# Why it is Possible that Wages and Pensions Can Increase Simultaneously in an Aging and Stagnating Economy

Kesting, Peter




# Why it is Possible that Wages and Pensions Can Increase Simultaneously in an Aging and Stagnating Economy

| | |
|---|---|
| Journal: | *Applied Economics* |
| Manuscript ID: | APE-06-0046.R1 |
| Journal Selection: | Applied Economics |
| Date Submitted by the Author: | 01-Aug-2007 |
| Complete List of Authors: | Kesting, Peter; Leipzig Graduate School of Management, Department of Microeconomics |
| JEL Code: | J11 - Demographic Trends and Forecasts < J1 - Demographic Economics < J - Labor and Demographic Economics, J14 - Economics of the Elderly < J1 - Demographic Economics < J - Labor and Demographic Economics |
| Keywords: | |
| | |

# Why it is Possible that Wages and Pensions Can Increase Simultaneously in an Aging and Stagnating Economy

## A theoretical investigation and a simulation of the German case

*Peter Kesting*[*]

**Abstract:** This paper investigates the possibilities and restrictions of intergenerational income development for aging and stagnating economies.

In a first step, the basic logic of aging will be investigated in a simple dynamic model. In particular, the investigation points out the existence of the *demographic distribution mass* and its meaning for intergenerational income development. It proves that the demographic distribution mass makes it possible for wages and pensions to grow *simultaneously* in an aging and stagnating economy.

In a second step, the development of wages and pensions is simulated for the German case through to the year 2050. It is demonstrated that (under normal circumstances) it can be expected that the burden from aging can almost always be overcompensated by the economic growth of the respective year. Against this background, aging appears to be rather a problem of acceptance and income distribution than of real income reductions.

**Keywords:** Aging, pension, demographic distribution mass, intergenerational income distribution.

**JEL-Classification:** H 00, H 55

* Reader (Privatdozent) at the HHL-Leipzig Graduate School of Management, Department of Microeconomics and Information Systems, Jahnallee 59, 04109 Leipzig, Germany, email: kesting@microec.hhl.de.

# Why it is Possible that Wages and Pensions Can Increase Simultaneously in an Aging and Stagnating Economy[1]

**A theoretical investigation and a simulation of the German case**

## 1. INTRODUCTION

Like many other OECD countries, the German society is expected to age significantly over the coming decades. And like in many other OECD countries, there is currently an intensive discussion in Germany about how to cope with the increasing burden that follows from this aging. Specifically, in the German case, the general perception of the problem appears to be about the following:

Currently, the German pension system is dominated by a public so-called 'pay-as-you-go' system: The pensions of year *X* are (almost) completely financed by transfers raised from the active population in that very year (Homburg 2000, Börsch-Supan/Wilke 2004). Hence, the system mostly consists of intergenerational income redistribution and not of capital accumulation. Moreover, since 1957 the German

[1] I am grateful to Inga Schroeder, Stefanie Thiel, Rolf Johannes, the audience of the HHL-colloquium and the anonymous reviewers of this Journal for useful comments that have helped me to improve the quality of the paper significantly. However, the responsibility for any errors or omissions rests with the author.

pension system has become dynamic as it ties the development of pensions to the development of the active population's average income (Steffen 2002). As a consequence, there is a broad apprehension within the German society that keeping the existing pension system running unchanged would increase the burden on the active population so much that it would have to suffer real income losses, particularly in the 'aging peak,' which is to be expected in the 2030s (Börsch-Supan/Schnabel 1998). This increasing burden would not only harm domestic demand, but moreover choke the active population and force it into the black economy (or abroad) to a considerable extent. All of this would have a negative effect on the economic dynamics and finally 'ruin' the German economy.[2] As a result, the word of a 'pension crisis' have spread.[3]

Following, the entire German pension system was put to the test (Siddiqui 1997, Schmähl 2000, Börsch-Supan 2000a, Homburg 2000, Bonin 2002, Börsch-Supan 2002).[4] In particular, there was a strong demand to move (at least partially) away from the old system and turn towards a private, capital-based pension system.[5] These political discussions in Germany (and other countries) were accompanied by

[2] *Financial Times* Germany, November 19, 2002.

[3] According to Hans Werner Sinn, President of the IFO Institute in an interview on June 15, 2005, available under http://www.finanznachrichten.de/nachrichten-2005-06/artikel-4945149.asp.

[4] For instance, the internet pages of the German Social Democratic Party, SPD, read: "The aging structure of the population in the Federal Republic is going through a dramatic process of change: There are increasingly more old and increasingly less young people…In the face of such changes, the pension system must be re-adjusted to maintain its effectiveness."

[5] One step in this direction, which has already been realized, is the so called 'Riester Rente' based on the *Gesetz über die zusätzliche private Altersvorsorge* , which became effective on January 1, 2002.

an intensive research on pensions. One important stream of this research was a comparison of the existing public pay-as-you-go system with different types of private, capital-based pension systems (Homburg 2000, Thøgersen 2001, Karayel 2006). In particular, there were (comparative) investigations about the meaning of different pension regimes for capital markets (Lavi/Spivak 1999, Winter 2002), domestic investment, domestic demand and economic growth (Börsch-Supan 1995, Börsch-Supan 1999) as well as on individual returns (Schnabel 1998). In addition to this, there was an intensive discussion about the consequences of a transformation from one system to the other (Börsch-Supan 2000b). It soon became clear that a transformation from a pay-as-you-go system to a capital-based pension system would burden the respective generation with both the duties of the old system and the provision for its own pension. In connection with this, the phrase 'the sandwich generation' was coined (Raphael/Schlesinger 1994).[6] As an alternative, the Swiss model and the meaning of corporate pensions also received some attention (Bütler 1999).

However, in all these discussions, one effect has been completely overlooked: This effect is fairly well known in statistics, but its meaning has never been investigated for aging societies. The effect is of importance for aging, since it produces an 'unbounded' income, ready to be distributed among the generations. In this paper, we refer to this unbounded income as *demographic distribution mass*.

