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Growth of Asian Pension Assets: Implications for Financial and Capital Markets

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Abstract

Pension assets have seen rapid growth world-wide over the past decades, although they suffered large losses during the global financial crisis of 2007–2008. Such growth is notably due to both structural and parametric pension reforms since the 1980s. In the Asian region too, the pension market has steadily expanded. This paper seeks to identify the impact of Asian pension funds on selected key transmission mechanisms from pension reform to financial development. Utilizing a panel error correction model, we found a statistical relationship between pension asset growth and development of financial and capital markets. The main policy implication is that governments in Asia should continue and/or strengthen pension reforms towards more pre-funding of future liabilities, since it brings beneficial impacts on the financial market.

JEL Classification: G23, G28, C54

Contents

1. BACKGROUND

The world is ageing, a trend that can be observed both in developed economies and emerging market economies (EMEs). How to tackle the problem of an aging population is at the top of governments' policy agendas. Over the past decades the trend of social security system reform has been marked by a shift from unfunded schemes, e.g., pay-as-you-go (PAYG), to funded schemes. As a result, pension fund assets have increased markedly across the world (BIS 2007; OECD 2009).

As highlighted in Davis and Hu (2005), pension fund markets in Organisation for Economic Co-operation and Development (OECD) countries have witnessed a noticeable increase in pension assets from 1980 to 2002. For example, United Kingdom (UK) pension assets were equivalent to US$115.6 bn in 1980, accounting for 21.5% of gross domestic product (GDP), but rose to US$ 1.6 trillion (or 73% of GDP) in 2011 (OECD 2011). The same trend could be observed in many other OECD countries. By 2009, total pension fund assets in the OECD countries reached US$16.7 trillion. The United States (US) was the biggest pension market, accounting for more than half of total assets. Two other major countries were the UK and Japan. In terms of pension assets relative to GDP, the Netherlands came in first place with 130% of GDP, while for Greece it was close to zero[1], the smallest of the OECD countries.

In the Asia-Pacific region, pension assets have also grown rapidly. As shown in Table 1a, pension assets in the 10 selected Asia-Pacific countries increased from US$369 bn in 2001 to US$1.7 trillion in 2010, i.e., a four-fold increase over 10 years. The average annual growth rate in the region over the 10-year period was 19.1%, with the People's Republic of China (PRC) showing the fastest growth at 34.5% (see Table 1b). In terms of the pension assets to GDP ratio, Australia came first with 2010 pension assets accounting for 105% of GDP. The other large markets are Malaysia and Singapore, i.e., the two economies with the longest history of pension asset accumulation through their provident pension system. Average pension assets to GDP ratio growth in the 10-country region over the 10-year period was 19.9% in 2001, but by 2010 had increased to 29.9%.

[1] It clearly indicates the huge debt burden borne by the Greek government as highlighted by the recent financial crisis in the country.

Table 1a: Pension Assets in the 10 Selected Asia-Pacific Economies, in US$ million

	AUS	CHN	HKG	KOR	IND	MLY	NZL	PAK	SGP	THL	Total
2001	185,581	3,050	4,618	58,792	618	48,570	11,954	773	51,471	3,573	369,001
2002	200,335	3,812	7,060	74,415	857	53,605	11,157	986	53,850	4,445	410,523
2003	271,430	4,765	11,482	94,410	1,278	58,476	10,140	1,200	59,431	5,747	518,359
2004	387,363	5,956	15,432	116,387	2,352	63,868	10,702	1,401	66,189	6,138	675,788
2005	487,569	8,298	19,462	152,326	3,825	70,030	11,324	1,613	71,971	7,135	833,553
2006	594,375	11,413	26,057	230,926	4,147	78,921	12,797	1,824	79,175	8,467	1,048,101
2007	825,001	19,980	33,941	267,475	5,314	92,193	12,589	2,172	90,629	10,880	1,360,175
2008	695,441	27,502	26,902	213,240	5,790	104,829	12,823	2,193	106,941	11,759	1,207,420
2009	787,733	36,962	39,845	217,416	5,993	113,108	14,736	2,229	114,680	12,508	1,345,210
2010	995,385	41,357	47,037	279,830	7,755	141,090	17,424	2,523	136,331	15,242	1,683,973

Note: see Section 3.1 for sources and country name.

Table 1b: Pension Assets Growth (Annual Growth Rate in %) in the 10 Selected Asia-Pacific Economies

	AUS	CHN	HKG	KOR	IND	MLY	NZL	PAK	SGP	THL	Total
2002	8.0	25.0	52.9	26.6	38.7	10.4	-6.7	27.5	4.6	24.4	11.3
2003	35.5	25.0	62.6	26.9	49.1	9.1	-9.1	21.7	10.4	29.3	26.3
2004	42.7	25.0	34.4	23.3	84.0	9.2	5.5	16.7	11.4	6.8	30.4
2005	25.9	39.3	26.1	30.9	62.6	9.6	5.8	15.2	8.7	16.2	23.3
2006	21.9	37.5	33.9	51.6	8.4	12.7	13.0	13.1	10.0	18.7	25.7
2007	38.8	75.1	30.3	15.8	28.1	16.8	-1.6	19.1	14.5	28.5	29.8
2008	-15.7	37.6	-20.7	-20.3	9.0	13.7	1.9	0.9	18.0	8.1	-11.2
2009	13.3	34.4	48.1	2.0	3.5	7.9	14.9	1.7	7.2	6.4	11.4
2010	26.4	11.9	18.1	28.7	29.4	24.7	18.2	13.2	18.9	21.9	25.2
Average	21.9	34.5	31.7	20.6	34.8	12.7	4.7	14.3	11.5	17.8	19.1

Note: see Section 3.1 for sources and country name.

Table 1c: Pension Assets as % of GDP in the 10 Selected Asia-Pacific Economies

	AUS	CHN	HKG	KOR	IND	MLY	NZL	PAK	SGP	THL	Total
2002	50.4	0.3	4.3	12.9	0.2	53.2	17.0	1.4	59.4	3.5	20.3
2003	57.9	0.3	7.2	14.7	0.2	53.1	11.7	1.4	63.7	4.0	21.4
2004	63.0	0.4	9.3	16.1	0.3	51.2	10.5	1.4	60.5	3.8	21.7
2005	70.0	0.4	10.9	18.0	0.5	50.8	10.2	1.5	58.3	4.0	22.5
2006	79.3	0.5	13.7	24.3	0.4	50.4	11.6	1.4	57.1	4.1	24.3
2007	96.3	0.7	16.4	25.5	0.4	49.4	9.1	1.5	53.9	4.4	25.8
2008	66.9	0.8	12.5	22.9	0.5	47.1	10.9	1.3	60.1	4.3	22.7
2009	85.2	0.8	19.0	26.1	0.4	58.6	11.6	1.4	60.8	4.7	26.9
2010	105.2	0.8	21.0	27.6	0.4	59.3	13.6	1.4	65.3	4.8	29.9
Average	72.3	0.5	11.7	20.0	0.4	52.5	12.9	1.4	59.6	4.1	23.5

Note: see Section 3.1 for sources and country name.

