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HOW WILL AGEING AFFECT THE STRUCTURE OF FINANCIAL MARKETS?

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Abstract: The ageing of the world population is an ineluctable process with major economic implications. Whereas there is extensive research on macroeconomic effects and on financial asset prices there has been more limited systematic research into the impact of demographic changes on financial asset volumes and financial market structure more generally, as driven by age related household saving and asset allocation decisions. Our empirical work based on experience of 72 countries, viewed in the light of the existing literature, suggests that demographic changes have had a detectable impact on financial structure. Ageing tends to benefit bond markets relative to equity markets, while depressing private saving and external balances, albeit not sharply reducing the overall size of the financial sector. Continuation of such patterns during the coming period of ageing have wide-ranging implications for policymakers and market participants.

Keywords: Ageing, personal finance, financial structure, international capital flows.

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Introduction

The ageing of the world population is an ineluctable process. It is anticipated (United Nations 2004) that by 2050, one in four people will be aged above 65 at the world level. This pattern reflects both rising longevity and declining fertility rates over the long term, as well as the exceptional size of the post war "baby boom" generation. Such future trends will have major macroeconomic consequences.

The economic literature on demographics is in our view unbalanced. The link between changing demographic structure and conjunctural trends at a macroeconomic level has been widely studied; see for example Turner et al (1998), Kohl and O'Brien (1998), McMorrow and Roeger (2003) and Batini et al (2006). There is also an extensive literature of the impact of ageing on pension systems and public finance, see Dang et al (2001) and McMorrow and Roeger (2002) for recent examples. US researchers have put a considerable focus on links of demographic trends to financial asset prices (see Poterba (2004) for a recent survey, also Davis and Li (2003) and Brooks (2006)). There has also been work on demographic impacts on saving (see the review in Bosworth et al 2004). However, there has been more limited systematic research into the impact of demographic changes on individual financial asset volumes and financial market structure more generally.

Accordingly, in this paper we seek to fill the gap by reviewing the literature and undertaking further investigation of the link of demographics to financial market structure[2]. The paper is structured as follows. After assessing a number of stylised facts in financial structure, we attempt to address the issue of the impact of ageing on a number of levels.

Firstly we use a priori economic reasoning in terms of the life cycle theory of saving, bearing in mind likely developments in ageing. Secondly we review the existing literature on demographics and saving, financial asset demand and asset prices (including the possible effect of pension funding) to assess likely changes. Thirdly, we seek to assess econometrically using cross-country data for up to 72 countries the impact of ageing on existing financial systems in terms of volume of assets as well as private saving over the last 40 or so years.

[2] Financial market structure can be viewed from several angles, namely in terms of overall size, by institutional sectors (e.g. household, corporate, banks, institutional investors), and by instrument (e.g. bonds, equities and deposits) as well as on a domestic and international level. A complication is that detailed "national-balance-sheet" data on all of these aspects is only available for a small number of OECD countries. However, a wider range of countries is covered by the World Bank financial structure database (2003), notably in terms of volumes of equities, bonds and bank assets that we utilise here.

This assessment employs the World Bank financial structure database, for both OECD countries and emerging market economies (EMEs). We seek to control for a number of factors affecting financial structure (such as pension systems and level of economic development) in detecting an effect of demographics without "omitted variables bias". In a final section, we estimate equations for demographic effects on external balances using our panel dataset. Policy aspects are highlighted in the conclusion.

1 The evolution of financial systems

As background to assessing ageing's impact, it is essential to consider how financial structures evolve as countries develop, and factors that influence such development. It is important to understand what such normal financial development entails so we do not mistake it for an effect of demographic developments, perhaps due to omitting key variables from the econometric specification.

There is a widespread perception, backed by empirical observation that financial systems go through stages of development. For example, Rybczinski (1997) suggests that one can distinguish a bank, market and securitised phase. In the bank phase all finance is directed through banks, whereas securities markets and institutional investors start to develop in the market phase and become dominant in the securitised phase. Most EMEs are still in the bank-oriented phase, although the most advanced such as Korea are moving to a market-oriented phase (Davis 2005). Advanced countries are either in the market or securitised phase (where "securitised" implies a growing importance of securities finance generally rather than just packaging of loans in the form of securities).

Stylised facts drawn from empirical observation suggest a somewhat more complex pattern (see Allen and Gale 2000), although the idea of phases remains helpful. On average, as shown by Demirguc-Kunt and Levine (2000), banks, nonbanks and stock markets are larger, more active and more efficient in richer countries. This is confirmed by background data on financial structure that we provide in Tables 1 and 2 for EMEs and advanced countries, respectively. Table 1 shows that for EMEs on average, private credit amounts to the equivalent of 46% of GDP, while stock markets are 44% of GDP, private bonds 16% and public bond stocks are 25%. In contrast, in advanced countries (Table 2) the private credit ratio is 118% of GDP, stock market capitalisation 72%, and both private and public bond markets have around 50% of GDP outstanding.

A further division is between countries at a similar level of development that are market oriented and bank dominated (see Table 3). Underlying the relative importance of markets and banks are aspects relating to the role of public information in markets as opposed to private information held by banks, as well as banks' role in corporate governance. The classic distinction is between the US and UK on the one hand and most Continental European countries and Japan on the other. In this context, advanced countries are themselves bimodal in their financial structure, with the market-oriented Anglo Saxon countries having larger than average securities markets and bank-dominated countries having dominant banking sectors.

Country status in terms of bank or market focus may be partly endogenous; Demirguc-Kunt and Levine (2000) show that in advanced countries, stock markets become more active and efficient relative to banks, and there is some tendency for financial systems to become more market oriented as the countries become richer. On the other hand, Schmidt et al (1999, 2001) argue that there is path dependence, meaning that a bank based system such as Germany will not automatically develop into a market based system, owing to the institutional and legal structure that in a sense cements the bank based structure in place.

A role for legal traditions in financial development and its link to market or bank orientation has been considered by recent empirical work on law and finance. This aspect appears to affect the relative size of banks and securities markets separate from the stage of economic development. A classification of countries by legal origin is also given in Table 3 (source: Impavido et al 2003). La Porta et al (1999) show that countries with a Common Law tradition, protection of shareholders' rights, detailed accounting, low corruption and no explicit deposit insurance tend to be market based – and have large institutional investor sectors - whatever their income level. In contrast, countries with a French Civil Law tradition, poor protection of the rights of shareholders and creditors, poor contract enforcement and accounting standards, restrictive banking regulation, high corruption and inflation tend to have underdeveloped banks and markets – and institutional investors. The few countries with a German law tradition, which offers strong protection for creditors, tend to have strong bank based systems, with small institutional investor sectors.

As regards historical trends, Rajan and Zingales (2000) show that financial development has not been monotonic. The major OECD countries were on some measures more financially developed in 1913 than 1980, and a significant reversal in financial development and financial

integration took place between 1913 and 1950. A tightening of regulation in the interwar period led to a decline in the size and importance of the financial sector relative to GDP. The imposition of such "structural regulation" implied that the service provided to the non-financial sector was sub optimal, and economic growth was hindered, with for example low deposit rates and rationing of credit to households and small companies. This illustrates the danger of complacency by lawmakers in respect of financial development. Meanwhile, financial liberalisation in the 1980s and 1990s has of course tended to improve financial-sector efficiency in securities and banking, also leading to increased household borrowing, implying a cost in terms of risk.

With this section as background we now turn to an assessment of the impact of ageing on financial structure.

2 The likely impact of ageing on total financial assets

The main focus of ageing has to be on the relation between ageing and financial asset demand for the personal sector since they are the ultimate holders of financial claims, if one abstracts from foreign claims. Theory suggesting a link between an individual's age, consumption and saving decisions originated with the permanent income hypothesis (Friedman 1957), and the later life cycle hypothesis (Modigliani and Brumberg (1954), and Ando and Modigliani (1963)). For an overview see Deaton (1992). Saving patterns will in turn affect the aggregate size of the financial system, albeit also being affected by features such as the presence of pay-as-you-go pension systems.