This paper departs from the origin of all current problems: The income development of the generations as a whole. The particular aim of this paper is to

[6] For the German discussion see, for example, the article in the *Frankfurter Allgemeine Zeitung*, April 28, 2003

investigate the meaning of the demographic distribution mass for the income development in an aging and stagnating economy. The argumentation of this paper proceeds in two steps:

The first step is focused on the theoretical elaboration of the effect. For practical reasons, this analysis is not based on an OLG model, which currently dominates research on pensions, but instead on a continuous dynamic model. The main result of the theoretical part is to proof that it is indeed possible for both pensions and wages to grow *simultaneously* in an aging *and* stagnating society. However, this result is based on the assumption of a dynamic pension system, in that the development of pensions is tied to the development of net wages. Following this, selected alternative pension formulas are investigated. It is shown that these alternative formulas always lead to absolute income reductions for one of the respective generations in the course of aging.

As a result, it becomes clear from the theoretical part of this paper that the possibilities and restrictions of income development in an aging society are mainly determined by two opposing forces: Technical progress on the one hand and aging on the other. Subsequently, the question arises; how do these two opposing forces relate in the real world and, as a consequence, how relevant is the statement that both – pensions and wages – can grow simultaneously in an aging and stagnating society? What meaning does the demographic distribution mass have for real aging processes? These questions will be answered in a second step exemplarily for the case of the intergenerational income development in Germany from the present through to 2050 (including the 'aging wave' of the 2030s). As a result of the simulation, it can be shown that the burden from increasing pensions alone is of

rather minor importance for German income development. Even under very conservative assumptions, it is not to be expected that aging alone will ever make significant income reductions for one of the generations (or both) necessary - not even at the peak of the aging wave. On the contrary, the simulation shows that incomes can remain stable, even in a contracting economy, as long as the GDP does not *de*crease by more than 0.45% on average.

Note that the analysis of this paper *only* concerns different possibilities of income development for the two respective groups, the active population (meaning people actively contributing to the pension system) and pensioners *as a whole*. This means: The analysis does *not* take any income differences within the generations into consideration and it does *not* investigate the income development of other groups, such as the unemployed or children. Additionally, this paper does *not* contain information on how to reach identified income paths, but rather which income paths are *possible* for a given development of GDP and a given aging process. Although it might appear so at the first glance, this paper does *not* introduce any production or growth theory and takes no account of the capital side. As a result, it assumes increases in labour productivity as externally given, coming out of a 'black box.' Finally, the paper does not refer to how the different intergenerational income developments are *realised*, but only which different intergenerational income developments are *possible*. Hence, there is nothing to find about particular pension systems, about public or private, pay-as-you-go or capital-based pensions. This procedure follows the insight that *ultimately* the pensions paid in period *t* are always and completely part of the GDP of this very period. With respect to the question of how much pension is to be paid in t, this is always a matter of distribution of this

very GDP, independent of how this distribution is arranged.[7]

## 2. THE MODEL

The following model is designed to represent the 'stylised' characteristics of an aging and stagnating economy. For simplification, we assume that the total population of the modelled society, $B_t$, is constant over time (in fact, the population in Germany and a couple of other OECD-countries is actually decreasing):

$$B_t = \overline{B}. \tag{1}$$

To focus the analysis on the development of wages, pensions and pension efforts in the course of aging, we will additionally assume that the total population of the modelled society consists of only two different income groups: Firstly, a certain number of $W_t$ identical workers and secondly, a certain number of $P_t$ identical pensioners at every point in time:[8]

[7] This insight has already been recognised by Mackenroth (1952). Of course, this does not mean that we can neglect the fact that the institutional arrangement of pensions has various effects – not only on income distribution, but also on economic growth and, thus, the size of the cake to distribute. For the discussion of the Mackenroth hypothesis see also Feldstein (1977), Schmähl (1981) and Homburg (1988).

[8] This implies that all other income groups, in particular unemployed and children, do not exist in our model world. As explained above, this simplification serves the purpose to focus the investigation on the development of the two remaining income groups – workers and pensioners – in the aging process. However, it should be mentioned that the *Statistisches Bundesamt* forecasts a decrease in the number

Deleted: -

(2) $$\overline{B} = W_t + P_t .$$

The gross output of the economy is entirely produced by the workers and will be completely (and equally) distributed among them, so that their gross income per-capita in t is $Y_t / W_t$. All pensioners receive an equal per-capita pension of $p_t$. These pensions consist entirely of transfers, which are equally subtracted from the gross income of the workers. Correspondingly, the (gross) output of the economy $Y_t$ is distributed as:

(3) $$Y_t = w_t W_t + p_t P_t .$$

In this equation, $w_t$ represents the workers' net wages per capita in t, consisting of the gross income minus the pension transfers. Consequently, the per capita pension transfers $r_t$ are:

(4) $$r_t = \frac{p_t P_t}{W_t} .$$

Wages, as well as pensions (per capita), are not assumed to be constant, but rather to change in the course of the aging process. To begin with, we will assume that both incomes do not develop independently of each other, but in the fixed ratio:

(5) $$\frac{p_t}{w_t} = \lambda .$$

---

of young people – a development, which, of course, only causes the entire process of aging. This development, again, has a relieving effect on the financial burden of the active population.

This is the case of a *dynamic pension system* in that (corresponding to the public pension system in Germany) the development of pensions is linked to the development of (net) wages.

We will model the aging process of the society as a decrease in the number of workers with a constant rate θ (but decreasing absolute number) over time:

(6) $$\frac{\partial W_t}{\partial t} = -\theta W_t .$$

The number of workers in *t* is then:

(6a) $$W_t = W_0 e^{-\theta t} .$$

Consequently (still holding the assumption of a constant population), the number of pensioners increases relatively to that of workers in the course of time, but with a decreasing rate. In *t*, the ratio between pensioners and workers is:

(6b) $$\frac{P_t}{W_t} = \frac{\overline{B}}{W_0 e^{-\theta t}} - 1 .$$

Figure 1 schematically depicts the aging process of the modelled society:

FIGURE 1: SET HERE

Furthermore, we assume the existence of a labour augmenting technical progress.[9] This technical progress is modelled as a constant increase of the number of *efficiency units* per worker $l_t$ in the course of time with a rate of $\gamma$ (it is assumed that the working hours per capita remain constant over time):

(7) $$\frac{\partial l_t}{\partial t} = \gamma l_t .$$

The number of efficiency units per worker in *t* is then:

(7a) $$l_t = l_0 \, e^{\gamma t} .$$

The efficiency units are nominated so that with one efficiency unit of labour exactly one unit of output can be produced: $l_t = \breve{y}_t$ ($\breve{y}_t$ denotes the potential per capita output in *t*). Hence, the development of the gross production potential of the economy $\breve{Y}$ is determined by two opposing forces: The increasing labour productivity and the decreasing number of workers:

(8) $$\breve{Y}_t = \breve{y}_t W_t = l_t W_t .$$

As a result of (6) and (7), the development of the production potential follows the path:

[9] Note that technical progress is a precondition for the stagnation of an aging economy. Without technical progress, any aging economy would be contracting. I will address this point later.

