Capital Markets In the Long Term: Demography, Economic Development and Funded Pension Systems

Content*

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* Opinions expressed in the articles are those of the authors alone and are not necessarily shared by Allianz Group.

Foreword

Dear Reader,

That people are getting older may not be a new phenomenon, but the speed of this process and the numbers involved are striking. What is clearly a very welcome development on an individual level also has important implications for society as a whole. On September 23, 2004, Allianz Group and the CFS attempted to shed some light on the economic consequences of these ongoing demographic changes with a joint conference on "Capital Markets In the Long Term: Demography, Economic Develop-

Michael Heise

ment and Funded Pension Systems". The focus of the discussion was on the long-term impact on capital markets and pension systems, and the speakers tried to identify the direction and

Volker Wieland

magnitude of potential changes as well as the likelihood of an eventual asset meltdown. The setup of the event was novel in that the CFS joined forces with a major financial market participant in organizing a research conference – in this case with Allianz Group. Our objective

was to combine insights from academia with those from the financial community in order to provide a more comprehensive outlook on capital market developments. This cooperation was well reflected not only in the different presentations by panel members but also in the audience, which showed that the conference was appealing to market practitioners and academic researchers alike.

Conference Summary

Manfred Neumann *(University of Bonn)* and Klaus Masuch *(ECB)* discussed inflation, growth, and productivity. Manfred Neumann looked at changes in the relationship between money growth and inflation resulting from the start of EMU and concluded that the ECB ought to tighten money growth. Klaus Masuch instead made the case for price stability and low inflation uncertainty as a result of a credible monetary policy regime and showed that thereby macroeconomic stability would obtain as a by-product.

Michael Schröder and Martin Schüler *(both Center for European Economic Research, Mannheim)* jointly presented the results of a survey on capital markets and demography that had been commissioned by Allianz Group. The focus of the study was on long-term effects with a 15-year horizon, and the survey sample consisted predominantly of banks, with the remainder made up of corporates and insurance firms. The survey predicts an increasing importance of capital markets in the future and shows an expected shift towards higher-risk assets and into emerging markets. The presentation was followed by a lively debate on potential sampling biases and worthwhile extensions of the survey.

After lunch, Dirk Krüger and Michael Haliassos *(both Goethe Universit Frankfurt)* discussed savings drivers and the importance of demographic trends. Dirk Krüger showed that based on a standard life-cycle model of consumption and saving, rich countries should see an increase in domestic savings and capital exports until around 2020, after which there would then be a decline in savings and an increasing inflow of foreign capital. These trends would become even more pronounced through a change in pension policy from the current pay-as-you-go system to fully funded pensions. However, the level of investments should largely be insulated from such savings patterns through internationally integrated capital markets. Michael Haliassos looked at the link between household demographics and savings compositions. Considerable differences across households can be observed in their decision whether or not to participate in risky investments, which are to a large part due to entry barriers in the form of fixed participation costs or simply a lack of information. In contrast, households that do participate in risky investments display greater homogeneity in their portfolio compositions.

Savings and interest rates were the topic of a follow-on panel with JOACHIM WINTER *(Mannheim Research Institute for the Economics of Aging)* and HELMUT REISEN *(OECD)*. Joachim Winter discussed the results of a simulation using a multi-region OLG model. He finds a future decline in the savings rate resulting

in minor declines in capital growth and the return on capital. While the latter would only be little affected by a fundamental pension reform, it is however heavily influenced by international capital mobility. Helmut Reisen arrived at predictions on saving patterns similar to Dirk Krüger's, suggesting that international demographic differences should make investments in non-OECD countries more attractive over the coming decades. The consequences of demographic changes will significantly outweigh potential benefits from better global diversification.

In the final panel, ALAN PICKERING *(European Federation for Retirement Provision)* and PETER LOCKYER *(Allianz Dresdner Asset Management)* specifically addressed pension security and asset management. Alan Pickering pointed out that there will necessarily be a significant amount of risk inherent in any pension system and that this risk cannot entirely be laid off. An important prerequisite for the long-term success of a pension system is a framework that provides the right incentives for regulators and politicians alike. Peter Lockyer's presentation looked at risk management for defined benefit and defined contribution systems and a desirable scope of regulation.

All presentations suggested that an asset meltdown is a very unlikely scenario over the foreseeable future and that the importance of capital markets is instead likely to increase further.

Marcus Pramor *(CFS staff)*

Opening Remarks

Ladies and Gentlemen:

Welcome to today's joint conference hosted by the Center for Financial Studies and Allianz Group. This is truly what you would call a Public Private Partnership – the CFS has done most of the work, and we at Allianz Group have provided a little money.

Allow me to express my gratitude to the CFS – in particular Volker Wieland and Marcus Pramor – for organizing the conference and inviting such distinguished speakers.

We shall use this conference to venture a look at the trends that will shape capital markets in 10, 20, 30 years from now.

Our point of departure is the demographic situation. We know that, although the world population will continue to grow, the age structure will also be changing dramatically. A shrinking working population will be shouldering the burden of a growing number of retirees.

This aging process will be particularly strong in the developed countries. Acknowledgment of this fact has increased in recent years and has prompted some initial reactions. Pay-as-you-go pension systems have been scaled down and incentives for funded systems put in place.

There is widespread concern that the aging process will have major adverse effects on capital markets. The baby-boomers – who in most countries won't retire until 2015-2020 – will substantially increase their savings, acknowledging that retirement provision from PAYG systems is going to be inadequate and encouraged by taxation changes.

The central question is how an increasing capital supply will affect capital markets. Will high demand for bonds, equity and real estate push down interest rates as well as returns on the other markets?

And what happens when the baby-boomers retire and sell off their assets? Will asset prices collapse and lead to rising returns?

We have structured today's discussions by dividing the topics up between various panels, all of which will look at the driving forces behind long-run capital market trends.

Let me mention that our recent research at Allianz has also been devoted to these topics and we shall be publishing a report on this issue next week. Allow me to say that preparing this conference has also provided much inspiration.

The first panel will look at the inflation component in nominal interest rates and the general prospects for growth and productivity in the years to come.

Our view is that increased tolerance for inflation – and the build-up of excess liquidity – will push up the price level in the next couple of years. However, in the longer term prospects for inflation are positive, private savings will increase and governments will finally face up to the demographic challenge by reining in deficits.

But what about real interest rates? Are they set to fall strongly given the abundant supply of capital? And will the increasing shortage of labor reduce labor intensity of production

and thereby push down the return on capital? Certainly, the capital intensity of production will increase in the next 10 to 20 years but there are some factors which will limit the decline in the rates of return:

1) the increase in savings will not be as strong as some suspect (savings patterns are not in line with ideal life cycle).

2) The demographic situation is not identical in all countries. In the US the population is set to grow to 400 million in 30 years' time, resulting in high demand for capital. In Japan the aging phase has already begun, the drop in savings boosts the need for capital, possibly generating substantial rates of return in the not too distant future. Nor should we forget the emerging market economies. On balance they are not big importers of capital today. But the situation varies from region to region. Asia has enough internal savings, but central and eastern Europe and Latin America are in need of funds.

3) Further countervailing factors in terms of falling rates could be technology and human capital. In our view, the digital revolution of recent years will have lasting effects on productivity. And, with an increase in capital spending and a shortage of labor, human capital will increase significantly – obviously another factor that will limit the fall in real rates of return.

We are therefore confident that the capital markets will be able to cope with the demographic changes ahead of us. Higher savings will be channeled into investment, the income of future working generations will increase and that will limit the impact of asset sales of the older generation.

A possible scenario could be the following: nominal interest rates will increase somewhat in the next couple of years due to slightly higher inflation (10yr yields in euro area 5 to 6%) and more stable economic policies. Then, as increased savings set in and governments step up their consolidation efforts, rates will go down to where they have been recently (around 3%). In the very long run, with growing budget deficits, more pressures on monetary policies and asset sales by the older generation, rates will recover but markets will not collapse – at least not for demographic reasons.

This of course sounds daringly precise and I hope that the speakers and all of you will challenge these ideas in the course of our discussions.

Michael Heise *(Allianz Group)*

Price stability and macroeconomic volatility in the euro area — the positive supply-side effects of credible and predictable monetary policy

Klaus Masuch[1]
(European Central Bank)

CONTENTS

Abstract

This paper discusses the relationship between credible monetary policy and macroeconomic volatility during and after the regime shift to price stability in the euro area. For many euro area countries this regime shift took place in the 1990s, during the convergence process resulting from the Maastricht Treaty and the need to fulfill the convergence criteria for joining the euro area. Looking at euro area aggregates, the new regime of price stability in the whole euro area seems to have started around the years 1996-97, while the main institutional regime change to a culture of stability for the whole euro area is marked by the start of the single monetary policy conducted by the European Central Bank (ECB) in January 1999. The paper has two main messages.

First it presents some stylized facts, which illustrate the increased macroeconomic stability achieved in the euro area as a result of the convergence process in the 1990s and the introduction of the euro. While it does not provide new econometric tests for breaks in the volatility or persistence of macroeconomic time series, the material presented clearly illustrates that, both during and after the regime shift to price stability in the euro area, macroeconomic volatility was reduced and stabilized at low levels, contrary to what was expected before by those observers who stressed that the euro area was not an optimal currency area. The paper also indicates that there appears to have been a fall in reduced-form estimates of the persistence of price and wage inflation over more recent sample periods. If more structural econometric analysis were to confirm that this reflects a lower degree of effective indexation of prices and wages to past inflation, it would represent an improvement in wage and price-setting behavior and, thus, the aggregate supply relation of the euro area

economy. Such a change would support the conduct of monetary policy and would result in lower nominal and real macroeconomic volatility for given exogenous shocks.

Second, the paper discusses various channels through which a credible monetary policy can lead to positive supply-side effects which help to reduce macroeconomic volatilities and support employment. It argues that a credible and predictable monetary policy may, over time, reduce the degree of indexation of price and wage-setting to past inflation, and at the same time it may also be associated with a perceived increase in nominal stickiness as individual prices and wages may be less often susceptible to change in an environment of stable prices. Furthermore, a systematic and predictable monetary policy enhances the risk management of corporate firms, banks and households, thereby improving production and investment decisions. Against this background it is argued that, if there is hysteresis in unemployment, these structural changes induced by monetary policy become even more important. In contrast, additional responsibilities for the central bank in terms of actively stabilizing employment or output are likely to be counterproductive, as they risk undermining one of the main reasons for the improved structure of the economy, namely the credibility and predictability of monetary policy.

1 Introduction

In various respects, the performance of the euro area economy during the last six years has been remarkable. It is true that labor productivity growth has been weak since the mid 1990s and unemployment is still much too high. However, a closer look at the developments which monetary policy can influence more directly and strongly shows that a regime shift to greater macroeconomic stability seems

to have taken place during the second half of the 1990s. This was associated with the Maastricht Treaty, the convergence process and the introduction of the euro. The euro area not only entered a new era of price stability, but it also seems to have experienced a great decline in nominal macroeconomic volatility. There are no visible signs of costs in terms of higher real macroeconomic volatility; on the contrary, the volatility of some real variables has also declined in recent years relative to the averages observed during the 1980s and 1990s.

There is no doubt that euro area averages hide the fact that macroeconomic dynamics were quite different across the euro area countries. For example, some countries achieved a regime of price stability as early as the 1980s, while others fully converged only rather late in the 1990s. Nevertheless, this paper mainly focuses on euro area averages, and only occasionally refers also to some country specific developments.

It was not only the stability-oriented monetary policy of the ECB, and, before 1999, of the national central banks which made the success of the euro possible. Social partners contributed via wage moderation, fiscal policies were more disciplined than before and some positive structural reforms were implemented. Certainly, it would have been better had these contributions been more decisive and stronger. However, it would be a serious mistake to underestimate their importance for macroeconomic stability and job creation simply because their positive effects have been diminished by uncertainties and hesitation regarding further reform projects and overshadowed by major adverse supply shocks in recent years. Without wage moderation, fiscal discipline and structural reforms, the euro area would not have experienced the improvements in terms of macroeconomic stability and employment growth, which have actually been observed.

Particularly striking progress has been made in the area of macroeconomic stability. Since the ECB became responsible for monetary policy in the euro area, HICP inflation has averaged 2% – only slightly above the "below, but close to 2%" at which the ECB aims over the medium term. During the last two decades, the average inflation rate was 4%.

A remarkable feature of the change in economic performance is the strong decline in macroeconomic volatility.

With the convergence process during the 1990s, inflation volatility fell strongly and it has remained low since the introduction of the euro. In most cases this decline had already started during the early 1990s. For example, the standard deviation of quarterly HICP inflation in the euro area (measured as a moving window over the last 24 quarters) fell from around 0.6% during the late 1980s to around 0.2% in the mid 1990s.

Inflation expectations have also been remarkably stable in recent years. Average long-term consensus inflation expectations have fallen by one percentage point, from 2.8% in the 1990s (until the end of 1998) to 1.8% in the last six years; the average volatility of these long-term inflation expectations has declined substantially by four fifths from 0.5% in the 1990s to 0.1% in recent years. The dispersion of inflation and inflation expectations within the euro area is now also much lower than during the previous two decades.

Most importantly, these achievements in the area of price stability did not come at the cost of higher unemployment or real volatility.

On the contrary, the unemployment rate has averaged 8 1/2% during the last six years and has therefore been on average 1.3 percentage points lower than during the 1990s. The annual employment growth rate has accelerated from an average of around 1/2% during the 1980s and 1990s to more than 1% since the start of the single monetary policy. Real GDP growth has been as high on average as during the 1990s.

Moreover, there are some hints that the persistence of price and wage inflation in recent years has been lower than before. If this reflects a more forward-looking behavior of those setting prices and wages, it would tend to contribute to lower volatility of employment and output. Indeed, in spite of major supply shocks which have hit the euro area since the late 1990s, the average standard deviation of quarterly real GDP growth has declined from levels between 0.5 and 0.6% in the last two decades to around 0.4% since the introduction of the euro. A very similar development can be observed for real consumption growth, and the volatility of employment growth has also moderated from above 0.3% in the 1990s to 0.2% since 1999.

Interestingly, the decline in the volatility of real activity took place a few years after the moderation of inflation volatility was observed.

A reduction in macroeconomic volatility can also be observed outside the euro area. As regards the United States, Bernanke (2004) recently called this phenomenon "the great moderation". Blanchard and Simon (2001) report a long-term decline in output volatility for a number of G7 countries since the 1960s.

They show that a first major decrease in output volatility (measured as a rolling standard deviation of output growth using a window of 20 quarters) took place as early as the late 1960s (France) and the mid-1970s (Germany). In the United States output volatility had substantially increased since the late 1960s until the early 1980s. Following the sharp disinflation during the first half of the 1980s it declined by half to around 0.5% since the mid-1980s and stabilized at this level since then. During the 1990s, output growth volatility declined further (in particular in Germany) and/or stabilized at low levels (at around 0.5%) in all G7 countries except Japan, where a sharp increase was observed from the mid-1990s onwards. All in all Blanchard and Simon (2001) find a trend decline in output volatility since the 1960s, temporarily interrupted by an increase in inflation volatility.

Increased macroeconomic stability has numerous benefits. While higher volatility of real growth per se might also reflect a welcome change like an increase in potential growth, reduced volatility of inflation, and output (relative to potential) enhances the efficient functioning of the market economy and reduces costs related to risks, uncertainties, hedging activities and adjustment to shocks. A lower persistence of inflation and wage growth allows monetary policy to react less to inflation shocks related to supply disturbances than would otherwise be the case.

How can the decline in macroeconomic volatility be explained? Bernanke (2004)[2] and Papademos (2003a)[3] argue that credible monetary policy played an important role. Blanchard and Simon (2001, p. 18) find that

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[2] "… improved monetary policy has likely made an important contribution not only to reduce volatility of inflation … but to the reduced volatility of output as well." Bernanke (2004), p 9.

"the sharp decline in output volatility in the 1980s appears mostly the result of a sharp decline in inflation volatility." In addition, structural policies, luck (reduced volatility of exogenous shocks) and improved fiscal policies have been cited as potential candidates. There can be little doubt that these "non-monetary" explanations are needed to provide a full picture. Nevertheless, in this paper no attempt is made to estimate the relative contribution of these and possibly other factors for the euro area. Instead, it concentrates on the channels by which monetary policy may contribute to increased macroeconomic stability mainly from a theoretical perspective.

Certainly, low inflation and well-anchored inflation expectations are mainly attributable to the credible conduct of monetary policy. However, while the importance of credibility for the success of monetary policy in anchoring inflation expectations and reducing disinflation costs has been discussed and recognised for a long time, an intense debate on the precise contribution of monetary policy to improving features of the supply side of the economy and thereby to reducing both nominal and real macroeconomic volatilities has emerged only more recently.[4]

If a credible monetary policy contributes over time to a supply-side improvement in the form of reduced persistence of changes in prices and wages and lower nominal and real volatility, this will have significant implications. Credible monetary policy would then gradually also enhance employment in the long run, especially in the case of negative supply shocks and if hysteresis effects are important. The old critique that tight monetary policy aimed at price stability via hysteresis effects may induce lasting increases in unemployment may thus be turned upside down, namely into a strong argument in favor of monetary policy credibility.

The remainder of the paper is organized as follows: The second section assesses the degree of macroeconomic stability achieved in the first six years of the euro. It is largely descriptive, comparing trends and average volatilities during this period with the 1980s and 1990s. The third section investigates mainly from a theoretical perspective the question how monetary policy contributes to low volatility, not only of inflation but also of real activity and unemployment. It argues that credible and predictable monetary policy can, over time, change the structure of the supply side of the economy in the direction of reducing the importance of backward-looking elements and uncertainty in private behavior, thereby enhancing macroeconomic stability. In this context it discusses the relation between monetary policy on the one hand and price setting, wage formation and risk management on the other hand. It also presents some available evidence on the persistence of price and wage inflation. The conclusions are set out in the fourth section.

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3 "Following the experience of high and variable inflation in the 1970s and early 1980s, monetary policy in many countries has put greater emphasis on attaining and maintaining price stability over the medium and longer term rather than on stabilizing short-term output fluctuations. This change … has helped to deliver not only lower and less variable inflation, but also more stable output growth." Papademos (2003a).

4 See in particular Bayoumi and Sgherri (2004a and b); Bernanke, (2004). Issing (2001) stresses that structural features of the economy may be endogenous to the process of monetary unification. In particular, he argues that the traditional conditions which constitute an optimum currency area (flexible goods and labor markets, similarity of the monetary policy transmission mechanism across the currency area, etc.) were not met ex-ante for the euro area, but may well be fulfilled ex post, partly as a result of the process of monetary union.
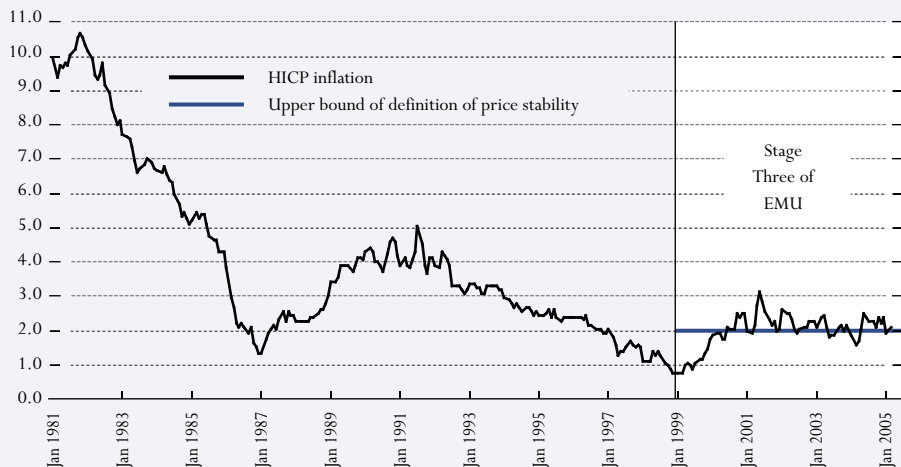
Sources: Eurostat and ECB calculations.
Note: Data before January 1990 compiled from monthly rates of change of national CPIs excluding owner occupied housing (except Spain). Fixed euro conversion rate used for weights. The last observation refers to February 2005.

CHART 1B: STANDARD DEVIATION OF INFLATION ACROSS EURO AREA COUNTRIES
(IN PERCENTAGES)

Sources: ECB and ECB calculations.
Note: Unweighted standard deviation of HICP inflation (EU 12); monthly data, not seasonally adjusted. The last observation refers to February 2005.

In the euro area, or more precisely in the
countries which now constitute the euro area,
inflation was high and volatile from the 1970s
until about the mid-1990s. *Chart 1a* shows that
in the euro area in the early 1980s inflation
was still around 10%. In the second half of the
1980s it came down to around 2%, but then
accelerated to above 4% in the early 1990s.
In many euro area countries price stability
was only established in the second half of the
1990s, around the years 1996-1997. Stability
oriented policies which were put in place some
time before, supported by the need to fulfill
convergence criteria, had finally achieved
regaining credibility. Of course, the euro area
aggregate hides that inflation trends initially
were quite divergent across countries, but
then strongly converged. *Chart 1b* shows the
standard deviation of inflation across euro
area countries. Again, the second half of the
1990s saw the beginning of a new regime with
substantially lower dispersion of inflation rates
within the euro area.

Most of the tables presented in this paper show
the average level and the average standard de-
viation for a number of macroeconomic vari-
ables over three periods: the last two decades,
the last decade (excluding 1999) and the first
six years of the euro. In addition, some of
the tables presented below also compare the
last nine years with the previous nine years.[5]
Furthermore, some Charts are presented
which show rolling 24 quarter windows for
standard deviations or 40 quarter windows
for estimation of simple autoregressive pro-
cesses.

Certainly, (unconditional) volatility measures
are rather rough measures. Other simple or
more complex measures may give different re-
sults. No attempt is made here to distinguish
between expected and unexpected macroeco-
nomic developments. Nevertheless, it seems
useful to illustrate the differences in macro-
economic developments since the introduction
of the euro and/or the second half of the 1990s
with the period before based on these simple
measures.

2.1 Low and stable inflation expecta-
tions and moderate wage developments
Inflation and inflation expectations
Both the level and the volatility of various
inflation measures have been partly sub-
stantially lower in the last six or nine years
compared to 1980s and early 1990s. The
volatility of consumer price inflation since
1999 is somewhat lower in the euro area
than in the US, but the volatility of changes
in the GDP deflator and the consumption de-
flator are similar in both currency areas *(see
Table 1)*. Interestingly, as can also be seen
from *Charts 2a and b*, the volatility of con-
sumer price inflation in the euro area fell to
very low levels already by the mid-1990s and
has stabilized since then. *Chart 2b* shows that
the decline in inflation volatility took place
roughly in parallel in the four largest euro
area countries.

Average realized HICP inflation in the last six
years was 2% and thus only slightly above the
ECB's definition of price stability. However,
this deviation can be explained by the
unfortunate clustering of adverse price shocks
in recent years (e.g. food prices, oil and other
commodity prices and administered prices and

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5 This notwithstanding, comparing the 1980s and 1990s with the years since January 1999 has the advantage that the start of the single
   monetary policy conducted by the ECB marks a clear institutional regime change, which, however, should not hide the fact that this
   regime change was prepared and preceded by national regime changes in the preceding years.

indirect taxes). Importantly, in spite of these shocks, both the level and standard deviation of long-term consensus inflation expectations could be stabilized at low levels in the period since 1999 (see *Table 2* and *Chart 3*). This is also the case for the ten-year break-even inflation rates (see *Table 2* and *Chart 4*).

Chart 4 shows that break-even inflation in the United States has been not only more volatile at high frequencies in recent years, but also experienced a clear upward shift since around mid-2003. While it fluctuated between 1.5 and 2.0% between mid 2001 and mid 2003, since 2004 it seems to have stabilized at a higher level, in a range around 2.5%. In contrast, euro area break even inflation, while also elevated somewhat in the course of 2004, seems to have decoupled from the upward trend in the United States more recently.

Short- and long-term interest rates

An indicator which provides particular interesting evidence on the positive effects of monetary policy credibility in the euro area are long-term interest rates and in particular forward rates many years into the future. Forward interest rates for contracts which start say in 6 or 10 years, should not be significantly affected by anticipated, possibly gradual responses of

Table 1: Various measures of inflation
(Quarter-on-quarter percentage changes; year-on-year percentage changes in brackets; seasonally adjusted)

		Average		Standard Deviation	
		Euro Area	US	Euro Area	US
HICP/CPI [1]	1980-1998	1.00 (4.06)	0.98 (3.88)	0.65 (2.49)	0.64 (2.03)
	1990-1998	0.66 (2.81)	0.74 (3.10)	0.31 (1.07)	0.35 (1.14)
	1999-2004	0.52 (2.00)	0.63 (2.49)	0.21 (0.48)	0.32 (0.72)
	1987-1995	0.80 (3.21)	0.92 (3.73)	0.24 (0.79)	0.34 (1.05)
	1996-2004	0.47 (1.88)	0.61 (2.42)	0.22 (0.52)	0.30 (0.70)
Consumption deflator [2]	1980-1998	1.18 (4.75)	0.87 (3.47)	0.82 (3.17)	0.52 (1.80)
	1990-1998	0.67 (2.81)	0.59 (2.49)	0.47 (1.63)	0.31 (1.08)
	1999-2004	0.51 (2.04)	0.50 (1.96)	0.19 (0.29)	0.23 (0.45)
	1987-1995	0.88 (3.57)	0.80 (3.27)	0.36 (1.16)	0.30 (0.98)
	1996-2004	0.45 (1.87)	0.46 (1.83)	0.29 (0.89)	0.22 (0.52)
GDP deflator [2]	1980-1998	1.18 (4.76)	0.83 (3.29)	0.78 (3.04)	0.53 (1.90)
	1990-1998	0.65 (2.70)	0.56 (2.31)	0.50 (1.78)	0.25 (0.84)
	1999-2004	0.48 (2.00)	0.49 (1.94)	0.19 (0.46)	0.18 (0.37)
	1987-1995	0.89 (3.65)	0.71 (2.90)	0.39 (1.28)	0.24 (0.74)
	1996-2004	0.42 (1.76)	0.45 (1.81)	0.31 (0.95)	0.18 (0.41)

Sources: Eurostat, National data and ECB calculations.
1) Based on quarterly data, calculated as averages of monthly data. Data before January 1992 compiled from monthly rates of change of national CPIs excluding owner occupied housing (except Spain).
2) From 1991 Eurostat data for the euro area, prior to this data taken from AWM model database (see G. Fagan, J. Henry and R. Mestre (2001)).

CHART 2A: ROLLING STANDARD DEVIATION OF QUARTERLY CHANGES IN
HICP INFLATION IN THE EURO AREA AND THE UNITED STATES
(IN PERCENTAGE POINTS; QUARTERLY DATA; SEASONALLY ADJUSTED)
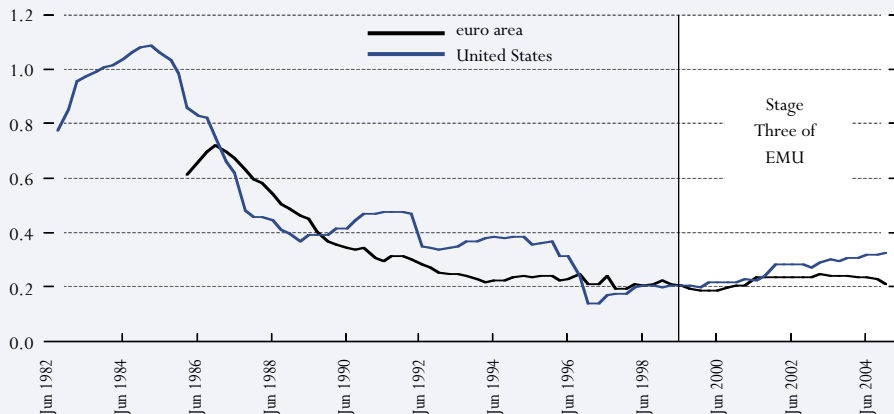
SOURCES: EUROSTAT AND ECB CALCULATIONS.
NOTE: ROLLING STANDARD DEVIATION WITH WINDOW OF 24 QUARTERS. THE LAST OBSERVATION INCLUDED IS THE 4TH
QUARTER OF 2004.

CHART 2B: ROLLING STANDARD DEVIATION OF QUARTERLY CHANGES IN
HICP INFLATION IN SOME EURO AREA COUNTRIES
(IN PERCENTAGE POINTS; QUARTERLY DATA; SEASONALLY ADJUSTED)
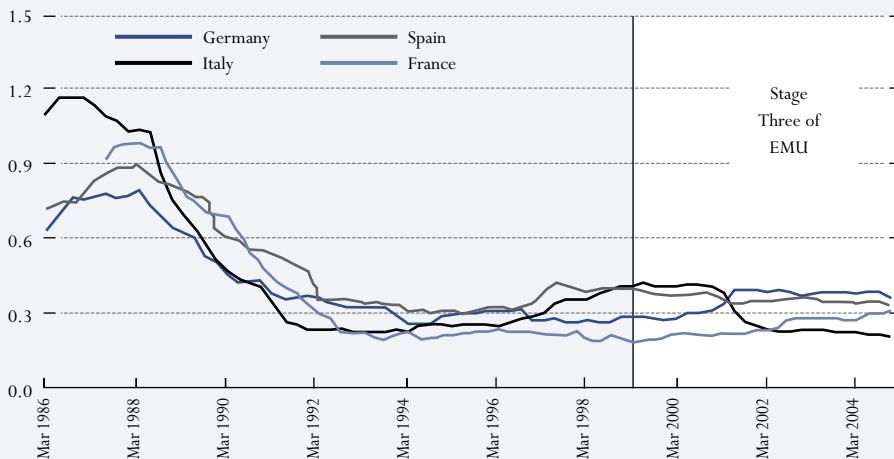
SOURCES: EUROSTAT AND ECB CALCULATIONS.
NOTE: ROLLING STANDARD DEVIATION WITH WINDOW OF 24 QUARTERS. THE LAST OBSERVATION INCLUDED IS THE 4TH
QUARTER OF 2004.

CHART 3: INFLATION AND INFLATION EXPECTATIONS IN THE EURO AREA
(ANNUAL PERCENTAGE CHANGES; MONTHLY DATA)
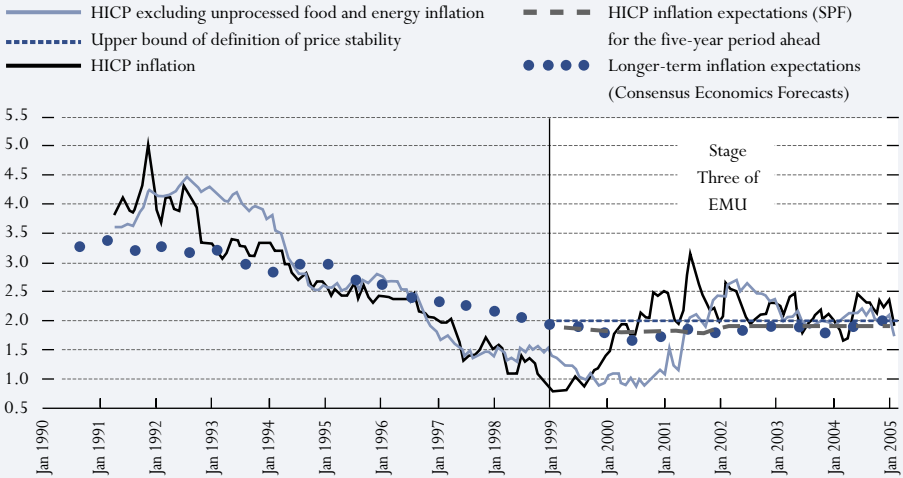
Sources: Eurostat, Consensus Economics Forecasts and ECB calculations.
Note: Longer-term inflation expectations from Consensus Economics Forecasts refer to a horizon of six to ten years, while those from the Survey of Professional Forecasters refer to five years ahead. Consensus inflation expectations until December 2002 are constructed on weighted average of five largest euro area countries, accounting for more than 80% of euro area GDP. The latest observation for overall HICP inflation refers to February 2005.

CHART 4: TEN-YEAR MATURITY BREAK-EVEN INFLATION RATES FOR THE UNITED STATES AND THE EURO AREA
(IN PERCENTAGES; DAILY DATA)

Sources: French Treasury and Reuters. The last observation refers to 31ST March 2005.

Table 2: Expected long-run inflation rate

		Average Level		Standard Deviation	
		Euro Area	US	Euro Area	US
Consensus Economic Forecasts [1]	1990-1998	2.77	3.47	0.47	0.50
	1999-2004	1.84	2.50	0.09	0.12
10-year break-even inflation rates [2]	2001-2004	1.99	1.98	0.18	0.40

Sources: Consensus Economics, Reuters.
1) Long-term inflation expectations at horizon of six to ten years. Data available on semi-annual frequency since 2003 (before the euro area data based on forecasts for FR, DE, IT, ES and NL).
2) Based on daily data. Euro area data (maturity=2012) from November 2001, US data (maturity=2011) from February 2001.

Table 3: Interest rates in euro area and in the United States
(percentages per annum)

		Average Level		Standard Deviation	
		Euro Area	US	Euro Area	US
Long-term interest rate [1]	1980-1998	9.90	8.79	2.64	2.59
	1990-1998	8.23	6.78	1.98	1.04
	1999-2004	4.70	4.92	0.56	0.83
Short-term interest rate [2]	1980-1998	9.31	6.95	3.07	2.98
	1990-1998	7.62	4.87	2.79	1.29
	1999-2004	3.23	2.97	0.95	1.87
Implied forward overnight interest rate ten years ahead [3]	1980-1998	8.01	–	0.96	–
	1990-1998	7.73	–	0.93	–
	1999-2004	5.76	–	0.37	–
Implied 1 year forward rate 9 years ahead [4]	1999-2004	5.84	6.73	0.54	0.78

Sources: BIS, ECB, ECB calculations, Eurostat, National data, Consensus Economics Forecasts, Reuters, US Bureau of Labor Statistics.
1) Based on monthly data. 10-year government bond yields or the closest available bond maturity.
2) 3-month money market interest rates; EURIBOR from January 1999 onwards.
3) Monthly data for Germany.
4) Daily data available from 1999.

monetary policy to past and current developments.[7] Long-term forward rates are thus mainly influenced by long-term inflation expectations, by the natural real interest rate expected to prevail in the long-run and by inflation and other risk premia. The long-term (forward) natural real rate, however, should not be very volatile. Low volatility of forward rates expected today for many years into the future should thus normally be a good indicator for a high degree of credibility attached by financial markets to monetary policy. *Table 3* shows a substantial decline in the volatility of both long-term and short-term interest rates since the last decade. It is striking that the volatility of interest rates in the euro area was still about twice as high as the one in the United States during the 1990s, while in the last six years this relation has reversed, with euro area interest rate volatility now being substantially below what can be observed in the US. This is especially the case for short-term rates, where the standard deviation since the 1990s has dropped by two thirds in the euro area, while it has increased by half in the United States. Also the expected volatility of long-term euro rates seems to have somewhat decoupled from the one of United States interest rates during the last years (see *Chart 6*).

An impressive feature of the time series of the German forward overnight interest rates 10 years ahead (see *Chart 5*) is the substantial and largely permanent decline which took place

between 1997 and the introduction of the euro. (The average forward rate fell by about 2 percentage points in the last six years compared to the 1990s.) The convergence of long-term rates in the late 1990s to very low levels is discussed in a recent contribution by Trichet (2005b) who attributes this success to a shift to a more credible policy regime. The determined and credible policy of national central banks, supported by a sound macroeconomic framework provided by the Maastricht Treaty, could convince markets in this period that the ECB would be uncompromising in its role as guardian of price stability.[8]

While lower long-term real growth expectations may have contributed to the decline, lower macroeconomic volatility likely has contributed to low and stable inflation expectations and lower risk premia in the last years. Even Germany now seems to enjoy a higher degree of monetary policy credibility and predictability than before the introduction of the euro.

This high degree of monetary credibility, but also wage moderation, an increased propensity to save and other factors dampening aggregate demand, enhanced fiscal discipline since the mid-1990s (see *Chart 7*) and not least lower productivity and population growth (see *Chart 8*) all contributed to a situation where monetary policy could afford to, or had to, keep short term real rates substantially lower

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7 Central banks normally do not immediately reverse their policy rate moves. On the contrary, short-term interest rates in empirical estimates of monetary policy reaction functions tend to show a certain degree of positive auto-correlation over time. The literature speaks of interest rate inertia, history dependence or smoothing. The more monetary policy is expected to behave in such a gradual manner in the future, the stronger is the impact of a given current rate change (or economic shock) on medium-term interest rates. However, even if some shocks we observe today are regarded as rather persistent, and even if monetary policy is expected to exhibit a high degree of inertia or gradualism, it is unlikely that monetary policy can significantly influence (risk adjusted) long-term real forward rates, say 6 or 10 years into the future.

8 "This brings me back to 1997. The evidence that we gather from that episode is very difficult to rationalise and highly controvertible (…). But my reading of the episode is that it is consistent with a shift to a more credible policy regime. (…) Not only did the remaining spread between the converging economies and the core countries progressively disappear. Thus, the remaining ambiguity about the very nature of the convergence process finally dissipated. But many commentators and market participants – not to mention policymakers – noted that the benchmark yield curve itself was changing shape in a direction that demonstrated an additional clear break in expectations." Trichet (2005b).

CHART 5: IMPLIED FORWARD OVERNIGHT INTEREST RATE TEN YEARS AHEAD AND CONSENSUS ECONOMICS FORECASTS FOR LONG-TERM NOMINAL GDP GROWTH
(PERCENT, ANNUALLY COMPOUNDED)
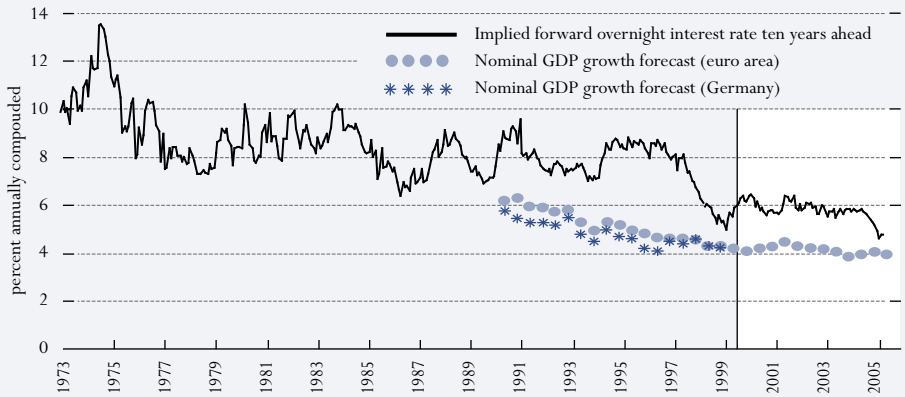
SOURCES: CONSENSUS ECONOMICS, DEUTSCHE BUNDESBANK AND ECB CALCULATIONS. THE LAST OBSERVATIONS REFER TO 15TH MARCH 2005.
NOTE: IMPLIED FORWARD OVERNIGHT INTEREST RATE TEN YEARS AHEAD — DATA FOR GERMANY. CONSENSUS FORECASTS REFER TO A HORIZON OF SIX TO TEN YEARS AHEAD AND ARE CALCULATED AS THE SUM OF REAL GDP GROWTH AND INFLATION EXPECTATIONS. UNTIL DECEMBER 2002, CONSENSUS FORECASTS ARE CONSTRUCTED AS THE WEIGHTED AVERAGE OF FIVE LARGEST EURO AREA COUNTRIES.