The permanent income hypothesis, while not explicitly basing saving and consumption on age, has the insight that an individual's consumption is likely to depend on permanent rather than current disposable income. People will only consume if they believe their income is sustainable. Consequently, if increases in their income are expected to be temporary, they will save rather then increase their consumption. The underlying assumption is that people seek to avoid fluctuations in their consumption when income fluctuates. Furthermore, when actual income is below permanent, i.e. in retirement, they may decumulate.

Following this insight, the life cycle theory of consumption suggests that early in one's life, consumption may well exceed income as individuals may be making major purchases related to buying a new home, starting a family, and beginning a career. At this stage in life,

individuals may borrow based on their expected labour income in the future (human wealth), if financial markets are sufficiently developed and liberalised. In mid-life, these expenditures begin to level off while labour income increases. Individuals at this point will repay debts and start to save for retirement in equities, bonds, pension schemes, etc. At retirement, income normally decreases, and individuals may start to dis-save. This involves selling off some of their financial assets, including pension fund decumulation.

Both theories of optimal consumption imply consumption will be smoothed out through an individual's lifetime, with corresponding accumulation of financial assets. In the context of ageing, the life cycle is a crucial background as it implies that personal saving will rise when the high saving group grows, then fall as the population ages, and a larger proportion of individuals enter the low- or negative-saving age groups.

As regards empirical evidence, at a macroeconomic time series level, Disney (1996) noted that, consistent with the life cycle, saving rates tend to decline in countries where there are a larger number of retired people. The changes in savings lead to changes in demand for financial assets. Econometrically, a strong effect of demographics on private saving is found by many studies. Pioneering work in this area was by Fair and Dominguez (1991); Attfield and Cannon (2003) apply their work to the UK using a vector-error-correction approach. Masson et al (1995) found the total dependency ratio to have a significant negative effect on private saving in a panel of both advanced and developing countries, with an elasticity of -1. later work by and Loayza et al (2001) reduced this estimate to around -0.2. McMorrow and Roeger (2003) found an average elasticity of –0.75 across existing studies.

Modigliani (1986) shows life-cycle savings follow a hump shaped pattern where an investor's asset holdings increase with age and decline after retirement. Higgins (1998) sought to estimate demographic effects via a third order polynomial in age and found strong demographic effects; a similar exercise by Bosworth and Keys (2004) found a peak impact on saving at 40-55 and a negative effect of cohorts over 70. Al-Eyd et al (2006) tested for demographic effects on consumption over and above the standard determinants (i.e. income and wealth), using the age cohorts 20-39, 40-64 and 65+ relative to the population in 15 countries (EU excluding Luxembourg plus US). They found a strong positive effect on consumption from the 20-39 cohort, but no differential between the middle aged and elderly as would be expected if the latter draw down savings to pay for retirement. This in turn may link to pay-as-you-go pension schemes in most of Europe.

Whereas the above work focuses on time series macroeconomic data, there is also a large literature on life cycle household saving using cross-sectional survey data, notably in the US (see the survey in Bosworth et al (2004)). A significant number of these studies have found that the retired cohorts do not have negative saving. There is an apparent contradiction between micro and macro evidence which would affect strongly the predictions about personal saving when ageing and asset accumulation takes place.

Poterba (1998) suggests the life cycle hypothesis cannot be proven by focus on average cross-section based asset accumulation profiles. First, average figures are distorted by the wealthiest 10 percent of households who hold approximately 70 percent of financial assets. If equities are included, this will raise the number to 90 percent, see Poterba and Samwick (1997). Second, micro data typically omit social security wealth and wealth in defined benefit pension funds, which are important aspects of asset accumulation and decumulation from the point of view of individual households. Third, there is a problem in using cross-section data to evaluate the life cycle hypothesis or project asset demands, in the style of Yoo (1994) and Bergantino (1998) since they mix age and cohort effects, as discussed by Poterba (2001). The associated problems can be described using equation (1) where $A_{\alpha t}$ is individual asset holdings of age α at time t:

$$A_{\alpha t} = \alpha_a + \beta_t + \delta_{t-a} \qquad (1)$$

α_a is the age-specific asset demand at age a. β_t is the time-period-specific shift in asset demand and δ_{t-a} is the cohort-specific effort for asset demand for those born in the period t-a. 'Cohorts' are a linear combination of age and time. With panel or repeated cross-section data, it is possible to estimate two effects, but it is impossible to estimate all three effects.

Poterba and Samwick (2001) estimated the effects of ageing using the US Survey of Consumer Finances data allowing for this critique. They found the hump shape for net worth but not for net financial assets, which level off in old age. The levelling off of net financial assets could link to precautionary saving or a bequest motive (Hurd (1990), Bernheim (1991)). On the other hand, Bosworth et al (2004) suggest there may be intergenerational interactions missed by even such micro studies, and problems of heterogeneity leading to difficulty in aggregating micro studies.

Whereas our main focus is on personal saving and related accumulation of financial assets, it is important to add that as the population ages, the public sector will tend to lower its saving, ceteris paribus. This will in turn help to drive external balances as discussed in Section 8. Such trends in public saving are largely driven by the scale of the public pension system in the light of ageing and the means of financing adopted (e.g. taxation versus debt finance). Recent estimates include those in Dang et al (2001) and McMorrow and Roeger (2002). Debt finance would imply a greater fall in public saving. Rapid increases in the proportion of the population over 65 (the dependency ratio) combined with generous social security pension schemes are particularly threatening. It is this aspect which is encouraging governments to scale down public pension commitments and switch to funding.

3 The likely impact of ageing on demand for financial assets

While the life cycle hypothesis focuses on overall household asset demand, empirical evidence also suggests households' desired portfolios of specific asset classes would vary with age, which in turn would have a major effect on financial structure. Hence, further work has related to the changing demand for financial assets over the lifecycle. One underlying aspect of this relates to implications for asset holding of the lifecycle pattern of borrowing and repayment, as well as pension accumulation. Another aspect of the underlying theoretical view is that risk aversion may vary over the life cycle, with individuals seeking lower risk late in the life cycle (i.e. shifting from equities to bonds). Complementing this, the duration of assets would appropriately change over the life cycle, with long duration assets such as equities being more appropriate for young workers saving for pension claims far in the future, and shorter duration assets such as bonds being more relevant for older workers (Blake 1997). This would be particularly the case when pensions in payment are annuities, which are generally backed by bonds. Note that such effects relate on the one hand to directly-held assets but on the other to assets held indirectly via pension funds. They may be partly offset if, as in many EMEs, households are multigenerational, with labour income from younger households in effect supporting pensioners.

Bergantino (1998), looking at cross sections derived from the US Survey of Consumer Finances, found young households under 40 usually draw credit from the financial markets via taking out mortgages for buying houses. Bergantino showed that households aged 40–60 tend to provide credit to financial markets, via employer and personal pension accounts. Those households which are over the age of 60 tend to withdraw from the financial markets as

a result of using accumulated assets to fund consumption at retirement. Mankiw and Weil (1989) found housing demand is high for those aged 25-40. Thus, again, their borrowings tend to exceed their purchases of financial assets.

Goyal (2001), using aggregate stock market data, looked at the effect of cohort size on outflows from the US equity market, defined as the difference between the value weighted stock market return (NYSE, AMEX and NASDAQ) including dividends and the percentage increase in stock market capitalisation. He found that outflows are related to a rise in the size of the cohort aged 65 and over, and inflows are linked to the size of the cohort aged 45-64, suggesting that a rise in the over-65 cohort will reduce the net supply of equity finance.

Yoo (1994) using survey data found demand for risky assets, bonds and equities increases with age and decreases after individuals retire. Bergantino (1998) showed that households with heads under the age of 35 generally have near zero ownership of bonds and stocks. However he found a divergence in stock and bond holding of older households. Ownership of stocks for those over 55 tends to decrease more rapidly than for bonds. He attributes this to possible cohort effects and risk aversion. It is also noteworthy that financial assets make up only 37% of household's total assets, of which 15% are held directly in stocks. Thus, total household assets are mostly non-financial assets, e.g. primary residences and vehicles which are not the focus of our current work.