(9) $$\frac{\partial \breve{Y}_t}{\partial t} = l_t W_t \gamma + l_t W_t (-\theta) = \breve{Y}(\gamma - \theta) .$$

Finally, we will assume full employment, which means nothing more than that the actual gross product of the economy equals the production potential for every *t*:[10]

(10) $$Y_t = \breve{Y}_t .$$

It follows that also the development of the economy's gross product is determined by the interplay of technical progress - the increase of labour productivity - on the one hand, and the aging process - the decrease of the numbers of workers - on the other. According to (9), three cases can be distinguished:

(a) In the case $|\gamma| = |\theta|$, both determinants cancel each other out exactly so that the total output remains constant over time: The economic development of the country 'stagnates'.

(b) In the case $|\gamma| > |\theta|$, the decrease of the number of workers is overcompensated by the increase of productivity and the total output increases in the course of time.

(c) On the contrary, in the case $|\gamma| < |\theta|$, the total output of the economy decreases.

For the time being, we want to turn to case (a) and to investigate the scenario of a

[10] This assumption might appear a little heroic for Germany and many other OECD-countries and requires some justification. Primarily it is just another simplification, which spares the necessity of an independent explanation for the development of the economy's gross product (beyond the neoclassical equilibrium framework). However, most of all, this assumption can be justified because it isolates the income effect of aging from effects that result from a change of unemployment in the economy.

stagnating economy. It becomes clear from the simulation below that this case comes quite close to the expectations for the development of Germany through to the year 2050. However, it must be emphasised that the basic results of this theoretical part of the paper - the existence and the meaning of the demographic distribution mass - do not depend on this assumption. Additionally, this assumption supports the analysis, as it isolates aging from growth and focuses the analysis on the relevant processes. However, this assumption will be relaxed at the end of the theoretical analysis and in particular later in the simulation of the German case.

**Analysis of the Income Development in an Aging, Stagnating Economy, Retaining the Dynamic Pension**

Let us first turn to the development of (net) wages in our model. This development is obviously a result of the interplay of two different factors: Firstly, an increase of the gross income in the result of increasing labour productivity and secondly, an increase of pension transfers in the result of aging. The question is, how these two factors combine and how - as a consequence - the per capita (net) wages of the workers will develop in the course of time. According to (3), the per capita net wages in $t$ are:

(11) $$w_t = \frac{Y - P_t p_t}{W_t}.$$

Because of (2) and (5), (11) can be transformed to:

(12) $$w_t = \frac{Y}{W_t + \lambda B_t - \lambda W_t} \ .$$

The derivation of the wage with respect to *t* is:

(13) $$\frac{\partial w_t}{\partial t} = \frac{Y(1-\lambda)W_t\theta}{(W_t + \lambda B_t - \lambda W_t)^2} \ .$$

Because of (2) and (12), (13) can finally be transformed to:

(14) $$\frac{\partial w_t}{\partial t} = \theta \frac{(1-\lambda)W_t}{W_t + \lambda P_t} w_t \ .$$

Equation (14) describes the development of the per capita (net) wages in the course of time. It is obvious that under normal conditions (i.e. when $\gamma$, $W_t$, $w_t > 0$ and $0 < \lambda < 1$) this term is positive, which means nothing more than that the net wages will increase in the course of time. However, because of (5) this means nothing more than that pensions will also increase. *Consequently, it is indeed possible that in an aging and stagnating economy with a constant population, all incomes - wages as well as pensions - can simultaneously increase over the course of time*.

How do we come to this result; how is it possible that wages *and* pensions can *both* increase simultaneously, although the gross product as well as the population of this economy remains constant? The reason for this is an effect, which is fairly well known in statistics, but which, so far, has never been applied to the investigation of aging. In fact, even in our model, one group of the economy has to put up with a *de*creasing income. This group consist of all workers, who additionally become

pensioners in the course of aging, i.e. $\theta W_t$ persons per period. As a consequence, a residual income of $\theta W_t(w_t-p_t)$ emerges, which can be distributed among the different income groups of the economy - in our model for the time being according to the algorithm of the dynamic pension. In the following, we will label this residual income as *demographic distribution mass*. However, it must be emphasised that this effect *only* holds for an aging society. In a rejuvenating society we would observe the opposite effect: The demographic distribution mass would become negative and incomes would decrease in the case of stagnation.

However, this mechanism should not belie the fact that aging always brings about financial burdens for at least one generation. In the assumed scenario of a dynamic pension, this burden materialises in a continuous increase of the pension ratio. The crucial thing is that this rate lies below the increase of the (per capita) gross income and provides room for net income growth. Hence, $0 < \frac{(1-\lambda)W_t}{W_t + \lambda P_t} < 1$ if $0 < \lambda < 1$ and so both wages and pensions can increase simultaneously. As a matter of fact, this net income growth is below the productivity growth: A growth, which could be realised for the wages, if there were no aging (of course, in this case the entire economy would grow).

One important implication of this result is that it is possible that both wages and pensions can increase simultaneously even in the *third* of the above cases – the contracting economy, in that $|\gamma| < |\theta|$ and the gross product of the economy *de*creases. The critical borderline for income growth in this economy is at the point where wages and pensions are constant over time. In this case, the gross product is:

(15) $$Y_t = \overline{w} W_t + \overline{p} P_t$$

and the growth rate of the economy's gross output is:

(16) $$\ddot{Y}_t = \frac{\frac{\partial Y}{\partial t}}{Y} = \frac{(\overline{p} - \overline{w}) W_t}{Y_t} \theta .$$

Given that θ, $W_t > 0$, this growth rate is negative, as long as wages exceed pensions (per capita) and the more negative, the larger the difference between these two incomes is.[11] *This means nothing more than that even in a contracting economy with a constant population it is possible that wages and pensions increase simultaneously in the long run* - of course only when the economy's population is aging, i.e. when the number of workers decreases relative to that of pensioners.