CHART 6: IMPLIED BOND MARKET VOLATILITY IN EURO AREA AND UNITED STATES
(PERCENTAGE PER ANNUM; TEN-DAY MOVING AVERAGE OF DAILY DATA)
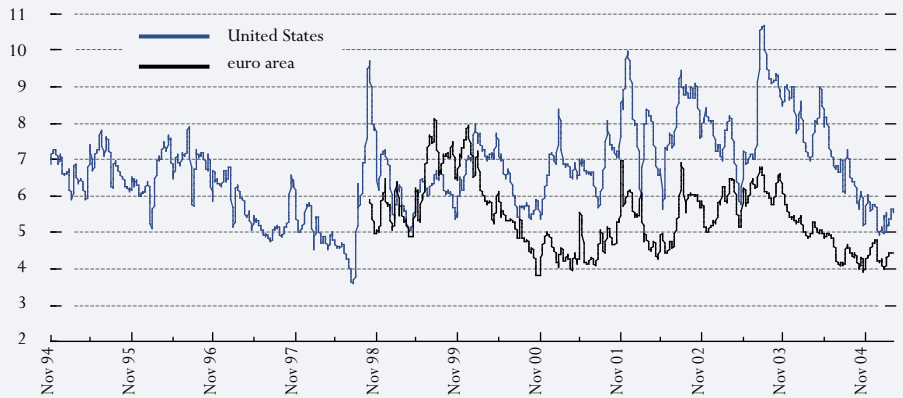
SOURCE: BLOOMBERG.
NOTE: THE IMPLIED VOLATILITY SERIES REPRESENT THE NEARBY IMPLIED VOLATILITY OF THE NEAR CONTRACT GENERIC FUTURE, ROLLED OVER 20 DAYS PRIOR TO, AS DEFINED BY BLOOMBERG. THIS MEANS THOSE 20 DAYS PRIOR TO EXPIRY OF THE CONTRACTS, A CHANGE IN THE CHOICE OF CONTRACT USED TO OBTAIN THE IMPLIED VOLATILITY IS MADE FROM THE CONTRACT CLOSEST TO MATURITY TO THE NEXT CONTRACT. THE LAST OBSERVATION REFERS TO 31ST MARCH 2005.

than in the 1990s in order to maintain price stability.

Indeed, as can be seen from *Table 4*, short-term real interest rates averaged only 1.2% during the first six years of the euro, while they averaged 4.8% during the 1990s. As inflation or inflation expectations did not accelerate in recent years, it can be concluded that the factors mentioned contributed to a decline in the natural real rate of interest. Of course, simple averages are a rather rough and problematic estimates of the natural real rate. In any case, while it is already very demanding to estimate this concept ex post, it is much more difficult to make predictions about the development of the natural real rate over the coming years.[9]

Wages and unit labor costs

Another factor behind the high degree of monetary stability in recent years is the wage moderation which likely has contributed to the relative large increase in employment growth, in an environment of overall modest real GDP growth. *Table 5* shows that the average increase in nominal wages during the last six years fell by about two percentage points relative to the 1990s. Given that inflation on average fell only by around three quarters of a percentage point (see *Table 1*), a significant moderation in real wage growth took place. This wage moderation ensured that in spite of weak labor productivity growth real unit labor cost declined, supporting conditions for employment growth. In parallel to real wage moderation, the volatility of nominal and

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9   For a discussion of the neutral real interest rate see ECB (2004).

Table 4: Measures of real interest rates
(Percentages per annum; monthly data; German rates in parentheses)

	average	Absolute minima	Absolute maxima
Short-term real interest rates (three-month-EURIBOR since 1999)			
1970s	-0.4 (1.9)	-5.2 -(2.3)	3.6 (8.0)
1980s	4.3 (4.0)	0.2 (1.4)	6.9 (7.7)
1990s	4.5 (3.6)	1.5 (1.3)	9.1 (6.5)
1990-1998	4.8 (3.8)	2.4 (1.3)	9.1 (6.5)
1999-March 2005	1.2 (−)	-0.4 (−)	2.9 (−)
The current range of measueres [1]	0.0 - 0.5		
Long-term real interest rates (10-year bond yield)			
1970s	0.5 (3.2)	-3.6 (1.7)	3.9 (5.4)
1980s	4.9 (4.8)	0.1 (2.4)	7.1 (7.8)
1990s	5.2 (4.5)	3.0 (2.8)	6.9 (6.8)
1990-1998	5.4 (4.6)	3.2 (2.8)	6.9 (6.8)
199-March 2005	2.7 (−)	1.3 (−)	4.1 (−)
The current range of measueres [1]	1.7 - 2.2		

1) Average of interest rates in March deflated with latest HICP, HICP excluding energy and unprocessed food and consensus forecast.

real unit labor costs declined substantially, in spite of various adverse shocks to oil, food and administered prices. This might signal a favorable change in the wage formation process in the euro area, which reflects increased credibility of monetary policy and at the same time contributes to lower unemployment volatility.[10]

2.2 Lower volatility of some real growth indicators

It is of course not possible to draw any strong conclusions concerning the contribution of monetary policy from just comparing the

standard deviations of various real economy variables during recent years. Nevertheless, it is reassuring that the volatility not only of inflation, inflation expectations, long-term interest rates and nominal wage changes, but also of real variables like real GDP and employment growth has partly been significantly lower in the euro area since 1999 both compared to the last and the last two decades (see *Charts 9 a* and b; *Table 6*).
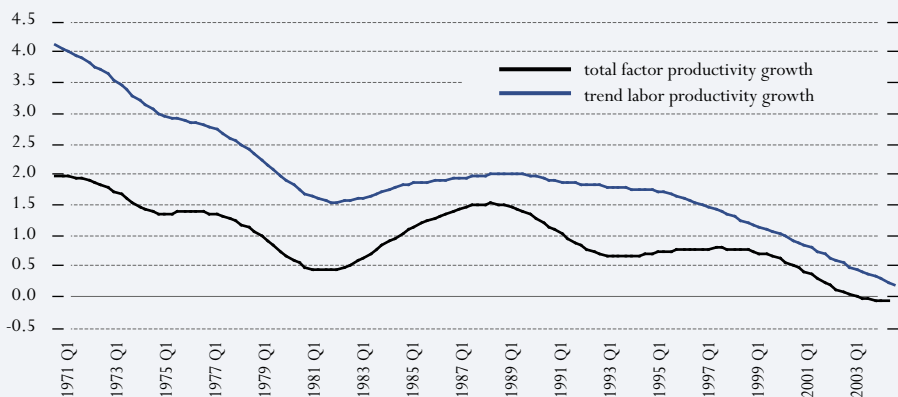
Chart 9a shows that the volatility of real GDP growth (measured as average over the past 24 quarters) dropped from levels around 0.5-

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10 An increased flexibility of real wages (possibly related to a lower degree of indexation to past inflation) can be expected to be associated with higher (short-term) real wage volatility and lower volatility of unit labor costs in case of supply shocks. In other words, real wages become more aligned with labor productivity.

TABLE 5: LABOR COST DEVELOPMENTS IN THE EURO AREA
(QUARTER-ON-QUARTER PERCENTAGE CHANGES; YEAR-ON-YEAR PERCENTAGE CHANGES IN BRACKETS, SEASONALLY ADJUSTED)

		Average	Standard Deviation
Compensation per employee	1980-1998	1.56 (6.39)	0.84 (3.05)
	1990-1998	1.06 (4.57)	0.80 (2.95)
	1999-2004	0.59 (2.45)	0.23 (0.36)
	1987-1995	1.52 (6.33)	0.68 (2.30)
	1996-2004	0.54 (2.25)	0.27 (0.55)
Nominal unit labor costs	1980-1998	1.08 (4.28)	0.90 (3.05)
	1990-1998	0.64 (2.69)	0.74 (2.37)
	1999-2004	0.39 (1.65)	0.37 (0.82)
	1987-1995	0.88 (3.59)	0.64 (1.88)
	1996-2004	0.32 (1.36)	0.43 (0.96)
Real unit labor costs [1]	1980-1998	-0.10 (-0.44)	0.55 (1.20)
	1990-1998	0.00 (0.00)	0.58 (1.30)
	1999-2004	-0.09 (-0.35)	0.31 (0.54)
	1987-1995	-0.01 (-0.04)	0.54 (1.26)
	1996-2004	-0.10 (-0.41)	0.42 (0.72)

SOURCES: EUROSTAT AND ECB CALCULATIONS.
NOTE: DATA AVAILABLE SINCE 1991, PRIOR TO THIS DATA TAKEN FROM AWM MODEL DATABASE (SEE G. FAGAN, J. HENRY AND R. MESTRE (2001)).
1) NOMINAL UNIT LABOR COSTS DEFLATED BY THE GDP DEFLATOR.

0.6% during most of the last two decades to around 0.3-0.4% in the late 1990s.[11] Interestingly, this fall in real volatility in the late 1990s comes some years after the decline in inflation variance (see *Charts 2a* and *2b*).

The reduced macroeconomic volatilities must be seen against the background of the high degree of uncertainty caused in recent years by an unusual clustering of major real disturbances and shocks like oil and commodity price shocks, food price shocks, the bursting of the stock market bubble and the major risks and disturbances related to terrorist attacks and the Afghanistan and Iraq wars. It is not difficult to imagine how financial markets in the euro area, intra-European exchange rates and possibly also interest rates would have been affected without the existence of the euro.

Concerning trends, real GDP growth averaged around 1.9% since 1999, and thus was only

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11 This fall in real volatility in the late 1990s is particularly pronounced in Germany and Spain. In Italy it comes a few years later and in France real volatility had already stabilized at very low levels since the second half of the 1980s (see *Chart 9b*). Interestingly, while the standard deviation in real GDP growth in recent years, compared to the late 1990s, fell further in Germany, Italy and Spain, and stabilized at a low level in France, the euro area aggregate increased slightly over the same period from around 0.3 to 0.4%. This may reflect an increased synchronisation of the business cycle within the euro area and/or increased volatility in smaller euro area countries.

CHART 9A: ROLLING STANDARD DEVIATION OF QUARTERLY CHANGES IN REAL GDP IN EURO AREA AND UNITED STATES

(IN PERCENTAGE POINTS; QUARTERLY DATA; SEASONALLY ADJUSTED)
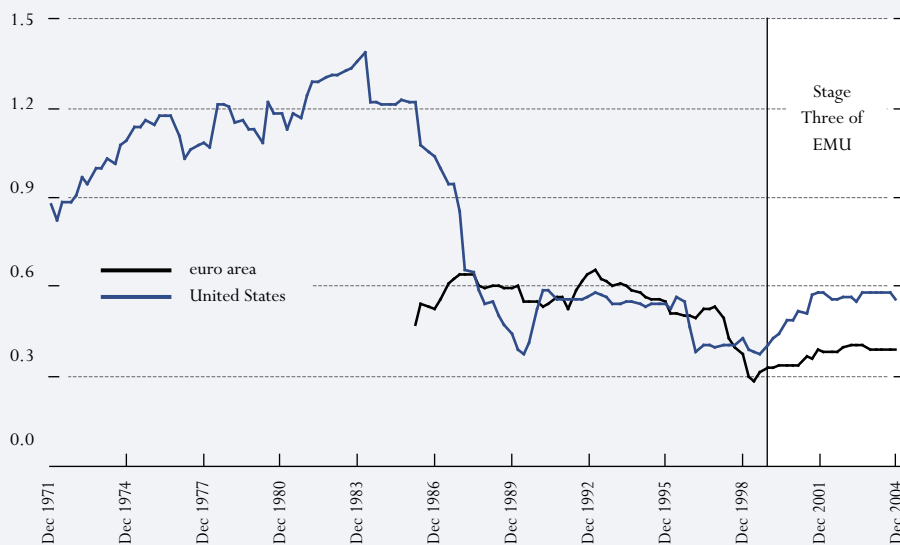
SOURCES: EUROSTAT, ECB CALCULATIONS AND AWM DATABASE.
NOTE: ROLLING STANDARD DEVIATION OF QUARTERLY CHANGES IN HICP INFLATION WITH WINDOW OF 24 QUARTERS. THE LAST OBSERVATION INCLUDED IS THE 4TH QUARTER OF 2004.
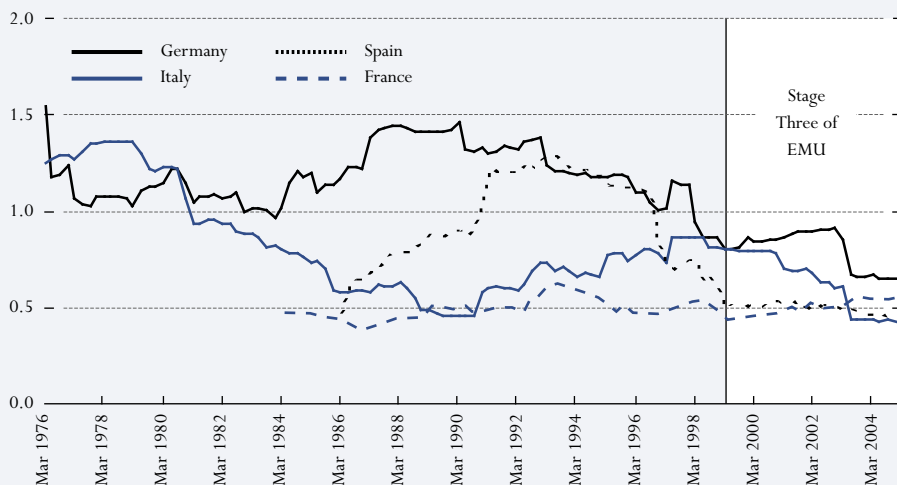
Sources: Eurostat and ECB calculations.
Note: rolling standard deviation of quarterly changes in HICP inflation with window of 24 quarters.
The last observation included is the 4TH quarter of 2004.

slightly lower than the average realized over the last two decades. It may also surprise some observers, especially those who are very much concentrated on the German economy, that employment growth since the introduction of the euro was on average 1% per annum, double as high as during the period of high and volatile inflation (see *Table 7*).

The following section discusses why the reduction of macroeconomic volatility might, in part, also reflect a positive impact of credible monetary policy on the supply side of the economy.

3 HOW CREDIBLE AND PREDICTABLE MONETARY POLICY CAN IMPROVE THE STRUCTURE OF THE SUPPLY SIDE OF THE ECONOMY

It is now widely accepted that monetary policy should aim first and foremost at price stability. Not least the experience of the Great Inflation during the 1970s and the costs associated with the related loss of monetary policy credibility and macroeconomic stability convinced researchers, politicians and, of course, central bankers of the importance of low and stable inflation.[12]

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12 The US Federal Reserve, although having a dual mandate, is also very clear that price stability has clear priority and serves the achievement of the other objectives: "For our part, the Federal Reserve will pursue its statutory objectives of price stability and maximum sustainable employment – the latter of which we have learned can best be achieved in the long run by maintaining price stability. This is the surest contribution that the Federal Reserve can make in fostering the economic prosperity and well-being of our nation and its people." A. Greenspan (2005).

Table 6: Volatility of real economic variables
(Quarter-on-quarter percentage changes; year-on-year percentage changes in brackets; seasonally adjusted)

		Standard Deviation	
		Euro Area	US
Real GDP [1]	1980-1998	0.54 (1.34)	0.79 (2.08)
	1990-1998	0.49 (1.33)	0.53 (1.50)
	1999-2004	0.39 (1.20)	0.56 (1.55)
	1987-1995	0.58 (1.57)	0.52 (1.40)
	1996-2004	0.37 (1.08)	0.52 (1.40)
Real Consumption [1]	1980-1998	0.56 (1.32)	0.67 (1.58)
	1990-1998	0.54 (1.21)	0.51 (1.37)
	1999-2004	0.39 (1.09)	0.39 (1.00)
	1987-1995	0.61 (1.43)	0.51 (1.20)
	1996-2004	0.40 (1.00)	0.38 (0.95)
Employment [2]	1980-1998	0.29 (1.06)	0.43 (1.28)
	1990-1998	0.34 (1.24)	0.35 (1.00)
	1999-2004	0.20 (0.78)	0.44 (1.05)
	1987-1995	0.34 (1.27)	0.36 (1.09)
	1996-2004	0.20 (0.75)	0.38 (0.97)
Productivity [3]	1980-1998	0.46 (0.82)	0.57 (1.12)
	1990-1998	0.40 (0.81)	0.39 (0.86)
	1999-2004	0.29 (0.67)	0.65 (1.12)
	1987-1995	0.45 (0.83)	0.38 (0.76)
	1996-2004	0.30 (0.67)	0.56 (0.94)
Unemployment rate [4]	1980-1998	1.38	1.43
	1990-1998	0.99	0.97
	1999-2004	0.48	0.82
	1987-1995	0.90	0.76
	1996-2004	1.01	0.71

Sources: Eurostat, National data and ECB calculations.
1) From 1991 Eurostat data for the euro area, prior to this data taken from AWM model database (see G. Fagan, J. Henry and R. Mestre (2001)). 2) Civilian data for United States.
3) Measured as ratio of real GDP to total employment. Euro area data on total employment from 1980, on real GDP from 1991 (prior to this data taken from AWM model database).
4) Percentage of labor force. Eurostat data for the euro area from 1993, prior to this data taken from AWM model database.

Table 7: Average growth rates of GDP, consumption and employment
(Quarter-on-quarter percentage changes; year-on-year percentage changes in brackets; seasonally adjusted)

		Average	
		Euro Area	**US**
Real GDP [1]	1980-1998	0.50 (2.10)	0.77 (3.20)
	1990-1998	0.46 (1.96)	0.76 (2.96)
	1999-2004	0.46 (1.88)	0.73 (3.04)
	1987-1995	0.58 (2.41)	0.70 (2.81)
	1996-2004	0.49 (1.98)	0.85 (3.40)
Real Consumption [1]	1980-1998	0.49 (1.99)	0.82 (3.38)
	1990-1998	0.45 (1.83)	0.78 (3.06)
	1999-2004	0.42 (1.83)	0.90 (3.74)
	1987-1995	0.55 (2.33)	0.69 (2.83)
	1996-2004	0.48 (1.90)	0.96 (3.85)
Employment [2]	1980-1998	0.14 (0.54)	0.38 (1.58)
	1990-1998	0.12 (0.49)	0.32 (1.28)
	1999-2004	0.25 (1.08)	0.24 (0.97)
	1987-1995	0.15 (0.64)	0.35 (1.47)
	1996-2004	0.27 (1.08)	0.31 (1.22)
Productivity [3]	1980-1998	0.36 (1.56)	0.39 (1.59)
	1990-1998	0.35 (1.47)	0.44 (1.66)
	1999-2004	0.21 (0.79)	0.49 (2.05)
	1987-1995	0.44 (1.76)	0.35 (1.32)
	1996-2004	0.22 (0.89)	0.54 (2.15)
Unemployment rate [4]	1980-1998	9.09	6.64
	1990-1998	9.79	5.93
	1999-2004	8.50	5.04
	1987-1995	9.38	6.16
	1996-2004	9.14	5.01

Sources: Eurostat, National data and ECB calculations.

1) From 1991 Eurostat data for the euro area, prior to this data taken from AWM model database (see G. Fagan, J. Henry and R. Mestre (2001)).

2) Civilian data for United States.

3) Measured as ratio of real GDP to total employment. Euro area data on total employment from 1980, on real GDP from 1991 (prior to this data taken from AWM model database).

4) Percentage of labor force. Eurostat data for the euro area from 1993, prior to this data taken from AWM model database.

Improvements in overall welfare associated with credible monetary policy do not show up to any great extent in trend GDP growth, especially over the short- to medium-term horizon. Both well-anchored inflation expectations and better predictability of interest rates reduce uncertainty concerning future real income and wealth. This in turn enhances the welfare of individuals averse to risk, even if it is not associated with higher GDP levels. On the contrary, to the extent that lower macroeconomic risks allow some economization on inventories and hedging activities, they may have a temporary negative effect on measured GDP growth.

Fiscal and structural policies as well as wages and labor market features determined by social partners are the main factors having an impact on employment growth, job creation and the volatility of real activity. In addition, cyclical developments are greatly affected by external disturbances like shocks to global growth, international traded goods and commodity prices. Nevertheless, a credible monetary policy can influence the supply side of the economy and thereby help to reduce real macroeconomic volatilities.[13] This section investigates this channel of monetary policy. It is less present in the public debate, which often concentrates on the short-term demand effects of monetary policy, but potentially has far-reaching implications for welfare and for the conduct of monetary policy.[14]

There are three aspects which are relevant in this context. The impact of monetary policy on the price and wage formation process (and, thus, on the importance of past inflation in the aggregate supply curve), on the risk management of private and public agents, and on longer-term employment in the event hysteresis effects are relevant.

3.1 A credible monetary policy tends to reduce the persistence of price and wage inflation

A more credible monetary policy anchors inflation expectations better and, thus, reduces inflation uncertainty and persistence.[15] In a world of uncertainty and learning, systematic private behavior may be affected by the perceived degree of credibility and predictability of monetary policy. In particular the effects of new policy announcements on private behavior will depend on past experience with similar announcements and on the soundness of the institution.

With agents having built up trust in stable prices, there is less reason for them to change their inflation expectations and, thus, current prices and wages at the micro level, if there is a change in current or past inflation on the macro level. Building such trust normally takes time[16] and the process needs to be supported by a convincing institutional design and a successful track record. The latter becomes more important if the former is less convincing,

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13 "… transparency contributes to macroeconomic stability and long-term growth by enhancing the price and wage setting mechanism, and by improving the functioning of the labor market. A credible monetary policy strategy oriented towards price stability contributes to moderate nominal and real wage developments. Workers do not have to ask for extra wage increases to compensate for inflation risk and firms know beforehand that they will not be able to pass higher wages on to consumer prices. Overall, transparent and credible monetary policy enhances firms ability to manage their production costs, retain profitability and create new jobs." Trichet (2005a).

14 Bayoumi and Sgherri (2004b) argue that "most of the fall in US: output volatility between the early 1980s and now can be ascribed to improved supply-side responses resulting from better monetary policies." (p. 16).

15 " … inflation persistence need not necessarily be an inherent feature of the economy, but can be also attributable to monetary policy itself. The credibility of the central bank is crucial in this regard. … This underlines the importance of giving clear signals in order to properly anchor inflation expectations; in this way, a credible policy regime that is focused on price stability will have the potential to reduce the persistence of inflation. This is also a key finding of the IPN: empirical estimates of inflation persistence fall significantly when accounting for shifts in the mean of inflation, which could be related to changes in the monetary policy regime." Issing (2004).

16 See Bayoumi and S. Sgherri (2004b).

and vice versa. In any case, a more credible monetary policy should, over time, reduce the degree of backward-looking or indexation elements in private sector decisions on wage and price-setting. The structure of the aggregate supply curve changes such that there is less weight on past inflation in the determination of current inflation. This welfare-enhancing change of the supply side of the economy implies a lower (intrinsic) persistence or inertia in inflation and, thus, an improved short-term trade-off between inflation and real activity. This in turn tends to reduce the volatility of real activity associated with shocks to inflation. A similar effect can be expected from the increased predictability of monetary policy, which reduces uncertainty about future economic conditions and should make private decisions more forward-looking.

For the United States T. Bayoumi and S. Sgherri (2004a) find strong evidence that a more predictable monetary policy appears to make the supply response gradually less sluggish. They find a close and statistically significant long-term link between changes in uncertainty regarding aggregate demand that are due to uncertainty in predicting the real interest rate determined by the central bank and the coefficient on past inflation in the Phillips curve, with no evidence of reverse causation. This has a number of important policy implications. In particular "it implies that there is a direct connection between some of the more recent improvements in the US economy, such as the fall in output volatility, and the conduct of mon-

etary policy. If a more stable monetary policy eventually makes the inflationary response of the economy less backward-looking, this reduction in inflation inertia can make the entire supply side of the economy more flexible, reducing output fluctuations. In short, it appears that some of the seemingly magical improvements in the supply side of the US economy since the early 1970s can be attributed to Federal Reserve behavior."[17]

It is not unlikely for there also to have been a similar effect in the euro area in more recent years.[18] While the period since the second half of the 1990s may still be too short to find strong and significant econometric evidence for such a change of the supply side of the euro area economy, it is interesting to observe the development of the persistence of price and wage inflation over more recent periods.

Fortunately, a major research project developed by the ECB and the 12 national central banks of the Eurosystem is under way to study price rigidities and inflation persistence in the euro area. This Inflation Persistence Network (IPN) has already produced a large volume of studies on various aspects of the topic, which are summarized in an interim report by Angeloni et al. (2004). They report that a number of studies find that both reduced-form and structural estimates of inflation persistence are reduced if the estimates cover more recent samples or stable monetary regimes, or at least if breaks are allowed for which reflect shifts to lower inflation objectives that took

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17 T. Bayoumi and S. Sgherri (2004a). They also stress: "Linking monetary policy and supply responses … first calls into question the large body of work that assesses monetary rules by assuming that such rules have no impact on underlying private sector behavior. While such analysis may be useful for the short-term impact of changes in monetary rules, the analysis in this paper suggests that it is fraught with difficulty as a guide to the longer-term consequences of a policy shift. Second, the inertia associated with the public first learning about the new policy rule and then incorporating it into their supply-side responses helps explain why the disinflation of the 1980s was so difficult."

18 "Some have argued that inflation persistence is the by-product of monetary policy regimes that are unable to anchor long-term inflation expectations. If so, we should see in the coming years dramatic drops in inflation persistence in all euro area countries… " Angeloni and Ehrmann (2004).

place in most industrialized countries during the 1980s or 1990s. Angeloni et al. (2004) conclude: "The bulk of the micro evidence points to significant stickiness in price setting in the euro area. … The evidence collected by the IPN in favor of significant "intrinsic" inflation persistence seems at the moment to be weaker than that supporting the existence of price level stickiness. … Finally, time series estimates seem to provide direct and indirect confirmation that inflation regimes possibly linked to expectations and to monetary policy, matter in determining the persistence of the inflation process."

Indeed, Gadzinski and Orlandi (2004), using the sample period 1984 to 2003, find evidence of an intercept break at the end of 1995 for euro area HICP inflation. Including a dummy for this break they find a point estimate of the persistence parameter of 0.64 (90% interval: 0.41-0.98).[19] However, they do not report estimates for the sample following this break, presumably because the sample is rather short and, moreover, as is also the case with some other studies, they do not find evidence for a break in the level of persistence.[20]

Nevertheless, given that a new regime of credible price stability was established during the second half of the 1990s with the introduction of the euro and the associated convergence process, one may argue that it is reasonable to look also at estimates which cover just this shorter sample period, i.e. the new price stability regime.[21]

For this reason, the following Charts *(see Charts 10a-b; 11a-c; 12a-b)* show rolling estimates of the persistence coefficient of quarterly changes in HICP inflation and nominal wages, in most cases using a window of ten years (one set of Charts uses two lags and the other three lags of the change in inflation in the estimation of the simple autoregressive process). The measure of persistence is based on the estimate of p from the following equation (1):

[22]

$$\pi_t = \mu + \rho\pi_{t-1} + \sum_{j=1}^{K-1}\phi_j\Delta\pi_{t-j} + \varepsilon_t \qquad (1)$$

Interestingly, the estimates of inflation persistence (but less so for wage growth) vary quite a lot when moving from two to three lags of inflation in the estimated AR model.

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19 As indicated above, the individual euro area countries have shown quite different dynamics of inflation during the last two decades. For example, Levin and Piger (2004) find strong evidence of a break in the mean of the inflation process for Italy in the mid 1990s (and, in the early 1990s, also for the United States, United Kingdom, Canada and Sweden), while they find very little evidence for such a break in the case of France, Germany, and the Netherlands.

20 Levin and Piger (2004) also find breaks in the mean of the inflation time series for the United States and many other industrialized countries, but not in the dynamic parameters of these processes. Nevertheless, they conclude that once they allow for a break in the mean "many of the inflation series exhibit very little persistence" and more generally, "… high inflation persistence is not an inherent characteristic of industrial economies" (p.6). Bilke (2005) also finds no break in the level of persistence concerning French data. Nevertheless, Bilke shows a Chart (see *Fig. 5*) with estimates of French CPI persistence based on 10 years rolling regressions which reveals that point estimates fluctuate around zero for sample periods covering the last 10 to 12 years.

21 Levin and Piger (2004), when using Bayesian estimates instead of classical estimates, find evidence of structural breaks in the autoregressive parameters of CPI inflation in France and Germany. Interestingly, for these countries the classical estimates detect no break in the mean and relatively high persistence. It could therefore be suspected that in cases where the (implicit) inflation objective and the conduct of monetary policy have changed rather gradually over time, the classical tests fail to detect a single break in the mean (perhaps as there were effectively many small breaks) and, thus, overestimate the degree of persistence. For example, French inflation declined gradually from around 6% in 1984-1985 to levels below 2% since the second half of the 1990s, but standard tests presented in Levin and Piger fail to find a break in the mean. However, given that France experienced a clear regime change during this period, there can be no doubt from an economic point of view that the inflation process in more recent years is different from the one observed before the regime change.

22 The number of lags included is either two or three. For *Charts 10a-b* and *11a-c* π refers to the quarterly change in HICP inflation. For *Charts 12a* and *b* π refers to the quarterly change in nominal compensation per employee. It should be stressed that such least-square estimators of the persistence parameter are biased downward, in particular for large (true) persistence values. In these Charts, no correction for this bias is included.

This shows that results concerning inflation persistence may be rather sensitive to the precise specification (number of lags) used and may therefore need to be interpreted with a grain of salt.

For the euro area, both specifications show that the degree of persistence in price and wage inflation over the most recent ten-year windows clearly fell compared with the estimates observed over previous windows. While this is certainly not a formal test for a break in the persistence of inflation associated with the start of the price stability regime in the euro area, it is at least not inconsistent with inflation persistence in the euro area being lower now than it was a few years ago.

The persistence estimates in the four largest euro area countries also fell compared with the values observed during the last years of the 1990s. However, there is a larger degree of heterogeneity than that observed for the ten-year windows ending during the first half of the 1990s, which seems mainly due to the relatively rapid decline in inflation persistence observed (for the ten-year windows ending) during the last five years in Germany (and France for the model with K=2). Interestingly, this heterogeneity in the most recent years seems very much diminished (in particular for K=2), if one looks at a slightly shorter window of 32 quarters (see *Chart 11c*).

CHART 10: ROLLING ESTIMATE OF THE PERSISTENCE COEFFICIENT OF QUARTERLY CHANGES IN HICP INFLATION IN THE EURO AREA AND THE UNITED STATES
(IN PERCENTAGE POINTS; QUARTERLY DATA; SEASONALLY ADJUSTED)

CHART 10A: TWO LAGS OF INFLATION (K=2); WINDOW OF 40 QUARTERS

euro area

United States

CHART 11: ROLLING ESTIMATE OF THE PERSISTENCE COEFFICIENT OF QUARTERLY CHANGES IN HICP INFLATION FOR SOME EURO AREA COUNTRIES
(IN PERCENTAGE POINTS; QUARTERLY DATA; SEASONALLY ADJUSTED)

CHART 11A: TWO LAGS OF INFLATION (K=2); WINDOW OF 40 QUARTERS

Germany   Spain

Italy   France
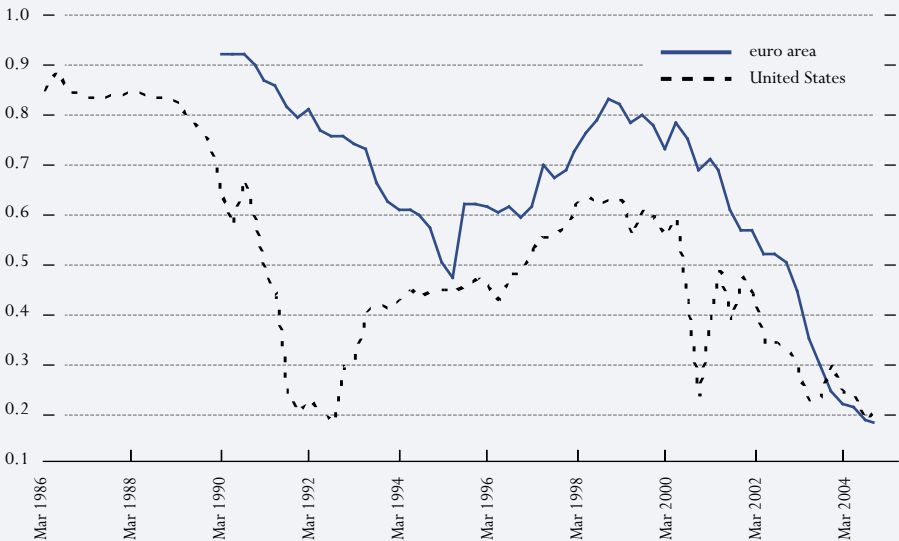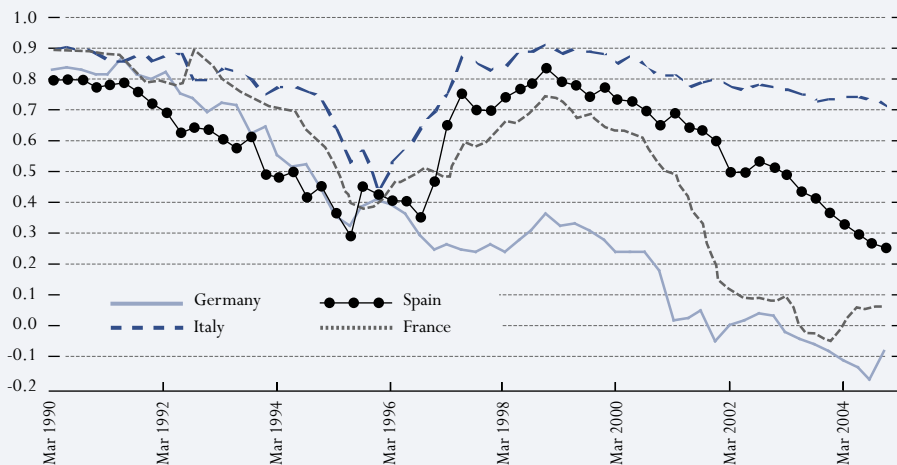
CHART 11B: THREE LAGS OF INFLATION (K=3); WINDOW OF 40 QUARTERS
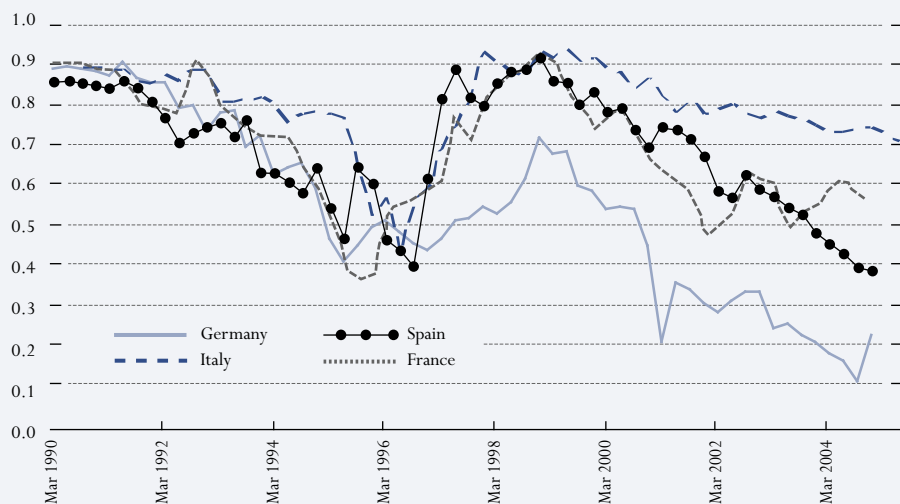
CHART 11C: TWO LAGS OF INFLATION (K=2); WINDOW OF 32 QUARTERS
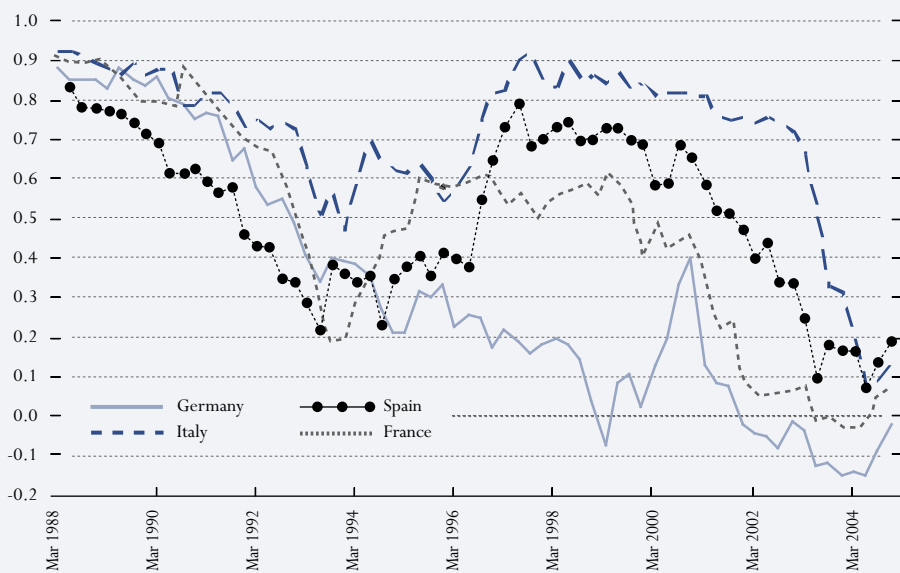
SOURCES: EUROSTAT AND ECB CALCULATIONS. SEE EQUATION (1). THE LAST OBSERVATION INCLUDED IS THE 4TH QUARTER OF 2004.

CHART 12A: TWO LAGS OF NOMINAL WAGE GROWTH (K=2); WINDOW OF 40 QUARTERS

CHART 12B: THREE LAGS OF NOMINAL WAGE GROWTH (K=3); WINDOW OF 40 QUARTERS

SOURCES: Eurostat, ECB calculations and AWM database. See equation (1). The last observation included is the 4TH quarter of 2004.

If thorough econometric and structural analysis were to confirm that the fall in price and wage inflation persistence reflects a decline in intrinsic persistence (e.g. a decline in the indexation of prices and wages to past inflation), there would be significant consequences for monetary policy.[23]

3.2 A predictable and systematic monetary policy tends to enhance risk management and macroeconomic stability

Although often neglected, there is a further supply-side effect which stems from a credible and transparent monetary policy framework and tends to reduce macroeconomic uncertainty and volatility. Effective monetary policy transparency implies that the systematic responses of monetary policy to new developments, or, in more technical terms, the main features of the reaction function of the central bank, are relatively well understood by the private sector. A good understanding of monetary policy in this sense reduces uncertainty about future macroeconomic developments and allows private agents to better manage and hedge their risks.[24]

Risk management can be improved if private agents can better predict the systematic responses of policy rates to various macroeconomic developments. For example, the conditional covariance risks associated with long-term financing and investment decisions (e.g. concerning the choice between equity and debt and between fixed and variable rate debt) can then be better assessed

and managed. This in turn would reduce the overall risks associated with investment, financing and employment decisions and, thus, improve the welfare of agents averse to risk. For example, better risk management at firm level will make the individual external finance premium less vulnerable to macroeconomic shocks, thereby stabilizing employment for given wages. Anticipating this, firms will have incentives to increase employment and investment in human capital as it becomes less likely that they will have to reduce employment due to rising external finance premia. Overall, better risk management tends to lead not only to a higher level and efficiency of investment and employment, but also to greater resilience of the economy to macroeconomic shocks, thus enhancing macroeconomic and financial stability and job creation.