Between 2007 and 2008 the pension market in the Asia-Pacific region shrunk significantly in terms of both absolute and relative indicators, largely due to the financial crisis in that period. For example, the mandatory provident fund in Hong Kong, China saw assets falling from US$33 bn in 2007 to US$26bn in 2008, a drop of nearly 21%. Similar declines could be seen in Australia and the Republic of Korea. But by 2010 the financial losses incurred during 2007–2008 had been more than recovered, exceeding pre-crisis levels.

Pension funds are highly likely to continue their rapid expansion in the coming decades. A major question arising from such large volumes of assets across many countries is how and to what extent they will affect financial and capital markets. It is widely held that pension reforms which introduce elements of funding tend to have a positive impact on financial market development, as they improve the functioning of financial markets (Merton and Bodie 1995; Davis and Steil 2001). For example, the financial systems' function of managing uncertainty and controlling risk has been strengthened by pension fund growth, because pension fund managers as portfolio professionals have greater expert knowledge than individual investors. Academics, however, do not always share such this view. For example, Lakonishok et al. (1992) and De Long et al. (1990) argued that institutional investors, e.g., pension funds are engaged in positive feedback trading and/or "herding behavior", thus potentially destabilizing equity markets. They argue that institutions are positive feedback traders, meaning they buy when or before prices rise, and sell when or before prices fall, resulting in deviations of share prices from fundamental values. This effect is exaggerated by "herding behavior", meaning institutions have strong incentives to follow alongside the market sentiment or movements regardless of whether such investment decisions are rational and consistent with economic fundamentals.

Empirical research investigating the relationship between growth of pension assets and economic growth and financial development (Walker and Lefort 2002; Hu 2006a; Davis and Hu 2008) has so far failed to focus on Asian countries. This lack of research is surprising given the expected rapid growth of Asian pension assets over the coming decades, and the increasing role of Asia in the global economy.

Current empirical work relates mostly to either developed economies, e.g., OECD countries, or selected EMEs (Chan-Lau 2004), e.g., Chile. This focus means findings may not apply to developing economies. Developed and developing economies are at different stages of development so the impact of pension funds growth will differ. Diamond (1995), for example, suggests that, the contribution of funding to financial sectors is zero for OECD countries, although it is potentially relevant in transitional and developing economies, for example in Asia.

A further criticism shortcoming the existing literature is that work on pension reform often focuses on only one country and fails to make a distinction between short- and long-run effects. In this paper we seek to address this shortcoming by using a panel error correction model which considers long-term and short-term relationships. Panel analysis is statistically more accurate and considering a single reform in a single country dos not have statistical significance.

By using a larger dataset and consistent up-to-date methodologies, we identify the impact of pension funds on selected key transmission mechanisms from pension reform to financial development. Our main purpose is to ensure consistency and comparability of the results, and to ensure that the hypotheses of a link between pension funding and financial development can stand up to more rigorous testing.

The remainder of this paper is divided into three parts. Section 2, a review of the literature, presents the main findings from existing studies ("frontier of knowledge") and identifies its main shortcomings of existing literature. After presenting data and variables in Section 3 and econometric specifications in Section 4, empirical work is undertaken to investigate how and to

what extent pension funds and financial development are linked together in Section 5. Section 6 concludes the paper and presents policy implications.

2. LITERATURE

2.1 Pension funds and financial development

Besides the question of whether pension reform boosts savings, one can view pension reform more broadly as aiding financial development, which may also stimulate economic growth. Extensive empirical work (e.g., Levine and Zervos 1998) has suggested that financial development aids growth, and in particular that equity market development has a positive effect on growth.

A quantitative impact of the development of pension funds on capital markets may arise mainly from differences in behavior from the personal sector. Pension funds in most cases hold a greater proportion of equities and bonds than households do. These differences can be explained partly by time horizons—for households these are relatively short, whereas for pension funds they are relatively long as they tend to hold portfolios with long-term assets yielding the highest returns. But given their size, pension funds also have a comparative advantage in compensating for risk by pooling and diversifying across assets with imperfectly correlated returns—an advantage linked also to lower transactions costs for large deals and their ability to invest in large indivisible assets such as property. Unlike banks, they tend to rely on public rather than private information when choosing investments and hence seek relatively liquid assets (i.e., securities rather than loans). Owing to economies of scale, specialization, links to investment banks. etc., the information available to pension funds tends to be superior to that of private individuals.

The implication is that, even if savings and wealth did not increase, a switch to pre-funding the future liabilities could increase the supply of long-term funds to capital markets. There may be increases in the supply of equities, long term corporate bonds and securitized debt instruments and a reduction in bank deposits, so long as individuals do not adjust the liquidity of their portfolios to fully offset effects of growth of pension funds, and so long as the macroeconomic environment favors long-term financing.

Catalan et al. (2000) sought to identify whether there is a Granger-causality relation between capital markets and contractual savings, which would reflect the above mechanism explaining the different behavior of households. They use two capital market indicators, stock market capitalization and stock market value traded across 26 countries, of which six are developing countries. They show that contractual savings institutions, e.g., pension funds, Granger-cause capital market development. The potential benefits of developing contractual saving sectors are, unsurprisingly, stronger for developing countries than for developed countries. Although they find a Granger causality relationship between contractual savings and the stock market, their estimation suffers from a low number of observations. For example, for the causality regression on Austria, they only have six observations, which is implausibly few. Therefore, their results need to be cross-checked by empirical work with more observations.

A more recent study by Meng and Pfau (2010) looked at the linkage between pension assets and capital market indicators across 32 countries. They found that, in general, pension assets have a positive impact on the stock market in terms of depth and liquidity. However, when the regressions are run by dividing the dataset into groups by level of financial development, the relationship is only statistically significant for those more developed countries.

There may also be impacts on prices; a panel study focusing on 33 EMEs by Walker and Lefort (2002) found that pension fund growth is accompanied by a decrease in dividend yield and an increase in the price to book ratio, implying a drop in the cost of capital. This result is robust when pension funds are proxied by four sets of variables, i.e., a) a dummy variable, b) the share of stocks in pension fund portfolios, c) the ratio of pension investment in stocks and private bonds to total market capitalization, and d) the ratio of pension fund assets to GDP. A more recent study (Hu 2006a) shows a positive effect of growth of pension assets on equity prices across OECD economies and EMEs. Hu (2006a) looked at the relationship for both the short-run and the long-run. For example, it was found that a 1% increase in the pension assets to GDP ratio in OECD countries would result in an increase in equity prices of 0.3% in the short-run and 0.1% in the long-run. Similar results are observed for EMEs, but the effect is stronger. One reason explaining this difference might be the smaller market size in EMEs, making it easier for pension funds to influence prices.

In terms of bond markets, in recent years governments have tried to attract foreign pension funds by modernizing the infrastructure of their public bond markets as well as facilitating private bond issuance. In a cross-country study, Impavido et al. (2003) found a positive relationship between contractual saving assets and bond market capitalization/GDP for 28 countries, whereby a 1% increase in the former leads to a 0.4% rise in the latter. They use the generalized method of moments (GMM) dynamic panel approach in their paper, which is an improvement on earlier studies by other authors. However, their study has some shortcomings. First, they use the value of aggregate outstanding public and private bond issuance to proxy bond market development, when the former is driven by government needs. Second, separate regressions on developed and developing countries ought to be conducted, in order to discern whether such impacts of contractual savings are identical across countries. Third, differences between the long-run and short-run effects might be a concern for policymakers.

