First, the estimates of the effect of low-skilled mobility are insignificant. Non-significant effects of low-skilled mobility can be interpreted in the light of often limited knowledge spill-overs from low-skilled and often negligible net contributions to the government budget. Second, estimates of the effect of high-skilled mobility are significant, but positive. This effect is apparently driven by reverse causality. We have already touched the issue of reverse causality when using observed migration data in Robustness 4 in Table 3.5. When using the Index of Potential Labor Mobility in Table 3.4, I could identify the effect of labor mobility on personal income taxation because the values of the index showed a sufficiently low correlation with observed migration data. The alternative index, however, is constructed by weighting its components to fit observed migrant stocks as good as possible. Apparently, the fit is sufficiently good to cause problems of reverse causality.

## 3.5 Conclusion

In this chapter, I quantify the effect of labor mobility on personal income taxation in OECD countries between 1986 and 2005. Using observed migration as explanatory variable creates severe problems of reverse causality, as I demonstrate in this chapter. Furthermore, observed flows do not allow to account for effects of strategic tax competition. To tackle both problems I create a new Index of Potential Labor Mobility. This new index is based on existing evidence on determinants of migration decisions and consists of components which are (in the short-run) not influenced by government tax policy. In addition to handling the problem of reverse causality, this index also allows to quantify the extent of labor mobility which used to be assumed to be zero in the tax competition literature.

I find robust empirical support for the hypothesis that labor mobility reduces effective average tax rates on personal income. In the case of Germany, the country with the largest increase in the sample period, higher labor mobility reduced effective average tax rates by at least five percentage points, accounting for roughly a third of the overall reduction since the mid 80s. However, I do not find evidence for heterogenous reductions across the distribution of taxable income. This result is somewhat unexpected given that high income earners are known to be most mobile. The absence of heterogenous effects might reflect political economy considerations in tax setting. In addition to exploring this

channel more deeply, it might also be worthwhile to employ more elaborate estimation methods as more comprehensive data on migration flows becomes available.

# Chapter 4

# How does Economic Integration Change the Effectiveness of Education Policy?

## 4.1 Introduction

International economic integration is one of the main forces shaping our economies. Despite its considerable impact on economic conditions, our knowledge about the role of economic integration for individual decisions about education and labor market participation is still quite limited. Enlarging our knowledge about this process is interesting for at least two reasons: First, decisions about education and labor market participation are key determinants of economic well-being, both at the individual and the aggregate level. It is thus important to understand how external income risk and goods market integration shape individual decisions at these tow margins. Second, many governments are concerned with low participation along these two dimensions. To target investment into activation programmes efficiently, it is necessary to understand why and how economic integration changes decisions about education and labor market participation decisions. Furthermore, we need to understand whether economic integration alters the effectiveness of existing programmes, that is whether governments need to adjust spending for activation programmes to reach the same goal as before.

In this chapter, we follow several objectives: First, we provide a model which allows to study the effects of falling trade costs on both education and labor market participation decisions at the same time. Second, we explicitly allow for government policies to affect these decisions. Third, we study how trade integration changes the effectiveness of these policies.

We contribute to understanding these issues by proposing a model of international trade in which individuals endogenously choose a level of education and the degree of labor market participation. These decisions are made under uncertainty about the realization of a economy-wide productivity shock and thus uncertainty about wages. Furthermore,

these decisions are subject to both the degree of economic integration and incentives provided by the governments. Therefore, the size and skill composition of the labor forces are endogenously determined.

Risk plays an important role in our model. Individuals know the distribution of productivity when making their education decisions and the realization of productivity when deciding whether to work or not. Risk generates unemployment among individuals with basic education. The share of the unemployed is the higher the worse the realization of productivity. This way of modeling allows to replicate important stylized facts about unemployment across educational groups: Since productivity risk is not equally important for all individuals, unemployment is the more prevalent the lower education.

We present a model of two countries. In each country there are two sectors: In sector 1 firms produce competitively a numeraire consumption good. In a second sector a continuum of varieties are produced in an oligopolistic market with a fixed number of firms (relaxed later). Firms produce output with labor as only input and compete in quantities. Due to oligopolistic competition it is worthwhile for firms in both countries to export to the other market (reciprocal dumping) if iceberg trade costs are not too high. Individuals are heterogeneous in their initial ability/effective labor. Wages per unit of labor are stochastic due to an economy-wide shock. Individuals can first decide on their level of education and then on whether to work or to receive some basic assistance. Governments influence both decisions by subsidizing education and providing basic assistance transfers which are both financed through head taxes. These transfers are at the heart of the mechanism driving our results on labor market participation. The amount of money paid to an unemployed relates to the expenditures made by the employed on differentiated goods and is thus tied to a real consumption basket. This reflects the fact that policymakers in most developed countries have some minimal standard of living in mind when setting these transfers.

Our approach is complementary to the standard way of modeling the relationship between trade and education as well as labor markets. Both the classical trade theory as well as the recent trade literature (e.g. Melitz (2003), Yeaple (2005), Chaney (2008), or Neary (2009)) treat the effective amount of labor as given and develop the resulting trade patterns. We take the opposite way and ask what kind of skill distribution and labor market participation result from a certain degree of trade integration and its interaction with government policies.

Within the framework of our model we analyze the effect of changes in government policies (i.e. education subsidies) and trade costs on education and labor market participation decisions. In our baseline model with a fixed number of firms, we show that subsidies for higher education increase the mass of individuals opting for advanced education. Higher taxes needed to finance these subsidies reduce incentives to educate and to work for all other individuals. None of these results depends on international integration.

This baseline specification is then extended by endogenizing the number of firms. In

this modified setting each firm needs to employ a certain amount of workers with advanced education. This way education subsidies increase competition in the differentiated goods sector, lower prices, and thereby reduce the relative value of the basic transfer fixed in real terms. As a result, more individuals participate in both types of education and more people work. Furthermore, a given education subsidy increases education and labor market participation the more the (i) higher education subsidies abroad, (ii) the lower trade integration, i.e. the higher the influence of the policy on the own price, and (iii) the more the number of firms increases in response to more skilled labor. These results already entail some policy implications: Economic integration reduces the effectiveness of education subsidies in increasing education and labor market participation. Governments can counter this deterioration either by unilaterally fostering competition in the goods market or by multilaterally coordinating education subsidies.

In the next step, we extend the analysis in two ways: First, we allow home and foreign to be asymmetric in population size. We can show that smaller countries are more effective in increasing education and labor market participation. Second, we generalize the basic transfer to cover more than needed to buy the full basket of differentiated goods. All results derived before are qualitatively robust to these alternative settings. In a final analysis, we endogenize the education subsidy via a median voter model. The subsidy chosen by the median voter heavily depends on the skill distribution in the economy. Two results, however, hold for general distributions: The chosen subsidy increases in economic integration and in the foreign subsidy. These results suggest that the subsidy chosen by the median voter allows for multilateral policy coordination and counters the lower effectiveness of subsidies in integrating economies.

Our chapter is related to three main strands of literature: First, the one on trade and education, second to the literature on trade and labor markets, and third to papers on the effectiveness of government policies in open economies.

There exists a quite limited amount of literature dealing with the impact of trade on educational decisions. The two papers which come closest to ours are Blanchard and Willmann (2011) and Janeba (2003). The paper by Blanchard and Willmann focusses on the interaction between trade and educational institutions in individuals education decisions. In their model economic integration generates a polarization in the skill distribution (cf. Autor et al. (2006)). Blanchard and Willmann study under which circumstances education subsidies are more effective then tariffs in mitigating the polarizing effects of globalization. Their approach differs from ours in several ways: First, we allow for a continuum of final goods, whereas they model a continuum of intermediated goods used to produce a single final output. Second, we model the differentiated sector to exhibit oligopolistic competition, whereas Blanchard and Willmann have perfectly competitive markets. Third, we allow for unemployment, whereas labor markets always clear in Blanchard and Willmann (2011). Finally, the degree of economic integration is exogenous in our model

and partially controlled through tariffs in their work.

The second closely related paper is Janeba (2003). He looks at the effects of either increasing import competition or lower taxes on skilled workers on the distribution of incomes and finds that both changes widen income inequality. This paper exhibits several features which distinct it from our approach. First, Janeba models a small open economy, whereas we consider two potentially asymmetric countries. Second, in Janeba (2003) unskilled individuals work in a sector which is subject to international competition, whereas the sector of the skilled is not. Hence the incentive to educate. In our model, every individual can work in any sector. Their incentive to educate is to increase their effective amount of labor.

A second strand of literature to which our work relates is the one on international trade and labor markets. A large share of this literature combines monopolistic competition trade models and labor market matching models (cf. Helpman (2010), Helpman et al. (2010a), Costinot and Vogel (2010), and Helpman et al. (2011)), whereas some others resort to the fair wage approach (cf. Egger and Kreickemeier (2011)). Both approaches have in common that they assume a given skill distribution and that trade interacts with labor markets imperfections in generating unemployment. In our model, skills are determined endogenously and labor markets are without frictions. Thus, unemployment is purely voluntary. In that way we stress the importance of incentives provided by government policies for labor market decisions. We do not, however, claim that e.g. search frictions are no additional source of unemployment.

The third strand of literature our work is related to deals with the interaction between trade integration and government policies. One paper which is close to ours in spirit is Itskhoki (2008). In this paper he analyzes how trade integration affects the tax scheme which is optimal to achieve a certain redistributive aim. Though the precise problem is quite different from ours, both papers share the focus on the effect of trade integration on the effectiveness of government policies. Another paper which is relevant for our work is Rodrik (1998)[1]. Rodrik analyzes how trade integration and external risk interact in shaping size and structure of government budgets. We are also interested in looking at the relationship between risk, trade integration and government policies. However, the source of risk we are looking at is not necessarily external.

The chapter organizes as follows: First, we present and solve the model with an exogenously given number of firms before extending it to an endogenously determined number of firms. In the third section we analyze the effectiveness of education policies in increasing education and labor market participation. In particular, we look at how these subsidies interact with the degree of economic integration and foreign subsidies. In the fourth section, we extend the previous analysis to asymmetric countries and a varying generosity of government transfers. We also endogenize the education subsidy via the

[1] cf. Rodrik (1997) and Epifani and Gancia (2009)

political process. Finally, we conclude and briefly discuss some policy implications.

## 4.2 The Model

We consider a world economy consisting of two countries. Foreign country variables are indexed by *. In each country there are two sectors: In sector 1 firms produce competitively a numeraire consumption good $z_0$. In a second sector a continuum of varieties are produced in an oligopolistic market with a fixed number of firms.[2] Let $z \in [0,1]$ be an index for a variety in sector 2, also called an industry, and $x(z)$ and $y(z)$ be the consumption and output of a firm for variety $z$. For each variety there are $n$ firms in home and $n^*$ firms in foreign and all industries are identical. Firms produce output with labor as only input and compete in quantities. The coefficient $\alpha$ ($\alpha^*$) represents the number of units of labor to produce one unit of output in both sectors in home (foreign), and is thus an economy wide productivity measure. Productivity is stochastic with two possible realizations $\alpha^h < \alpha^l$, where $h$ ($l$) stands for high (low). The probability of a good shock $\alpha^h$ is $q \in [0,1]$.

Trade within an industry of the second sector takes place if international trade costs are not too large. Trade costs are modeled as iceberg costs and are captured by the parameters $\theta^* \geq 1$ and $\theta \geq 1$. These costs can be interpreted as non-tariff barriers (so that typically $\theta \neq \theta^*$) or simply transportation costs (and then $\theta = \theta^*$). Due to oligopolistic competition it is worthwhile for firms in both countries to export to the other market (reciprocal dumping).

Individuals are heterogeneous in their individual labor productivity (measured by the amount of effective labor) and have quasi-linear preferences over the consumption goods of both sectors. Consumption is financed out of labor income net of taxes and government transfers. Individuals make two types of decisions. They first decide on the level of education, which can be advanced, basic or none. In the latter case individuals are always unemployed. Advanced education provides the individual with a higher amount of effective labor per unit of time (i.e., generates a larger amount of effective labor). Second, educated workers either work and suffer a fixed utility loss $\gamma$, or decide to be unemployed and then receive a government transfer $B$. Not working despite being educated can be optimal due to the stochastic nature of $\alpha$. Choosing basic education is costless but advanced education costs $c - s$, where $c$ is the market price/production cost of advanced education and $s$ is an education subsidy by the government. This assumption is meant to capture that basic education like secondary schooling is less expensive than tertiary education. Not all workers become educated because individual labor productivity could be too low relative to the disutility of working. Workers are heterogeneous in their effective amount of labor (if they become educated). A worker has $\phi^{-1}$ units of effective labor under basic

[2] This assumption is relaxed in an extension to the basic model.

education and $\lambda\phi^{-1}, \lambda > 1$, under advanced education. More productive individuals have lower values of $\phi$.

The government collects a head tax $T$ from all *working* individuals and spends revenues on education subsidies and basic assistance transfers.

The timing of decisions is as follows:

1. Nature draws individual productivity $\phi \in [\underline{\phi}, \overline{\phi}]$, with $F(\phi)$ being the cumulative distribution function
2. The government sets the education subsidy $s$, head tax $T$, and benefits $B$
3. Workers decide on education (advanced, basic, none)
4. Productivity shock $\alpha$ realizes ($\alpha^h$ or $\alpha^l$)
5. Workers decide on labor market participation (work or be unemployed)
6. Output produced and consumed, taxes and transfers paid; all markets clear

Our main interest is in studying the effects of education subsidies and economic integration in the form of falling international trading costs ($\theta$ and $\theta^*$) on education and labor market decisions. The model is solved by backward induction.

### 4.2.1 Stage 6: Production and Consumption

#### Household behavior

Each individual is indexed by $\phi$, $\phi \sim [\underline{\phi}, \overline{\phi}]$ which corresponds to ability $\frac{1}{\phi}$ and determines income $I(\phi)$. The household maximization problem of a *working* individual who was previously educated is

$$\begin{aligned} \max_{x(z), z_0} U[x(z), z_0, \gamma] &= z_0 + \int_0^1 u[x(z)]\, dz - \gamma \qquad (4.1) \\ s.t.\ \ p_0\, z_0 + \int_0^1 p(z)\, x(z)\, dz &= I(\phi) \end{aligned}$$

where $u[x(z)] = ax(z) - \frac{b}{2}[x(z)]^2$ is a quadratic subutility function for each variety, $I(\phi)$ is the income of an individual with ability $\phi$ after tax $T$ and education cost ($c - s$ for advanced education), and $\gamma$ is the disutility of labor. We assume $a > 1$ and $b > 0$. Gross income is $(\alpha\phi)^{-1}$ and $\lambda(\alpha\phi)^{-1}$, respectively.

Non-working individuals receive a transfer of $B$ sufficient to buy a share $\delta$ of the bundle of differentiated goods as consumed by the employed individuals. This transfer guarantees a fixed real level of consumption for the unemployed if $\delta \in (0, 1]$ (parsimonious welfare state)[3] or allows to participate in lower prices of the differentiated good if $\delta > 1$ (generous

[3]Since the computation of the aggregate demand for the differentiated good in the case of $\delta \in (0, 1)$ is somewhat involved, we restrict the analysis to $\delta = 1$ for the parsimonious case. However, all results presented for $\delta = 1$ carry over $\delta \in (0, 1]$.

welfare state). Furthermore it implies that the differentiated goods should be thought of as necessities whereas the numeraire good represents the luxuries. Unemployed enjoy utility $u(B)$. There is no decision to be made.

Since $z_0$ is decreasing in $\phi$ we assume in the following that given $\alpha$ there exists a critical level of individual productivity $\widetilde{\phi}$ such that individuals with lower values of $\phi$ work, while those with higher values choose to be unemployed. The assumption is verified later.