Increased credibility and predictability of monetary policy should also help to reduce macro risk premia in financial market prices. For example, if long-term inflation uncertainty is reduced, inflation risk premia in long-term interest rates should fall. Moreover, if markets understand that in an environment of price stability short-term real rates tend to be higher in periods of strong real growth and lower in periods of weak growth, they will regard long-term bonds as a certain hedge against persistent real income fluctuations, which may reduce or even turn negative the so-called covariance risk premium included in long-term interest rates. The significant fall of the levels and volatility of long-term interest rates observed since 1997-98 (see *Charts 5* and *6* and

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23   See Issing (2004) for a discussion of the implications of a given degree of inflation persistence for the conduct of monetary policy.

24   "… the central bank's communication should ensure that markets understand the systematic responses of monetary policy to economic developments and the current assessment of the central bank. Successful central bank communication supports predictability and correct price formation in financial markets, contributes to efficient allocation of funds and reduces uncertainty about future interest rates. In an environment where the predictability of interest rate movements and their relation with key macroeconomic developments is well understood, firms can better manage their balance sheets. This reduces both their vulnerability to economic shocks and their risk management costs and creates the conditions for better investment decisions." Trichet (2005a).

Table 3) may in part also be explained by these effects of predictable monetary policy.

How can monetary policy contribute to a better understanding of the likely conditional relation between interest rates, on the one hand, and other macroeconomic variables which also impact on economic conditions and balance sheets of firms, banks and private households, such as inflation, real growth or asset prices, on the other hand? It is, of course, not possible for the central bank to publish a quantitative reaction function specifying the likely response of policy rates to all possible future contingencies.[25] What is needed is a transparent strategy that outlines the main principles and the analytical and procedural framework governing the systematic conduct of policy over time, including an ongoing explanation of day-to-day policy decisions. Such a rule-based framework[26] enhances credibility and predictability and allows the private sector to better form interest rate expectations and at the same time to fully understand the conditional nature of these expectations. From the point of view of both the central bank and the market, this seems preferable to announcing a likely path for future policy rates, as such announcements always risk being misunderstood, in particular because of their highly conditional nature.

3.3 Monetary policy, wage formation and unemployment volatility
Importantly, the positive supply-side effects of credible monetary policy discussed here do not necessarily require that the level of individual prices or wages becomes less sticky, in the sense that a higher frequency of price or wage changes is observed. On the contrary, if workers and firms have more confidence in monetary stability and predictability, they may tend to reduce the information and transaction costs associated with preparing and implementing changes in individual prices and re-negotiating wages, implying that nominal rigidity at the micro level may appear to have increased. For example, as regards wage rigidity, if workers have gained the belief that monetary policy behaves in a credible and symmetric manner and is determined to avoid second-round effects related to cost push or supply shocks, they no longer need to fear that high and persistent inflation may erode their real income. The average duration of wage contracts may then over time become longer, while (implicit or explicit) indexation of wages to past inflation is reduced, although "indexation" to the inflation objective of the central bank might be increased.

This is possibly a surprising result. Over time successful monetary policy may tend to dampen persistence in wage and price inflation, but at the same time increase the measured degree of (symmetric) nominal wage stickiness at the micro level.[27]

In any case, credible and systematic monetary policy may impact on the wage formation process and thereby on the supply-side of the economy. For example, based on the understanding that the transitory first-round effects

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25 "The public needs to have as clear as possible an understanding of the rule that the central bank follows in deciding what it does. Inevitably, the best way to communicate about this will be by offering the public an explanation of the decisions that have already been made; the bank itself would probably not be able to describe how it might act in all conceivable circumstances, most of which will never arise. But it is important to remember that the goal of transparency should make the central bank's behavior more systematic, and to make its systematic character more evident to the public…" Woodford (2001, pp. 17-18).

26 See ECB (2001).

27 A recent study for the US economy by Edge, Laubach and Williams (2003) that focuses on the response of prices and wages to technology shocks finds that prices adjust very flexibly and moreover there is no intrinsic inflation inertia. However, it estimates a high degree of inertia in nominal wages and also some wage inflation persistence. The authors acknowledge that this latter result is difficult to reconcile with micro-evidence, which suggests more flexible wages.

of supply shocks on inflation are accepted, while it is absolutely clear that second-round effects will be counteracted, more longer-term nominal wage contracts which are not indexed to past inflation might be chosen. The transitory first-round impact of supply shocks on inflation will then directly affect real wages, given that (most) nominal wages are fixed for some time. This ensures that negative supply shocks have a smaller downward impact on unemployment than in the case where wages are indexed to past inflation. However, in order to accept such an endogenous fall in real wages in the event of adverse supply shocks (and to resist the attempt to effectively index wages to past inflation), workers and unions need to be sure that monetary policy acts in a "fair" or symmetric manner and lets positive supply shocks result in transitorily lower inflation, such that real wages in this case can rise without a need for re-negotiation of nominal wage levels. Such a change in the process of wage formation may be welfare-enhancing as less wage indexation contributes to lower volatility of unemployment in response to supply shocks. It may also make monetary policy easier, as it could help to better anchor economy-wide inflation expectations and avoid policy rates having to react aggressively to the initial inflationary impact of supply disturbances. Of course, it would be even better if nominal wages would quickly respond to supply shocks, which would further contribute to dampening volatility of unemployment, but minimizing (intrinsic) persistence in wage inflation and/or indexation of wages to current and past inflation would already be an important improvement.[28]

It is certainly the case that, in order to empirically assess the possible impact of price stability on the wage formation process, there is a need to better understand the wage setting and the wage formation process in the euro area, and in particular any changes which may have taken place in this respect in recent years. It would be particularly important to obtain a full picture of all the components of hourly wage and unit labor costs, including taxes, variable compensation and bonus payments and effective working time.

3.4 Supply-side effects of monetary policy and the hysteresis argument

Two decades ago, Blanchard and Summers (1986; 1987) started the hysteresis debate. They argued that any increase in the actual rate of unemployment will, if it lasts sufficiently long, likely lead to an increase in the natural rate of unemployment. There are various potential sources of hysteresis. First, unions may be mainly interested in the welfare of those who are employed (insider-outsider problem). This would imply that real wages are set at too high a level, making it impossible for the unemployed to find new (official) jobs. Second, those who are unemployed for some time lose their skills due to a lack of training on the job or learning by doing. This makes it more difficult for them to find a new position, in particular if employers are averse to risk and face large hiring and firing costs. Third, if fiscal policies react by increasing unemployment benefits and employment protection, incentives to accept new jobs will decline and firms will demand less labor, in particular if taxes are expected to rise as a result of increased government expenditures.

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28 The main contribution for lower unemployment must of course come from other measures. The contribution of real wage developments is discussed by Issing (2000a): "… real wage increases in relation to labor productivity growth should take into account the need to strengthen, where necessary, and subsequently maintain the profitability of employment-creating investment. In principle, as a very broad guideline real wage increases in line with productivity gains would ensure no upward pressure on unit labor costs while not necessarily contributing to further employment and growth. … in order to improve employability, wage agreements should take into account differentials in productivity levels according to qualifications, skills and geographical areas."

It is crucial to see that all these explanations for hysteresis require that real wages do not adjust flexibly enough to clear the labor market. Against this background, it is somewhat surprising that the hysteresis argument, which identifies labor market rigidities and regulations as the final source of a persistent impact of actual unemployment on the natural rate, has been used by some observers to ask for monetary accommodation to prevent persistent increases in unemployment. Giving monetary policy such a responsibility would, however, be misguided, not only because it is very difficult to estimate the unemployment gap in real time. Most importantly, it would endanger the credibility of monetary policy and undermine both the positive supply-side effects of monetary policy discussed above and the incentives for governments and social partners to remove the structural rigidities which are at the source of too high unemployment levels. Not least the "Great Inflation" during the 1970s has shown that imposing an activist stabilization role on monetary authorities implies major risks for economic performance. "… in a dynamic economy with agents continuously learning, the rise in inflation resulting from the policy errors and the activist approach to stabilization policy unmoored inflation expectations, eventually resulting in the stagflation of the 1970s. Towards the end of that decade, the fatal flaw in activist policy strategies was recognized. Out of this experience grew the realization that active control of resource utilization should be downplayed and that policies focusing on price stability could achieve better outcomes in terms of the stabilization of both inflation and unemployment."[29]

More recently Blanchard (2003) admitted that "I still do not have a good sense today of how important this [hysteresis] channel is." In any case, if hysteresis is indeed an important feature of the European labor markets, it becomes even more important to ensure that real wages can adjust quickly enough to new economic conditions, are not indexed to past inflation and do not include risk premia for uncertain inflation. As discussed above, credible monetary policy can, over time, contribute to this aim. Overburdening central banks with extended mandates risks being counterproductive.

4 Conclusion

Macroeconomic volatility in the euro area has fallen substantially during recent years compared with the levels observed in the 1980s or the early 1990s. The persistence of price and wage inflation also appears to have declined, which in turn seems to have supported the stabilization of inflation and output volatility at low levels in spite of major supply shocks hitting the euro area in recent years. There are good theoretical arguments that credible monetary policy has contributed to this success by influencing price and wage-setting behavior.

If credible monetary policy contributes to reduced indexation of prices and wages to past inflation, and possibly also to a longer duration of the level of individual prices and wages, it is of course problematic to assume that any observation of a low frequency of price and wage changes necessarily implies that there are severe "rigidities" or "nominal inertia" that can and should fully be removed by appropriate structural reforms.

The discussion in this paper has remained largely descriptive and theoretical. Thorough empirical and structural analysis is needed to

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29 Orphanides and Williams (2004).

investigate the link between monetary policy and macroeconomic volatility in the euro area more closely. Nevertheless, a few tentative conclusions concerning the key principles of the conduct of monetary policy may be drawn at this stage.

First, monetary policy credibility and predictability allows price and wage setters to build trust and, over time, to change their supply behavior, reducing (de facto) indexation to past inflation and instead using the quantitive definition of price stability provided by the central bank as a guide for updating nominal wage contracts. A strong and quick short-term response of nominal and real wages to supply shocks, with negative (positive) shocks leading to lower (higher) real wages would certainly appear optimal for reducing unemployment volatility. However, the transaction and uncertainty costs related to frequent re-negotiation of nominal wages may be significant, preventing a very high degree of nominal and real wage flexibility. In this case, the principles followed by monetary policy may have important implication for the wage process and employment volatility.

The ECB's monetary policy has a medium-term orientation and tailors its response to the nature and magnitude of shocks. For example, in the case of cost-push shocks monetary policy may respond more gradually than in the case of aggregate demand shocks or labor cost shocks. First-round effects of supply shocks on the price level are normally accepted, while second-round effects are clearly not and will therefore be counteracted. Against the background of such a monetary policy design and

with nominal wages fixed for some time (and otherwise linked to the price stability objective of the central bank and not to past inflation), real wages would automatically react to supply shocks, as inflation is allowed to temporarily respond to such shocks. In this way, a credible monetary policy aimed at price stability with a medium-term orientation contributes to dampening unwarranted fluctuations in unemployment related to supply shocks.[30]

Of course, this mechanism will not normally be sufficient to fully avoid employment fluctuations related to supply shocks. Moreover, monetary policy can only deal with aggregate shocks and keep area-wide prices stable. This implies that labor market reforms and social partners need to actively ensure that real wage developments as close as possible reflect trends and differentials in the productivity levels of workers, as well as the geographical and sector-specific unemployment situation, in a way which is conducive to full employment everywhere.

Second, monetary policy transparency is crucial if monetary authorities want to exert positive supply effects. This also includes exchanging information with governments and social partners (this allows each player to better understand the objectives and reaction functions of the other player, thereby building trust without endangering the independence of any participant).

Third, and more generally, a high degree of credibility and predictability can be seen as the main asset of a central bank. Putting this asset at risk involves substantial real costs for

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30 Such an approach was outlined in early 1999 by the ECB (1999). Issing (2004) discusses the medium-term orientation of monetary policy and explains: "This also means clearly explaining to the public how monetary policy tailors its response to the nature and magnitude of the shocks hitting the economy. Specifically in the case of cost-push shocks, like the ones seen in the last few years, a more gradual monetary policy response might be required than in the case of demand shocks or shocks coming from labor cost developments."

the whole society. The fact that to a large extent these real costs become fully apparent only with a substantial lag, namely after price and wage-setting behavior has structurally changed and it ultimately becomes unavoidable to tighten monetary policy substantially in order to re-establish credibility, should not cause observers to confuse the direction of causality. The ultimate reasons for the normally large costs in the form of reduced macroeconomic stability and higher unemployment associated with inflation and disinflation are too lax and misguided policies in the past which undermined credibility and predictability, and destabilized expectations, not the tight policy which is finally needed to re-establish credibility and price stability.[31]

Finally, the positive supply-side effects of credible monetary policy do not require direct responsibility on the part of the central bank for output stabilization or other real variables. On the contrary, a direct mandate for output stabilization may lead to excessive and asymmetric activism which, in the end, may risk destabilizing the economy.[32]

The critique sometimes raised by observers that a tight monetary policy aimed at price stability via so-called hysteresis effects dampens employment and output for a persistent period of time, if not permanently, needs to be seen against the background of the points raised before. The hysteresis argument effectively acknowledges that labor markets and wage setting are not flexible enough to ensure full employment. Putting the burden on monetary policy thus not only neglects the main reason for hysteresis, it also disregards the positive impact of credible and predictable monetary policy on the supply side of the economy and the related long-term gains in terms of lower macroeconomic volatility and uncertainty. If there was indeed hysteresis in unemployment, these supply-side effects would tend to contribute even more to higher employment levels in the long run. Asking monetary policy to take active responsibility for unemployment developments, however, would risk undermining credibility and predictability and thus endanger these positive supply-side effects. Or, in the words of Issing (2000b) "… the existence of hysteresis places a premium on ensuring that the central bank avoids a situation in which disinflation becomes necessary."[33]

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31 "Economists generally agree that the 1970s, the period of highest volatility in both output and inflation, was also a period in which monetary policy performed quite poorly, relative to both earlier and later periods (Romer and Romer, 2002). Few disagree that monetary policy has played a large part in stabilizing inflation, and so the fact that output volatility has declined in parallel with inflation volatility, both in the United States and abroad, suggests that monetary policy may have helped moderate the variability of output as well." Bernanke (2004).

32 " .. since the 1980s the central banks of the major industrial nations have been largely successful at bringing down inflation to low and fairly stable levels. Nor does this seem to have involved any permanent sacrifice of other objectives. For example, real GDP growth has been if anything higher on average, and certainly more stable, since inflation was stabilized in the United States. Somewhat paradoxically, this period of improved macroeconomic stability has coincided with a reduction, in certain senses, in the ambition of central banks' efforts at macroeconomic stabilization. Banks around the world have committed themselves more explicitly to relatively straightforward objectives with regard to the control of inflation, and have found when they do so … that price stability creates a sound basis for real economic performance as well." M. Woodford (2003), p. 2.

33 Issing (2000b)

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Capital Markets and Demography (A Survey of Financial Experts)

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Executive Summary

This study deals with the interrelations between ageing societies and capital markets. The implications of the ageing of populations and the consequent reform of the pension systems on the capital markets are highly complex and depend on a variety of developments and factors. In contrast to the problem of financing public retirement income provision, this aspect has been tackled only in a few studies so far.

Ageing societies and the necessary reform of the overburdened state-administered pension systems will have a significant impact on the market for retirement provisions and on capital markets in general. The acceptance of taking (at least partly) personnel responsibility for old-age provision is rising and the demand for private pension products will be boosted by cuts in the public pension systems.

In this context, there arise a number of interesting question which our study tries to discuss: What is the future role of capital markets for old-age provision? Which investment alternatives will gain in importance? How are savings in general be affected? What is the impact on securities prices? How likely is a so called asset meltdown (i.e. a rapid fall in securities prices due to a withdrawal of assets by the retiring baby-boomers)? Can international diversification help?

Our study is based on a survey among financial experts. A questionnaire comprising 10 questions on the demography-capital markets nexus was sent as part of the monthly ZEW Financial Market Survey to financial analysts from banks, insurance companies and large industrial enterprises. From the 375 experts participating in the ZEW Financial Market Survey, 247 replied our questionnaire which produces a rather good response rate of 65.9%. Their assessment of the effects of ageing societies on capital markets is presented and discussed.

According to the questionnaire's focus which is threefold, the main results are the following:

1. **Expected future role of capital markets and specific investment products for old-age provision**

Capital markets in general are expected to be more important for retirement provision in the future. The awareness of the relationship between risk and return is expected to become more pronounced. This is reflected in the expected relative importance of specific investment forms and products: Low risk-products such as money market accounts, time deposits, bank savings schemes and bank deposits are expected to become less important for old-age provision as compared with other investment alternatives in the retirement portfolio. Occupational pension schemes, investments funds as well as direct investments in stocks and bonds are expected to gain in importance. Life insurance and real estate (particularly self-used real estate) will slightly increase in importance. This is interesting as these assets already represent a relatively large share of the total investment portfolio of private households.

When interpreting these results it is important to keep in mind that the assessments refer to the relative importance within the retirement portfolio of the households. Thus, it might well be the case that more assets are invested in a specific product in absolute terms, even though the product will be less important in relative terms. This can be explained by a possible increase in the total amount invested by private households.

2. Impact of the demographic change and the reform of pension systems on the savings behavior of households and, consequently, on the capital market return

The majority of respondents expects the savings ratio after retirement to decline but to stay positive, i.e. does not reckon dissaving behavior to take place. Often it is feared that such a decline in savings after the retirement of the baby-boom generation may cause securities prices to fall dramatically (asset meltdown hypothesis). According to the surveyed experts this fear is unwarranted, although on average the respondents expect a slightly negative effect on stock prices. With respect to the bond market almost no negative effect is predicted.

3. Role and importance of international diversification

An often cited reason for the absence of severe negative effects on capital markets is the possibility of international diversification. Indeed, the majority of financial experts is of the opinion that international diversification can help to mitigate the negative effects of ageing societies. The regions and countries that are expected to experience an increase in the share in the future retirement portfolio are emerging markets. These comprise countries in Middle and Eastern Europe, China, and other Asian countries with the exception of Japan. For Western Europe a drop in the portfolio share is predicted.

1 Introduction

It is an inescapable fact that the combination of higher life expectancy and lower fertility rates results in ageing populations. This phenomenon applies to many industrial countries especially in Europe. It has substantial implications for social policy, in particular for Europe's state-administered pension systems. These are, for most part, financed on a pay-as-you-go (PAYG) basis. Today's workers are forced to finance yesterday's workers' pensions. PAYG systems are based on the assumption that workers hugely outnumber retirees. This, however, no longer holds true in many European countries. The current worker-pensioner ratio in Europe has fallen to about three workers for each pensioner, and it is predicted to fall to a mere three workers for every two pensioners within 30 years (Economist, 2003a). Patching up the overburdened PAYG system by cutting benefits or raising contribution rates is no longer sufficient. Consequently, a reform of the public pension systems seems to be required and in particular a shift from the PAYG to funded systems.

Countries such as Great Britain, the Netherlands, Switzerland as well as Scandinavian countries have already shifted much of their pension burden from the state pension system (first pillar) to occupational systems (second pillar), and to private systems (third pillar) where the individual pensioners-to-be save for themselves (Economist, 2003b). In Germany, as in countries like Austria, Italy, and France, such a reform has just been started. These reforms and of course also the pure demographic change have implications for the capital markets.

The interrelations between ageing societies and capital markets are in the focus of our study. In contrast to the problem of financing public retirement income provision, this aspect has been tackled only in a few studies so far.

In light of the crisis of the state administered pension systems the awareness for the necessity of private pension provision rises; and thereby also the total volume of retire-

ment savings. Reforms are partly on the way, for example in Germany with the introduction of the so called "Riester"- and "Rürup"-products. This raises particularly the following questions that are dealt with in the study: How does this higher demand affect capital markets in general? How will specific investment products develop? How will private savings in general be affected? What is the impact on securities prices? How likely is a so called asset meltdown (i.e. a rapid fall in securities prices due to a withdrawal of assets by the retiring baby-boomers)? Can international diversification help to mitigate these negative repercussions?

As is outlined in section 3 the effects of ageing societies on capital markets are very complex and depend on a variety of developments and factors. A few studies have tried to predict the outcome based on simulation models. In contrast, our study is based on a survey amongst financial experts. Their assessment of the effects of ageing societies on capital markets is presented and discussed in the light of earlier theoretical and empirical studies.

The remainder of the paper is organized as follows. The next section describes our survey and the questionnaire. Section 3 gives a brief overview of the issues discussed in the literature. Sections 4, 5 and 6 present the results of the survey amongst financial experts. The questionnaire's focus is on the following aspects: The expected future role of capital markets and specific investment products for old-age provision (section 4); the impact of the demographic change and the reform of pension systems on the savings behavior of households and, consequently, on the capital market return (section 5); and the role and importance of international diversification (section 6).

2 Survey and Questionnaire

As mentioned above the awareness of consumers for the necessity of private retirement savings is increasing. Their assessment of retirement investment products is known from consumer surveys and appears in the actual allocation of assets (as is shown in section 4). However, when trying to assess future developments it seems to be more appropriate to consult experts that overlook the whole spectrum of financial markets and products. Therefore, this study relies on the assessment of financial experts that regularly analyze international capital markets and international economic conditions.

A questionnaire (see Appendix) comprising 10 questions on the demography-capital markets nexus was sent as part of the monthly ZEW Financial Market Survey. 375 financial analysts from banks, insurance companies and large industrial enterprises participate in this survey. Among the respondents are experts from the finance, research and economic departments as well as traders, fund managers and investment consultants. 247 replied our questionnaire which produces a rather good response rate of 65.9%. *Table 1* gives the composition of the participants in the ZEW Financial Market Survey according to countries of origin and sectors.

With respect to the sector, three-quarters are working for banks. 13% and 9% of the analysts are from industrial enterprises and insurance companies, respectively. Although, the lion's share of participants comes from Germany – only 10% come from abroad – the results of our survey may also be interpreted in a European context. The financial experts that regularly respond to our survey are used to analyze international financial markets and the world-wide economic conditions. Thus, it

	Number of experts	Share
Total	**375**	**1.00**
According to country of origin		
Germany	343	0.91
Foreign countries	32	0.09
thereof:		
· Great Britain	12	0.38
· France	5	0.16
· Switzerland	3	0.09
· USA	3	0.09
· Others	9	0.28
According to sector		
Industrial companies	48	0.13
Insurance companies	35	0.09
Banks	283	0.75
thereof:		
· Commercial banks	84	0.30
· Investment companies/advisors	76	0.27
· Savings banks ("Sparkassen")	41	0.14
· Credit co-operatives	35	0.12
· Mortgage banks, building and loan associations	16	0.06
· Other banks (e.g., "Landesbanken", banks with special functions)	31	0.11
Others (e.g., associations)	9	0.02

can be expected that the results of this survey are not only representative from a German but also from a European point of view, because most of the respondents are regularly analyzing both world-wide economic developments and international capital markets.

3 Demographic Chnage and the Effects on Capital Markets – a Review of the Literature

The implications of the ageing of populations on the capital markets are highly complex and their explanation requires consideration of many factors. There are both direct and indirect effects (Börsch-Supan et al., 2003): Direct effects are the purely demographic effects without any change of the present pay-as-you-go pension systems. Indirect effects arise from the necessity that an ageing population requires a reform of the pension system. In many ageing countries such a reform towards a more capital funded system has already been started. These changes also affect capital markets. The different effects of ageing societies on capital markets are of course strongly interdependent and cannot be investigated separately.

In general the demographic change has an impact on many aspects of capital markets. Particularly of interest seems to be the development of savings, the return to capital, and securities prices (Börsch-Supan et al., 2003; Lueg et al., 2003). Besides, international capital flows and therefore also the balance-of-payments as well as exchange rates are affected.

An ageing population causes the relative supply of the factors of production (labor and capital) to shift. The decline in the labor force means that labor becomes relatively scarce and therefore capital becomes relatively abundant. As a consequence, wages tend to rise and the return to capital tends to fall. Based on an overlapping generations model Börsch-Supan et al. (2003) forecast the return to capital in Germany to fall by some 120 basis points by 2035 due to this purely demographic effect assuming that there are no opportunities to diversify internationally.

Often it is argued that this negative effect on the return to capital could be further intensified by the reform of the PAYG-pension systems towards more funded systems as this increases retirement savings. The additional supply of capital will exert pressure on returns. Börsch-Supan et al. (2003) forecast this effect to amount to some further 40 basis points if all old-age provision is invested in Germany.

Crucial in this context is the development of savings of households which determine private sector capital supply. According to the life-cycle-hypothesis individuals try to smooth their consumption by varying their savings over the life cycle (e.g., Bräuninger et al., 2002). Young adults should exhibit a negative savings ratio to finance major purchases. This phase of

life is followed by a phase of saving for pension provision. And finally, accumulated savings should be reduced again after the end of active working life to maintain living standards. Therefore, the savings rate is expected to be high when a large percentage of the population is employed (European Commission, 2002). Likewise, a low savings rate is expected when a large proportion of the population is either very young or above the retirement age.

As long as a large percentage of the population is employed the rise in retirement savings increases capital supply and exerts pressure on the expected return to capital. This in turn should lead to an increase in securities prices (Heigl and Katheder, 2001). In Germany – as in many other ageing countries – the baby-boomer cohorts will work and thus concentrate their savings activity until around 2010-2020. When the baby-boomers retire they are expected to withdraw financial assets and consume large parts of their wealth. Since there will not be enough young buyers for these assets the old want to sell, securities prices are expected to slump. This is what is often referred to as asset meltdown.

However, there are also contrary effects that make the impact of ageing populations on the return to capital and the securities prices less obvious, and the above described fear – at least to this extent – unwarranted.

With respect to the fall in the return to capital the following effects have to be considered:

• An increase in the labor participation of women as well as a rise in the average retirement age may mitigate the relative shortage of labor supply (Lueg et al., 2003).[1] Nevertheless

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1 In general, the same holds true for an increase in migration. However, migration effects are hardly predictable.

these effects are certainly not strong enough to totally offset the demographic change.

- An ageing society needs more capital since capital (IT, machines, etc.) must increasingly replace labor (Börsch-Supan et al., 2003). Consequently the demand for real capital is increased, stabilizing the return to capital.

- International capital flows help to mitigate the negative effects on the return to capital (Lueg et al., 2003; Börsch-Supan et al., 2003). Although in general the ageing of the population is a phenomenon to all industrial countries, there are differences. Countries such as France, the United Kingdom and the United States do not share Germany's problem of a severe drop in the working population to the same degree. Investors in strongly ageing countries can benefit from growth and higher returns to capital in slowly ageing countries. As a consequence, countries with a higher average age are expected to expand their net capital exports to countries of a lower average age which exhibit a stronger investment demand and a limited savings capacity (Bräuninger et al., 2002). Börsch-Supan et al. (2003) forecast that this diversification effect will reduce the fall in the (annual) return to capital, which is due to the pure demographic effect, by about 10 to 20 basis points.

It is sometimes argued that such diversification in emerging markets might be restricted due to a limited absorption capacity for capital. The reasons for that could be, for instance, underdeveloped financial market infrastructure, institutions, regulation and supervision. This topic will be further analyzed in section 6.

Regarding the asset meltdown-hypothesis the following counter-arguments have to be considered (Lueg et al., 2003):

- There is no clear empirical evidence for the life-cycle-hypothesis. Although there is evidence for a decline in the savings ratio over the life-cycle, for Germany a negative savings ratio after retirement (i.e. dissaving) is not confirmed empirically. In contrast wealth still increases after retirement. However, this may change with an increasing importance of funded pension systems.

- The demographic development is by and large predictable, and capital markets will anticipate this development. Retirements of baby-boomers will drag on for a period of some 15 to 20 years. A potential asset meltdown is thus neither a sudden nor an unexpected event. The price effect of a potential over-supply would be spread over a long period.

- In an open economy with international capital flows a reduction of domestic demand for financial assets can be compensated by foreign demand.

- Retirement savings are not only invested in financial assets (e.g., equities and bonds) but to a large part also in real estate. This real capital can be consumed after retirement and does not have to be sold to younger generations immediately. In this case the problem of an asset meltdown should be not so severe.

- According to the dividend discount model the fair value of stocks is determined by the expected value of future dividends, and not by the development of the number of people offering and demanding.

- Funded pension schemes will still not have reached maturity by 2030 (Börsch-Supan et al., 2003). Until 2050 fewer retirees will be drawing their pension than young employees will be paying into new private retirement

accounts up. Thus, the negative effect on securities prices due to a withdrawal of funds by the baby-boomers will be curbed.

To sum up, the implications of ageing societies for capital markets, in particular for the return to capital and the securities prices, depend on a variety of different contrary effects. The outcome is difficult to forecast. There are several studies that try to make predictions based on overlapping generations models or general equilibrium models (Börsch-Supan, 2003; McMorrow and Röger, 2003; European Commission, 2002). In what follows this paper presents the results of a survey among financial experts on their assessment of the effects of ageing societies on capital markets.

The results of the survey are organized in three sections. The issues of the effects on savings and on securities prices are discussed in section 5; and the role of international diversification in section 6. Beforehand (section 4), the future importance of capital markets in general and of specific investment products in particular for old-age provision are discussed.

4 Future Role of Capital Markets for Old-age Provisions

In ageing societies the PAYG pension systems are no longer sustainable, and indeed in many countries a reform towards funded systems has at least been started. Funded pension systems require higher private savings. This section discusses the question of how private retirement savings are invested.

Question no. 1 asks what role capital market investments in general will play for private retirement provision in the future. Almost all surveyed financial experts expect capital market investments to be more important within the next 15 years (see *Figure 1*). On a scale from

"1" to "7", "1" indicating a strong decrease and "7" a strong increase in importance, 242 of 246 (98.4%) experts assign a value of "5", "6" or "7". No single respondent thinks the importance of capital market investments will be decreasing; only 4 think it will be unchanged.

The reasons for that may be twofold: First, political reform may make people to invest more on the capital markets. Second, there may be an increase in the awareness of the need for increased private retirement savings which are invested on the capital markets.

Before looking in greater detail on the expected future importance of specific investment forms and products, one should take a look at the current absolute amounts that households currently have invested in different products. *Table 2* shows the investment structure of the financial assets of private households for the year 2003.

At the moment apart from bank deposits the largest share (25%) of financial assets is held with insurance corporations (particularly in life insurance products). Another important investment at present is building society savings which is not listed separately in T*able 2* but is part of "bank deposits". A survey amongst households (Börsch-Supan and Essig, 2002) for the year 2000 showed that building society savings accounted for some 14% of the total investment portfolio of German private households. According to this ratio in 2003 about 549 billion should have been invested by German households in building societies. This amounts to about 39% of "bank deposits".

One should keep this current allocation of assets in mind, when interpreting the results from our survey with respect to the future importance of specific investment products.

Mean: 6.12
Standard deviation (SD): 0.68
Number of respondents (N): 246

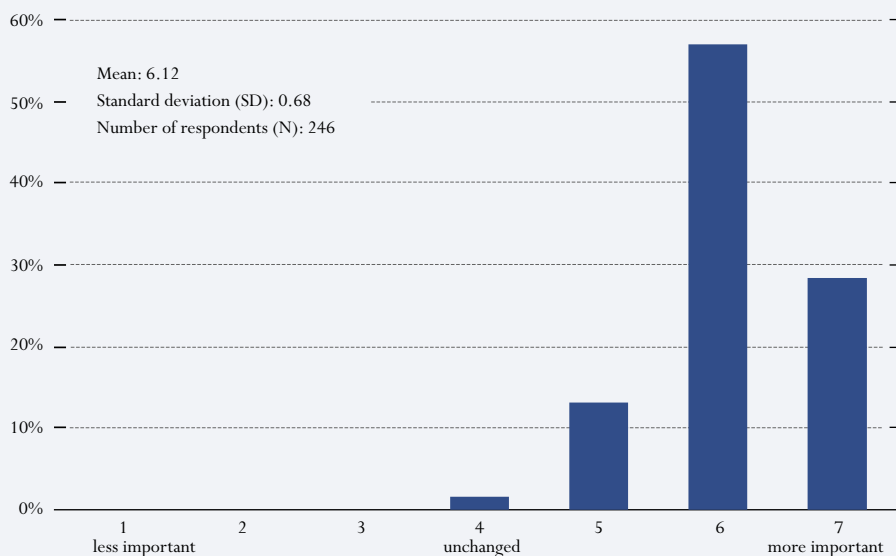| | 1 less important | 2 | 3 | 4 unchanged | 5 | 6 | 7 more important |

TABLE 2: INVESTMENT STRUCTURE OF THE FINANCIAL ASSETS OF PRIVATE
HOUSEHOLDS IN GERMANY

(YEAR 2003)

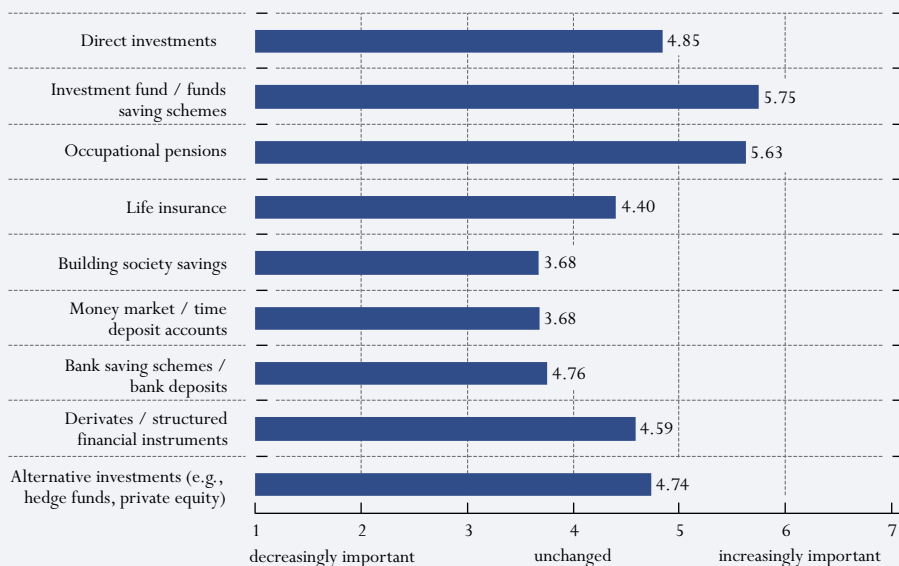|	billion EUR	share
Bank deposits[1] (short-term and long-term)	1,399	0.35
Assets with insurance corporations[2,3]	997	0.25
Bonds[4] (direct investments)	442	0.11
Shares (direct investment)	231	0.06
Other equity	170	0.04
Mutual fund shares	464	0.12
Claims due to company pension commitments	220	0.06
Total financial assets	3,922	1.00

1 IN GERMANY AND ABROAD.
2 INCLUDING PRIVATE PENSION FUNDS AS WELL AS OCCUPATIONAL PENSION SCHEMES AND SUPPLEMENTARY
   PENSION FUNDS.
3 INCLUDING OTHER CLAIMS.
4 INCLUDING MONEY MARKET PAPER.
SOURCE: BUNDESBANK MONTHLY BULLETIN JUNE 2004.

Investment form	Value
Direct investments	4.85
Investment fund / funds saving schemes	5.75
Occupational pensions	5.63
Life insurance	4.40
Building society savings	3.68
Money market / time deposit accounts	3.68
Bank saving schemes / bank deposits	4.76
Derivates / structured financial instruments	4.59
Alternative investments (e.g., hedge funds, private equity)	4.74

1   2   3   4   5   6   7

decreasingly important   unchanged   increasingly important

The assessment of experts concerning the future importance of a specific investment form is made relative to the importance of the other investment forms in the retirement portfolio. This does not say anything about the absolute development of assets flowing into this investment product. It might well be the case that the total amount invested increases. As a consequence more assets would be invested in every specific product in absolute terms, even though some of the products will be relatively less important. In this case the other investment products will gain even more in absolute terms.
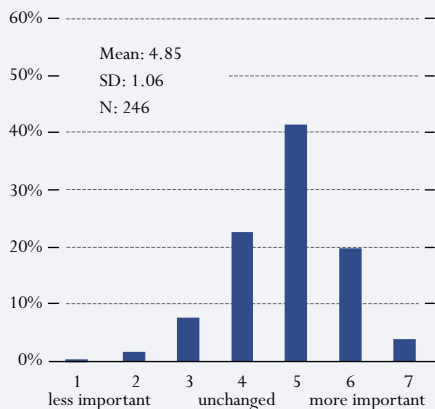
With respect to specific investment forms and products, the expected future importance for retirement provision varies. *Figure 2a* summarizes the answers by showing the average value

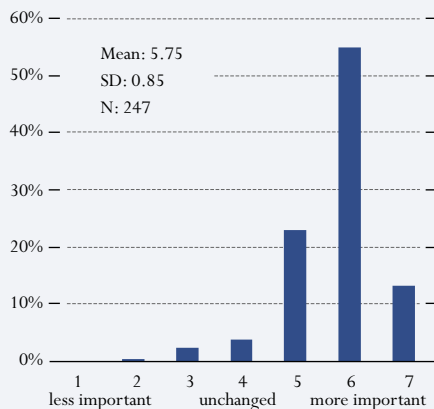the respondents assign to every investment product. *Figure 2b* displays the distribution of answers.