These estimates are subject to the critique pointed out above of mixing cohort and age effects for estimates of the life cycle based on cross sectional data. On the other hand, Poterba (1998) shows that holdings of equities decline in old age even if age and cohort effects are allowed for. Ameriks and Zeldes (2000), who also correct for age and cohort effects using data from the US pension fund TIAA-CREF noted a rapid increase in the proportion of household owning equities, from 33% in 1989 to 49% in 1998 as the baby boom generation increased in size. This is consistent with high equity holding by the high-saving middle age group. But they also note that half of Americans do not hold any wealth in the stock market.

Bodie and Crane (1997) looked at the total asset holdings of individuals both inside and outside retirement accounts and found that behaviour was in line with economic theory and the "best advice" of investment professionals. They hold a proportion of cash that declines with wealth and a proportion of equities that declines with age and rises with wealth.

Consistent with this, Brooks (2000) suggests that given the need to finance annuities, demand for equities would fall more than demand for bonds as the population ages.

4 Impacts on financial asset prices

A number of authors have sought to assess whether asset prices will also be put under downward pressure in coming decades by declining saving in OECD countries implicitly affecting the real interest rate or the risk premium. Particular focus has been put on the concept of a “meltdown” of equity prices when the baby boom generation retires. The underlying issue for the current paper is the balance between price and quantity effects of changing demands for financial assets. Arguably in an efficient market an excess demand for a certain type of financial asset will lead initially to price rises but in the longer term to balance sheet adjustments that entail higher issuance of associated claims.

Schieber and Shoven (1994) suggest that given the correlation of ageing in OECD countries, and the likely decumulation of defined benefit pension fund assets, there could be widespread falls in asset prices, linked to high real interest rates. Supporting this, Erb et al (1997) find a positive correlation in the US between the fraction of the population 25-45 and 65+ to stock returns (i.e. a negative effect on prices), while those 45-65 have a negative effect. Looking at a range of OECD and EME countries, they find a positive relation of stock returns to the average age of the population. On the other hand Brooks (2006) using an econometric approach shows estimates suggesting at most a modest decline in equity prices and possibly no decline at all.

Poterba (2001, 2004), although he acknowledges that standard models suggest that equilibrium returns on financial assets will vary in response to changes in population age structure, argues that the rapid meltdown hypothesis is inconsistent with empirical survey data. Consumers decumulate assets at a less rapid rate than the life cycle suggests. This is because the life cycle model takes no account of the bequest motive and lifetime uncertainty. Hence, although asset demands rose to fuel the 1990s boom, future declines will be modest. However, Abel (2001) using a rational expectations model, which took account of the bequest motive, found stock prices are still expected to fall when baby boomers retire despite high projected asset demands owing to shifts in the supply of capital in response to changes in its price.

Davis and Li (2003) give econometric evidence that demographics have had a significant impact on US, panel and aggregated international stock prices and bond yields, even in the presence of standard additional independent variables . As noted by Poterba (2004), the Davis and Li study "moves beyond most of the previous work in including control variables for non-demographic factors that may affect asset prices, such as the rate of economic growth, the inflation rate, and the recent volatility of the equity market. The findings are robust to the inclusion of these control variables." In this context, the 40-64 cohort has a strong positive influence on equity and bond prices, a support that would be removed as its share of the population declines.

Rather few studies have looked at relative demand for different assets with ageing and their impact on prices. One exception is Brooks (2000) who, using a theoretical overlapping generations model, focuses on the relation between ageing and the demand for equities and bonds, and suggests that there will be excess demand for bonds and excess supply of equities in coming decades, with a modest decline in the returns on the retirement savings of baby boomers. He found that the bond yield would rise from 4.5% to 4.8% as the baby boomers buy equity then fall to 4.1% as they retire.

Consistent with the point we made above, Neuberger (1999) argues that the increase and subsequent decrease in flows during ageing will be balanced by rises and falls in equity issues, with little effect on prices and returns. This suggests that there could nevertheless be a substantive impact on financial structure.

5 Impacts of pension funds on financial structure

As noted above, growth of pension funds is likely to accompany ageing and there is hence an important issue whether pension reform more broadly affects financial structure. An impact on saving and hence financial asset volumes separate from demography would have to rely on inability of the household sector to offset forced saving via pension funds (e.g. due to credit constraints) and also at a national level that any rise in personal saving is not offset by falling public saving.

As reviewed in detail in Davis (2005, 2006) and Davis and Hu (2006), there is evidence that pension fund growth raises personal saving, but not one-to-one, as households reduce discretionary saving to offset growth in pension claims. Effects on saving are particularly

marked where credit markets are imperfect (limiting borrowing) or for lower income individuals who are less creditworthy or who do not have other assets to decumulate. Meanwhile, public dissaving may partly or wholly offset rises in personal saving at a national level, especially if the transition from pay-as-you go to funding is financed by debt issuance as opposed to higher taxes. On the other hand, Lopez Murphy and Musalem (2004) using a panel of 43 industrial, and developing countries find evidence suggesting that the accumulation of pension fund financial assets might indeed increase national saving, when these funds are the result of a mandatory pension program. The boost to personal saving is thus greater than the dissaving of the public sector due to reform. By contrast, national saving might be unaffected, when pension funds are the result of a public program, implemented to foster voluntary pension saving.

Meanwhile, at the level of demand for individual financial assets, there is evidence that growth of pension funds accompanies equity market development (Catalan et al 2000), as well as entailing rises in the stock of private and public bonds (Hu 2005, Impavido et al 2003). In terms of asset prices, pension fund growth accompanies a decreased dividend yield and increased price to book ratio, as well as lower equity price volatility implying a drop in the cost of capital (Walker and Lefort 2002).

6 Econometric analysis of the impact of demographics on financial structure

In light of the work cited above, in this section we undertake new tests of the hypothesis that ageing affects financial structure. We assess demographic impacts both for aggregates and also for ratios of financial assets. Data are for up to 72 countries from 1960-2002, of which 23 are OECD countries, 36 are EMEs and 13 are transition economies[3]. Countries covered are listed in the Appendix.

We use GLS panel techniques with fixed effects. We follow authors such as Walker and Lefort (2002) in adding extra explanatory variables such as inflation, per capita income, urbanisation and openness (average of import and export/GDP ratios) to estimated equations for financial structure and financial development, so as to avoid the possibility of omitted variables bias boosting the effect of the demographic variables. Openness we consider to be of particular interest, given it proxies the degree to which the country is integrated in the global

[3] Data are largely from World Bank's World Development Indicators and the Financial Structure and Economic Development Database. I am indebted to Yu-Wei Hu for use of the data he has collected.

economy, which may in turn impact on the effect demographics has on the domestic financial system.

On the other hand, following Arestis et al (2004) we do not include some of the standard variables typically entered in cross-sectional cross country growth regressions such as years of schooling, as well as corruption, social capital, inequality and rule of law. We consider using panel data with fixed effects will capture any relevant differences in financial structure across countries. We estimate for all countries together, then for the EMEs and OECD countries separately (transition economies are included with EMEs).

The dependent variables are firstly size variables, namely the bank loan/GDP ratio, M3/GDP, the equity capitalisation/GDP and bond market/GDP, as well as the sum of all three (overall size indicator). These sum to a rough total of domestic financial assets, which are held by households either directly or indirectly via financial institutions. Unfortunately, data on bond market capitalisation are not widely available, so the observations for that variable and the total size aggregate are limited. Note also that the equity market capitalisation variable (and to a lesser extent the bond market capitalisation) mix price and volume effects of ageing as the data do not distinguish rises in capitalisation from new issues from those due to revaluations. Furthermore, we do not have data on housing wealth for a wide range of countries, that may be an important complement and determinant of financing patterns that can vary with age.

