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Abstract: Population aging is just beginning to hit the industrialized countries in full force, and it will have a tremendous impact on capital markets. Capital market effects of population aging are particularly strong in continental European economies such as Germany, with their large pay-as-you-go public pension systems. The younger generations in these countries are becoming aware of the need to provide for more retirement income through own private saving, and these effects will be accentuated by fundamental pension reforms that aim at more pre-funding. Population aging therefore changes households' savings behavior and portfolio composition, and much more assets will be invested in the stock market. Capital markets will grow in size, and active institutional investors such as pension funds are likely to become more important in continental European countries.

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1. Introduction

Continental European countries such as France, Germany and Italy, have large pay-as-you-go public pension systems that face severe problems due to population aging (for early accounts of the aging crisis, see OECD, 1988, and World Bank, 1994). As computed by the International Monetary Fund (Chand and Jaeger, 1996), the size of the public pension systems relative to GDP will increase by about 50 percent from 1995 to 2030 in France and in Italy, and almost double in Germany, if benefits stay as they were in 1992 in real terms (see table 1). If the additional expenditures are financed solely by contributions, these will rise approximately in proportion. Expressed as a percentage of the wage bill, French workers would then pay 38 percent to their pension system in the year 2030 rather than 24 percent in 1995. In Germany, the contribution rate would rise to 41 percent, and in Italy even to 62 percent of the wage bill. If the additional burden was financed solely by debt, it would exceed 100 percent of GDP in France, 115 percent in Germany, and as much as 180 percent in Italy by the year 2035. Similar numbers have been published by the OECD (Rosevaere et al., 1996). Fundamental pension reforms that involve a shift towards more pre-funding of retirement income appear to be the only way out of the pension crisis caused by demographic change.

In this paper, I discuss how reforms of the pay-as-you-go pension systems in countries such as that passed in Germany in 2001 affect capital markets. Germany as well as other continental European countries with large pay-as-you-go pension systems such as France and Italy has thin capital markets in the sense that only few households own and control productive capital (either directly or via investment and pension funds). French, German and Italian savers hold a considerable smaller share of stocks than Anglo-Saxon households. As a result, stock market capitalization is low in these three countries, and pension funds play only a minor role in household saving (see table 2). The focus of the paper is Germany and its 2001 pension reform, the so-called “Riester reform”, although I will stress that population aging itself would have strong effects on capital markets even in the absence of a reform that introduces a funded component to the pension system.

The line of argument is straightforward. Population aging (or, more generally, demographic change) is a fact in virtually all countries across the world (with some differences in timing). Population aging will change households’ saving behavior – even if current pension systems were

to be maintained – because the internal rate of return of pay-as-you-go pension systems will decrease, making own savings as a vehicle for retirement income both more necessary and more attractive. Moreover, in many countries, such as Germany, population aging makes fundamental reform of public pension systems a top priority, reducing retirement benefits from the public pension system and strengthening the need for own savings for retirement even more.

A macroeconomic simulation model shows that these mechanisms result in rising aggregate savings and capital stocks over the first few decades of this century, while thereafter, when the baby-boom cohorts retire, the higher old-age dependency ratio will lead to lower saving rates. Our quantitative predictions show that the amount of additional capital generated until about 2035 is substantial. Finally, increased household saving and changes in households' portfolio structure will also change the nature of capital markets, in particular in those countries that implement fundamental pension reforms. Even if no additional savings were created, a higher share of savings would flow into stock and bond markets.

The remainder of the paper is structured as follows. In section 2, I discuss how population aging has created the need for fundamental pension reform in Germany. Section 3 delivers a picture of households' life-cycle saving decisions and portfolio choice, and links it to the existing pay-as-you-go pension systems. In section 4, I consider how pension reform affects capital markets from a macroeconomic perspective, and I present quantitative predictions of the size of the capital stock generated by households' optimal response to population aging and pension reform. Section 5 summarizes and concludes.

2. The need for fundamental pension reform

Germany's public pay-as-you-go pension system faces severe problems which can hardly be solved without introducing a substantial degree of pre-funding. I first present some demographic projections that highlight the problems faced by the public pension system. I then outline the main measures of the 2001 pension reform.

2.1 Demographic change and the German public pension system

According to OECD projections (Rosevaere et al., 1996), Germany's old-age dependency ratio (i.e., the ratio of the number of persons aged 65 and older and of the number of persons between ages 20 and 64) will about double from 26.0 percent in 2000 to around 50.0 percent in 2030. Figure 1 shows the old-age dependency ratio for several OECD countries. Note that dependency ratios increase throughout the OECD countries, but Germany has one of the most severe aging problems.¹ There are two main reasons for population aging, the first is decreasing fertility (i.e., less children are born per woman), the second is increasing length of life. Both are hard to influence by economic policy, so policy-makers have to focus on how to deal with the consequences of population aging.

In the remainder, I focus on demographic change and pension reform in Germany.² As most continental European countries, Germany has a contribution-based pay-as-you-go pension system which covers almost all workers and provides most of their retirement incomes through a single system. Historically, this system has been very successful in providing a high and reliable level of retirement income. In recent years, however, the German public pension system has been under increasing pressure (see Börsch-Supan, 1998b). In the year 1997, to balance current pension claims of retirees with current revenue from workers, the contribution rate to the public pension system has increased to 20.3 percent of the payroll.³ Additional increases of the contribution rate could be avoided only by substantial subsidies from general tax revenue. The recent increase in federal subsidies, mostly financed through new taxes on the consumption of energy and mineral oil, was sufficient to cut the contribution rate to its current level of 19.1 percent (but of course, this cut does not imply that the public pension system has become more stable). In 2000, the total subsidy to the public pension budget was about EUR 50 bn, the largest expenditure item in the government budget, about a fifth of total government spending.

¹ It should also be noted that populations are aging not only in industrial countries, but also in developing countries, see Ludwig (2002).

² Pension reforms in other European countries are discussed, inter alia, by Boldrin et al. (1999), Disney (2000), and Börsch-Supan and Miegel (2001).

³ Technically, the contribution to the public pension system is split equally between employees and employers. From an economic viewpoint, this distinction is purely rhetoric.

There are two main reasons for the increasing difficulties of the public pension system. In addition to population aging, the public pension system provides substantial negative incentive effects on labor supply. In particular, demographic problems have been exacerbated by a strong decrease in labor force participation due to early retirement and unemployment, and by a shift to jobs that escape social security taxation. The declining labor force participation in these countries can at least partially be attributed to the negative incentive effects of their public pension systems (Gruber and Wise, 1999; Schnabel, 1999).