However, the dynamic pension is rather a German specific and even in this case it is fundamentally questioned in the current discussion. Hence, in the following we investigate the effect of three alternative pension formulas: (I) a determination of the pension ratio, (II) a determination of the (absolute) amount of per capita pension transfers, and (III) a linking of the pension to the gross income.

**Discussion of the Effect of a Change in the Pension Formula**

(I) The current German discussion is dominated by the demand to keep the contribution ratio – i.e. the part of the gross income, which every worker contributes

[11] However, $|\ddot{Y}_t|$ (ceteris paribus) decreases in the course of time.

to the pension system - constant and to opt out of the dynamic pension system for good. In fact, every increase in the contribution ratio leads to an intensive media-discussion, which puts serious pressure on the Federal Government.[12] In the following we will first investigate how the fixing of a particular contribution ratio will affect the income development in our stagnating model economy with a constant population.[13] Therefore, we assume that:

$$\sigma = \frac{p_t P_t}{Y} \quad \Leftrightarrow \quad p_t = \sigma \frac{Y}{P_t}, \tag{17}$$

where σ denotes the (fixed) contribution ratio. In the stagnating economy (with |γ| = |θ|), the gross pension revenue is constant due to the fact that the decrease in the number of workers exactly equals the per capita increase in the gross income. The derivation of $p_t$ with respect to $t$ is:

$$\frac{\partial p_t}{\partial t} = -\theta \frac{\sigma Y W_t}{P_t^2}, \tag{18}$$

which is negative under normal conditions (i.e. when θ, σ, Y, $W_t$, $P_t$ >0). According to (3) and (17), the wages are now:

[12] For instance, an article in the *Frankfurter Allgemeinen Zeitung* from November 6, 2002 reads: "The President of the Confederation of German Employer's Association (BDA), Dieter Hundt characterized the plans of the governing coalition to increase pension duties as an additional blow against growth and employment policy. 'These plans are a fatal consequences of a misguided economic and social policy and of insufficient reforms of the pension system.'…" (own translation).

[13] We still assume that the 'contribution ratio' represents all transfers from the active to the inactive

(19) $$w_t = \frac{Y - \sigma Y}{W_t}$$

and the derivation of $w_t$ with respect to $t$ is:

(20) $$\frac{\partial w_t}{\partial t} = \theta w_t ,$$

which means that – still holding the assumption of a stagnating economy – wages increase at exactly the same rate as labour productivity. However, this means nothing more than that in the case of a constant contribution ratio, the workers can enjoy the fruits of technical progress without any restriction. Due to the fact that the number of pensioners is increasing (while the gross pension revenue remains constant over time), there is a decrease in per capita pensions in the course of aging. Consequently, fixing the contribution ratio results in loading the burden of aging on to the pensioners.

(II) The result is even more distinctive in the case where the per capita pension transfer of the workers (in absolute terms) is fixed instead of the contribution ratio. This is the case, when:

(21) $$r = \frac{p_t P_t}{W_t} \quad \Leftrightarrow \quad p_t = r \frac{W_t}{P_t} ,$$

where r denotes the (fixed) per capita transfer. Since the numerator decreases in equation (21) while it is constant in equation (17), it follows (not very surprisingly)

generation.

that in scenario (II) $p_t$ decreases even stronger in the course of time than in (I). However, of particular interest are the wages: These do not only increase with the rate of the technical progress, but even more so than with the rate:

(24) $$\frac{\partial w_t}{\partial t} = \theta(w_t + r)$$

*As a result of a determination of the per capita pension transfer, the workers do not only enjoy the increase in labour productivity completely; moreover, the entire demographic distribution mass will also be distributed among them.*

(III) It is easy to comprehend that, in contrast to (I) and (II), a dynamic linking of the pension to the development of the (per capita) gross income leads to an increase in pensions with the rate of the technical progress. In this case, wages will decrease, as long as $W_t/B_t > p_t/w_t$.

Finally, it becomes clear that only one of the investigated pension formulas results in both a wage and pension increase simultaneously in an aging and stagnating economy (although at the price of an increasing pension ratio): The dynamic pension, which is linked to the development of the (net) wages. All other investigated formulas cause one of the respective income groups to be burdened with absolute income losses in the course of time.

So far, we have concentrated on the theoretical framework. In the following, we now turn to the German case and investigate the expectations for the income development in this particular country.

## 3 SIMULATION OF THE INCOME DEVELOPMENT IN GERMANY THROUGH TO THE YEAR 2050

Up until now, only a theoretical possibility has been expounded. But how relevant is this possibility to understand the real development in aging societies? What meaning does the demographic distribution mass have there? The answer to these questions obviously depends mainly on two developments: Technical progress on the one hand and aging on the other. In the end, whether the theoretical possibility of increasing wages and pensions in an aging and stagnating economy becomes real, merely depends on which of the developments actually predominates in the country. Consequently, the following simulation is based on assumptions about the development of labour productivity on the one hand and about the demographic development in Germany through to the year 2050 on the other.

However, by now it is impossible to give a reliable prediction for the development of the labour productivity for longer periods. Thus, we have to take a look at the past. Figure 2 shows the development of the labour productivity (per working hour) for the *Alte Länder* (the Federal Republic of Germany before unification) from 1971 to 1991 and unified Germany from 1991 through to 2001:

FIGURE 2: SET HERE

For this time period, the following developments can be recognised: Throughout the entire period between 1971 and 2001, the labour productivity (per working hour)

constantly increased by rates between 0.5% and 5.2%. The average increase was 2.8%, although it slightly reduced over the course of time - in Germany (1991-2001) the average increase of labour productivity was only about 2.0%.

In contrast to the development of labour productivity, the demographic development in Germany can be predicted very accurately. In its forecast, the *Statistisches Bundesamt* distinguishes between two different scenarios: The development of a long-term net immigration of +100,000 people per year and that of a long term net immigration of +200,000 people per year. Since the retirement age is also relevant for the analysis of the development of the different income groups, we will additionally distinguish between the following two scenarios: An average retirement age of 60 and one of 65.

