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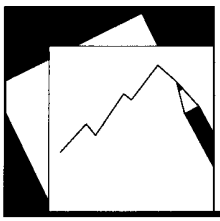

IMF Working Paper

Capital Flows and Demographics—An Asian Perspective

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Capital Flows and Demographics—An Asian Perspective

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Abstract

This paper calibrates the production functions of 176 countries to fit 2003 data and examines the capital flows that emerge, when labor forces change according to the 2007 UN population projections. It finds that demographic factors are no help in correcting today's global imbalances; that Japan's capital outflows have as much to do with population aging as with the yen carry-trade; and that China is key to understanding Asia's demographic impact on the world. It also finds that Asia offers the greatest arbitrage opportunities worldwide during the demographic transition and has the greatest potential for regional financial integration among world regions. Moreover, the demographic transition is unlikely to result in an asset price meltdown and could even raise world interest rates under perfect capital mobility.

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I. INTRODUCTION

Asian capital flows are at the center of many academic and policy debates. Emerging Asia is the largest provider of capital for industrialized countries through the investment of its foreign currency reserves. At the same time, emerging Asia is the largest recipient of private capital flows, including the exchange rate pressures that go along with it. Capital outflows from Japan are a leading theme in the financial press, where they are commonly attributed to the yen carry trade; and the magnitude of FDI inflows into China has raised eyebrows among both countries of origin and competitors in the region. There is also a lively debate about capital flows within Asia, or the lack thereof, a fact that has led to several policy initiatives, such as the Asian Bond Market Initiative.

The determinants of capital flows are manifold, ranging from business-cycle fluctuations, and volatile fiscal policies to long-term growth trends and demographic change. The idea behind demographic change is that the world is undergoing a massive demographic transition, marked by rising life expectancy and falling fertility. Since individual countries are at different stages of the demographic transition, this should give rise to capital flows. For example, countries that are ahead in the demographic transition and experience slowing or negative labor growth should be able to earn more on their capital by investing it in countries that are at early stages of the demographic transition and witness strong labor growth. The latter countries should benefit from the additional capital through higher output per worker.

Again, Asia seems predestined for the study of demographics and capital flows. It is host to the most populous nations in the world, China and India. It includes the oldest country in the world, Japan, measured by the median age of its population, and one of the oldest developing countries in the world, China. Asia also hosts the fastest aging country in the world, Korea. At the same time, it is home to some of the youngest countries in the world, like India or Bangladesh, making Asia the most diverse region worldwide in terms of age structure and population dynamics.

And yet, studies that investigate the impact of demographics on capital flows—usually with dynamic overlapping generations (OLG) models—remain largely silent about Asia. Many studies confine themselves to a subset of, typically developed, countries. Examples of this strand of the literature are Cutler and others (1991), Fehr and others (2003), and Krueger and Ludwig (2007). However, with developing countries accounting for one-third of all capital flows and even Africa experiencing an unprecedented surge in capital inflows, these models look increasingly outdated. Another set of papers does assume global capital mobility, but has little to say about Asia or Asian countries other than Japan and, in one case, China. Examples of this strand of the literature are Brooks (2003), IMF (2004), Börsch-Supan and others (2005), and Domeij and Flodén (2006).

This paper uses a simple neoclassical framework to simulate the effect of population dynamics on international capital flows. It calibrates the production functions of 176 countries to fit 2003 data and examines the capital flows that emerge, when labor forces change according to the 2007 UN population projections. The framework abstracts from the effects of demographics on national saving, which according to the life-cycle hypotheses, falls with rising dependency ratios. However, there is broad agreement in the literature that

the size of the population (and labor force) is more important in determining capital flows than its composition. The framework employed here generates capital flows for 176 countries over the period 2004–2050 and allows to slice up the world in whatever way the problem requires. For the first time, it sheds light on the role of Asia in the global reallocation of capital that is likely to accompany the demographic transition; and on inter-Asian capital flows that are likely to emerge. In addition, the framework can make predictions about the effects of capital flows on individual countries, rather than a handful of regions.

The findings of the paper are as follows. Demographic factors are no help in correcting the global imbalances one observes today. With its relatively young population the US will remain a capital importer over most of the projection period, while China with its rapidly aging labor force is likely to remain a major capital exporter in the future. Japan's large capital outflows may have as much to do with population aging as with the yen carry trade. China is key to understanding the demographic impact of Asia on the world, despite its neglect in virtually every study on capital flows and demographics. Asia offers the greatest arbitrage opportunities worldwide during the demographic transition, since it is host to some of the biggest, oldest, and youngest economies worldwide. Asia has the greatest potential for regional financial integration among world regions, given its demographic diversity, but this potential diminishes after 2025. The demographic transition is unlikely to result in an asset price meltdown, as suggested by the popular press and some academics. Under perfect capital mobility, world asset prices may even rise. Open capital accounts will speed up the relocation of production from fast aging to slower aging economies, but this reallocation will improve everybody's welfare.

The paper proceeds as follows. The next section describes the framework used for simulating capital flows over 2004–2050. Section III gives a brief overview of global and Asian demographic trends. Section IV presents the implications of demographic change for global capital flows with a special focus on Asia. Section V illustrates the effects of capital flows using the closed-economy scenario as a counterfactual; and Section VI concludes with some policy implications.

II. THE THEORETICAL FRAMEWORK

In this simple framework it is assumed that countries employ capital and labor to produce output with constant returns to scale technology. Markets are competitive, hence, capital and labor earn their marginal product. Except for total factor productivity, the production technology is the same for all countries. Labor is immobile, while capital can flow freely between countries. At the international level, countries are connected by two equilibrium conditions. The first requires that the return to capital is equalized across all countries, reflecting perfect capital mobility. The second requires that the capital accounts of all countries add up to zero. As countries enter different stages of the demographic transition, their labor forces will evolve differently. The emergence of different capital-labor ratios and factor incomes will be instantly arbitraged away with capital flowing from countries that are relatively rich in capital to countries that are relatively rich in labor.

The exercise in this paper is comparative-static in nature. First, the production function of all countries is calibrated to fit actual data in the base year 2003. Then the labor force in each

country is changed based on population projections by the United Nations to see what capital flows emerge. Assuming a Cobb-Douglas production function of the form

$$Y = AK^{\alpha}L^{1-\alpha}, \tag{1}$$

where Y, A, K, L, and α denote real output, total factor productivity, capital, labor, and the capital income share, respectively, the interest rate can be expressed in either of two ways:

$$r = \frac{\alpha Y}{K}, \tag{2}$$

$$r = \alpha A\left(\frac{K}{L}\right)^{\alpha-1} \tag{3}$$

With the estimate for α provided in the literature, an assumed real interest rate of 4 percent, and real GDP in 2003 observable, Equation (2) can be solved for K in 2003. Similarly, with the labor force in 2003 observable, Equation (1) can be solved for total factor productivity A. According to Equation (3), capital in the subsequent period is a function of the exogenous supply of labor in that period and the endogenous interest rate. The interest rate will be set such that the changes in the capital stocks of all countries—or their capital accounts in the present context—add up to zero.

The data comes from the following sources. Gollin (2002) shows that the capital income share α is relatively constant across time and countries, when treating the income of self-employed as labor income. The framework at hand uses the midpoint of his estimates, which range from 0.2 to 0.35. Real GDP in 2003 is calculated from the Penn World Tables (Heston and others, 2006) by multiplying real GDP per capita with the size of the population. Labor supply is assumed to equal the working age population (15–65) in each country and stems from the medium variant of the United Nations (2007) population projections, which extend to 2050. The simulation exercise comprises 176 countries accounting for 99 percent of the world's population and GDP in 2003.