We also assess a number of financial structure ratios, namely the economy wide loan/equity ratio, debt (loans plus bonds)/equity and loan/securities (bonds plus equities) ratio. Following the point made above, the loan/equity ratio has the most observations. Finally, we consider two flow ratios, namely private saving/GDP and (reported in the next section) the external balance/GDP ratio.

Table 4A records results for size variables for the full sample of up to 72 countries. In terms of GDP per capita it is evident that most of the variables are correlated with economic development – countries with higher living standards also have a larger financial sector, banking assets and liabilities, and equity market. Only the bond market result is opposite to this. Equally, urbanisation tends to accompany financial development, although the coefficient for equities is insignificant. Inflation is clearly inimical to bond issuance, as would be expected, but not to overall financial-sector size or bank loan volume. More open economies tend to have larger banking sectors and equity markets although the size effect is

insignificant. Note that the size and bond results are based on quite small samples (37 countries and around 400 observations instead of 65 and over 1000 for the others) and hence may be less well determined than the bank and equity results.

Turning to the demographic effects, a common feature is that the size of the over 65 cohort is significantly positively related to all the size variables. We need to infer causality with caution however, as it may link partly to the fact that countries with higher living standards have larger populations of pensioners. The relative size of the 40-64 and 65+ coefficients is of interest. For bonds, it is the over-65 cohort that is most favourable to bond market development, consistent with the idea of greater risk aversion of older people in work cited above. On the other hand, for equities it is the 40-64 cohort that is most favourable, consistent with higher demand for equities among those in peak years of saving for retirement. The coefficients for M3 and bank lending are similar for the two cohorts. Meanwhile, the 20-39 cohort is insignificant or negative for most of the equations, consistent with low or negative financial saving by this cohort - but a high demand for bank loans in the form of mortgages, where the lending equation coefficient is positive.

To check for robustness, we add two lagged financial development variables, the pension fund/GDP and the bank lending to the private sector/GDP ratio (right hand side of Table 4). Most of the existing demographic coefficients are unchanged. Especially, the bulk of the over-65 cohort coefficients are still positive and significant, and the pattern for the 40-64 relative to the over-65s for equities and bonds is as cited above. The exception is that the lending equation has a negative sign for the younger cohorts with the extra variables. Pension funding is shown to entail a larger bond and equities stock, and a smaller size of the banking sector, but a larger financial sector overall. Bank lending to the private sector is positively related to size (with a smaller coefficient) while there is also, unsurprisingly, a positive relationship with the banking sector variables (where it is more or less a lagged dependent variable).

A further robustness check was to change the specification for one where the dependent variable is a five-year average and the lagged variables are the “initial conditions” at the beginning of each 5-year period (Table 4B). We find that the demographic results are remarkably similar. Notably, we again find the relatively greater effect of the 65+ generation on bonds and the 40-64s on equities, consistent with risk aversion effects. The signs on most of the non financial variables are also robust.

As regards the size estimates for the EME countries and OECD countries (Table 5), results are similar despite the differing living standards and levels of financial development, which underpins the results for the full sample of countries. There remain some differences, however. For EMEs, GDP per capita is favourable for financial development except for bond markets, while for the OECD countries there is a negative sign for standards of living for equity markets, possibly reflecting high living standards in some "bank dominated" countries. Bond market development for OECD countries is not affected by GDP per capita, the level of which is of course fairly common across OECD countries. In this context, note that in OECD countries, the correlation between bonds and government debt is closer than in EMEs where much of government debt is a bank asset.

Urbanisation is positive and significant for all of the EME equations, but only for total size for the OECD. Again, urbanisation is comparable across the OECD. Openness has a positive effect on financial development for both sets of countries, although the coefficient for size in EMEs and for size and M3 in the OECD are insignificant, and for the OECD the bond coefficient is negative – possibly reflecting lesser fiscal discipline in the more closed economies. Inflation appears to have a more frequent negative effect on financial development in the OECD, where it has for example a significant negative effect for bonds, equities and overall size. In contrast, it is positive for overall size and loans in EMEs.

In terms of the demographic variables, the age 65+ cohort has a positive and significant effect throughout, except for equities[4] where it is insignificant for both subsets of countries. This is a more telling result than for the full set of countries, given that the OECD and EME countries separately have more similar age distributions than when they are pooled together. It suggests that there may indeed be a positive effect of the elderly on quantities in financial markets other than equities, consistent with a pattern whereby they switch from equities to safe assets, but the decline in net financial assets is not a sizeable one for reasons of precaution or bequest as also suggested by Poterba and Samwick (2001)).[5]

Consistent with this suggestion, the dichotomy of equities and bonds across the 40-64 and 65+ cohorts again applies, with only the 40-64 coefficient being significant (and positive) for equities in both country groups. The bond coefficient is insignificant for the 40-64s in both

[4] We note that the lack of significance of equities for the over-65 variable rules out the possibility that results for EMEs are driven by a correlation of longevity with overall development.

[5] Or course, the foreign sector may also be an important concurrent investor in these assets, notably in small open economies.

groups and significant for the 65+. Hence again, there is implied to be a relative switch by the elderly from equities to bonds. Meanwhile, especially for the OECD the coefficients of these subgroups is comparable (positive and significant) for M3 and bank lending, suggesting that liquid asset holding needs do not change with retirement. Meanwhile the 20-39 cohort is shown to have a negative impact on M3 for the OECD, but a positive effect on M3 and borrowing in the EMEs. The contrast for M3 may reflect greater liquidity constraints in the EMEs. Finally, the 20-39 cohort has a negative effect on overall size in both cases, as do the 40-64s for EMEs.

Turning to estimates for ratios (Table 6), the loan-equity equation has most countries (67) and observations (1219). This shows that economic development accompanies growth in securities markets relative to banks, as witness a negative sign on the GDP per capita and on urbanisation. This is consistent with a shift to market orientation as economic development proceeds, as discussed in Section 1. More open countries also have a larger stock of equity relative to bank lending, consistent with internationally integrated securities markets. Inflation is inimical to equities as opposed to bank lending. The demographic variables are all negative for this equation, but with the largest value for the 40-64 cohort, consistent with larger relative demand for equities rather than risk free bank liabilities for this group. Meanwhile, for the loan-securities ratio there are no significant demographic effects, and for the debt-equity ratio the younger cohorts are shown (on the smaller sample) to tend towards debt (loans and bonds). The equations with the financial development variables show similar patterns for the demographic effects. A large pension fund sector is shown to accompany a larger stock of equity relative to bank loans, as, interestingly, does a larger banking sector. On the other hand, a larger volume of bank loans to the private sector accompanies a higher loan-security and economy wide debt-equity ratio.

Looking at the ratio results for the separate country groups (Table 7) briefly, the loan-equity ratio is reduced strongly in OECD countries by the high saving 40-64 cohort, who as shown in Table 6 direct funds to equities more than banks. In the EMEs it is the 20-39 and 65+ cohort that drives a fall in the loan-equity ratio – the result for all countries in Table 6 was a mixture of these effects.

We finally highlight some results for private saving using demographic effects, as shown in Table 8. Note that this includes corporate as well as household saving. Given this area has been widely researched (see Section 5), we do not put a major emphasis on these results.

Nevertheless, it is notable that strong and consistent demographic effects are detected for all countries and both subgroups, with a range of financial structures. The results are in turn consistent with the life cycle hypothesis (although the results do not *prove* the life cycle pattern holds for each individual cohort, since the aggregate macro data show the average age-behaviour of a range of cohorts).