In all these different scenarios, the total population and the number of workers tend to decrease and that of the pensioners to increase: Consequently, in all different scenarios, the German society is aging. The extent and course of this aging process becomes particularly clear from a view of the age-ratio: The age-ratio records how many pensioners have to be supported on average by one worker and thus gives a clue as to the burden of the active part of a society (i.e. a pension ratio of 0.4 means that on average, one worker has to support 0.4 pensioners).

FIGURE 3: SET HERE

Figure 3 particularly highlights the strong increase in the age-ratio - the demographic turn - which will reach its peak (depending on the scenario) in about twenty to thirty

years and whose existence is one important reason for the current debates in Germany.

It can also be recognised in figure 3 that a high immigration number and a late retirement age mostly just delay aging and only marginally diminish it: For both scenarios, the *Statistisches Bundesamt* forecasts a doubling of the age-ratio until the year 2050, although on a significantly higher level with an annual immigration of +100,000 per year and a retirement age of 60: In this case, the age-ratio increases from about 0.4 in 1999 to about 0.8 in 2050, whereas it only increases from about 0.25 in 1999 to about 0.5 in 2050 with an annual immigration of +200,000 per year and a retirement age of 65.[14]

**First Scenario: Annual Net Immigration of +100,000 People Per Year and a Retirement Age of 60**

In the first scenario, we are going to simulate the most 'pessimistic' forecast, where the aging of the German society progresses most steeply and on the highest level. For the time being, we will additionally stick to the assumption of a dynamic pension system, where the pension development is tied to that of net wages. The question is, if and to what extent it is possible for wages and pensions to increase simultaneously in the German case. The continuous line in figure 4 shows the (identical)

[14] To isolate the intergenerational income development and that of the demographic distribution mass, we will exclude all people below the age of twenty from the simulation: As in the theoretical part, the total population consists only of those people aged twenty or over. However, all changes in this 'total population' through to 2050 will be completely taken into account, i.e. the above assumption of a

development of wages and pensions with an assumed continuous increase of labour productivity by 1% per annum:

FIGURE 4: SET HERE

It is clearly recognisable that even in this most pessimistic of all scenarios, wages and pensions almost always (both) increase over the entire time period (on average by about 0.62% per annum). The pattern of this increase is hardly surprising: It pretty well mirrors the demographic development. More surprising, however, is the extent of this growth: Even the increase in the aging-ratio by about 3.5% in 2024 leads to almost no decrease in incomes. In the year 1999, an increase in the aging-ratio by 3.7% is even accompanied by an *increase* in incomes by 0.2 % - and all this based on a (constant) increase in the labour productivity of just 1 %!

One important reason for this development is the existence of the demographic distribution mass, which emerges as a result of the aging of the German society and considerably reduces the burden of the additional pension effort. Figure 5 shows the development of the demographic distribution mass in Germany through to the year 2050 in absolute terms:

FIGURE 5: SET HERE

On average, the size of the demographic distribution mass is about 4.8 billion per

constant population will be dropped.

annum (still holding the assumption of a dynamic linking of pensions to net wages), with a maximum of about 10 billion. How much this demographic distribution mass in fact contributes to the simulated income development can be recognised, if we turn back to figure 4: The dotted line exhibits the size of the demographic distribution mass in relation to the (absolute) amount of wages paid in the German economy in the previous year. It shows that the meaning of the demographic distribution mass is considerable, particularly during those years, in which the aging-ratio increases very steeply: For instance, in the year 2024, it causes an increase in wages and pensions of almost 0.4% alone. In other words: Without the demographic distribution mass, incomes would not only stagnate during the peak of the aging process, but actually decrease by about 0.4 %.

FIGURE 6: SET HERE

It is this demographic distribution mass in particular, which brings about that an average increase in the labour productivity by about 0.38% is sufficient to keep incomes constant. The gross product would than *de*crease by about 0.45% on average. In other words: Productivity growth of even less than half a percent on average and of about 1% at the aging peak is sufficient to carry the burden resulting from the aging of the German society. As a result of a decrease in population, the GDP also decreases in this case, meaning that the requirement of a constant GDP is completely compatible with increasing per capita incomes. *All of this means: The theoretical analysis of chapter 2 describes a relevant mechanism, at least for the*

*German case.*

If we assume even an average productivity growth of 2% p.a., both wages and pensions can simultaneously increase over the entire time period through to 2050 and the increase in these incomes is not seriously affected by the burdens of the aging for most of the time.[15] This means: *Under normal conditions, nobody in Germany necessarily has to fear real income reductions from aging alone*! So far, the good news.

The bad news is that a retention of the dynamic pension would considerably increase the pension ratio, according to the simulation, from 20% to over 35%. Again, this increase in pension transfers would remain below the increase in gross wages (per capita), so that the net wages would still increase. However, experience shows that such an increase in burdens always has problematic consequences: In particular, it reduces the motivation of the active part of the population and forces it into the black economy or abroad (Tanzi 1980, Frey/Weck 1983, Schneider/Ernste 2000). Nevertheless, it must be emphasised that (due to the fact that net wages are still increasing) these are not problems of diminishing wealth, but rather of perception, of attitude towards public burdens, and possibly of international competitiveness.

The relative meaning of aging and pension transfers for the German income development may be highlighted by figure 7:

[15] Due to the higher level of income, the demographic distribution mass is larger in this scenario than in the case of an assumed productivity growth of 1%: It is now about 6.6 billion per year, on average.

FIGURE 7: SET HERE

Figure 7 compares the effect of an exit from the dynamic pension system on the one hand and that of an isolated productivity increase by 2% p.a. (maintaining the dynamic pension system) on the other, with the scenario in which nothing changes, i.e. the productivity growth remains at 1% p.a. and the dynamic pension is maintained. As demonstrated above, even if nothing is changed, per capita (net) wages will almost always increase, during the entire time period by about 38 %. However, the simulation shows that the income effect of an exit from the dynamic pension system is far beyond that of 2% productivity growth: In the first scenario, the income will increase only by about 68%, whereas in the second scenario, it will increase by more than 130%. (This result might not be too surprising if one takes into account that an average productivity growth of about 0.38% is sufficient to maintain wages and pensions during this time period.)

However, fixing the pension ratio at the value of 20% would lead to a considerable *de*crease in pensions by an average of about 0.36 % p.a., *reducing* the pensions over the entire period by about 20% (and even by an average of more than 0.8% p.a. over the time period until 2031, the year in which pensions reach their base). At the peak of the 'aging wave' around 2024, the annual decrease in pensions would be even larger than -2% for five and larger than -1.5% for nine years in a row. In this case, the pensions would indeed 'no longer be secure' (as prophesied many times in the media).