The simple framework of this paper has the advantage that it relies on very few assumptions and that it allows to make predictions for a rich set of countries, rather than a handful of regions. Obviously, these simplifications come at a cost. Most importantly, the framework will overestimate capital flows for a number of reasons. First, capital is not perfectly mobile. To the extent that capital accounts are closed, countries differ in risk, or capital adjustment costs are present, capital flows will ebb before interest differentials are eliminated. Second, labor is partly mobile, implying that less capital needs to flow before factor incomes are equalized. Third, national saving is also affected by population aging and will reduce the need for capital to flow across borders, as is explained below.

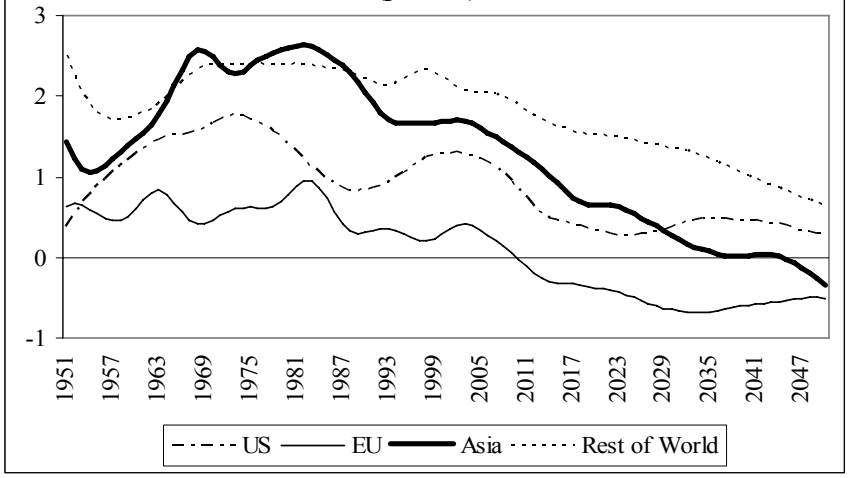
The capital account is the difference between investment and saving (or the inverse of the current account). By focusing solely on investment—or next period's capital stock, which is the same thing—the framework implicitly assumes that saving is unaffected by population aging. This is not the case. Apart from a shrinking labor force, population aging implies a

rising old-age dependency ratio, that is a rising number of pensioners relative to workers. Since people save during their working years for consumption during retirement, the ratio of savers to consumers deteriorates and national saving falls. This happens just at the time, when the country needs less capital owing to the shrinking labor force, meaning that there is less surplus capital to flow abroad. The effect of population aging on saving is particularly pronounced if the country has a pay-as-you-go pension system with defined benefits in place. By increasing the resource transfer from prime savers to prime consumers such a system exacerbates the decline in saving during a demographic transition. Nevertheless, there is general agreement in the literature that movements in the investment rate induced by population aging outweigh movements in the saving rate, preserving this framework as a rough approximation of reality (see, for example, Auerbach and Kotlikoff, 1992; Higgins, 1998; Bosworth and others, 2004; Krueger and Ludwig, 2007).

III. DEMOGRAPHIC TRENDS

This sections reviews some demographic trends, both global and within Asia. In line with the framework above, it focuses on the evolution of the labor force. Figure 1 depicts the growth of the labor force from 1950 to 2050 for the US, the EU, Asia, and the Rest of the World. It is obvious that these regions are at different stages of the demographic transition. Europe, with the lowest growth rate since the early 1950s, is most advanced in the demographic transition. Europe's fertility started to decline as early as 1890 (Lee, 2003) and from 2010 onwards its labor force in going to shrink. Europe is followed by the US, but in contrast to Europe the US labor force continues to grow over the observation period. In Asia, fertility started to decline only after World War II, but the decline has been much more rapid than in the US and Europe. As a consequence, the growth rate of its labor force will fall below the US rate by 2030 and will turn negative by 2045. The rest of the world has also begun the demographic transition, but its labor force will continue to grow well into the second half of the 21st century.

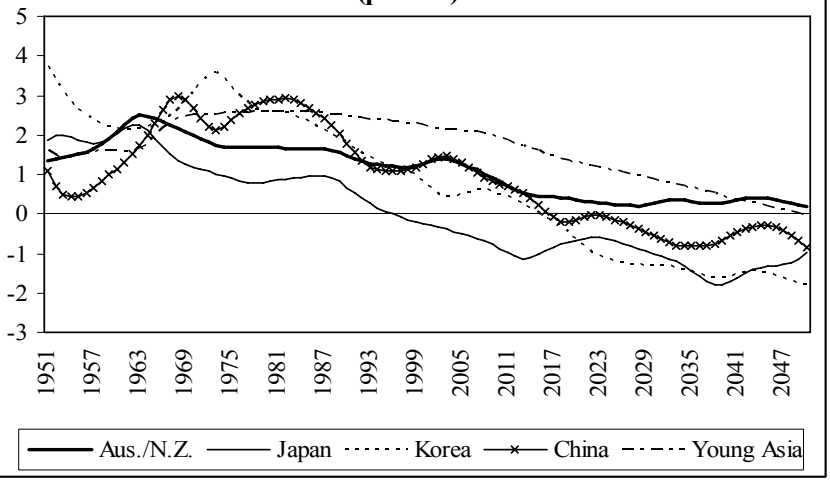
Figure 1. Growth Rate of Labor Force, 1950-2050 (percent)



In Asia, Japan is most advanced in the demographic transition as is apparent from Figure 2. With its labor force contracting since 1996, it has actually overtaken Europe as the leader in the demographic transition. Next are Australia and New Zealand, but like the US, their growth rate seems to be approaching a new steady state before turning negative. Korea and China start experiencing negative labor growth around 2015 (as do Thailand and Sri Lanka). However, the contraction in Korea is more pronounced and by 2020, Korea joins Japan in

having the fastest shrinking labor force worldwide. The demographic evolution in the rest of Asia is relatively uniform—if staggered in time—and is therefore aggregated under the label "Young Asia". The most advanced country in this group is Indonesia, whose labor growth drops steadily from 1.5 percent in 2007 to -0.3 percent in 2050. The least advanced in this group is Papua New Guinea, whose growth rate drops steadily from 2.6 percent to 0.8 percent during this time span. India falls in the middle of these two extremes.[1]

Figure 2. Growth Rate of Labor Force, 1950-2050
(percent)



IV. THE PATTERN OF CAPITAL FLOWS

This section looks at the capital flows that emerge from the simulation exercise both from a global and Asian perspective. However, before doing that it will compare the performance of the comparative static simulation framework with that of a dynamic OLG model. To this end, the simulation framework will address a slightly different question; one that has previously been addressed by Krueger and Ludwig (2007) using an OLG model. The question is, how will different demographic developments affect capital flows between the US, the EU, and the rest of the OECD, if capital is only mobile within the OECD.[2]

Krueger and Ludwig (2007) use the same United Nations population projections—if an older version—and the same production technology as the current paper.[3] In their baseline projection, they also abstract from pension systems. However, their detailed modeling of the household sector allows to take into account the effect of population aging on aggregate saving. The authors find capital flowing to the US between 2015 and 2040 from both the EU and the rest of the OECD. While the EU provides most of the capital in the early stages, it is overtaken by the rest of the OECD around 2025. At their peaks capital accounts amount to about 1¾ percent of GDP for the US, -1 percent of GDP for the EU, and -2¼ percent for the rest of the OECD.

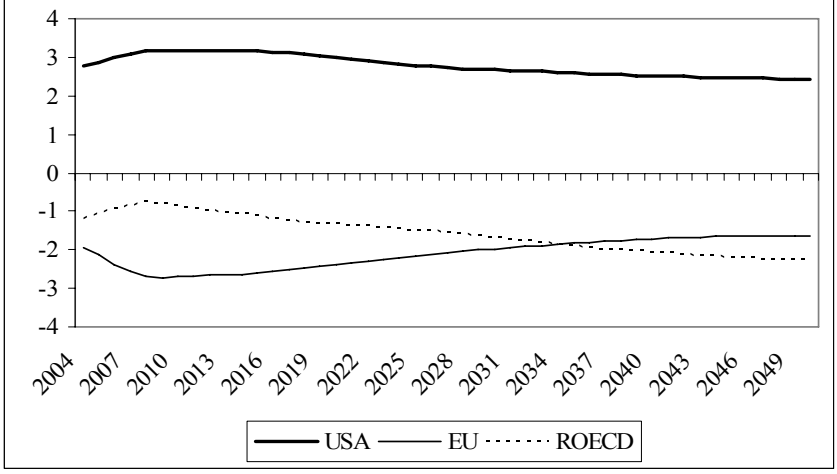
[1] For a country-by-country breakdown of labor force growth rates, refer to Table A1 in the Appendix.