Utility maximization of a working individual leads to optimal demand for a variety of the differentiated good

$$x(z) = \frac{a - p(z)}{b}. \tag{4.2}$$

Inserting (2) into (1) the net surplus of consumption of a variety $z$ is

$$u(x(z)) - p(z)x(z) = \frac{(a - p(z))^2}{2b}.$$

Aggregate demand for variety $z$ in the home country amounts to

$$X(z) = \int_{\underline{\phi}}^{\overline{\phi}} x(z) f(\phi)\, d\phi = \frac{[a - p(z)]}{b} \tag{4.3}$$

which in turn gives the inverse demand function

$$p(z) = a - bX(z). \tag{4.4}$$

**Firm behavior**

The firm optimization problem in the numeraire sector is trivial. Given constant returns to scale, a normalization of the price for the numeraire good to one, and price taking behavior the wage equals productivity

$$w = \alpha^{-1}. \tag{4.5}$$

For now we use the symbol $\alpha$ to denote the economy wide productivity when not referring to a specific realization. The wage rate must be the same in both sectors because aggregate productivity is the same and labor markets are competitive. The cost per unit of output $w\alpha$ are 1 in both sectors.

In the differentiated sector a typical home firm in industry $z$ solves the problem

$$\max_{y_d(z), y_{ex}(z)} \Pi = p(z)y_d(z) + p^*(z)y_{ex}(z) - [y_d(z) + \theta^* y_{ex}(z)]$$

where $y_d(z)$ and $y_{ex}(z)$ stand for domestic sales and exports of the home firm to foreign, respectively. $\theta^* \geq 1$ represents transport costs or import barriers imposed by foreign on

home exports. A value of $\theta^* = 1$ means full economic integration as barriers to trade are absent. We assume for the moment interior solutions for domestic and export sales of both home and foreign firms and consider a symmetric equilibrium among firms of the same country. We obtain the reaction functions

$$\begin{aligned} y_d(z) &= \frac{(a-1)}{b(n+1)} - \frac{n^*}{n+1} y^*_{ex}(z) \\ y_{ex}(z) &= \frac{a^* - \theta^*}{b(n+1)} - \frac{n^*}{n+1} y^*_d(z), \end{aligned} \tag{4.6}$$

and similarly for foreign firms. Substituting the foreign firm's export reaction function for $y^*_{ex}$ into the first line of (6) gives the equilibrium output of home and foreign firms consumed in the home market as

$$\begin{aligned} y_d(z) &= \left[\frac{a - 1 + n^*(\theta - 1)}{b(n + n^* + 1)}\right] \\ y^*_{ex}(z) &= \left[\frac{a - \theta + n(1 - \theta)}{b(n + n^* + 1)}\right], \end{aligned} \tag{4.7}$$

and analogeously in the foreign market as

$$\begin{aligned} y^*_d(z) &= \left[\frac{a^* - 1 + n(\theta^* - 1)}{b(n + n^* + 1)}\right] \\ y_{ex}(z) &= \left[\frac{a^* - \theta^* + n^*(1 - \theta^*)}{b(n + n^* + 1)}\right]. \end{aligned} \tag{4.8}$$

A home firm's profit equals $\pi = (p-1)y_d + (p^* - \theta^*)y_{ex}$. Aggregate profits are distributed lump sum to consumers such that one randomly chosen consumer or a small group of consumers obtain this profit income, reflecting the concentration of capital income and wealth in most societies. Under this assumption important thresholds for labor market participation and education are not affected by the amount of profits. This allows us to analyze the role of economic integration or productivity shocks via price effects and not through profit income.

### Goods Market Equilibrium

In order to describe the goods market equilibrium it is useful to introduce the following notation for home market and foreign market output

$$Y(z) = n y_d(z) + n^* y^*_{ex}(z) \quad \text{and} \quad Y^*(z) = n y_{ex}(z) + n^* y^*_d(z).$$

Equilibrium in industry $z$ of the home country requires $X(z) = Y(z)$. Substituting the sales in the home market from (7) and (8) for $Y(z)$ $Y^*(z)$ and using (3) yields the equilibrium prices in the home and foreign markets

$$p(z) = \frac{a + n + n^*\theta}{n + n^* + 1} \quad \text{and} \quad p^*(z) = \frac{a^* + n^* + n\theta^*}{n + n^* + 1}. \tag{4.9}$$

We note that prices are independent of aggregate productivity $\alpha$ and demand depends only on price due to quasi-linearity of the utility function. Finally, an important property we will exploit further below is that prices for differentiated goods are falling with economic integration, which is equivalent to stating

$$\frac{dp(z)}{d\theta} > 0 \quad \text{and} \quad \frac{dp^*(z)}{d\theta^*} > 0.$$

Note that the home country's net trade position in a differentiated good equals $nex(z) = ny_{ex}(z) - n^*y^*_{ex}(z)$. To support an interior solution we need that quantities computed for exports are positive ($y^*_{ex}(z), y_{ex}(z) > 0$), which requires positive numerators in the export sales expression of (7) and (8), and therefore

$$\frac{a + n}{n + 1} > \theta \quad \text{and} \quad \frac{a^* + n^*}{n^* + 1} > \theta^*. \tag{4.10}$$

Condition (10) represents a restriction on parameter values that allow for positive trade in all industries in both directions. As $a > 1$, an increase in domestic competition (via $n$) makes trade less likely, as profit margins decline.

An equilibrium for this world economy given a policy vector $(s, T, B)$ at home and similar $(s^*, T^*, B^*)$ at foreign is a price vector for each differentiated good $p(z)$ at home and in foreign $p^*(z)$, wages $w$ and $w^*$, and an allocation of consumption for each individual, an output level for each firm, an education and labor market participation decision for each individual, such that (i) each individual maximizes utility by choosing the consumption bundle given prices and income; (ii) firms maximize profits given the output of all firms in the same industry, prices in all other sectors and given wages; (iii) the labor market participation of each individual is optimal given the realization of $\alpha$ and the amount of education accumulated, (iv) each individual's education decision is optimal given rational anticipation of the labor market and consumption decision in subsequent play, (v) the government budget is balanced, (vi) all labor and output markets clear, and (vii) trade is balanced.

### 4.2.2 Stage 5: Labor Market Participation

At this stage the level of education and the economy wide productivity are given. An individual with ability $\phi$ and basic education has gross labor income $(\alpha\phi)^{-1}$. Recall that

only individuals with education can work and earn income. All others are unemployed. Individuals with *basic* education work when the utility from working is not less than the utility from being unemployed

$$z_0(\alpha,\phi)+\int_0^1 u[x(z)]\,dz-\gamma \geqq u(B). \tag{4.11}$$

The left hand side gives the utility of consumption of goods from both sectors net of the fixed disutility from work, while the right hand side gives utility from consuming the full bundle of the differentiated good when unemployed. We use $z_0(\alpha,\phi)=\frac{1}{\alpha\phi}-T-E(z)$, where $E(z)=\int p(z)x(z)dz = \int \frac{p(z)(a-p(z))}{b}dz$ is the total expenditure on differentiated goods. Let $\overline{u} := \int_0^1 u[x(z,\alpha)]\,dz = \frac{a^2-p^2}{2b}$ denote the utility from differentiated goods consumption (ignoring expenses for those goods). The critical value of individual productivity $\phi$ of a worker with basic education for which condition (13) is binding is

$$\widetilde{\phi}_b(\alpha^j)=\frac{1}{\alpha^j\left[\gamma+T+E(z)+u(B)-\overline{u}\right]}=\frac{1}{\alpha^j A}, \tag{4.12}$$

for shock realizations $j=h,l$ and parameter $A:=\gamma+T+E(z)+u(B)-\overline{u}$, where subscript $b$ stands for basic education.

Individuals with advanced education solve the same problem as in (13) with the difference that individual income is $\lambda(\alpha\phi)^{-1}$ rather than $(\alpha\phi)^{-1}$ and education expenses must be taken into account. While the education decision is sunk at the time of labor market participation, the expenditures influence the amount of numeraire good consumption. The same is true, however, for an individual with advanced education who decides not to work but needs to repay the education costs from the government transfer, so that numeraire good consumption equals $B-(c-s)$.

The value of $\phi$ for which an individual is indifferent between working and being unemployed is therefore

$$\widetilde{\phi}_{ad}(\alpha^j)=\frac{\lambda}{\alpha^j\left[\gamma+T+E(z)+u(B)-\overline{u}\right]}=\frac{\lambda}{\alpha^j A}>\widetilde{\phi}_b(\alpha^j), \tag{4.13}$$

where the subscript $ad$ refers to the decision of a worker with advanced education. The critical value in (4.13) is higher than the one for those with basic education (4.12). For a good realization of $\alpha$ (i.e., $\alpha=\alpha^h$ is small) more individuals work compared to a bad realization.

### 4.2.3 Stage 3: Education Decision

Stage 4 is the realization of the productivity shock. Moving to stage 3 individuals can opt for one of three education options each of which has different implications for the labor market:

1. no education: no education cost but unemployed
2. basic education: no education costs, individual productivity $\frac{1}{\phi}$, disutility $\gamma$ if work [4]
3. advanced education: education cost $c - s > 0$, productivity $\frac{\lambda}{\phi}$, $\lambda > 1$, disutility $\gamma$ if work

When making the choice, individuals know the distribution of productivity (i.e. $q, \alpha^h, \alpha^l$), but not its realization, and fiscal policy parameters $s, T, B$. Individuals are assumed to maximize expected utility anticipating rationally the outcome of subsequent play.

In the following we assume that individuals with advanced education work regardless of the shock realization. Workers with basic education and low productivity (i.e., relatively high $\phi$ among basic education workers) are assumed to work only in the good realization of the productivity shock. We show which conditions must be satisfied such that these assumptions are justified. The reason for making these assumptions is to reflect important features of labor markets in many countries: the probability of unemployment is decreasing with education, and workers with basic education have more volatile labor market status than those with advanced education.

#### Education Decisions: Basic vs No Education

When the marginal individual works only for the good realization of the productivity shock an individual opts for basic education when the following condition holds:

$$q\left[z_0(\alpha^h,\phi)+\int_0^1 u[x(z)]\,dz-\gamma\right]+(1-q)u(B)\geqq u(B), \tag{4.14}$$

where the left hand side is the expected utility under basic education and the right hand side is the utility from staying uneducated. Using the expression for $z_0$, the critical productivity level $\phi$ at the cut-off is given by:

$$\widehat{\phi_b}=\frac{1}{\alpha^h\left[\gamma+T+E(z)+u(B)-\overline{u}\right]}=\frac{1}{\alpha^h A}. \tag{4.15}$$

[4] As a tie-breaking rule for those individuals who are indifferent between basic and no education we assume basic education to be associated with a cost $\epsilon > 0$.

Note from comparing (4.12) and (4.15) that $\widetilde{\phi}_b(\alpha^h) = \widehat{\phi}_b$. In the good state of the world the critical values for getting a basic education and being active in the labor market coincide.

**Education Decisions: Advanced vs Basic Education**

When an individual always works both with advanced and basic education, the disutility of work and the net surplus from consuming differentiating goods are irrelevant for the marginal consumer, as they are constants offsetting each other under basic and advanced education. Therefore individuals opt for advanced education when the expected consumption of the numeraire good is higher under advanced education than under basic education

$$qz_0^{ad}(\alpha^h, \phi) + (1-q)z_0^{ad}(\alpha^l, \phi) \geqq qz_0(\alpha^h, \phi) + (1-q)z_0(\alpha^l, \phi), \tag{4.16}$$

where $z_0^{ad}(\alpha^j, \phi) = \frac{\lambda}{\alpha^j \phi} - T - E(z) - (c-s)$ refers to consumption of the numeraire good under advanced education. The condition leads to the cut-off

$$\widehat{\phi}_{ad} = \left(\frac{\lambda - 1}{c - s}\right)\left(\frac{q}{\alpha^h} + \frac{1-q}{\alpha^l}\right), \tag{4.17}$$

which does not depend on $T, B$, and $\gamma$.

We assumed so far that the marginal individual who is indifferent between advanced and basic education works always under both education levels, and the marginal individual who is indifferent between basic and no education works under the former only in the good state of the world. For this to be correct, the following three conditions need to be met:

- Everybody preferring advanced over basic education is in the set of those preferring basic over no education, i.e. $\widehat{\phi}_{ad} < \widehat{\phi}_b$. This condition guarantees that there are workers with basic education.
- The individual indifferent between advanced and basic education is willing to work for any realization of productivity, given it has a basic education, i.e. $\widehat{\phi}_{ad} < \widetilde{\phi}_b(\alpha^l) < \widetilde{\phi}_b(\alpha^h) = \widehat{\phi}_b(\alpha^h)$. Together with the first requirement this condition implies that under the bad realization of the productivity shock some workers with basic education work, while others don't.
- The individual indifferent between advanced and basic education is willing to work for any realization of productivity, given it has a advanced education, i.e. $\widehat{\phi}_{ad} < \widetilde{\phi}_{ad}(\alpha^l) < \widetilde{\phi}_{ad}(\alpha^h)$.

The third requirement is fulfilled when the second condition holds, as $\widetilde{\phi}_{ad}(\alpha^j) > \widetilde{\phi}_b(\alpha^j)$. We can guarantee the first two conditions by choosing returns to advanced education $\lambda$ to

be sufficiently close to one or net costs of higher education $c - s$ to be sufficiently high so that $\widehat{\phi}_{ad}$ is small. In this case, individuals with advanced education work for both states of productivity, whereas some but not all individuals with basic education choose to be unemployed in case of a bad productivity shock.[5]

### 4.2.4 Stage 2: Government

We assume that the government credibly sets the tax $T$, transfer policy $B$, and education subsidy $s$ prior to the education decision. Recall the critical values for becoming educated, $\widehat{\phi}_{ad}$ and $\widehat{\phi}_b$, and for participating in the labor market, $\widetilde{\phi}_b(\alpha^j)$ and $\widetilde{\phi}_{ad}$. We assume $\widetilde{\phi} \leq \widehat{\phi}$. The general structure of the government budget constraint then reads :

$$\underbrace{\int_{\underline{\phi}}^{\widetilde{\phi}_b(\alpha)} T f(\phi)\, d\phi}_{\text{tax revenue from workers}} + \underbrace{D_1 - R \cdot D_0}_{\text{net debt/investment}} = \underbrace{\int_{\widetilde{\phi}_b(\alpha)}^{\overline{\phi}} B f(\phi)\, d\phi}_{\text{transfers to unemployed}} + \underbrace{\int_{\underline{\phi}}^{\widehat{\phi}_{ad}} s f(\phi)\, d\phi}_{\text{cost of education subsidy}} \tag{4.18}$$

The government is assumed to balance its budget in expectation, i.e. for $\alpha = q\alpha^h + (1 - q)\alpha^l$. To ensure the balance of the budget, governments can issue bonds or make investments ($D_1$) on perfectly competitive international bond markets, both at an exogenous rate R (small open economy). Governments play exactly the same game in each period and balance their budget in each period in expectation.[6] Thus, one should think of the game played in this chapter as one shot within a series of games where the only link between periods is the issuance of or investment in bonds. Normalizing $D_0$ to zero (without loss of generality) yields that $D_1$ is positive when there is a bad productivity draw (issuance of government debt) and negative in the good productivity case (investment/repayment of debt).