Investment funds and funds saving schemes as well as occupational pensions are expected to gain most in importance relative to the other products. Financial experts assign funds a value of 5.75 on average (the scale ranges from "1" to "7", "1" indicating a strong decrease and "7" a strong increase in importance). 232 respondents (94%) give the value "5", "6" or "7". Only 6 (2%) think the importance of investment funds will decrease. With respect to occupational pension schemes, 212 experts (86%) assign a value of "5", "6" or "7". Only 10 (4%) are of the opinion that occupational pension systems will decrease in importance. Direct investments (such as equities and

Figure 2b: Expected future importance of specific
investment forms and products for private pension systems
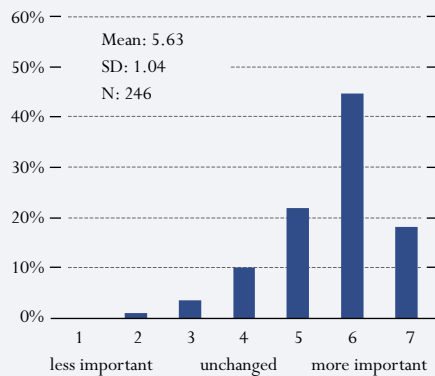(percentage of respondents, time horizon: 15 years)
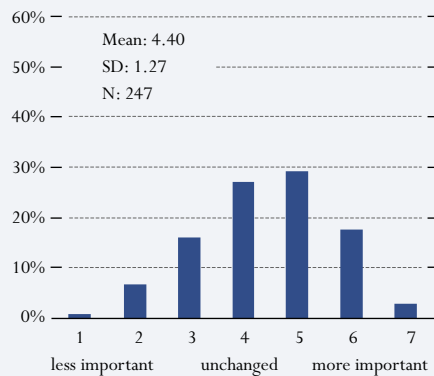
Direct investments

Mean: 4.85
SD: 1.06
N: 246

Investment funds/funds saving schemes

Mean: 5.75
SD: 0.85
N: 247

Occupational pensions

Mean: 5.63
SD: 1.04
N: 246

Life insurance

Mean: 4.40
SD: 1.27
N: 247

bonds) are also expected to increase slightly in importance: The average value is 4.85. The same is true for alternative investments such as hedge funds and private equity investment (4.74); derivatives and structured financial instruments (4.59); and life insurance (4.4). In greater detail: 67% think that direct in-

vestments gain in importance as opposed to only 9% who think that they will lose. Almost the same numbers apply to alternative investments: 67% as opposed to 14%. In the case of life insurance a share of 23% of the respondents assign a value lower than "4", i.e. expect it to become decreasingly important

Building society savings

Mean: 3.68
SD: 1.04
N: 247

Money market/time deposit accounts

Mean: 3.68
SD: 1.00
N: 247

Bank saving schemes/bank deposits

Mean: 3.76
SD: 1.16
N: 247
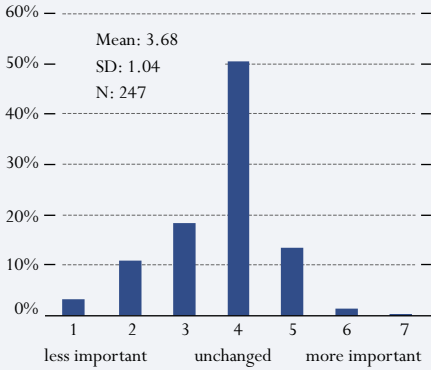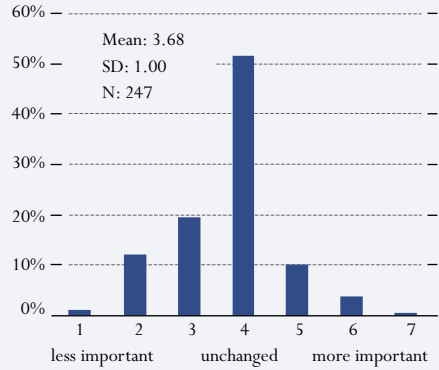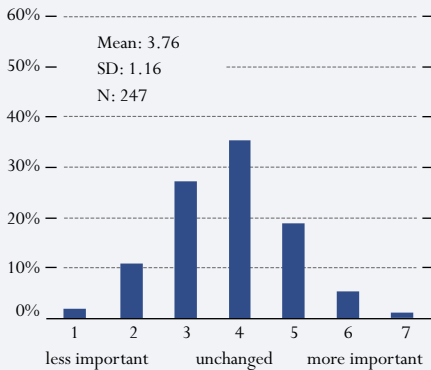
Derivatives/structured financial instruments
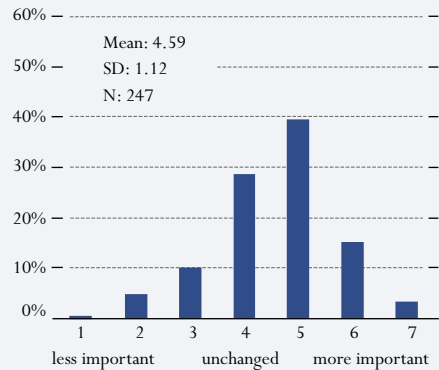
Mean: 4.59
SD: 1.12
N: 247

Alternative investments (e.g., hedge funds, private equity)

Mean: 4.74
SD: 1.19
N: 247
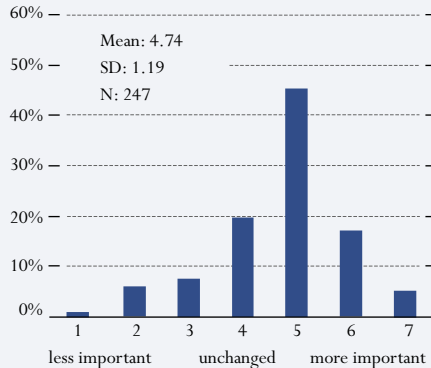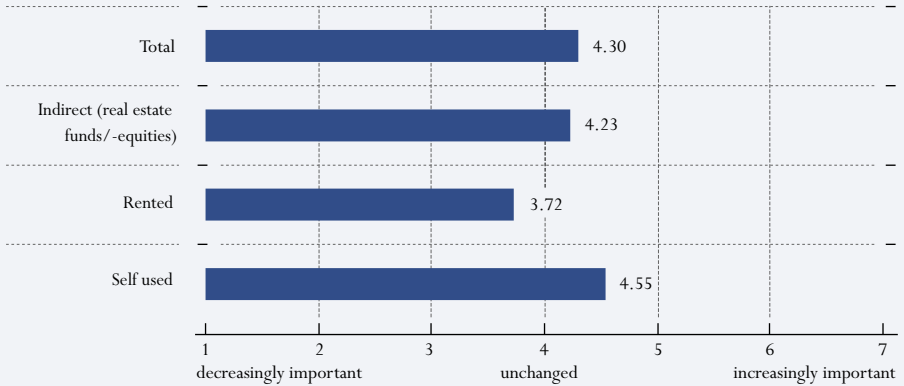
for old-age provision in the future. 28% give a value of "4", i.e. expect its importance to be unchanged. Nevertheless, 49% of the financial experts expect that life insurance will gain further in importance.

A somewhat decreasing importance is expected for building society savings with an average value of 3.68, money market and time deposit accounts (3.68) as well as bank saving schemes and bank deposits (3.76). In the cases of building societies and money market/ time deposit accounts, however, a majority of respondents (51% and 53%, respectively) assign a value of "4", i.e. they are of the opinion that the importance for retirement provision will be unchanged. With respect to bank saving scheme/bank deposits 40% of the respondents actually think that these investments become decreasingly important. Recalling *Table 2*, these are all investment forms that account for a very large part of total household's investment portfolio.
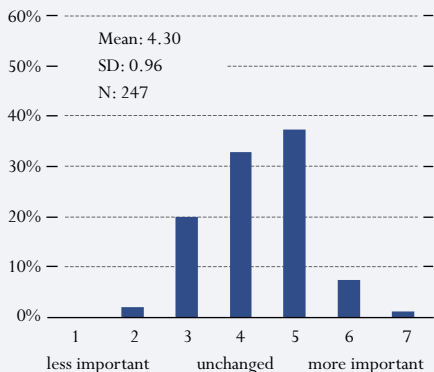
Retirement savings are not only invested in financial assets but to a large part also in real estate. With respect to the threat of a potential asset meltdown this would have the advantage that real capital can be consumed after retirement and does not have to be sold to younger generations. In the context of retirement savings real estate may play a significant role. *Figures 3a* and *3b* show the assessment of the surveyed experts with respect to the future importance of real estate for old-age provision.

Real estate in general is expected to become slightly more important relative to the other investment forms. On average experts assign a value of 4.3. 45% of the respondents give a value of "5", "6" or "7" which means that real estate will even play a bigger role in the future than today. 22% think that the importance of real estate will decrease, 33% that it will be unchanged. When differentiating between self-used, rented real estate and indirect real estate investments (e.g., real estate funds) the

Total

Mean: 4.30
SD: 0.96
N: 247

Self-used

Mean: 4.55
SD: 1.06
N: 247

Rented

Mean: 3.72
SD: 1.09
N: 247
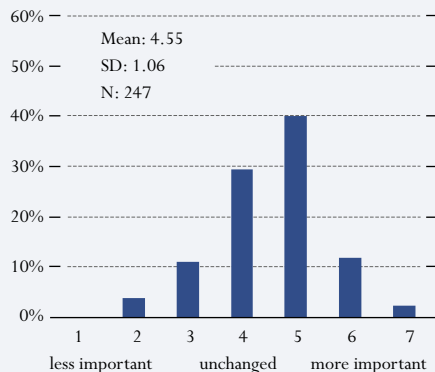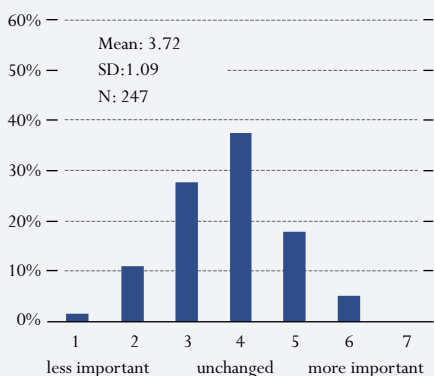
Indirect (real estate funds/-equities

Mean: 4.23
SD: 1.08
N: 247
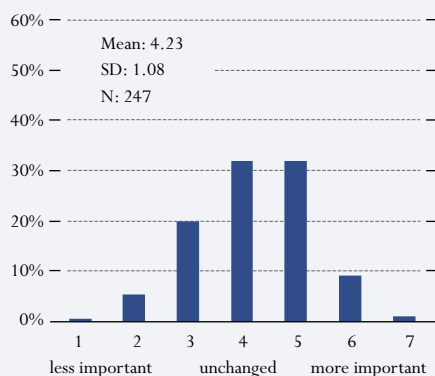
following picture emerges: Whereas experts are of the opinion that self-used real estate and indirect real estate investments will increase in relative importance (average values of 4.55 and 4.23, respectively), they expect rented real estate to become decreasingly important (3.72).

Often it is argued that today the awareness of the risk-return relationship is much more pronounced than in the past (Bulthaupt et al., 2001). A consequence is that households, particularly younger people, invest rather in equity and bond products than in, for example, savings accounts. We asked the financial experts whether there will be more investments in high-risk capital market segments due to higher return requirements (*Figure 4*). The scale to this question ranges from "1" to

"7", "1" indicating that this statement does not apply at all ("definitely false") and "7" that it is "definitely true". On average the surveyed experts assign a value of 4.6, i.e. they think that higher risk-investments will gain slightly in importance. 62% of the respondents assign a value of "5", "6" or "7", i.e. have the opinion that the above statement is true – in other words think that more investments will be made in higher risk-market segments. Only 17% think that this will not happen.

Recalling question 2 (see *Figure 2*) on the expected future importance of specific investment forms and products the answers fit quite well. On the one hand, the list of products that will gain in relative importance includes high risk-investments such as derivatives and alternative investments (e.g., hedge funds and private equity investments). On the other hand, diversified products such as investment funds and occupational pension schemes are expected to gain in importance, too. Although exhibiting higher risk-return than, e.g., sav-

ings accounts, these investments are usually not classified as highly risky. The same holds true for life insurance which is expected also to slightly increase in relative importance even though accounting already for a very large part of total investments.

Overall, the following expectations regarding future investments for retirement provisions emerge from the answers:

• The awareness of the relationship between risk and return seems to be more pronounced than in the past.

• (Very) Low risk-investments such as building society savings, money market and time deposit accounts, as well as bank saving schemes and bank deposits are expected to become relatively less important.

• The highest increase in relative importance is expected to experience higher risk-return investments that are, however, well

FIGURE 4: WILL THERE BE MORE INVESTMENTS IN HIGH RISK-CAPITAL MARKET SEGMENTS DUE TO HIGHER RATES OF RETURN REQUIREMENTS?
(AS PERCENTAGE OF RESPONDENTS, TIME HORIZON: 15 YEARS)

Mean: 4.60
SD: 1.15
N: 245

diversified such as investment funds and funds saving schemes as well as occupational pension schemes.

• But also very high risk investments such as derivatives and hedge funds are expected to become relatively more important for old-age provisions.

5 Demographic Change and Capital Market Return

When assessing the effects of the demographic change on the capital market return and on the prices of securities it is crucial to gauge the development of savings of households. As mentioned above theoretically – i.e. according to the life-cycle-hypothesis – savings are expected not only to decline after retirement but to become negative (dissaving). Thereby the wealth accumulated during the working life is consumed.

For Germany such dissaving behavior is not confirmed empirically. Contrary, savings in-

crease even further after retirement. This, may change with a shift from the state-run PAYG pension systems to more private pension provision. People will have to save more during working life and will actually have to sell assets, i.e. dissave or at least diminish savings after retirement in order to keep up the standard of living.

Figure 5 presents the results of the question on the expected development of the savings ratio after retirement.

The vast majority of respondents (197 of 245; some 80%) expect the savings rate after retirement to decline in the future, only about 12% think that the savings rate will increase; some 7% reckon that it will be unchanged. From those experts who expect a decline, more than 70% (some 58% of all respondents) think that the savings ratio will stay positive in spite of the decrease. 56 experts or about 23% of all respondents expect dissaving behavior after retirement.

In sum, the majority of respondents expect the savings rate to decline but to stay positive, i.e. do not reckon dissaving behavior to take place. As mentioned in section 3 it is often argued that a rapid decline in savings and a withdrawal of financial assets in the course of retirement of the baby boomers may result in an asset meltdown. *Figure 6* shows the expectations of the surveyed experts on the consequences of the change in the savings ratio for securities prices at the climax of the demographic crisis, i.e. around 2030.

Overall, the respondents do not expect a dramatic asset meltdown. However, for the stock market they predict quite a negative effect. On average respondents assign a value of 2.53 on scale ranging from "1" to "7", where "1" represents very negative and "7" very positive effects on prices. For the bond market the surveyed experts give a value of 3.83 on

average, i.e. expect almost no change due to a decrease in the savings ratio after retirement of the baby-boomers.

With respect to equities, about the half of the surveyed experts (51%) reckon a negative effect on stock prices, assigning a value of "1", "2" or "3". Most of those respondents, however, expect the negative price effect to be rather minor. Only some 13% reckon a positive effect. About 36% are the opinion that there will be neither a negative nor a positive effect in the course of retirement of baby-boomers and a fall in the savings ratio.

With respect to bond markets, most experts (46%) think that there will be neither a negative nor a positive effect. 34% reckon a negative and about 20% a positive effect. This means, that also long-term interest rates should be relatively unaffected.

FIGURE 6: EXPECTED IMPACT OF THE CHANGE IN THE SAVINGS RATIO ON SECURITIES PRICES AT THE CLIMAX OF THE DEMOGRAPHIC CRISIS (PERCENTAGE OF RESPONDENTS)
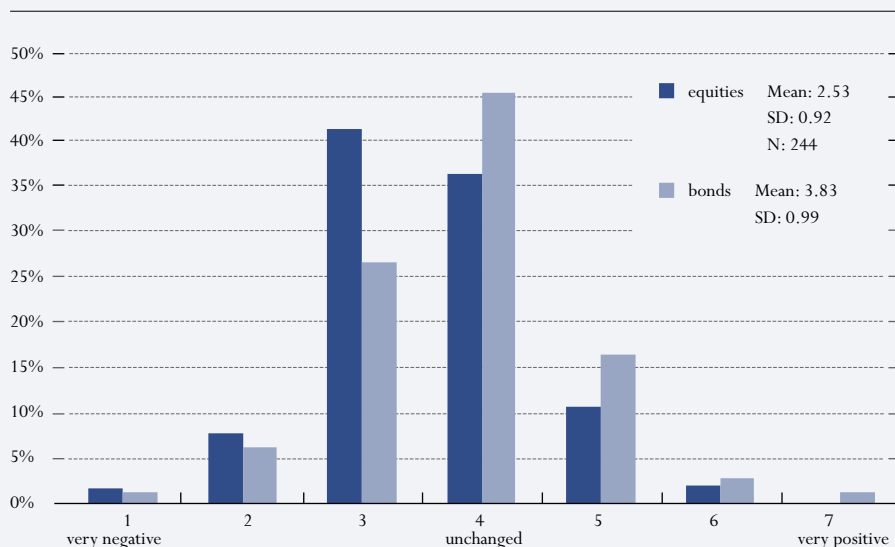
Given the observation that the risk aversion increases over the life-cycle the portfolio of retirees should include a larger part of bonds than stocks. Thus, when retirees withdraw assets to consume part of their wealth one would expect the demand for bonds to decrease more heavily than the demand for stocks. Consequently, one would expect the negative price effect to be more pronounced on the bond than on the equity markets. However, long-run interest rates are highly correlated internationally and hence the impact on a currency are is expected to be rather small. Whereas on stock markets often home bias can be observed, i.e. people prefer investments at home. Therefore, a withdrawal of financial assets by the baby-boomers to consume their wealth results in a negative price effect that is relatively higher with respect to stocks than with respect to bonds.

Overall, however, one should keep in mind that the expectations of financial experts do not endorse the fear of a dramatic asset meltdown.

6 Internationa Diversifiation

In section 3 it is outlined that international capital flows may help to mitigate the negative consequences of an ageing society. Firstly, the fall in the return to capital due to a shift in the relative supply of labor and capital may be lessened. The reason for that is that investors in strongly ageing countries can benefit from growth and higher returns to capital in slowly ageing countries. Additionally, in an open economy with international capital flows an oversupply of financial assets can be absorbed by foreign supply. Thus, a potential asset meltdown due to a withdrawal of funds of the baby-boomers after retirement may be retarded. *Figure 7* shows the answers to the question on whether possible negative effects of ageing societies may be mitigated through international diversification.

Almost three thirds of the respondents (about 71%) are confident that international diversification can help (i.e. assign a value of "5", "6" or "7"). Only some 15% are of the opinion that international diversification is no mean of mitigating the negative effects of ageing societies. About 14% are undecided.

There remains of course the question whether investors will actually make use of international diversification. *Figure 8* displays the answers to this question which almost completely resemble the answers to the question on whether international diversification can mitigate negative effects. Some 73% believe that people will actually diversify their retirement investments internationally. Only some 14% do not expect retirement savers to make use of international diversification; and about 13% are undecided.

Sometimes it is argued that diversification above all in the emerging markets is restricted due to a limited absorption capacity. Reasons for that are, for example, underdeveloped financial market infrastructure, institutions, regulation and supervision. The responses of the financial experts partly confirm this estimation (see *Figure 9*).

On average financial experts assign a value of 4.91 on a scale ranging from "1" to "7", "1" indicating that this assessment is definitely false and "7" indicating that it is definitely true. About 66% have the opinion that an underdeveloped financial market infrastructure restricts diversification in emerging markets (i.e. give a value of "5", "6" or "7"), whereby most respondents (84 of 244) assign a value of "6". Only some 21% think that an underdeveloped financial market infrastructure is no problem or that the infrastructure is sufficiently developed. About 12% are undecided.

FIGURE 7: CAN POSSIBLE NEGATIVE EFFECTS BE
MITIGATED THROUGH INTERNATIONAL DIVERSIFICATION?
(AS PERCENTAGE OF RESPONDENTS)

Mean: 5.02
SD: 1.42
N: 243
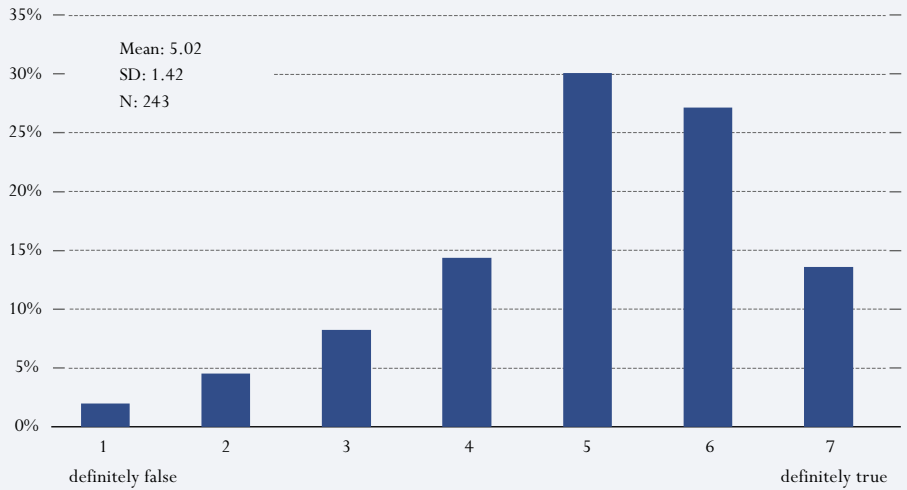
FIGURE 8: WILL RETIREMENT SAVERS
ACTUALLY USE INTERNATIONAL DIVERSIFICATION?
(AS PERCENTAGE OF RESPONDENTS)

Mean: 4.93
SD: 1.21
N: 244
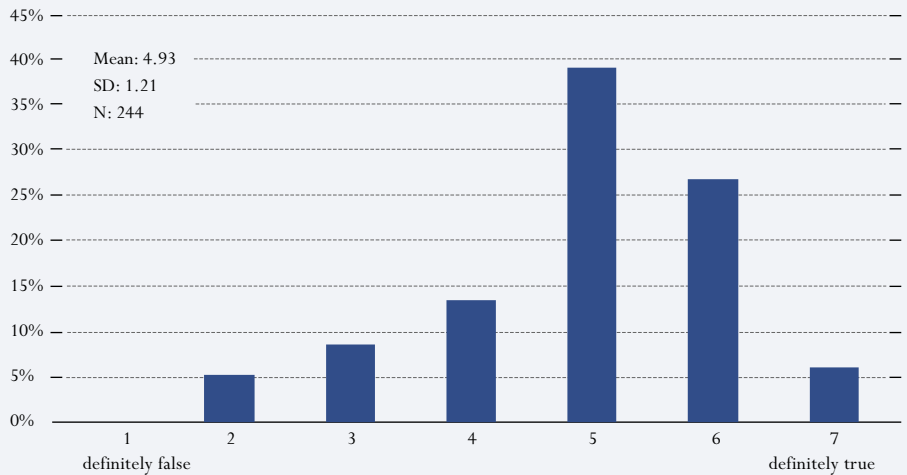
FIGURE 9: DIVERSIFICATION IN THE EMERGING MARKETS IS RESTRICTED
DUE TO AN UNDERDEVELOPED FINANCIAL MARKET INFRASTRUCTURE

(PERCENTAGE OF RESPONDENTS)

Mean: 4.91
SD: 1.59
N: 244

1 definitely false — 7 definitely true
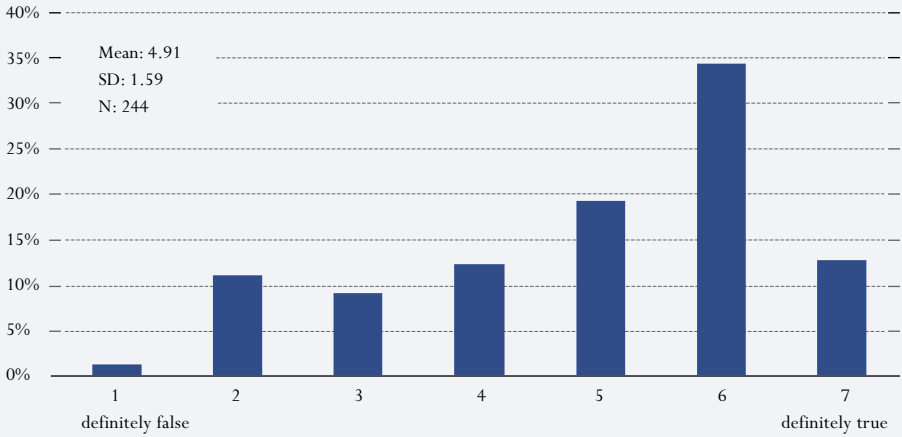
FIGURE 10A: CHANGE IN THE SHARE OF DIFFERENT
REGIONS IN THE PORTFOLIO FOR OLD-AGE PROVISION

(BALANCE*)
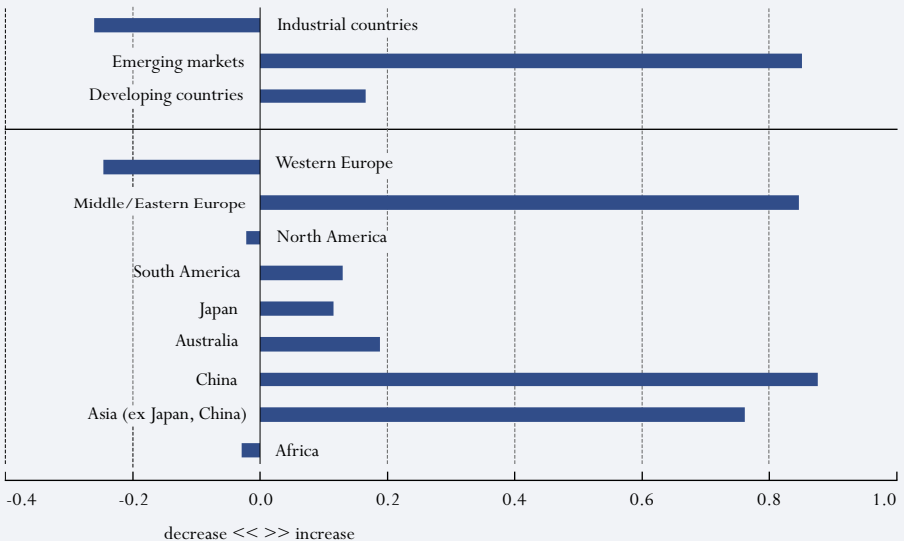
decrease << >> increase

* DIFFERENCE BETWEEN THE SHARE OF RESPONDENTS THAT RECKON AN INCREASE AND THOSE THAT EXPECT A DECREASE.

With the expectations that international diversification can help to mitigate the negative consequences of ageing societies and that retirement savers will actually make use of it, the question emerges to which regions and countries the capital will flow. The respondents could choose between the values "-1" indicating a decrease in the share in the average future retirement portfolio; "0" an unchanged share; and "+1" an increase in the share. In the first part of question 10 we differentiate between industrial countries, emerging markets and developing countries. In the second part, we differentiate between the regions/countries Western Europe, Middle and Eastern Europe, North America, South America, Japan, Australia, China, Asia (excluding Japan and China), and Africa. *Figure 10a* summarizes the expectations on this issue by displaying the average values assigned to different regions and countries; *Figure 10b* gives the respective distribution of answers.

The responses of the surveyed experts confirm the expectation that retirement savers will diversify by increasingly investing in slowly ageing countries and regions.

The financial experts expect that the share of emerging markets in the future retirement portfolio will strongly increase (average value of 0.85). The responses here are very clear-cut: 87% reckon a rise; 11% no change; and only 2% a decrease in the share. Regarding developing countries most experts (56%) expect the share in the portfolio to be unchanged. 30% estimate a rise, and 14% a decrease, resulting in an average value of 0.17. Industrial countries are expected to lose weight; on average a value of -0.26 is given. 49% are the opinion that the share will decrease, 23% that it will rise, and 27% that it will be unchanged.

When looking at specific regions and countries the following picture emerges: Respondents expect a large increase in the portfolio share of Middle and Eastern Europe (average value of 0.85), China (0.88) and Asia excluding Japan, China (0.76). With respect to these regions/countries about 90% (in the case of Asia 80%) of the surveyed experts assign "+1", i.e. are of the opinion that these regions/countries will gain from an increase in international diversification of retirement investments. The reasons for that are most likely that in those countries the problem of an ageing population is not as dramatic as in some Western European countries and/or that those countries exhibit fast growing economies.

The only region that is expected to lose weight is Western Europe (average value of -0.25). 46% of the respondents assign the value "-1"; 33% the value "0"; and 21% the value "+1". Given the ageing societies there, this prediction is not surprising.

For North America the respondents expect on average an unchanged portfolio share (-0.02), despite the fact that the population in North America is also ageing. 40% assign the value "0"; and some 30% the value "-1" and "+1", respectively. The US capital market is probably too important to experience significant losses due to demographic changes.

Japan is given a value of 0.12 on average. About 45% expect the weight to be unchanged; 34% reckon an increase, and 22% a decrease in the share in the retirement portfolio. This is rather surprising given the severe ageing problem in Japan. Almost the same numbers apply to South America.

With respect to Australia and Africa a majority of some 60% reckon the portfolio
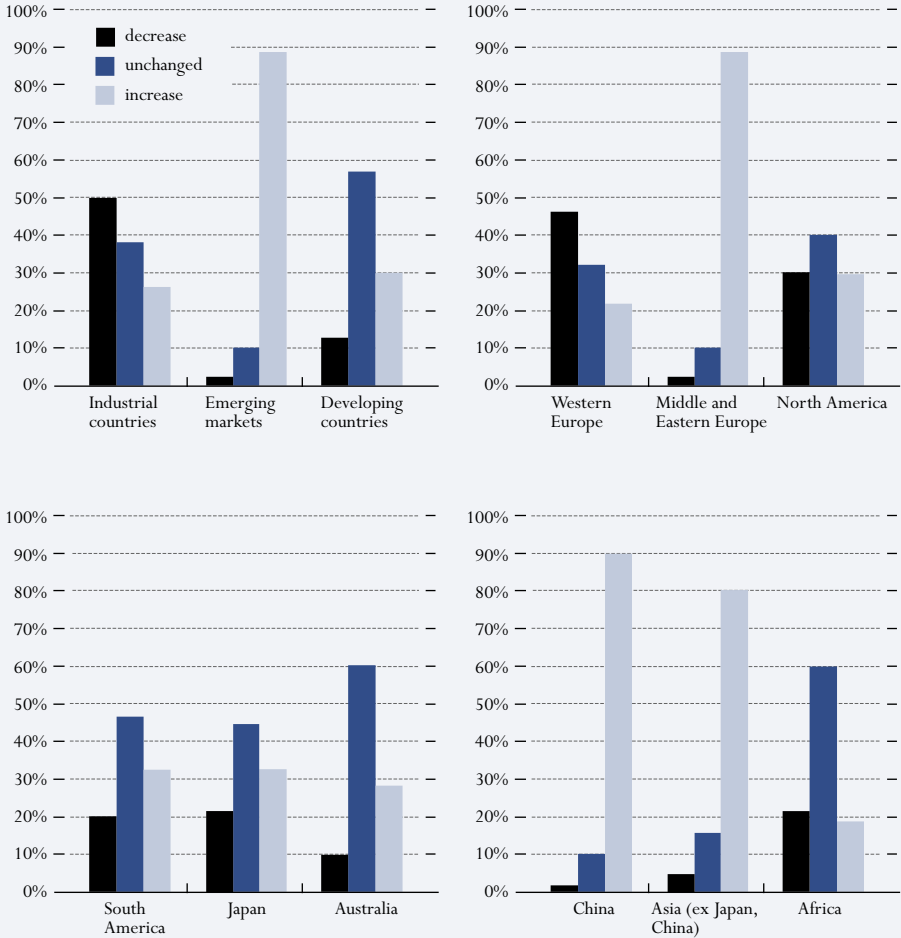
share to be unchanged. For Africa the issue of an underdeveloped financial market infrastructure may be decisive in spite of an slowly ageing population.

Figure 10c summarizes the results of question 10 by showing a world map that highlights the countries/regions that are expected to gain weight in the retirement portfolio in light grey; the countries whose share is expected to remain unchanged in dark grey; and the countries that are expected to lose weight in black.

| **decreasing importance** | **importance unchanged** | **increasing importance** |
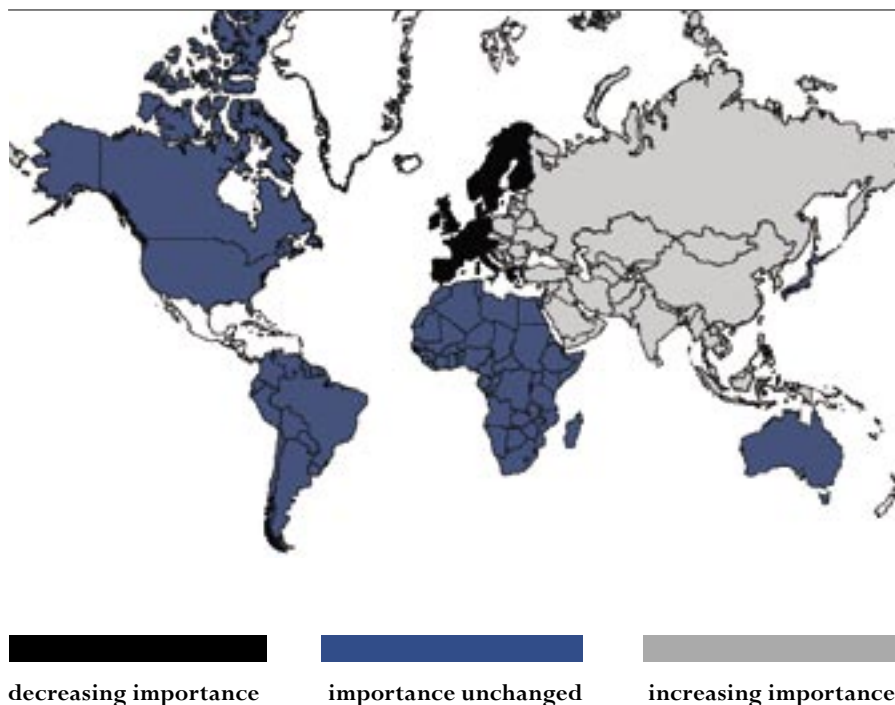
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Appendix: Questionnaire

Sehr geehrte(r) Frau/Herr [Name],

wir würden uns sehr freuen, wenn Sie in diesem Monat einige zusätzliche Fragen beantworten würden. Diese Zusatzbefragung ist Bestandteil des ZEW-Forschungsprojektes „Kapitalmärkte und Demographie". Als kleinen Anreiz werden wir unter den Teilnehmern an dieser Befragung einen kostenlosen Besuch von zwei ZEW-Weiterbildungsseminaren verlosen.*

Selbstverständlich werden ihre Angaben streng vertraulich behandelt. Die Erfassung der Daten erfolgt nur in anonymisierter Form.

Bei Rückfragen stehen Ihnen gerne
Dr. Michael Schröder
(E-Mail: schroeder@zew.de
Tel.: 0621/1235-140) und
Martin Schüler
(E-Mail: schueler@zew.de
Tel.: 0621/1235-148) zur Verfügung.

Vielen Dank für Ihre Teilnahme!

Hintergrund

In vielen Industrieländern steigt das Durchschnittsalter der Bevölkerung und dieser demographische Wandel ist für die nächsten Jahrzehnte unumkehrbar. Diese Entwicklung hat massive sozialpolitische Auswirkungen. In Deutschland wie auch in anderen Ländern wurde eine teilweise Verlagerung der Alterssicherung auf kapitalgedeckte Systeme eingeleitet. Diese Reformen wie auch der demographische Wandel an sich haben Auswirkungen auf die Kapitalmärkte. Dieser Zusammenhang zwischen Demographie und Kapitalmärkte ist Gegenstand des Fragebogens.

Im Folgenden möchten wir Sie nach ihrer *Einschätzung* über die voraussichtliche Entwicklung an den Kapitalmärkten befragen. Falls nicht anders angegeben, unterstellen wir einen *Zeithorizont von etwa 15 Jahren.*

Wir bitten um Rücksendung des Fragebogens per Fax (0621/1235-223) bis spätestens Freitag, den 18.06.2004.

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* Die beiden Sieger der Auslosung können kostenlos an einem ZEW-Weiterbildungsseminar des Seminarprogramms 2004/05 teilnehmen. Die Reisekosten müssen von den Teilnehmern selbst getragen werden. Der Rechtsweg ist ausgeschlossen.

1) WELCHE ROLLE IM VERGLEICH ZU HEUTE WERDEN KAPITALMARKTANLAGEN IN ZUKUNFT BEI DER FINANZIERUNG DER PRIVATEN ALTERSVORSORGE SPIELEN?

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

2) WIE WERDEN SICH DIE FOLGENDEN ANLAGEFORMEN UND -PRODUKTE IM EINZELNEN IN IHRER BEDEUTUNG ENTWICKELN?

a) **Direkte Anlage** an Kapitalmärkten (wie Aktien und Anleihen)

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

b) **Investmentfonds und Fondssparpläne**

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

c) Produkte und Durchführungswege der **Betriebliche Altersvorsorge**

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

d) **Lebensversicherungen**

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

e) **Bausparen**

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

f) **Geldmarktkonten und Festgeldanlagen**

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

g) **Banksparpläne/Bankeinlagen**

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

h) **Derivate und strukturierte Finanzprodukte**

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

i) **Alternative Investments** (wie Hedge Fonds und Private-Equity-Beteiligungen)

1	2	3	4	5	6	7
viel geringere Bedeutung			unverändert		viel größere Bedeutung	

3) WIE WIRD SICH DIE NACHFRAGE NACH IMMOBILIEN FÜR DIE ALTERSVORSORGE ENTWICKELN?

a) **Selbstgenutzt**

1	2	3	4	5	6	7
stark sinken			unverändert		stark steigen	

b) **Vermietet**

1	2	3	4	5	6	7
stark sinken			unverändert		stark steigen	

c) **Indirekt (in Form von Immobilienfonds/-aktien)**

1	2	3	4	5	6	7
stark sinken			unverändert		stark steigen	

d) **Insgesamt**

1	2	3	4	5	6	7
stark sinken			unverändert		stark steigen	

4) Werden aufgrund höherer Renditeerfordernisse vermehrt Anlagen in risiko-, aber auch chancenreicheren Kapitalmarktsegmenten durchgeführt werden?

1	2	3	4	5	6	7
trifft überhaupt nicht zu					trifft auf jeden Fall zu	

5) In der ökonomischen Theorie wird in der Regel folgender Verlauf der Sparquote im Lebenszyklus angenommen: In jungen Jahren ist die Sparquote zunächst negativ; danach steigt sie allmählich an, um mit Eintritt ins Rentenalter wieder zu sinken und negativ zu werden (‚Entsparen'). Im Moment ist in Deutschland eine negative Sparquote im Rentenalter jedoch im Durchschnitt nicht zu beobachten. Wie glauben Sie, dass sich in Zukunft die durchschnittliche Sparquote im Alter entwickeln wird?

1	2	3	4	5	6
stark sinken und negativ werden	stark sinken aber positiv bleiben	sinken aber positiv bleiben	gleich bleiben	steigen	stark steigen

6) Wie schätzen Sie, ausgehend von der Entwicklung unter 5), die Kurseffekte auf den Kapitalmärkten auf dem Höhepunkt der demographischen Krise (ab etwa dem Jahr 2030) ein?

a) **Aktienmärkte**

1	2	3	4	5	6	7
sehr negativ						sehr positiv

b) **Anleihemärkte**

1	2	3	4	5	6	7
sehr negativ						sehr positiv

7) Können mögliche negative Effekte auf die Kapitalmarktrenditen durch eine stärkere internationale Diversifikation abgeschwächt werden?

1	2	3	4	5	6	7
trifft überhaupt nicht zu			trifft auf jeden Fall zu			

8) Glauben Sie, dass ein noch unterentwickelter rechtlicher und regulatorischer Rahmen in potenziellen Anlageländern eine internationale Diversifikation einschränkt?

1	2	3	4	5	6	7
trifft überhaupt nicht zu						trifft auf jeden Fall zu

9) Werden sich die Anleger tatsächlich verstärkt für internationale Kapitalanlagen entscheiden?

1	2	3	4	5	6	7
trifft überhaupt nicht zu						trifft auf jeden Fall zu

10) Wie werden sich dabei die Anteile der folgenden Kapitalmärkte im Portfolio entwickeln (Abnahme: −, unverändert: 0, Zuwachs: +)?

Industrieländer ____ Emerging Markets ____ Entwicklungsländer ____

West-Europa ____ Mittel-/Ost-Europa ____ Nordamerika ____ Südamerika ____ Japan ____ Australien ____ China ____ Asien (ex Japan, China) ____ Afrika ____

The Effects of Demographic Changes on Aggregate Savings: Some Implications from the Life Cycle Model*

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CEPR and NBER)*

Abstract

In this essay I review the basic life cycle theory of saving to obtain predictions for aggregate savings dynamics in societies that undergo an aging process like the one predicted for all major industrialized countries in the near future. The data indicates that the phenomenon of population aging is driven both by longer life expectancy as well as lower birth rates (and thus lower population growth rates). The life cycle model is then used to deduce the likely effect on aggregate savings from both longer life expectancy and lower population growth rates. While longer expected life, ceteris paribus, increases individual and thus aggregate savings, a lower population growth rate may increase per capita saving in the short run, but reduces it in the long run.