Such overall shifts toward long-term assets should reduce the cost of and increase the availability of equity and long-term debt financing to companies, and hence should raise productive capital formation. Particularly, existing firms with small equity bases may be able to gain important competitive advantages from equity issuance in terms of growth potential, as well as reducing their risk of financial distress in case of an economic downturn. Economically efficient capital formation due to the ready availability of bond or equity financing could in turn raise output and grow "endogenously", independent of a change in savings (Holzmann 1997). Higher growth will feed back to savings. "Endogenous growth" effects of more efficient capital investment in labor productivity may be particularly strong in developing economies if a switch from pay-as-you-go to funding induces a shift of labor from the labor-intensive and low productivity "informal" sector to the capital-intensive and high productivity "formal" sector (Davis and Hu 2005).

Apart from inducing a shift to longer-term assets, funding also increases international portfolio investment, if the latter is permitted. On the one hand, international investment may be seen as a loss of potential in terms of developing domestic capital markets. On the other hand, by generating inflows of profits, interest, and dividends, offshore asset holdings could actually contribute to greater stability of national income (Fontaine 1997). This may in turn benefit growth, since fixed investment responds negatively to uncertainty. Meanwhile, pension funds could achieve a higher return for a given risk when invested globally compared with purely domestic investment, as found by Hu (2006b).

Apart from such quantitative effects, the development of pension funds is also likely to trigger qualitative developments in financial markets, which may benefit growth through more efficient resource allocation. Such qualitative developments are in general subject to positive externalities as, once instituted, other investors may also benefit from them. Apart from

corporate governance, the effects of pension asset growth on qualitative developments are not easily validated by means of direct econometric analysis, but may be part of the transmission, e.g., of pension asset growth to financial development and economic growth. One qualitative improvement is financial innovation, which in the early stage of financial development may include development of equity markets, junior markets, as well as markets for corporate bonds, securitization, certificate of deposits (CDs), derivative markets, and indexed instruments. In OECD countries, pension funds' need for hedging against shortfalls of assets against liabilities has led to the development of a number of recent financial innovations such as zero coupon bonds, index futures, and a longevity index. Similarly, “immunization strategies” and the development of indexation strategies by and for pension funds have increased demand for futures and options.

Modernization of the infrastructure of securities markets, as required by pension funds, should entail improved clearing and settlement on the one hand, and provide more sensitive price information, on the other, thus improving resource allocation. This may help to reduce the cost or increase the availability of capital market funds, thus aiding industrial development and growth per se, as well as facilitating privatizations. In developing countries, the influence of pension funds may be seen in terms of the development of the overall market infrastructure (such as trading and settlement systems) and greater liquidity. In OECD countries, given their focus on liquidity and lesser emphasis on investor protection, pension funds offer benefits to wholesale equity markets, as opposed to heavily regulated retail markets. They are footloose in their trading, thus making the business of trading “contestable” rather than monopolistic, facilitating its concentration. Increased pension-funding would raise the proportion of “wholesale” trading activity willing to translocate. It would also put pressure on cartels in bond issuance and on price fixing in equity trading.

With pension funds pressing for improvements in the "architecture of allocative mechanisms", important indirect benefits may include better accounting, auditing, brokerage, and information disclosure. The development of modern banking and insurance supervision, new securities and corporate laws, junior equity markets and credit rating agencies will also be stimulated. Such improvements are crucial for financial development and growth more generally.

Development of equity markets and them being dominated by pension funds would have implications not just for companies’ balance sheet structure—with potentially lower debt-equity ratios—but also for corporate governance, resulting in a greater degree of corporate control by capital markets in general and pension funds in particular. In this context, the "corporate governance movement" in OECD countries reflects dissatisfaction among pension funds with the costs involved in the merger and acquisition (M&A) transactions, and their preference for direct influence as equity holders over incumbent management (Clark and Hebb 2002). It also links to indexation by large funds, which seek to improve the performance of firms they have to hold, as well as more generally where pension funds are very large and cannot readily sell their participations without significant market movements against them[2]. In practice, however, the scope of "direct influence" is limited in most EMEs.

There is a growing literature on the impact of pension funds’ corporate governance initiatives on performance, albeit mainly focusing on the effects on share prices per se (rather than underlying efficiency or productivity). Positive results may be favorable to economic growth via efficiency gains. For example, on the positive side, Wahal (1996), in a sample of 43 cases, found that efforts by institutional investors to promote organizational change via negotiation with

[2] It refers to cases where a pension fund holds a large share of a publicly listed company. If the pension fund decides to sell a large amount of the shares in the market, which normally would lead to a big drop in the share price, the total value of the shares held by the pension fund may drop significantly.

management (as opposed to proxy proposals) are associated with gains in share prices. On the negative side, Del Guercio and Hawkins (1999) found no evidence that activism had a significant effect on stock returns over the three years following the proposals. Evidence from outside the US on the effectiveness of corporate governance initiatives is sparse, but Faccio and Lasfer (2000) show that the monitoring role of UK pension funds is concentrated among mature and low-performing firms. Furthermore, in the long run, the firms in which pension funds have large stakes markedly improve their stock returns.

All of these studies are based on micro evidence and hence only indirectly bear on the issue of whether pension funding affects growth at a macro level. Davis (2004) undertook macro work based on the share of equities held by pension funds and life insurers in national markets. The results, he argued, are complementary to micro work if the view is taken that the effects of takeovers, institutional activism, etc. are not just apparent in the performance of targeted firms but also in the wider economy. This may plausibly be the case if managers of "unaffected" firms nonetheless change their behavior in response to the threat of such action. Davis found results consistent with a disciplining role of institutions in the Anglo Saxon countries, particularly life insurers and pension funds. They exert restraint of investment, and lead to a boost in dividends and Total Factor Productivity. The trend for corporate use of equity to rise, for equity shares of institutions to increase, and for traditional corporate governance structures to break down in continental Europe and Japan, suggests these results could hold there in the future, as well as in EMEs.

More recent research (Davis and Hu 2008) provides similar results to Davis (2004). In their paper, Davis and Hu (2008) employed a modified Cobb-Douglas production model with pension assets as a shift factor. After experimenting with a range of different econometric specifications, as well as a large dataset covering 38 countries, they found that the pension assets to GDP ratio affects output per head, both significantly and statistically. Such effects are consistently larger for EMEs than for OECD countries, thus indicating the catch-up effects relating to economic development.

2.2 Potential costs of pension fund growth for financial markets

An aspect that could weaken the growth-benefits of funding is if pension funds reduce liquidity and raise price volatility in securities markets. In normal times, pension funds, being willing to trade and having good information and facing low transactions costs, should tend to speed the adjustment of prices to fundamentals. Such market sensitivity generates an efficient allocation of funds, and acts as a useful discipline on lax macroeconomic policies. Furthermore, the liquidity that institutional activity generates may dampen volatility, as is suggested by lower average share price volatility in countries with large institutional sectors. Evidence on average day-to-day asset price fluctuations shows no tendency for such volatility to increase (Davis and Steil 2001).

Consistent with this, Walker and Lefort (2002) found that pension fund growth reduces security price volatility for 33 EMEs. This negative link between pension funds and market volatility might be justified by the large investors' ability to access more information, thus restraining prices from deviating too far away from fundamentals. In contrast, Hu (2006) found results supporting a positive linkage between growth of pension assets and equity price volatility in both the short run and the long run. His dataset covers 24 countries, i.e., 16 OECD countries and 8 EMEs, with the longest observation period from 1960 to 2004. Furthermore, the results are consistent across different sub-groups, namely separately on OECD countries and EMEs.