### 4.2.5 Extension: Endogenizing the Number of Firms

So far, we have assumed the number of firms n to be exogenously given, leading to pure profits in this sector. Now, we relax this assumption by allowing for an endogenous adjustment of the number of firms. We make two changes with respect to the previous setup. First, we assume that each firm in the differentiated goods sector needs to hire a mass $\xi$ of advanced skilled workers to start and operate the firm. Since we maintain the assumption that individuals with advanced education are willing to work for both

[5] We do not need to consider the decision between advanced and no education because by construction an individual with advanced education prefers this over basic education who in turn gets from this option more utility than from no education. Hence advanced education must be preferred over no education.

[6] Due to the law of larger numbers, the government budget is balanced in the long run.

realizations of the productivity shock, the number of firms is given by

$$n = \frac{1}{\xi} \int_{\underline{\phi}}^{\widehat{\phi}_{ad}} \phi f(\phi) d\phi \tag{4.19}$$

unless the zero profit-condition were binding.

Second, we assume that profits are used to prop up wages of the advanced skilled, i.e. each unit of advanced labor receives an equal share of total profits. In formal terms, this reads as

$$\begin{aligned} \Pi_{unit} &= \frac{\Pi_{total}}{\int_{\underline{\phi}}^{\widetilde{\phi}_{ad}} \phi f(\phi) d\phi} \\ &= \frac{n[p(z)-1]y_d(z) + n[p^*(z)-\theta^*]y_{ex}(z)}{\int_{\underline{\phi}}^{\widehat{\phi}_{ad}} \phi f(\phi) d\phi} \\ &= \frac{[p(z)-1]y_d(z) + [p^*(z)-\theta^*]y_{ex}(z)}{\xi} \end{aligned} \tag{4.20}$$

One should note that this expression still depends on the size of advanced skilled labor through the price effect of the number of firms.

Since firms profits are paid out to the advanced skilled, individuals solve a slightly changed optimization problem when deciding on whether to acquire advanced education and whether to work given advanced education. The optimality condition for the working decision changes to:

$$\left(\frac{1}{\alpha} + \Pi_{unit}(\alpha)\right)\frac{\lambda}{\phi} - T - E(z) + \int_0^1 u[x(z)]\, dz - \gamma \geqq u(B), \tag{4.21}$$

what leads to the cut-off value

$$\widetilde{\phi}_{ad} = \frac{\lambda\left(\frac{1}{\alpha} + \Pi_{unit}(\alpha)\right)}{\gamma + T + E(z) + u(B) - \overline{u}} \tag{4.22}$$

This is the same one as before except for that the profit income appears in the numerator. For a positive profit income, more individuals find it optimal to work.

The education decision is now described by:

$$\begin{aligned} q\left[\left(\frac{1}{\alpha^h} + \Pi_{unit}(\alpha^h)\right)\frac{\lambda}{\phi}\right] + (1-q)\left[\left(\frac{1}{\alpha^l} + \Pi_{unit}(\alpha^l)\right)\frac{\lambda}{\phi}\right] - T - E(z) - (c-s) \\ \geqq q\left[\left(\frac{1}{\alpha^h}\right)\frac{1}{\phi}\right] + (1-q)\left[\left(\frac{1}{\alpha^l}\right)\frac{1}{\phi}\right] - T - E(z) \end{aligned} \tag{4.23}$$

Solving for $\phi$ yields the education cut-off

$$\widehat{\phi}_{ad} = \left(\frac{\lambda - 1}{c - s}\right)\left(\frac{q}{\alpha^h} + \frac{1-q}{\alpha^l}\right) + \left(\frac{\lambda}{c-s}\right)\left(q\,\Pi_{unit}(\alpha^h) + (1-q)\Pi_{unit}(\alpha^l)\right) \tag{4.24}$$

This expression, however, describes the cut-off in an implicit way, since the right hand-side depends on $\widehat{\phi}_{ad}$ through prices in the profit income.

The interpretation of this expression is similar to the previous one with fixed number of firms. It consists of a probability weighted average of both wage and profit income multiplied by a ratio made up of the *additional* units of labor receiving this income and the net cost of advanced education. Again, more individuals then before find it optimal to opt for advanced education.

Cut-offs for individuals with basic education are affected only indirectly through the effects of prices for differentiated goods. Lower prices make it more attractive to work, i.e. a higher number of firms moves both thresholds for basic-educated outwards.

The two cut-offs for advanced skilled derived above consist both of a part which is the same as above and a new additive component capturing the effects from participation of advanced skilled in firms' profits. By choosing $\xi$ sufficiently low, i.e. increasing the number of firms so that profit income becomes relatively unimportant, one can recover the previous predictions in this setup. However, a closer look at cut-off (4.22) immediately reveals that effects of changes in most exogenous parameters on the working decision of advanced-skilled are highly non-linear and require numerical approaches.

## 4.3 Analysis of Education Policy

In this section we use the model developed before to analyze the effects of changes in education subsidies on participation in labor markets and in education programmes. Furthermore, we investigate how the effectiveness of education subsidies changes when the home economy interacts with the foreign one, either through increasing trade integration or via foreign education subsidies. The whole analysis is performed both with an exogenous and an endogenous number of firms.

### 4.3.1 Effects of Education Policy on Education and Labor Market Outcomes with Exogenous Firms

Subsidies for higher education directly enter the cut-off between basic and advanced education: They move all education decision cut-offs involving advanced education outwards, i.e. more individuals opt for advanced education as the net costs decrease

$$\frac{\partial \widehat{\phi}_{ad}}{\partial s} = \frac{(\lambda - 1)}{(c-s)^2}\left(\frac{q}{\alpha^h} + \frac{1-q}{\alpha^l}\right) > 0. \tag{4.25}$$

The decision between basic and no education as well as all labor market participation are not directly affected as the subsidy does not enter A. Nonetheless, a higher subsidy paid to an increasing number of individuals opting for higher education needs to be financed. Via the balanced budget requirement this translates into an increase of head tax T. This increase causes a reduction in labor market participation and of participation in basic education as working becomes relatively less attractive. The resulting erosion of the tax bases requires a further increase in head tax T, and so on. A comparison between the direct and the indirect effect can be done once the distribution of skills has been determined. As one cannot determine the size of the indirect effect analytically for all skill distributions, we focus in the remainder on the direct effect.

Looking at expression (4.25), one can immediately see that neither iceberg trade costs $\theta$ nor the foreign education subsidy $s^*$ are part of the first-order condition. Thus, second-order derivatives with respect to these two variables are zero.

We summarize in

**Proposition 1.** *In a setting with a fixed number of firms, i.e. when more investment in education does not translate into more competition in the goods market, an increase in the subsidy for advanced education s*

*(a) increases the number of individuals with advanced education ($d\widehat{\phi}_{ad}/ds > 0$) via the direct effect,*

*(b) reduces the number of individuals with basic education ($d\widehat{\phi}_{ad}/ds > 0$, $d\widehat{\phi}_b/ds < 0$) and increases the number of the uneducated ($d\widehat{\phi}_b/ds > 0$) via the balanced budget.*

*(c) The mass of individuals active in the labor market is reduced ($d\widetilde{\phi}_b/ds < 0$), but the*

*(d) effect on effective units of labor in the labor market is ambiguous ($d\widehat{\phi}_{ad}/ds > 0, d\widetilde{\phi}_b/ds < 0$).*

*(e) None of these effects is influenced by trade integration ($\theta$) or foreign education subsidies ($s^*$).*

### 4.3.2 Effects of Education Policy on Education and Labor Market Outcomes with Endogenous Firms

In this subsection we use the extension of the model which allows for an endogenous determination of the number of firms: The higher the mass of high skilled individuals, the higher the number of firms firms operating and thus the more competition in the goods market. Within this extended setting, we analyze how changes in education subsidies affect decisions on labor market participation and education. For simplicity of exposition, we assume that $\xi$ is chosen such that there are enough firms in the market to neglect the

impact of profit income on individuals decision, but that there is still a sufficient amount of market power such that both countries continue exporting.

In the setting with an exogenously given number of firms shown above, the only threshold directly affected by changes in education subsidy s is the one for advanced education. This direct effect prevails with endogenous firms: subsidizing advanced education increases the number of people opting for it. However, there is now an additional channel through which education subsidies affect education and working choices: the effects of increased competition on prices.

Prices enter the key parameter $A = \gamma + T + E(z) + u(B) - \overline{u}$ via the expenditures for the full basket of differentiated goods $E(z)$. Throughout this chapter we assume that higher prices increase these expenditures. Thus, we can focus on the effect of a change in the mass of advanced skilled on prices for differentiated goods. This effect can be decomposed in the following way:

$$\frac{\partial A}{\partial s} = \frac{\partial A}{\partial E(z)} \cdot \frac{\partial E(z)}{\partial p(z)} \cdot \frac{\partial p(z)}{\partial n} \cdot \frac{\partial n}{\partial s} \tag{4.26}$$

From our previous analysis, we already know that all derivatives but $\frac{\partial p(z)}{\partial n}$ are positive. The remaining derivative is given by

$$\frac{\partial\, p(z)}{\partial\, n} = \frac{(1-a) - n^*(\theta - 1)}{(n + n^* + 1)^2} \quad < 0 \tag{4.27}$$

Consequently, an increase in education subsidy s moves all three remaining participation thresholds outwards. We cannot state analytically for general skill distributions whether this effect out-weights the negative effect of higher taxes described in the previous section. However, we can state that more individuals participate in education and in the labor market than before when education subsidies increase competition in the goods market.

The next step is to analyze whether the effectiveness of the subsidy changes due to economic integration. As the direct effect of education subsidies on decisions about advanced education is the same as with exogenous firms, the effectiveness of s in this decision continues to be unaffected by trade costs $\theta$ and foreign subsidy $s^*$. It is more interesting to focus on the effects on the three participation thresholds involving A. Looking at expression (4.26), one can see that the key is to understand how the magnitude of the derivative of the price with respect to the number of firms at home is affected by the foreign variables. To quantify these effects, we take the second derivatives with respect to the foreign variables:

$$\frac{\partial^2\, p(z)}{\partial\, n\, \partial\, \theta} = \frac{n^*}{(n + n^* + 1)^2} \quad > 0 \quad \text{and} \tag{4.28}$$

$$\frac{\partial^2\, p(z)}{\partial\, n\, \partial\, n^*} = \frac{2(a-1) + (\theta - 1)(n^* - n - 1)}{(n + n^* + 1)^3} \quad > 0 \tag{4.29}$$

Both derivatives are positive.[7] The implications of these two results are as follows: When the home government invests education subsidy s, it also increases participation in basic education and in the labor market. For a given s, the increase in participation is the larger, the higher the foreign education subsidy $s^*$ (and thus the higher the number of foreign firms $n^*$) and the less integrated the international goods market. The rationale behind both results is similar: Subsidies are the more effective the more the they drive down prices through increased competition. If trade costs are very low (i.e. $\theta \simeq 1$) then markets are already quite integrated and thus the increase in global competition due to a higher number of firms at home is limited.

These results state that the effectiveness of domestic education subsidies decreases in the degree of economic integration (cf. derivative (4.28)) implying that governments need to invest more in education to achieve the same educational objectives as economic integration intensifies. However, the indirect effects through prices are intensified by increasing subsidies in the foreign country, as the cross derivative (4.29) shows. A coordinated education policy of both countries might thus be a way to mitigate adverse effects on educational outcomes when increasing the degree of economic integration.

A further important insight can be derived when comparing the situations with an exogenous and an endogenous number of firms. In both cases, the high-skilled benefit in the same way from the subsidy targeted to their education choice. The degree to which the low-skilled benefit, however, is quite different. Their decisions are only affected through the competition effect of entering firms. Although we perform a quite rough static comparison, one can nonetheless draw an important policy conclusion: In our model governments have a further instrument at hand to increase the well-being of low-income earners. This instrument is some kind of competition policy. Governments can increase the educational and the labor market participation of low-skilled individuals by facilitating the entrance of new firms into the market. In our model, subsidizing the education of the high-skilled and policies fostering the creation of new firms (e.g. by lowering skill requirement $\xi$) are complements in improving the economic situation of the low-skilled.

We summarize in

**Proposition 2.** *In a setting with an endogenous number of firms, i.e. when more investment in education increases competition in the goods market, an increase in the subsidy for advanced education s*

*(a) increases the number of individuals with advanced education ($d\widehat{\phi}_{ad}/ds > 0$) via the direct effect.*

*(b) Compared to the setting with exogenous firms, the number of individuals without any education and the number of the unemployed decreases as the balanced budget effect*

[7] The derivative with respect to $n^*$, (4.29), is positive for all values of trade costs $\theta$ for which trade occurs.

*is dampened or even out-weighted by the competition effect.*

*(c) All effects via the competition effect increase in size when foreign education subsidies are high and trade integration is low.*

*(d) The number of individuals without any education and the number of the unemployed is the more likely to decrease when education subsidies are introduced the more new firms are created for a given subsidy.*

## 4.4 Education Policy in Different Environments

In this section, we generalize the previous analysis. More specifically, we allow countries to differ in size and look at the role of the generosity of basic transfers.

### 4.4.1 Effects of Different Country Sizes

So far, we have assumed home and foreign to be symmetric. In this section, we relax this assumption by allowing for different sizes of the populations in both countries. More specifically, we assume that both countries have skill distributions of the same shape, but that there are k ($\in (0,\infty)$)-times as many individuals in foreign for each value of ability $\phi$. This results in two changes: First, the aggregate demand in foreign is scaled up by the factor k, i.e. $X^*(z) = k\frac{a^*-p^*(z)}{b}$. Second, for given education and labor market decisions, there are k times as many advanced skilled as before. When the number of firms is determined *endogenously* this results in k times as many firms: $n^* = k \cdot n^*(k=1) = k \cdot n_1^*$, for a given skill requirement $\xi^*$.

Let us first focus on the situation with an exogenously fixed number of firms. In this case, changes in k have no effect on the home price as neither home demand nor global supply is affected. Things are a bit different in the foreign market, where aggregate demand is scaled up ba factor k. The resulting foreign equilibrium price is then given by

$$p^*(z) = \frac{a^*[k(n+n^*+1)-2]+1+\theta^*}{k(n+n^*+1)} \tag{4.30}$$

If the preference for the differentiated goods is high and goods market are integrated (i.e. $2a^*-1-\theta^*>0$), then the foreign price increases in country size and vice versa. However, both the home and the foreign price react in the same way to changes in home subsidies, foreign subsidies, and trade integration as in the analysis with symmetric countries.

Things are somewhat different when we allow for an endogenous determination of the number of firms. In addition to the same change in foreign aggregate demand as shown just before, the larger country is also home to a larger number of firms, affecting global

supply of the differentiated good. As a result, the home market prices becomes

$$p(z) = \frac{a + n + kn_1^*\theta}{n + kn_1^* + 1} \tag{4.31}$$

whereas the price in the foreign market changes to

$$p^*(z) = \frac{ka^* + n\theta^* + kn_1^* + a^*(k-1)(n + kn_1^*)}{k(n + kn_1^* + 1)} \tag{4.32}$$

It can be easily checked that both prices are identical to the expressions derived for countries of same size when k=1. Furthermore, it can be shown that the home price decreases in the size of foreign, i.e. $\frac{\partial p(z)}{\partial k} < 0$. Signing the effect of the size of foreign on the foreign price is more involved and depends on taste parameters, the degree of economic integration, and the relative size of foreign.

In the remainder of this section, we focus on establishing how foreign country size changes the effect of home education subsidies on home education and labor market participation. Since none of the factors determining the choice between basic and advanced education is affected by country since, all results for advanced education go through. This is different for all other decisions since the key variable driving these decisions is $A = \gamma + T + E(z) + u(B) - \overline{u}$, which is directly affected by country size via the price in $E(z)$. Recall that

$$\frac{\partial A}{\partial s} = \frac{\partial A}{\partial E(z)} \cdot \frac{\partial E(z)}{\partial p(z)} \cdot \frac{\partial p(z)}{\partial n} \cdot \frac{\partial n}{\partial s}$$

To assess the effect of country size, we thus need to evaluate how k changes the derivative of the price with respect to the number of firms and the second derivatives with respect to trade integration and foreign subsidy.