**Second Scenario: Annual Net Immigration of +200,000 People Per Year and a Retirement Age of 65**

For a comparison, we will take a brief look at the most optimistic scenario with a net immigration of +200,000 people per year and a retirement age of 65. Figure 8 shows the development of wages and pensions in this scenario with an assumed productivity growth of 1% p.a. (in comparison with the development of the first scenario):

FIGURE 8: SET HERE

As is to be expected from the demographic development, the development of wages and pensions in scenario 2 is delayed compared with scenario 1, but follows a similar pattern. Nevertheless, in scenario 2, wages and pensions increase a little more, by roughly 0.73% p.a. on average (compared to 0.62% p.a. in the first scenario) and remain positive even in the aging peak during the 2030s. With an amount of 4.3 billion, the average demographic distribution mass is lower in scenario 2 (compared to 4.8 billion in scenario 1), but higher at the aging peak ( 10.5 billion compared to 10.2 billion in scenario 1).

One important difference, however, is that the development in scenario 2 takes place at a significantly lower level overall than that of scenario 1: In particular, the pension ratio departs only at roughly 15% in 1998 and approaches only 26% in 2050 in scenario 2 (compared to 20 % in 1998 and 35 % in 2050 in scenario 1). This

explains the repeated demand for an extension of the retirement age in Germany.[16]

## 4 CONCLUSIONS

The results of this paper are somewhat confusing and should be handled with some care: It should not entrap us to play down the problems of aging, assuming that since it does not lead to absolute income reductions, aging does not significantly burden the active population, for at least two reasons: Firstly, increasing pension transfers are not the only consequence of aging, but aging will also affect the costs of health care and perhaps the mental condition of the society. Additionally, aging is not the only burden, the active population has to shoulder in many OECD countries. Burdens also result from unemployment, domestic and foreign debt, inflating social systems and so on. Hence, the analysis of this paper has to be set within the overall context of economic development. Secondly, even if no real income reductions are necessary, aging *always* leads to an increased burden for at least one generation. This increasing burden is particularly materialised in an increasing pension rate: If we already have such resistances against an increase in the pension ratio above 20%, how should the reactions be to 30%? The harmful effects of increasing pension rates are well known. They especially affect the general dynamics of an economy. In addition to this, increasing burdens are usually unequally distributed within the

[16] For instance, in a speech before the LVU-Unternehmertag on June 3, 2004, BDA-President, Dieter Hundt comes to the conclusion: "Due to the demographic development, we have no choice but to extend working life." Source: http://www.lvu.de/04/0603_8.html (own translation). In their coalition talks, SPD and CDU both explicitly expressed the extension of working life as being one of their political targets. See. *Frankfurter Allgemeine Zeitung*, October 28, 2005.

generations and result in cases of hardship.

However, one thing might become clear from the analysis of this paper: The financial burdens of aging alone do not have to ruin us. On the contrary, it is *theoretically* possible that the entire population of Germany will be much better off in 2050 than at the present. The background of this insight is that technical progress is a strong force, which allows us to produce an ever-growing wealth with a continuously reduced working force. Even at the peak of aging, it is not to be expected that the remaining, reduced working force will not be capable of increasing the wealth of the population, as long as technical progress does not stop and we do not face different restrictions. On the contrary: Obviously, most OECD countries are not even capable of employing the remaining workforce. As a result, unemployment grows continuously or remains at a high level. In this connection, Horst Siebert even asks, if the Germans are 'running out of work' (Siebert 1994).

Against this background, the aim of this paper is to shift the perception of the problem setting: The main problem of aging is not that it affects the economy's capability to produce an increasing wealth, but that increasing burdens are not accepted by the active population and negatively affect economic dynamics. Hence, aging first and foremost is a problem of psychology and incentives. Nevertheless, in discussions, we must always take the fact into consideration that we cannot stop aging and that there is a social responsibility to provide for this part of the population, which created the economy state from which we are moving away. Moreover, in an aging society, pensioners constitute an ever growing part of the voting force. We are not too far away from a time when half of the voting population will consist of pensioners or people close to pension age. Faced with this

situation, discussions should also face the question of how to prepare the active population to accept increasing burdens from aging.

One crucial factor is certainly the visibility of pension duties and their perception as burdens. In this connection, it does not appear to be very supportive when workers find their pension duties explicitly displayed on the pay roll (as it currently is the case in Germany). In this regard, a private, capital-based pension system appears much less problematic, since it gives the active generation the impression of caring for its own old-age provision and not of paying into an anonymous pension system.



## 5 REFERENCES

Bonin, Holger (2002) Will it Last? An Assessment of the 2001 German Pension Reform, *The Geneva Papers on Risk and Insurance*, **24 (4)**, 547-64.

Börsch-Supan, A. and Wilke, C.B. (2004), The German Public Pension System: How it Was, How it Will Be, *NBER Working Paper* No. W10525.

Börsch-Supan, A. (2002), *Nach der Reform ist vor der Reform: Weitere Schritte für eine nachhaltige Reform der Altersvorsorge in Deutschland*. Discussion Paper No. 15-02. Mannheim: Mannheim Research Institute for the Economics of Aging

Börsch-Supan, A. (1995), The Impact of Population Ageing on Savings, Investment and Growth in the OECD Area. *Future Global Capital Shortages: Real Threat or Pure Fiction?* OECD, Paris, pp. 103-141.

Börsch-Supan, A. (1999), Zur deutschen Diskussion eines Übergangs vom Umlage- zum Kapitaldeckungsverfahren in der Gesetzlichen Rentenversicherung, *Finanzarchiv*, **55 (3)**, 400-28.

Börsch-Supan, A. (2000a), A Model under Siege: A Case Study of the German Retirement Insurance System, *The Economic Journal*, **110**, F24-45.

Börsch-Supan, A. (2000b), Was lehrt uns die Empirie in Sachen Rentenreform?, *Perspektiven der Wirtschaftspolitik*, **1**, 431-51.

Börsch-Supan, A., and R. Schnabel (1998), Social Security and Declining Labor Force Participation in Germany, *The American Economic Review*, **88 (2)**, 173-78.