[2] Apart from reducing the country universe, the capital income share α is increased to 0.33 to match the value of Krueger and Ludwig (2007).

[3] In their paper labor supply grows with labor augmenting progress. However, since the growth rate is exogenous and equal across countries, it has no bearing on the comparison.

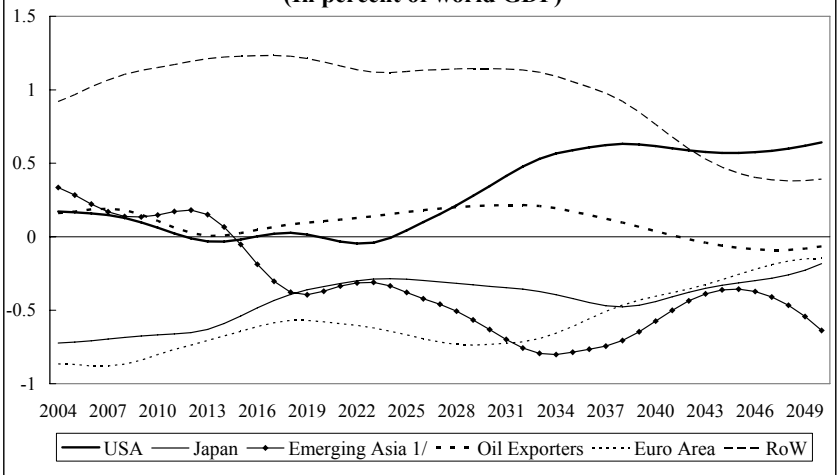
The results of the comparative static framework are displayed in Figure 3. The capital accounts behave less dynamic than in the OLG setting. In particular, the regions remain creditors or borrowers over the entire projection horizon. However, at 1–3 percent of GDP the size of capital flows is surprisingly similar to that of the OLG model, if somewhat larger, as expected. Also, the international pattern of capital flows matches relatively well that of the OLG model. Both the EU and the rest of the OECD export capital to the relatively younger US, and the EU is overtaken by the rest of the OECD as main capital exporter around 2035. Given the divergence in results for relatively similar OLG models, the differences at hand seem modest and give some reassurance that the comparative static framework is able to capture important aspects of reality.

Figure 3. Capital Accounts in the OECD, 2004-2050
(percent of GDP)



The paper now returns to the main scenario, a world of perfect capital mobility. Figure 4 displays global capital flows, as a share of global GDP, that emerge from population dynamics dividing the world into six regions, namely the US, Japan, emerging Asia, the Euro area, oil exporters, and the rest of the world. This breakdown of the world is commonly used to illustrate today's global imbalances—the US' reliance on the other regions' capital and the other regions' reliance on US demand—and is identical to the breakdown chosen, for example, in IMF (2006, page 17). Apparently, population dynamics are no help in correcting the global imbalances one observes today. With its relatively young population relative to Europe, Japan, and eventually China, the US will probably continue to import capital over the next decades. In fact, by 2025 the US would embark on becoming the world's largest capital importer according to this simulation. Similarly, demographic factors reinforce emerging Asia's

Figure 4. Capital Accounts of World Regions, 2004-2050
(In percent of world GDP)

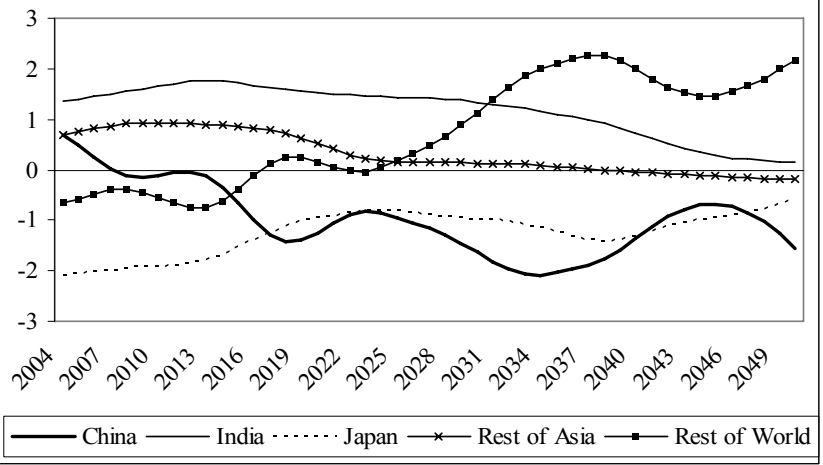


1/ China, Hong Kong SAR, Indonesia, Korea, Malaysia, Phillipines, Singapore, Taiwan POC, and Thailand.

position as a major creditor. According to this simulation, emerging Asia and, in particular, China would become a capital exporter in about seven years and the world's largest capital exporter by 2030. Another thing to notice is that the yen carry trade may not be the only reason for the Japanese capital account deficit. Its contracting labor force alone can explain capital outflows on the order of ¾ percent of world GDP. Finally note, what difference the inclusion of a wider set of countries makes relative to the OECD-only scenario. The rest of the world replaces the US as the main capital importer in the early decades of the 21st century. In fact, non-OECD countries account for 58 percent of all capital flows in the current framework.[4]

Figure 5 depicts capital accounts in Asia—as a share of Asia's GDP—including the capital account of the rest of the world. Japan, with its falling labor force is the main capital exporter until 2017 when it is joined by China. India with its relatively young population is the main capital importer, but decreasingly so. The rest of Asia imports capital until about 2025, after which its capital account remains broadly balanced. Main players in this aggregate are Indonesia, Philippines, Bangladesh, as well as Korea as the single most important capital exporter.[5] With less and less capital needed in the region, capital exports to the rest of the world take off around 2025. Most striking in Figure 5 is the co-movement of China's capital account and the world's capital account with Asia. Apparently much of Asia's demography-induced capital flows are going to be driven by China. Nevertheless, most studies that analyze the impact of population aging on capital flows only look at Japan (for example, IMF, 2004; Batini and others, 2006).

Figure 5. Capital Accounts in Asia, 2004-2050
(percent of Asia's GDP)



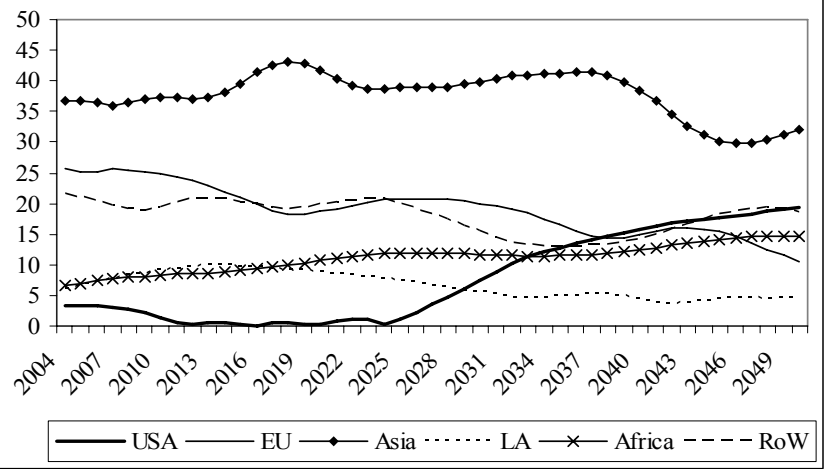
Worldwide, Asia offers by far the largest arbitrage opportunities as a result of population aging. This is shown in Figure 6, which depicts the share of different regions in global capital flows under the current framework. Asian countries account for 30-40 percent of global capital flows, compared to 10–25 percent for Europe, the next biggest player. This dominance is attributable to the fact that Asia hosts some of the biggest economies

[4] The share of a country in total capital flows is calculated by dividing the absolute value of its capital account by the absolute value of all capital accounts. The share of a group of countries is calculated by adding up country shares.