In each case the 20-39 and 40-64 cohorts are positive for private saving, and the 40-64 group always has a larger coefficient. In EMEs the 20-39 group is positive and significant (and also for all countries) but in the OECD countries, the 20-39 group is insignificant, which may reflect heavy borrowing in financially liberalised economies, while the 20-39s face liquidity constraints in EMEs. Meanwhile, the over-65 cohort has a consistently negative and significant impact for saving, across all country groups. The contrast with some of the positive results for financial asset accumulation may reflect the existing stock of wealth that this cohort has built up, and positive revaluations that will not be reflected in private sector saving. Finally, whereas the pension sector has no effect on private saving, there is a tendency for countries with large bank lending to the private sector to have lower private saving also.

Overall, we conclude from this preliminary empirical work that there are indeed detectable demographic effects on financial structure, that can be expected to impact in the future. Inter alia, there is a switch from equities to bonds between the 40-64 and 65+ cohorts, as well as a positive impact of the older cohorts on banking and overall size of the financial sector. Saving regressions show a strong positive effect for the 40-64 cohort and negative for the 65+ one, consistent with other work in this area. So in an ageing economy, a financial system may well become more bond- as opposed to equity-based, and somewhat larger overall, while also facing declining inflows of saving.

This is an area which clearly warrants further research. Further work could assess different specifications, notably using lagged dependent variables for the financial structure variables, which would in turn necessitate using the Generalised Method of Moments method of estimation.

7 Impacts of ageing on cross border financial claims

In open economies, ageing will also impact on the external balance, depending on the path of investment. In this context, most studies suggest that investment rates will fall with ageing,

which would temper the increase in external deficits from lower saving. For example, Cutler et al (1990) suggest that total investment may fall with ageing, given the reduced need for capital widening with a smaller workforce; they also envisage a fall in the rate of return on capital from 6.7% in 1990 to 3.5% in 2025. Disney (1996) shows a significant negative relationship between the dependency ratio and fixed capital growth over 1977-92 in 24 OECD countries. Blommestein (1998) again sees falling investment as likely to occur as the labour force shrinks and the capital labour ratio rises, depressing returns to new investment. Higgins (1998) estimates that cohort age 15-24 has a peak positive effect on investment, earlier than the 30-45 found for saving.

Bikker (1996) focuses directly on balance-of-payments effects of ageing and finds that the effects in OECD countries may be towards a surplus as long as national saving is boosted by ageing, which seems possible as long as the 'baby boom' generation remains at work. But once people in this generation retire and begin to dissave, there could be balance-of-payments problems.

In the light of this work, we undertook panel estimates for the external balance, bearing in mind that it is a product of public as well as private sector behaviour, and of investment as well as saving. These are also reported in Table 8. Looking first at the non-demographic effects, countries with higher GDP per capita tend to have surpluses, in the full group as well as the EMEs and OECD countries separately. Rapid income growth tends to entail a deficit, but interestingly not for the OECD countries, where high inflation is a stronger indicator of external deficits. As regards demographic effects, the 20-39 cohort is not in any case a significant influence on the external position. The 40-64 cohort tends to encourage a surplus position, albeit not significantly for the OECD countries. This is plausible in the light of high saving by this group, and also a likely beneficial effect on government saving (higher tax receipts than expenditure needs). The 65+ generation is associated with a tendency to deficit in the external position in all cases, consistent with lower private saving as discussed above as well as pension and health expenditures by government with less offsetting tax inflows. Finally, whereas the pension sector has no effect on the external position, there is a tendency for countries with large bank lending to the private sector to have deficits also. This may of course reflect private investment financed by such lending, as we now go on to discuss.

On balance, our results suggest that the pattern of ownership of financial claims will shift relatively from OECD countries towards EMEs as the former age more rapidly, although later

ageing of the EMEs will tend to redress the balance. These suggestions are supported by various macroeconomic projections as summarised below:

8 Global macroeconomic projections

Illustrating the overall outcome of these ageing patterns, and giving further clues about changes in financial structure with ageing. Turner et al (1998) provided a simulation of the global effects of population ageing (focusing both on changing population growth and age structure), using the OECD's international dynamic general equilibrium macromodel MINILINK. Reflecting the declining labour supply with ageing, economic growth is forecast to decline to 0.25% per annum in Japan, 1% in Europe and 1.4% in the United States by around 2030. The slowdown in growth reduces investment needs directly. Furthermore, a decline in the weight of the OECD in the world economy tends to improve OECD current accounts (and hence saving-investment balances) as non-OECD imports rise faster than OECD import demand. The US, Europe and Japan all generate balance of payments surpluses of 2-3% of GDP up to 2025, as saving is initially boosted by the high proportion of high-saving age groups while growth potential and hence investment weaken, thus building up net external assets which help to buttress GNP. They thus build up ownership of global financial claims, including those on EMEs.

On the other hand, eventual downwards pressures on public and private saving are greater in the OECD than elsewhere, generating – in combination with exchange rate appreciation – deficits for the three OECD regions after 2025. The balance of ownership of global financial assets would tend to switch at this point from OECD countries to EMEs. As world investment in this simulation falls less than saving, world real interest rates are expected to rise slightly, reinforcing the decline in investment. Reflecting differing returns on capital, interest rates are higher in Emerging Market Economies (EMEs) than in the OECD. The authors note that higher saving in OECD countries could generate quite different results, with lower real interest rates and consequently higher investment and capital-labour ratios. There would also be greater net external assets, boosting OECD GNP via inflows of interest, profits and dividends[6].

[6] The return on such investments will depend on factors such as labour and product market reforms in the EMEs as well as the overall size of such flows from the OECD (if the flows are sufficiently sizeable, they will depress the return on capital in the EMEs).

McMorrow and Roeger (2003) concur that the EU and Japan will run surpluses for some time, but expect the US to run ongoing deficits, reflecting growth differentials and an assumption that the absorptive capacity of slow ageing EMEs is limited. Their projection, unlike that of Turner et al (1998) thus implies that the bulk of cross-border claims will remain within the OECD region during ageing. They also note that such a continued concentration of capital flows within the OECD is more likely to generate downward pressure on rates of return and a risk of bubbles.

Finally, Batini et al (2006) using a dynamic intertemporal general equilibrium model, again find slower growth and a current account deterioration for the advanced countries as the elderly run down assets in retirement. Interestingly, more rapid productivity growth (in terms of catch-up with the US) can markedly reduce the loss in growth from ageing[7], and related current account imbalances.

8 Conclusions

Summarising the paper, we noted initially that financial structure is intimately related to the stage of development and legal structure of an economy. We then highlighted that, in line with the life cycle, overall personal saving is likely to rise then fall as ageing proceeds, thus impacting on the size of financial claims and overlaying standard patterns of financial development. Existing work also shows that ageing tends to accompany an initial shift into securities followed by a relative shift from equities to bonds, as well as a fall in household debt. There has been extensive work on securities prices and ageing, much of which suggests that ageing will depress equity prices, albeit modestly. Finally, most analysis suggests that ageing will accompany rising current account surpluses in the OECD followed by deficits, largely driven by changes in saving albeit also affected by demographic effects on investment.

Our own empirical work suggests that demographic changes have had a detectable impact on financial structure in both OECD countries and EMEs and will continue to do so in future if current relationships continue to hold. The similar results for the two subgroups suggest that this may indeed be the case (as OECD countries can be viewed as akin to EMEs at a later stage in ageing and economic growth.) Ageing tends initially to benefit equities (as the 40-64 cohort grows) but then as the 65+ cohort becomes predominant, it will rather benefit bond

[7] See Davis (2006) for a review of existing work and new estimates of the age structure impact on productivity, as well as that of pension funding.

markets relative to equity markets. Banking tends to benefit from large 40-64 and 65+ cohorts. Finally, a rise in the 65+ cohort also tends to depress private saving and external balances, albeit not reducing the overall size of the financial sector.

Policy-relevant issues, also necessitating further research that are raised by the effect of ageing on financial market structure include the following:

- What will be the balance between price and quantity effects on financial markets as the asset-demands of the household sector evolve with ageing? If there is a "meltdown" will there be pressure on governments to accept some of the burden of adjustment, notably in the concept of defined contribution pension funds?