1 Introduction

Motivation and Some Data

We are getting older. This fact not only becomes apparent every morning when trying to get out of bed. When plotting measures of the age distribution of industrialized countries over time, one observes a substantial increase in the share of the population of old age in the last decade, a trend that is predicted to persist and even accelerate in the near future. To make things precise, let's define the Old Age Dependency Ratio as the ratio of the total population of a country or region 65 years and older to the total population of ages 15 to 64, or

$$\text{Old Age Dependency Ratio} = \frac{65+}{15-64}$$

Figure 1: Old Age Dependency Ratio, 65+/(15-64)
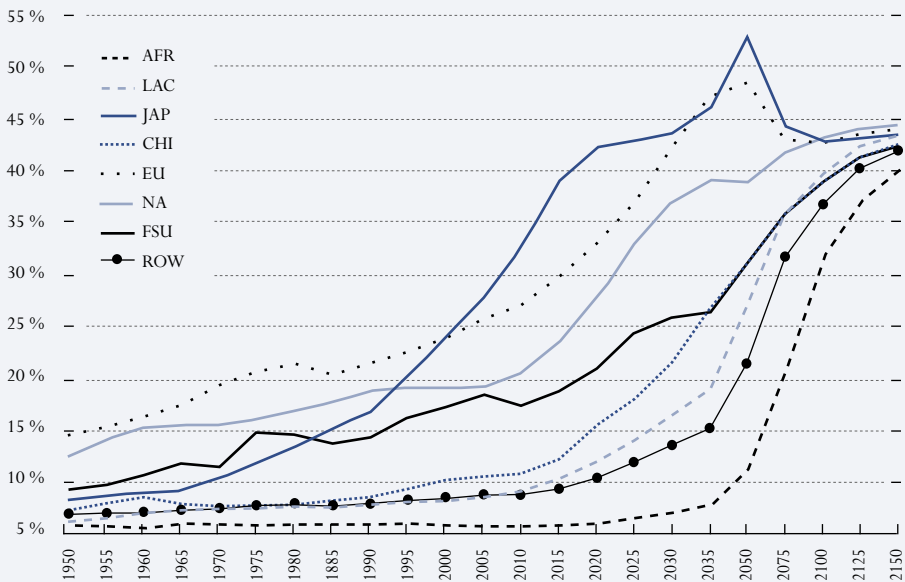
Notes: AFR = Africa; LAC = Latin American countries; JAP = Japan; CHI = People's Republic of China; EU = European Union region; NA = North America; FSU = countries of the former Soviet Union; and ROW = the rest of the world.

Roughly speaking, this ratio measures how many people of retirement age a country has per person of working age. For countries with a public pension system it also is a good approximation as to how many pensions have to be supported per working age adult.

Figure 1, taken from Brooks (2003) plots Old Age Dependency Ratios for eight major regions of the world from 1950 onwards, and predicts them into the future.

While the forecasted data beyond 2050 rely heavily on the assumption that population growth rates will converge across regions at that date, the data before 2050 show several intriguing facts. First, population aging is predicted to occur for all world regions, albeit at different degree and speed. Japan's and Europe's aging process has already set in, and is predicted to continue until about 2035, at which old age dependency ratios of close to 50% are reached. At that time, assuming all working age individuals actually work and no change in retirement ages (and disregarding early retirement), one working person has to support the pension of one pensioner. Taking into account labor market non-participation, the ratio is likely to be substantially higher. The figure also shows that population aging

in North America, driven mainly by the US, is a phenomenon mostly of the future, and is predicted to occur slower than in Europe and Japan. The difference in timing of population aging is also an important determinant of the direction and size of international capital flows likely to occur in the near future.

Before discussing the basic theory underlying the changes in aggregate savings, it is instructive to look one step deeper into the causes of the phenomenon of the aging population within the US, Europe and elsewhere. There are two basic reasons for this trend. First, individuals live longer and longer. Second, households have fewer and fewer children. *Table 1*, taken from Börsch-Supan and Lusardi (2002), demonstrates that, conditional on surviving to the age of 65, a typical male in Germany is expected to live another 15 years, a typical woman can count on living another 19 years. The numbers for other European countries and the US are similar, Japanese fare even better, with residual life expectancies at 17 and 22 years for males and females, respectively.

In *Table 2* we show how longevity has changed over time. Using data for the US we demonstrate how live expectancies have changed over the last hundred years.[1]

TABLE 1: DEMOGRAPHIC FEATURES

	Germany	Italy	Japan	Netherlands	UK	USA
Life expectancy at birth (male/female; 1998)	74.5/80.5	75.3/81.6	77.2/84.0	75.2/80.7	74.8/79.7	73.9/79.4
Life expectancy at 65 (male/female; 1998)	15.3/19.0	15.8/20.2	17.1/22.0	14.7/18.8	15.0/18.5	16.0/19.1
Share of population aged 65 and over (1998)	16.4	18.2	17.1	13.8	16.0	12.5

SOURCES. OECD HEALTH DATA (2001).

1 See the website of the National Center for Health Statistics. The data used stem from · http://www.cdc.gov/nchs/data/hus/tables/2003/03hus027.pdf.

Group	2000	90	80	70	60	50	40	30	20	10	1900
Pop.	77	75	74	71	70	68	64	59	56	52	49
Female	80	79	78	75	73	71	66	61	57	53	51
Male	74	72	70	67	67	66	62	58	56	50	48

TABLE 3: PAST AND FUTURE TOTAL FERTILITY RATES

Region	1990	2000	2010	2025
World	3.4	2.8	2.5	2.3
Poor Countries	4.7	3.1	2.7	2.4
Rich Countries	1.9	1.6	1.7	1.7

The increases are quite astonishing. Around the turn of the 19-th century a typical male could expect to live 48 years; in the last hundred years roughly 26 years of extra live have been added to that expectation, due to improvements in medical technology, basic hygiene, improved nutrition and other important factors. Women even gained 29 extra years on average, or more than a 50% longer life now than a hundred years ago. Despite all the negative connotations the discussion of the phenomenon of population aging usually has[2], we should not forget the basic fact that adding fruitful and enjoyable years to the average person's life is a very positive development (at least according to the most commonly used specifications of individual's preferences).

The second major factor responsible for the aging of the population in industrialized countries is the decline in the number of children households have, that is, in fertility rates. Define as the Total Fertility Rate the average number of children a woman has during her reproductive years. Absent migration a total fertility rate of about 2,1 is needed to keep a population stable over time. *Tables 3* and *4* summarize total fertility rates (past and predicted) for rich and poor regions, as well as current fertility rates in Europe and North America.[3] We observe from *Table 3* that a) rich countries have lower fertility rates than poor countries, b) rich countries have, and are predicted to have in the future, fertility rates consistent with a shrinking population (gain absent immigration from poor countries).

Finally *Table 4* summarizes the extremely low total fertility rates in Europe, especially Germany and Southern Europe, whereas the US has a total fertility rate that just suffices to keep the US population size stable even with-

2   For a refreshing exception, see the essay by E. Niejahr in Die Zeit, 43, 2004.
3   See McDevitt (1999), p. A-39. Alternatively, the data can be found at http://www.overpopulation.com/faq/basic_information/total_fertility_rate/.

Country	Germany	Italy	France	UK	Spain	Canada	US
TFR (1998)	1.3	1.2	1.6	1.6	1.2	1.7	2.1

out immigration (and thus expanding if one takes into account substantial legal and illegal immigration into the US).

The previous two facts (longer lifetimes, lower fertility rates) motivate performing two experiments with the basic life cycle model of consumption and saving to be constructed next. We want to investigate how aggeragate saving is expected to change over time as households live longer, and as the size of newborn cohorts, relative to existing cohorts, decreases (that is population growth rates decline), due to a decline in total fertility rates.

2 THE BASIC LIFE CYCLE MODEL

The basic life cycle model developed by Franco Modigliani and Richard Brumberg (1954), and, with slightly different focus, by Milton Friedman (1957) envisions a single individual living for J years (in practice, J may equal to 60, from 21, the age at which the individual becomes economically independent, to age 80 at which she dies). She enjoys consumption in all her living years, denoted by $(c_1, c_2, \ldots, c_J)$. The lifetime utility the individual derives from consumption is given by the discounted sum of period by period utility

$$\sum_{j=1}^{J} \beta^{j-1} u(c_j)$$

where β is the time discount factor, a number typically assumed to lie between 0 and 1 and measuring the degree of impatience of the household (the smaller β; the more impatient). The

period utility function is increasing and strictly concave, which simply means that the individual likes more consumption better than less, but that each additional amount of consumption gives less and less additional utility.

We assume that households work for jr years (in practice jr may equal 45 years), earning income. After age jr no labor income (or pension income) is being earned. For simplicity it is assumed that as time progresses the real income of the household increases at a constant growth rate g, reflecting both general technological progress as well as individual learning on the job. If we let $y_1 = y$ denote real income of the individual in her first working year, this assumption implies that income in the second year equals $y_2 = (1+g)y$; and in general

$$y_j = (1 + g)^{j-1} y$$

for all years $j = 1, \ldots, jr$. For technical reasons we make the empirically plausible assumption that $g < r$.

In the simplest possible version of the model households are assumed to be able to borrow and lend money at a fixed common real net interest rate r. Abstracting from bequests from parents, the individual solves the following maximization problem: by choosing $(c_1, c_2, \ldots, c_J)$,

$$\max \sum_{j=1}^{J} \beta^{j-1} u(c_j)$$

subject to the intertemporal budget constraint

$$\sum_{j=1}^{J} \frac{c_j}{(1+r)^{j-1}} = \sum_{j=1}^{jr} \frac{y_j}{(1+r)^{j-1}} \qquad (1)$$

which simply states that the present discounted expenses for consumption has to equal the present discounted value of income. The right hand side of this equation can be simplified, using the assumption of constant income growth, to[4]

$$\sum_{j=1}^{jr} \frac{y_j}{(1-r)^{j-1}} = \sum_{j=1}^{jr} \frac{(1-g)^{j-1}y}{(1-r)^{j-1}} = \frac{y(1+r)}{r-g} * \left(1 - \left[\frac{1+g}{1+r}\right]^{jr}\right)$$

The optimal consumption life cycle profile an individual chooses depends on the relative size of the individual's impatience and the market interest rate. For now we assume that these two forces exactly balance, so that $\beta\,(1+r) = 1$. Then the assumption that the individual values additional consumption at a decreasing rate (strict concavity of u) immediately imply that it is optimal for the individual to equalize consumption in all periods of life[5], or

$$c_1 = c_2 = \ldots = c_J$$

Let this common consumption level be denoted by c.
Using the budget constraint and some tedious algebra the optimal consumption level is given by

$$c = y * \frac{r}{r-g} * \frac{1 - \left[\frac{1+g}{1+r}\right]^{jr}}{1 - [1+r]^{-J}} \qquad (2)$$

Several implications immediately arise from the optimal consumption rule (2):

• An increase in income y increases consumption in all periods of the individual's life.

• The higher the growth rate of income g (for a given level y); the higher is consumption in each period of a person's life.

• For given retirement age jr and given income, increasing a person's life expectancy J decreases consumption in all periods.

• For given life expectancy and income, increasing the retirement age increases consumption in all periods.

• A change in the real interest rate has ambiguous effects on lifetime consumption.

Our main interest in the life cycle model arises from its predictions for savings behavior and asset accumulation. The lifetime budget constraint (1) obscures savings behavior over an individual's lifetime. The period by period budget constraint of the individual reads as

$$c_j + s_j = y_j + (1+r)s_{j-1} \qquad (3)$$

for each period j of the individual's life. Here s_j are financial assets (or debt, if negative) carried from period j to $j+1$. Casually this is often called savings, but this term should be reserved for

$$\begin{aligned} sav_j &= s_j - s_{j-1} \\ &= y_j + r\,s_{j-1} - c_j \end{aligned}$$

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4 In general, for any number $\alpha \in (0, 1)$ we have the formula $\sum_{j=0}^{J} \alpha^j = \frac{1 - \alpha^{J+1}}{1-\alpha}$.

5 If $\beta\,(1+r) < 1$ it is optimal to have consumption to decline over time, and if $(1+r) > 1$ consumption should increase over time. The explicit solution of the problem cannot be characerized without making specific assumptions on the form of the utility function, unless $\beta\,(1+r) = 1$, as assumed in the text.

that is, for the change in an individual's asset position, equal to total income (labor income y_j plus capital rs_{j-1} minus consumption c_j). Since the individual starts her life with no assets, $s_0 = 0$. Furthermore we require $s_j \geq 0$, that is, individuals cannot die in debt. Therefore it is optimal to set $s_J = 0$, since, absent any altruism, it never makes sense to carry assets into the grave, given the preferences specified above.[6]

Since we know that $y_j = y\,(1+g)^{j-1}$ and have already solved for the optimal consumption level in (2); we can use (3) to obtain the optimal asset levels over an individual's lifetime. The precise formula changes once a person retires, and is given by

$$s_j = \frac{y}{r-g}\left(1 - \left[\frac{1+g}{1+r}\right]^{jr}\right) * \left(\frac{1 - (1+r)^{j-J}}{1 - (1+r)^{-J}}\right)$$

for a retired person of age $j \geq jr,$ and

$$s_j = y\sum_{\tau=0}^{j-1}(1+r)^\tau (1+g)^{j-1-\tau} - c\sum_{\tau=0}^{j-1}(1+r)^\tau$$

where c is given by (2): Thus for a retired person savings equal

(4)

$$
\begin{aligned}
sav_j &= s_j - s_{j-1} \\
&= \frac{y}{r-g}\left(1 - \left[\frac{1+g}{1+r}\right]^{jr}\right) * \left(\frac{-r(1+r)^{j-1-J}}{1 - (1+r)^{-J}}\right)
\end{aligned}
$$

which is negative (and increasingly so). For a nonretired person we obtain

(5)

$$sav_j = (y-c)(1+r)^{j-1} + g\sum_{\tau=0}^{j-2}(1+r)^\tau (1+g)^{j-2-\tau}.$$

Unfortunately we can't say whether $y > c$ from (2). Thus there are two possibilities. Either $y \geq c,$ in which case savings sav_j are always posi-

tive, increasing over time until retirement, at which point they turn negative as individuals dissave to finance retirement consumption. Or, if $y < c,$ savings are initially negative (and possibly at first become more negative over time), but at some point during the individual's working life start to increase and turn increasingly positive, until retirement. Then, as before, households, decumulate assets to finance retirement consumption, so that savings turn negative again after retirement. *Figure 2* shows stylized life cycle profiles of labor income, consumption and savings.

2.1 Extensions of the Basic Model

Several simplifying assumptions were made to derive analytical solutions of the model above. First, individuals were allowed to freely borrow (subject to the constraint of having to pay back the loan with certainty in the future. In practice, to borrow against future labor income may be di¢cult, in particular if a country's personal bankruptcy code provides for only mild punishments for defaulting on noncollateralized loans. Second, individuals in the real world face important uncertainties that the model abstracted from, such as labor income uncertainty, uncertainty about health status and medical expensive, as well as uncertainty about the exact time of death. Third, while we modelled income as an exogenous manna from heaven, in reality households have to provide labor services to command labor income. If leisure and consumption are not separable in the utility function, the analysis above has to be altered to incorporate the interaction between consumption and labor supply choices. An important abstraction was the absence of government policy in the analysis, in particular income taxation and social security. As long as

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6   It is easy to show that if one consolidates the period by period budget constraints (3) into a single constraint, one obtains back equation (1): We also implicitly assume that individuals cannot go deeper in debt than the amount they can repay with their future income (the borrowing constraints arising from this consideration are often called solvency constraints).

FIGURE 2: INCOME, CONSUMPTION, ASSETS AND SAVINGS
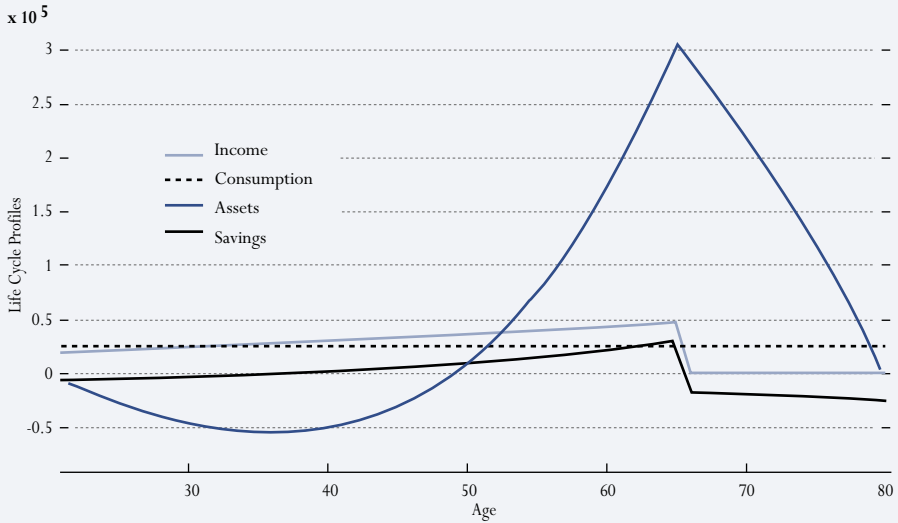
FIGURE 3: LIFE CYCLE ASSET ACCUMULATION IN AN EXENDED
LIFE CYCLE MODEL
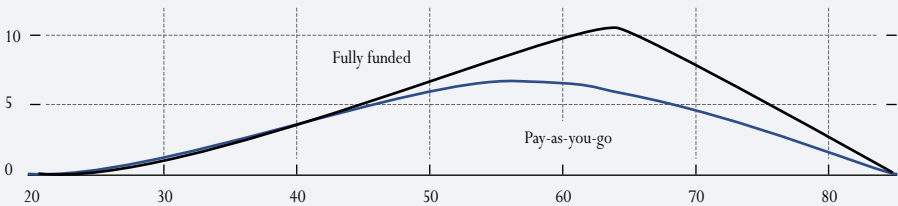
these policies do not distort the labor leisure decision or affect the after tax real interest rate, our analysis can proceed as above, with income streams adjusted for taxes. Finally, we have so far considered a household in isolation, taking the interest rate as exogenously given. More complex models like the ones discussed below determine the interest rate as a general equilibrium outcome, either to equilibrate domestic saving and investment, or, if an open

economy is considered, to equilibrate international investment demand and saving supply.

Starting with the seminal work of Auerbach and Kotlikoff (1987), models incorporating the features described above have been solved on computers, with the basic features from the simple model remaining intact: individuals accumulate assets during their working years to finance consumption in retirement. *Figure 3*,

taken from Conesa and Krueger (1999) shows the asset accumulation path over the life cycle derived from a model with borrowing constraints, income and mortality uncertainty, endogenous labor supply, a government pension system and interest rates determined in general equilibrium. Here one of the profiles refers to a model with a Pay As You Go social security system, and one to a model with a private accounts-based pension system.

3 Model Predictions for Aggregate Savings of Population Aging

3.1 An Increase in Life Expectancy J

If people live longer, for a given income profile and retirement age, the implications of the model are clear-cut. From equation (2) we see that per-period consumption has to decline, and from (4) and (5) we see (after a little algebra) that savings increase in all periods of an individual's life. This is perfectly intuitive, as a given income now has to be stretched over a longer life time horizon, thus requiring bigger savings for retirement. It is, of course, possible that individuals will respond with an increase in the number of years worked, in which case the total effect on savings of an increase in life expectancy is ambiguous. To the extent that current public pension systems provide strong incentives to retire at the normal retirement age, baring reforms in the pension system the standard life cycle model predicts an increase in individual, and thus aggregate asset accumulation and savings in response to an increase in life expectancy.

3.2 A Decline in Fertility Rates

So far it was sufficient to analyze an individual in isolation. In order to study the impact of a decline in fertility and thus population growth rates we now have to consider the economy as a whole, aggregating over all individuals, each

of which is assumed to behave according to the standard life cycle model. Formally, suppose that the population grows at a rate n per year, where n may be negative. This means that there are $(1 + n)$ times as many individuals of age 25 as individuals of age 26. If we let μ_j denote the fraction of the population of age j, a population growth rate of n implies that

$$\mu_j = \frac{\mu_{j-1}}{1+n}$$

and, since all fractions have to sum to 1,

$$\sum_{j=1}^{J} \mu_j = 1,$$

so that one can compute the population fractions as

$$\mu_j = n\frac{(1+n)^{-j}}{1-(1+n)^{-J}}$$

Per capita asset holdings are then given as

$$\bar{S} = \sum_{j=1}^{J} \mu_j s_j$$

and per capita savings as

$$\overline{SAV} = \sum_{i=1}^{J} \mu_j sav_j.$$

We are interested in the short and long run effect of declines in the population growth rate n on per capita asset holdings and per capita savings. The long-run effects can basically be read off *Figure 2*. A lower population growth rate, in the long run, yields a larger fraction of the population in older cohorts. Since older cohorts, as *Figure 2* shows, tend to have more assets and save less (at least if they are already retired), we would expect per capita asset holding

to increase and per capita savings to decline as a long-run consequence to a (permanent) decline in the population growth rate.

The short run consequences of a sudden and permanent decline in the population growth rate are less clear. The decline in n gradually makes the population older. As the large cohorts arising from the previous, higher population growth rate, age, they move from being borrowers to being savers (during the high earning years from 45-65) to being dissavers in retirement. This suggests that asset accumulation is increasing over time, while average savings should first increase, but then decline, as the big cohorts enter their retirement age.

Since this cannot be shown theoretically for all parameter values, the paper now presents a simple simulation analysis. This is meant to be a thought experiment demonstrating the economic forces at work, rather than an exact quantitative predictions about future asset accumulation and savings. For the simulation we assume the following parameter values, summarized in *Table 5*.

We carry out the following thought experiment: until the year 2000 the population growth rate is assumed to be 1%; then it falls permanently to 0%. In *Figure 4* we plot how, over time, per capita asset holdings and savings change, in response to the decline in the population growth rate.

First, we observe that changes in aggregate savings and asset accumulation terminate after sixty years. This is due to our assumption that individuals live for 60 years, plus the assumption that the change in the population growth rate is permanent. This implies that all adjustments in the demographic structure of the economy are completed after 60 years. Since individual behavior does not change as the population growth rate changes, after 60 years the economy has reached its new long run equilibrium. The dynamics of per capita assets and savings is as conjectured above. While asset holdings increase monotonically over time as the population ages, per capita savings first increase (as the big cohorts reach their prime earnings years) and then decline as more and more people retire and dissave. In the long run, savings declines, compared to the initial situation with a higher population growth rate.

This completes our discussion of the predictions the standard life cycle model has for aggregate savings dynamics in the light of an

Table 5: Parameter Values

|		
Economic Birth		21
Retirement Age	jr	65
Life Expectancy	J	80
Interest Rate	r	3%
Time Discount Factor	β	$\dfrac{1}{103}$
Income Growth Rate	g	2%
Initial Pop. Growth Rate	n	1%

aging population, driven both by increased life expectancy and reductions in fertility and thus population growth rates.

4 Conclusion

The population is aging, and, as I have argued above, theory predicts that this has profound consequences for individual and aggregate savings dynamics. Stepping beyond the par-

(1999), Brooks (2003) and Börsch-Supan, Ludwig and Winter (2004) have analyzed the issues of international capital flows and/or public pension reforms in dynamic general equilibrium models that have the life cycle model as its basic building block and demographic changes as exogenous driving force. Since the paper by Börsch-Supan, Ludwig and Winter (2004) is contained in this volume,

Figure 4: Savings and Asset Changes
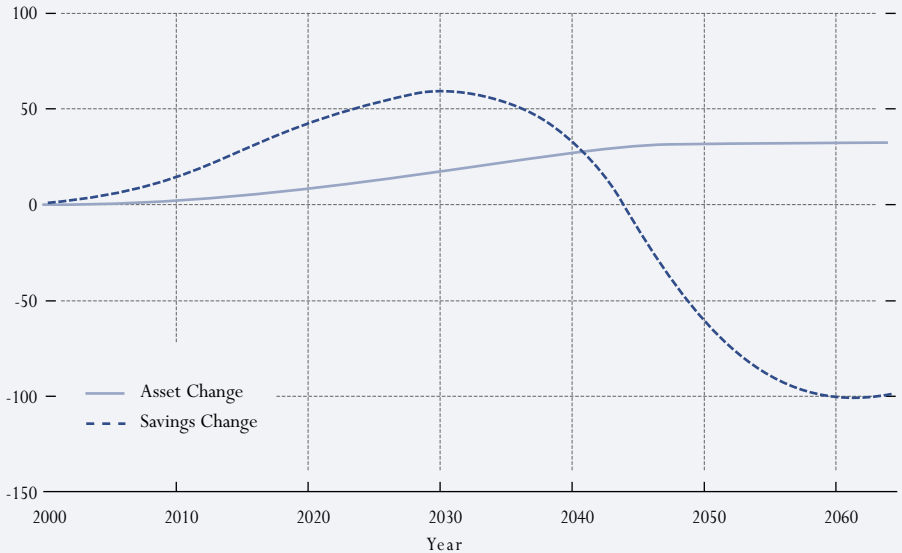
tial equilibrium life cycle model is beyond this essay, but analyzes of the consequences of population aging for the future of social security, the direction and magnitude of international capital flows in a world where regions age at different paces and other applied questions usually start from the individual optimization problem discussed here. Recently, the papers by De Nardi, Imrohoroglu and Sargent

it is not useful to give an executive summary here. But by providing the partial equilibrium analysis for an analytically solvable version of the life cycle model this paper has hopefully provided some additional intuition for the quantitative results obtained by the papers cited above.

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Household demographics and the composition of savings

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Contents

ABSTRACT

This paper discusses the role of demographic and other household characteristics in risky asset participation and in portfolio composition, in view of the main computational and econometric findings of recent portfolio studies. The overall message seems to be that household characteristics can be quite important, but they tend to play a bigger role in determining participation than in influencing risky portfolio shares conditional on participation. Based on observed portfolio inertia, it seems that the biggest challenges for the financial sector in the medium run are likely to arise from managing entry or exit of households from risky asset markets rather than from handling portfolio rebalancing of households that already participate in risky assets.

1 INTRODUCTION

The development of capital markets over the longer term is heavily influenced by the evolution of household preferences for different types of assets and by associated changes in observed patterns of asset accumulation. The 1990s have witnessed a dramatic change in this context, namely a substantial shift of household preferences on both sides of the Atlantic towards riskier assets, especially financial assets. This shift was encouraged by both market developments and by government policies. The stock market boom in the second half of the decade, the gradual drop in stock market participation costs, as well as government policies (e.g., privatization programs or introduction of tax incentives for retirement accounts) are often noted as major driving forces behind this portfolio shift.

Table 1 illustrates the portfolio shift by tracking changes over time in the proportion of house-

holds investing in risky financial or risky real assets in the US and in major European countries. In some countries, such as the UK, we observe dramatic increases in the proportion of households investing directly in stocks, mainly as a result of government privatization efforts and of the associated advertising campaign. In other countries, notably in the US, participation in direct stockholding remains fairly constant across the 1980s and 1990s, but major changes are observed in indirect stockholding mainly in the form of individual retirement accounts. In countries such as the US and the UK, stockholding participation is quite high, while in others, such as Italy, households are much slower to get into the stock market.

This increased tendency to participate in the stock market did not come at the expense of participation in other risky assets, such as corporate bonds or private equity and investment real estate. The bottom panel of *Table 1* shows that participation rates have increased in all countries shown, and across the spectrum of asset categories examined. It also shows an interesting difference in the tendency of households to hold risky real versus risky financial assets: witness the very high proportion of households investing in risky real but not in risky financial assets in Italy, compared to the much smaller such proportion in the US.[1]

The tendency of households to invest their savings in risky forms, and to continue to do so in the face of recent stock market downturns and difficult economic conditions, is not uniform but seems to depend crucially on their demographic characteristics, attitudes towards risk taking, financial resources and borrowing opportunities.

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1   This can be accomplished by subtracting the percentage of those investing in "Direct and indirect Stockholding" from the percentage of those investing in "Total risky assets" in a given country.

Table 1: Proportion of Households Investing in Risky Assets

Year	Direct stockholding					Direct and indirect stockholding				
	US	UK	Neth-erlands	Ger-many	Italy	US	UK	Neth-erlands	Ger-many	Italy
1983	19.1	8.9	n.a.	9.7	n.a	n.a.	n.a	n.a.	11.2	n.a.
1989	16.8	22.6	n.a.	10.3	4.5	31.6	n.a.	n.a.	12.4	10.5
1995	15.2	23.4	11.5	10.5	4.0	40.4	n.a.	29.4	15.6	14.0
1998	19.2	21.6	15.4	n.a.	7.3	48.9	31.4	35.1	n.a.	18.7

Year	Risky financial assets					Total risky assets				
	US	UK	Neth-erlands	Ger-many	Italy	US	UK	Neth-erlands	Ger-many	Italy
1983	n.a.	n.a.	n.a.	13.7	n.a.	n.a.	n.a.	n.a.	17.8	n.a.
1989	31.9	n.a.	n.a.	17.2	12.0	46.4	n.a.	n.a.	24.1	47.0
1995	40.6	n.a.	21.9	20.2	18.5	51.6	n.a.	28.4	25.2	46.9
1998	49.2	32.4	27.7	n.a.	22.1	56.9	n.a.	32.8	n.a.	43.8

Note: Risky Asset Definitions

Direct stockholding	Shares held directly.
Direct and indirect stockholding	Shares held directly, mutual funds, investment accounts, retirement accounts. Except for the US, information on the specific types of mutual funds and investment accounts is not available, and one cannot disentangle indirect stockholding in mutual funds and managed investment accounts from investment in other financial assets. For this reason the reported Figures overestimate the true value of indirect stockholding. In Germany there is no information on pension funds.
Risky financial assets	In the US direct and indirect stockholding, plus corporate, foreign and mortgage-backed bonds. In the UK direct and indirect stockholding plus corporate bonds. In the Netherlands direct and indirect stockholding, but excluding defined-benefits pension funds. In Germany direct and indirect stockholding plus foreign bonds. In Italy direct and indirect stockholding plus long-term government bonds and corporate bonds.
Total risky assets	Risky financial assets, business, investment real estate. In Germany there is no information on investment real estate in wave 1983 of the Income and Expenditure Survey, and no information on business property in 1993. In the UK there is no information on real assets.

Thus, understanding the channels through which demographics and other relevant household characteristics influence asset market participation and portfolio composition seems crucial for financial sectors interested in assessing the prospects for household asset accumulation, demand for financial products, and capital market development over the longer run.

Ten years ago, such analysis would have been nearly impossible. Use of portfolio data from National Accounts allows at best analysis of asset aggregates, without providing information on whether movements are due to changes in the extent of household participation in asset markets or to changes in the composition of savings conditional on such participation. Nor is it possible to assess how asset market participation, or portfolio composition conditional on participation, depends on household demographics. During the 1980s and especially during the 1990s, the development of household-level data bases with rich portfolio information has made such analyzes possible. At the same time, development of computational techniques has allowed us to solve calibrated theoretical models of household saving and portfolio choice under non-diversifiable income risk and attractive preference specifications, providing a useful background against which to interpret empirical findings.

In this paper, we first highlight in Section 2 the main lessons from existing computational portfolio models regarding the channels through which household demographics and other factors could influence the composition of savings. We then turn to the data and review in Section 3 recent empirical findings on the role of such demographics, interpreting them in light of existing theory and computations. Section 4 offers some concluding remarks.

2 Why Should Demographic and Other Household Characteristics Matter?

2.1 Participation versus Conditional Portfolio Shares
Conceptually, analysis of demand patterns for risky assets and of the role of household characteristics in shaping such demands should be broken down into two parts: (i) participation in risky assets; and (ii) portfolio share devoted to each risky asset conditional on participation in it.

Our portfolio choice models can be used to derive and discuss optimal portfolio composition, assuming that the household solves such a problem, i.e. perceives risky financial assets as part of its asset menu. However, households do not need to participate in all asset markets. Whether they do so depends on how expected lifetime utility under such participation compares to that attainable under no participation in the risky asset over the relevant horizon. Analysis of this choice is implemented through comparison of the value functions associated with each type of behavior.

It can be shown that, under a broad set of conditions, an expected utility maximizer would find it optimal to participate in risky financial assets, in large or in limited amounts (see Arrow, 1974; Haliassos and Bertaut, 1995). In view of these results, extensive non-participation in risky instruments, such as stocks, constitutes a puzzle, which has been dubbed "the stockholding puzzle" in recent portfolio literature. Such behavior is usually attributed to the presence of fixed entry or participation costs that discourage households from investing in such instruments unless their demand for such assets is sufficiently high to make it worthwhile for them to pay the fixed entry or participation cost.

Powerful evidence in favor of the fixed-cost approach to non-participation in risky assets has been provided by findings that participation tends to be higher when observable participation costs are lower both in a given country over time and across countries at a given point in time (see Guiso, Haliassos, Jappelli, 2003). This is corroborated by findings in recent empirical studies suggesting that relatively small fixed participation costs can explain the behavior of a large proportion of stock market non-participants (Vissing-Jorgensen, 2002; Paiella, 1999). It should be noted, however, that the full set of participation costs facing a household contemplating investment in stocks is ultimately unobservable, as it consists not only of objective and observable costs but also of costs arising from inertia, misperceptions, and limited ability to process financial information.

Participation and optimal portfolio shares conditional on participation, are intimately linked under the fixed-cost view. The greater the optimal portfolio share and the optimal amounts of investment of a given household in risky financial assets over the relevant horizon, the greater is its incentive to pay any given fixed costs in order to make use of risky financial instruments.

Still, there may be factors that discourage participation without necessarily influencing optimal portfolio composition once the household gains access to stocks. These are factors that operate mainly by influencing entry or participation costs. A striking example is that of ignorance of certain classes of assets (see Guiso and Jappelli, 2004). Households that are unaware of the existence of stocks or of mutual funds will obviously not choose to participate, but we would not expect such ignorance to continue to be a factor for participants in the process of deciding their portfolio share. Luckily, recent econometric work on portfolio choice

allows distinct treatment of demographics and other relevant factors in the first stage of participation choice from that in the second stage of portfolio share determination.

Bearing in mind the distinction between participation in a risky asset and portfolio share of that asset conditional on participation, we now turn to discuss important channels through which household demographic and other characteristics can influence these two choices.

2.2 Age and Life-Cycle Considerations

Table 2 breaks down participation in the countries and assets shown in *Table 1*, according to age group. The general impression from this tabulation is that of a usually hump-shaped pattern of participation rates in most countries, starting small in early working life, peaking prior to retirement, and turning down again during the later part of life. *Table 3* presents a similar breakdown by age for portfolio shares of each risky asset category, conditional on participating in this category. No clear pattern emerges, with some countries displaying increasing age-portfolio share profiles (e.g., direct stockholding in the US), others decreasing (e.g., the UK), others fluctuating (e.g., the Netherlands), and others relatively flat (e.g., Italy). Tabulations can, of course, be misleading, and econometric analysis is needed to disentangle the effect of each demographic or other household characteristic on participation in risky assets, while controlling for other factors. As we will see below, empirical studies tend to find weak and rather mixed influences of age on participation in risky assets, and even weaker or dubious effects of age on conditional portfolio shares.

What lies behind the mixed empirical evidence on participation and conditional portfolio shares at different ages is the variety of ways in which changing conditions over a

household's life cycle can influence participation and portfolio shares. One relevant consideration is "time diversification", which is related to the remaining length of time until the end of the household's investment horizon (Gollier, 2001). An investor who suffers a portfolio loss at a particular point in time can spread the financial consequences of this loss over the remaining periods in the horizon. Obviously, younger households have more remaining periods over which to spread losses ("time diversify"), compared to their older counterparts. As a result, younger households can afford to hold greater proportions of their wealth in risky assets than older households with similar other characteristics.

A further important consideration is related to the length of the remaining working life, or more generally of the remaining time during which the household earns income, and was first pointed out by Cocco et al. (1997). Although income earners face non-diversifiable risk associated with their income, there is a minimum level of income, typically nonzero and time-varying, that can potentially be earned in each future period. Entitlement of a household to such a stream of "worst-case" incomes is equivalent to holdings of a riskless asset yielding these same payments. Such "surrogate holdings of riskless assets" should be added to any observable holdings in the household's portfolio to assess its overall holdings of riskless assets and exposure to asset risk. As the household ages, remaining years of working life and holdings of surrogate riskless assets diminish, making it optimal for households to reduce the portfolio share of risky assets. Put differently, as households age, they tend to rely increasingly on accumulated observable wealth and progressively less on human wealth for financing consumption. This should make them moderate their exposure to risky assets.

Both time diversification and increased reliance on accumulated wealth justify a shift in the composition of savings towards relatively riskless assets as the household ages. Interestingly, this is also what households are urged to do by their financial advisors, though not necessarily with these factors in mind. Whether age noticeably influences portfolio composition when controlling for other factors is, of course, an empirical matter to which we will turn below.

Besides the continuous aging process, discrete life-cycle events can also affect willingness to hold stocks. An important such change, superimposed on the natural aging process, is retirement. In addition to getting closer to the end of the household's horizon, retirement also signals a reduction in background income risk and usually a flattening of the age-income profile. Along with this come a reduction in the ability to buffer major expenditure shocks via adjusting labor supply, and a concomitant reduction in the ability to obtain loans. While the combined effect of all these considerations could in principle be ambiguous, emerging computational models with an explicit retirement period suggest that benefits from access to stocks are more limited among retirees than among working-age households (see, for example, Bilias and Haliassos, 2004). For given fixed costs, this would imply more limited participation rates during retirement, and more limited portfolio shares of risky financial assets, controlling for other factors.

Another discrete event over the life cycle is the switch to homeowner status. The house represents the biggest purchase for a household and typically the biggest wealth item. Renters accumulating down payments for a home may be unwilling to introduce financial risk into their down payment accumulation. The younger and poorer among households who have invested in

Direct Stockholding							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	11.8	16.0	21.2	24.8	23.7	18.2	9.2
UK	10.8	19.6	24.5	28.1	26.2	18.5	21.6
Netherlands	4.7	6.8	13.4	18.4	17.8	21.2	14.4
Germany	8.5	11.3	12.1	11.2	10.1	6.1	10.0
Italy	3.4	9.9	8.4	9.3	6.4	4.2	7.3

Direct and Indirect Stockholding							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	34.3	51.8	58.3	61.4	47.1	32.4	48.9
UK	20.4	31.5	37.0	41.2	34.8	21.9	31.5
Netherlands	12.1	25.6	33.7	40.1	38.6	35.9	33.5
Germany	18.6	21.8	22.0	21.0	17.1	11.7	18.9
Italy	11.9	27.5	24.2	23.4	15.8	7.8	18.9

Risky Financial Assets							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	34.5	51.8	58.5	61.5	47.9	33.4	49.2
UK	20.9	32.0	37.7	42.2	36.4	23.1	32.4
Netherlands	8.7	15.6	21.0	31.1	31.1	35.1	24.8
Germany	23.9	28.2	28.0	27.8	23.1	18.0	25.1
Italy	17.3	30.3	26.9	26.3	20.6	10.3	22.1

Total Risky Assets							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	38.7	58.6	67.0	68.4	59.2	42.4	56.9
UK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	12.8	22.9	29.6	41.2	32.8	38.8	31.5
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Italy	32.4	50.6	50.6	51.7	45.9	26.4	43.8

a home have limited financial wealth to invest in stocks, and this reduces the benefits of equity market participation (Cocco, 2004). Moreover, homeowners with mortgages have monthly payment commitments that may discourage them from holding their savings in risky form

(Fratantoni, 2001). Still, homeownership can also have positive effects on the tendency to assume financial risk. For instance, homeowners have access to home equity loans not available to renters, and this may make them less averse to bearing risk in savings.