An earlier study by Davis (2004), using a dataset covering both pension and life insurance assets across G-7 countries, showed a positive link between equity price volatility and share of equity held by pension funds and life insurance across both Anglo-Saxon countries and continental European countries and Japan (CEJ). He notes, however, that such a link might reflect a shift in sectoral holdings of equities rather than institutional holdings per se.

Besides these average patterns, periodically some unfamiliar systemic risks may arise in financial systems dominated by pension funds and other institutional investors, about which regulators need to learn, and which will not be captured by econometric assessments depicting long-term average behavior (Davis and Steil 2001). One is extreme price volatility after a shift in expectations and asset allocations (such as the 1987 stock market crash and the 1992 European Exchange Rate Mechanism (ERM) crisis). Another is a protracted collapse of market liquidity and issuance after similar portfolio shifts (as for Russia/ Long-Term Capital Management (LTCM) in 1998). Such periodic market-crisis events were characterized, inter alia, by features such as heavy involvement of pension funds in both buying and selling waves, international investment, and signs of overreaction to the fundamentals and excessive optimism prior to the crisis. Underlying factors appear to be influences on fund managers that induce herding behavior. In countries such as Chile, "herding" may also be stimulated by regulations which require pension funds to obtain similar returns.

Banking is widely seen as essential to growth (Beck and Levine 2004). By leading to disintermediation, growth of pension funds is likely to entail increased competition for the banking sector, as funds that used to be deposited in banks go to capital markets via pension funds. Effects can also be positive. Davis and Tuori (2000) suggest that banks across OECD countries have increased their fee-earning ability, following financial deregulation and competition from other institutions (including pension funds). They have benefited from growth of pension funds, e.g., by offering asset management services. For example, the ratio of non-interest income/asset increased from 0.9% in 1984–1987 to 1.0% in 1992–1995 for European Union (EU) countries, while the corresponding figures for the US were 1.3% and 2.1%. Such competition may lead to heightened efficiency of banks, thus aiding economic development. Consistent with this, Impavido et al. (2001a) show that contractual savings in developed and developing countries on aggregate have a positive effect on bank profitability and a negative effect on net interest margins. Another paper by the same authors (2001b) looks at the linkage between contractual savings and firms' financing choices, and they found that growth of contractual savings decreases firm's leverage (debt/equity) in market-based economies, and increases maturity of debts in bank-based economies; both of the above effects are beneficial to the firms and banks which lend to them, since firms' resilience to outside shocks is enhanced given the improved financing structure.

Disintermediation, however, may also help to generate banking problems; the lessons of history from OECD countries suggest a need for vigilance, particularly if disintermediation coincides with deregulation and hence heightened competition within the banking sector. This is because disintermediation historically led to increased risk-taking via aggressive balance sheet expansion (e.g., by lending to property developers) with risk premiums which in retrospect proved to be inadequate.

Hence, whereas existing empirical work shows that institutionalization, i.e., the growth of institutional investors, affects the banking industry positively on balance, existing econometric studies remain open to further questions. In particular, is the impact of institutional investors on the banking industry homogeneous across all countries? In addition, what are the long run and short run effects and are they the same?

In this context, a relative shift of financing from banks to pension funds could be of concern, even if it does not generate banking crises, because there is evidence that pension funds are reticent in investing equity in small firms, despite the fact that small firms' potential for innovation, growth, and job creation is widely seen as crucial for economic growth[3]. For example, Sias (1996) shows that institutional holding of the largest US firms is over 47% on average over 1977–91, and for the smallest only 8%. The consequence of the neglect of small firms by pension funds (assuming individual investors do not fill the gap) may be biases in the economy towards sectors with larger firms (for even if small firms can obtain bank loan finance, growth potential via debt is likely to be more restricted than with equity in addition). This may be contrary to the comparative advantage of the economy as a whole. It suggests a need for venture capital funds, junior equity markets, and appropriate pension fund regulation, as well as an ongoing role for banks. Interestingly, it has been observed that partly due to pressure to increase returns and reduce risk, pension funds have been paying increasing attention to and even invested in alternative investment vehicles, e.g., private equity—which has closer link with SMEs.

As is the case for excess volatility as outlined above, regular performance evaluation of pension fund managers by trustees is said to underpin the short-termist hypothesis, (entailing under-valuation of firms with good earnings prospects and willingness of funds to sell shares in take-over battles). This in turn is held to discourage long-term investment or research and development (R&D) as opposed to distribution of dividends, which would imply a suboptimal transfer and allocation of resources.

3. DATA

3.1 Data and variables

In this paper, we use macro-economic and financial data across a selection of 10 Asian and Pacific economies, namely, Australia; the PRC; Hong Kong, China; India; the Republic of Korea; Malaysia; New Zealand; Pakistan; Singapore; and Thailand.

3.1.1 Pension fund assets

Pensions is a generalized term, and could refer to social security funds, occupational pensions (mandatory and voluntary), individual pensions, among others, while in many existing papers such differences are ignored. In order to ensure consistency—which is important for a cross-country study—we define pensions in our paper as occupational pensions, namely employment-based pensions. We collect the following pension data for each of the 10 economies:

Australia (AUS): Superannuation

The PRC (CHN): Enterprise annuity

Hong Kong, China (HKG): Mandatory provident fund

The Republic of Korea (KOR): National pension service

[3] This tendency may link to illiquidity or lack of marketability of shares, levels of risk that may be difficult to diversify away, difficulty and costs of researching firms without track records and limits on the proportion of a firm's equity that may be held. The development and improvement of stock markets for small company shares is one initiative that may make such holdings more attractive to pension funds.

India (IND): Employees' provident fund

Malaysia (MLY): Employee provident fund

New Zealand (NZL): Kiwi saver fund

Pakistan (PAK): EOBI fund

Singapore (SGP): Central provident fund

Thailand (THL): government pension fund

Our pension variable in the regression is the pension assets/GDP ratio, and all pension fund assets data are collected from the official websites and the OECD Global Pension Statistics. GDP data for each country is collected from the World Development Database (World Bank 2009).

3.1.2 Other data

The empirical work looks at the impact of pension fund assets on financial and capital markets in three areas—the banking industry, the stock market, and the bond market.

Regarding the banking industry, we use two indicators to measure the size and efficiency of the industry, respectively. One is DBACBA, i.e., deposit money bank assets relative to the sum of deposit money bank assets and central bank assets. This ratio measures the extent to which deposit money banks play a role in the financial system; normally the higher the DBACBA ratio, the more developed the banking industry. The other one is NETINTMARGIN, i.e., a bank's interest revenue as a share of its interest bearing assets. Banks with a low net interest margin are under greater pressure to look for other income sources, the underlying logic of which is to find out whether pension fund growth implies a decline in the bank's profits generated from traditional interest revenue due to competition from pension funds.

Concerning the stock market, we employ stock market capitalization to GDP (STKCAP), stock market total value traded to GDP (STKTRD), and stock market turnover (STKTNV), which are the most commonly used stock market indicators (Levine and Zervos 1998). In this way, three different aspects of the stock market, i.e., size, efficiency, and activity can be examined. Previous work only focused on one aspect of the stock market; e.g., Walker and Lefort (2002) investigated the impact of pension assets on total value traded, while Catalan et al. (2000) focused on market capitalization and total value traded.