- How should government financing evolve to meet the changing demands of the household sector in terms of asset-risk? Should they issue bonds linked to longevity to overcome uncertainty over demographic changes?

- How will companies cope with the changing demand for bonds and equities from the household sector during ageing? Will there be an initial fall in debt-equity ratios followed by a rise – leading to heightened bankruptcy risk at a time when economic growth may also be sluggish? Or could asynchronous demand for bonds and equities by OECD and EME households flatten out this pattern?

- Saving has seen a decline in many advanced countries after financial liberalisation, as household sectors have undertaken heavy borrowing and relied on asset prices (notably house prices) to maintain wealth/income ratios. Can this continue as the population ages, and how will ageing, borrowing and house prices interact?

- Is it plausible that banking sectors will be relatively unaffected by ageing, as implied by the empirical results?

- Will there be difficulties in dealing with major cross border flows, initially from OECD countries to EMEs and later reversed, which are also likely to drive shifts in exchange rates and even financial instability (Davis 2002). Why are such flows not occurring now – but rather it is EMEs that are financing the OECD via foreign exchange reserves? Can EMEs absorb the potential volume of OECD claims in the

short term (cf. McMorrow and Roeger (2003) cited above) – and what are the economic and political implications of major shifts later by EMEs into creditor status, when economic development is much more comparable than it is now? Will cross border EME asset demand help attenuate any pressures cited above for changes in asset prices and composition of assets in OECD countries?

- How should financial regulation adapt to the changing patterns of financial stocks and flows foreshadowed in this work?

- Interaction of changing structure of finance with growth in conjunction with ageing, given that there is an extensive literature on finance and growth (see Beck and Levine (2004) and Davis and Hu (2004) for example), while there is also emerging evidence that ageing may affect growth (such as Davis (2006) who looks at a possible impact on total factor productivity).

- Will past patterns, which were estimated over periods when pension systems were more pay-as-you-go based, change as pension funding becomes more important? Will the switch from defined benefit to defined contribution pension funds change saving, and its composition between debt and equity claims (e.g. as risk bearing households under defined contribution become more cautious)?

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Table 1. Financial structure within EMEs (as of 2003)

Country Name	Private credit by deposit money banks and other financial institutions to GDP	Concentration	Net Interest Margin	Stock market capitalization to GDP	Private bond market capitalization to GDP	Public bond market capitalization to GDP
Argentina	0.118	0.468	0.052	0.624	0.100	0.056
Bulgaria	0.224	0.468	0.044	0.063	n.a.	n.a.
Bolivia	0.486	0.511	0.056	0.173	n.a.	n.a.
Brazil	0.332	0.467	0.120	0.362	0.097	0.426
Chile	0.750	0.591	0.051	0.864	0.194	0.274
Colombia	0.227	0.379	0.061	0.150	0.003	0.253
Costa Rica	0.287	0.591	0.081	0.111	n.a.	n.a.
Czech Republic	0.295	0.702	0.020	0.183	0.072	0.515
Dominican Republic	0.354	0.716	0.139	n.a.	n.a.	n.a.
Ecuador	0.245	0.695	0.074	0.073	n.a.	n.a.
Estonia	0.292	0.982	0.036	0.021	n.a.	n.a.
Fiji	n.a.	n.a.	n.a.	0.342	n.a.	n.a.
Hong Kong, China	1.519	0.703	0.027	3.733	0.189	0.097
Honduras	0.380	0.489	0.081	n.a.	n.a.	n.a.
Hungary	0.378	0.540	0.056	0.174	0.034	0.409
Indonesia	0.219	0.534	0.048	0.204	n.a.	n.a.
Kazakhstan	0.189	0.632	0.057	n.a.	n.a.	n.a.
Korea, Rep.	1.199	0.478	0.027	0.479	0.504	0.183
Sri Lanka	0.276	0.683	0.037	0.119	n.a.	n.a.
Mexico	0.181	0.590	0.068	0.181	0.025	0.203
Malaysia	1.327	0.429	0.025	1.414	0.530	0.363
Pakistan	0.270	0.551	0.033	0.190	n.a.	n.a.
Panama	n.a.	0.347	0.029	0.235	n.a.	n.a.
Peru	0.213	0.820	0.100	0.244	0.038	0.035
Philippines	0.349	0.430	0.033	0.396	0.001	0.280
Poland	0.281	0.419	0.040	0.153	n.a.	0.291
Russian Federation	n.a.	0.225	0.057	0.411	n.a.	0.020
Singapore	1.132	0.964	0.012	1.360	0.231	0.389
Slovak Republic	0.350	0.674	0.034	0.071	n.a.	n.a.
Slovenia	0.392	0.606	0.032	0.207	n.a.	n.a.
Thailand	0.957	0.522	0.026	0.564	0.156	0.210
Ukraine	0.197	0.490	0.053	0.075	n.a.	n.a.
Uruguay	0.503	0.661	0.066	0.017	n.a.	n.a.
Average	**0.464**	**0.574**	**0.052**	**0.440**	**0.155**	**0.250**

Table 2: Financial structure within advanced countries (as of 2003)

Country Name	Private credit by deposit money banks and other financial institutions to GDP	Concentration	Net Interest Margin	Stock market capitalization to GDP	Private bond market capitalization to GDP	Public bond market capitalization to GDP
Australia	0.953	0.664	0.021	0.937	0.341	0.156
Austria	1.037	0.798	0.021	0.172	0.368	0.373
Belgium	0.757	0.830	0.022	0.501	0.394	0.971
Canada	0.989	0.543	0.027	0.885	0.214	0.561
Switzerland	1.559	0.903	0.015	2.080	0.403	0.287
Germany	1.174	0.637	0.030	0.370	0.426	0.378
Denmark	1.483	0.852	0.038	0.485	1.193	0.481
Spain	1.113	0.729	0.028	0.714	0.240	0.445
United Kingdom	1.413	0.427	0.028	1.199	0.389	0.276
Iceland	1.000	0.975	0.021	0.748	1.326	0.158
Italy	0.825	0.405	0.026	0.375	0.439	0.847
Japan	1.046	0.331	0.017	0.601	0.444	1.207
Netherlands	1.515	0.833	0.018	0.876	0.566	0.446
Norway	0.952	0.919	0.021	0.368	0.242	0.173
New Zealand	1.136	0.608	0.024	0.361	n.a.	0.278
Portugal	1.476	0.838	0.034	0.340	0.282	0.464
Sweden	1.022	0.967	0.031	0.776	0.401	0.411
United States	1.736	0.311	0.039	1.175	1.126	0.443
Average	**1.177**	**0.698**	**0.026**	**0.720**	**0.517**	**0.464**

Table 3: Characteristics of financial systems

country	Legal origin	Bank-based	Market-based	Low developed	Antidirector rights
Argentina	F	0	0	1 (B)	4
Australia	CL	0	1	0	4
Austria	G	1	0	0	2
Belgium	F	1	0	0	0
Brazil	F	0	0	1 (M)	3
Canada	CL	0	1	0	5
Chile	F	0	0	1 (C)	5
Denmark	SC	0	0	1 (M)	2
Finland	SC	1	0	0	3
France	F	1	0	0	3
Germany	G	1	0	0	1
Greece	F	0	0	1 (B)	2
Hungary	G	0	0	1 (.)	3
India	CL	0	0	1 (B)	5
Ireland	CL	0	0	1 (B)	4
Italy	F	1	0	0	1
Japan	G	1	0	0	4
Korea (South)	G	0	1	0	2
Malaysia	CL	0	1	0	3
Mexico	F	0	0	1 (M)	1
Netherlands	F	0	1	0	2
New Zealand	CL	1	0	0	4
Norway	SC	1	0	0	4
Portugal	F	1	0	0	3
Singapore	CL	0	1	0	4
South Africa	CL	0	1	0	5
Spain	F	1	0	0	4
Sri Lanka	CL	0	0	1 (B)	3
Sweden	SC	0	1	0	3
Switzerland	G	0	1	0	2
Thailand	F	0	1	0	2
Turkey	F	0	0	1 (M)	2
United Kingdom	CL	0	1	0	5
United States	CL	0	1	0	5