To start, let us look at whether the effect of more competition on prices decreases or increases in larger countries:

$$\frac{\partial^2 p(z)}{\partial n \partial k} = \frac{n^*}{(n + kn^* + 1)^3} \left[(1-\theta)(n + n^*k + 1) + 2(a-1)\right] \tag{4.33}$$

Clearly, this expression cannot be unambiguously signed. However, when the number of firms n is large, the preference for the differentiated good a is not too large, and trade cost $\theta$ is sufficiently high, then this derivative is negative.[8] That is, the home price reduction due to more competition is the larger, the smaller the home market in relative terms. This results suggests that smaller countries are more effective in influencing education and labor market participation decisions.

In the next step, we look at whether the effect of country size on the ability of governments to influence labor market and education decisions via subsidies depends on our

[8] That is, when $(\theta - 1)(n + n^*k + 1) > 2(a-1)$.

two measures for economic integration, namely trade costs and foreign subsidies. We thus have to look at the third order derivatives with respect to these two variables;

$$\frac{\partial^3 p(z)}{\partial n \partial k \partial \theta} = \frac{-n^*}{(n+kn^*+1)^2} < 0 \tag{4.34}$$

$$\frac{\partial^3 p(z)}{\partial n \partial k \partial n^*} = \frac{1}{(n+kn^*+1)^3}\left[(1-\theta)(n+1-n^*k) + \frac{2(a-1)(n+1-2n^*k)}{(n+kn^*+1)}\right] \tag{4.35}$$

The first of the two derivatives indicates that the impact of relative country size on the effectiveness of subsidies declines as goods markets integrate internationally. Interpreting the other third derivative is a bit more subtle since we cannot sign it for all possible parameter values. However, we can focus one one particularly relevant case, namely when trade costs are very small ($\theta \simeq 1$) as the influence of foreign competition on the domestic market is largest in this case. Given low trade costs, the derivative is negative when foreign is relatively large (and home small), and vice versa. If an economy is small and in a free trade situation, more foreign competition increases the role of country size for government policy effectiveness.

We summarize in

**Proposition 3.** *Suppose that countries are asymmetric and that the relative size k of foreign as measured by the size of its population relative to the population in home varies. Then*

*(a) relative size k has no effect on education or labor market participation at home when the number of firms is set exogenously.*

*(b) smaller countries are more effective in influencing education and labor market participation decisions when the number of firms is endogenous since the home price reduction due to more competition is the larger, the smaller the home market in relative terms.*

*(c) international goods market integration reduces the ability of governments to influence decisions but the resulting increasing role of foreign competition dilutes this effect.*

### 4.4.2 Effects of the Generosity of Benefits

In this part, we distinguish between two types of welfare states: A parsimonious one ($\delta = 1$) provides individuals with exactly the amount of money needed to buy the same bundle of differentiated goods as consumed by workers. A generous welfare state ($\delta > 1$) provides them with more than that amount of money. In both cases, individuals receive *de facto* a transfer in real terms: As economic integration depresses prices for the differentiated goods, nominal benefits are cut proportionally. However, there is one distinction to be made between the two systems: In the parsimonious case, individuals

consume only the differentiated good, i.e. their utility stays constant whatever the changes in the price for the differentiated goods. The generous welfare state provides unemployed individuals with enough money to consume the same bundle of differentiated goods as workers do *plus* some units of the numeraire good. Since the price of the numeraire good is exogenously given, the level of consumption and therefore utility changes when the value of the full differentiated bundle fluctuates: Higher prices for the differentiated good lower the relative price of the numeraire good and thus push an unemployed's consumption possibility frontier outwards (when $\delta > 1$).

These changes also affect education and employment decisions. Remember that three out of the four cutoffs contain $A = \gamma + T + E(z) + u(B) - \overline{u}$, where $u(B)$ is the utility derived from the benefit and $\overline{u}$ the utility from consuming the whole bundle of differentiated goods. By definition, these two are equal when $\delta = 1$. When the welfare state is generous ($\delta > 1$), individuals can in addition consume some units of the numeraire good and thus $u(B) > \overline{u}$, and vice versa. Therefore, $u(B) - \overline{u}$ increases in $\delta$. Furthermore, a balanced budget requires to increase head tax T as the welfare system becomes more generous (holding the education subsidy constant). As a result of these two effects, A increases in $\delta$, i.e. the cutoff for the three education and labor participation decisions move inwards.

In the next step, we are interested in the role of economic integration and education subsidies in affecting the strength of this effect. When the welfare state is generous ($\delta > 1$) then the utility derived from a benefit B is decreasing in the price of the differentiated good p(z), as higher prices leave less money for the consumption of the numeraire good. As a consequence, all effects of policies on the prices that we derived previously, carry over to this situation as well. The economic rationale behind these effects is the following: An individual who is indifferent between basic and advanced education works for both realizations of productivity, whereas the one indifferent between none and basic education works only for the good realization. Thus, the generosity of the benefit is only relevant for the less educated. Lower prices, either through domestic or international competition, increase consumption possibilities for a given budget. This is also true for a given basic transfer B what increases the magnitude of the generosity effect. Of course, lower prices also decrease expenditures E(z) and thus push A inwards, but this is not related to generosity $\delta$[9].

We summarize in

**Proposition 4.** *An increase in the generosity of welfare states* $\delta$

*(a) reduces the number of individuals with basic education* ($d\widehat{\phi}_b/d\delta < 0$, $d\widehat{\phi}_{ad}/d\delta = 0$)

*(b) reduces the number of workers with basic education* ($d\widetilde{\phi}_b/d\delta < 0$, $d\widehat{\phi}_{ad}/d\delta = 0$)

[9]Technically speaking, the second derivative of E(z) with respect to $\delta$ and either $\theta$ or $s$ is zero as the derivative of E(z) with respect to $\delta$ is zero.

*(c) leaves the number of individuals with advanced education unchanged ($d\widehat{\phi}_{ad}/d\delta = 0$).*

*(d) These effects become stronger as economies integrate and*

*(e) increase in education subsidies when the number of firms is endogenous.*

### 4.4.3 Political Equilibrium: Preferred Policy of the Median Voter

So far, the policy parameters were set exogenously. In this part of the chapter, we endogenize the choice of the education subsidy via the political process.[10] More precisely, we analyze how the education subsidy chosen by a median voter changes when (i) the economy integrates further with foreign and (ii) foreign changes its education subsidy unilaterally. Throughout this section, we assume that the median voter is of basic education and working.

The utility of the median voter is given by

$$\begin{aligned} U_m[x(z), z_0, \gamma] &= z_0 + \int_0^1 u[x(z)]\, dz - \gamma \\ &= \underbrace{\frac{1}{\alpha\phi} + \frac{a^2}{2b} - \gamma}_{const.} + \frac{1}{b}\left[\frac{p^2}{2} - ap\right] - T(s) \end{aligned} \tag{4.36}$$

Taking the first derivative with respect to the education subsidy s yields the following first order condition:

$$\begin{aligned} \frac{\partial U_m[x(z), z_0, \gamma]}{\partial s} &= \frac{1}{b}\left[p \cdot \frac{p(z)}{n} \cdot \frac{n}{s} - a \cdot \frac{p(z)}{n} \cdot \frac{n}{s}\right] - \frac{\partial T(s)}{\partial s} \\ &= \underbrace{\frac{1}{b}(p-a)\left[\frac{(1-a) + n^*(1-\theta)}{(n+n^*+1)^2} \cdot \frac{n}{s}\right]}_{>0} - \underbrace{\frac{\partial T(s)}{\partial s}}_{>0} \\ &\gtreqless 0 \end{aligned} \tag{4.37}$$

The sign of the effect depends on which part of the FOC dominates: The first one representing the utility gain from lower prices due to higher competition in the market for the differentiated goods, or the second one representing the higher tax burden associated with with more generous education subsidies. The relative strength of these two effects depends on the chosen skill distribution, i.e. the preferred policy of the median voter can be explicitly calculated for a given distribution.

Although the preferred policy cannot be explicitly calculated in general, one can nonetheless analyze how it is affected by changes in economic integration ($\theta$) or the for-

[10] We do not endogenize the generosity of the benefit, since there is no explicit trade-off for a median voter. For a working individual, it is always optimal in our model to choose the most parsimonious option.

eign education subsidy ($s^*$) by applying the Implicit Function Theorem to the FOC. Two results emerge:

First, more economic integration increases the politically chosen education subsidy, i.e. $\frac{\partial s}{\partial \theta} < 0$. Sufficient conditions for the result to hold true are (i) a concave relationship between the tax and the home education subsidy and that (ii) economic integration does not dampen the effect of higher subsidies on taxation too much.

Second, the preferred home education subsidy increases in the foreign subsidy, i.e. $\frac{\partial s}{\partial s^*} > 0$. Sufficient conditions for this effect are (i) a concave relationship between the tax and the home education subsidy and (ii) that the effect of the home subsidy on home taxation does not decrease too much as the foreign subsidy increases.

We summarize in

**Proposition 5.** *A median voter who is of basic education and employed chooses an education subsidy $s$ which*

*(a) increases in the degree of economic integration ($\frac{\partial s}{\partial \theta} < 0$) and*

*(b) increases in the education subsidy unilaterally chosen by foreign ($\frac{\partial s}{\partial s^*} > 0$).*

## 4.5 Conclusion

In this chapter we develop a model of two countries with two sectors each. In sector 1 firms produce competitively a numeraire good. In the second sector a continuum of varieties are produced in an oligopolistic market. Firms produce output with labor as only input. Oligopolistic competition leads to reciprocal dumping unless iceberg trade costs are too high. Individuals are heterogeneous in their initial ability and can first decide on their level of education and then on whether to work or to receive some basic assistance. Wages per unit of labor are stochastic due to an economy-wide shock. A key ingredient of the model is that governments influence both decisions by subsidizing education and providing basic assistance transfers. These transfers are at the heart of the mechanism driving our results on labor market participation as they are tied to a real consumption basket.

Within the framework of our model we analyze the effect of education subsidies and its interaction with economic integration on education and labor market participation decisions. Our main focus is on a version of the model in which we endogenize the number of firms. As firms has to employ a certain amount of workers with advanced education, education subsidies increase competition in the differentiated goods sector, lowering prices, and thereby reducing the relative value of the basic transfer fixed in real terms. As a result, more individuals participate in both types of education and more people work. Furthermore, a given education subsidy increases education and labor

market participation the more the (i) higher education subsidies abroad, (ii) the lower trade integration, i.e. the higher the influence of the policy on the own price, and (iii) the more the number of firms increases in response to more skilled labor. Later on, we show that these results are qualitatively robust to country asymmetries and varying generosity of government transfers.

In a final analysis, we endogenize the education subsidy via a median voter model. Two main results emerge from this analysis: The chosen subsidy increases in economic integration and in the foreign subsidy. These results suggest that the subsidy chosen by the median voter allows for multilateral policy coordination and counters the lower effectiveness of subsidies in integrating economies.

The main policy implications of our chapter are the following: Economic integration reduces the effectiveness of education subsidies in increasing education and labor market participation. Governments can counter this deterioration either by unilaterally fostering competition in the goods market or by multilaterally coordinating education subsidies. Put differently, in the absence of multilateral agreements, governments concerned with the well-being of low-skilled individuals should increase competition in the goods market in response to economic integration. In reality, governments often aim at "protecting" these industries.

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# Appendix A

# Appendix to Chapter 2

## A.1 Description of Data Set

### A.1.1 Summary Statistics

Table A.1: Descriptive Statistics for Newspaper Readers

| Newspaper | insurance | cons. | libdem | labour | age | female | educ. | income | unemployed | obs. |
|---|---|---|---|---|---|---|---|---|---|---|
| Express | 0.29 | 0.45 | 0.14 | 0.26 | 56.68 | 0.52 | 4.34 | 8.22 | 0.03 | 425 |
| Mail | 0.27 | 0.49 | 0.12 | 0.24 | 54.81 | 0.57 | 4.18 | 9.13 | 0.02 | 1440 |
| Mirror | 0.45 | 0.09 | 0.06 | 0.66 | 53.01 | 0.51 | 4.96 | 6.62 | 0.06 | 1095 |
| Star | 0.43 | 0.13 | 0.07 | 0.50 | 39.47 | 0.39 | 4.69 | 8.11 | 0.07 | 211 |
| Sun | 0.41 | 0.22 | 0.07 | 0.43 | 45.57 | 0.54 | 4.96 | 7.34 | 0.06 | 1796 |
| Telegraph | 0.35 | 0.64 | 0.12 | 0.17 | 57.25 | 0.42 | 3.06 | 11.08 | 0.03 | 501 |
| Guardian | 0.78 | 0.05 | 0.18 | 0.66 | 45.07 | 0.45 | 1.97 | 11.40 | 0.06 | 344 |
| Independent | 0.70 | 0.06 | 0.32 | 0.43 | 46.57 | 0.34 | 2.62 | 11.55 | 0.05 | 110 |
| Times | 0.45 | 0.37 | 0.14 | 0.32 | 48.48 | 0.40 | 2.26 | 11.75 | 0.03 | 404 |
| Record | 0.51 | 0.06 | 0.06 | 0.56 | 51.81 | 0.61 | 5.01 | 6.81 | 0.06 | 160 |

All values are shares, unless indicated otherwise. *educ.* and *income* are ordinal indicators, with higher values of *educ.* indicating a lower educational degree and higher values of *income* indicating a higher income.