Direct Stockholding							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	22.5	28.3	29.4	32.7	37.5	41.3	34.6
UK	57.1	51.3	46.7	38.9	33.0	37.6	42.7
Netherlands	24.2*	48.8	30.2	41.1	57.2	56.3	47.6
Germany	17.0	15.2	15.0	16.6	22.1	27.5	18.6
Italy	18.9*	22.3	23.4	23.7	22.8	22.7	23.0

Direct and Indirect Stockholding							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	52.0	53.4	61.0	61.4	60.8	57.9	59.6
UK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	29.8*	37.5	42.9	54.9	61.6	59.1	53.6
Germany	20.6	19.3	16.9	19.0	26.2	32.6	21.8
Italy	47.9	52.5	52.2	56.2	53.2	59.1	57.3

Risky Financial Assets							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	52.1	53.7	61.8	62.1	61.4	59.4	60.5
UK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	32.1*	40.0	37.0	43.2	56.6	64.0	49.7
Germany	24.8	23.2	20.7	22.3	30.2	40.8	26.3
Italy	46.4	58.0	58.3	67.0	71.4	71.1	65.4

Total Risky Assets							
	<30	30 – 39	40 – 49	50 – 59	60 – 69	≥70	Total
US	44.4	43.0	52.9	58.8	56.2	56.1	54.4
UK	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	24.2*	27.1	28.0	34.8	32.3	44.7	33.1
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Italy	42.8	43.9	38.6	46.5	44.3	40.5	42.9

SOURCE: GUISO, HALIASSOS, JAPPELLI (2001B). ALL STATISTICS USE SAMPLE WEIGHTS. A STAR INDICATES THAT THE FIGURE IS BASED ON FEWER THAN 20 OBSERVATIONS. FOR DATA SOURCES AND RISKY ASSET DEFINITIONS, SEE NOTES TO TABLE 1.

Though important, housing is not the only lumpy expenditure over the life cycle. Having children often implies a need to pay for at least part of their college education, encouraging the household to engage in financial planning. Soule-les (2000) has found evidence of considerable consumption smoothing by parents in anticipation of college. While exposure to stockholding risk may interfere with reaching a specific savings accumulation target by the time children

enter college, taking advantage of the equity premium may actually facilitate reaching this target with a smaller amount of savings over the medium term. Having children also makes it more likely that household financial behavior is influenced by bequest motives likely to affect accumulation of risky assets, especially since capital gains on such assets are often exempt from taxation when transferred to descendants ("step up of basis"). On the other hand, a larger number of children carries with it, for given household income, a greater burden of supporting them and leaves smaller amounts for risky saving.

Other family conditions, such as marital status, can also impact the tendency to hold stocks, possibly in complicated ways. An interesting channel of influence is through the combined working potential of two spouses. Having two (potential) workers helps reduce overall labor income risk and enhance the household's willingness to save in risky assets. Again, however, given household income it means additional obligations that can discourage investment in risky assets.

Based on these considerations, prospects for risky asset demands and for development of capital markets for an aging population seem to be subject to conflicting considerations. Demographers expect greater population masses of middle- and old-aged people in the years to come. Such people have shorter horizons, and this should discourage them from holding risky assets. However, they will be displacing in importance cohorts of young households which, despite their longer horizons, tend to hold significantly fewer assets. Despite their lower optimal portfolio shares in risky assets, such aged households may generate more overall demand for risky assets (at given returns) than a population tilted more

towards the young. This should be reinforced by the fact that these aged households will be spending less time in retirement, as long as the prolongation of working life is not matched by miraculous improvements in longevity. Finally, middle- and old-aged households will be supporting fewer children, thus leaving more room for risky investments, but they will also have weaker bequest motives, which could somewhat discourage asset holding. Net effects are hard to predict, though it seems that the fact that aged households tend to have sizeable accumulated assets for retirement should be a dominant consideration, at least until retirement. Thereafter, a lot will depend on the extent of asset liquidation and on demand by young savers abroad.

2.3 Education, Awareness, and Financial Sophistication

Although economic optimization models typically assume that households are aware of the full set of available assets and of their main properties, and also that they possess the ability to come up with optimal portfolio strategies, there are empirical considerations to suggest that the potential role of education, awareness, and financial sophistication should not be finessed in portfolio analysis.

Guiso and Jappelli (2004) use 1995 and 1998 household-level data from the Survey of Household Income and Wealth (SHIW) collected by the Bank of Italy and find that about 35 percent of Italian households are not aware of stocks, 50 percent do not know about mutual funds and corporate bonds, and almost 70 percent are unaware of investment accounts. Indeed, they find that less than 30 percent of the sample is simultaneously aware of stocks, mutual funds and investment accounts. This finding is in stark contrast with the standard assumption of theoretical models that households perceive

the full set of available savings instruments and choose among them.

As stressed by Guiso and Jappelli, the pool of unaware households can be reduced by direct advertising and related efforts at information dissemination undertaken by the financial sector itself. The financial sector, though, responds itself to incentives, and it will thus be hesitant to undertake the costs of disseminating information if it knows that potential investors face high entry costs and are thus less likely to enter.

Social interactions can provide an alternative or a complement to advertising by practitioners, and there is evidence in Guiso and Jappelli that social interactions with knowledgeable peers increase the probability of asset market participation. Hong, Kubik and Stein (2001) use data from the US Health and Retirement Study to show that households who interact with their neighbors or who attend church are substantially more likely to invest in the stock market than those who do not, controlling for factors like wealth, race, education, and risk tolerance. Moreover, the impact of sociability is stronger in states where stock market participation is more widespread.

Formal education can influence stock market participation and conditional portfolio shares through at least two different channels: fixed costs and income processes. Education can improve a person's overall level of information, alertness, and problem solving ability, thus making it more likely that the person will overcome any given (objective or subjective) obstacles to gaining access to risky instruments. Formally, this is captured by assum-

ing that more educated households face lower fixed entry or participation costs than their less educated counterparts, thus making it more likely that they will choose to participate in risky assets.

In addition to the channel operating through (subjective and objective) fixed entry or participation costs, econometric studies of income determination show that households with different educational attainment face both different age-income profiles and different stochastic processes of income shocks.[2] Specifically, more educated households tend to face steeper age-income profiles and smaller variance of both transitory and permanent income shocks.[3] Computational models have shown that education-induced differences in income processes by themselves tend to produce sizeable effects on gains from stock market access and on stock market participation (see Bilias and Haliassos, 2004). The steeper age-income profiles make more educated households less willing to accumulate savings for the future, ceteris paribus, while the smaller shock variances reduce their precautionary motives for accumulating wealth in general, including risky assets. Thus, if the only difference between educated classes consisted in the income processes each faced (and not, for example, in differences in fixed entry and participation costs, initial endowments, attitudes to risk, etc.), then the more educated households should be saving less and should be less likely to participate in risky assets.

The conflict between education effects on fixed costs and on income processes, controlling for other household characteristics, can

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2 See, for example, Carroll and Samwick (1997), and Laibson, Repetto, and Tobacman (2000).
3 Lower variances are mostly due to the smaller unemployment risk faced by the more educated.

be assessed through calibrated models and through empirical estimation. In recent computational work using a calibrated intertemporal model of portfolio choice with background income risk, finite but uncertain lifetimes, and an explicit retirement period, Bilias and Haliassos (2004) find that small or moderate fixed costs, close to existing empirical estimates, do not seem sufficient to overcome the negative influence of education on participation probabilities in the stock market, if household characteristics other than education are controlled for. The existing empirical evidence on the role of education, controlling for other characteristics, is reviewed below.

Although formal education is likely to facilitate sound financial choices by reducing costs associated with entry and participation, it may be argued that effects should be even more visible for financial education directly relevant to such choices. Household-level databases do not contain data on financial education at the household level, but there is some evidence that countries with high levels of financial education, at least as perceived by management leaders, tend to be also countries with higher rates of participation in stockholding (see Guiso et al., 2003). While not conclusive, this together with other indicators could lend some support to the relevance of financial education for participation in risky assets.

Finally, formal education may be linked to specific attitudes to risk taking, length of investment horizon, etc. For example, there is evidence in household surveys, such as the Survey of Consumer Finances, that willingness to undertake financial risk, or above average such risk, is more pronounced in the more

educated households compared to households in the lower levels of educational attainment. While one can debate about the direction of effects, the typical approach in empirical but also in theoretical portfolio research is to examine the role of education for asset market participation and portfolio composition, controlling for other household characteristics, such as aversion to financial risk and investment horizon length.

2.4 Occupation and Employment Status
The typical approach in recent studies of household portfolio choice is to consider labor income as exogenous, generating background income risk that influences asset accumulation and portfolio composition. An important way in which occupation influences portfolio choice is in determining the size of this background risk. Carroll and Samwick (1997) provide estimates of variances of earnings shocks for various occupational categories, but computational models have tended to provide solutions either for a single type of households or for a small number of education categories. There is certainly room to explore the precise implications of different occupations.

A different channel through which occupation can influence the composition of savings is via knowledge of assets and of their properties, transmitted in the course of everyday professional life. There are various strong indications that familiarity with particular companies tends to contribute to holding stocks in those companies, ranging from the celebrated "home equity bias"[4] of stock ownership to the important case of employees who own stock in their own companies. This tendency appears to be strong enough to generate suboptimal or

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4   For a description of this tendency of households to own domestic stocks rather than foreign stocks with similar or superior characteristics, see Lewis (1999).

puzzling behavior on the part of households. Lewis (1999) demonstrates that the observed degree of home equity bias results in suboptimal portfolios, reviewing also similar work by others. The practice of employees to hold own company stock is certainly puzzling from a pure diversification perspective, as it generates positive correlation between labor income and portfolio returns. Familiarity could contribute to both.

More factors than mere knowledge of the company and of its prospects seem to play a role in the choice of entrepreneurs to devote a large part of their savings to a single firm (see Carroll, 2001). Carroll (2001) reports that over 80% of the business equity of the US rich owning such equity is in a single entrepreneurial venture, and about 50% of all their household income comes directly from enterprises in which the household has an ownership stake. On the one hand, these entrepreneurs are putting too many eggs in one basket, while on the other they are generating substantial positive correlations between their portfolio returns and their employment income.

This suggests that there are aspects to being an entrepreneur other than the desire to hold a diversified portfolio, sufficiently strong to overcome it. Examples of such considerations include a desire for power and control, pride in owning and running a firm, strong bequest motives, and even capital market imperfections precluding investments in a multitude of small entrepreneurial ventures. After reviewing available data and alternative explanations of the behavior of the rich, Carroll (2001) presents a formal model in which the pattern of savings is dictated by a "capitalist spirit" or equivalently a view of "bequests as a luxury good". Smaller risk aversion concerning the size of bequests than that concerning the level

of consumption leads to a greater proportion of lifetime resources being devoted to bequests as their resources increase. The model can also explain the tendency of the rich to display smaller aversion to risk taking (noted above), as well as their tendency to hold riskier portfolios even excluding their private equity.

Unemployment can affect the composition of savings in at least two important ways. First, the prospect of unemployment, even in small probability, can significantly discourage exposure to financial risk and depress demand for risky assets. Bad or catastrophic states can have major effects on behavior, because they typically involve considerably lower consumption and thus considerably higher marginal utility of consumption. They can thus have visible influence on expected future marginal utility of consumption and consequently on current optimal household choices. Second, unemployment as a current state can influence the composition of savings. Limited current cash on hand, combined with uncertainty as to the length of the unemployment spell can depress current demand for risky assets and willingness to assume financial risk. Whether savings composition effects of transitions to unemployment are visible in the aggregate does depend on the extent to which unemployment affects poorer population segments, as these tend to have very limited or zero assets anyway.

What do these observations imply about longer-run demographic effects on the composition of savings? The factors discussed in this subsection provide a channel through which economic growth, macroeconomic stabilization policies, and risk pooling by governments can influence the composition of savings. Developments that increase earnings uncertainty and unemployment risk tend to

discourage households from investing considerable parts of their portfolios in risky assets. Correspondingly, measures that reduce earnings or unemployment risk, such as sound macroeconomic policies, novel insurance mechanisms, training programs and employment agencies should make households more willing to assume risk. Increased importance of services, especially financial services, and development of information and communication flows, e.g. via the internet, should also make it more likely that households know and trust risky financial instruments, thus contributing to their importance as a component of household savings.

2.5 Race, Ethnic, and Other Background Factors

One of the most robust empirical findings in stockholding participation regressions for the United States is a statistically significant role of race and ethnic background. Specifically, such studies consistently find that being white, non-hispanic significantly increases the probability of participation in stockholding, controlling for other factors such as current income and wealth, education level, employment status, etc. On the face of it, this is a puzzling finding and interpreting it is far from straightforward.

One possible explanation that is often advanced is based on the supply side of financial services. It is argued that the financial services sector targets minority households less when advertising mutual funds and other risky financial instruments. Another possible factor is that current income, education, and wealth are imperfect proxies for future income prospects of minority households, and inclusion of the ethnic dummy captures complicated factors that influence future earnings but are not reflected in the other control variables.

A different channel through which race and ethnic variables can influence the composition of savings is provided by social interactions and other background considerations. As mentioned above, there is some recent evidence that interacting with people who know about certain new or complicated risky assets tends to encourage participation in such assets. Belonging to population groups that did not have much exposure to such assets in the past may contribute to perpetuating this situation of more limited participation. Unless such groups avoid investment in risky assets for religious, historical, ethical or other reasons, the source of such effects has relatively little to do with the fundamental characteristics of the group itself and much more to do with its past portfolio practices. For instance, Eymann and Börsch-Supan (2001) found evidence that former East German households tended to have more limited participation in stockholding compared to their former West German counterparts, even after controlling for education level, current resources, and other demographics. Assuming that their future prospects were similar in a united Germany, this finding suggests that limited past exposure to stocks may have been a key factor.

Turning to longer-term prospects, an important factor should be the increasing cultural and ethnic diversity of the EU, both as a result of the recent and of planned future expansions, and as a result of immigration. Some of these ethnic groups may find it more difficult to start investing in risky assets than their counterparts who are more familiar with such investments. Yet, if we believe in the importance of social interactions, increased ethnic diversity should eventually be beneficial as it brings together people less familiar with risky assets and immerses them into environments where investment in such assets is much more

widespread. Investment in risky assets can be expected to spread as a result of these interactions, even though such spread is unlikely to occur very quickly, if the German (or indeed the US) experiences can be used as a guide.

2.6 Factors Spanning Demographic Groups

In the previous section, we focused on household-specific demographic factors. Here we discuss briefly factors important for portfolio choice which are not themselves demographic but can influence different demographic groups to different extents. Changes in demographics could thus influence the size and nature of the effects of these factors on the composition of savings.

2.6.1 Government Policies

An important factor influencing longer-run trends in the composition of savings is government policy. While policy can take many forms and influence savings through various channels, here I will mention a few that relate directly to household portfolio choice.

The demographic transition and the funding problems that an aging population poses for social security systems have already encouraged several governments, notably the US government and major EU states, to set up individual retirement accounts and to provide tax incentives for using them to accumulate retirement assets, mainly in the form of tax deferrals. Use of such accounts has spread quickly. In the United States, the share of households having a tax-deferred retirement account --either IRA or 401(k)-type-- rose from about 31 percent in 1983 to about 49 percent in 1998, and to about 52 percent in 2001 (Bertaut and Starr-McCluer, 2001; Aizcorbe et al, 2003)[5]. As households are allowed to include stocks in these accounts, their spread has been a major factor behind the spread of indirect stockholding and of equity culture more generally. Continued use and spread of retirement accounts, both within the US and across other countries can prove to be a powerful engine of growth in demand for risky assets over the longer run.

Government policy can also have effects on participation in risky assets by providing the necessary elements for making potential investors feel secure about the financial risk they undertake. Safe accounting practices and investor protection are two such elements. Guiso, Haliassos and Jappelli (2003) report some evidence that countries with higher levels of transparency, as judged by domestic managers, tend to exhibit higher levels of participation in risky assets. Giannetti and Koskinen (2003) find that, in countries where minority investor rights are poorly protected, both domestic portfolio investors and foreign investors have a disincentive to hold stocks. Such countries tend to exhibit lower participation rates.

Unfortunately, governments often face conflicting objectives. A relevant example is that of universal banking. In their effort to promote banking, various governments have allowed commercial banks to hold stocks in addition to making loans and to providing financial advice to customers. This flexibility has created conflicts of interests within such banks. If a bank owns stock or has made loans to a troubled company, it has an incentive to encourage its retail customers to put their savings in stocks of this troubled company, thus raising its price. While there are

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5 By comparison, mutual fund ownership rose from 4.5 percent in 1983 to 12.3 percent in 1995, to 16.5 percent in 1998 and 17.7 in 2001.

some disincentives to providing bad financial advice, one wonders whether these are sufficient to discourage bad practices that the institutional framework makes possible and profitable. All in all, the way governments respond to the demographic transition and to political pressures imposed by this transition can have important implications for the future tendency of households to invest their savings in risky assets.

2.6.2 Credit Market Conditions and Borrowing Constraints

Borrowing constraints and overall credit market conditions have been shown to have powerful influences on household choices regarding the level and the composition of savings.[6] A recurring result in much of the theoretical literature is that, in the absence of quantity constraints on borrowing, households expecting their resources to increase in the future would tend to borrow in order to increase current consumption and their holdings of the risky asset. The presence of borrowing constraints discourages participation in risky assets and lowers the amount of risky assets held by those who do participate.

This theoretical finding is corroborated by empirical stockholding participation regressions, where the presence of borrowing constraints is typically found to lower the probability of participation (see, for example, the contributions in Guiso et al., 2001a). The incidence of borrowing constraints is now typically measured by survey responses, without requiring households to have close-to-zero assets in order to be classified as borrowing-constrained. Households are asked whether

they have been turned down for credit, or been given less than requested, or been discouraged to apply by fear that they would be turned down. Demographic groups that normally display greater incidence of borrowing constraints are the young, the less educated, and the poorer population segments. The oldest population segments could also face loan rejections as a result of limited horizons and restricted ability to increase work effort in order to repay the loan, but they make up for this by having accumulated assets that can be used as collateral or liquidated to finance consumption needs without seeking loans. Thus, a general aging of the population can be expected, at given levels of asset returns, to increase the supply of loanable funds, reduce the incidence of binding borrowing constraints, and increase demand for risky assets, at least before the bulk of the population enters retirement and asset liquidation.

2.6.3 Household Attitudes to Risk and Precautionary Motives

It is natural to suppose that higher risk aversion discourages savings in risky assets and encourages accumulation of a riskless asset. Recent computational work involving models with background income risk has uncovered a potential conflict between risk aversion and "precautionary" motives to save for a rainy day or more generally as a result of facing background income or health risk.[7] These models confirm that households with higher relative risk aversion will find it optimal to have smaller portfolio shares in risky assets at (most) given levels of current resources, consistent with the commonly held view. However, for utility functions displaying precautionary motives[8], higher risk aversion is

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6 See, for example, Deaton (1991) and Haliassos and Michaelides (2003).
7 See Heaton and Lucas (1997), Haliassos and Michaelides (2003), Bilias and Haliassos (2004).
8 Important utility functions that do not display such motives are the linear and the quadratic.

usually combined with stronger precautionary motives that encourage wealth accumulation. The net effect on demand for risky assets depends on the relative strength of the two factors (i.e., lower portfolio share and higher wealth level), but it is often the case that the stronger precautionary motive dominates and higher risk aversion is found to imply greater demand for risky assets, at least over some range of current resources.

It is hard to draw clear implications for practitioners from such findings yet, especially because risk aversion of the utility function, as well as the strength of the precautionary motive ("prudence") are not directly observable, despite some recent attempts to measure them based on survey responses (see, for example, Guiso and Paiella, 2001). These findings do suggest, however, that demographic shifts towards groups displaying greater tendencies to save for a rainy day (given their background income risk) could also result in greater demand for risky assets, even when combined with greater risk aversion and with lower *shares* of risky assets in savings.

3 ECONOMETRIC FINDINGS

In this Section, we report indicative econometric results regarding most of the demographic and other household characteristics discussed above. The advantage of econometric research over mere cross-tabulation by characteristic is that it allows us to disentangle the effect of each factor, while controlling effects of all other factors. Sometimes this changes completely the picture given by tabulations. Econometric research in the area of household saving and portfolio choice has relied mostly on probit or logit regression for analyzing the participation decision, and on second-stage regressions for portfolio shares that allow for selection in the first stage.

3.1 Asset Market Participation

Table 4 reports probit regressions for direct participation in stockholding for the United States and for six European countries (France, Germany, Italy, Netherlands, Sweden, and the UK). Data refer to 1998 for all countries, except for Sweden for which 1999 data are used. The table is taken from Guiso, Haliassos, and Jappelli (2003). Control variables include marital status, family size, education (specifically whether the household head has college education), age of household head, and position in the income and in the wealth distribution within the country.

Financial resources (i.e., income and wealth) are seen to have a consistently positive and statistically significant effect on participation across the countries shown. This is entirely consistent with computational models of household portfolio choice reviewed above, which predict both increased consumption and increased stockholding with higher resources. The resulting greater gains from participation make it more probable that any given level of fixed entry or participation costs will be overcome.

College education of the household head (i.e. of the household member responsible for handling finances) is also shown to contribute to participation in directly held stocks (at the 10% level of significance). This finding is in accordance with the majority of the empirical literature based on standard probit and logit estimation of stockholding participation (see, for example, the country studies in Guiso et al., 2001a).

Recently, application of modern binary quantile regression estimation techniques has challenged the robustness of these findings and has found instead that education effects may

	France	Germany	Italy	Nether-lands	Sweden	UK	US
Married	-0.0088 (0.0084)	0.0024 (0.0060)	0.0143 (0.0049)**	-0.0437 (0.0205)*	0.0390 (0.0120)**	0.0294 (0.0069)**	0.0017 (0.0219)
Family size	-0.0050 (0.0033)	-0.0156 (0.0022)**	-0.0068 (0.0021)**	0.0098 (0.0090)	-0.0257 (0.0049)**	0.0031 (0.0115)	0.0023 (0.0077)
College-Educated Head	0.0555 (0.101)**	0.0422 (0.0046)**	0.0287 (0.0082)**	0.0390 (0.0169)*	0.0800 (0.0093)**	0.0581 (0.0070)**	0.0846 (0.0160)**
Age 31-40	0.2036 (0.0145)	-0.0474 (0.0074)**	0.0216 (0.0160)	0.0055 (0.0509)	0.0053 (0.0137)	0.0218 (0.0120)	-0.0841 (0.0279)**
Age 41-50	0.0066 (0.0137)	-0.0891 (0.0068)**	0.0044 (0.0125)	0.0253 (0.0524)	-0.0033 (0.0135)	0.0419 (0.0126)**	-0.1195 (0.0262)**
Age 51-60	0.0207 (0.0149)	-0.0906 (0.0066)**	0.0123 (0.0136)	0.0528 (0.0580)	0.0372 (0.0139)**	0.0388 (0.0131)**	-0.0612 (0.0289)*
Age 61-70	0.0002 (0.0145)	-0.0839 (0.0069)**	0.0067 (0.0131)	0.0749 (0.0637)	0.0146 (0.0146)	0.0266 (0.0135)*	-0.0646 (0.0300)*
Age > 70	-0.0134 (0.0139)	-0.1101 (0.0063)**	-0.0005 (0.0123)	0.1146 (0.0782)	-0.0453 (0.0121)**	-0.0022 (0.0129)	-0.0529 (0.0310)
II income quartile	0.0396 (0.0127)**	-0.0125 (0.0076)	-0.0082 (0.0071)	0.0010 (0.0285)	0.0699 (0.0141)**	0.0477 (0.0100)**	0.0928 (0.0380)**
III income quartile	0.0643 (0.0132)	0.0241 (0.0074)**	-0.0012 (0.0073)	-0.0118 (0.0255)	0.1090 (0.0151)*	0.1541 (0.0114)**	0.1032 (0.0386)**
IV income quartile	0.1316 (0.0149)**	0.0966 (0.0076)**	0.0319 (0.0103)**	0.0268 (0.0283)	0.2258 (0.0177)**	0.2200 (0.0128)**	0.2163 (0.0365)**
II wealth quartile	0.1284 (0.0187)**	0.2054 (0.0121)**	0.0362 (0.0177)*	0.1478 (0.0625)**		0.2403 (0.0096)**	0.2094 (0.0508)**
III wealth quartile	0.2224 (0.0199)**	0.3407 (0.0115)**	0.1237 (0.0248)**	0.2975 (0.0662)**	0.3422 (0.0129)**	0.3893 (0.0125)**	0.4121 (0.0493)**
IV wealth quartile	0.4280 (0.0200)**	0.4977 (0.0105)	0.3132 (0.0347)**	0.5235 (0.0623)**	0.5519 (0.010)**	0.5183 (0.0094)**	0.6331 (0.0322)**
Number of observations	10207	39393	7147	1679	17043	22858	4305

Source: Guiso, Haliassos, and Jappelli (2003). In Sweden very few households in the first wealth quartile have stocks. The regression therefore uses financial wealth tertiles. The coefficients in the table indicate the effect of the independent variable on the probability of stockownership. Standard errors are reported in parenthesis. One star indicates that the coefficient is statistically different from zero at the 5 percent level, two stars at the 10 percent level

Survey Data Sources for Tables 4 and 5						
France	Germany	Italy	Netherlands	Sweden	UK	US
1998 INSEE Survey on Wealth	*1998* Income and Expenditure Survey	*1998* Survey of Household Income and Wealth	*1998* Center Saving Survey	*1999* HEK-Household Economy	*1998* Family Resources Survey	*1998* Survey of Consumer Finance

not be statistically significant across the entire spectrum of the distribution of net gains from stock market access (Bilias and Haliassos, 2004). A possible interpretation of such more mixed results on the role of education for participation rests in the conflict between education effects on participation costs and on income processes noted above.

One cannot help but notice the very mixed findings regarding age variables. In some countries (such as France, Italy, and the Netherlands), the authors fail to find a statistically significant role for age variables. In others, notably the US, UK, and Germany, they do find statistically significant effects, but the pattern is not common among the countries and not the same as that indicated in tabulations above (*Table 2*).[9]

In Italy, Sweden, and the UK, being married is found to contribute to the probability of direct stockholding, while in the rest of the countries no significant effect (or a negative effect) is found. Greater family size, when significant, is found to discourage participation, controlling for financial resources. It is possible that greater family size leaves fewer resources for savings and sometimes makes households less willing to jeopardize their accumulation by investing part of it in stocks.

Table 6, taken from Bertaut and Starr-McCluer (2001) who used US Survey of Consumer Finances pooled data, studies participation in broader risky asset categories, namely risky financial assets and risky total assets. These regressions also include a wider range of control variables, exploiting the breadth of the SCF. Ownership regressions are shown in the 3rd and 5th columns.

The roles of financial resources and of education are similar for participation in risky financial assets (3rd col.) as for direct stockholding. Aging now seems to lower the probability of participation, while being married to increase it. Results are consistent with the negative effect of belonging to a minority discussed in Section 2, as well as with the negative effect of being retired, even after controlling for age.

Declared unwillingness to undertake any financial risk ("no risk") has a statistically significant negative effect on participation probability, while willingness to undertake high risk has the opposite effect, both relative to the case of being willing to assume average risk. This clear pattern of dependence on stated attitudes does not invalidate our theoretical discussion in which we painted a much less clear picture of the link between the degree of relative risk aversion and the demand for stocks. It rather suggests that survey responses about willingness to undertake financial risk refer directly to the demand for risky assets rather than to the underlying risk aversion parameter in the utility function stressed by theory. Finally, being self-employed is estimated to lower the probability of investing in risky financial assets.

Turning to total risky assets, which include also risky real assets such as private equity and investment real estate (col. 5), gives a

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9 In interpreting effects of age, we should note that the age effect may be confounded with time and cohort effects. For instance, if older cohorts are more reluctant than younger cohorts to enter the stock market, in the cross section this creates the impression of a negatively sloped age-stockownership profile. It is not possible to control for such an effect in the absence of panel or repeated cross-sectional data.

	France	Germany	Italy	Nether-lands	Sweden	US
Married	-0.0065 (0.0142)	-0.0342 (0.0076)**	0.0534 (0.0348)	-0.0549 (0.0436)	0.0017 (0.0155)	-0.0493 (0.0263)
Family size	-0.0049 (0.0055)	-0.0155 (0.0028)**	-0.0031 (0.0117)	-0.0563 (0.0199)**	-0.0290 (0.0067)**	0.0069 (0.010)
College-Educated Head	0.0351 (0.0137)**	0.0425 (0.0054)**	0.0576 (0.0277)*	-0.0187 (0.0379)	0.0919 (0.0114)**	-0.0009 (0.0207)
Age 31-40	0.0537 (0.0250)*	-0.0257 (0.0105)**	0.0772 (0.0741)	0.0716 (0.1283)	-0.0300 (0.0195)**	-0.0257 (0.0389)
Age 41-50	0.0482 (0.0247)*	-0.0669 (0.0109)**	0.0640 (0.0737)	0.0236 (0.1238)	-0.0518 (0.0192)**	-0.0452 (0.0376)
Age 51-60	0.0415 (0.0254)	-0.0769 (0.0111)**	0.0897 (0.0733)	0.0573 (0.1237)	-0.0347 (0.0182)	-0.0473 (0.0379)
Age 61-70	0.0641 (0.0265)*	-0.0366 (0.0117)**	0.0769 (0.0747)	0.1037 (0.1256)	-0.0970 (0.0196)**	-0.001 (0.0419)
Age > 70	0.0614 (0.0272)*	-0.0027 (0.0132)	0.0329 (0.0784)	0.0894 (0.1298)	-0.159 (0.0183)**	0.0478 (0.0416)
Income	0.4363 (0.2489)	0.5028 (0.1273)**	0.1216 (0.4212)	0.0205 (0.7999)	0.1420 (0.0202)**	-0.2257 (0.1871)
Financial wealth	0.0644 (0.0217)**	0.2358 (0.0252)**	-0.0046 (0.0688)	0.3961 (0.0763)**	0.1212 (0.0163)**	0.1037 (0.0196)**
Constant	-0.0056 (0.0362)	0.0749 (0.0160)**	-0.0998 (0.0935)	0.3440 (0.1605)*	0.0461 (0.0253)	0.1941 (0.0569)**
Number of uncensored observations	1702	8247	578	276	5036	775

Source: Guiso, Haliassos, and Jappelli (2003). The first stage regression includes dummies for married and college degree, family size, and dummies for income and financial wealth quartiles. Income and wealth are measured in million of euro. Standard errors are reported in parenthesis. One star indicates that the coefficient is statistically different from zero at the 5 percent level, two stars at the 10 percent level.
For data sources, see Notes to Table 4.

broadly similar picture with a few interesting exceptions. One exception is that there seems to be no statistically significant effect of age on participation in this broader class of risky assets. Another is that self-employment now switches sign, but this is understandable given the inclusion of private business in this category of assets. Limited resources, education, or willingness to bear risk, and retirement status all make participation in risky total assets less likely.

From the point of view of assessing effects of longer-run demographic trends on participation in risky assets, perhaps the most important empirical findings are the negative effect of being in the retirement period on participation in such assets, controlling for age; and the mixed findings regarding effects of age on participation that do not suggest a common direction across countries. Thus, our discussion in Section 2 seems relevant in the face of existing empirical evidence.

Table 6: Models of risky financial assets: ownership and risky share

	Risky Financial Assets						Total Risky Assets			
	– Tobit		– Heckman selection model				– Heckman selection model			
	Share		Ownership		Share		Ownership		Share	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Constant	-.7721*	(.03)	-4.5803*	(.16)	-.0149	(.16)	-6.0648*	(.20	-.8267*	(.07)
Married	.0326*	(.01)	.1885*	(.04)	-.0133	(.02)	.0013	(.04)	-.0681*	(.01)
Female-headed	.0148	(.01)	.1523*	(.05)	-.0135	(.02)	-.0277	(.05)	-.0607*	(.02)
Age <35	-.0247*	(.01)	.0352	(.04)	-.0303+	(.02)	-.0008	(.04)	.0037	(.01)
Age 55-64	-.0398*	(.01)	-.1157*	(.04)	-.0091	(.01)	.0693	(.05)	.0144+	(.01)
Age 65+	-.1029*	(.01)	-.3652*	(.05)	-.0393*	(.02)	-.0879+	(.06)	-.0173+	(.01)
Log income	-.0076*	(.00)	.0385*	(.01)	-.0026	(.00)	.0819*	(.01)	-.0153*	(.00)
Log wealth	.0955*	(.00)	.3779*	(.01)	.0356*	(.01)	.4572*	(.01)	.1032*	(.00)
Nonwhite or hispanic	-.0746*	(.01)	-.2471*	(.04)	-.0323	(.02)	-.1576*	(.04)	.0099	(.01)
Below high school	-.0793*	(.01)	-.1753*	(.04)	-.0194	(.03)	-.1378*	(.04)	-.0045	(.02)
College degree	.0372*	(.01)	.1194*	(.03)	.0285*	(.01)	.0970*	(.03)	-.0082	(.01)
DB pension	.0393*	(.01)	.1124*	(.03)	.0107	(.01)	.0223*	(.03)	-.0220*	(.01)
Self-employed	-.1292*	(.01)	-.4994*	(.04)	-.0642*	(.02)	.4914*	(.05)	.1333*	(.01)
Retired	.0936*	(.01)	-.3061*	(.05)	-.0419*	(.02)	-.1986*	(.05)	.0003	(.01)
No risk	-.1606*	(.01)	-.4477*	(.03)	-.0908*	(.03)	-.4381*	(.03)	-.0586*	(.01)
High risk	.0680*	(.01)	.1071*	(.04)	.0802*	(.01)	.2369*	(.04)	.0470*	(.01)
Unemployment rate	.0009	(.00)	-.0039	(.01)	.0019	(.00)	-.0139	(.01)	-.0026	(.00)
1989	-.1000*	(.01)	-.2377*	(.04)	-.0914*	(.02)	-.0790+	(.04)	-.0271*	(.01)
1992	-.0415*	(.01)	-.0749+	(.04)	-.0379*	(.01)	.0347	(.04)	.0177+	(.01)
1998	.0981*	(.01)	.1431*	(.04)	.1023*	(.01)	.0660+	(.04)	.0326*	(.01)
% FIRE employment	–	–	.0181+	(.01)	–	–	.0015	(.01)	–	–
% large employer	–	–	.0164*	(.00)	–	–	.0146*	(.00)	–	–
Shop around	–	–	.0114*	(.01)	–	–	.0142*	(.01)	–	–
Inverse Mills Ratio	–	–			1601+	(.10)			.2261*	(.06)
Estimate of p					.5374				.8354	
Joint significance of age variables	.0000		.0000		.0633		.0541		.0321	
			.0000				.0116			

Source: Bertaut and Starr-Mc Cluer (2001), *Table 8.*
Note: *: Significant at 5 percent level; +: Significant at 10 percent level.

3.2 Portfolio Composition Conditional on Participation

Table 5 reports portfolio share regressions for directly held stocks that allow for selection in the first (participation) stage. The countries are the same as in *Table 4*. Although the level of financial wealth is seen to contribute to greater portfolio shares as well as to greater participation, there are on the whole fewer consistent influences of household characteristics on conditional portfolio shares of directly held stocks than on participation.

The same is true comparing participation and share regressions in *Table 6*, which refer to risky financial assets and to total risky assets in the US, though more factors are significant for explaining portfolio shares than in *Table 5*. Findings in *Table 6* suggest a negative effect of retirement on the portfolio share of risky financial assets (though not of total risky assets), controlling for age. Age itself does not appear to have an important influence on conditional portfolio shares. College educated households tend to have greater proportions of their savings in risky financial assets, but such effects are not present for the broader class of total risky assets. The same reversal of sign is observed between the two categories of assets for the variable showing self-employment status as that noted for participation, and it can be attributed to the same reasons. Finally, declared willingness to undertake financial risk also influences portfolio shares in the expected direction.

Weak findings on the role of demographics in shaping portfolio shares of risky assets are consistent with findings of considerable portfolio inertia in the limited number of longitudinal studies of portfolio shares, such as those of Ameriks and Zeldes (2001) based on the TIAA-CREF data base of retirement portfolios of educators in the US. Ameriks and Zeldes found that 47 percent of these highly educated account holders made no changes in how the flow of their contributions gets allocated to alternative investment accounts over a ten-year period, while another 14 percent made only one change. Account holders can also change portfolio allocation by moving accumulated funds from one account to the other, but roughly 73 percent made no such change in the ten-year period, while another 14 percent made only one change.

It seems hard to avoid the conclusion that households are more preoccupied with choosing which assets to hold in their portfolio than with changing their portfolio composition when their age or other characteristics change. Although we are far from having a concrete explanation for this inertia, one can speculate that it is related to the greater difficulty and costs of adjusting optimally portfolio composition rather than participation when individual circumstances change. In other words, it seems likely that households find it much easier to know whether they should be holding a particular risky asset than to calculate the optimal portfolio share of this asset. Whatever the cause of such inertia, it seems fair to conclude that most of the effects of demographic changes on capital markets over the longer run are likely to be felt in changing participation patterns rather than in dramatic changes in portfolio shares conditional on participation.

4 CONCLUDING REMARKS

In this paper, we have discussed the role of demographic and other household characteristics in risky asset participation and in portfolio composition, in view of the main computational and econometric findings of recent portfolio studies. The overall message seems

to be that household characteristics can be quite important, but they tend to play a bigger role in determining participation than in influencing risky portfolio shares conditional on participation. Based on observed portfolio inertia, it seems that the biggest challenges for the financial sector in the medium run are likely to arise from managing entry or exit of households from risky asset markets rather than from handling portfolio rebalancing of households that already participate in risky assets.

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Demography, savings, and global capital markets

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Contents

Abstract

This paper summarizes results from a simulation study of the capital and labor market effects of demographic change and pension reform. Population aging is just beginning to hit the industrialized countries in full force, and it will have a tremendous impact on capital markets. The younger generations in these countries are becoming aware of the need to provide for an increasing share of their 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' saving behavior, and more assets will be invested in the capital market. At the same time, differences in the age structure across countries result in differences in the domestic rates of return that will be equalized by capital flows, to the extent that capital is internationally mobile. Population aging, therefore, will not only affect domestic capital markets in the fast-aging industrialized countries, but global capital markets more broadly.

1 Introduction

The present paper summarizes results from a quantitative simulation study of the capital and labor market effects of demographic change and pension reform. In particular, we focus on the capital flows induced by differential aging processes across countries. This paper is part of an ongoing research project conducted at the Mannheim Research Institute for the Economics of Aging (MEA); a more detailed and more technical discussion can be found in Börsch-Supan, Ludwig, and Winter (2004).

Our research program is related to different strands of the academic literature. First, several recent papers evaluate the ability of overlapping generations models to predict long-term trends in international capital flows (see, e.g., Brooks, 2003; Feroli, 2002; Henriksen, 2002; Dmoeij and Floden, 2004). These papers as well as our analysis show that calibrated overlapping generations models explain a good fraction of the low frequency movements of international capital flows as observed in the data. In addition, we show that the existence of pay-as-you-go pension systems in different world regions adds an additional indirect channel to the interaction between capital flows and demographic change. This channel is of particular importance if countries severely affected by the impact of population aging such as the continental European countries reform their pension systems, creating additional savings.