Bütler, M. (1999), Milestones in the History of the Swiss Pension System: A Politico–Economic Analysis, *Swiss Journal of Economics and Statistics*, **135(3),** 369–85.

Feldstein, M. S. (1977), Social Security and Private Savings: International Evidence in an Extended Life-Cycle Model, in: *The Economics of Public Sevices*, Mac Millan, London.

Frey, S.B. and Weck, H. (1983), What Produces a Hidden Economy. A International Cross Section Analysis, *Southern Economic Journal*, **49,** 822-32.

Homburg, S. (1988), *Theorie der Alterssicherung*, Springer, Berlin et al.

Homburg, S. (2000), Ein Schnellkurs in Sachen Rentenreform, *Perspektiven der Wirtschaftspolitik*, **1,** 379-82.

Karayel, A. (2006), The intragenerationally redistributive effects of the retirement insurance scheme in Turkey before and after the 1999 reform, *Applied Economics*, **38**, 441-8.

Lavi, Y, and Spivak, A. (1999), The impact of pension schemes on saving in Israel, *Applied Economics*, **31**, 761-74.

Mackenroth, G. (1952), Die Reformpolitik durch einen deutschen Sozialplan, *Schriften des Vereins für Socialpolitik*, N. F. 4, Berlin: Duncker und Humblodt.

__ (2002a), Rentengesetz passiert das Kabinett, *Frankfurter Allgemeine Zeitung*, 6.11.2002.

__ (2002b), Alterung treibt Industriestaaten in den Ruin, *Financial Times Deutschland*, 19.11.2002.

__ (2003), „Sandwich-Generation“ kann aufatmen, *Frankfurter Allgemeine Zeitung*, 28.4.2003.

Schnabel, R. (1998), *Kapitalmarktrenditen und die Rendite der gesetzlichen Rentenversicherung*. Working paper, University of Mannheim.

Raphael, D., and B. Schlesinger (1994). "Women in the Sandwich Generation: Do Adult Children Living At Home Help?" *Journal of Women and Aging*, **6**, 21–45.

Schmähl, W. (1981), Über den Satz "Aller Sozialaufwand muß immer aus dem Volkseinkommen der laufenden Periode gedeckt werden", *Hamburger Jahrbuch für Wirtschafts- und Gesellschaftspolitik*, **26**, 147-171.

Schmähl, W. (2000), Perspektiven der Alterssicherungspolitik in Deutschland - Über Konzeptionen, Vorschläge und einen angestrebten Paradigmenwechsel, *Perspektiven der Wirtschaftspolitik*, **1**, 407-430.

Schneider, F. und D.H. Ernste (2000), Shadow Economies: Size, Causes and Consequences, *Journal of Economic Literature*, **38(1)**, 77-114.

Siddiqui, S. (1997), The Pension Incentive to Retire: Empirical Evidence for West Germany, *Journal of Population Economics*, **10(4)**, 463-86.

Steffen, J. (2002), *Die Anpassung der Renten in der Rentenversicherung der Arbeiter und Angestellten. Von der Rentenreform 1957 bis zum AvmEG*, Bremen.

Siebert, H. (1994), *Geht den Deutschen die Arbeit aus? Wege zu mehr Beschäftigung*, Bertelsmann Verlag, München.

Tanzi, V. (1980), The Underground Economy in the United States: Estimates and Implications, *Banca Nazionale del Iavaro Quarterly Review*, **33**, 427-53.

Thøgersen, Ø. (2001), Reforming social security: assessing the effects of alternative funding strategies, *Applied Economics*, **33**, 1531-40.

Winter, J. (2002), The impact of pension reforms and demography in stock markets. In: *Stock Markets: Impact of Macroeconomic Developments* (Ed.) M.H. Stierle, VWF Berlin, Berlin, pp. 7-29.

*FIGURE 1: AGING PROCESS OF THE MODELLED SOCIETY*

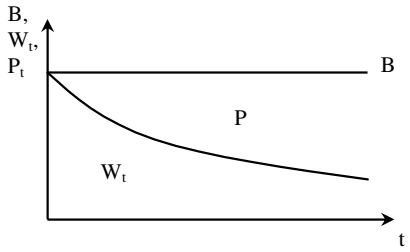


*FIGURE 2: DEVELOPMENT OF LABOUR PRODUCTIVITY PER WORKING HOUR IN THE* ALTE LÄNDER *AND IN GERMANY SINCE 1971. SOURCE: SACHVERSTAENDIGENRAT ZUR BEGUTACHTUNG DER GESAMTWIRTSCHAFTLICHEN ENTWICKLUNG, OWN CALCULATIONS.*

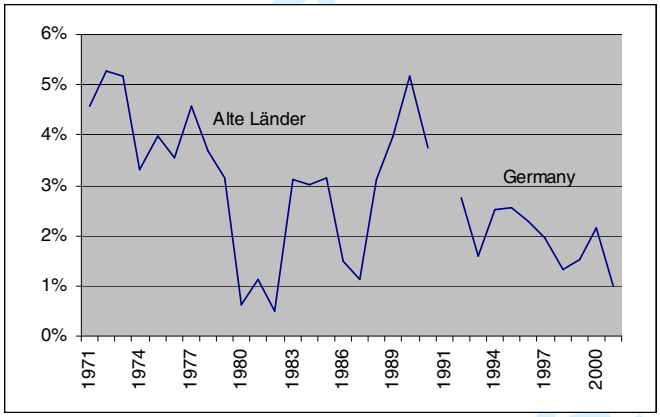

*FIGURE 3: CHANGE IN THE AGE RATIO IN GERMANY (IN PERCENT, COMPARED TO THE PREVIOUS YEAR). CONTINUOS LINE: WITH AN ANNUAL NET IMMIGRATION OF +100,000 PEOPLE AND A RETIREMENT AGE OF 60; DOTTED LINE: WITH AN ANNUAL NET IMMIGRATION OF +200,000 PEOPLE AND A RETIREMENT AGE OF 65. SOURCE: STATISTISCHES BUNDESAMT*