Figure 2 shows projections of the number of pensioners relative to the number of workers. This is the key ratio that determines the financial situation of a pay-as-you-go pension system since at every point in time, payments to current pensioners have to be financed by current workers via wage taxes (if the public pension system is not allowed to run a deficit and ignoring, or holding constant, subsidies financed from federal taxes). Because workers retire, on average, much earlier than age 65 years in Germany, and since not all persons aged 20 to 64 are working, this ratio is much higher than the pure old-age dependency ratio depicted in figure 1.

Demographic projections necessarily involve making assumptions about major driving forces of demographic change. Figure 2 shows how varying these assumptions changes the predictions. According to Birg and Börsch-Supan (1999), the modest aging and constant fertility scenario is the most likely scenario. Even a very optimistic and also quite unlikely scenario in which the increase in life expectancy slows down (“weak aging”) and fertility starts to increase again results in a deteriorating demographic situation. In a pessimistic scenario, the ratio of pensioners to workers might approach one by the year 2050. In addition to fertility and life expectancy, there are two other main factors – immigration and labor market conditions such as female labor market participation or unemployment – that determine demographic change. In figure 2, medium scenarios are used for these two factors; Birg and Börsch-Supan (1999) present a sensitivity analysis similar to that contained in figure 2 that varies these two factors as well.

Given the restriction that the pay-as-you-go pension system cannot run a deficit, and if subsidies from general tax revenues are held constant, the projections in figure 2 imply directly that the contribution rate to the public pension system must increase dramatically from its already high levels in the first half of this century if current replacement rates were to be maintained. Figure 3

shows projections for the direct contribution rate (excluding subsidies financed from other taxes) for three demographic scenarios.⁴ It is evident that contribution rates of 28 percent or more are not acceptable; Börsch-Supan (1998b) provides a more detailed discussion. Population aging is therefore a serious threat to the stability of the pay-as-you-go public pension systems in Germany and elsewhere in continental Europe.

2.2 The 2001 pension reform

Germany has experienced a flurry of pension reforms in recent years, but they have not succeeded in stabilizing contribution rates, public support, and system enrollment. Given the demographic projections presented in the previous section, the prospects for the future are much worse. Economists' suggestions for a fundamental pension reform that would address the crisis caused by population aging have primarily focused on schemes that hold the contribution rate fixed at its current level, which automatically implies that replacement rates will have to go down. In effect, the public pension system will become less generous, creating a gap in retirement income. Rational-forward looking households will start to save more in order to build up funds that yield extra income during retirement and help close the gap left by pension reform. Such a reform would imply a partial transition to a funding system; the role of public pay-as-you-go benefits will still be substantial under such a reform.

There are several reasons why it is unrealistic to model a full transition to pre-funding. For example, public pension systems traditionally also have redistributive character, and redistribution is, through one mechanism or the other, always pay-as-you-go. Estimates of the share of pensions that are pure intra-generational transfers are about 20 percent in Germany (mainly topped-up pensions by a minimum retirement income mechanism and pension points earned while in education or while raising children), see Börsch-Supan and Reil-Held (2001). This would leave about 80 percent of pensions available for potential privatization in a multi-pillar system. There are also other reasons to be conservative in the degree of pre-funding. For instance, pay-as-you-go systems have a built-in insurance against inflation and secular capital market failures (see Miles and Timmer-

⁴ The optimistic and pessimistic scenarios are, respectively, combinations of optimistic and pessimistic assumptions for the four driving factors, as discussed above.

mann, 1999). Finally, introducing a funded component in a pay-as-you-go pension system involves transition costs since some generations have to pay both into the public pension system and into private savings accounts. This is a complicated issue, see Börsch-Supan and Winter (2001) for a discussion.

In practice, until the year 2000 pension reforms in Germany have been of the parametric type, changing some feature of the pay-as-you-go pension system, but avoiding more radical steps such as introducing a funded component. Germany's 2001 pension reform was radical because for the first time after the pay-as-you-go-system was introduced in 1957, a funded component is added to the pension system.⁵ The size of this funded component is by no means radical – it is small compared with other countries, and arguably too small to solve the old-age crisis of the pay-as-you-go system.

Even though there are substantial differences in detail and degree, Germany's 2001 reform operates along the same lines as the stylized reform model outlined above. In particular, it cuts down pay-as-you-go benefits, it provides incentives for saving, and it creates new products for private retirement provision, thus strengthening the second and third pillars of old-age provision (namely, occupational pension schemes and private old-age provision). The declared goal of the reform is to keep the (direct) contribution rate below 20 percent until 2020 and below 22 percent beyond 2030 while keeping the replacement rate above 64 percent.

Under the 2001 pension reform, workers should save one percent of their gross wage in authorized private pension plans during 2002 and 2003 (up to the earnings cap on contributions to the public pension system, currently about EUR 57,300). This amount will increase every other year, reaching a level of four percent of the gross wage in 2008. While savings via private pension accounts are voluntary, the government has created a complex system of incentives to encourage private provision for old-age that combines tax deductions and direct payments.

The introduction of private pension accounts is complemented by a move to the internationally compatible system of deferred taxation, which means that voluntary savings via private pension plans are completely exempt from taxation (unlike mandatory contributions to the pay-as-you-go

⁵ When the public pension system was enacted by Bismarck in 1889, it was fully funded. A partial pay-as-you-go system was introduced in 1957, and once the system's funds were depleted in 1969, the system became purely pay-as-you-go.

scheme). Accordingly, pension benefits are subject to taxation.⁶ In short, the main vehicle for creating saving incentives is tax credits. In addition, to support low income earners who would not benefit from tax credits, individual savings can be subsidized directly. This allowance starts with an amount of EUR 38 per person and year in 2002 and will reach EUR 154 when the reform is completed in 2008. Spouses are also qualified for the standard allowance, provided that the partner pays into a separate private savings plan for them. Furthermore, an extra allowance is given for each child.

For the sake of brevity, I do not comment in detail on the new regulations for occupational pensions. I return to the implications of this alternative way to build up retirement savings in the concluding section; for most of the discussion that follows, the difference is not material. Let it suffice to say that as an alternative to purchasing personal pension products (which constitute “Riester” products in the narrow sense), employees can participate in an occupational scheme provided by their employer (*Entgeltumwandlung*), with similar subsidies or tax reliefs. Two points are important, however. First, even if an employer does not offer a (2nd pillar) retirement saving scheme, employees are of course still entitled to subsidies for 3rd pillar private retirement saving. Second, occupational pensions are much more flexible than before the reform with respect to vesting periods and portability.