[5] For a country-by-country breakdown of capital accounts in Asia, refer to Table A2 in the Appendix.

worldwide and has some of the most unusual demographics by global standards, with Japan being most advanced and India being very early in the demographic transition. Africa, despite making up only 4 percent of global GDP in 2003, accounts for 14 percent of global capital flows by 2050, which is explained by the exceptional growth of its labor force.

Figure 6. Share of Regions in Global Capital Flows, 2004-2050
(in percent)



There should be plenty of opportunity for inter-Asian capital flows, given that the countries are so diverse demographically. This is good news for policy makers who are making great efforts to strengthen regional financial integration, for example, through the Chiang Mai Initiative.[6]

Potential intraregional capital flows are constrained by the amount of matching capital account surpluses and capital account deficits in the region.[7] This measure as generated by the simulation exercise is displayed in Table 1, both as a share of regional GDP and as a share of total regional capital flows. Among geographical regions, Asia has the greatest opportunities for regional financial integration. If regional differences in capital intensity were explored to the fullest, some 75 percent of Asia's capital flows could occur within the region, compared with 30 percent

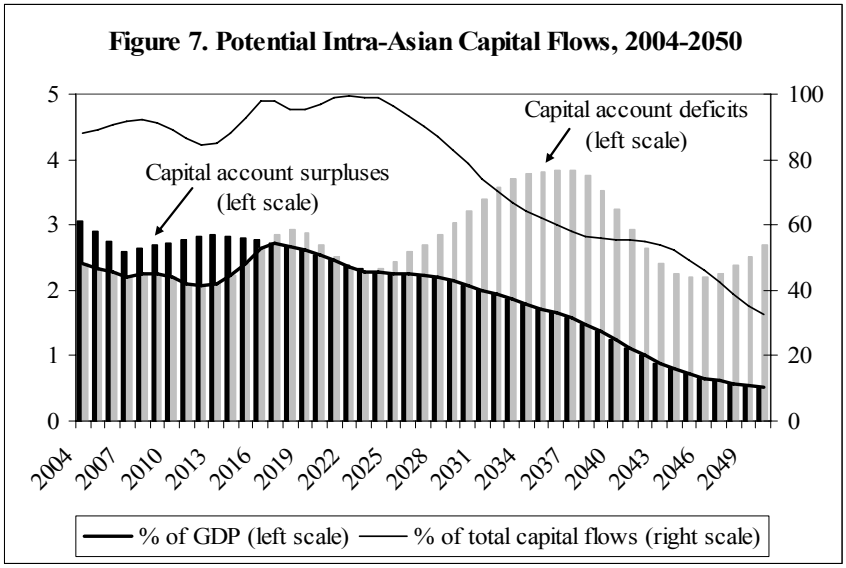
Table 1. Potential Intraregional Capital Flows, Average 2004-2050 1/

	Percent of	
	Regional GDP	Regional Capital flows
United States	...	...
Europe	0.1	8.3
Asia	1.8	75.8
Latin America	0.3	30.3
Africa	0.1	3.1
Rest of World	2.7	84.8

1/ For a given region, let S and D denote the sum of all current account surpluses and deficits in absolute terms, respectively. Then, the first measure is calculated as min(S,D)/GDP times hundred and the second measure as [min(S,D)*2]/(S+D) times hundred.

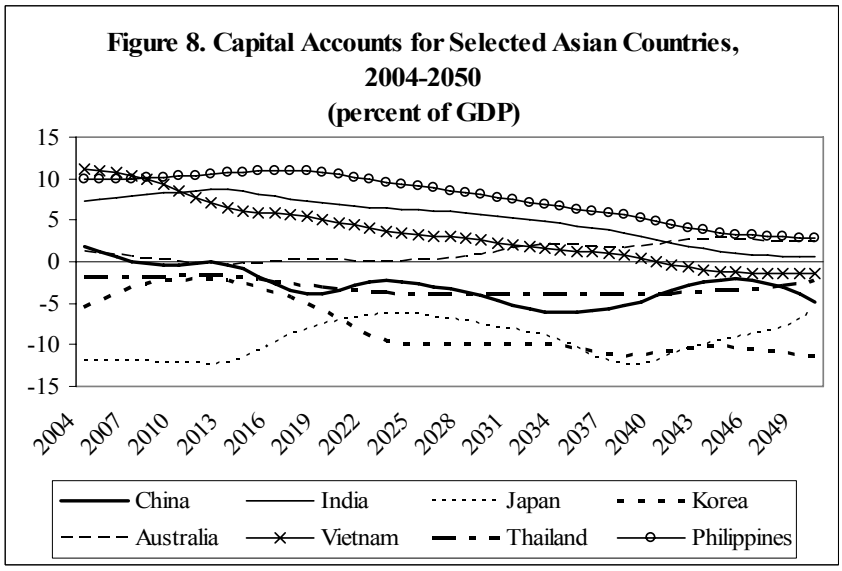
[6] For an overview of regional financial integration, which is still in its infancy, see IMF (2005).

[7] This is not true for capital flows that are motivated by risk diversification, which are not subject to the current investigation.



for Latin America, 8 percent for Europe, and 3 percent for Africa. The lines in Figure 7 depict the potential for intra-Asian capital flows over 2004–2050, again in terms of total regional capital flows and regional GDP (the bars show capital account deficits and surpluses as a share of regional GDP). Population dynamics remain conducive to regional financial integration until 2020–2025, depending on the measure one chooses. After that population dynamics become ever more similar across Asia with the increasing mismatch of capital demand and supply that this entails.

Figure 8 illustrates the impact of demography-induced capital flows on selected Asian countries using their GDP as a scaling factor.[8] As noted earlier, the magnitude of these capital flows is likely overestimated and should be interpreted with caution. The capital account-to-GDP ratio of a country will be the higher, the more its labor growth rate deviates from the world average, the smaller the country is (the lower *L*) and the less developed it is (the lower *A*). According to the simulation exercise, China's and India's demography-induced capital flows could peak at 6 and 8 percent of GDP, respectively, compared to 3 percent of GDP for Australia. Most striking is the magnitude of simulated capital flows for Japan



[8] For a comprehensive list, refer to Table A3.

(peaking at 12 percent of GDP) given its size and development. Being the country with the fastest shrinking labor force worldwide, it has the entire world to trade capital with.[9]

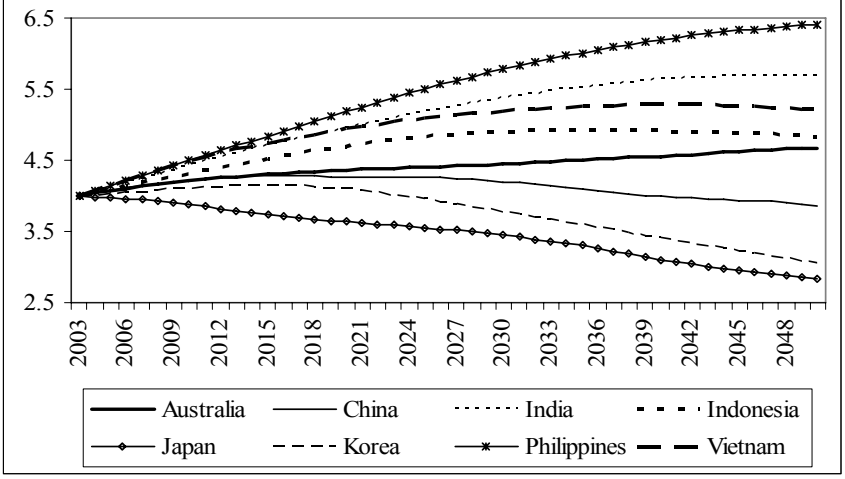
V. THE EFFECTS OF CAPITAL FLOWS

This section looks at the effects of capital flows during a demographic transition. In particular, it explores how open capital accounts affect the rate of return on capital, economic growth, and welfare.