Table A.2: Summary Statistics (Raw Data)

| Variable | Mean | Std. Dev. | Min. | Max. | Obs. |
|---|---|---|---|---|---|
| *Dependent Variable* | | | | | |
| insurance | 0.4 | 0.49 | 0 | 1 | 15757 |
| *Newspaper Variables* | | | | | |
| newspaper position | 0.02 | 0.27 | -0.61 | 0.62 | 10950 |
| Mondo Times | 3.77 | 1.13 | 2 | 5 | 10950 |
| *Control Variables at Individual Level* | | | | | |
| Heckscher-Ohlin | 0.03 | 0.04 | 0 | 0.09 | 23465 |
| Ricardo-Viner adv. | 0.63 | 0.48 | 0 | 1 | 23614 |
| Ricardo-Viner disadv. | 0.35 | 0.48 | 0 | 1 | 23614 |
| middle offshorability | 0.27 | 0.44 | 0 | 1 | 23614 |
| high offshorability | 0.17 | 0.37 | 0 | 1 | 23614 |
| very high offshorability | 0.01 | 0.12 | 0 | 1 | 23614 |
| low-skilled | 0.73 | 1.41 | 0 | 5 | 21234 |
| medium-skilled | 1.23 | 1.66 | 0 | 5 | 21234 |
| high-skilled | 0.87 | 1.58 | 0 | 5 | 21234 |
| firm size | 2.89 | 1.37 | 1 | 5 | 21234 |
| female | 0.57 | 0.5 | 0 | 1 | 23614 |
| non-european | 0.07 | 0.26 | 0 | 1 | 23492 |
| unemployed | 0.05 | 0.21 | 0 | 1 | 23612 |
| out of laborforce | 0.38 | 0.49 | 0 | 1 | 23612 |
| labour | 0.39 | 0.49 | 0 | 1 | 23614 |
| libdem | 0.12 | 0.32 | 0 | 1 | 23614 |
| conservative | 0.25 | 0.43 | 0 | 1 | 23614 |
| *Categorial Variables at Individual Level* | | | | | |
| age | 48.85 | 18.13 | 18 | 99 | 23614 |
| income | 8.62 | 4.85 | 1 | 16 | 20503 |
| education | 4.14 | 2.17 | 1 | 8 | 23614 |
| *Macro Controls at Regional Level* | | | | | |
| real GDP per capita | 17552.14 | 4137.18 | 13025.56 | 30042.74 | 23614 |
| GDP growth | 2.58 | 0.87 | 0.92 | 4.99 | 23614 |
| employment share hi-tech | 6.34 | 1.86 | 2.43 | 11.39 | 23614 |
| employment share services | 41.45 | 4.68 | 34.1 | 54 | 23614 |
| unemployment rate | 4.89 | 1.13 | 3.22 | 7.24 | 23614 |
| population older 65 | 912666.88 | 257115.52 | 418000 | 1344600 | 23614 |
| population density | 775.16 | 1353.43 | 64.92 | 4741.35 | 23614 |
| vote share conservative | 34.88 | 8.57 | 18.63 | 46.2 | 23614 |
| vote share labour | 39.42 | 9.76 | 23.68 | 51.05 | 23614 |
| vote share libdem | 19.42 | 4.92 | 14.23 | 31.63 | 23614 |
| year | 2003.07 | 1.41 | 2001 | 2005 | 23614 |

Table A.3: Summary Statistics (Working Sample)

| Variable | Mean | Std. Dev. | Min. | Max. | Obs. |
|---|---|---|---|---|---|
| *Dependent Variable* | | | | | |
| insurance | 0.4 | 0.49 | 0 | 1 | 5834 |
| *Newspaper Variables* | | | | | |
| newspaper position | 0.02 | 0.27 | -0.61 | 0.62 | 5834 |
| Mondo Times | 3.76 | 1.14 | 2 | 5 | 5834 |
| *Control Variables at Individual Level* | | | | | |
| Heckscher-Ohlin | 0.03 | 0.04 | 0 | 0.09 | 5834 |
| Ricardo-Viner adv. | 0.64 | 0.48 | 0 | 1 | 5834 |
| Ricardo-Viner disadv. | 0.36 | 0.48 | 0 | 1 | 5834 |
| middle offshorability | 0.26 | 0.44 | 0 | 1 | 5834 |
| high offshorability | 0.17 | 0.38 | 0 | 1 | 5834 |
| very high offshorability | 0 | 0 | 0 | 0 | 5834 |
| low-skilled | 0.8 | 1.46 | 0 | 5 | 5834 |
| medium-skilled | 1.32 | 1.7 | 0 | 5 | 5834 |
| high-skilled | 0.76 | 1.5 | 0 | 5 | 5834 |
| firm size | 2.92 | 1.37 | 1 | 5 | 5834 |
| female | 0.52 | 0.5 | 0 | 1 | 5834 |
| non-european | 0.06 | 0.24 | 0 | 1 | 5834 |
| unemployed | 0.04 | 0.21 | 0 | 1 | 5834 |
| out of laborforce | 0.41 | 0.49 | 0 | 1 | 5834 |
| labour | 0.42 | 0.49 | 0 | 1 | 5834 |
| libdem | 0.1 | 0.3 | 0 | 1 | 5834 |
| conservative | 0.29 | 0.45 | 0 | 1 | 5834 |
| *Categorial Variables at Individual Level* | | | | | |
| age | 50.64 | 17.69 | 18 | 99 | 5834 |
| income | 8.44 | 4.77 | 1 | 16 | 5834 |
| education | 4.26 | 2.1 | 1 | 7 | 5834 |
| *Macro Controls at Regional Level* | | | | | |
| real GDP per capita | 17481.8 | 4091.36 | 13025.56 | 30042.74 | 5834 |
| GDP growth | 2.31 | 0.66 | 0.92 | 3.54 | 5834 |
| employment share hi-tech | 6.43 | 1.92 | 2.43 | 11.39 | 5834 |
| employment share services | 41.36 | 4.71 | 34.1 | 54 | 5834 |
| unemployment rate | 4.95 | 1.14 | 3.22 | 7.24 | 5834 |
| population older 65 | 911443.16 | 257268.81 | 418000 | 1344600 | 5834 |
| population density | 765.38 | 1342.26 | 64.92 | 4741.35 | 5834 |
| vote share conservative | 35.60 | 8.72 | 18.63 | 46.2 | 5834 |
| vote share labour | 39.62 | 9.64 | 23.68 | 51.05 | 5834 |
| vote share libdem | 19.28 | 4.83 | 14.23 | 31.63 | 5834 |
| year | 2002.92 | 1.4 | 2001 | 2005 | 5834 |

### A.1.2 Description of Variables

**Heckscher-Ohlin** Captures the prediction of the Heckscher-Ohlin model. Interaction of (1) total trade flows of UK with non-OECD countries in percent of UK GDP per year and (2) qualification dummy taking the value 1 if the individual has a least an O-level qualification (hedqual<=4), 0 else.

**Ricardo-Viner adv./disadv.** Measures the comparative advantage or disadvantage of an industry in a given year. Constructed as in Mayda and Rodrik (2005, p.1410).

**middle/high offshorability** This variable is based on the data-set on the potential to offshore jobs by Blinder (2009). The index ranks 291 occupations in the US according to their potential to be offshored using 2004 official data. All occupations not comprised in the dataset (526 out of 817) are declared to be highly non-offshorable. Since the index is ordinal in nature, I generate dummies for highly offshorable(index value between 100 and 75), offshorable(74-50), and non-offshorable (49-25) occupations as suggested by Blinder (2009). Highly non-offshorable occupations (index $< 25$) are the omitted category. To match these indicators to individuals in my data set, occupational classifications have to be adjusted since occupations are coded according to 3-digit International Standard Classification of Occupations (ISCO 88) in the BSAS and according to 6-digit SOC 2000 in Blinder (2009). Matching is carried out using correspondence tables provided by the UK Office for National Statistics and the US Bureau of Labor Statistics, respectively. In case that more than one SOC 2000 category corresponds to a ISCO 88 category, unweighted averages of offshorability scores are calculated.

Table A.4: Description of Variables

| Variable | Definition | Source |
|---|---|---|
| *Dependent Variable* | | |
| insurance | Dummy for demand for higher unemployment benefits | BSAS: dole |
| *Newspaper Variables* | | |
| newspaper position | Text content measure | compare Section A.2.1 |
| Mondo Times | Measure for general slant of newspapers | compare Section A.1.2 |
| *Control Variables at Individual Level* | | |
| Heckscher-Ohlin | Indicator: 1 if indiv. favored according to Heckscher-Ohlin, 0 else | compare Section A.1.2 |
| Ricardo-Viner adv. | Indicator: 1 if indiv. working in favored sector according to Ricardo-Viner, 0 else | compare Section A.1.2 |
| Ricardo-Viner disadv. | Indicator: 1 if indiv. working in disfavored sector according to Ricardo-Viner, 0 else | compare Section A.1.2 |
| middle offshorability | Indicator: 1 if indiv. has non-offshorable occupation, 0 else | compare Section A.1.2 |
| high offshorability | Indicator: 1 if indiv. has offshorable occupation, 0 else | compare Section A.1.2 |
| very high offshorability | Indicator: 1 if indiv. has highly offshorable occupation, 0 else | compare Section A.1.2 |
| low-skilled | educational attainment: no degree | BSAS: hedqual |
| medium-skilled | educational attainment: school degree, but no further qualification | BSAS: hedqual |
| high-skilled | educational attainment: further qualification or university | BSAS: hedqual |
| firm size | Number of employees at workplace of respondent | BSAS: rempwork |
| female | indicator: 1 if respondent female | BSAS: rsex |
| non-european | indicator: 1 if of non-european ethnical origin, 0 else | BSAS: raceori2 |
| unemployed | indicator: 1 if unemployed, 0 else | BSAS: reconact |
| out of laborforce | indicator: 1 if not in labor force, 0 else | BSAS: reconact |
| labour | indicator: 1 if supporting Labour Party, 0 else | BSAS: partyid2 |
| libdem | indicator: 1 if supporting Liberal Democrats, 0 else | BSAS: partyid2 |
| conservative | indicator: 1 if supporting Conservative Party, 0 else | BSAS: partyid2 |
| *Categorial Variables at Individual Level* | | |
| age | grouped age of respondent | BSAS: age |
| income | grouped nominal annual household income | BSAS: hhincome |
| education | highest educational degree | BSAS: hedqual |
| *Macro Controls at Regional Level* | | |
| real GDP per capity | Regional real GDP per capita | OECDstat Regional statistics |
| GDP growth | Growth of regional real GDP | OECDstat Regional statistics |
| employment share hi-tech | Share of employment in high-tech manufacturing in total manu. employment | OECDstat Regional statistics |
| employment share services | Share of employment in skilled services in total service employment | OECDstat Regional statistics |
| unemployment rate | Regional unemployment rate | OECDstat Regional statistics |
| population older 65 | Population older than 65 | OECDstat Regional statistics |
| population density | Regional population density: persons per square-kilometer | OECDstat Regional statistics |
| vote share conservative | Regional average share of votes for Conservative Party in general elections 1992-2005 | House of Commons Statistical Section |
| vote share labour | Regional average share of votes for Labour Party in general elections 1992-2005 | House of Commons Statistical Section |
| vote share libdem | Regional average share of votes for Liberal Democrats in general elections 1992-2005 | House of Commons Statistical Section |

## A.2 Quantitative Text Analysis: Wordscores Procedure

### A.2.1 Selection and Preparation of Newspaper Articles for Text Analysis

All newspaper articles are obtained through the online database *LexisNexis*. This database allows to select articles according to the newspaper they have been published in and the date of publication. Furthermore, every article has been assigned to several keywords with a score indicating the relevance of every keyword in describing the content of the specific article.[1]

For every newspaper and year in the dataset, I select all articles with a relevance of at least 90% in at least one of the following categories: *international trade*, *foreign investment*, *enterprise globalization*, *offshoring*, *free trade treaties & agreements*, *tariffs & duties*, *non-tariff barriers*, *protectionism*, *antidumping laws*, *export controls*, *import controls*, *foreign labor*, and *migrant workers*. All articles are carefully corrected for spelling mistakes. Information describing the newspaper article that does not belong to the original article is removed. In the next step, I construct word count matrices. The routine for Wordscores implemented within Stata allows to construct these matrices treating either single words or groups of several words as unit of observation. In the analysis for this paper, I construct word count matrices for groups of two and three words. This choice reflects the rare occurrence of compound words in the English language. Results for textscores derived using these different matrices are reported in Table 2.2.

### A.2.2 Quantitative Text Analysis: An Example

This paragraph provides an example for the selection of word groups to distinguish between the policy positions of unknown texts by the algorithm by Laver et al. (2003). Let us suppose there are two texts, each of them consisting of one sentence. The first sentence is *Unemployment is increased by globalization* and is coded as very anti-globalization, i.e. -1. The other sentence is *Unemployment is* ***not*** *increased by globalization* and is coded as very pro-globalization, i.e. +1. Suppose furthermore that the unit of analysis are groups of two words (so-called bigrams). The algorithm generates the following bigrams:

The algorithm focusses on bigrams which occur in only one of both texts since bigrams which occur in both texts are useless for distinguishing the positions. Thus, it assigns the weights to distinguish the policy positions to those bigrams which occur in only one of both sentences. Bigrams occuring in both sentences receive a zero-weight. Although only

[1] More detailed information on the precise procedures can be obtained through the company website (`http://law.lexisnexis.com/infopro/Training-and-Resources/SmartIndexing-Resource-Center`) or is available from the author upon request.

| *Unemployment is increased by globalization* | -1 | +1 | *Unemployment is **not** increased by globalization* |
|---|---|---|---|
| Unemployment is | 0 | 0 | Unemployment is |
| is increased | -1 | +0.5 | is not |
| | | +0.5 | not increased |
| increased by | 0 | 0 | increased by |
| by globalization | 0 | 0 | by globalization |

one single word changes the whole meaning of the sentence, the algorithm nonetheless identifies bigrams which allow to draw inference on different policy positions.

### A.2.3 Descriptive Statistics on Readership an Newspaper Reporting

Figure A.1: Share of Newspaper Readers in Overall BSAS Sample

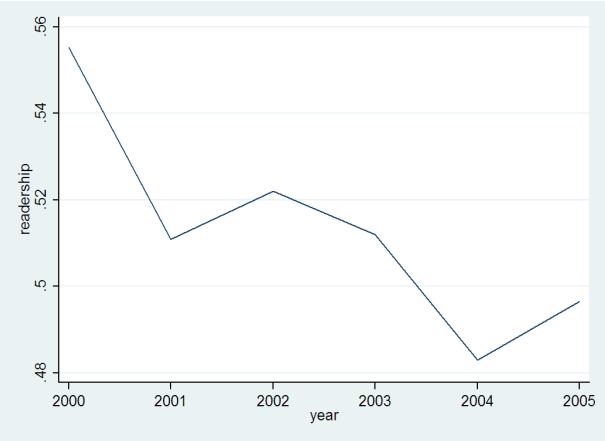
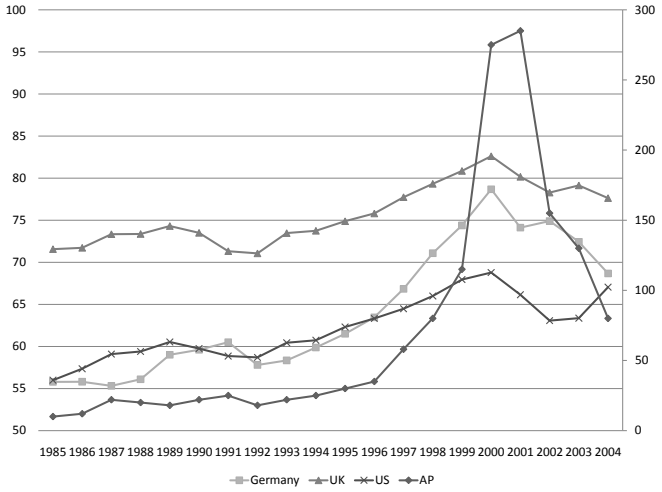



Figure A.2: Reporting on Economic Globalization and Index of Economic Globalization




Index of Economic Globalization for Germany, UK, and US on left scale (Dreher 2006), number of articles in Associated Press on right scale (Marks et al. 2006)

Figure A.3: Share of articles in sample, which do not mention labor markets

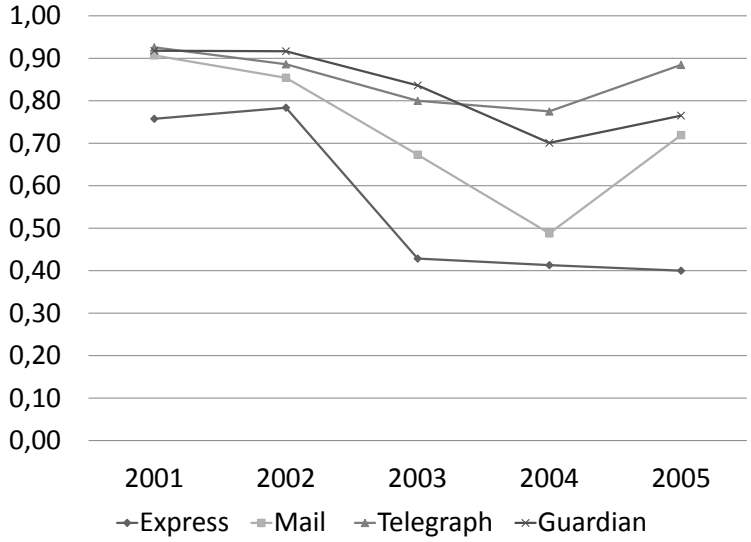
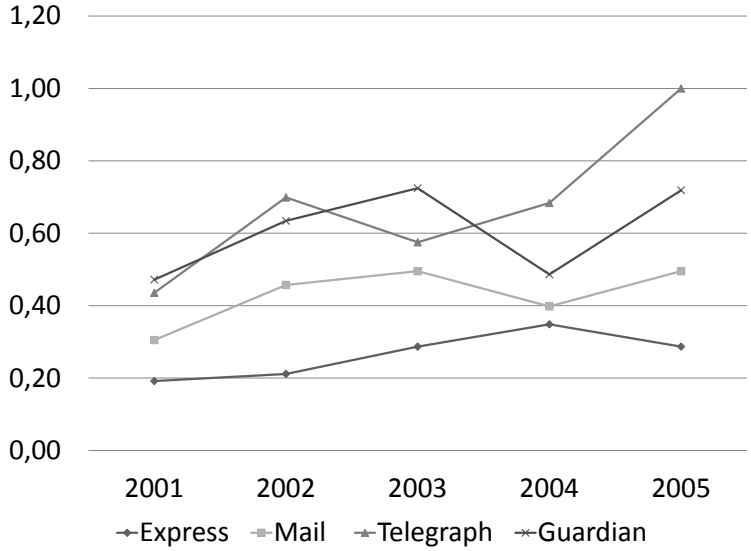