The 2001 reform is definitely a step in the right direction since it introduces a funded component to complement a pay-as-you-go system that cannot be maintained at its current level of generosity. However, it is unclear whether this reform will generate sufficient extra saving – households that save according to the provisions of the 2001 reform (but not more) might not be able to fill the entire gap in their retirement incomes created by cutting benefits from the pay-as-you-go system. This could happen if the new “Riester” savings just replace (“crowd out”) other forms of saving that households have already done in the past. Moreover, based on realistic demographic projections, it is likely that pay-as-you-go benefits will have to be cut by more than officially projected in order to keep the contribution rate below 22 percent, in line the primary goal of Germany’s pension policy for the coming years; see Bonin (2001) and Schnabel (2001) for detailed assessments of the 2001 reform. If public pension system benefits are indeed cut further, the gap in old-age

⁶ See Börsch-Supan and Lührmann (2000) for a discussion of taxation issues in old-age provision.

income would increase, and extra saving would be called for. In short, it is likely that the funded component of the German pension systems will continue to grow. I present realistic simulations in section 4.

3. Retirement saving and portfolio choice in Germany

To understand the capital market effects of population aging and the 2001 pension reform, it is useful to take a closer look at households' life-cycle savings and portfolio choice patterns. The discussion in this section is based on Börsch-Supan and Winter (2001) who show that relative to other savings motives, saving for retirement plays only a small role in countries with generous pay-as-you-go pension systems such as France, Germany and Italy. Turning this argument around, they argue that a distinct change in savings patterns is likely after a fundamental pension reform because the retirement savings motive is strengthened. In addition, the 2001 reform provides new private pension products that channel new savings into stock and bond markets.

3.1 The public pension system, retirement income and life-cycle savings patterns

As a point of departure, it is important to realize that the pay-as-you-go public pension system in Germany has traditionally been characterized by a very generous replacement rate – it has generated net retirement incomes that are approximately 70 percent of pre-retirement net earnings. In addition, the public pension system provides generous survivor benefits that constitute a substantial proportion of total pay-as-you-go pension wealth, and disability benefits at similar and often even higher replacement levels than old-age pensions. As a result, public pensions are by far the largest pillar of retirement income. They constitute more than 80 percent of the income of households headed by persons aged 65 and older, while funded retirement income, such as asset income from private saving or firm pensions in which the employer saves on behalf of the worker, plays a much smaller role than, e.g., in the Netherlands or the Anglo-Saxon countries. Börsch-Supan, Reil-Held and Schnabel (2001) provide a more detailed discussion.

The generosity of the public pension system is reflected in the fact that once they are in retirement, households in Germany reduce their wealth by much less than predicted by the pure life-cycle the-

ory of savings. Börsch-Supan, Reil-Held, Rodepeter, Schnabel and Winter (2001) use repeated cross-section data to separate age from cohort effects, and they find that the observed age-consumption profiles are rather flat and show almost no dissaving in old age. Apparently, saving for retirement has historically not been the main savings motive in Germany, even though attitudes are changing (Boeri, Bösch-Supan and Tabellini, 2001; Bösch-Supan and Essig, 2002b). If other saving motives, such as precaution and intergenerational transfers, are more important than retirement saving, age-saving profiles are likely to be much flatter than under the famous textbook life-cycle hypothesis (as German data indeed suggest). This explanation is in line with Jappelli and Modigliani (1998) who argue that the main mechanism for retirement savings in countries such as Germany is the pay-as-you-go system. If one adds contributions to these pension systems to savings and subtracts benefits from them, the familiar textbook hump-shaped saving profiles can be recovered.

Since household saving patterns currently observed in Germany can be explained largely by the pay-as-you-go pension systems with its generous retirement benefits, we should expect distinct changes in saving patterns in the future. As described above, a pension reform towards a multi-pillar system with a substantial portion of funded retirement income will revive the retirement motive for saving. Hence, it is likely that saving rates among the young will increase (to accumulate retirement savings), and saving rates among the elderly will decline sharply (because they will dissolve their retirement savings once benefits from the public system decline). In section 4 below, I present qualitative predictions on these effects.

Note that some substitution between these new savings for old age and other savings is likely. This will decrease the effect of a fundamental pension reform on the overall household saving rate, but will increase the effect on portfolio composition. We do not know the precise magnitude of such effects. Precautionary saving may even increase, while saving for intergenerational transfers is more likely to decrease in response to introducing a higher degree of self-provided retirement income.

3.2 Portfolio composition

The German pay-as-you-go public pension system appears to have shaped the composition of household financial wealth. Table 3 displays portfolio choice in Germany. The small role of stocks and mutual funds in Germany is apparent: In the most recent 1997 data, stocks amount to 8.3 percent, mutual funds to 6.6 percent and fixed-income securities to 17.1 percent of financial portfolios. Börsch-Supan and Essig (2002a) show that stock market participation is extremely low in Germany – in 1993, only 12 percent of households held stocks directly (total stock ownership, including indirect holdings, was 19.8 percent). By 1998, direct stock holding has increased to 17.6 percent, but stock market participation is still well below other countries' levels. The reasons for German households' unwillingness to hold risky assets are still not well understood.

In the financial portfolios data presented in table 3, the large share of life insurance wealth is particularly interesting; the main reason for the important role of whole life insurance in German households' life-cycle savings decisions is its favorable tax treatment (see Brunsbach and Lang, 1998, and Walliser and Winter, 1999). At the household level, financial saving in whole life insurance is more important than saving in stocks and bonds (see Eymann and Börsch-Supan, 2002). The important role of whole life insurance is also significant for financial markets, as life-insurance companies are not allowed to invest significantly in stocks, which in turn has been one of the main reasons for thin capital markets in Germany (see Deutsche Bank Research, 1996). These restrictions will become less important because of increased availability of alternative products and the resulting increase in competition for retirement saving.

Portfolio composition in Germany is likely to change under a partial transition to a multi-pillar system. Börsch-Supan and Winter (2001) predict that – given that there were no substitution between new retirement saving and current saving – the net household saving rate would increase by about 4 percentage points. If all of this new saving was channeled into pension funds, pension funds would amount to between 15 and 18 percent of households' portfolios, comparable to the United Kingdom, the U.S., the Netherlands and Switzerland. Substitution between new retirement saving and current saving would increase this share, although part of new retirement saving may also be made through whole life insurance given its preferential tax treatment. Moreover, the new private pension products involve a nominal guarantee – that is, the provider must guarantee the

nominal value of contributions. This restriction has substantial effects on asset management: providers won't be able to invest assets fully in the stock market as in a traditional Anglo-Saxon pension fund. Households' direct and indirect exposure to stock markets therefore depends on future investment decisions made by the providers of private pension products. Additional changes in the (indirect) asset allocation of households might occur since life insurance companies have recently begun to increase their portfolio share of stocks, after changes in regulations that govern their investment policies.