There is a lively debate both in the popular press and academic circles about the effect of population aging on asset returns. The meltdown hypothesis, as it is known, maintains that the return on capital will plummet as large cohorts of retiring baby-boomers try to sell their assets to much smaller cohorts of baby-busters. Put differently, the return on capital is expected to decline as labor forces shrink and capital becomes relatively more abundant. The empirical literature does indeed find a link between population dynamics and asset returns (see, for example, Bergantino, 1998; Brooks, 1998; Davis and Li, 2003; Geanakoplos and others, 2004).

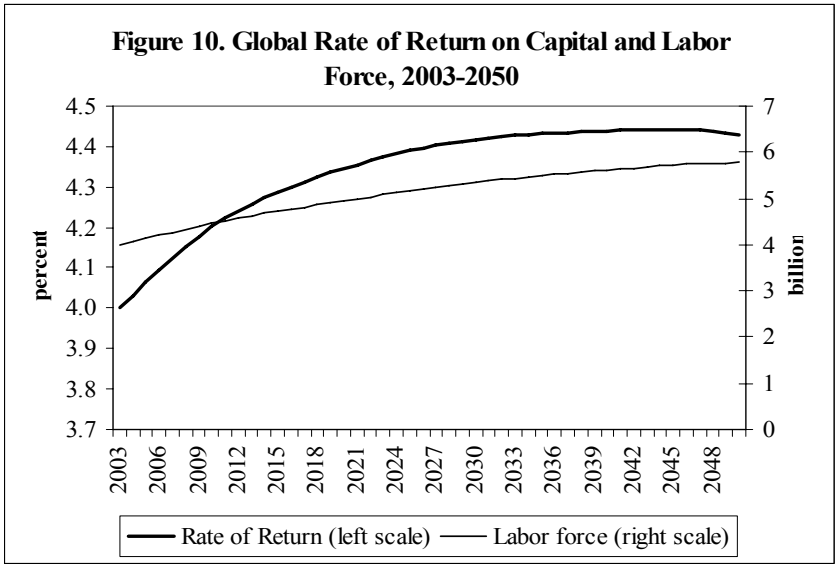
The meltdown hypothesis is based on the assumption of an aging closed economy or of a world where capital is mobile only among fast aging industrialized countries (see, for example, Krueger and Ludwig, 2007). To illustrate this point Figure 9 depicts the rate of return on capital for selected Asian economies assuming that capital is not mobile internationally. For Japan and Korea, the rate of return would indeed fall by some 100 basis points over the next 50 years and even China could experience somewhat lower asset returns. That this is nothing close to the asset meltdown evoked by the popular press has been noted previously (see, for example, Brooks, 2003; Börsch-Supan and others, 2005). Other countries in Asia could experience rising rate of returns on capital as their labor forces swell. The current framework suggests that capital returns would rise by 250 basis points in the Philippines, 170 basis points in India, and 130 basis points in Vietnam.[10]

Figure 9. The Rate of Return without Capital Flows, 2003-2050 (percent)

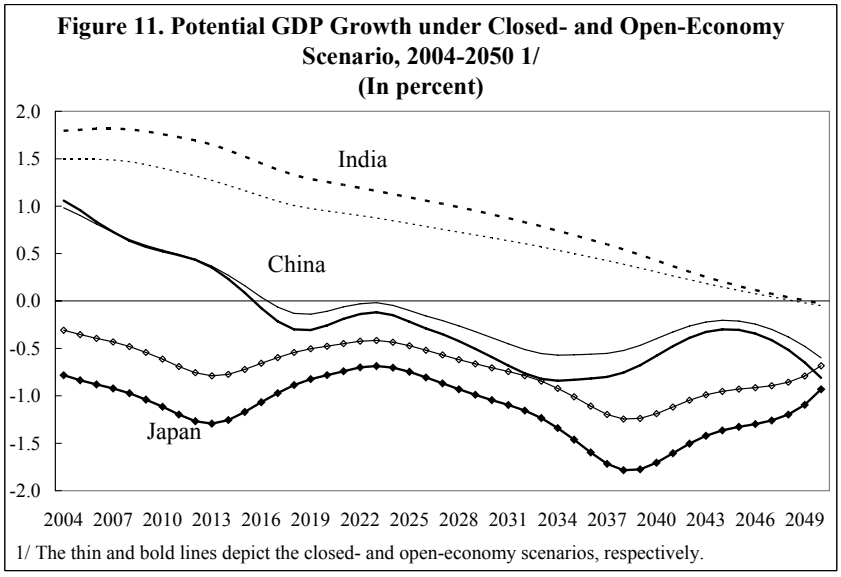


[9] Note, that the size of the Japanese capital account is not a peculiarity of the current framework. Brooks (2003), for example, obtains a capital account of 17 percent of GDP for Japan using an OLG model.

[10] For a complete list of Asian countries, refer to Table A4.



While the assumption of a closed economy or closed set of economies made sense in the past, a surge of capital flows into India, Vietnam, or even Africa makes this assumption look more and more untenable. If, on the other hand, capital is mobile across countries that are at different stages of the demographic transition, one country's capital abundance may be traded against another country's labor abundance. This is illustrated in Figure 10, which depicts the global rate of return on capital under the baseline assumption of perfect capital mobility, as well as the global working age population. Instead of falling, the rate of return actually increases by 50 basis points over the next 50 years, given that labor becomes relatively more abundant globally.[11]



The effect of capital flows on countries' potential growth is depicted in Figure 11. India, China, and Japan are used as examples of countries at different stages of the demographic transition.[12] The closed-economy scenario, shown as a thin line, depicts the effect of population dynamics on potential GDP growth, given that capital and total factor productivity are held

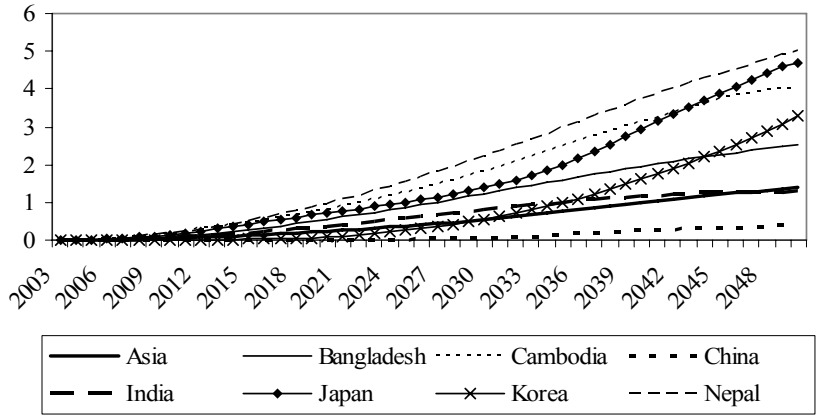
[11] The rate of return on capital starts falling around 2045, while the global labor force continues to increase. This, at first, counterintuitive result is driven by the fact that the global rate of return is determined by the global labor force weighted by each country's total factor productivity. Hence, the falling labor force of developed countries starts to dominate in 2045, despite the rising labor force of less developed countries still dominating in unweighted terms.