Figure A.4: Ratio # articles on globalization/# articles on labor markets



## A.3 Additional Regression Results: Robustness Checks and First-Stage IV

Table A.5: Robustness Checks

| | Dep. Var.: Extend unemployment benefits? | | | |
|---|---|---|---|---|
| | Lag Structure | | | Internet |
| | (A.5.1) | (A.5.2) | (A.5.3) | (A.5.4) |
| newspaper position | -0.121*** | | -0.124*** | -0.099** |
| | (0.044) | | (0.042) | (0.040) |
| 1.lag newspaper position | | 0.000 | 0.001 | |
| | | (0.001) | (0.001) | |
| internet | | | | -0.029 |
| | | | | (0.019) |
| (newspaper position) x (internet) | | | | -0.024 |
| | | | | (0.053) |
| Heckscher-Ohlin | -4.154* | -3.534 | -4.046 | -3.124 |
| | (2.498) | (2.418) | (2.510) | (2.489) |
| Ricardo-Viner adv. | 0.416*** | 0.420*** | 0.412*** | 0.348*** |
| | (0.076) | (0.076) | (0.075) | (0.086) |
| Ricardo-Viner disadv. | 0.518*** | 0.521*** | 0.512*** | 0.395*** |
| | (0.101) | (0.100) | (0.099) | (0.096) |
| middle offshorability | -0.028* | -0.026 | -0.028* | -0.027* |
| | (0.016) | (0.016) | (0.016) | (0.015) |
| high offshorability | -0.037* | -0.038* | -0.037* | -0.024 |
| | (0.022) | (0.022) | (0.022) | (0.020) |
| (low-skilled) x (firm size) | -0.040 | -0.040 | -0.043 | -0.078** |
| | (0.035) | (0.035) | (0.034) | (0.036) |
| (medium-skilled) x (firm size) | -0.026 | -0.024 | -0.029 | -0.082*** |
| | (0.025) | (0.025) | (0.025) | (0.031) |
| (high-skilled) x (firm size) | -0.072** | -0.071** | -0.075** | -0.117*** |
| | (0.035) | (0.034) | (0.034) | (0.040) |
| firm size | 0.033 | 0.033 | 0.036 | 0.081** |
| | (0.029) | (0.029) | (0.029) | (0.033) |
| female | -0.032 | -0.031 | -0.031 | -0.036 |
| | (0.024) | (0.024) | (0.024) | (0.025) |
| non-european | -0.109* | -0.107* | -0.108* | -0.091 |
| | (0.063) | (0.062) | (0.063) | (0.069) |
| unemployed | 0.258*** | 0.257*** | 0.256*** | 0.269*** |
| | (0.075) | (0.073) | (0.073) | (0.060) |
| out of laborforce | 0.142*** | 0.141*** | 0.141*** | 0.127*** |
| | (0.036) | (0.035) | (0.035) | (0.038) |
| labour | 0.069** | 0.071** | 0.068** | 0.084** |
| | (0.031) | (0.031) | (0.030) | (0.039) |
| libdem | 0.023 | 0.023 | 0.024 | -0.005 |
| | (0.037) | (0.037) | (0.037) | (0.031) |
| conservative | -0.122*** | -0.121*** | -0.122*** | -0.135*** |
| | (0.029) | (0.029) | (0.029) | (0.031) |
| $R^2_{pseudo}$ | 0.137 | 0.136 | 0.137 | 0.132 |
| Obs. | 4607 | 4607 | 4607 | 5834 |

Dependent variable is binary with higher values indicating demand for higher unemployment benefits. Marginal effects of second-stage probit estimation reported in all columns. No observations from 2000 in regressions (A.5.1) - (A.5.3). *internet* is a dummy for internet access in household. Clustering at newspaper level. Age, education, and income categories, reginal macro controls, and newspaper and year fixed effects in all regressions. Stat. significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

Table A.6: First Stage Regressions (Part 1)

| | Dep. Var.: Newspaper Choice | | | | |
|---|---|---|---|---|---|
| | Express | Mail | Mirror | Star | Sun |
| *IV: Regional Newspaper Readership Shares* | | | | | |
| Express | 17.629*** | 4.380** | -6.893*** | -4.659 | 1.592 |
| | (2.742) | (2.037) | (1.597) | (3.041) | (2.821) |
| Mail | 0.075 | 7.484*** | -0.212 | -1.719 | -2.696* |
| | (1.095) | (0.975) | (0.951) | (2.053) | (1.390) |
| Mirror | -0.698 | -2.242* | 8.045*** | 1.674 | -2.900** |
| | (1.617) | (1.279) | (0.982) | (2.046) | (1.127) |
| Star | -2.757 | -2.406 | 1.795 | 40.956*** | -0.357 |
| | (3.452) | (2.667) | (3.255) | (9.349) | (4.556) |
| Sun | -1.510 | -1.504 | -1.959 | 0.009 | 4.062*** |
| | (1.183) | (1.597) | (1.241) | (2.129) | (1.512) |
| Telegraph | 0.104 | -3.675*** | 0.917 | -3.441 | -3.919** |
| | (1.560) | (1.210) | (0.764) | (2.590) | (1.857) |
| Guardian | 1.613 | -6.095*** | 6.348** | -5.392 | -0.893 |
| | (1.847) | (1.471) | (2.871) | (6.411) | (2.522) |
| Independent | 4.297 | 1.639 | 8.931** | 1.794 | -2.851 |
| | (4.317) | (2.535) | (3.533) | (9.000) | (3.889) |
| Times | 0.929 | -3.884** | -1.334 | 11.672** | -0.901 |
| | (2.410) | (1.896) | (1.713) | (5.469) | (0.890) |
| Record | -1.185 | -2.165 | 0.170 | 2.860 | -2.962** |
| | (1.895) | (1.371) | (1.225) | (2.307) | (1.255) |
| *Trade controls* | | | | | |
| Heckscher-Ohlin | -2.957 | -6.130 | 6.085 | -0.150 | 3.933 |
| | (5.492) | (6.005) | (9.013) | (7.710) | (6.057) |
| Ricardo-Viner adv. | -0.339 | 0.667* | -0.082 | -0.901 | 0.426 |
| | (0.293) | (0.389) | (0.242) | (0.584) | (0.489) |
| Ricardo-Viner disadv. | -0.409 | 0.704* | -0.095 | -0.935* | 0.440 |
| | (0.280) | (0.383) | (0.249) | (0.514) | (0.483) |
| middle offshorability | 0.050 | 0.133*** | -0.077 | -0.024 | -0.172** |
| | (0.056) | (0.033) | (0.078) | (0.131) | (0.078) |
| high offshorability | 0.089 | 0.158*** | -0.014 | -0.020 | -0.181** |
| | (0.078) | (0.041) | (0.049) | (0.108) | (0.074) |
| (low-skilled) x (firm size) | 0.154 | 0.197 | -0.268*** | | -0.341*** |
| | (0.207) | (0.187) | (0.095) | | (0.106) |
| (medium-skilled) x (firm size) | 0.078 | 0.270 | -0.290*** | -0.087 | -0.351*** |
| | (0.227) | (0.179) | (0.091) | (0.080) | (0.106) |
| (high-skilled) x (firm size) | 0.133 | 0.263* | -0.331*** | -0.032 | -0.360*** |
| | (0.211) | (0.156) | (0.084) | (0.120) | (0.131) |
| firm size | -0.131 | -0.235 | 0.310*** | -0.004 | 0.347*** |
| | (0.213) | (0.182) | (0.079) | (0.057) | (0.109) |
| *Individual controls* | | | | | |
| female | 0.057 | 0.297*** | -0.099* | -0.360*** | 0.016 |
| | (0.069) | (0.049) | (0.051) | (0.070) | (0.047) |
| non-european | 0.171 | 0.289** | 0.227* | -0.269 | -0.336** |
| | (0.106) | (0.143) | (0.129) | (0.276) | (0.167) |
| unemployed | -0.240 | -0.028 | 0.116** | -0.128 | -0.340*** |
| | (0.223) | (0.127) | (0.055) | (0.171) | (0.091) |
| out of laborforce | -0.278** | -0.088 | -0.057 | -0.011 | -0.034 |
| | (0.117) | (0.090) | (0.037) | (0.103) | (0.064) |
| labour | -0.249** | -0.183*** | 0.475*** | -0.066 | -0.212*** |
| | (0.118) | (0.070) | (0.085) | (0.123) | (0.067) |
| libdem | 0.247* | 0.280*** | 0.002 | -0.346** | -0.471*** |
| | (0.143) | (0.046) | (0.097) | (0.165) | (0.114) |
| conservative | 0.160 | 0.420*** | -0.495*** | -0.406*** | -0.235*** |
| | (0.122) | (0.060) | (0.054) | (0.139) | (0.062) |
| Age categories | yes | yes | yes | yes | yes |
| Education cat. | yes | yes | yes | yes | yes |
| Income cat. | yes | yes | yes | yes | yes |
| Macro Controls | yes | yes | yes | yes | yes |
| Year FE | yes | yes | yes | yes | yes |
| Clustered SE | yes | yes | yes | yes | yes |
| $R^2_{pseudo}$ | 0.093 | 0.106 | 0.170 | 0.220 | 0.173 |
| Obs. | 5834 | 5834 | 5834 | 5834 | 5834 |

Dependent variable is a dummy taking the value 1 when newspaper is read. Marginal effects of probit estimation reported. Clustering at regional level. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

Table A.7: First Stage Regressions (Part 2)

| | Dep. Var.: Newspaper Choice | | | | |
|---|---|---|---|---|---|
| | Telegraph | Guardian | Independent | Times | Record |
| *IV: Regional Newspaper Readership Shares* | | | | | |
| Express | -4.414 | 1.729 | -16.011*** | -0.243 | 177.981 |
| | (2.747) | (3.907) | (3.322) | (2.056) | (.) |
| Mail | -2.947* | -5.078** | 0.602 | -1.776* | -40.700* |
| | (1.564) | (2.047) | (2.759) | (1.056) | (23.417) |
| Mirror | -4.835*** | 1.234 | 4.408 | -0.363 | -88.315** |
| | (0.955) | (1.060) | (3.848) | (1.446) | (40.454) |
| Star | -21.168*** | 8.806** | 22.967*** | -7.409* | 56.744 |
| | (4.193) | (3.477) | (7.580) | (4.256) | (.) |
| Sun | -3.186* | 0.549 | 10.800*** | 2.189 | 168.543 |
| | (1.887) | (2.317) | (3.116) | (1.331) | (.) |
| Telegraph | 12.537*** | 1.492 | 13.852*** | 0.394 | -118.732 |
| | (2.813) | (2.881) | (5.110) | (1.110) | (149.470) |
| Guardian | 6.199* | 35.620*** | -12.986* | 1.371 | 151.435*** |
| | (3.487) | (6.349) | (6.661) | (2.615) | (27.842) |
| Independent | -1.796 | 0.792 | 50.205*** | -16.603** | 229.315 |
| | (5.682) | (7.188) | (13.128) | (8.221) | (216.401) |
| Times | -9.339*** | 7.525* | 0.903 | 18.709*** | 267.979*** |
| | (3.037) | (4.138) | (5.993) | (4.116) | (30.371) |
| Record | -2.299** | -0.859 | 5.532 | -1.087 | 9.781 |
| | (1.144) | (1.211) | (4.393) | (1.874) | (.) |
| *Trade controls* | | | | | |
| Heckscher-Ohlin | 1.749 | -7.023 | 10.591 | 3.578 | 49.480*** |
| | (9.461) | (7.550) | (10.181) | (5.908) | (7.279) |
| Ricardo-Viner adv. | -0.371 | -1.518*** | 3.917 | 4.545*** | 5.968*** |
| | (0.341) | (0.449) | (3.135) | (0.973) | (0.100) |
| Ricardo-Viner disadv. | -0.249 | -1.434*** | 3.871 | 4.382*** | 6.069 |
| | (0.335) | (0.500) | (3.155) | (0.995) | (.) |
| middle offshorability | 0.173* | -0.047 | -0.126 | 0.089 | 0.466*** |
| | (0.096) | (0.123) | (0.096) | (0.109) | (0.071) |
| high offshorability | 0.187*** | 0.131 | -0.425** | 0.062 | 0.042 |
| | (0.068) | (0.084) | (0.207) | (0.085) | (0.168) |
| (low-skilled) x (firm size) | -0.043 | 0.304* | -0.010 | -3.815*** | -0.252** |
| | (0.109) | (0.171) | (0.119) | (0.916) | (0.110) |
| (medium-skilled) x (firm size) | 0.006 | 0.242 | 0.068 | -3.772*** | 0.206* |
| | (0.133) | (0.220) | (0.124) | (0.899) | (0.105) |
| (high-skilled) x (firm size) | 0.056 | 0.238 | -0.052 | -3.667*** | -0.159 |
| | (0.136) | (0.228) | (0.064) | (0.919) | (0.130) |
| firm size | -0.043 | -0.283 | -0.022 | 3.798*** | 0.051 |
| | (0.139) | (0.202) | (0.086) | (0.892) | (0.105) |
| *Individual controls* | | | | | |
| female | -0.126*** | -0.078 | -0.281** | -0.143** | 0.284*** |
| | (0.045) | (0.104) | (0.137) | (0.068) | (0.081) |
| non-european | -0.086 | 0.005 | -0.611*** | 0.224 | |
| | (0.112) | (0.093) | (0.066) | (0.178) | |
| unemployed | 0.459** | 0.325 | 0.446 | -0.156 | 0.201*** |
| | (0.180) | (0.348) | (0.483) | (0.203) | (0.062) |
| out of laborforce | 0.217 | -0.109 | -0.224 | 0.199 | -0.151 |
| | (0.152) | (0.137) | (0.139) | (0.129) | (0.191) |
| labour | -0.060 | 0.454*** | 0.135 | -0.111 | 0.203** |
| | (0.109) | (0.160) | (0.096) | (0.105) | (0.095) |
| libdem | 0.239* | 0.314* | 0.359 | 0.022 | -0.449* |
| | (0.145) | (0.180) | (0.221) | (0.131) | (0.250) |
| conservative | 0.677*** | -0.531** | -0.772*** | 0.002 | -0.482*** |
| | (0.100) | (0.215) | (0.164) | (0.095) | (0.067) |
| Age categories | yes | yes | yes | yes | yes |
| Education cat. | yes | yes | yes | yes | yes |
| Income cat. | yes | yes | yes | yes | yes |
| Macro Controls | yes | yes | yes | yes | yes |
| Year FE | yes | yes | yes | yes | yes |
| Clustered SE | yes | yes | yes | yes | yes |
| $R^2_{pseudo}$ | 0.093 | 0.106 | 0.170 | 0.220 | 0.173 |
| Obs. | 5834 | 5834 | 5834 | 5834 | 5834 |

Dependent variable is a dummy taking the value 1 when newspaper is read. Marginal effects of probit estimation reported. Clustering at regional level. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

# Appendix B

# Appendix to Chapter 3

## B.1 Supplementary Information on Index for Potential Labor Mobility

### B.1.1 Description of Variables in Index for Potential Labor Mobility

**Economic Growth** Indicator of the economic growth rate in potential host countries. First, the minimal value of this indicator is added to ensure the non-negativity of the index. Second, the index is normalized by dividing all values by the maximum, such that all values are bound by zero and one, with one describing the maximal growth rate.