While exact predictions are difficult, a more prominent role of equities on the supply side of the capital markets seems very likely when the provision of retirement income is shifted from the pay-as-you-go pension system towards a funded component. This is in line with the international experience in countries as diverse as the United Kingdom, the U.S., the Netherlands and Switzerland.

4. Pension reform and capital markets

From a macroeconomic point of view, population aging changes the balance between capital and labor, in particular in industrialized countries. Labor supply is going to be relatively scarce whereas capital is going to be relatively abundant. This will drive up wages relative to the rate of return on capital, reducing households' incentive to save (if the interest elasticity of saving is positive). In addition, some fraction of the capital stock may become obsolete due to the shrinking labor force and diminishing returns to scale, making the accumulation of capital even less attractive. In general, these mechanisms should eventually result in a declining rate of return on capital. An alternative interpretation is that once the baby-boom generations retire around the year 2030, they start consuming out of their retirement savings; this will result in capital market outflows, and via declining prices for financial assets reduce rates of return – the so-called “asset market meltdown hypothesis”, see Poterba (2001) for a discussion. In this section I discuss these mechanisms and the meltdown hypothesis. I first present quantitative predictions for capital market inflows and outflows, then I turn to the effects on the rate of return, and finally, I discuss effects of pension reform on corporate governance and equity culture.

4.1 Capital market inflows and outflows

In order to quantify the macroeconomic effects of population aging and pension reform, Börsch-Supan, Heiss and Winter (2000) have developed a dynamic simulation model. This model is a version of the overlapping generations model as introduced by Auerbach and Kotlikoff (1987). Overlapping generations models have been used extensively to study the effects of population aging on social security systems, a purpose for which they are well suited since they are based on households' and firms' optimal reactions to movements in the demographic structure and public policy measures. The model by Börsch-Supan, Heiss and Winter (2000) is a very stylized representation of the real world in many respects, but it focuses on the first-order effects of demographic change on capital markets. In particular, demographic projections used in this 75-generation model are very detailed (these projections are based on Birg and Börsch-Supan, 1999).

Consider first the effects of a fundamental pension reform that freezes contribution rates to the public pay-as-you-go pension system at its current level. Per-capita savings would be substantially higher under such a reform than under the present system. For example, in the year 2035, when the peak of the aging problem occurs, per-capita savings are projected to be negative under the current pay-as-you-go system while they would be positive under a fundamental pension reform. These projections also suggest that optimal life-cycle behavior generates additional saving under a fundamental pension reform – it is not the case that additional retirement saving crowds out other saving totally, as often claimed. The projections by Börsch-Supan, Heiss, and Winter indicate a substitution of about one third, leaving two thirds to new saving. Figure 4 shows their projections for the aggregate saving rate, assuming a fundamental pension reform had been enacted in 1999. The reform scenario they use is deeper than the current reform, with 30 percent of retirement income coming from funded components after full implementation. This reform was suggested by Börsch-Supan (2002) as a feasible way to address the problems created by population aging. While the 2001 reform does not go that far, the future might well bring additional reforms that eventually amount to such a stylized reform.

Based on projections of individual savings decisions, one can compute the aggregate savings generated by pension reform. Figure 5 shows the accumulated contributions to private pension accounts in Germany. Here, the peak would be reached around the year 2030, with a balance of

roughly EUR 1,000 bn. held in private savings accounts. This would amount to a substantial fraction of the German economy's total capital stock. Projections of capital market inflows originating from the 2001 pension reform, as presented by Morgan Stanley (see Koenig and Mahnert, 2001), are shown in figure 6. Morgan Stanley predicts that inflows will be close to EUR 100 bn per year once the reform is fully phased in. The magnitudes of the projections by Börsch-Supan, Heiss, and Winter and Morgan Stanley are roughly comparable.

It has been argued – the so-called “asset market meltdown hypothesis” – that rates of return on capital will decrease substantially once the baby-boom cohorts retire; see Poterba (2001) for a summary of the discussion in the United States. The simulations by Börsch-Supan, Heiss and Winter (2000) suggest that the decrease in the rate of return on capital – the economic quantity that drives long-run returns on financial markets – is relatively small, probably less than one percentage point around the year 2050 when dissaving effects are to be strongest. Poterba comes to a similar conclusion using historical data for the United States; he could not find large effects of demographic structure on asset returns. Börsch-Supan, Heiss, and Winter also point out that the negative rate-of-return effect is primarily due to population aging and its effects on the capital-labor ratio, not so much due to pension reform. In other words, rates of return would fall even if the current pay-as-you-go pension system were maintained. Introducing a funded component exacerbates these effects, but the *additional* decrease caused by pension reform is of second order relative to the first-order effect from population aging.

Finally, traditional macroeconomic models of pension reform operate using the closed economy assumption. As Börsch-Supan, Ludwig and Winter (2002) argue, in a more realistic open-economy scenario, population aging generates international capital flows that will change rate-of-return predictions relative to a closed-economy model. While the patterns of population aging are similar in most countries, the timing differs substantially, in particular between industrialized and less developed countries. To the extent that capital is internationally mobile, population aging will therefore induce capital flows between countries. In order to quantify these effects, they develop a stylized multi-country overlapping generations model, and they use long-term demographic projections for several world regions to simulate international capital flows over a 50 year horizon. Their simulations suggest that capital flows from fast-aging industrial countries such as Germany to the rest of the world will be substantial. Since capital can flow to regions where rates of return

are relatively higher (because those regions still have more labor relative to capital than Germany), the decline in the rate of return will be smaller. Börsch-Supan, Ludwig and Winter (2002) conclude that closed-economy models of pension reform miss the effects of international capital mobility which are likely to be quantitatively important.

4.2 Corporate governance and equity culture

Population aging affects the rate of return on capital through its influence on the capital-labor ratio. A pension reform that involves more pre-funding also affects the rate of return primarily through its (additional) influence on the capital stock and the capital-labor ratio. Moreover, the additional savings induced by a fundamental pension reform influence the rate of return on capital via feedback effects from strengthened capital markets. It has been argued that as pension funds become more important in households' portfolios, the equity culture in Germany will improve, and more generally, that capital markets will be strengthened (see Deutsche Bank Research, 1996). In this section, I sketch the underlying mechanisms only briefly, for details see Börsch-Supan and Winter (2001).