[12] For a complete list of Asian countries, refer to Tables A5 and A6.

constant. Under this scenario, India's potential growth drops from 1.5 percent in 2004 to zero percent around 2050; during the same time China's potential growth drops from 1 percent to -0.8 percent and Japan's from -0.3 percent to -0.7 percent. Hence, global production relocates from relatively fast aging economies to relatively slow aging economies over the next 50 years. Under the open-economy scenario, this reallocation of global production is more pronounced, because capital flows where the labor is. Under the open-economy scenario, Japan's GDP growth would be another ½ percentage points lower, while India's GDP growth would be another ¼ percentage point higher, on average.

The relocation of capital and production toward slower aging economies, improves everybody's welfare. The current simulation suggests that the global relocation of capital in response to population dynamics boosts world GDP by 0.05 percent in 2010, 0.5 percent in 2030, and 1.3 percent in 2050. What is more, every single country will profit from this reallocation of capital. Fast aging economies like Japan will earn more on their capital if they are allowed to invest it abroad, while relatively young economies like India will have more capital at their disposal to boost output per worker. This welfare effect can not be captured by looking at GDP per capita, the output per capita produced in a country—despite many studies' preoccupation with this metric (for example, IMF, 2004; Gómez and de Cos, 2006). Instead, it requires an examination of disposable income per capita, the income earned by a country's residents both at home and abroad.[13] Figure 12, shows disposable income per capita for Asia and some Asian economies under the open-economy scenario, relative to the closed-economy scenario.[14] The welfare gain for Asia associated with open capital accounts is 1.4 percent by 2050, or very much in line with the global welfare gain. However, welfare gains are much larger for a number of Asian countries, both capital importers and capital exporters. Open capital accounts would boost Nepal's welfare by up to 5 percent, Japan's by up to 4.7 percent, and Cambodia's by up to 4 percent.

Figure 12. Income Per Capita Gain Relative to Closed-Econmy Scenario, 2003-2050
(percent)



[13] Under the open-economy scenario, national disposable income is calculated as the sum of labor income, $(1-\alpha)Y$, and income earned on the initial capital stock at world interest rates, $K_0 r$. Under the closed-economy scenario, national disposable income equals GDP.

[14] For a complete list of Asian countries, refer to Table A7.

VI. POLICY IMPLICATIONS

Identifying some phenomena as partly driven by demographics, can give some important clues about their sustainability. The distinction between structural and cyclical phenomena is particularly important for economic policymakers, who try to make reversals in cyclical swings less abrupt and painful. The simulation exercise above suggests that some phenomena observed today may have a demographic and, hence, less cyclical underpinning than commonly acknowledged. For example, net private capital flows to emerging markets have reached unprecedented levels in US dollar terms in 2007, leading to speculation that loose monetary policies in Europe and Japan are fuelling an asset bubble (see, for example IMF, 2007, Box 4.2). The above simulation, instead, suggests that demographic change is behind massive capital export from Japan and Europe to the rest of the world, making a sudden reversal less likely.

Future asset returns have important implications for public policy because of their impact on the elderly. Governments are interested in the path of asset returns, because in many countries, assets are the main income source for the elderly. In addition, the elderly have a shorter time span to smooth consumption over, leaving them particularly vulnerable to income shocks. In this light, the finding that asset returns are unlikely to fall steeply as populations age, and could even increase if globalization proceeds at the current pace, should be reassuring. It should also boost prospects for pension reforms that seek to shift from pay-as-you-go to partly funded systems.

Policymakers that have the closer financial integration of Asia at heart should loose no time. There are many factors that make closer integration beneficial over the long term, including increased risk diversification, trade, and growth. However, the demographic dividend of increased integration will start to decline after 2020–2025, as Asian economies become ever more similar in terms of population dynamics.

Capital flows induced by population dynamics are good for everyone, but strong policies are needed to reap the benefits of demographic diversity (Holzmann, 2000). Receiving countries need to pursue prudent macroeconomic policies and ensure that additional funds are translated into higher capital accumulation to generate the output needed for debt service. Moreover, good policy is required to manage the threats to price stability and competitiveness associated with large capital inflows. On the structural front, receiving countries should continue to develop capital markets that are sufficiently regulated and supervised. For many sending countries, the paramount task is the reform of their unsustainable pay-as-you-go pension systems. Without such reforms, welfare levels could fall steeply and capital flows would probably be small. In addition, sending countries need to overcome the home bias of pension funds, including by raising mandatory ceiling on funds invested abroad.

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Table A1. Growth Rates of Labor Force in Asia, 1955 - 2050

	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Australia	2.1	2.0	1.8	1.5	1.3	0.8	0.4	0.3	0.3	0.2
Bangladesh	2.0	2.7	2.9	2.7	2.7	2.2	1.7	1.2	0.8	0.3
Bhutan	2.5	3.4	2.7	0.6	4.6	2.5	1.0	0.9	0.3	-0.8
Brunei	3.4	6.1	3.8	3.8	2.8	2.4	1.6	1.1	0.7	0.5
Cambodia	2.3	1.8	0.4	2.8	3.8	2.6	1.7	1.6	1.3	0.0
China	1.1	2.7	2.9	1.8	1.3	0.8	-0.2	-0.6	-0.6	-0.9
Fiji	3.5	3.5	2.2	0.9	1.0	1.0	0.5	0.3	0.1	-0.6
Hong Kong	2.8	2.7	3.1	1.4	1.6	1.1	-0.2	-0.6	-0.3	-0.3
India	1.4	2.4	2.5	2.4	2.2	2.0	1.3	0.9	0.4	-0.1
Indonesia	1.7	2.3	2.7	2.5	1.9	1.4	1.0	0.3	-0.1	-0.3
Japan	2.0	1.2	0.8	0.7	-0.3	-0.9	-0.7	-1.0	-1.7	-1.0
Korea, Dem. Rep.	3.5	1.9	2.6	1.6	0.9	0.8	0.3	-0.3	-0.2	-1.1
Korea, Republic of	2.1	3.1	2.6	1.8	0.8	0.5	-0.6	-1.3	-1.6	-1.8
Laos	1.8	3.0	1.0	3.1	2.7	3.0	1.7	1.4	0.9	0.2
Malaysia	2.5	3.2	3.1	3.2	3.0	2.0	1.3	0.8	0.4	0.0
Maldives	0.9	2.6	2.4	2.9	3.8	2.6	1.4	1.5	0.7	-0.1
Micronesia, Fed. Sts.	2.5	2.1	4.0	2.7	0.9	1.1	1.2	0.9	0.8	-0.6
Mongolia	2.4	2.8	3.0	2.8	2.3	1.6	0.9	0.4	-0.2	-0.6
Nepal	1.3	2.1	2.2	2.4	2.7	2.7	2.0	1.7	1.3	0.8
New Zealand	2.0	1.9	0.9	1.2	1.1	0.8	0.3	0.0	0.2	0.0
Papua New Guinea	1.1	2.9	2.3	2.9	2.6	2.7	2.2	1.5	1.3	0.8
Philippines	2.9	3.3	3.0	2.8	2.6	2.3	1.9	1.3	0.8	0.3
Samoa	2.8	2.7	1.4	0.3	0.4	2.0	1.2	0.1	0.3	-0.1
Singapore	3.1	3.6	2.8	2.7	2.4	1.5	-0.7	-1.2	-0.3	-0.7
Solomon Islands	2.3	2.9	3.6	3.7	3.3	2.9	2.5	1.8	1.3	0.9
Sri Lanka	2.7	2.8	1.9	2.0	1.3	0.5	-0.2	-0.5	-0.4	-1.6
Thailand	2.5	3.1	3.4	2.1	1.3	0.6	-0.1	-0.4	-0.5	-0.5
Tonga	3.9	1.7	1.5	0.7	0.4	1.1	1.3	0.9	0.7	-0.5
Vanuatu	3.1	3.1	2.8	2.9	2.8	3.0	2.4	1.9	1.4	0.8
Vietnam	0.7	2.4	2.6	2.7	2.6	2.0	1.0	0.5	0.0	-0.4

Table A2. Capital Accounts of Asian Countries, 2005-2050
(percent of Asia's GDP)