Regarding the bond market, public bond market capitalization to GDP (PUBBND) and private bond market capitalization to GDP (PRIBND) are employed. Most attention should, however, be focused on estimation results of the private bond market. This is because public bond issuance will often increase "automatically" following pension reform towards funded systems if the government chooses debt financing to make up the implicit pension debt (Holzmann et al. 2004).

Regarding other explanatory variables in this empirical work, a number of control indicators are employed as shown in Table 2a. If these were omitted, any effect of pension funds we detect would be subject to omitted variable bias. The inflation rate (INFL) and real interest rate (INT) are used to proxy macro-economic conditions. INFL is measured by the annual percentage change in the consumer price index, while the real interest rate is the nominal interest rate minus the corresponding inflation rate. In addition, one indicator (i.e., GDP) is used to proxy economic growth. Lastly, two indicators are used to take into account the financial development, i.e., LLGDP (liquid liabilities as % of GDP), and PCRDBGDP (private credit provided by deposit money bank as % of GDP).

Table 2a: Variable Summary, Definition, Sources, and Observation Period

Group	Variable	Definition	Source
Pension assets	PFAGDP	pension fund assets/GDP, %	Various
The banking industry	DBACBA	Deposit money bank assets as % of the sum of deposit money and central bank assets	WDI (2011); BDL (2010)
	NETINTMARGIN	a bank's interest revenue as a share of its interest bearing assets	WDI (2011); BDL (2010)
Stock market	STKCAP	Stock market capitalization to GDP	WDI (2011); BDL (2010)
	STKTNV	Stock market turnover ratio	WDI (2011); BDL (2010)
	STKTRD	Stock market total value traded to GDP	WDI (2011); BDL (2010)
Bond market	PRIBND	Private domestic debt securities issued by financial institutions and corporations, % of GDP	WDI (2011); BDL (2010)
	PUBBND	Public domestic debt securities issued by government, % of GDP	WDI (2011); BDL (2010)
Other	PCDDBGDP	Private credit provided by deposit money bank as % of GDP	WDI (2011); BDL (2010)
	LLGDP	Liquid liabilities as % of GDP	WDI (2011); BDL (2010)
	INFL	Inflation, consumer price index (%),	WDI (2011); BDL (2010)
	INT	Real interest rate (%)	WDI (2011); BDL (2010)
	GDP	GDP	WDI (2011); BDL (2010)

Sources: Pension data: various sources, mainly national official sources and the OECD Global Pension Statistics. All other data are from WDI (World Development Indicators database 2011) and BDL (Financial Structure database; Beck, Demirguc-Kunt and Levine 2010).

Most of the macro-data above is obtained from the Financial Structure database (Beck, Bemirguc-Kunt, and Levine 2010) and World Development Indicators (2009).

3.1.3 Panel unit root test

Before proceeding with any type of formal panel regression analysis, as highlighted in studies of financial development and economic growth (e.g., Beck and Levine 2004), we need to examine the data's stationarity.

There are a number of ways to test panel data's stationarity (Maddala and Wu 1999; Baltagi 2001). Two methods are commonly quoted and used in the literature, i.e., one designed by Levin, Lin, and Chu (2002) (hereafter LLC), and the other by Im, Pesaran, and Shin (2003) (hereafter IPS).

Consider the following model

$$y_{i,t} = \rho_i y_{i,t-1} + X_{i,t}\delta_i + \varepsilon_{i,t} \quad i = 1,...N : t = 1,...T \qquad (1)$$

where y is the variable of interest; X is the vector of exogenous variables, including fixed effects and/or a time trend, or simply a constant, based on the modelers' assumptions. $\varepsilon_{i,t}$ are i.i.d. $(0, \sigma_\varepsilon^2)$. As customary, t proxies time, while i proxies country.

The principal difference between LLC and IPS is the assumption made on ρ_i. LLC proposes that $\rho_i = \rho$, implying the coefficient on the lagged dependent variable in Equation 1 is the same across countries, while under IPS, ρ_i is allowed to vary across countries. Given that in this sample both OECD countries and EMEs are included, greater emphasis is put on the latter test, i.e., IPS (2003), as there might be heterogeneity across countries.

Both LLC and IPS tests are an extended version of the time series' Augmented Dickey-Fuller test (ADF) into the context of panel data. The formulations for LLC and IPS are as follows:

$$\Delta y_{i,t} = \alpha y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{i,j}\Delta y_{i,t-j} + X_{i,t}\delta_i + \varepsilon_{i,t} \quad \text{i = 1…N; t= 1…T Specification for LLC} \qquad (2a)$$

$$\Delta y_{i,t} = \alpha_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{i,j}\Delta y_{i,t-j} + X_{i,t}\delta_i + \varepsilon_{i,t} \quad \text{i = 1…N; t= 1…T Specification for IPS} \qquad (2b)$$

Regarding the above two equations, it is assumed that the y series follows the AR(p) process and therefore p lagged difference terms of the dependent variable y are added on the right-hand side of the equations. The optimal lag order (p_i) is allowed to vary across countries, and $\beta_{i,j}$ is the coefficient on lagged difference terms of the y series. When checking stationarity of the y series, LLC tests the null hypothesis of α =0 (Equation 2a), while IPS is testing that of α_i =0 for all i (Equation 2b). In addition, for the IPS test, t-bar statistics are used, which are formed as a simple average of the individual t statistics for testing α_i =0 in Equation 2b, namely

$$t - bar_{NT} = N^{-1}\sum_{i=1}^{N} t_{iT} \qquad (3)$$

In this study, we mainly rely on the IPS test given its greater relevance to our cross-country dataset. Results for the panel unit root tests on logs of variables are given in Table 2b, where

test results for all variables used in this paper are presented. According to the IPS test, NETINTMARGIN, INFL, and INT are stationary, while the other variables (except PRIBND) are non-stationary in levels, but become stationary after first-differencing.

Table 2b: Panel Unit Root Test (Probability) on VVariables

Variable	Level	First difference
PFAGDP	0.917	0.000***
DBACBA	0.211	0.000***
NETINTMARGIN	0.000***	n.a.
STKCAP	1.000	0.022**
STKTRD	1.000	0.000***
STKTNV	0.883	0.000***
PUBBND	1.000	0.000***
PRIBND[a]	0.396	0.000***
GDP	1.000	0.000***
LLGDP	0.999	0.000***
PCRDBGDP	1.000	0.000***
INFL	0.000***	n.a.
INT	0.000***	n.a.

Note: IPS, Im, Pesaran and Smith (2003). This method is based on null hypothesis of unit root. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%. a) PRIBND becomes stationary after second difference.