As pointed out above, few households in Germany hold financial assets with at least some minimal ownership rights. These assets are highly concentrated among few households, in stark contrast to countries in which a substantial share of retirement income is financed through pension funds. A lack of relatively actively managed pension funds contributes to a financial system with diffuse control structures and weak corporate governance, which in turn results in low capital productivity relative to other countries (Börsch-Supan and Winter, 2001). Pension reform towards a higher degree of pre-funding can therefore strengthen corporate governance, increase capital productivity at constant or even increasing levels of labor productivity, and increase total factor productivity. Even if such productivity effects of a fundamental pension reform are small, they change the growth path of an economy and therefore have large effects in the long run.

Pension funds play only a minor role in the capital markets of continental European countries. As reported by the Bank for International Settlements (1998), in 1996 pension fund assets represented only 3 percent of total GDP in Germany and 4 percent in Italy, while in the U.S. and the U.K., the shares were 57 percent and 77 percent, respectively. A fundamental pension reform

would lead to a significant increase in the funds controlled by investment funds in Germany. Based on the theoretical and empirical findings about the link between active pension funds and firm performance (see Börsch-Supan and Winter, 2001), it is likely that an increase in the volume of equity controlled by pension funds has substantial effects on corporate governance in continental European countries. The basic theoretical argument has been made, for example, by Pound (1988): Institutional investors such as pension funds that have no business relations with a firm can do a better job in disciplining management.

Evaluating the effects of improved corporate governance on capital productivity is a difficult task given the absence of sufficient variation of institutional arrangements within a single country. International comparisons are one way to exploit variation in governance structures. Börsch-Supan (1998a) combines variation across countries and across companies, using data from company benchmarking studies by McKinsey Global Institute (1996) for West Germany, Japan and the United States. He estimates rates of return on investment and investigates the contribution of capital – more precisely, capital management and capital utilization – to total factor productivity. Notwithstanding substantial variation across companies and industries, the market sectors of West Germany and Japan had significantly lower rates of capital utilization in the early 1990s and created less productive capacity per unit of physical assets than the United States did. Börsch-Supan (1998a) shows that these low rates of capital utilization were only partially due to high labor costs relative to capital, leading to high capital intensity at short work hours. More important for the aggregate result of poor capital productivity were the many cases in which management did not focus on how productively they were using their assets. Conversely, a focus on financial performance, especially prevalent among U.S. firms, did create a clear performance objective that generally resulted in productivity improvements. Additional empirical results can be found in Hall and Jones (1999) and Mueller and Yurtoglu (2000).

Quantitative predictions using the macroeconomic model by Börsch-Supan, Heiss and Winter (2000) illustrate possible feedback effects of improvements in corporate governance and capital productivity on the rate of return on capital, and on pension reform in general. Suppose that after the implementation of a fundamental pension reform, the growth rate of total factor productivity increases by 0.2 percentage points for 15 years (i.e., the productivity effects induced by the reform are rather modest and only transient). Such an increase in the growth rate of total factor produc-

tivity raises the rate of return on capital temporarily, by about 0.2 percentage points around the year 2010. This result shows that feedback effects from capital markets are very powerful: By making everybody better off, they might address the problem of transitional burdens that arise during the introduction of a funded component. These benefits can change the welfare effects of a fundamental pension reform substantially. It is of course hard to predict the exact magnitude of productivity gains arising from improved corporate governance in Germany; see Börsch-Supan and Winter (2001) for a detailed discussion.

5. Conclusions

Population aging will change saving behavior, and pension reform – an ongoing process in the core European countries – will amplify these changes. Population aging will induce an increase in savings between 2015 and 2025. Saving rates will decline thereafter. Pension reform adds to the increase and dampens the decrease even though about one third of saving for retirement will displace other saving. A higher share of saving will flow through stock and bond markets, thereby changing the nature of the capital markets in countries where stock market capitalization is low and markets for non-government bonds are underdeveloped – notably in France, Germany and Italy. Finally, there is ample evidence that the size of capital markets and productivity growth are related. There is also reason to believe that larger capital markets and actively managed investment and pension funds enhance corporate governance.

There are many open questions. First of all, it is very difficult to predict the exact amount of net saving generated by the 2001 pension reform. While it is very likely that there will be high demand for the new products, these savings might just crowd out existing saving such as life insurance contracts or pre-Riester occupational pensions. It is hard to assess how large this crowding-out effect will be, but as Börsch-Supan (2002) argues, it might be substantial since the government still publishes overly optimistic projections of contribution rates to, and replacement rates of, the pay-as-you-go pension system (see also Schnabel, 2001). Thus, households' total saving (existing saving that is kept up, plus new saving in Riester products) might be less than actually required to close the old-age income gap. For the same reason, total saving might also be less than predicted by long-term forecasting models such as those reported in this paper, since these models assume

perfect information about future conditions, including retirement income obtained from the pay-as-you-go system.

For financial markets, one of the most important questions is: How will the new funds generated by the German pension reform be divided between stock and bond markets? Much of the discussion in this paper focused on simulations with very stylized models of pension reform. The 2001 pension reform in Germany is complicated by the fact that private pension products that qualify for government incentives (subsidies or tax credits) need to provide a nominal guarantee – that is, the provider must guarantee the nominal value of contributions. This restriction has substantial effects on asset management: providers won't be able to invest assets fully in the stock market as in a traditional Anglo-Saxon defined-contribution pension schemes. Rather, a substantial fraction of assets will have to be invested in bonds.

Also, it is as yet unclear how the market for private pension products will be divided among insurance firms, banks and pension funds. Currently, the key players in these markets enter into fierce competition for private pension savings, and the outcome of such a competitive process is hard to predict. Moreover, occupational pension plans are a potential substitute for private pension products (i.e., “Riester” products in the narrow sense) since they are eligible for similar subsidies or tax reliefs. Interestingly, these products are less tightly regulated, and assets can be more freely invested. It is unclear how the market for occupational pension schemes will be divided. Pension funds that try to enter the German market might find it easier to focus on this segment rather than facing the high distribution costs associated with Riester products.