**Hourly Wages** Based on exchange rate converted measures of average hourly wages in manufacturing, provided by the US Bureau of Labor Statistics. Normalization analogously to "Economic Growth". Missing values are imputed using data on real per capita GDP, taken from the Penn World Tables 7.0 (analogously constructed). These GDP values show a correlation with average hourly wages of 0.79 in my sample.

**Employment Ratio** Share of the total labor force that is in any kind of official employment.

**Labor Market Flexibility** Based on the employment protection index of the OECD. Consists of 21 items measuring the costs and procedures associated with individual or collective firings as well as obstacles to temporary employment. Values between 0 (no employment protection) and 6 (extreme employment protection). Recoded by a linear transformation to take values between 0 (extreme employment protection) and 1 (no employment protection). An extensive discussion of the underlying data is provided by Venn (2009).

**Openness to Immigration** Based on questions on openness to immigration from the 2003 wave of the International Social Survey Programme (ISSP 2003). Average with equal weights of responses to "Immigrants increase crime rate" (v50), "Immigrants are generally good for [COUNTRY'S] economy" (v51), "Immigrants take jobs away from people who were born in [COUNTRY]" (v52), and "Immigrants improve [COUNTRY NATIONALITY] society by bringing in new ideas and cultures" (v53). If necessary, answers were recoded such that higher values indicate more openness to immigration. In the last step linearly scaled down to the range [0,1], with 1 indicating maximal openness to immigration.

**Share of Foreign Born** Based on data on migrant stocks from the World Development Indicators of the World Bank. Provides information on the share of foreign-born in countries' total populations. Data available every five years for each country, separately linearly interpolated within each gap.

**Share of English Speakers** Share of individuals in the total population who have a knowledge of English sufficient for at least basic conversations. Single cross-section for early 2000s.

**Common Language** Indicator that takes the value 1 if a language is the *mother tongue* of at least 9 per cent of the population in both countries of a country pair, zero otherwise.

**Common Legal System** Based on La Porta et al. (1999). Indicator that takes the value 1 if two countries have a legal system of the same origin, zero otherwise. Legal systems are: British, French, Socialist, German, Scandinavian.

**Immigrant Networks** Based on data of bilateral migration stocks in 1990 from Ortega and Peri (2012). A network of migrants from a source country i in a host country j is measured as the ratio of migrants from source i living in host j over the total population in source i.

**Common Border** Indicator that takes the value 1 if two countries share a common inland border, zero otherwise.

**Inverse Geographical Distance** Calculates the bilateral distance between two countries based on distances between their biggest agglomerations. These inter-agglomeration distances are weighted by the share of the agglomeration in country's overall population. To obtain an inverse measure (i.e. larger values indicating greater proximity) between zero and one, I calculate $invdist_{ij} = \frac{\min(distw_{ij})}{distw_{ij}}$, where $distw_{ij}$ is the measure of the

population-weighted distance between countries i and j provided by the CEPII-dataset, and min($distw_{ij}$) is the smallest value for all $i, j$ ($i \neq j$) in this data set.

**Number of Children** Measured by the share of individuals aged 0-14 in the total population.

**Family Values** Based on the questions on "More Emphasis on Family Life" and "How important is family in your life" from the first four waves of the World Values Survey. Highest agreement is coded as one, highest disagreement as zero, values assigned linearly in between. Values for each country in each year are obtained by summing the frequency-weighted answers. When both questions have been asked, the un-weighted average of both questions is used. When only one question has been asked, this response is taken for the overall index. Missing values are filled by fitting a fourth-order polynomial separately on the data for each country. Means of actual data and of fitted values are not statistically significantly different for any country used in this analysis. Values are finally normalized as before such that they are between 0 and 1, with 1 corresponding to minimal possible family attachment and 0 to maximal possible family attachment.

Table B.1: Components of Index for Potential Labor Mobility

| Sub-Category | Component | Weight | Specific to | Mean | Std | Min | Max | Obs. | Source |
|---|---|---|---|---|---|---|---|---|---|
| Economic Conditions | Hourly Wages in Manufacturing | 1/4 | Host | 0.35 | 0.2 | 0.05 | 1 | 16841 | Bureau of Labor Statistics, (Penn Tables) |
| | Economic Growth | 1/4 | Host | 0.65 | 0.08 | 0 | 0.92 | 16762 | Heston et al. (2011) |
| | Employment Ratio | 1/4 | Host | 0.92 | 0.04 | 0.76 | 0.99 | 15234 | OECD Stat |
| | Labor Market Flexibility | 1/4 | Host | 0.65 | 0.17 | 0.3 | 0.96 | 13186 | OECD Stat |
| Openness of Host | Openness to Immigration | 1/3 | Host | 0.6 | 0.05 | 0.47 | 0.69 | 13088 | ISSP (2003) |
| | Share of Foreign Born | 1/3 | Host | 0.1 | 0.09 | 0.01 | 0.38 | 15130 | World Development Indicators |
| | Share of English Speakers | 1/3 | Host | 0.55 | 0.31 | 0.05 | 0.98 | 17160 | Crystal (2003), EuropeanCommission (2006) |
| (Cultural) Proximity | Common Language | 1/6 | Host/Origin | 0.1 | 0.29 | 0 | 1 | 17160 | Head et al. (2010) |
| | Common Legal System | 1/6 | Host/Origin | 0.2 | 0.4 | 0 | 1 | 17160 | Head et al. (2010) |
| | Immigrant Networks | 1/6 | Host/Origin | 0 | 0.01 | 0 | 0.14 | 17160 | Ortega and Peri (2012) |
| (Geographical) Proximity | Common Border | 1/4 | Host/Origin | 0.07 | 0.26 | 0 | 1 | 17160 | Head et al. (2010) |
| | Inverse Geographical Distance | 1/4 | Host/Origin | 0.01 | 0.02 | 0 | 0.13 | 17160 | Head et al. (2010) |
| Characteristics of Workforce | Number of Children | 1/12 | Origin | 0.81 | 0.03 | 0.71 | 0.86 | 17160 | OECDstat |
| | Family Values | 1/12 | Origin | 0.06 | 0.03 | 0 | 0.19 | 17160 | World Values Survey |
| | Non-native Workers | 1/6 | Origin | 0.09 | 0.07 | 0.01 | 0.34 | 17160 | World Development Indicators |
| | Share of English Speakers | 1/6 | Origin | 0.55 | 0.31 | 0.05 | 0.98 | 17160 | Crystal (2003), EuropeanCommission (2006) |
| | Hourly Wages in Manufacturing | 1/6 | Origin | 0.41 | 0.19 | 0.06 | 1 | 17160 | Bureau of Labor Statistics, (Penn Tables) |
| | Economic Growth | 1/6 | Origin | 0.65 | 0.06 | 0.44 | 0.9 | 17160 | Heston et al. (2011) |
| | Unemployment Rate | 1/6 | Origin | 0.08 | 0.04 | 0.01 | 0.24 | 17160 | OECD Stat |

All values are either naturally defined on [0,1] or normalized to that range. Sample consists of observations at host-origin pair level. Observations were dropped from sample when (a) there was no full information on origin in a given year or (b) there was not a single host country with full information in a given year.

Table B.2: Data of Index of Potential Labor Mobility

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | avg. | Δ '86-'05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 0.057 | 0.060 | 0.062 | 0.062 | 0.060 | 0.061 | 0.062 | 0.062 | 0.065 | 0.065 | 0.066 | 0.066 | 0.065 | 0.066 | 0.065 | 0.064 | 0.065 | 0.070 | 0.073 | 0.078 | 0.065 | 0.021 |
| Austria | | | | | | | | | 0.085 | 0.092 | 0.089 | 0.084 | 0.087 | 0.085 | 0.084 | 0.082 | 0.085 | 0.092 | 0.100 | 0.101 | 0.090 | 0.016 |
| Belgium | 0.069 | 0.073 | 0.078 | 0.077 | 0.082 | 0.079 | 0.081 | 0.078 | 0.085 | 0.089 | 0.086 | 0.086 | 0.084 | 0.089 | 0.086 | 0.084 | 0.087 | 0.095 | 0.105 | 0.106 | 0.086 | 0.037 |
| Canada | 0.098 | 0.103 | 0.106 | 0.107 | 0.105 | 0.102 | 0.106 | 0.107 | 0.110 | 0.109 | 0.110 | 0.112 | 0.108 | 0.114 | 0.116 | 0.109 | 0.110 | 0.117 | 0.124 | 0.129 | 0.111 | 0.031 |
| Czech Rep. | | | | | | | | 0.018 | 0.019 | 0.020 | 0.020 | 0.018 | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.022 | 0.024 | 0.024 | 0.021 | 0.006 |
| Denmark | 0.023 | 0.024 | 0.024 | 0.025 | 0.030 | 0.030 | 0.030 | 0.029 | 0.032 | 0.034 | 0.033 | 0.033 | 0.032 | 0.033 | 0.032 | 0.031 | 0.033 | 0.036 | 0.039 | 0.040 | 0.032 | 0.017 |
| Finland | 0.047 | 0.050 | 0.053 | 0.054 | 0.053 | 0.050 | 0.051 | 0.051 | 0.059 | 0.065 | 0.061 | 0.062 | 0.062 | 0.061 | 0.062 | 0.058 | 0.059 | 0.065 | 0.072 | 0.074 | 0.059 | 0.027 |
| France | 0.021 | 0.022 | 0.023 | 0.023 | 0.024 | 0.051 | 0.052 | 0.051 | 0.055 | 0.057 | 0.056 | 0.053 | 0.055 | 0.054 | 0.053 | 0.051 | 0.053 | 0.056 | 0.061 | 0.061 | 0.047 | 0.040 |
| Germany | | | | | 0.035 | 0.083 | 0.084 | 0.083 | 0.089 | 0.095 | 0.092 | 0.087 | 0.088 | 0.086 | 0.085 | 0.084 | 0.086 | 0.093 | 0.100 | 0.101 | 0.087 | 0.066 |
| Greece | 0.015 | 0.015 | 0.017 | 0.017 | 0.018 | 0.018 | 0.017 | 0.017 | 0.018 | 0.019 | 0.019 | 0.019 | 0.019 | 0.021 | 0.021 | 0.021 | 0.021 | 0.023 | 0.024 | 0.024 | 0.019 | 0.009 |
| Hungary | | | | | | | 0.007 | 0.008 | 0.026 | 0.026 | 0.026 | 0.028 | 0.026 | 0.024 | 0.025 | 0.026 | 0.027 | 0.028 | 0.030 | 0.031 | 0.025 | 0.024 |
| Ireland | 0.089 | 0.095 | 0.099 | 0.100 | 0.102 | 0.096 | 0.099 | 0.099 | 0.102 | 0.107 | 0.108 | 0.111 | 0.107 | 0.111 | 0.109 | 0.108 | 0.111 | 0.116 | 0.123 | 0.129 | 0.107 | 0.040 |
| Italy | 0.027 | 0.028 | 0.029 | 0.029 | 0.030 | 0.050 | 0.050 | 0.046 | 0.050 | 0.052 | 0.051 | 0.049 | 0.050 | 0.049 | 0.048 | 0.048 | 0.049 | 0.052 | 0.057 | 0.056 | 0.046 | 0.029 |
| Japan | 0.000 | 0.000 | 0.000 | 0.000 | 0.012 | 0.016 | 0.016 | 0.017 | 0.018 | 0.019 | 0.018 | 0.017 | 0.016 | 0.017 | 0.018 | 0.017 | 0.017 | 0.018 | 0.020 | 0.020 | 0.014 | 0.020 |
| Luxembourg | 0.037 | 0.037 | 0.040 | 0.040 | 0.039 | 0.039 | 0.038 | 0.038 | 0.040 | 0.041 | 0.041 | 0.039 | 0.039 | 0.042 | 0.040 | 0.037 | 0.039 | 0.043 | 0.046 | 0.048 | 0.041 | 0.011 |
| Netherlands | 0.015 | 0.016 | 0.017 | 0.016 | 0.031 | 0.030 | 0.030 | 0.029 | 0.031 | 0.033 | 0.032 | 0.033 | 0.032 | 0.033 | 0.032 | 0.031 | 0.032 | 0.035 | 0.038 | 0.038 | 0.030 | 0.023 |
| New Zealand | 0.057 | 0.060 | 0.063 | 0.062 | 0.060 | 0.061 | 0.061 | 0.064 | 0.066 | 0.066 | 0.066 | 0.065 | 0.061 | 0.065 | 0.062 | 0.063 | 0.064 | 0.071 | 0.074 | 0.079 | 0.065 | 0.022 |
| Norway | 0.050 | 0.055 | 0.057 | 0.060 | 0.063 | 0.062 | 0.061 | 0.060 | 0.065 | 0.070 | 0.070 | 0.069 | 0.065 | 0.071 | 0.075 | 0.065 | 0.068 | 0.076 | 0.086 | 0.089 | 0.068 | 0.039 |
| Poland | | | | | | | 0.018 | 0.018 | 0.021 | 0.021 | 0.021 | 0.021 | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.022 | 0.023 | 0.023 | 0.021 | 0.005 |
| Portugal | 0.019 | 0.019 | 0.019 | 0.019 | 0.020 | 0.019 | 0.019 | 0.017 | 0.020 | 0.020 | 0.021 | 0.021 | 0.021 | 0.022 | 0.021 | 0.021 | 0.022 | 0.023 | 0.025 | 0.027 | 0.021 | 0.008 |
| Slovak Rep. | | | | | | | | | 0.026 | 0.026 | 0.026 | 0.027 | 0.026 | 0.025 | 0.027 | 0.028 | 0.029 | 0.029 | 0.029 | 0.030 | 0.027 | 0.004 |
| Spain | 0.027 | 0.028 | 0.029 | 0.028 | 0.029 | 0.028 | 0.028 | 0.026 | 0.028 | 0.030 | 0.029 | 0.029 | 0.029 | 0.029 | 0.028 | 0.027 | 0.028 | 0.030 | 0.032 | 0.033 | 0.029 | 0.006 |
| Sweden | 0.050 | 0.055 | 0.055 | 0.057 | 0.060 | 0.060 | 0.060 | 0.057 | 0.061 | 0.066 | 0.067 | 0.066 | 0.062 | 0.067 | 0.071 | 0.061 | 0.063 | 0.071 | 0.080 | 0.084 | 0.065 | 0.034 |
| Switzerland | | | | | | 0.063 | 0.064 | 0.063 | 0.073 | 0.078 | 0.076 | 0.071 | 0.073 | 0.072 | 0.071 | 0.069 | 0.072 | 0.079 | 0.086 | 0.087 | 0.074 | 0.024 |
| UK | 0.085 | 0.090 | 0.094 | 0.094 | 0.097 | 0.091 | 0.094 | 0.094 | 0.097 | 0.102 | 0.103 | 0.107 | 0.104 | 0.109 | 0.109 | 0.107 | 0.111 | 0.115 | 0.122 | 0.128 | 0.104 | 0.043 |
| US | 0.094 | 0.099 | 0.102 | 0.103 | 0.101 | 0.098 | 0.102 | 0.101 | 0.104 | 0.104 | 0.104 | 0.106 | 0.104 | 0.109 | 0.112 | 0.105 | 0.107 | 0.114 | 0.120 | 0.125 | 0.106 | 0.031 |
| avg. | 0.046 | 0.049 | 0.051 | 0.051 | 0.052 | 0.057 | 0.054 | 0.051 | 0.056 | 0.058 | 0.058 | 0.057 | 0.056 | 0.057 | 0.057 | 0.055 | 0.057 | 0.061 | 0.066 | 0.068 | | |