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Australia	0.03	0.00	-0.01	0.00	0.01	0.04	0.07	0.07	0.10	0.09
Bangladesh	0.17	0.19	0.21	0.21	0.19	0.18	0.17	0.15	0.13	0.10
Bhutan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brunei	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
Cambodia	0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.00
China	0.49	-0.12	-0.64	-1.24	-0.95	-1.62	-2.03	-1.36	-0.68	-1.56
Fiji	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hong Kong	0.02	0.03	-0.01	-0.04	-0.07	-0.05	-0.03	-0.03	-0.02	-0.01
India	1.40	1.65	1.71	1.53	1.44	1.34	1.10	0.72	0.28	0.15
Indonesia	0.20	0.25	0.32	0.27	0.16	0.07	-0.02	-0.06	-0.10	-0.08
Japan	-2.07	-1.92	-1.54	-0.97	-0.83	-0.97	-1.23	-1.31	-0.94	-0.56
Korea, Dem. Rep.	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	0.00	0.00	-0.01
Korea, Republic of	-0.22	-0.10	-0.14	-0.29	-0.40	-0.37	-0.37	-0.36	-0.32	-0.33
Laos	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Malaysia	0.15	0.16	0.15	0.14	0.11	0.10	0.09	0.06	0.03	0.02
Maldives	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Micronesia, Fed. Sts.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mongolia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nepal	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.03	0.03
New Zealand	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.01	0.01
Papua New Guinea	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Philippines	0.19	0.20	0.23	0.24	0.23	0.21	0.18	0.15	0.10	0.09
Samoa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Singapore	0.03	0.04	-0.01	-0.05	-0.07	-0.06	-0.04	-0.01	0.00	-0.02
Solomon Islands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sri Lanka	0.00	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01	-0.03	-0.04
Thailand	-0.05	-0.04	-0.05	-0.08	-0.09	-0.09	-0.09	-0.09	-0.08	-0.05
Tonga	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanuatu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vietnam	0.13	0.11	0.08	0.07	0.05	0.03	0.02	0.00	-0.02	-0.02

Table A3. Capital Accounts of Asian Countries, 2005-2050
(percent of GDP)

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Australia	1	0	0	0	0	1	2	2	3	2
Bangladesh	10	10	10	9	8	7	6	5	4	3
Bhutan	24	12	9	4	4	5	4	2	-2	-4
Brunei	12	11	10	8	7	7	5	4	4	4
Cambodia	14	13	10	9	10	10	9	8	6	1
China	1	0	-2	-3	-3	-5	-6	-4	-2	-5
Fiji	-2	1	2	1	1	1	2	1	-2	-3
Hong Kong	2	2	-1	-4	-6	-5	-2	-2	-2	-1
India	7	8	8	7	6	6	4	3	1	1
Indonesia	4	5	6	4	3	1	0	-1	-2	-1
Japan	-12	-12	-11	-7	-6	-8	-10	-12	-9	-6
Korea, Dem. Rep.	-3	0	2	0	-4	-3	-5	-2	0	-7
Korea, Republic of	-5	-2	-3	-7	-10	-10	-10	-11	-10	-11
Laos	14	15	12	9	9	9	8	6	3	2
Malaysia	9	9	8	7	5	5	4	3	1	1
Maldives	17	13	9	8	9	9	7	5	2	0
Micronesia, Fed. Sts.	0	2	5	6	6	5	6	5	2	-3
Mongolia	10	6	5	4	2	2	1	-1	-3	-3
Nepal	12	14	13	12	11	11	10	8	7	6
New Zealand	2	0	0	0	-1	-1	0	1	1	1
Papua New Guinea	11	13	14	13	10	9	9	8	8	7
Philippines	10	10	11	10	9	8	6	5	3	3
Samoa	0	9	10	6	1	0	0	2	3	0
Singapore	5	5	-1	-7	-10	-9	-6	-2	-1	-3
Solomon Islands	14	15	16	14	13	11	10	8	7	7
Sri Lanka	0	-2	-3	-4	-4	-4	-3	-3	-6	-10
Thailand	-2	-2	-2	-3	-4	-4	-4	-4	-3	-2
Tonga	-5	2	4	6	7	5	5	5	2	-2
Vanuatu	17	16	15	14	13	12	10	9	8	7
Vietnam	11	9	6	5	3	2	1	0	-1	-1

Table A4. Rate of Return of Closed Economy, 2003-2050

	2003	2004	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Australia	4.00	4.04	4.07	4.22	4.30	4.36	4.41	4.45	4.51	4.56	4.62	4.67
Bangladesh	4.00	4.07	4.14	4.48	4.80	5.12	5.39	5.64	5.86	6.05	6.21	6.31
Bhutan	4.00	4.14	4.27	4.73	5.11	5.34	5.49	5.68	5.82	5.93	5.92	5.81
Brunei	4.00	4.08	4.15	4.54	4.88	5.18	5.44	5.69	5.87	6.03	6.16	6.27
Cambodia	4.00	4.09	4.17	4.62	4.98	5.30	5.62	5.96	6.29	6.59	6.85	6.95
China	4.00	4.04	4.08	4.21	4.29	4.27	4.26	4.20	4.09	3.99	3.94	3.86
Fiji	4.00	4.02	4.05	4.19	4.31	4.39	4.46	4.51	4.55	4.59	4.57	4.50
Hong Kong	4.00	4.04	4.08	4.27	4.36	4.37	4.30	4.20	4.15	4.11	4.06	4.02
India	4.00	4.06	4.12	4.43	4.72	4.96	5.18	5.37	5.53	5.64	5.69	5.69
Indonesia	4.00	4.05	4.09	4.31	4.52	4.70	4.83	4.91	4.93	4.92	4.89	4.84
Japan	4.00	3.99	3.97	3.88	3.73	3.63	3.55	3.44	3.30	3.11	2.95	2.83
Korea, Dem. Rep.	4.00	4.02	4.03	4.15	4.26	4.36	4.33	4.30	4.21	4.15	4.15	4.07
Korea, Republic of	4.00	4.01	4.03	4.11	4.14	4.09	3.94	3.77	3.59	3.40	3.23	3.04
Laos	4.00	4.08	4.17	4.65	5.10	5.43	5.75	6.06	6.35	6.57	6.73	6.80
Malaysia	4.00	4.07	4.13	4.47	4.75	4.99	5.19	5.36	5.50	5.60	5.66	5.67
Maldives	4.00	4.10	4.20	4.67	5.02	5.28	5.59	5.90	6.18	6.38	6.48	6.48
Micronesia, Fed. Sts.	4.00	4.03	4.06	4.22	4.39	4.59	4.78	4.94	5.10	5.26	5.37	5.34
Mongolia	4.00	4.07	4.14	4.43	4.65	4.82	4.94	5.02	5.07	5.06	5.01	4.92
Nepal	4.00	4.08	4.16	4.58	5.01	5.39	5.77	6.15	6.51	6.84	7.12	7.34
New Zealand	4.00	4.04	4.08	4.23	4.31	4.37	4.40	4.40	4.42	4.44	4.47	4.49
Papua New Guinea	4.00	4.07	4.15	4.55	4.99	5.41	5.78	6.10	6.41	6.71	7.01	7.25
Philippines	4.00	4.07	4.14	4.50	4.84	5.18	5.50	5.78	6.01	6.19	6.33	6.41
Samoa	4.00	4.02	4.05	4.31	4.63	4.88	5.01	5.04	5.05	5.09	5.17	5.21
Singapore	4.00	4.04	4.09	4.37	4.48	4.43	4.27	4.08	3.94	3.88	3.86	3.82
Solomon Islands	4.00	4.09	4.17	4.64	5.12	5.61	6.06	6.49	6.88	7.21	7.51	7.76
Sri Lanka	4.00	4.03	4.06	4.17	4.19	4.16	4.12	4.05	3.98	3.93	3.84	3.67
Thailand	4.00	4.03	4.05	4.15	4.20	4.20	4.16	4.10	4.04	3.96	3.90	3.83
Tonga	4.00	4.01	4.02	4.17	4.30	4.49	4.70	4.88	5.01	5.16	5.24	5.23
Vanuatu	4.00	4.10	4.20	4.69	5.18	5.66	6.11	6.55	6.95	7.32	7.68	7.95
Vietnam	4.00	4.07	4.15	4.50	4.75	4.94	5.09	5.19	5.26	5.28	5.26	5.21