Finally, many German firms have offered their employees occupational pension schemes in the past. Even though their role in the provision of retirement income has been small in Germany (less than 5 percent, compared with 25 percent in the United Kingdom and as much as 40 percent in the Netherlands), substantial funds have been accumulated. Most of these pre-Riester occupational pension assets are in the form of direct commitments – that is, they appear as book reserves in firms' balance sheets and are not invested in the stock market.⁷ In the past, these book reserves have been useful as sources for internal financing of investments, but many firms are now eager to

move these funds out of their books and invest them in the stock market (in order to improve risk diversification, for instance). While progress is slow due to complicated tax issues related to the valuation of book reserves, active management of these funds might open up another interesting market for pension funds in Germany.

In any case, a fundamental pension reform that involves a shift towards more pre-funding of retirement income such as the 2001 reform in Germany will strengthen capital markets. Since the 2001 reform will most likely be followed by similar reforms in the future, stock and bond markets will continue to benefit from sizeable inflows of new capital from private and occupational pension provision for the next two or three decades.

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⁷ The share of direct commitments in total assets held in occupational pension schemes was 57 percent in 1998. Of the remainder, 13 percent were held via direct insurance, 22 percent in narrow-sense pension funds, and 8 percent came in the form of support funds (*Unterstützungskassen*).

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Table 1: The future of pay-as-you-go pension systems

| | 1995 | 2010 | 2030 |
|--|--------------------|-------------|-------------|
| France | | | |
| Pension expenditures (percent of GDP) | 12.5 | 12.6 | 19.4 |
| Equilibrium contribution rate (percent of wage bill) | 24.3 | 24.4 | 37.7 |
| Fiscal deficit (percent of wage bill) | 0.5 | 0.6 | 100.5 |
| Germany | | | |
| Pension expenditures (percent of GDP) | 10.0 | 11.0 | 18.4 |
| Equilibrium contribution rate (percent of wage bill) | 22.6 | 24.7 | 41.1 |
| Fiscal deficit (percent of wage bill) | (1.1) ^a | 8.8 | 115.6 |
| Italy | | | |
| Pension expenditures (percent of GDP) | 16.0 | 15.2 | 23.3 |
| Equilibrium contribution rate (percent of wage bill) | 42.6 | 40.4 | 61.9 |
| Fiscal deficit (percent of wage bill) | 0 | 29.9 | 186.8 |

Notes: The equilibrium contribution rate is the percent of the wage bill required if the increase in pension expenditures is financed by contributions only. The fiscal deficit is the percent of the wage bill arising if the increase in pension expenditures is financed by debt only. a) Surplus.

Source: Chand and Jaeger (1996).

Table 2: Capital market features, 1996

| | Pay-as-you-go systems | | | Partially funded systems | | |
|--|------------------------------|----------------|--------------|---------------------------------|-----------|-----------|
| | France | Germany | Italy | Netherlands | UK | US |
| Share of stocks held by households and institutional investors (percent) ^a | 6.5 | 11.4 | 8.3 | . | 59.8 | 43.4 |
| Share of pension funds (percent of household assets) ^b | 3 | 2 | 2 | . | 25 | 20 |
| Stock market capitalization (percent of GDP) ^c | 26.3 | 22.9 | 21.4 | 96.5 | 87.0 | 55.1 |
| Size of pension funds (percent of GDP) ^b | 5.6 | 3 | 4 | 92 | 77 | 62 |
| Size of pension funds (billion USD) ^b | . | 65 | 43 | 363 | 897 | 4,752 |

Sources: a) OECD Financial Accounts; b) Bank for International Settlements (1998), Table V.5. c) World Bank, 1998, Table 5.2;

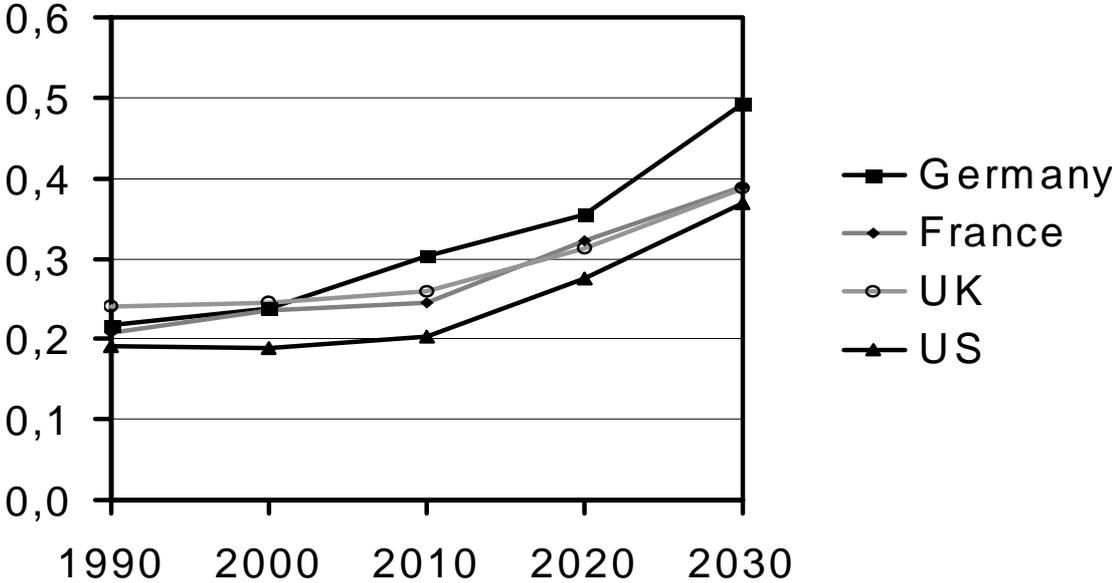
Table 3: Financial asset shares based on national account data

| | 1975 | 1980 | 1985 | 1990 | 1992 | 1997 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|
| Checking, deposit, and savings accounts | 51.6 | 46.7 | 39.6 | 37.1 | 35.4 | 33.6 |
| Building society savings contracts | 7.8 | 7.3 | 5.5 | 4.1 | 3.7 | 3.4 |
| Stocks, bonds, mutual funds on stocks and bonds and other financial assets | 27.4 | 31.7 | 38.5 | 40.4 | 42.5 | 40.5 |
| Insurance and pension wealth | 13.2 | 14.5 | 16.3 | 18.6 | 18.6 | 22.5 |

Note: Figures are based on national account data. 1975-1992: West Germany, 1997: Germany.

Sources: Deutsche Bundesbank, Börsch-Supan and Essig (2002a).