4. ECONOMETRIC SPECIFICATION

In order to assess the extent to which pension fund assets are correlated to economic growth, we use the panel error correction model (PECM). The advantage of this model is its ability to identify the short- and long-term relationships simultaneously between economic variables (Banerjee, Hendry, and Smith 1986) as well as testing the co-integration hypothesis with the presence of significant lagged level terms (Pesaran and Shin 1995). This technique was originally popularized by Davidson et al. (1978), and widely used by researchers (Barrell and Davis 2004; Hu 2006), but has never been used in the Asian context. Hence the application of this technique in the Asian context is an advance on previous studies.[4]

The model specification is as follows:

[4] Some caveats in interpreting the results: I am aware that the PECM employed in this paper aims to find the correlation relationship between the explanatory and dependent variables, or whether the former has any impact or explanatory power on the latter. Such correlation does not necessarily imply a causal relationship between variables. Ideally, we could run the causality test, e.g., the Granger causality test to identify the causality direction between variables to complement the results from the PECM; however, unfortunately due to limitation of annual pension data in many of the sample countries, the results according to our tentative regressions were not satisfactory, therefore disregarded herein. However, if data permits in the future, it would be very interesting to identify the causality relationship between pension assets and financial market development.

$$DLog(Y) = \beta_1 DLOG(PFAGDP)_{i,t} + \beta_2 DLOG(X1)_{,it} + \beta_3 DLOG(X2)_{,it} + \beta_4 ECM_{i,t-1}$$
$$\beta_5 LOG(PFAGDP)_{i,t-1} + \beta_6 LOG(X1)_{i,t-1} + \beta_7 LOG(X2)_{i,t-1} + \varepsilon_i + \upsilon_{i,t} \quad (1)$$

$$ECM_{i,t-1} = LOG(Y_{i,t-1}) - \lambda_1 LOG(PFAGDP_{i,t-1}) - \lambda_2 LOG(X2_{i,t-1}) \quad (2)$$

D is the first difference, and LOG is the natural logarithm. Subscript (i) is the country dimension, while subscript (t) is the time dimension. Y is a vector of dependent variables, e.g., DBACBA and STKCAP. X1 represents the macro-stability indicators, i.e., INFL and INT. X2 is a vector of other variables which we believe are determinants of the dependent variables, e.g., GDP.

ECM, as the error correction model, is the central term in the regression, which measures the speed of convergence from short run to long run equilibrium. It is noted that the values of the ECM term should be negative if there is a co-integration relation. Coefficients of DLOG variables show the short run relationship, while those of LOG variables show the long run relationship. Note that INFL and INT are stationary, so we use the level terms of these two variables in line with Hu (2006). Moreover, it is also not included in the term ECM_{it}, as it is I(0) variable and should not affect the co-integration test (Demetriades and Luintel 1996) (See Table 2b for results of panel unit root tests).

The methodology is cross-section weighted generalized least squares (GLS), and the intercept is specified as a fixed effect. We believe that the fixed-effects model is more appropriate than the random-effects model, in that pooling data together across the selected Asia and Pacific countries indicates the importance of removing the individual heterogeneity effect, in light of their different stages of economic and financial development.

Furthermore, in order to consider the hypothesized differentiating impacts of pension asset growth on financial and capital markets across countries, our estimations are split into three groups—ALL (all 10 countries), MDE (more developed economies), i.e., Australia; Hong Kong, China; the Republic of Korea; Singapore; and New Zealand, and LDE (less-developed economies), i.e., the PRC, India, Malaysia, Pakistan, and Thailand.

5. EMPIRICAL WORK

Compared with the study of the impact of pension assets on economic growth, the relationship between pension assets and financial markets has been investigated quite extensively, as discussed in the literature survey (e.g., Catalan et al. 2000; Walker and Lefort 2002). In this section, we seek to advance the literature by revisiting this same issue, but in the Asia-Pacific context and with more robust econometric specifications. As noted earlier, the estimations are split into three groups, i.e., ALL, MDE, and LDE, to seek to identify the possible heterogeneous impacts across countries.

5.1 Impact on the banking industry

Results regarding the impact of pension fund assets/GDP on deposit money banks are given in Table 3. The coefficient on DLOG(PFGDP) is statistically significant at 5% in the All and LDE regressions, which suggests that pension asset growth does have a short-term impact on the relative size of deposit money banks, and that such an impact would be negative, although this is not applicable to the more developed countries. The coefficient on LOG(PFGDP) is also negative and statistically significant. It means that pension fund growth in the long run

negatively impacts deposit money banks in the overall financial system, which may be a demonstration of the competitive role played by pension funds in financial intermediation.

Table 3: Panel Error Correction Model Estimation for Difference of Log of DBACBA

	ALL	MDE	LDE
C	0.052349	-0.002519	-0.113338
DLOG(PFAGDP?)	-0.016841**	-0.003574	-0.052877**
DLOG(LLGDP?)	0.006046	-0.022609	0.027605
DLOG(PCRDBGDP?)	0.018634	0.023262	0.007711
DLOG(GDP?)	0.015726*	0.023146	0.008170
RESID?(-1)	-0.375986***	-0.458713**	-0.336770*
LOG(PFAGDP?(-1))	-0.380520***	-0.458350*	-0.360226*
LOG(LLGDP?(-1))	-0.352544***	-0.442479*	-0.319861**
LOG(PCRDBGDP?(-1))	-0.381628***	-0.470793*	-0.348099*
LOG(GDP?(-1))	-0.378579***	-0.458707*	-0.336057*
LOG(INFL?(-1))	0.000572	0.001604	-0.003383
LOG(INT?(-1))	-0.000433	0.000178	-0.001787
Adjusted R-bar squared	0.442295	0.309897	0.510522
Standard errors of regression	0.010300	0.008468	0.011829
No. of observations	98	54	44

Note: D first difference and L log; see Table 2a for variable details. MDE = more developed economies, LDE = less developed economies; see the main text for details. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%.

As for other variables, we find the negative and statistically significant term associated with RESID(-1) (i.e., ECM) at the level of -0.38. It clearly indicates an overall integrated relationship between dependent and independent variables in both the short and the long run. Furthermore, we found some evidence of the negative impact of a destabilizing macro environment on DBACBA, as highlighted by the negative coefficients on LOG(INFL) and LOG(INT), but they are not statistically significant.

Turning to the industry efficiency indicator, Table 4 gives the results of the regressions of PFGDP on NETINTMARGIN. As shown in the table, the coefficients on DLOG(PFAGDP) in the All regression is positive and significant, implying that banks' interest revenue is positively related to pension assets in the short run, which is in contrast to our hypothesis, but it is not observable in the long run. In the MDE regression, the coefficients on both DLOG(PFAGDP) and LOG(PFAGDP) are not statistically significant, but in the LDE regression, that on LOG(PFAGDP) is negative and significant. These results suggest that pension asset growth in the richer Asia-Pacific region does not necessarily lead to lower bank interest revenue, whereas in the less developed Asia-Pacific region, the former does has a negative effect on the latter in the long run. It may reflect that in those less developed Asian economies, it is easier for pension funds to wield influence in the banking industry. Our results on the LDE regression are similar to those in Impavido et al. (2001a), where a negative relationship between pension assets and net interest margins was found.