Source, Impavido et al (2003). Key: F: French Origin, G: German Origin, SC: Scandinavian Origin, CL: Common Law
B : Bank-based, M: Market-based financial systems

Table 4A: Estimates of demographic effects on financial structure (size variables) – all countries

	All countries					All countries with financial development variables				
% of GDP	Size	Loans	M3	Equities	Bonds	Size	Loans	M3	Equities	Bonds
GDPPC	**0.099 (7.8)**	**0.0176 (11.5)**	**0.003 (2.4)**	**0.0084 (2.1)**	**-0.0058 (1.8)**	**0.079 (5.5)**	**0.0072 (5.2)**	**-0.0046 (3.3)**	0.0038 (0.8)	-0.005 (1.3)
INFLATION	**0.018 (2.0)**	**0.0031 (2.6)**	0.00031 (0.4)	-0.002 (0.6)	**-0.0059 (2.5)**	0.0074 (0.9)	0.00006 (0.1)	-0.00072 (1.2)	-0.0019 (0.6)	**-0.0063 (2.7)**
URBAN	**0.048 (4.2)**	0.0014 (1.6)	**0.0038 (6.0)**	0.0017 (0.6)	**0.0012 (2.4)**	0.0081 (0.6)	**0.0024 (3.4)**	**0.0036 (5.6)**	-0.0001 (0.1)	**-0.0069 (2.1)**
OPEN	0.0025 (0.7)	**0.0053 (8.4)**	**0.0044 (10.3)**	**0.0092 (6.8)**	0.0014 (1.6)	0.0045 (1.4)	**-0.0014 (2.8)**	0.0006 (1.5)	**0.0094 (6.1)**	**0.0026 (3.0)**
20-39	**-0.093 (4.1)**	**0.0056 (2.7)**	0.0014 (1.0)	-0.0063 (1.0)	-0.0062 (1.1)	**-0.06 (2.6)**	**-0.0014 (2.8)**	0.00004 (0.1)	-0.0002 (0.1)	0.0072 (1.2)
40-64	-0.036 (1.5)	**0.021 (7.7)**	**0.025 (14.2)**	**0.064 (8.5)**	**0.014 (2.3)**	**-0.037 (6.3)**	**-0.0059 (2.5)**	**0.012 (6.1)**	**0.048 (5.6)**	**0.018 (2.6)**
65 +	**0.156 (5.2)**	**0.039 (8.4)**	**0.027 (6.9)**	**0.025 (2.1)**	**0.081 (10.3)**	**0.15 (5.2)**	**0.019 (5.6)**	**0.018 (5.0)**	-0.0082 (0.7)	**0.076 (9.7)**
PFAGDP(-1)						**1.5 (6.3)**	**-0.011 (3.2)**	**-0.23 (6.2)**	**0.98 (9.5)**	**0.38 (6.4)**
BANK GDP(-1)						**0.5 (3.5)**	**0.91 (43.0)**	**0.53 (27.4)**	0.057 (0.9)	0.047 (1.3)
R2	0.93	0.8	0.87	0.71	0.97	0.95	0.93	0.93	0.77	0.97
COUNTRIES	37	71	65	66	37	35	68	62	63	35
OBS	395	2468	2160	1246	419	365	1937	1684	1069	380

Key: SIZE: loans plus bonds plus equities as a share of GDP, LOANS, loans as a share of GDP, M3, ratio of M3 to GDP, EQUITIES, ratio of stock market capitalisation to GDP, BONDS, bond market capitalisation to GDP, GDPPC: Real GDP per capita, OPEN, average of the export and import-GDP ratios, URBAN: urbanisation ratio, 20-39 share of 20-39 age group in total population, 40-64 share of 40-64 age group in total population, 65 + share of age group over 65 in total population, BANKGDP, ratio of bank credit to GDP, PFAGDP, ratio of pension fund assets to GDP

Table 4B: Robustness check using 5-year averages and lags

% of GDP (5 year averages)	Size	Loans	M3	Equities	Bonds
GDPPC (-5)	**0.00004 (2.5)**	**0.00002 (13.5)**	**0.000004 (3.0)**	**-0.00002 (3.6)**	-0.000003 (0.7)
INFLATION (-5)	-0.00002 (0.3)	-0.00001 (0.9)	**-0.00001 (2.0)**	-0.00002 (0.7)	-0.000008 (0.6)
URBAN (-5)	**0.082 (7.4)**	0.00041 (0.5)	**0.0032 (5.4)**	0.00007 (0.1)	-0.0015 (0.5)
OPEN (-5)	**0.007 (1.8)**	**0.0086 (13.1)**	**0.0053 (12.0)**	**0.016 (12.1)**	-0.00044 (0.4)
20-39 (-5)	**-0.13 (5.8)**	0.0032 (1.6)	**0.0035 (2.6)**	0.007 (1.2)	-0.00056 (0.1)
40-64 (-5)	-0.04 (1.3)	**0.029 (10.3)**	**0.034 (17.9)**	**0.086 (9.8)**	**0.019 (2.5)**
65 + (-5)	**0.19 (5.0)**	**0.026 (5.1)**	**0.025 (6.0)**	**0.077 (6.3)**	**0.089 (9.8)**
R2	0.98	0.85	0.9	0.83	0.99
COUNTRIES	35	71	65	65	35
OBS	236	2092	1748	963	272

Key, see Table 4A

Table 5: Demographic effects on financial structure (size variables) – subsets of countries

	EME COUNTRIES					OECD COUNTRIES				
	Size	Loan	M3	Equity	Bond	Size	Loan	M3	Equity	Bond
GDPPC	**0.11 (2.7)**	**0.021 (6.1)**	**0.012 (5.2)**	**0.041 (5.1)**	**-0.023 (3.1)**	**0.1 (5.2)**	**0.018 (8.8)**	**0.006 (3.2)**	**-0.014 (2.3)**	-0.00001 (0.1)
INFLATION	**0.025 (2.6)**	**0.0028 (2.4)**	0.00025 (0.3)	-0.0023 (0.9)	**-0.0055 (3.0)**	**-0.036 (3.8)**	0.05 (0.4)	-0.072 (1.0)	**-1.7 (3.2)**	**-1.1 (4.1)**
URBAN	**0.07 (2.9)**	0.00074 (0.7)	**0.0021 (3.0)**	0.0053 (1.6)	**0.0092 (2.1)**	**0.036 (2.6)**	**-0.0075 (3.6)**	**-0.0015 (1.7)**	-0.0059 (1.1)	**-0.009 (2.1)**
OPEN	-0.004 (0.9)	**0.0067 (9.4)**	**0.0053 (11.5)**	**0.0095 (7.7)**	**0.0024 (2.8)**	0.0065 (0.9)	**0.0025 (1.9)**	-0.0011 (0.9)	**0.011 (3.0)**	**-0.005 (2.5)**
20-39	**-0.08 (1.9)**	**0.019 (6.9)**	**0.0093 (5.1)**	0.0018 (0.3)	**-0.017 (2.2)**	**-0.17 (4.2)**	0.002 (0.5)	**-0.012 (4.3)**	-0.0012 (1.0)	-0.0027 (0.2)
40-64	**-0.17 (2.8)**	**-0.0068 (1.8)**	**0.01 (4.1)**	**0.015 (1.8)**	-0.004 (0.4)	-0.077 (1.1)	**0.045 (8.5)**	**0.024 (7.1)**	**0.14 (8.6)**	**0.041 (2.1)**
65 +	**0.61 (3.8)**	**0.041 (4.9)**	**0.037 (6.6)**	0.023 (0.9)	**0.13 (4.4)**	**0.092 (2.8)**	**0.049 (8.0)**	**0.034 (6.8)**	-0.018 (1.1)	**0.069 (6.8)**
R2	0.93	0.68	0.83	0.79	0.91	0.92	0.83	0.91	0.66	0.95
COUNTRIES	15	48	48	43	15	20	22	16	22	20
OBS	160	1560	1562	714	167	227	900	590	524	244