Table B.3: Descriptive Statistics of Variables in Sample

| Variable | Mean | Std. Dev. | Min | Max | Obs. | Definition | Source |
|---|---|---|---|---|---|---|---|
| index of labor mobility | 0.06 | 0.03 | 0 | 0.13 | 416 | see Appendix B.1.1 | own calculation |
| sum of labor mobility | 0.2 | 0.12 | 0 | 0.48 | 416 | see Appendix B.1.1 | own calculation |
| avg. eff. tax rate at 1xGDP pc | 0.18 | 0.09 | 0 | 0.47 | 416 | see source | Peter et al. (2010) |
| avg. eff. tax rate at 2xGDP pc | 0.27 | 0.1 | 0.05 | 0.62 | 416 | see source | Peter et al. (2010) |
| avg. eff. tax rate at 3xGDP pc | 0.32 | 0.1 | 0.1 | 0.68 | 416 | see source | Peter et al. (2010) |
| avg. eff. tax rate at 4xGDP pc | 0.36 | 0.09 | 0.15 | 0.71 | 416 | see source | Peter et al. (2010) |
| top marg. tax rate | 0.42 | 0.14 | 0.12 | 0.72 | 416 | see source | Peter et al. (2010) |
| left government | 0.27 | 0.44 | 0 | 1 | 416 | 1 if government dominated by left-wing parties, 0 else | Armingeon et al. (2011) |
| institutional constraints | 2.45 | 1.32 | 0 | 5 | 416 | number of veto players | Armingeon et al. (2011) |
| legislative fractionalization | 0.68 | 0.11 | 0.41 | 0.89 | 416 | $= 1 - \sum_{i=1}^{m} s_i^2$ , where $s_i$: share of seats for party i, m: number of parties | Armingeon et al. (2011) |
| real GDP per capita | 23.37 | 8.52 | 7.56 | 68.91 | 416 | in tsd of USD, PPP converted | OECD stat |
| GDP growth | 0.05 | 0.03 | -0.03 | 0.22 | 416 | annual growth rate of nominal GDP | OECD stat |
| unemployment rate | 0.08 | 0.04 | 0.01 | 0.24 | 416 | share of registered unemployed in civilian labor force | OECD stat |
| capital intensity | 0.17 | 0.76 | 0 | 7.98 | 416 | capital in production per worker, in tsd. of USD | OECD stat |
| employment share of service | 0.66 | 0.07 | 0.43 | 0.79 | 416 | share of workers in service sector in civilian labor force | OECD stat |
| population density | 130.24 | 125.84 | 2.09 | 483.41 | 416 | inhabitants per $km^2$ | OECD stat |
| rural population | 0.25 | 0.11 | 0.03 | 0.54 | 416 | share of rural population in total population | OECD stat |
| population aged 15-64 | 0.67 | 0.02 | 0.6 | 0.70 | 416 | share of population aged 15-64 in total population | OECD stat |
| government outlays | 0.46 | 0.08 | 0.31 | 0.71 | 416 | share of government outlays in GDP | OECD stat |
| government receipts | 0.44 | 0.08 | 0.28 | 0.63 | 416 | share of government receipts (ex. debt) in GDP | OECD stat |
| corporate income taxation | 3.15 | 1.47 | 0.27 | 11.74 | 413 | share of revenue in GDP | OECD stat |
| indirect taxation | 10.89 | 2.96 | 3.67 | 17.22 | 416 | share of revenue in GDP | OECD stat |
| economic globalization | 0.77 | 0.12 | 0.44 | 0.99 | 416 | see source | Dreher (2006) |
| skilled emigration | 0.08 | 0.07 | 0 | 0.38 | 307 | see source | Defoort (2006) |
| year | 1995.85 | 5.68 | 1986 | 2005 | 416 | | |

Descriptives for sample used to estimate regressions with EATRs as dependent variable in Table 3.4

## B.2 Estimation of Weights and Descriptives for the Alternative Index of Labor Mobility

The weights for the alternatively constructed Index of Labor Mobility are derived by regressing measures of observed migration on the components of the Index of Potential Labor Mobility. Data on migration is taken from Docquier et al. (2011) who provide information on bilateral migration stocks for 194 countries in 1990 and 2000. This data distinguishes between migrants with at least college education (high-skilled) and those without a corresponding degree (low-skilled). Information on the regressors can be found in Table B.1 in the appendix. To allow for some comparison between both indices, I use the share of migrants in the total population of the sending country rather than the number of migrants as dependent variable. Using this data has the advantage that I can link information on both the host and the origin country to each observation. On the downside, Docquier et al. (2011) provide information on stocks rather than flows. Furthermore, one would like to calculate the ration of high-skilled migrants over the high-skilled population rather than the total population. However, data on the skill composition of native populations in all OECD countries over the last two decades is not available.

Results from regressing migration shares on the set of explanatory variables are presented in Table B.4 in the appendix. Looking a the effects of specific regressors, labor market flexibility in the destination country and a common legal systems show the most consistent pattern across time and skill groups in fostering migration. Other factors are of significance only in some years (real GDP growth in 2000, employment rate in 1990, or a common border in 2000), or for a certain skill group (openness to immigration and language related regressors only for high-skilled migration).

These results are then taken to predict migrant stocks for every country pair in each year. Predictions are restricted to the domain [0,1]. Since I have estimated the stock of migrants with high or low skills using both data from 1990 and 2000, I predict two different values migrant stocks for each country pair and skill-group based on these two estimates. These two predictions per skill group are then condensed into a single values by linear interpolation for years 1990 to 2000. These country pair-year specific values are then transformed into indices in the same way as described previously for the Index of Potential Labor Mobility.

Some descriptives for the alternatively calculated Index of Labor Mobility are shown in Figure B.1. Two features of the index catch the eye: First, values for low-skilled mobility are always higher than for high-skilled individuals. This result is caused by the construction of the index since I have to normalize the number of migrants by total population rather that population with the same educational attainment due to data

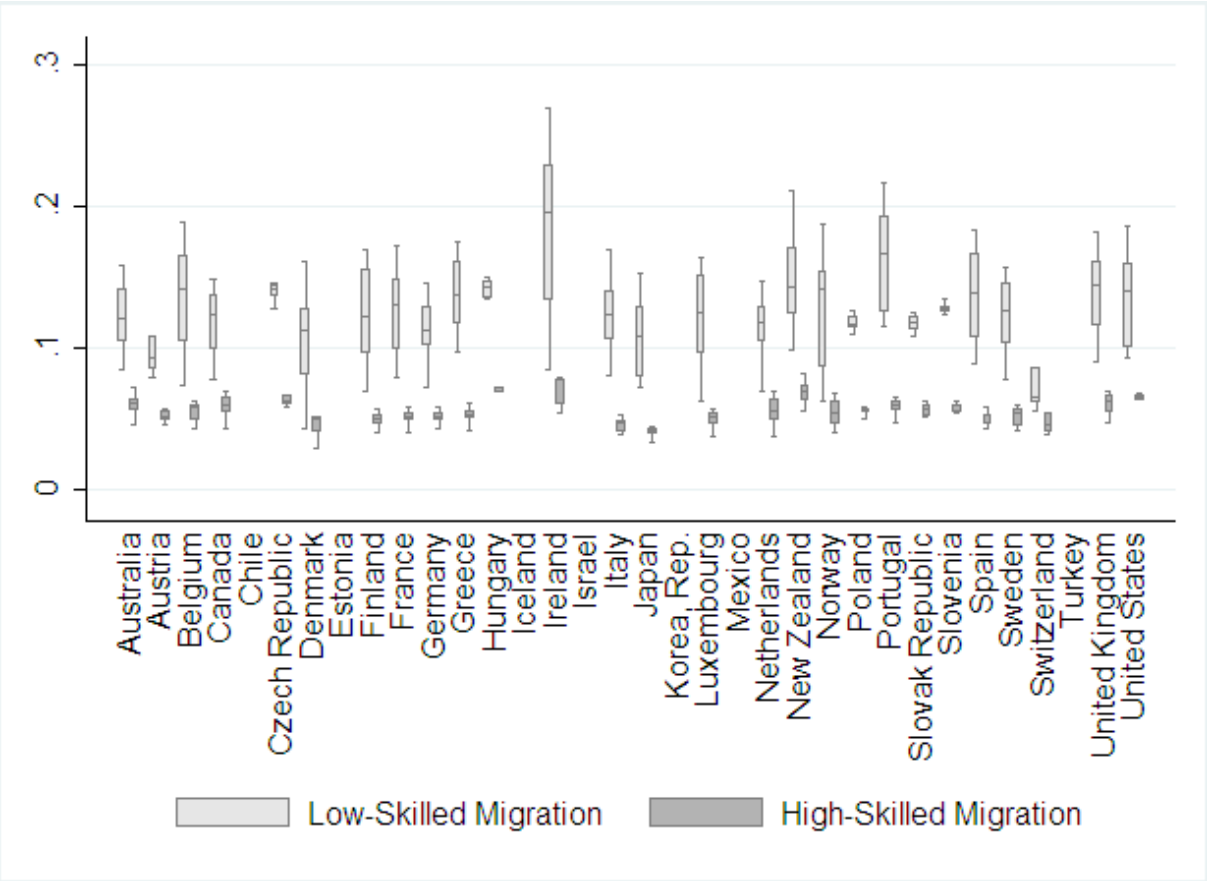



Figure B.1: Median, 75% range, and 95% range for Alternative Index of Labor Mobility, by source country 1986 - 2006 and for individuals with above and below college education; Source: Own calculations based on own index

restrictions. However, the differences in educational participation are captured by country fixed-effects in the regressions unless there are huge changes over time and/or countries significantly deviate from the general path of educational expansion.

Second, English-speaking countries continue to show high levels of mobility and southern-European ones and Japan the lowest. However, differences are much smaller than previously, in particular for the mobility of low-skilled individuals. Third, the low-skilled are considerably more mobile than the high-skilled in some countries such as Poland.

Table B.4: Determinants of Migration Flows

| | Dependant Variable: Share of Migrants in Population | | | | | |
|---|---|---|---|---|---|---|
| | total migration | | low-skilled migration | | high-skilled migration | |
| | 1990 | 2000 | 1990 | 2000 | 1990 | 2000 |
| hourly wages (dest.) | -0.005 | 0.001 | -0.005 | 0.001 | 0.001 | 0.000 |
| | (0.009) | (0.001) | (0.008) | (0.001) | (0.001) | (0.000) |
| real GDP growth (dest.) | -0.007 | -0.012*** | -0.007 | -0.008** | 0.000 | -0.004*** |
| | (0.012) | (0.004) | (0.010) | (0.003) | (0.002) | (0.001) |
| employment rate (dest.) | 0.018* | -0.000 | 0.012 | -0.001 | 0.006*** | 0.000 |
| | (0.010) | (0.006) | (0.008) | (0.005) | (0.002) | (0.002) |
| labor market flexibility (dest.) | 0.010*** | 0.004** | 0.006** | 0.002 | 0.003*** | 0.003*** |
| | (0.003) | (0.002) | (0.003) | (0.002) | (0.001) | (0.001) |
| openness to immigration (dest.) | 0.000 | 0.004 | -0.008 | 0.000 | 0.008** | 0.003** |
| | (0.022) | (0.005) | (0.019) | (0.004) | (0.003) | (0.001) |
| share of foreign born (dest.) | 0.013 | -0.003 | 0.014 | 0.000 | -0.001 | -0.003 |
| | (0.017) | (0.011) | (0.014) | (0.008) | (0.004) | (0.003) |
| share of english speakers (dest.) | -0.001 | 0.003 | -0.001 | 0.001 | 0.000 | 0.001** |
| | (0.003) | (0.002) | (0.002) | (0.001) | (0.000) | (0.000) |
| common language | 0.001 | 0.002 | 0.000 | 0.001 | 0.001 | 0.001** |
| | (0.002) | (0.002) | (0.002) | (0.001) | (0.000) | (0.001) |
| common legal system | 0.003** | 0.003*** | 0.002* | 0.002** | 0.001*** | 0.001*** |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) |
| common border | 0.007 | 0.005** | 0.006 | 0.003** | 0.001 | 0.001* |
| | (0.004) | (0.002) | (0.004) | (0.002) | (0.001) | (0.001) |
| inverse geograph. distance | 0.111 | -0.011 | 0.106 | 0.001 | 0.005 | -0.013** |
| | (0.076) | (0.017) | (0.065) | (0.013) | (0.014) | (0.006) |
| share of population age 0-14 (origin) | -0.064 | -0.008 | -0.056 | -0.001 | -0.009 | -0.007 |
| | (0.055) | (0.020) | (0.048) | (0.015) | (0.008) | (0.007) |
| family values (origin) | -0.019 | 0.010* | -0.017* | 0.004 | -0.002 | 0.006*** |
| | (0.013) | (0.005) | (0.010) | (0.004) | (0.004) | (0.002) |
| non-native workers (origin) | -0.010* | -0.005 | -0.008* | -0.004 | -0.001 | -0.001 |
| | (0.005) | (0.004) | (0.004) | (0.003) | (0.001) | (0.001) |
| share of english speakers (origin) | 0.002 | 0.002 | 0.001 | 0.001 | 0.001*** | 0.001* |
| | (0.001) | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) |
| hourly wages (origin) | -0.006 | -0.007** | -0.006 | -0.005** | -0.001 | -0.002*** |
| | (0.006) | (0.003) | (0.005) | (0.002) | (0.001) | (0.001) |
| real GDP growth (origin) | 0.019 | 0.008 | 0.016 | 0.006 | 0.003 | 0.002 |
| | (0.018) | (0.006) | (0.015) | (0.004) | (0.003) | (0.002) |
| unemployment rate (origin) | -0.013 | -0.011 | -0.012 | -0.008 | -0.000 | -0.003 |
| | (0.011) | (0.011) | (0.010) | (0.009) | (0.002) | (0.002) |
| constant | 0.026 | 0.005 | 0.034 | 0.003 | -0.008 | 0.003 |
| | (0.051) | (0.017) | (0.045) | (0.012) | (0.007) | (0.007) |
| $R^2_{adj.}$ | 0.17 | 0.14 | 0.15 | 0.11 | 0.23 | 0.20 |
| F-stat | 2.15 | 4.45 | 1.81 | 3.68 | 2.70 | 4.74 |
| Obs. | 324 | 576 | 324 | 576 | 324 | 576 |

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp. Compare Table B.1 for further information on regressors.

# Eidesstattliche Erklärung

Hiermit erkläre ich, die vorliegende Dissertation selbständig angefertig und mich keiner anderen als den in ihr angegebenen Hilfsmitteln bedient zu haben. Insbesondere sind sämtliche Zitate aus anderen Quellen als solche gekennzeichnet und mit Quellenangabe versehen.

Mannheim, den 04.Dezember 2012

# Lebenslauf

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