Table 4: Panel Error Correction Model Estimation for Difference of Log of NETINTMARGIN

	ALL	MDE	LDE
C	7.433762***	6.761055	4.547154
DLOG(PFAGDP?)	0.261176**	0.223790	-0.258571
DLOG(LLGDP?)	-0.928405***	-0.619500	-4.152911***
DLOG(PCRDBGDP?)	-0.070015	-0.053620	1.278706**
DLOG(GDP?)	-0.196043	-0.127353	-0.239121
RESID?(-1)	-0.381978*	-0.437084***	-0.484775***
LOG(PFAGDP?(-1))	-0.156658	-0.266959	-0.588816***
LOG(LLGDP?(-1))	-0.466985**	-0.566007	-2.659850
LOG(PCRDBGDP?(-1))	-0.504510**	-0.314168	0.414412
LOG(GDP?(-1))	-0.704157***	-0.755472***	-0.753420***
LOG(INFL?(-1))	-0.000574	-0.007224	-0.105666*
LOG(INT?(-1))	-0.037633*	-0.074287	-0.050973***
Adjusted R-bar squared	0.250473	0.103958	0.608831
Standard errors of regression	0.210801	0.243717	0.102419
No. of observations	88	50	38

Note: D first difference and L log; see Table 2a for variable details. MDE = more developed economies, LDE = less developed economies; see the main text for details. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%.

As for other explanatory variables in Table 4, it was found that the coefficients on RESID(-1) are frequently negative and statically significant, which again indicates a long-term co-integration relationship between the dependent and independent variables in the regressions. Moreover, the inflation rate in the LDE regression has a negative effect on the interest revenue aspect of financial development in the long run.

Taking into account all the empirical results and statistics presented and discussed in this section, there is some evidence that relative to other financial intermediaries, commercial banking institutions may lose ground in traditional business, e.g., interest revenues, in the less developed Asia-Pacific region in the long run, but not in the more developed region. However, such negative impact on the relative size of deposit money banks in the long run can be observed for all regions. The findings may reflect the strong competition from pension assets faced by the banking industry, but it need not necessarily mean that banks are in decline in terms of absolute size, given other work suggests that the banking industry is in a state of evolution by developing and entering new businesses, e.g., securities underwriting (Allen and Santomero 2001).

5.2 Impact on the stock market

The results for pension fund assets' impact on the stock market in the PECM are given in Tables 5–7. Although large stock markets do not necessarily function efficiently, stock market capitalization (STKCAP) is still the most frequently used indicator (Levine and Zervos 1998), measuring the overall size of markets (although it cannot distinguish between the effects of new issuance and the effects of price rises). Our estimated results suggest that both in the long run and in the All and LDE regressions, pension fund growth has a positive impact on the stock market in a statistically significant manner. This finding is interesting, signaling a long run relationship between pension assets and market capitalization. In other words, pension asset

growth not only contributes to the liquidity of the stock market as found by Walker and Lefort (2002), but also to the size of the stock market in both the short run and the long run.

Table 5: Panel Error Correction Model Estimation for Difference of Log of STKCAP

	ALL	MDE	LDE
C	0.681237	1.783257	5.189675
DLOG(PFAGDP?)	0.304809	0.167549	0.675760*
DLOG(LLGDP?)	0.806092**	1.172261**	0.879395
DLOG(PCRDBGDP?)	-1.105789**	-2.173220***	-0.831060
DLOG(GDP?)	0.395651**	0.131327	0.672504*
RESID?(-1)	-0.018832**	-0.095747	-0.133790
LOG(PFAGDP?(-1))	0.158801*	-0.065666	0.692456***
LOG(LLGDP?(-1))	-0.097917	-0.170407	-0.071123
LOG(PCRDBGDP?(-1))	-0.258854	0.196356	-0.722961*
LOG(GDP?(-1))	-0.032255	-0.158506	-0.235419*
LOG(INFL?(-1))	-0.031814	-0.047547*	0.045869
LOG(INT?(-1))	0.024507	0.058645	0.042717
Adjusted R-bar squared	0.183074	0.218441	0.402227
Standard errors of regression	0.191160	0.164945	0.189866
No. of observations	101	57	44

Note: D first difference and L log; see Table 2a for variable details. MDE = more developed economies, LDE = less developed economies; see the main text for details. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%.

Table 6: Panel ErrorCorrection Model Estimation for Difference of Log of STKTRD

	ALL	MDE	LDE
C	-5.321673	-6.484061	7.244845
DLOG(PFAGDP?)	0.542519**	0.121215	1.327582**
DLOG(LLGDP?)	2.602408***	3.120095***	2.511706
DLOG(PCRDBGDP?)	-2.501324***	-3.776831***	-2.169647
DLOG(GDP?)	0.888487***	0.320147	1.697115**
RESID?(-1)	-0.276659*	-0.148850	-0.322076**
LOG(PFAGDP?(-1))	-0.006243	-0.042704	0.519517*
LOG(LLGDP?(-1))	-1.058830**	-0.804870	-1.088940
LOG(PCRDBGDP?(-1))	0.491405	0.425160	0.260886
LOG(GDP?(-1))	-0.042185	0.119198	-0.474128*
LOG(INFL?(-1))	0.023985*	0.010604	0.193305
LOG(INT?(-1))	0.098326	0.159399	0.109869
Adjusted R-bar squared	0.406074	0.314919	0.509697
Standard errors of regression	0.329304	0.268929	0.386629
No. of observations	98	55	43

Note: D first difference and L log; see Table 2a for variable details. MDE = more developed economies, LDE = less developed economies; see the main text for details. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%.

Table 7: Panel Error Correction Model Estimation for Difference of Log of STKTNV

	ALL	MDE	LDE
C	-8.009063**	-16.76359***	-3.641946
DLOG(PFAGDP?)	0.131990	-0.095036	0.480667
DLOG(LLGDP?)	1.850309***	1.881512*	0.891822
DLOG(PCRDBGDP?)	-1.575087**	-1.669994	-0.734427
DLOG(GDP?)	0.606381**	0.373916	2.098033***
RESID?(-1)	-0.231159***	-0.351212***	-0.390085**
LOG(PFAGDP?(-1))	-0.273776**	-0.373668**	-0.902840
LOG(LLGDP?(-1))	0.362830	0.307941	-0.988408
LOG(PCRDBGDP?(-1))	-0.634297	-1.115895*	0.726801
LOG(GDP?(-1))	0.082779	0.295187	-0.302306
LOG(INFL?(-1))	0.040723	0.053093	0.050786
LOG(INT?(-1))	0.076948	0.044571	0.056696
Adjusted R-bar squared	0.250682	0.287550	0.245917
Standard errors of regression	0.344348	0.283982	0.396032
No. of observations	100	56	44

Note: D first difference and L log; see Table 2a for variable details. MDE = more developed economies, LDE = less developed economies; see the main text for details. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%.

In terms of the stock market liquidity indicator, i.e., total value traded (STKTRD), Table 6 shows a positive link is found for pension funds in all three groups, but only in terms of the short run effect. The finding might reflect the fact that a supportive environment, e.g., excellent telecommunications, is available to utilize and take advantage of pension growth. And if there are economies of scale or technological advance, the more pension funds trade in the markets, the lower the transaction costs, which in turn encourages infrastructure development. In terms of the long-run effect, it is interesting to note that for the more developed economies the impact is negative, albeit not significant, and positive for the less developed economies. Such difference may be due to different stages of financial development, i.e., in less developed economies, the financial market is not advanced enough to absorb possible irrational trading, therefore triggering higher STKTRD ratios, and vice versa.

The last indicator used is the stock market turnover ratio (STKTNV). Results on the long term effect are statistically significant and the signs are negative in the All and MDE regressions. This means that growth of pension assets decreases the turnover ratio, therefore improving market efficiency in the MDE but not in the LDE region. This finding is interesting in that it may reflect the stabilizing effect of pension asset growth in the stock market, largely due to the fact that pension funds as long-term institutional investors have a lesser tendency to participate in short-term speculative activities, typically via more frequent trading. The reason why such impact is not found in the LDE may be due to less prepared financial markets and less experienced institutional investors, e.g., pension funds, when compared with the MDE region.