Second, our paper adds to the discussion about the so-called "asset market meltdown hypothesis". Several articles in the popular press have attributed recent turbulences in stock market prices to population aging and raised the fear that an asset market meltdown might occur when the baby boom generation decumulates its assets. In the academic literature, there is no consensus on the asset market meltdown hypothesis (see e.g. Poterba, 2001; Abel, 2001; and Brooks, 2002). We argue that standard closed-economy models that have been used in the academic literature ignore the potentially important role of international capital flows and international diversification. Our simulations show that the dynamics of capital accumulation and rates of return generated by models that account for international capital mobility are different from what would be predicted by closed-economy models.

Third, our research sheds light on the effects of international diversification on savings behavior and its interaction with pension reforms. Deardorff (1985) contains an early analysis of these issues, and Reisen (2000)

provides a comprehensive overview. Reisen argues that there are pension-improving benefits of global asset diversification. In a theoretical paper, Pemberton (1999) highlights the importance of international externalities caused by the effects of national pension and savings policies on the world interest rate. Pemberton (2000) goes a step further and shows that an intergenerational Pareto improvement through coordinated pension reforms is possible. We do not address this policy issue in this paper, but our results indicate that accounting for capital mobility may well change the welfare implications of pension reforms.

We conclude this introduction with a brief preview of our simulation results. Our main finding is that population aging generates substantial capital flows between world regions. Countries most affected by aging such as the European Union will initially be capital exporters, while countries less affected by aging like the United States und other OECD countries will import capital. However, once baby-boom households decumulate their assets after entering retirement, capital exports from these fast-aging countries to the rest of the world decrease. Consequently, these countries are projected to become capital import countries around the year 2020. Pension reforms that involve increasing the degree of pre-funding are likely to induce more capital exports, but they also increase labor supply considerably. The effects on the rate of return to capital are small. Overall, our results confirm that the rate of return to capital declines in response to population aging, but the projected decrease is rather small. We conclude that a devastating "asset market meltdown" due to population aging is unlikely.

The remainder of this paper is structured as follows. Section 2 presents the basic facts of population aging around the world. In Section 3, we review the empirical evidence on, and theoretical explanations for, the effects of population aging on international capital flows. In Section 4, we describe the main features of a multi-country overlapping generations model that allows to evaluate these effects quantitatively. We present some simulation results in Section 5. Section 6 concludes.

2 SOME FACTS ABOUT POPULATION AGING

Throughout the world, demographic processes are determined by the demographic transition which is characterized by falling mortality rates followed by a decline in birth rates, resulting in population aging and reducing the population growth rate (in some countries, even turning it negative). While patterns of demographic change are similar in most countries, extent and timing differ substantially. Europe and some Asian countries have almost passed the closing stages of the demographic transition process while Latin America is only at the beginning stages (Bloom and Williamson, 1998). North America is in between.

In order to capture projected differences in demographic change across the world (particularly within the European Union) and differences in the generosity of public pension systems, we distinguish five world regions: (i) France, Germany, and Italy as three European countries that are severely affected by population aging and at the same time share large pay-as-you-go pension systems, (ii) the remainder of the European Union, (iii) North America (the US and Canada), (iv) the remaining OECD countries, and (v) all other countries in the world.[2]

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2 While we treat France, Germany, and Italy as separate countries in our simulations, we simplify the presentation by aggregating the results into one region.
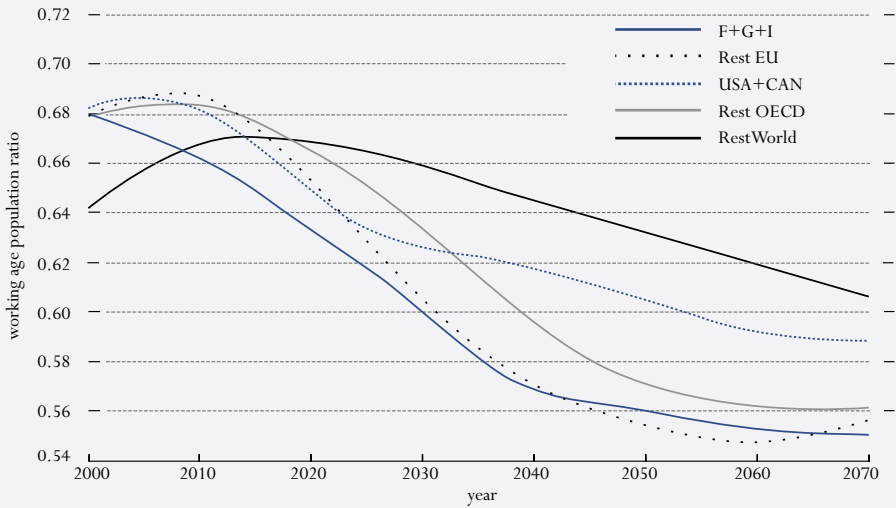
Figures 1 and *2*, based on United Nations (2001), show the effects of demographic change on two important demographic measures, the working age population ratio (the number of persons aged 15 to 65 as a percentage of total population) and the old-age dependency ratio (the number of persons older than 65 as a percentage of the working age population).
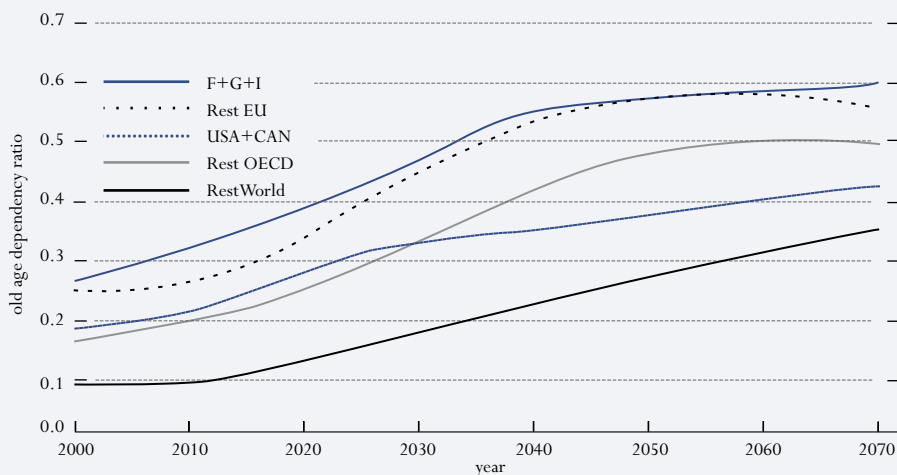
A number of lessons can be learned from these graphs. First, all world regions that we consider are affected by the consequences of demographic change; as a result, they face decreasing working age population ratios and increasing old-age dependency ratios. Second, while working age population ratios are more or less identical in 2000 for the OECD countries, the decrease in the work-

ing age population ratio is strongest for the European Union countries, especially the three-country group of France, Germany, and Italy. Third, the latter group has the highest old-age dependency ratio. Forth, there are significant differences in the timing and the pattern of demographic change across regions. As we will see, these different patterns have profound implications for the evolution of saving rates, rates of return, and international capital flows.

3 DEMOGRAPHY AND CAPITAL MARKETS: INTUITION AND EMPIRICAL EVIDENCE

From a macroeconomic point of view, population aging will change the balance between capital and labor, in particular in industrialized countries. Labor supply will be relatively

scarce whereas capital will 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).

Theoretical arguments that establish this link build on the well-known life-cycle theory of consumption and savings by Modigliani, Ando and Brumberg (Modigliani and Brumberg, 1954; Ando and Modigliani, 1963). The aggregation of individual, cohort-specific life-cycle savings profiles leads to a decrease of national saving rates in an aging economy. In a general equilibrium model of forward-looking individuals, it is not only the current demographic structure that alters the time path of aggregate savings, but also future demographic developments. These effects can best be

analyzed in overlapping generations models, following Auerbach and Kotlikoff (1987).

Once we leave the closed-economy perspective and consider international capital mobility, additional effects arise. Differences in timing of demographic change across countries and regions induce international capital flows. In an open economy, the link between saving and investment is broken to the extent that capital is internationally mobile. Empirical evidence on how demographic change has affected saving behavior across countries in the past is reviewed by Poterba (2001). Following earlier work by Higgins (1998) and others, Lührmann (2003) presents a comprehensive study of demographic change and capital flows, using a broad panel of 141 countries that covers the period 1960-1997. She confirms that

cross-country capital flows have indeed been influenced by demographic variables. Moreover, she shows that relative differences in the age structure across countries are the most important determinants of capital flows and that future changes in the age structure are important determinants of current saving and investment decisions, a finding that confirms forward-looking household behavior.

For quantitative projections of international capital flows induced by population aging, the degree of capital mobility is crucial. This is essentially an empirical question. In their seminal contribution, Feldstein and Horioka (1980) show that national saving and investment rates are highly correlated in virtually all OECD countries. While the coefficient has fallen over time, it is still remarkably high. These findings have been interpreted as an indication that capital is imperfectly mobile. Even if capital is fully mobile, this does not necessarily imply that households do actually diversify their portfolios optimally. There is a large empirical literature on "home bias" in international portfolio choice (e.g., French and Poterba, 1991), and it is not yet fully understood why households do not optimally diversify their portfolios across countries. Applied to retirement saving and pension reforms, this literature suggests that households might be more willing to invest their savings in "similar" countries (for France, Germany, and Italy, this would be the other EU or OECD countries) than in, say, developing countries.

For the lack of a better model of capital mobility, we consider several stylized scenarios in our simulations. One extreme capital mobility scenario treats France, Germany, and Italy as a closed capital market while the others assume perfect capital mobility within large regions such as the entire EU, the entire OECD, or the entire world. This approach allows us to understand the potential effects of capital mobility on savings, domestic and international capital formation, and rates of return. The true effect should be bounded between the extreme scenarios, its actual magnitude depending on how mobile capital will be in the future.

4 The multi-country macroeconomic simulation model

This section contains a brief and non-technical description of the dynamic macroeconomic model used to analyze the effects of population aging and of a shift from a pay-as-you-go system to a (partially) funded pension system on global capital markets. A detailed, technical presentation of this model can be found in Börsch-Supan, Ludwig, and Winter (2004).

The simulation model is based on the version of the overlapping generations model introduced by Auerbach and Kotlikoff (1987, – chapter 3). 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. It is less known that overlapping generations models have also been employed to analyze international capital flows, starting with Buiter (1981). More recently, several authors have developed large-scale multi-country overlapping generations models to study the effects of population aging and pension reform on international capital flows. While Attanasio and Violante (2000) focus on how the Latin American demographic transition affects international capital markets, Brooks (2003), Feroli (2002), Henriksen (2002) and

Domeij and Floden (2004) examine capital flows in multi-regional overlapping generations models.

Börsch-Supan, Ludwig, and Winter (2004) improve in several dimensions on the existing literature. The papers cited above do not model pay-as-you-go pension systems and accordingly do not address the important issue of pension reform with its associated changes in saving patterns which in turn have implications on international capital flows.[3] Issues related to pension reform are have been addressed by INGENUE (2001) and Fehr, Jokisch, and Kotlikoff (2003, 2004). We improve on these papers in that we use more detailed demographic projections which reflect the various dimensions of demographic change and distinguish between the effects of population aging and population shrinkage. We argue that the delicate effects of the differential timing of demographic change across countries on macroeconomic aggregates and capital flows can only be assessed with realistic demographic forecasts; these effects are largely ignored in the stylized demographic transition schemes used in other work. Finally, we focus on three European countries (France, Germany, and Italy) which share large pay-as-you-go pension systems. Modeling these countries as one region, and the rest of Europe, the United States and Canada, and the rest of the OECD, respectively, as the other regions of our world model, we account for differences in the generosity of pension systems and simulate the impact of a stylized pension reform in one of the regions of our model.

The model has three building blocks: a demographic projection sub-model, a stylized pension system, and a macroeconomic overlapping generations model which generates a general intertemporal equilibrium of the internationally linked economies. The dynamic equilibrium of this model is computed numerically. We describe these building blocks in turn.

4.1 Demography
The individuals (households) of our model enter economic life at age 20; the maximum age as implied by the demographic projections is 104 years. Detailed demographic projections form the background of our analysis. Demography is taken as exogenous and represents the main driving force of our simulation model. Our demographic projections are based on the assumptions (such as age-group specific mortality rates, life expectancy, and aggregate migration) used in the United Nations' demographic projections (United Nations, 2001). Our demographic model extends the United Nations' forecasts beyond 2050. To this end, we assume that demographic processes stabilize after year 2200 with constant mortality and fertility rates.

4.2 Pension systems
Each region has a two-tier pension system. The first tier represents a conventional public pay-as-you-go system characterized by country-specific contribution and replacement rates. For each region, the exogenous policy variable is the time-specific gross replacement rate, defined as the ratio of average gross pension to average gross wage income. The budget of the pay-as-you-go pension system is balanced in all periods. As a consequence, the contribution rate is determined endogenously. Given the projected demographic dependency ratios, holding the replacement rate constant implies that contribution rates will rise. Alternatively, a government may choose to fix the contribution rate which would result in declining replacement rates.

The second tier of the pension system consists of private pensions. This funded component builds up over time by voluntary private savings that result from households' optimal life-cycle decisions. Note that households react to their intertemporal budget constraints which include the benefit level of public pensions. Rational (forward-looking) behavior implies that households adjust their voluntary savings in response to the public pension replacement rates.

To separate the direct effects of population aging on capital markets and potential feedback effects from pension reform, we present our simulations for two pension scenarios. These two scenarios are extreme cases, and they are both counterfactual. However, they allow us to separate the effects of population aging and the (additional) effects of fundamental pension reform. These two pension scenarios are defined as follows.

(a) In the "status quo scenario", the 2006 replacement rates are maintained throughout our projection period, which results in rising contribution rates.

(b) In the "fundamental reform scenario", the 2006 contribution rates are frozen in France, Germany, and Italy, which results in decreasing replacement rates. In response, households in these countries (which historically have almost exclusively relied on pay-as-you-go pensions) build up a funded component.

4.3 Household behavior and production in the overlapping generations model
The macroeconomic general equilibrium model is an elaborate version of the well-known overlapping generations framework. The two main sectors are the production sector and the household sector. The government sector is rather small – the government's only role is to organize its country's pay-as-you-go pension system, as described above.

The production sector in each country consists of a representative firm that uses a CES production function with capital and labor as inputs, and further characterized by age-specific labor productivity, technological progress, and international variation in productivity levels. The production efficiency of labor supplied by a household depends on the household's age, the time period, and the country (region). Labor productivity changes over the life-cycle according to age-specific productivity parameters. Technological progress is modeled via a "growth in time endowment" specification that is equivalent to the standard labor augmenting technological change specification for the production sector. The technology level of each country is calibrated such that aggregate GDP averaged over the calibration period is replicated. Finally, we assume that investment is subject to convex adjustment costs.

Under these technological constraints, firms maximize an intertemporal profit function. The first order conditions resulting from profit maximization characterize firm behavior. In particular, the return on financial investment is equal to the marginal product of capital plus capital gains on non-depreciated capital plus the reduction in marginal adjustment costs minus depreciation.

Household behavior is derived from intertemporal utility maximization. By choosing an optimal consumption path, each cohort of households maximizes, at all points in time and at all ages, the sum of discounted future utility. The within-period utility function

exhibits constant relative risk aversion, and a CES functional form describes the trade-off between consumption and leisure. Over time, preferences are additive and separable with exponential discounting. Households also take into account their survival probabilities for all future periods. Here, a complication arises because households face the risk of prematurely dying with positive wealth. We assume perfect annuity markets which implies that accidental bequests are distributed across future generations. We do not include intended bequests in our model. Other than our treatment of bequests, the budget constraint is standard in the overlapping generations literature.

The solution to the households' optimization problem can be characterized by two first-order conditions. First, the intertemporal Euler equation describes the consumption growth rate of each household. Second, the intratemporal Euler equation relates current period consumption to current period leisure choice. For given factor prices (i.e., wages and interest rates), shadow wage rates and the parameters of the public pension system (i.e., contribution and replacement rates), the lifetime consumption paths of all generations can be computed using these Euler equations.

4.4 Dynamic equilibrium and numerical solution of the model

The dynamic general equilibrium of the model is defined by four conditions: (i) allocations are feasible; (ii) factor prices equal their marginal productivities; (iii) firms and households behave optimally, i.e., firms maximize profits and households maximize life-time utility subject to the constraints they face; (iv) all

markets clear. Market clearing on the international capital market and the assumption of perfect capital mobility across regions require that the rate of return on financial investment equalize across all countries.
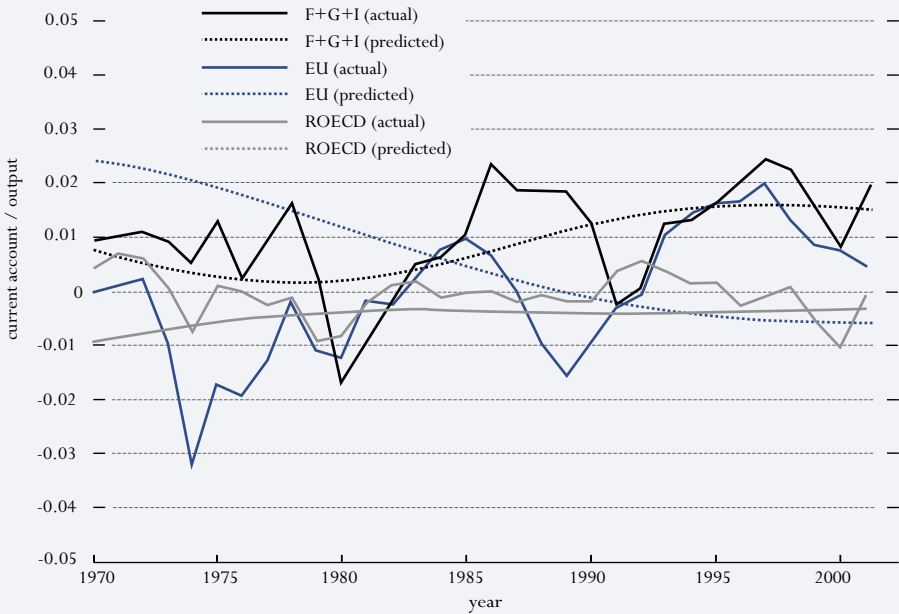
We determine the equilibrium path of this overlapping generations model numerically using the recursive block Gauss-Seidel algorithm (see Auerbach and Kotlikoff, 1987) in an improved version (Ludwig, 2004), referred to as the "Gauss-Seidel-Quasi-Newton Algorithm" Our simulations consist of four periods: a phase-in period, a calibration period (1960-2001), a projection period (2002-2100), and a phase-out period. For details of the calibration procedure used to determine the values of the free parameters of households' preferences and countries' production technologies, see Börsch-Supan, Ludwig, and Winter (2004).

To evaluate whether our calibrated model captures the main historical trends of international capital flows, we consider how well capital flows are replicated in the calibration period. Note that capital flows fluctuated heavily during this time, obfuscating the long-run trends which we are interested in. Moreover, and at least as importantly, the benchmark assumption of free capital mobility within the OECD did not hold for the beginning of the benchmark period when stiff capital flow controls were imposed even among France, Germany, and Italy. Nevertheless, *Figure 3* displays predicted and actual current-account to GDP ratios.[4]

The patterns of international capital flows generated by our model for the period 1970-2001 are encouraging, in particular for the

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4   In line with our theoretical model, we define the current account as the difference between gross national savings and gross fixed capital formation (domestic investment).

three large continental European countries and the rest of the OECD. We overpredict capital flows of the rest of the EU until the mid 1980s, and underpredict thereafter. Overall, even though any capital market frictions are absent from our model, magnitudes of international capital flows are within reasonable ranges. Moreover, our model correctly replicates the facts that core European countries have been net capital export countries for most of the post-war period and that the rest of the OECD countries (in particular, North America) is a net capital import region. While our model replicates the broad trends of international capital flows, it cannot capture high-frequency variations. This should not come as a surprise given that our model is non-stochastic and has a clear long-run focus.

5 SIMULATION RESULTS: CAPITAL FORMATION, RATES OF RETURN, AND CAPITAL FLOWS

In this section, we present selected results of our macroeconomic simulation model; again, a more detailed discussion of the rather complicated dynamic effects that are behind these results are found in Börsch-Supan, Ludwig, and Winter (2004).

To separate the direct effects of population aging on capital markets and potential feedback effects from pension reform, we present our projections for the two pension policy scenarios described above, the "status quo scenario" which maintains current generous public pension systems in France, Germany, and Italy, and the "fundamental reform scenario" which forces a transition to a partially funded pension system in these three countries by freezing contribution rates. The other regions' pension systems remain unchanged. By comparing these polar scenarios, we can show that a good portion of the capital market effects of population aging arises even without a fundamental pension reform. As discussed above, our simulations also distinguish four capital mobility scenarios. The first scenario corresponds to a closed economy where all investment of France, Germany, and Italy takes place within these three countries. The other three capital mobility scenarios assume that France, Germany, and Italy diversify their investments (i) across all countries of the European Union, (ii) across all OECD countries, and (iii) across the entire world.

Population aging has immediate effects on labor supply and the balance of the pension system. During the entire observation period, labor supply shares in France, Germany, and Italy decrease from current levels of slightly below 42 percent to below 36 percent in 2050. The economic dependency ratio, defined as the ratio of pensioners to workers, is projected to increase from roughly 50 percent in 2002 to about 80 percent in 2050. As a result of the decrease in labor supply shares and the corresponding increase in the economic dependency ratio, the contribution rate to the pay-as-you-go pension system increases sharply under the status quo scenario, i.e. if current generous pension systems are maintained. Recall that these contribution rates are equilibrium contribution rates such that the budget of the pension system of each country is balanced at every point in time. The projected time patterns of net replacement and contribution rates for France, Germany, and Italy are summarized in *Table 1*.

If current generous replacement rates are maintained, our model predicts increases in the equilibrium contribution rate in Germany from its current levels of roughly 27 percent to 41 percent in 2050. In stark contrast, our stylized pension reform freezes contribution

TABLE 1: PREDICTED CONTRIBUTION AND REPLACEMENT RATES OF
PUBLIC PENSION SYSTEMS

	Germany			France			Italy		
	2000	2030	2050	2000	2030	2050	2000	2030	2050
Status quo system									
Contribution rate	0.273	0.369	0.411	0.277	0.354	0.375	0.330	0.457	0.523
Net replacement rate	0.7	0.7	0.7	0.654	0.654	0.654	0.646	0.646	0.646
Fundamental reform									
Contribution rate	0.273	0.292	0.292	0.277	0.294	0.294	0.330	0.347	0.347
Net replacement rate	0.7	0.572	0.507	0.654	0.553	0.514	0.646	0.512	0.437

NOTES: FIGURES SHOWN IN THE TABLE REFER TO THE OPEN-ECONOMY SCENARIO "OECD".

rates at the level reached in 2006, roughly at 29 percent. As a result of this reform, average pension levels decrease: the net pension replacement rate is projected to decrease from 70 percent in 2000 to about 50 percent in 2050. Hence, for Germany, our model predicts a one-third transition towards pre-funding until 2050. Results for the other countries are similar.

Households respond to these decreases in pension benefit levels not only by increasing savings, but also by increasing labor supply. Our stylized pension reform would lead to quite substantial increases in aggregate labor supply. Labor supply shares are predicted to increase by more than 6.5 percent or 2.5 percentage points until 2050. This increase is roughly the same for all capital mobility scenarios. For instance, labor supply shares in the France-Germany-Italy region increase from about 36 to 38.5 percent in the year 2050. As a consequence, the economic dependency ratio is projected to decrease by almost 6 percentage points. Endogenous labor supply reaction is therefore a helpful mechanism to dampen the effects of population aging.

Figure 4 shows the aggregate average saving rate of France, Germany, and Italy in our four capital mobility scenarios, all in the status quo pension scenario. In the year 2000, savings rates are substantially higher in the open economy scenarios than in the closed France-Germany-Italy region. This is in line with the higher rates of return (see below) generated in an open economy which diversifies a great deal of the demographic effects that create lower saving rates (and rates of return) in economies with a large share of older persons.

This level effect is superseded by the demographic changes during the 2000 to 2070 prediction window. Saving rates decrease until 2050 across all capital mobility scenarios since the baby boom generation decumulates assets. Saving rates are projected to rebound after the year 2050. The decrease of the savings rate caused by population aging – the difference between the value in 2000 and the minimum reached just after 2040 – is roughly 4.5 percentage points if capital mobility is restricted at most to the EU region (scenarios "F+G+I" and "EU"). If we allow for capital mobility within the OECD or the entire world, this decrease is 6.5 or 8 percentage points, respectively.

Figure 5 shows that projected aggregate saving rates under a fundamental pension reform are substantially higher and the effect of a pension reform is stronger in the OECD / World open-economy scenarios (the saving rate is projected to increase by slightly more than one percentage point in the EU scenario as compared to 2 percentage points in the OECD / World scenarios). An increase in national savings leads to an increase in the capital stock and thereby to a decrease in the rate of return to capital which then crowds out further savings. In those scenarios with a larger international capital market, substantially more savings is generated since – as we show below – the rate of return decreases by much less. These projections show that optimal life-cycle behavior generates additional saving under a fundamental pension reform – in our model, it is not the case that additional retirement saving induced by a pension reform crowds out other saving totally, as has often been claimed.

We also accumulate aggregate savings to obtain the world region's asset holdings and capital stocks and the related capital-to-output ratios (*Figures* 6 and 7). As a consequence of decreasing labor supply, the capital-to-output ratio increases from its current level of about

FIGURE 4: PROJECTIONS OF THE SAVING RATE
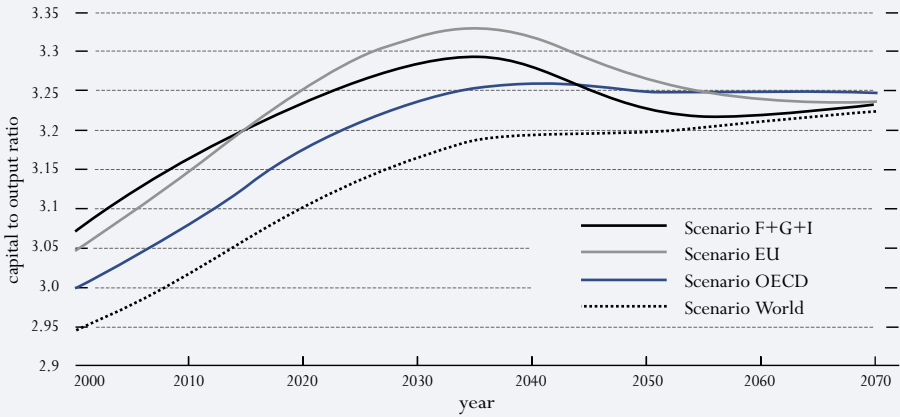
(STATUS QUO PENSION SYSTEM)
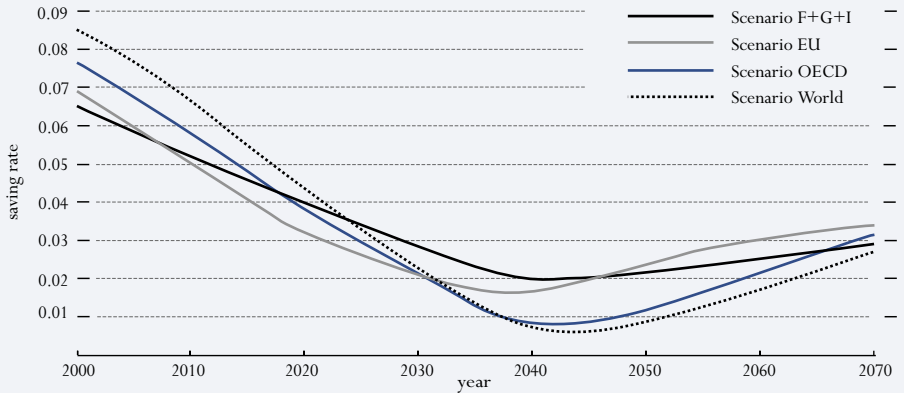
SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED AGGREGATE SAVING RATE OF HOUSEHOLDS LIVING IN FRANCE, GERMANY, AND ITALY. SCENARIO F+G+I: PERFECT CAPITAL MOBILITY WITHIN FRANCE, GERMANY, AND ITALY; SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITH THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.

FIGURE 5: PROJECTIONS OF THE SAVING RATE
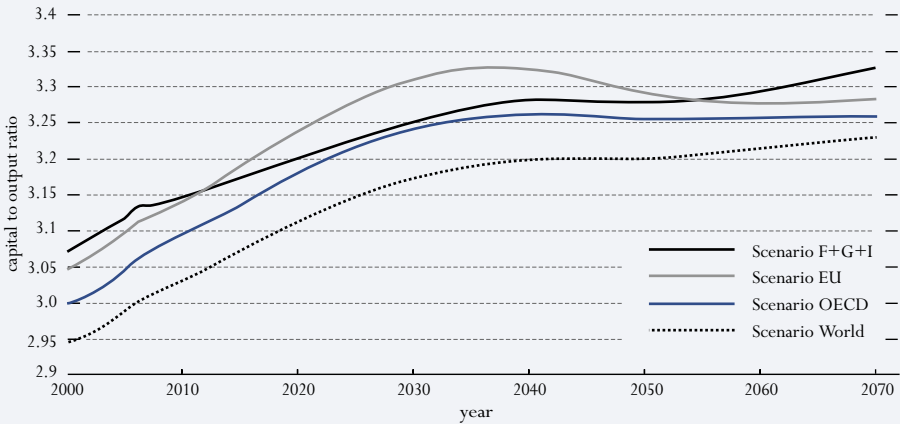
(FUNDAMENTAL PENSION REFORM)
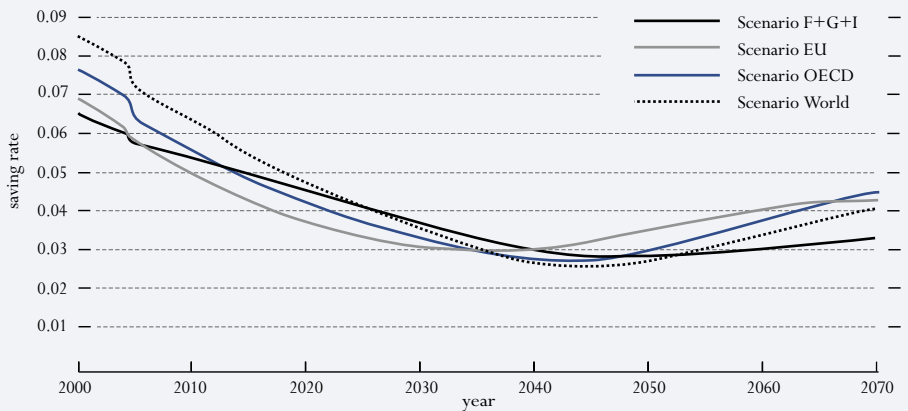
SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED AGGREGATE SAVING RATE OF HOUSEHOLDS LIVING IN FRANCE, GERMANY, AND ITALY. SCENARIO F+G+I: PERFECT CAPITAL MOBILITY WITHIN FRANCE, GERMANY, AND ITALY; SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITH THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.

Figure 6: Projections of the capital-to-output ratio
(status quo pension system)

SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED CAPITAL-TO-OUTPUT RATIO IN FRANCE, GERMANY, AND ITALY. SCENARIO F+G+I: PERFECT CAPITAL MOBILITY WITHIN FRANCE, GERMANY, AND ITALY; SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITH THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.

Figure 7: Projections of the capital-to-output ratio
(fundamental pension reform)

SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED CAPITAL-TO-OUTPUT RATIO IN FRANCE, GERMANY, AND ITALY. SCENARIO F+G+I: PERFECT CAPITAL MOBILITY WITHIN FRANCE, GERMANY, AND ITALY; SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITH THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.

3 until it reaches a level of about 3.25 around 2040 and then decreases slightly when baby boomers decumulate assets (capital mobility scenario "OECD"). This decrease is much more pronounced if we restrict the international capital market to the EU area only. The simultaneous fundamental pension reform of France, Germany, and Italy leads to substantial increases in the capital-to-output ratio if we restrict capital mobility to these countries or to the EU area (*Figure* 7). The increase is much lower if we relax this constraint which suggests that the additional savings are largely invested abroad.

Much of the political and academic debate on the capital market consequences of demographic change and of pension reforms is centered around the rate of return to capital. First, we observe some level effects. Since the pay-as-you-go systems are slimmer in the aggregate rest-of-the-world region than in France, Germany, and Italy, the capital stock accumulated for retirement savings is larger which depresses rates of return. Second, as a consequence of population aging and the resulting increase in capital-to-output ratios, our model predicts the rate of return of return to capital to decrease by a bit less than one percentage point if capital moves freely within the OECD, see *Figure 8*. This decrease is less than what would be associated with a "meltdown of asset prices". Third, while the rate of return decreases across all capital mobility scenarios, substantial gains would be possible by shifting investments to demographically younger countries since our model predicts higher returns if we allow for free capital mobility across all world regions. However, as demographic processes are highly correlated across countries (see *Figure 1*), differences in demographic processes across countries more or less only affect the level of the rate of return.

Furthermore, diversification advantages decrease over time.

As a comparison of *Figures 8* and *9* suggests, there would be an additional decrease in the rate of return to capital if France, Germany, and Italy would simultaneously reform their pension systems in a fundamental way. This decrease would amount to about 0.25 percentage points until 2070 if capital was mobile only within these countries. Due to the increase in labor supply, this long-run decrease in the rate of return is lower than a model with exogenous labor until 2070 if capital was mobile only within these countries. Due to the increase in labor supply, this long-run decrease in the rate of return is lower than a model with exogenous labor supply would suggest. Moreover, and in line with our earlier results, the decrease in the rate of return is negligibly small if capital moves freely across OECD countries (or the entire world). In contrast to a model of exogenous labor supply, the present model even predicts an increase in the rate of return until about 2030 or 2040 (as a result of the endogenous labor supply reaction). While saving rates immediately start to increase after the reform, labor supply increases as well. As a net effect, this initially leads to a decrease in the capital to output ratio and an associated initial increase in the rate of return to capital.

Finally, our simulations show that international capital flows from the France, Germany, and Italy to other OECD countries roughly follow the pattern of savings and decrease steadily until 2050 (*Figure 10*). In the OECD and World capital mobility scenarios, they are initially positive at about 2 and 3.2 percentage points and turn negative to -2 and -2.5 percentage points in 2050, respectively. *Figure 11* shows similar patterns in the fundamental
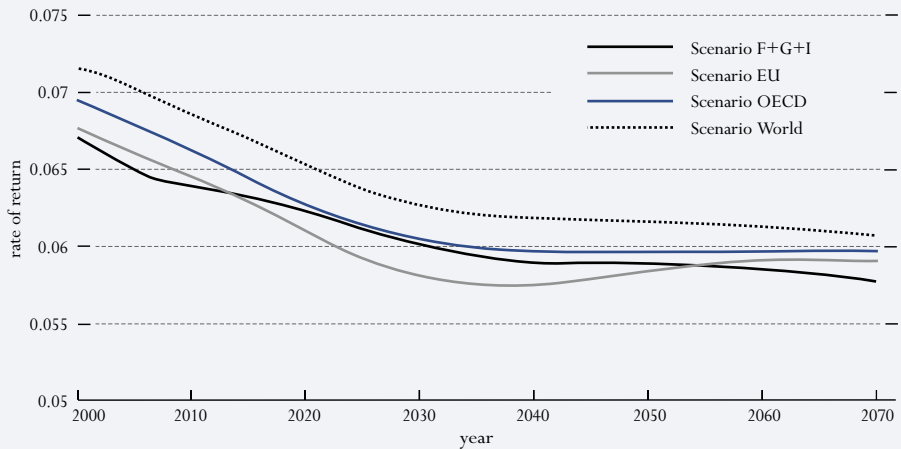
FIGURE 8: PROJECTIONS OF THE RATE OF RETURN
(STATUS QUO PENSION SYSTEM)
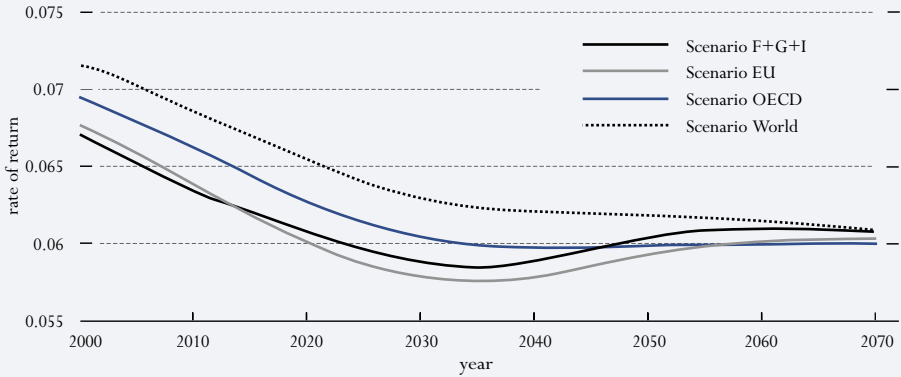
SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED RATE OF RETURN ON THE AGGREGATE CAPITAL STOCK IN FRANCE, GERMANY, AND ITALY. SCENARIO F+G+I: PERFECT CAPITAL MOBILITY WITHIN FRANCE, GERMANY, AND ITALY; SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITH THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.
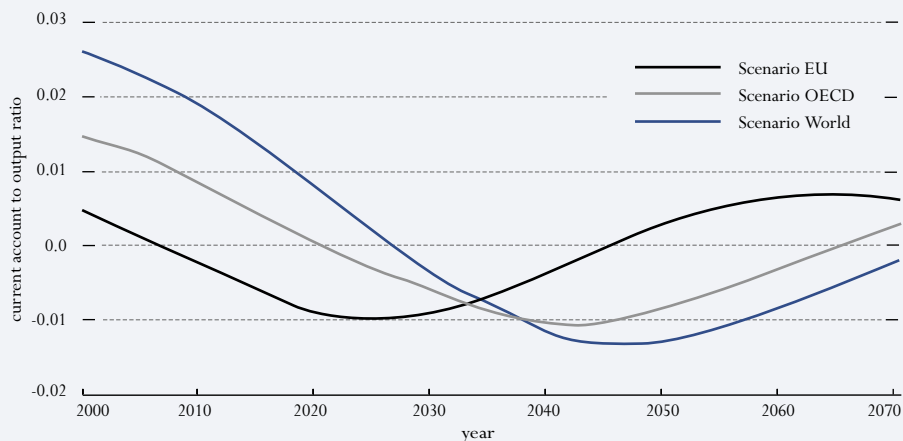

FIGURE 9: PROJECTIONS OF THE RATE OF RETURN
(FUNDAMENTAL PENSION REFORM)

SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND 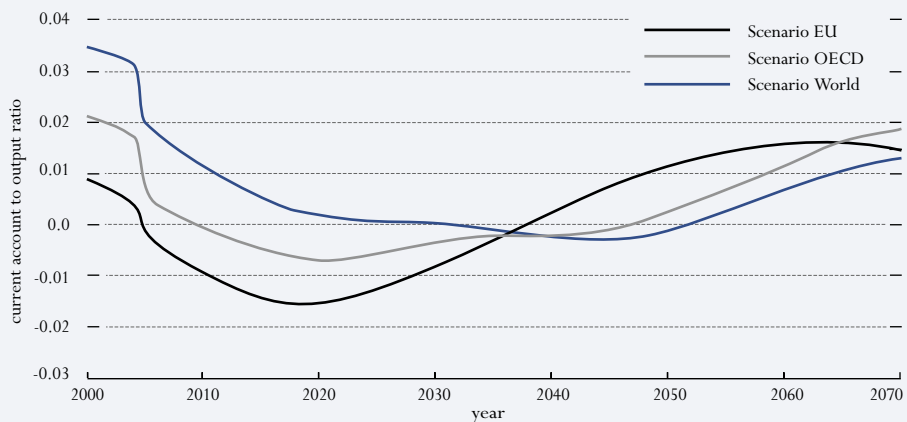MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED RATE OF RETURN ON THE AGGREGATE CAPITAL STOCK IN FRANCE, GERMANY, AND ITALY. SCENARIO F+G+I: PERFECT CAPITAL MOBILITY WITHIN FRANCE, GERMANY, AND ITALY; SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITH THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.