Table A5. Potential GDP Growth of Closed Economy, Holding Total Factor Productivity Constant, 2005-2050

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Australia	0.9	0.6	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.2
Bangladesh	1.7	1.5	1.3	1.2	1.0	0.9	0.7	0.6	0.4	0.2
Bhutan	3.0	1.8	1.3	0.7	0.6	0.6	0.5	0.2	-0.2	-0.5
Brunei	1.9	1.7	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.4
Cambodia	2.1	1.8	1.4	1.2	1.2	1.1	1.0	0.9	0.6	0.0
China	0.9	0.5	0.2	-0.1	-0.1	-0.4	-0.6	-0.4	-0.2	-0.6
Fiji	0.6	0.7	0.5	0.3	0.3	0.2	0.2	0.1	-0.2	-0.4
Hong Kong	0.9	0.8	0.2	-0.1	-0.4	-0.4	-0.2	-0.2	-0.2	-0.2
India	1.5	1.4	1.2	0.9	0.8	0.7	0.5	0.3	0.1	0.0
Indonesia	1.1	1.0	0.9	0.7	0.4	0.2	0.0	-0.1	-0.2	-0.2
Japan	-0.4	-0.6	-0.7	-0.5	-0.5	-0.7	-1.0	-1.2	-0.9	-0.7
Korea, Dem. Rep.	0.4	0.6	0.5	0.2	-0.2	-0.2	-0.4	-0.2	0.0	-0.8
Korea, Republic of	0.3	0.4	0.0	-0.5	-0.8	-0.9	-1.0	-1.1	-1.1	-1.3
Laos	2.1	2.1	1.6	1.2	1.1	1.0	0.8	0.6	0.4	0.1
Malaysia	1.6	1.4	1.1	0.9	0.7	0.6	0.5	0.3	0.1	0.0
Maldives	2.4	1.8	1.2	1.0	1.1	1.0	0.8	0.5	0.2	-0.1
Micronesia, Fed. Sts.	0.7	0.8	0.9	0.9	0.8	0.6	0.6	0.6	0.2	-0.4
Mongolia	1.7	1.2	0.9	0.6	0.4	0.3	0.1	-0.1	-0.3	-0.4
Nepal	1.9	1.9	1.7	1.4	1.3	1.2	1.1	0.9	0.7	0.6
New Zealand	1.0	0.6	0.3	0.2	0.1	0.0	0.1	0.1	0.2	0.0
Papua New Guinea	1.8	1.9	1.8	1.5	1.2	1.0	1.0	0.9	0.8	0.6
Philippines	1.7	1.6	1.4	1.3	1.1	0.9	0.7	0.5	0.4	0.2
Samoa	0.7	1.4	1.4	0.8	0.3	0.1	0.1	0.2	0.3	-0.1
Singapore	1.2	1.1	0.2	-0.5	-0.9	-0.9	-0.6	-0.2	-0.1	-0.5
Solomon Islands	2.1	2.1	1.9	1.7	1.5	1.3	1.1	0.9	0.8	0.6
Sri Lanka	0.7	0.3	0.0	-0.2	-0.3	-0.3	-0.3	-0.3	-0.6	-1.1
Thailand	0.6	0.4	0.1	-0.1	-0.2	-0.3	-0.3	-0.4	-0.3	-0.3
Tonga	0.3	0.7	0.7	0.9	0.9	0.7	0.5	0.5	0.2	-0.3
Vanuatu	2.4	2.1	1.9	1.7	1.5	1.3	1.1	1.0	0.9	0.6
Vietnam	1.8	1.4	0.9	0.7	0.5	0.3	0.2	0.0	-0.1	-0.3

Table A6. Potential GDP Growth of Open Economy, Holding Total Factor Productivity Constant, 2005-2050

	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Australia	0.9	0.6	0.3	0.3	0.2	0.3	0.3	0.3	0.4	0.3
Bangladesh	2.1	1.9	1.8	1.6	1.3	1.2	1.0	0.8	0.6	0.4
Bhutan	4.0	2.3	1.7	0.9	0.8	0.9	0.6	0.3	-0.3	-0.7
Brunei	2.4	2.1	1.8	1.5	1.3	1.1	0.8	0.7	0.6	0.6
Cambodia	2.7	2.4	1.8	1.6	1.6	1.6	1.4	1.3	0.9	0.0
China	1.0	0.5	0.1	-0.3	-0.2	-0.6	-0.8	-0.6	-0.3	-0.8
Fiji	0.5	0.7	0.6	0.4	0.3	0.3	0.3	0.1	-0.3	-0.5
Hong Kong	1.0	0.9	0.2	-0.3	-0.7	-0.6	-0.3	-0.3	-0.3	-0.3
India	1.8	1.7	1.5	1.2	1.1	0.9	0.7	0.4	0.2	0.0
Indonesia	1.3	1.2	1.1	0.9	0.6	0.3	0.0	-0.1	-0.2	-0.3
Japan	-0.8	-1.1	-1.2	-0.8	-0.8	-1.1	-1.5	-1.7	-1.3	-0.9
Korea, Dem. Rep.	0.3	0.6	0.6	0.2	-0.3	-0.4	-0.6	-0.2	0.0	-1.1
Korea, Republic of	0.1	0.3	-0.1	-0.8	-1.3	-1.4	-1.5	-1.6	-1.5	-1.8
Laos	2.7	2.8	2.1	1.6	1.5	1.4	1.2	0.9	0.5	0.2
Malaysia	2.0	1.8	1.5	1.2	0.9	0.8	0.6	0.4	0.2	0.0
Maldives	3.2	2.4	1.6	1.3	1.5	1.5	1.2	0.7	0.3	-0.1
Micronesia, Fed. Sts.	0.7	0.9	1.1	1.1	1.0	0.9	0.9	0.8	0.3	-0.5
Mongolia	2.1	1.4	1.1	0.8	0.5	0.4	0.1	-0.2	-0.4	-0.5
Nepal	2.4	2.5	2.2	1.9	1.8	1.7	1.5	1.3	1.0	0.8
New Zealand	1.1	0.5	0.3	0.2	0.0	0.0	0.1	0.2	0.2	0.1
Papua New Guinea	2.3	2.4	2.4	2.1	1.6	1.4	1.3	1.3	1.1	0.9
Philippines	2.1	2.0	1.9	1.8	1.5	1.2	1.0	0.7	0.5	0.3
Samoa	0.7	1.8	1.8	1.1	0.4	0.0	0.1	0.3	0.5	0.0
Singapore	1.4	1.3	0.1	-0.8	-1.3	-1.3	-0.8	-0.3	-0.1	-0.6
Solomon Islands	2.7	2.7	2.6	2.3	2.0	1.8	1.5	1.2	1.1	0.9
Sri Lanka	0.7	0.2	-0.2	-0.3	-0.5	-0.5	-0.5	-0.4	-0.9	-1.6
Thailand	0.5	0.3	0.0	-0.2	-0.4	-0.5	-0.5	-0.5	-0.5	-0.4
Tonga	0.2	0.8	0.9	1.2	1.2	0.9	0.7	0.7	0.3	-0.4
Vanuatu	3.1	2.8	2.6	2.3	2.0	1.8	1.6	1.4	1.2	0.9
Vietnam	2.3	1.8	1.2	0.9	0.7	0.4	0.2	0.0	-0.2	-0.3