On balance, by using three indicators, a positive link between pension asset growth and stock market development is found, in line with arguments from the World Bank (1994) and Davis (1998). Such a positive impact may reflect not only equity market issuance per se, but also the creation and emergence of new financial instruments through financial engineering, and secondary/qualitative effects (Davis and Hu 2005). The latter effects will be beneficial to the whole financial market infrastructure, not just to the pension funds industry.

5.3 Impact on the bond market

Results for pension assets' impact on the public bond market (PUBBND) are given in Table 8. The regression results show that coefficients on DLOG(PFAGDP) and LOG(PFAGDP) are positive but not statistically significant, but when running separate MDE and LDE regressions, the results vary. For the more developed economies in the Asia-Pacific region, pension asset growth tends to have a long-term effect, which may be linked to higher public debt issuance following the pension reforms. For the less developed economies, such relationship only exists in the short run, which may be because in those countries when reforming the social security system, governments enjoy a better fiscal position and lower implicit pension debts—which could be due to low pension coverage—hence do not necessarily rely on issuing public bonds to meet the fiscal deficit in the short run as in some OECD countries (Hu 2006a).

Table 8: Panel Error Correction Model Estimation for Difference of Log of PUBBND

	ALL	MDE	LDE
C	2.801055***	6.253913***	1.532610
DLOG(PFAGDP?)	0.040367	0.038261	0.123122*
DLOG(LLGDP?)	0.568914***	1.550727***	0.510040***
DLOG(PCRDBGDP?)	-0.698816***	-0.934614	-0.893323***
DLOG(GDP?)	-0.324728***	-0.323496**	-0.411774***
RESID?(-1)	-0.035100	0.103312	-0.245218***
LOG(PFAGDP?(-1))	0.038695	0.128013*	-0.067745
LOG(LLGDP?(-1))	0.369694***	0.176026	0.065797
LOG(PCRDBGDP?(-1))	-0.376787***	0.253365	-0.815101***
LOG(GDP?(-1))	-0.136547***	-0.120707	-0.293161***
LOG(INFL?(-1))	-0.007836	0.014262	0.026642
LOG(INT?(-1))	-0.001322	0.014202	-0.002413
Adjusted R-bar squared	0.625429	0.453477	0.983208
Standard errors of regression	0.083141	0.096808	0.047446
No. of observations	95	54	41

Note: D first difference and L log; see Table 2a for variable details. MDE = more developed economies, LDE = less developed economies; see the main text for details. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%.

Regarding the private bond market (PRIBND), compared to results related to the public bond market, Table 9 indicates a positive and significant link between pensions and PRIBND in the long run. This important result is favorable to the hypothesis that growth of pension funds boosts the scope for bond issuance by firms in the securities market, which may in turn favor investment and economic growth. Our results are complementary to those obtained by Meng and Pfau (2010) and by Impavido et al. (2003). It should be noted, however, that we used pension asset data, while Impavido et al. (2003) used contractual savings data, which includes pension fund and insurance assets. Hence, our results are more relevant to the pension study.

Table 9: Panel Error Correction Model Estimation for Difference of Log of PRIBND

	ALL	MDE	LDE
C	-0.831994	0.822070	-2.614260
DLOG(PFAGDP?)	0.063789*	0.002218	0.277082
DLOG(LLGDP?)	0.043183	1.333270***	-0.668791**
DLOG(PCRDBGDP?)	0.356972*	0.623303	1.081337***
DLOG(GDP?)	-0.247347**	-0.162366	-0.296253
RESID?(-1)	-0.016558	-0.266591***	-0.338802***
LOG(PFAGDP?(-1))	0.040727*	0.406377***	0.195751**
LOG(LLGDP?(-1))	-0.336135***	-0.498373***	-0.420690
LOG(PCRDBGDP?(-1))	0.237681**	0.765459***	0.076280
LOG(GDP?(-1))	0.019310	-0.320496***	-0.198208**
LOG(INFL?(-1))	-0.002187	-0.002333	0.001296
LOG(INT?(-1))	-0.015868	-0.067688***	-0.003977
Adjusted R-bar squared	0.554748	0.796015	0.822205
Standard errors of regression	0.106784	0.064817	0.077553
No. of observations	84	46	38

Note: D first difference and L log; see Table 2a for variable details. MDE = more developed economies, LDE = less developed economies; see the main text for details. ***, rejection of null hypothesis at 1%, **, at 5%, and * at 10%.

6. CONCLUSIONS AND POLICY IMPLICATIONS

In this paper we used the advanced PECM to investigate the relation between pension fund growth and financial development. Below is a summary of the main findings, which I believe contribute to the current literature.

First, I looked at the dynamic relationship between pension asset growth and development of the banking industry. By utilizing the PECM, a negative effect of pensions on the relative size of deposit money banks as well as falling interest revenues in the LDE region was shown, reflecting strong competition from institutional investors (Davis and Steil 2001). Although there is empirical work on this subject, few empirical studies have focused on the dynamic relationship in both the short and the long run, and particularly using Asian pension data. Therefore, our finding of a negative impact of pension fund growth on the banking industry contributes to the existing literature.

Second, when turning to the stock market, use of the panel error correction model shows a strong positive link between pension fund assets and market capitalization, while the pension-asset growth has different impacts on the market value traded and market turnover. For example, we found that pension assets have a long-term positive impact on market liquidity in the less developed economies in Asia, but not in the more developed economies. It may reflect the heterogeneous influence of pension growth across different stages of financial development.

Third, when analyzing the impact of pension fund assets on the bond market, we used separate public and private bond data, which is different from Impavido et al. (2003) who used aggregate data. Our specification is more appropriate in that it can disentangle the differential impacts of pension asset growth on public bond markets (i.e., not statistically significant) and private bond markets (i.e., positive). We also believe that analysis of the impact on private bond markets is more relevant, as the amount of public bond issuance largely depends on the government's willingness to issue and its fiscal position, which may itself link to pension reform. The amount of

private bonds is dependent on the maturity of the financial markets where pension funds can play an increasingly important role following pension reform.

Last but not least, our sole focus on the Asia and Pacific pension market is rare in the existing literature, so I believe it contributes to the debate on the effect of pension assets growth on Asian financial and capital markets.

As shown in our empirical results, pension asset growth has positive impacts on financial development, e.g., lower interest margins and higher stock market capitalization. Therefore, governments in Asia-Pacific should continue their pension reforms towards pre-funding the future liabilities. The establishment of voluntary funded pension schemes, as was done in the PRC and India in the recent past, would be useful in this context.

Some impacts depend on the level of financial development. For example, pension assets have long-term, positive impacts on stock market efficiency in the LDE region, but not in the MDE region. This observation has important policy implications: to achieve maximum positive effects when implementing their pension reforms, Asian governments ideally should ensure some pre-conditions (e.g., a relatively stable macro-economic environment; basic financial supervisory structure) are met first (Hu 2006b).

To assess the impact of pension reform on pension asset growth the short-term impact and the long-term impact need to be distinguished. Both the short-term effects and the long-term effects should be considered by the government, but, largely due to the nature of pension reform, the long-term effects should be given more attention.

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