FIGURE 10: PROJECTIONS OF THE CURRENT-ACCOUNT-TO-OUTPUT RATIO
(STATUS QUO PENSION SYSTEM)

SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED CURRENT-ACCOUNT-TO-OUTPUT RATIO IN FRANCE, GERMANY, AND ITALY. SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITHIN THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.

FIGURE 11: PROJECTIONS OF THE CURRENT-ACCOUNT-TO-OUTPUT RATIO
(FUNDAMENTAL PENSION REFORM)

SOURCE: COMPUTATIONS USING THE MACROECONOMIC SIMULATION MODEL BY BÖRSCH-SUPAN, LUDWIG, AND WINTER (2004), BASED ON DEMOGRAPHIC PROJECTIONS BY THE UNITED NATIONS (2001) AND MACROECONOMIC DATA FROM THE WORLD BANK (2003). NOTES: THIS FIGURE SHOWS THE PROJECTED CURRENT-ACCOUNT-TO-OUTPUT RATIO IN FRANCE, GERMANY, AND ITALY. SCENARIO EU: PERFECT CAPITAL MOBILITY WITHIN THE EUROPEAN UNION; SCENARIO OECD: PERFECT CAPITAL MOBILITY WITHIN THE OECD; SCENARIO WORLD: PERFECT CAPITAL MOBILITY ACROSS ALL WORLD REGIONS.

reform scenario. Hence, the model predicts reversals in current account positions for fast aging countries such as France, Germany, and Italy.

6 Conclusions

In this paper, we presented a simulation analysis of the effects of population aging and pension reform on international capital markets, based on the multi-country overlapping generations model by Börsch-Supan, Ludwig, and Winter (2004). The main insights from this analysis are as follows. Demographic change alters the time path of aggregate savings within each country. This process may be amplified when a (fundamental) pension reform shifts old-age provision from pure pay-as-you-go towards more pre-funding. Finally, while the patterns of population aging are similar in most countries, timing and initial conditions differ substantially. Hence, to the extent that capital is internationally mobile, population aging will induce capital flows between countries. All three effects influence the rate of return to capital and interact with the demand for capital in production, and with labor supply.

Our simulations predict substantial capital flows due to population aging. The countries most affected by aging such as the European Union will initially be capital exporters, while countries less affected by aging like the United States und other OECD regions will import capital. This pattern will reverse around the year 2020 when baby boomers decumulate their assets and the fast aging economies therefore become capital import regions. Pension reforms with higher degrees of pre-funding are likely to induce more capital exports.

They also increase labor supply considerably, but the effects on the rate of return to capital are small. Overall, while the rate of return to capital declines in response to population aging, our simulation results suggest there will not be a devastating "asset market meltdown". Another important insight is that the timing of these adjustments is complex, and one has to carefully distinguish level effects from changes over time.

In the light of our simulation results, the most important open issue is: How internationally mobile will capital be? The results presented in this paper are based on the assumption of perfect capital mobility within specified regions such as the EU, the OECD, or the entire World, but all these scenarios are of course abstractions. We should stress that much more research on the determinants of international capital flows, in particular the role of country-specific risks, is needed. Nevertheless, the degree of capital mobility as captured by our scenarios has a substantial impact on macroeconomic variables such as domestic saving rates, capital flows, and the rate of return to capital. Overall, we conclude that the adverse macroeconomic effects of population aging can be dampened by capital mobility, and our economic intuition says that our basic results are likely to hold in more complex models as well. In any case, an important political message from our analysis is that free capital mobility is a crucial component of macroeconomic policies in the face of population aging and should not be tampered with.

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5 Börsch-Supan, Ludwig, and Winter (2004) analyze the effects of some other crucial modeling assumptions on the simulation results. The main results remain unchanged in this sensitivity analysis.

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Demography, Exchange Rates and Financial Assets: A Two-Country Perspective

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Contents

Demography, Exchange Rates and Financial Assets: A Two-Country Perspective

Let me start with apologies and caveats first. I have been asked by the conference organisers to address the issue of ‚International portfolio diversification and exchange rate movements‘, with a focus on the effect of international savings patterns on exchange rates, the risks of an asset melt-down, and the connection between capital market depth, risk, and returns. While I remain interested in the subject, I have not worked on it for quite a while now.[1] Nor am I specifically knowledgeable about the German situation. But I will try my best, using my own earlier research as well more recent studies from the OECD secretariat in particular. In doing so, I will devide the world into a country group with rapidly ageing populations (with some exceptions, the OECD) and a group with slowly ageing populations.

1 Some Demographic Features

Despite some uncertainties in forecasting demographic trends over the next 50 or so years, uncertainties which are mostly due to assumed changes in fertility rates, some demographic trends can be predicted with a high degree of confidence. Three salient aspects deserve to be highlighted, because of their great importance for the future economic interdependence between the ageing OECD and the non-OECD area:

• While population ageing is a global phenomenon, OECD populations are ageing from the ‘middle’ of the age pyramid, in contrast to non-OECD which is ageing from the ‘bottom’. In other words, the prospective demographic changes imply divergent trends across the two regions. Labor force growth rates will strongly decline in the ageing OECD area and turn negative after 2010. In strong contrast, ageing is increasing the labor force in the non-OECD area; the proportion of the working-age group in total non-OECD population will roughly remain constant (see *Figure 1*).

• Ageing from the ‘middle’, the ageing OECD area will face a strong drop in the ratio of workers to retirees, in particular after 2010. Likewise, the support ratio will start to fall in the non-OECD area, but from much higher levels than in the OECD area (*Figure 2*).

• A much-neglected aspect of prospective demographic changes is that it will shift the balance between the age groups that may be characterized as net borrowers and net savers. Changes in the age composition of the population will have consequences for the rate of net financial asset accumulation and on the rate of return of financial assets. The United States shows relatively high household savings in the high-income age cohorts (40-60), whereas net savings in the other age cohorts is low or negative. As the ‘baby boom’ generation filters through its peak asset accumulation years, the ratio of prime savers to the working age population will rise until the year 2007 and then decline. For the entire ageing OECD, the prime savers ratio will peak somewhat later (2015), before it starts to drop. By contrast, the rise of the prime savers ratio in the rest of the world, which started around 1990, will not halt before the year 2050 (*Figure 3*).

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1   For more detail, see H. Reisen (2000), which collects my papers on pensions, emerging markets and savings. Poterba (2004) has at a recent symposium of the Federal Reserve Bank of Kansas City dealt with the same issues as this paper; but the basic insights still hold.

FIGURE 1: RELATIVE CHANGE OF LABOR FORCE (= AGE GROUP 15-60)
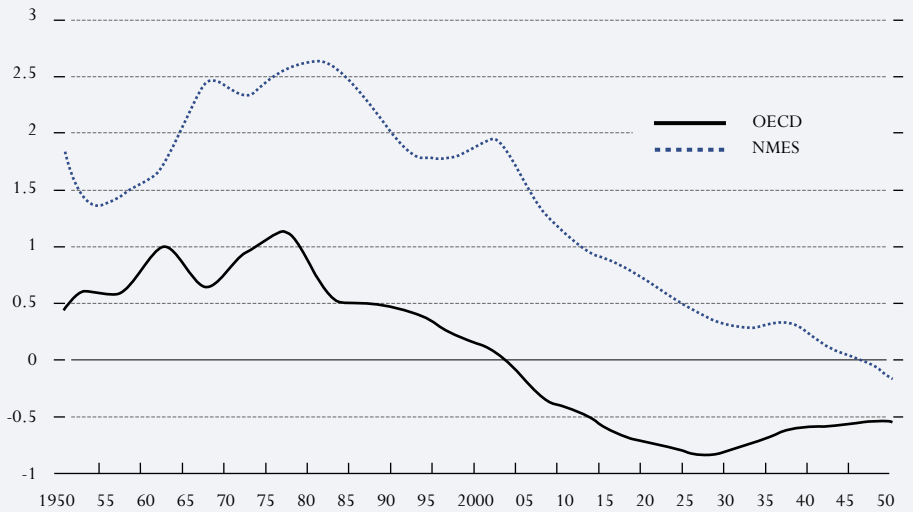OECD AND NMEs, 1950-2050

FIGURE 2: SUPPORT RATIO = AGE GROUP (15-60)/AGE GROUP 60++
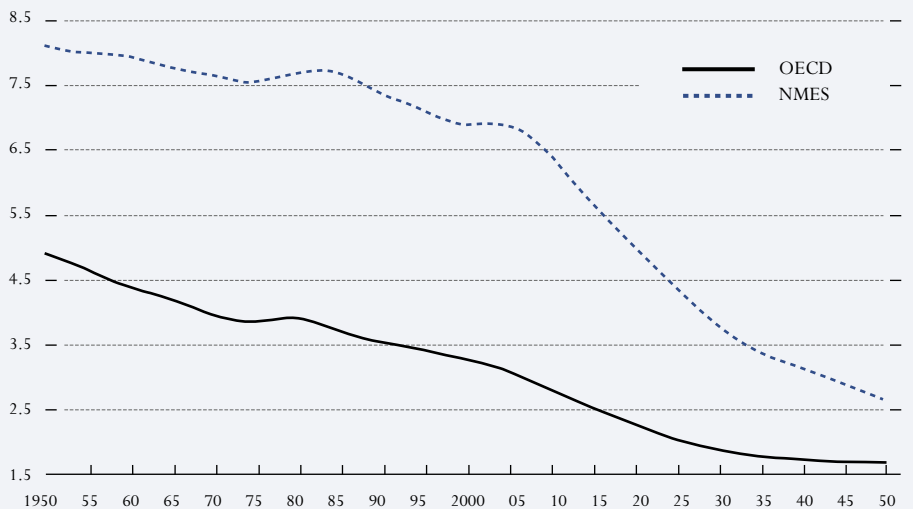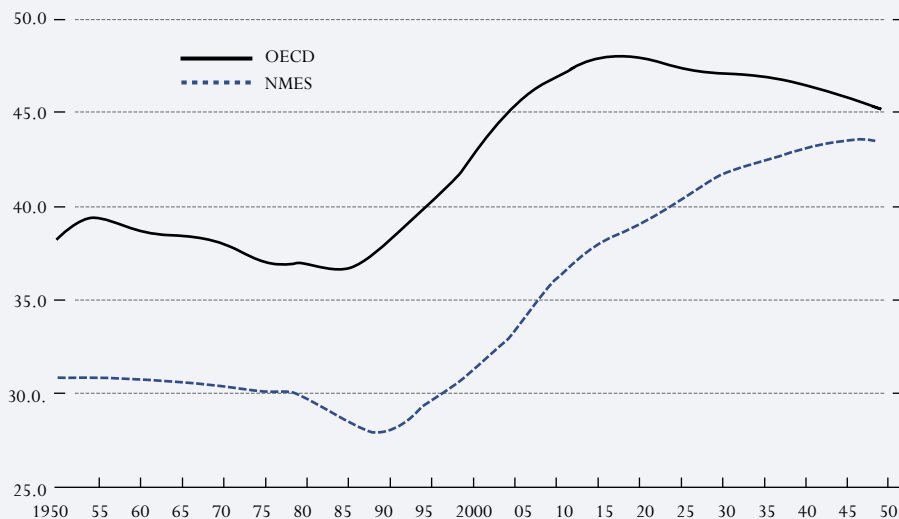OECD AND NMEs, 1950-2050

Multiplying the prime savers ratio (40-60 years old/15-60 years old) with the support ratio (15-60 years old/60+) yields another ratio that relates the prime savers cohort in the United States with the age cohort of people 60 years and older. This demographic variable, which corresponds to the peak asset accumulation relative to the peak asset decumulation cohorts according to the life cycle hypothesis, can be expected to drive financial asset accumulation and stock market valuations, at least in the United States (*Figure 4*).

Indeed, it does. I have shown elsewhere (Reisen, 1998) that US stock market valuations have been significantly supported by the rise in the prime savers ratio (since 1983), while the support ratio has remained fairly stable. That favorable demographic support for valuations will not last for much longer, as around the year 2000 the support ratio is prospected to start a 30-year long decline, to be reinforced by the prospected decline of the prime savers ratio from the year 2007. For the entire ageing OECD, the prime savers ratio will peak somewhat later (2015), before it starts to drop. By contrast, the rise of the prime savers ratio in the rest of the world, which started around 1990, will not halt before the year 2050; this should provide incentives to increase portfolio investments into non-OECD regions where prime savers cohorts will become strong. Obviously, PAYG schemes cannot exploit such divergent demographic trends, but funded pensions can.

2 Savings-Investment Balances and Exchange Rates

As stated above, population aging is a global phenomenon. Thus, the effect on a country's current account position is determined by whether its population ages relatively faster or

slower than average, rather than by its absolute demographic position. The dependency ratio variable for each country should be expressed as the deviation from the average dependency ratio for all countries in the sample, rather than the level of the ratio.

General-equilibrium multi-country studies have either used the Solow optimal growth model, where the aggregate savings rate responds to age-induced changes in the relative scarcity of labor and capital, or a macroeconomic dynamic model, such as IMF's MULTIMOD or OECD's MINILINK, where the demographic shock impacts on output and investment, with endogenous changes to corporate, public and household savings.

In the OECD model (Turner et al., 1998), pressures on savings and investment originate from three main sources: a world-wide slowdown in growth; a decline in the weight of the OECD in world output; and the negative impact on savings, concentrated in the OECD. First, the decline in population growth causes a gradual slowdown of growth in the OECD and non-OECD, which in turn reduces the marginal return to capital and interest rates in both regions. Lower global growth lowers investment needs to maintain the required capital stock and hence lowers interest rates, with virtually no effect on exchange rates and net foreign asset positions. (Note that with consumption-smoothing, a permanent drop in interest rates should affect current account positions in net debtor, resp. net creditor countries.) Second, an age-induced decline of the OECD share in world output leads initially to larger OECD current account surpluses, a downward pressure on OECD relative to non-OECD interest rates, but – with increasing relative demand for OECD goods – to an upward

FIGURE 4: SUPPORT RATIO = AGE GROUP (15-60)/AGE GROUP 60++
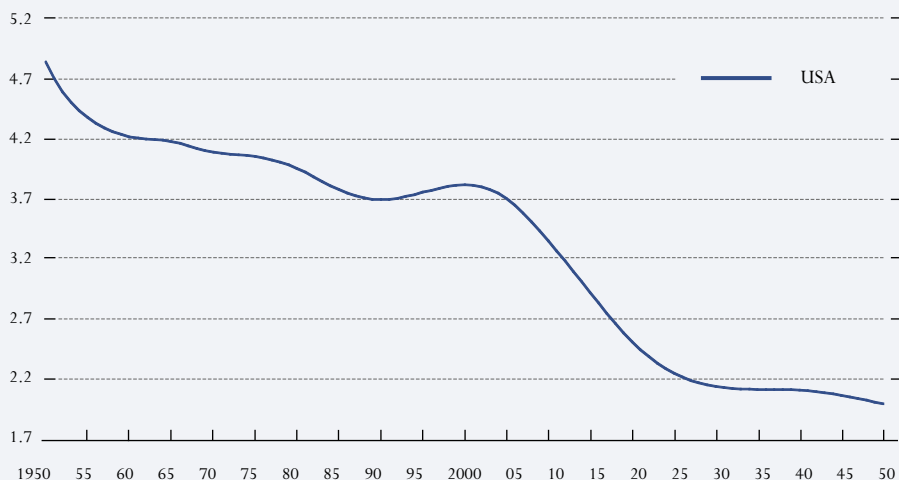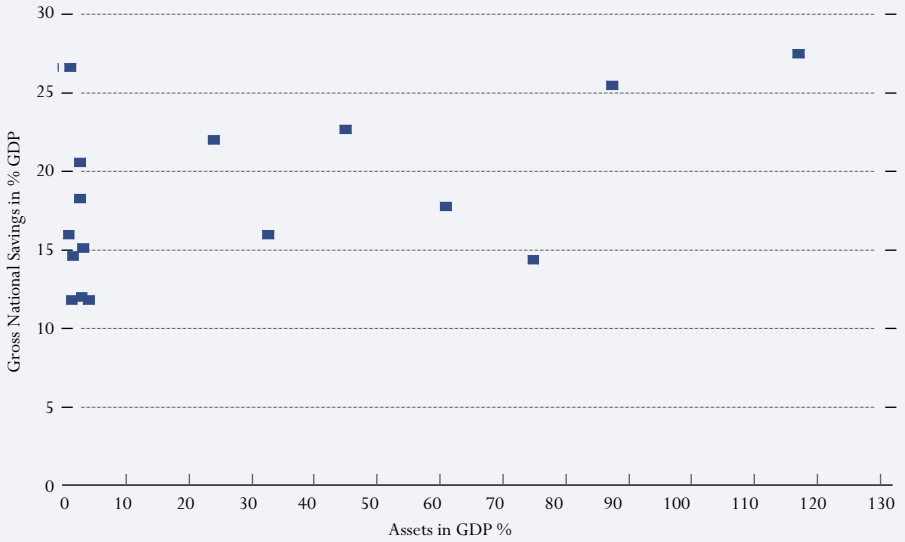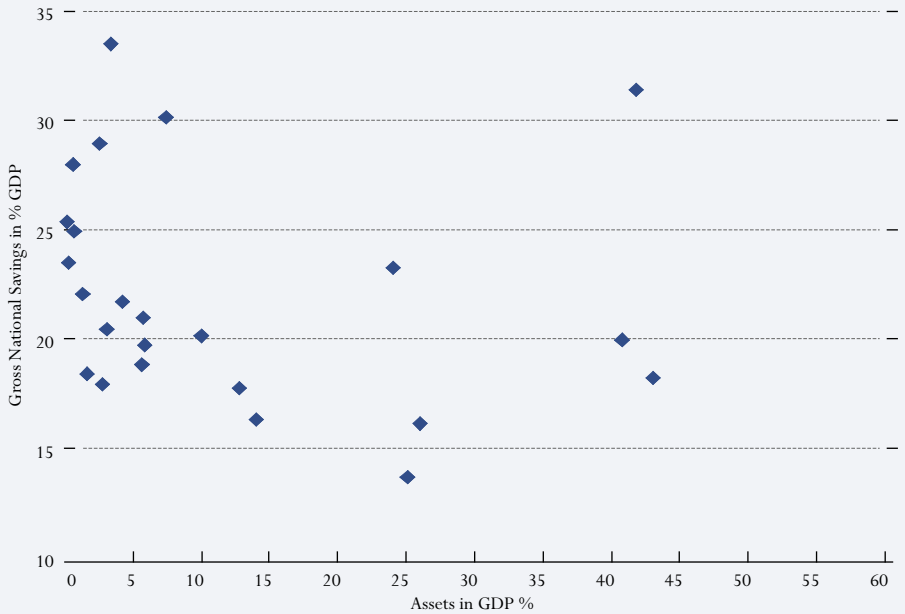UNITED STATES, 1950-2050

Figure 5: Countries with Mandatory Schemes

Gross National Savings in % GDP vs Assets in GDP %

Figure 6: Countries with Non Mandatory Schemes

Gross National Savings in % GDP vs Assets in GDP %

pressure on the OECD exchange rate. A third simulation features a fall in the OECD private savings propensity, which leads to a relative scarcity of global savings relative to investment and hence increases interest rates in both regions. The overall effect on world interest rates depends on whether the effect of the slowdown in world growth dominates the demographic pressures on savings, but interest rates will be higher in the non-OECD in any case (regardless of the level of sovereign risk premia). The OECD exchange rate is likely to rise, because the relative scarcity of OECD goods is likely to dominate the demographic pressures on savings. There will be an initial build-up of OECD net foreign assets, driven by faster growth in the non-OECD region, which is subsequently reversed as a result of demographic pressures on OECD savings.

Much will depend on the degree of pension funding with which the OECD regions will enter the coming decades of acute demographic pressures. Bailliu and Reisen (1998) find a significant negative impact of the level of PAYG benefits per elderly on the aggregate national savings rate, while funded pensions tend to stimulate savings (but only in the presence of strong-incentive/mandatory schemes and liquidity constraints). By contrast, the arithmetic of unfunded, earnings-related PAYG pensions is largely governed by changes in the support ratio and by real wage growth (which in turn depends on labor productivity in the long run). These pension arrangements are essentially locked into the ageing economy, unable to escape the prospective demographic pressures resulting from the expected drop in support ratios.

It is less understood, however, that even fully funded pension schemes will not escape demographic pressures in the absence of consider-able capital flows (retirement-related or other) between the ageing OECD and the younger part of the world. First, higher life expectancy will put pressure on the arithmetic of funded pensions. Second, the demographic changes highlighted above may well add to that pressure by driving down the rate of return on pension investments.

3 Pension Decumulation, Asset Returns, and Global Diversification

During the 1990s, financial markets in general and equity markets in particular may have benefited from large inflows into pension funds and other institutionalised forms of saving. These inflows reflected to a considerable extent saving for retirement by baby boom generations. These baby boom generations are expected to start to move into retirement after 2010. Almost as a natural corollary to the developments during the 1990s, some observers have argued that when baby boomers start entering retirement they will become net sellers of financial assets to finance retirement consumption. As subsequent generations are smaller in numbers, other things equal, this would put downward pressure on financial asset prices ("asset meltdown hypothesis"). Others have pointed out that large-scale liquidations of assets are unlikely to occur because of bequest motives and lifetime uncertainty and that international capital mobility and forward-looking capital markets will mitigate any possible impact of mass retirement of baby boomers on financial asset prices.

Based on a simple regression analysis (from Reisen, 1998) where the SP 500 P/E ratio is determined within a standard stock market valuation model, with the demographic variable depicted in *Figure 5* (40-60 years old/60 years+), the (inverse of the) US Federal Reserve discount rate and the annual change in average hourly wages

as explanatory variables, *Figure 6* provides an out-of-sample forecast, assuming interest rates staying at constant levels and hourly wage rises along the pace experienced over the recent decade. The out-of-sample scenario, which is fully driven by the ratio of prime savers to people older than 60, tells us that the US stock market valuations will peak soon (2006/7) and then start a long decline, before P/E ratios will stabilize around 2030. The prospective

long-term bonds into short-term securities or cash, as Schieber and Shoven suggest, but it can also lead to a shift of equity portfolios into the younger economies where the prime savers ratio will continue to rise well into the year 2050.

However, several arguments suggest that there may not be a strong adverse impact of the retirement of baby boom generations on financial

FIGURE 7: S&P 500 PRICE/EARNING RATIO: FITTED VALUES AND PROJECTION
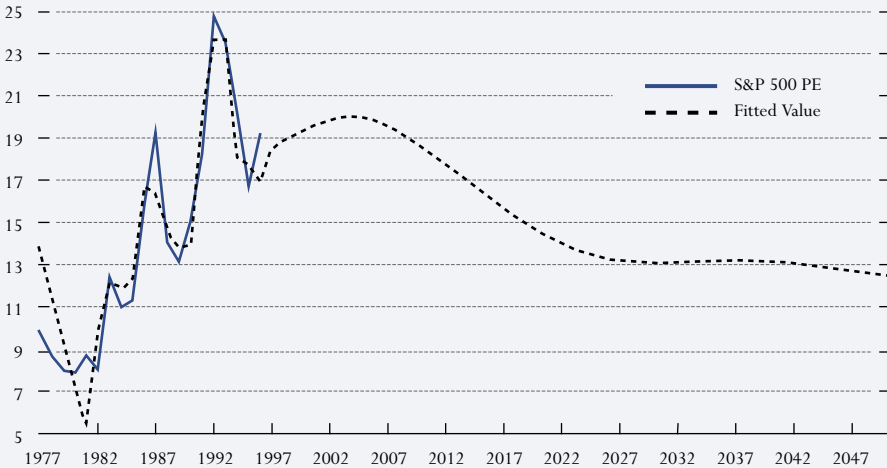
drop in the SP 500 P/E ratio would represent a decline of 30 per cent, on account of deteriorating demographic fundamentals.

This scenario would confirm earlier concerns (Schieber and Shoven, 1994) that, as US funded pensions cease to be a source of net savings, asset prices will be negatively affected. This can reinforce the maturity-induced shift of pension portfolios from equities and

asset prices. First, the assumption of rational expectations provides an argument against the 'asset meltdown hypothesis', provided that demographic developments are predictable with some degree of accuracy. Well-functioning asset markets would price financial assets so that their current market price would equal the expected present discounted value of future earnings and demographic developments and their impact on future earnings should be re-

flected in current prices once the information on demographics-induced developments becomes available. However, while financial markets have been assumed to be efficient, no arbitrage opportunities exist if demographics affect the demand for assets in a similar way.

Second, bequest motive and lifetime uncertainty may imply that financial assets are decumulated at a less rapid rate than the standard life cycle hypothesis would suggest. Given increasing longevity and life time uncertainty, decumulation of assets may be slow and only start at a more advanced age, as retirees attempt to ensure that sufficient capital remains available for the entire uncertain lifetime. As well, there may be intergenerational transfers out of the bequest motive.

Third, deregulation and liberalisation of financial systems over the past decades have increased international capital mobility, which could weaken any link between domestic asset prices and domestic demographic developments. Increasingly integrated international financial markets should provide better opportunities for the global allocation of saving and investment.

In principle, the case for mutual benefits arising from the global diversification of portfolios is nowhere stronger than for funded retirement savings (Reisen, 1994). The diversification of OECD pension assets into the non-OECD stock markets provides the prospect of higher expected return for a given level of risk or, put alternatively, lower risk by eliminating non-systemic volatility without sacrificing expected return. It is less the superior growth performance of the non-OECD area than the low correlation of returns generated by the emerging stock markets with those of the OECD stock markets that governs this expectation. The correlation between returns on OECD and emerging stock

markets will remain low even when diversification gains are seriously exploited. Differences between the two areas with respect to the exposure to country-specific shocks, the stage of economic and demographic maturity and the (lack of) harmonization of economic policies suggest that the diversification gains for OECD pension assets will not disappear quickly.

The evidence has not been kind to the reasoning outlined above. Two distinct regional currency crises, the 1994-95 tequila crisis in Latin America and the 1997-98 Asian crisis, have tarnished the reputation of emerging stock markets to provide superior returns to OECD-based investors. While the emerging economies have grown more quickly than the OECD countries, this has not translated into higher earnings per share growth in the emerging markets. The emerging markets have to increase corporate profitability if they are to attract a growing share of OECD pension assets.

Moreover, a series of financial crises over the last decade has triggered strong contagion effects. Contagion leads to higher correlation of stock market returns among the emerging markets, taking away their potential diversification benefits. Contagion leads to shrinking benefits of international portfolio diversification as returns to emerging stock markets are driven by systemic factors external to these markets themselves. Global diversification can reduce only non-systemic risk. Therefore, emerging markets will only then be able to improve OECD pension returns if they catch up with OECD levels of corporate profitability and if they reduce their vulnerability to the currency crises witnessed in the 1990s.

Financial globalization can only attenuate, not compensate the demographic impact on capital returns and net savings. *Table 1* reports some

selected results from simulating age-structure effects and two scenarios on future financial integration between the OECD and the non-OECD area. The results are based on MacKellar and Reisen (1998) who use a neoclassical economic-demographic accounting model in which age-specific saving and labor force participation rates are held constant. In the baseline scenario, which in view of assumed growth differentials in favor of the South corresponds roughly to a situation of autarky, OECD investors – including pension funds – allocate 10 per cent of their annual investment expenditure to the non-OECD. In the alternative scenario, designed to illustrate the impact of financial globalization, this share is increased to reflect the growing share of non-OECD in global stock market capitalization and in global output.

With financial autarky, the drop in the Northern labor force will lead to higher capital-labor ratios in the OECD, resulting in a drop to capital returns by 150 basis points in the OECD area. Lower capital returns in turn drive net savings lower, from 6.9 per cent of GDP in 1995 to 2.7 per cent in 2050. But even under

TABLE 1: SUMMARY RESULTS OF THE MACKELLAR/REISEN SIMULATION

	1995	2020	2050
Rate of return to capital, OECD (%)			
Autarky scenario	8.0	7.1	6.5
Globalization scenario	8.0	7.3	6.9
Difference	–	0.2	0.4
Net saving rate, OECD (% of GDP)			
Autarky scenario	6.9	5.0	2.7
Globalization scenario	6.9	5.4	3.4
Difference	–	0.4	0.7
Non–OECD share of OECD pension assets (%)			
Autarky scenario	0.9	6.4	7.5
Globalization scenario	0.9	14.1	22.0
Difference	–	7.7	14.5
Net foreign assets, OECD (% of GDP)			
Autarky scenario	2.6	9.3	10.3
Globalization scenario	2.6	24.3	54.9
Difference	–	15.0	44.6
Income at retirement age, OECD (1995 US dollars per person aged over 60)			
Autarky scenario	16 830	17 947	19 005
Globalization scenario	16 830	18 092	19 754
Difference (per cent)	–	0.8	3.9

the autarky scenario, net pension flows from the OECD to the non-OECD will strongly rise by the year 2020 and rise further (albeit more slowly) for the rest of the century. These trends result from growth differentials that favor the non-OECD area, reinvested pension returns and higher OECD pension assets. Other capital flows to the non-OECD will even rise more strongly, as high capital returns are reinvested (by half of earnings). This will result in a higher non-OECD share of OECD pension assets until 2050, before the run-down of pension assets invested abroad and more favorable demographic trends in the OECD area will lead to reversals in these trends.

Financial globalization can only attenuate, not compensate the demographic impact on capital returns and net savings in the neoclassical simulation model. Globalization leads to a partial convergence of capital returns between the two regions, reducing the ageing-induced drop in the North by 40 basis points by 2050. Globalization is estimated to slow the drop in the net saving rate in the OECD countries by one half of one percentage point over the next half-century. Analysis of the components of saving reveals that this increase in aggregate savings is entirely attributable to increased corporate savings. Higher capital returns on domestic capital and a higher share of foreign investment abroad where capital returns are higher account for this result. By contrast, globalization depresses household savings below their already sluggish level in the baseline scenario, as OECD labor is equipped with relatively less capital and thus earns lower wages.

The distributional effects of globalization are much discussed, but the generational dimension is underappreciated. Improved performance of retirement saving portfolios in the globalization scenario raises the income of the OECD retirees significantly, by roughly 3 per cent in 2020-30, when retirement of the baby boom generation will peak. Lower availability of capital in the OECD, on the other hand, slightly hurts the income of workers. In other words: financial globalization may hurt OECD retirees as long as a large share of their pensions is pegged to wages through the PAYG system; it only will benefit retirees with funded pensions.

Finally, net foreign asset positions and net capital flows grow so important in terms of OECD output under the globalization scenario that they will become clearly vulnerable to sovereign risk and changes in investor sentiment (witness Asia's crisis in 1997-98). As the MacKellar/Reisen simulation suggests only modest benefits for capital returns and savings from financial globalization which in turn implies massive exposure of OECD pension assets to sovereign risk, it is suggested that global diversification will not be able to 'beat demography'.

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STRIKING THE BALANCE BETWEEN REGULATION AND PERFORMANCE

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CONTENTS

1 Striking the balance between regulation and performance

There is no such thing as a risk free pension. Risk is a very powerful four letter word with many meanings. Most of these meanings can be applied to pension systems particularly if one includes both absolute and relative risk.

Pensions are dealing with uncertain events. We do not know whether the events will actually occur or how long they will persist. The greatest uncertainty of all in a pensions environment is longevity. Although actuarial science can circumscribe the uncertainty at a collective level, neither the actuary nor the medical specialist would wish to place too big a bet on individual life expectancy.

Pension policy making – and more particularly the updating of such policies – is made difficult because of a lack of honesty. Politicians have to be honest with their electorates that risk and pension systems are inextricably linked.

2 Pensions are inherently risky

For society, the over-riding risk is that some citizens will face absolute poverty in old age. This is particularly so if modern society no longer expects those who are old to work until they die. If we did expect people to work until the very end, old age poverty would be one element of broader income inequality. Some societies or some sub-cultures may find retirement an alien concept. However, most modern societies do not expect people to work, full-time at least, until they die. If absolute poverty in old age does exist to a meaningful extent, the risks of electoral fallout or social strife may be unavoidable.

For an employer the risks are both financial and reputational. Financially they may not be able to meet commitments entered into. Even though promises may have been made in good faith, subsequent developments may undermine the basis upon which the promise was given. In many countries, employers are having to honor promises which they never made since initial offerings have been augmented by legislative intervention. In an era where brand values are cherished, the prospect of branded companies having former employees enduring absolute poverty in old age may result in them being branded in quite a different way.

For commercial providers of financial services there is both business risk and reputational risk again. Business risks manifest themselves in many forms while reputational risk may be influenced by their own behavior or may result from guilt by association.

Professional advisers face increasing risks in our contemporary litigious society. Many professionals may be unwilling to give good clear advice in future for fear of being sued. In many countries the debate rages about the extent to which professionals can legitimately avoid responsibility for the impact of subsequent events or hindsight on advice carefully given in the context of all known facts.

Then we have the risks faced by individuals. They too face a risk of absolute poverty in old age. However, they risk being disappointed. They may feel that politicians have not delivered what they expected, employers have reneged on promises which might not have been the guarantee which many folk perceived, advisers may have been salesmen masquerading in advisers' clothing. They also run the risk of being let down by the market in general or by particular market participants.

Actuaries, underwriters and markets can always put a price on risk. There may not

always be agreement on such pricing. This lack of agreement is what makes markets.

If we seek to price and then pay for the avoidance of every conceivable risk, society will operate sub-optimally. Unless societies are prepared to take risks, progress will never be made. Sometimes the price will never be worth paying. Sometimes it will be paid up-front while on other occasions it will be paid retrospectively, perhaps by some form of compensation or additional injection of finance.

Where the uncertainty affects everyone, the price of dealing with the associated risk will be reduced if we increase the size of the population covered. Thus, the state and the taxpayer are ideally placed to provide a guarantee against absolute poverty in old age. This is why the state should remain a proud provider of pensions which will clearly lift every citizen above the level of absolute poverty determined by national parliaments. At the other extreme, costs are reduced if we engage in clear segmentation. If it is decided to insure against the risks of mountaineering, only those involved in mountaineering should be covered. Only then can proper risk rated premiums be identified which provide a reasonable profit margin for the underwriter at an appropriate price to those who are exposed to a particular risk.

Between these two extremes, there is scope for risk sharing. At the workplace, risks can be shared by employers and employees. In the marketplace, commercial providers and their customers can do a deal on the extent to which customers will be protected against uncertain outcomes. It is for the parties to a deal, in the workplace or the marketplace, to identify risks and then determine the extent to which these risks should be covered by some form of insurance or guarantee. Guarantees cost money and should not generally be imposed by politicians on those who enter into voluntary agreements in either the workplace or the marketplace.

3 The role of regulation

Some critics have argued that the Pensions Directive was inappropriately located within the Financial Services Action Plan. This criticism would have been relevant if that was the end of the story. It is not. Market efficiency is essential if pension systems are to work optimally. It was, therefore, sensible to pursue a prudential framework for pension provision within the context of the FSAP.

Increased attention is now being placed on the social dimension of our pension system. The awareness of increased longevity and actual or perceived market failing have increased the temperature of this particular debate.

Because the financial aspects of our pension system are somewhat technical, there is a danger in believing that technical solutions will be sufficient if our social objectives are to be fulfilled. There is no shortage of technical solutions. However, there are severe resource constraints. In pension provision as in other aspects of economic activity, we cannot make good things happen simply by wishing for them. Whilst the heart may determine objectives, the head must allocate priorities.

As the debate moves from the financial to the social, we must be aware of an inherent conflict. On the one hand, we are seeking to expand access to good quality pension coverage while, on the other, we are seeking to increase the quality of that coverage. In a voluntary environment one has to be careful that improved quality, with its associated cost, does not act as a barrier to entry which thereby serves to reduce access.

4 The role of the regulator

The words supervisor and regulator are used in a pensions context as if they were interchangeable. However, this is not always the case since in some countries either body can be fulfilling a quasi-political policymaking role while the other might have operational responsibility at a systems level. Here, I propose to use the word "regulator" as if it was an interchangeable definition of those to whom politicians delegate the responsibility for the safe fulfillment of financial objectives in a social policy environment.

Nobody loves a regulator. Politicians will, on the one hand, espouse a light regulatory touch. On the other hand, those same politicians will blame regulators if things go wrong. Because members of the public are encouraged to believe that market failures are due to inadequate regulation rather than inept policymaking, they too will blame the regulator.

Against this background, there is a real danger that regulators will see their over-riding function as the protection of regulators. After all, their reputation and personal financial security is based on avoiding blame. This may drive them to over-regulate to a point where nothing could go wrong but nothing could go right either. Because politicians are short-term in perspective, they may be happier with moribund markets where nothing happens than with vibrant markets where there is the potential for blemishes, some of which may be high profile.

Those of us who do not have an axe to grind must regularly make the case for a balanced approach to regulation. There is no such thing as a fail-safe financial system. If we are prepared to tolerate a transport system where things could go wrong, we must not seek a higher degree of security in areas of finance where the issues involved are not of such a life and death nature.

Regulators will be helped with the pursuit of a balanced approach to regulation if it is clearly understood that it is the state's responsibility to provide absolute security in old age. In those countries, such as the UK and Ireland, where the state pension system does not currently offer such a guarantee, there is a real danger that private provision is seen as privatized welfare. Against such a background, it is not surprising that public and politicians alike wish to pursue risk-free private provision. In such an environment, regulators will inevitably over-regulate and the system will operate sub-optimally.

5 Putting trust back into the system

Traditionally, there has not been much trust in cross border financial arrangements. Hopefully, things are changing and the institutions spawned by the Pensions Directive, and other aspects of the FSAP will foster a rapid increase in consumer and employer trust within the European pensions and financial services system.

More challenging, however, might be the restoration of trust within domestic systems. The only way in which we can do this is through increased honesty based on a steady increase in financial literacy.

Politicians need a long-term vision which transcends the normal electoral cycle. We then need wide-ranging and inclusive debates on how we get from where we are to where the consensus wants us to end up. I think there is an emerging consensus in many countries based on a public/private partnership. Public systems deal with absolute poverty while private systems deal, in a lightly regulated fashion, with relative aspirations.

If politicians are to be trusted, they must not make promises which, in their heart of hearts,

they know are financially undeliverable. Employers and commercial providers, in return for less regulation, should use their utmost best endeavors to deliver promises made in good faith. Peer pressure within both the employer and commercial provider communities should be used to drive out bad practice. Those who are guilty of such practice should be hit hard financially.

Workers and consumers cannot, however, absolve themselves of responsibility. Improved financial literacy will help bring this about over time. In the short term, however, consumers must always remember that, if something looks too good to be true, it probably is too good to be true.