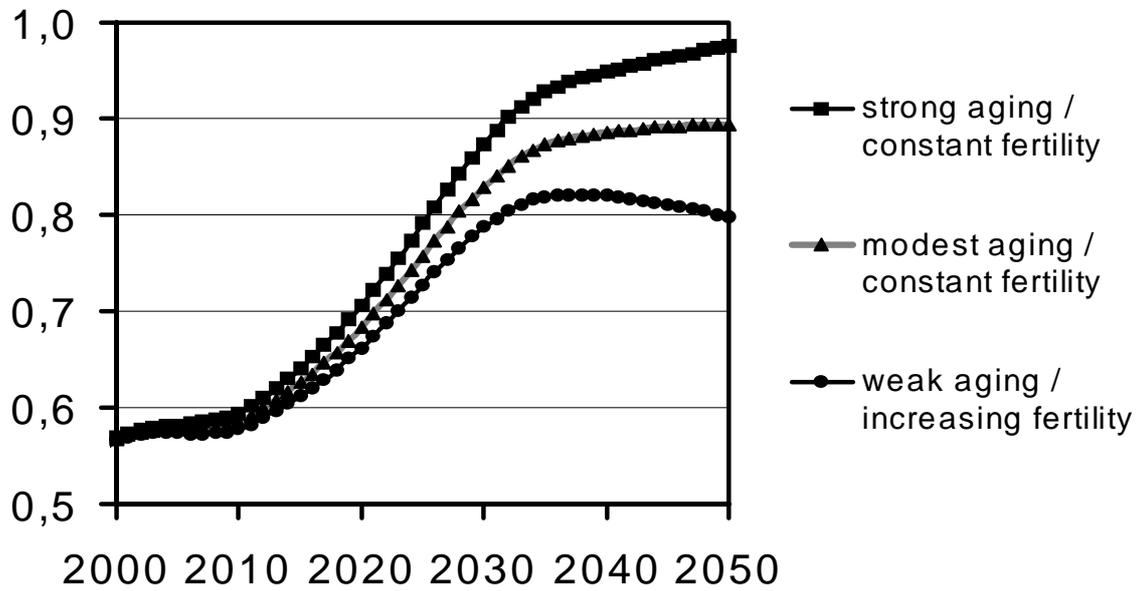
Figure 1: Old-age dependency ratios in four OECD countries



Note: The old-age dependency ratio is defined as the number of persons aged 65 and older and of the number of persons between ages 20 and 64.

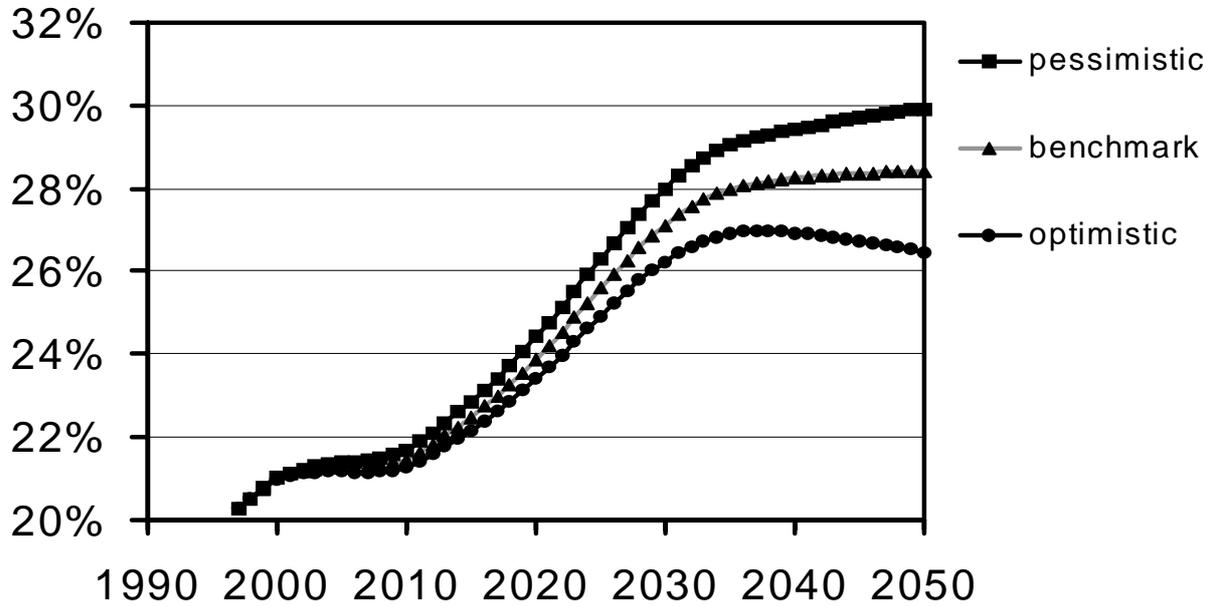
Source: OECD (1996).

Figure 2: Number of pensioners per worker in Germany



Source: Börsch-Supan and Birg (1999).

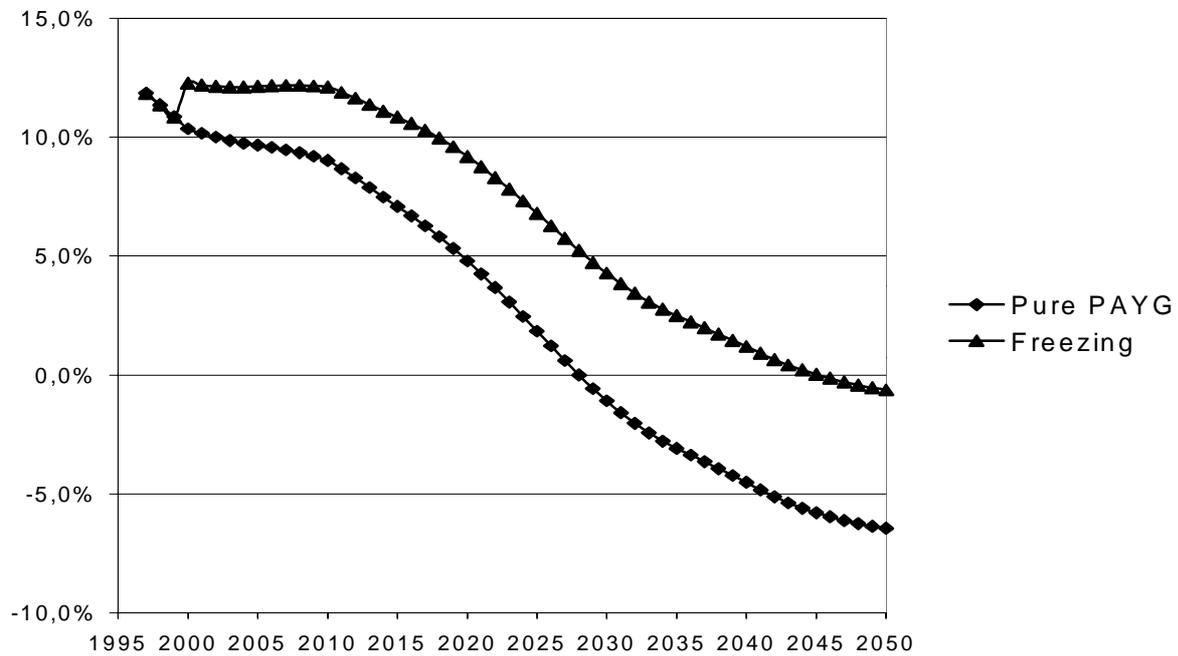
Figure 3: Contribution rates to the pay-as-you-go pension system in Germany



Note: The three lines represent alternative demographic scenarios.