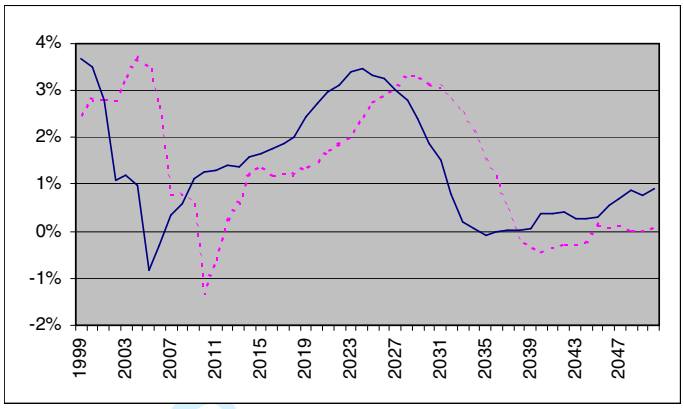


*FIGURE 4: CONTINUOS LINE: CHANGE OF WAGES AND PENSIONS COMPARED WITH THE PREVIOUS YEAR (IN %); DOTTED LINE: SIZE OF THE DEMOGRAPHIC DISTRIBUTION MASS (IN RELATION TO THE WAGES OF THE PREVIOUS YEAR) WITH AN ASSUMED PRODUCTIVITY INCREASE OF 1 % P.A.. SOURCE: STATISTISCHES BUNDESAMT, OWN CALCULATIONS*

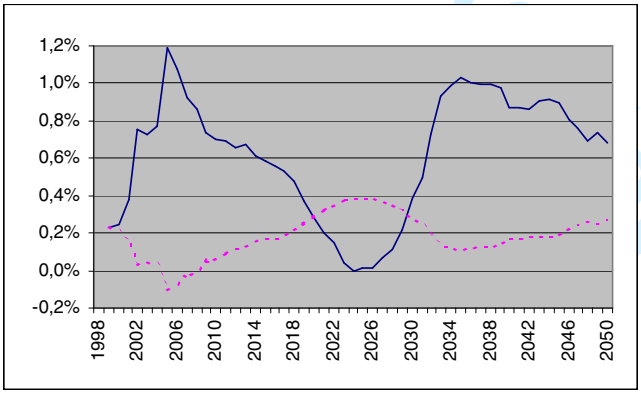

*FIGURE 5: SIZE OF THE DEMOGRAPHIC DISTRIBUTION MASS (IN BILLION EUROS) PER ANNUM AT AN ASSUMED ANNUAL INCREASE OF LABOUT PRODUCTIVITY OF 1 % AND A DYNAMIC PENSION SYSTEM. SOURCE: STATISTISCHES BUNDESAMT, OWN CALCULATIONS*

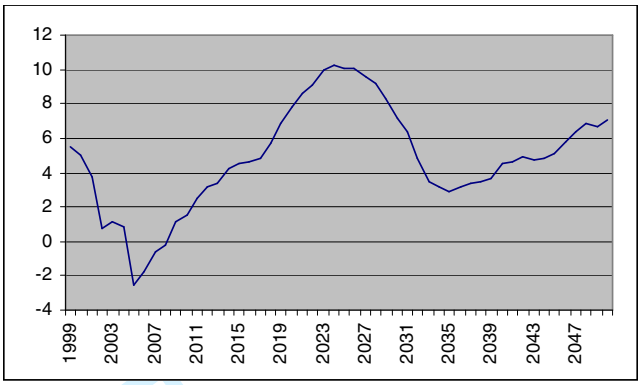


*FIGURE 6: REQUIRED PRODUCTIVITY INCREASE (CONTINUOUS LINE) AND REQUIRED CHANGE IN THE GDP IN ORDER TO KEEP WAGES AND PENSIONS CONSTANT OVER TIME (DOTTED LINE). SOURCE: STATISTISCHES BUNDESAMT, OWN CALCULATIONS*

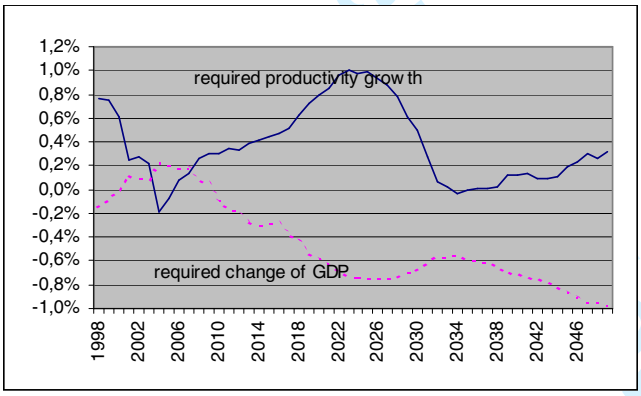

*FIGURE 7: DEVELOPMENT OF ANNUAL PER CAPITA NET WAGES (IN EUROS), MAINTAINING A DYNAMIC PENSION SYSTEM WITH AN ASSUMED PRODUCTIVITY GROWTH OF 1 % P.A. (CONTINUOUS LINE), WITH A FIXED PENSION RATIO OF 20 % AND AN ASSUMED PRODUCTIVITY GROWTH OF 1 % (DOTTED LINE), AND MAINTAINING THE DYNAMIC PENSION SYSTEM WITH AN ASSUMED PRODUCTIVITY GROWTH OF 2 % (CROSSED LINE). SOURCE: STATISTISCHES BUNDESAMT, OWN CALCULATIONS*

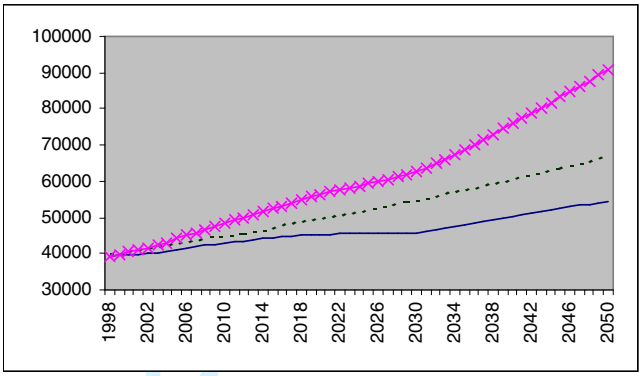


*FIGURE 8: CHANGE IN WAGES AND PENSIONS COMPARED WITH THE PREVIOUS YEAR (IN %);DOTTED LINE: SCENARIO 1; CONTINUOUS LINE: SCENARIO 2. SOURCE: STATISTISCHES BUNDESAMT, OWN CALCULATIONS*