Key, see Table 4

Table 6: Estimates of demographic effects on financial structure (ratio variables) – all countries

	All countries			All countries with financial development variables		
Percent	Loan Equity	Loan Security	Debt Equity	Loan Equity	Loan Security	Debt Equity
GDPPC	**-0.0033 (2.3)**	-0.0008 (0.3)	-0.4 (1.6)	**-0.0069 (3.7)**	0.011 (0.4)	-0.47 (1.4)
INFLATION	**0.0054 (4.7)**	**0.086 (5.3)**	0.25 (1.4)	**0.0043 (3.9)**	**0.062 (4.8)**	0.13 (0.7)
URBAN	**-0.0052 (5.0)**	-0.031 (1.5)	-0.21 (0.9)	**-0.0041 (3.5)**	**-0.052 (2.1)**	-0.46 (1.6)
OPEN	**-0.0018 (3.4)**	**-0.028 (4.5)**	**-0.38 (5.4)**	**-0.0029 (5.1)**	**-0.033 (5.2)**	**-0.42 (5.6)**
20-39	**-0.0046 (2.1)**	0.018 (0.4)	**1.0 (2.2)**	**-0.0067 (2.8)**	0.012 (0.3)	**1.23 (2.7)**
40-64	**-0.016 (6.0)**	0.032 (0.7)	**1.6 (3.3)**	**-0.017 (5.6)**	-0.028 (0.6)	**1.61 (2.7)**
65 +	**-0.011 (2.6)**	-0.055 (1.0)	-0.61 (1.0)	**-0.0077 (1.7)**	-0.056 (1.0)	-0.45 (0.7)
PFAGDP (-1)				**-0.172 (4.5)**	-0.27 (0.6)	2.25 (0.4)
BANKGDP (-1)				**-0.178 (7.7)**	**0.99 (3.5)**	**5.6 (1.7)**
R2	0.71	0.61	0.41	0.73	0.63	0.41
COUNTRIES	67	36	36	63	35	35
OBS	1219	395	395	1059	365	365

Key, see Table 4, also LOAN/EQUITY, ratio of loans to stock market capitalisation, LOAN/SECURITY, ratio of loans to bonds plus equities, DEBT/EQUITY, ratio of loans plus bonds to equity

Table 7: Demographic effects on financial structure (ratio variables) – subsets of countries

	EME COUNTRIES			OECD COUNTRIES		
	Loan Equity	Loan Security	Debt Equity	Loan Equity	Loan Security	Debt Equity
GDPPC	-0.00021 (0.4)	-0.025 (0.2)	-0.35 (0.3)	-0.0007 (0.5)	-0.009 (0.7)	**-0.39 (2.5)**
INFLATION	**0.0054 (4.3)**	**0.071 (2.9)**	0.27 (1.0)	**0.44 (3.2)**	**0.027 (4.5)**	**20.0 (2.7)**
URBAN	**-0.0073 (4.5)**	**-0.137 (2.2)**	0.13 (0.2)	0.0003 (0.2)	0.012 (1.4)	-0.095 (0.8)
OPEN	**-0.0015 (2.3)**	**-0.028 (2.4)**	**-0.54 (4.1)**	**-0.003 (3.2)**	**-0.018 (4.1)**	**-0.14 (2.7)**
20-39	**-0.0071 (2.0)**	0.17 (1.6)	**2.6 (2.1)**	-0.0004 (0.1)	0.016 (0.6)	0.027 (0.1)
40-64	0.0011 (0.2)	**0.43 (2.8)**	**4.2 (2.4)**	**-0.029 (7.0)**	-0.029 (0.7)	0.1 (0.2)
65 +	**-0.05 (4.0)**	**-1.1 (2.6)**	-7.3 (1.6)	-0.0007 (0.2)	-0.011 (0.5)	-0.22 (0.9)
R2	0.69	0.57	0.33	0.78	0.83	0.77
COUNTRIES	44	15	15	22	20	22
OBS	696	160	160	515	227	227

Key, see Tables 4 and 6

Table 8: Estimates of demographic effects on financial structure (flow variables)

	Private Saving/GDP				External Balance/GDP			
	ALL1	ALL2	EME	OECD	ALL1	ALL2	EME	OECD
GDPPC	0.0006 (0.8)	0.00075 (0.8)	**0.0068 (3.8)**	-0.00023 (0.5)	**0.3 (9.5)**	**0.24 (4.9)**	**0.14 (1.7)**	**0.24 (7.5)**
GROWTHPC	**0.0008 (2.8)**	**0.0006 (2.0)**	0.00031 (0.8)	**0.0026 (6.9)**	**-0.059 (2.9)**	**-0.056 (2.4)**	**-0.09 (3.6)**	**0.09 (2.1)**
INFLATION	0.00043 (1.5)	0.0001 (0.3)	0.00046 (1.3)	**0.063 (3.1)**	0.028 (1.0)	0.03 (1.1)	0.023 (0.7)	**-0.074 (3.8)**
URBAN	**-0.00095 (2.4)**	-0.00067 (1.3)	**-0.0015 (2.6)**	0.0005 (1.1)	0.021 (1.1)	-0.0026 (0.1)	0.039 (1.5)	-0.014 (0.5)
OPEN	**0.001 (4.4)**	**0.0019 (6.2)**	**0.00072 (2.3)**	**0.0015 (4.9)**	0.019 (1.4)	0.013 (0.7)	-0.011 (0.7)	**0.15 (7.2)**
20-39	**0.0045 (5.5)**	**0.0023 (2.2)**	**0.0052 (3.5)**	0.00064 (0.8)	0.0033 (0.1)	0.045 (0.8)	-0.0047 (0.1)	-0.048 (0.7)
40-64	**0.0067 (4.9)**	**0.0048 (2.6)**	**0.0094 (3.7)**	0.0019 (1.6)	**0.021 (3.5)**	**0.029 (3.4)**	**0.37 (3.8)**	0.056 (0.6)
65 +	**-0.011 (5.3)**	**-0.0079 (3.3)**	**-0.022 (4.4)**	**-0.0046 (3.5)**	**-0.59 (5.8)**	**-0.35 (2.8)**	**-0.63 (3.2)**	**-0.41 (4.3)**
PFAGDP (-1)		0.021 (0.9)				-0.22 (0.2)		
BANKGDP (-1)		**-0.031 (2.5)**				**-1.65 (2.1)**		
R2	0.6	0.62	0.53	0.76	0.57	0.6	0.56	0.55
COUNTRIES	59	53	35	22	71	68	48	22
OBS	1398	1103	830	560	2600	1950	1663	928

Key, see Table 4, GROWTHPC annual growth rate of GDP per capita

APPENDIX

List of countries utilised in econometrics:

Emerging market economies	Transition economies	Advanced countries
Algeria	Bulgaria	Australia
Argentina	China	Austria
Bolivia	Croatia	Belgium
Brazil	Czech Republic	Canada
Chile	Hungary	Denmark
Colombia	Kazakhstan	Finland
Costa Rica	Latvia	France
Dominican Republic	Poland	Germany
Ecuador	Romania	Greece
Egypt, Arab Rep.	Russian Federation	Iceland
El Salvador	Slovak Republic	Ireland
Fiji	Ukraine	Italy
Honduras	Vietnam	Japan
Hong Kong, China		Luxembourg
India		Netherlands
Indonesia		New Zealand
Israel		Norway
Jordan		Portugal
Korea, Rep.		Spain
Malaysia		Sweden
Mexico		Switzerland
Morocco		United Kingdom
Nigeria		United States
Pakistan		
Panama		
Paraguay		
Peru		
Philippines		
Singapore		
South Africa		
Sri Lanka		
Thailand		
Tunisia		
Turkey		
Uruguay		
Venezuela, RB		