Source: Börsch-Supan and Birg (1999).

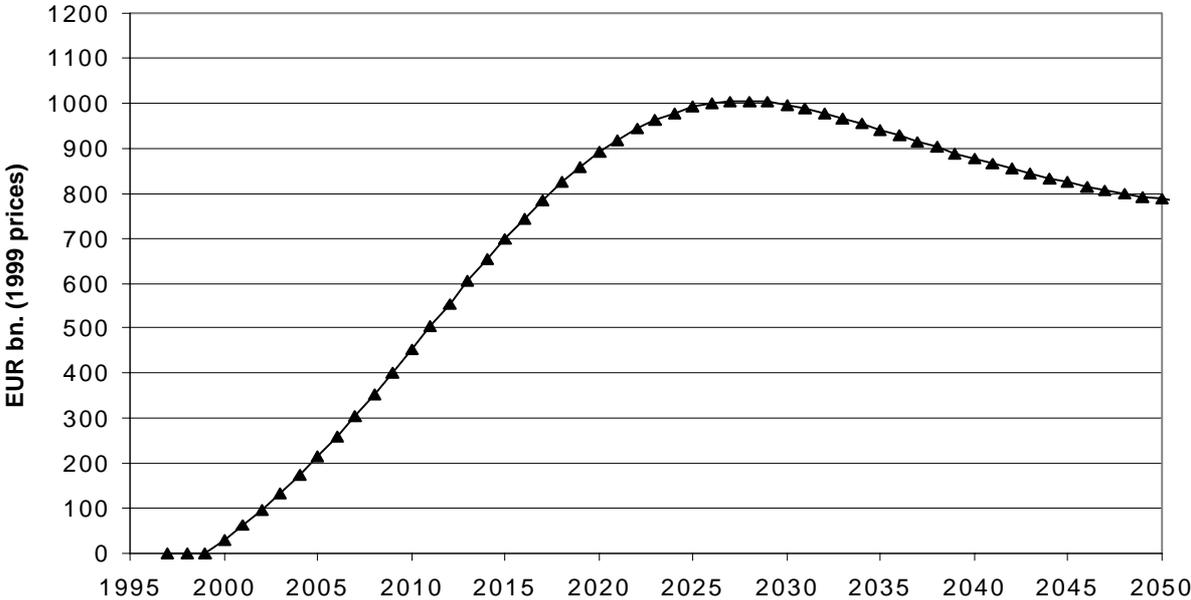
Figure 4: Projections of the aggregate saving rate under alternative pension systems



Note: This figure shows projections of the aggregate saving rate derived from an overlapping generations model under benchmark assumptions for demographic change, and for alternative pension systems. The top line is obtained assuming pension reform following the scheme suggested by Börsch-Supan (2002), with hypothetical reform measures beginning in 1999; the bottom line assumes that a pure pay-as-you-go system is maintained.

Source: Börsch-Supan, Heiss and Winter (2000).

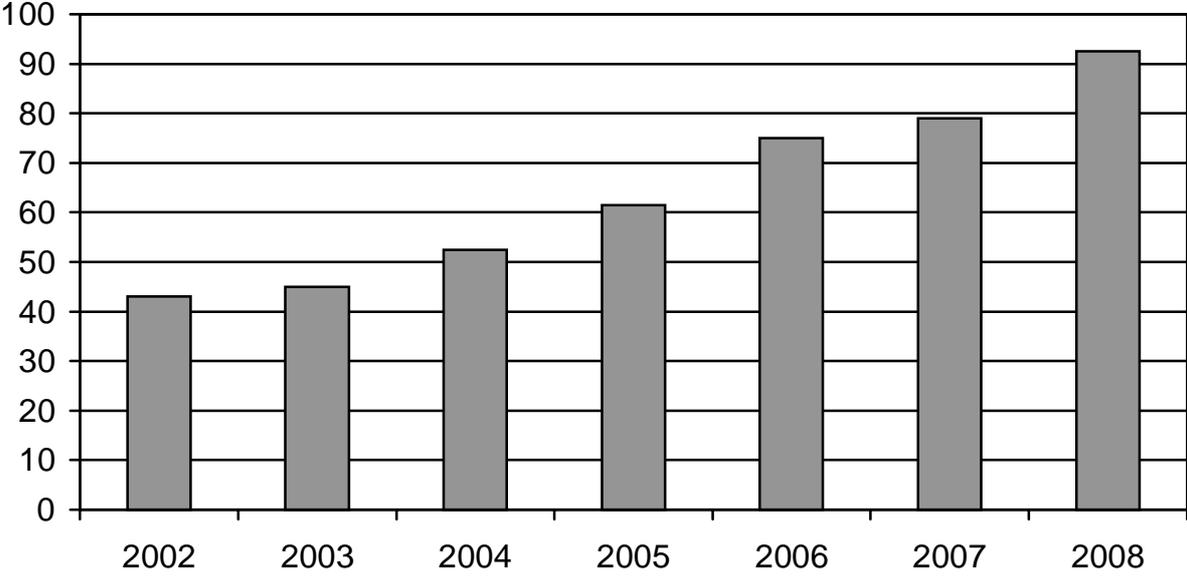
Figure 5: Projection of assets in private pension accounts under a fundamental reform



Note: This figure shows projections of assets held in private pension accounts after a fundamental pension reform following the scheme suggested by Börsch-Supan (2002), with hypothetical reform measures beginning in 1999.

Source: Börsch-Supan, Heiss and Winter (2000).

Figure 6: Capital market inflow generated by Germany's pension reform (EUR bn)



Source: Koenig and Mahnert (2001).