IMF Working Paper

WP/97/136   INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

Implications for Savings of Aging in the Asian "Tigers"[1]

Prepared by Peter S. Heller and Steve Symansky

October 1997

Abstract

Significant aging is projected for many high-saving emerging economies of East and Southeast Asia. By 2025, the share of the elderly in their populations will at least double in most of these countries. The share of the young will fall. Aging populations could adversely affect saving rates in these economies, particularly after 2025. For the world, one may observe that, initially, the Asian Tigers could become increasingly important for world savings, reflecting their increased weight in the world economy, their high saving and growth rates, and the aging of the industrial countries. After 2025, the aging of the Tigers may reinforce the tendency toward a declining world saving rate.

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SUMMARY

Significant aging is projected for many high-saving countries of East and Southeast Asia. Between now and 2025, the share of the elderly in their populations will at least double in China, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand, Taiwan Province of China, Vietnam, and Hong Kong, China. The share of younger age groups will fall sharply. This paper assesses the impact of demographic factors on the national saving rate of the Asian Tigers through the period 2050 as well as the evolving role of their savings in a global context. Using macroeconometric estimators from the literature as well as a complementary study by Heller (1997) on the impact of demographic factors on government savings, the results suggest that aging could significantly affect the private and national savings rates in the Tiger economies, particularly after 2025.

In a global context, the phenomenon of aging populations may well place significant pressures on world savings after 2010. Initially, the aging of industrial countries could lead to both a progressive decline in their saving rate as well as a fall in their share in world output. The Asian Tigers, because of their increased weight in the world economy, could become increasingly important in terms of world savings, and indeed, their saving rate performance may buoy up world saving rates at least over the medium term. However, by 2025, the increased share of the elderly in the Tigers' populations may begin to reinforce the adverse prognosis for world saving rates. The study concludes by noting that beyond the significant uncertainties underlying these results, the ultimate macroeconomic impact of these developments will also be shaped by how the demand for savings evolves and by the response of savings and investment to the changes that will inevitably occur in world interest rates.

I. INTRODUCTION

As recently as the Denver G-7 Summit, the aging of the populations of Western Europe, North America, and Japan has been the focus of considerable attention. Many studies have commented on the likely adverse impact of aging on their fiscal balance and national saving rates.[2] Much less remarked upon, but equally consequential over the next several decades—both for their own economies and the global economy—is the significant aging that is projected for many of the high-saving countries of East and Southeast Asia. Although their adverse demographics will be realized at a later date than in the industrial countries, between now and 2025, the share of the elderly in their populations will at least double in all the Asian "Tiger" economies (defined in this paper to include China, Indonesia, Korea, Malaysia, the Philippines, Singapore, Thailand, Taiwan Province of China, Vietnam, and Hong Kong, China). At the same time, the share of younger age groups will fall sharply.

While economic growth in these countries is still expected to be rapid relative to many other parts of the world—increasing their share of world output—how will their saving rates respond to these demographic pressures? Will the aging of their populations add to the already projected pressure on world savings that is expected from the "greying" of the industrial countries? If so, the impact of such additional pressure on capital markets could put pressure on world interest rates and pose difficult challenges for the global macroeconomy.

This paper will demonstrate that the aging of the Tigers will have a significant impact on private sector and national savings rates, particularly during the period 2025-2050. Although the Tigers will be an important force in contributing to global savings as the industrial economies age, their own aging will significantly cut into their saving performance. Although there is likely to be some diminution in the global demand for investment, these aggregate saving developments may have significant macroeconomic implications for the world economy.

In what follows, Section II highlights the salient demographic trends projected for the Tigers, noting differences across countries in the timing of the aging process. Section III examines the econometric evidence on the impact of demographic factors on the saving rate. The results observed in the literature are then used to project the private saving rate of the Tigers through 2050. Since most econometric studies focus on private savings, Section IV takes account of the implications of aging populations on government social expenditure in order to estimate the overall impact on national saving rates (relying on a recent study by Heller (1997)). Section V then makes a projection to assess the role of Asian Tiger savings in a global context in the coming decades. The section also reflects upon some of the macroeconomic policy implications of these trends. It is shown that these demographic developments could have significant effects, with plausibly important macroeconomic implications, both at a regional and global level. Section VI provides some concluding thoughts.

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[2] See Heller (1989); and OECD (1996).

II. DEMOGRAPHIC TRENDS

How and when the aging of these populations manifests itself will have important implications for the structure of the social and fiscal policy choices confronting each of the Tigers in the coming years.[3] In terms of timing, the countries fall into three principal groups: (i) the East Asian countries—the most demographically mature and developed in economic terms—are defined to include Korea, Taiwan Province of China, and Singapore, and Hong Kong, China; (ii) China, the largest of the Tigers, where the aging process is occurring somewhat later than in East Asia; and (iii) Southeast Asia, defined to include Indonesia, Malaysia, Philippines, Thailand, and Vietnam, where there have recently been significant declines in fertility and increased life expectancy, but where a further maturing of these indicators can be expected.

Recent demographic projections suggest the following likely developments in the age structure over the period (see Chart 1):

* **The East Asian countries are furthest advanced in terms of population aging.** Their **working age population,** which has grown at rates of 0.8-1.5 percent in recent years, will increase far more slowly during the period 2000-2030. After 2030, their labor force will shrink. This slowdown will put a brake on real growth rates (in the absence of large scale immigration).[4] **Through 2010, overall dependency rates** (viz., the ratio of the population under age 15 or over 64 to the working age population, which is the equivalent of the sum of the youth and elderly dependency rates) will be either stable or will increase modestly, and will fall below those of the other Tigers, reflecting primarily a significantly lower (and declining) youth dependency rate. Indeed, the absolute size of the 0-14 and 15-19 population groups will contract on the order of 15-30 percent in all these countries. This period will also see the beginning of an acceleration in the elderly dependency rate. **After 2010,** the overall dependency rate begins to rise sharply, wholly reflecting the increasing share of the elderly population relative to a slowly growing, if not declining, potential work force. The young population will remain roughly static. By 2020, the elderly dependency rate will double, relative to now, to about 20-30 percent, only slightly below the rates then

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[3]The study relies on the most recent World Bank demographic projections. It uses their central tendency assumptions on birth and death rates as well as likely immigration levels. Annex Table 1 illustrates the assumed decline in fertility rates and the gradual growth in life expectancy, with the former moving closer to replacement levels (about 2.1) and the latter rising to the mid-70s. While the direction of these trends is clear, the speed and timing of the potential developments are subject to more uncertainty. Immigration is, of course, a more difficult variable to predict.

[4] Immigration or temporary worker flows have already proven important in Malaysia and Thailand and may also become relevant for Singapore, Taiwan Province of China.

Chart 1. Demographic Indicators
(1995-2050)

Total Dependency Ratio

Legend:
- Hong Kong, China
- Korea
- Singapore
- Taiwan Province of China
- Indonesia
- Malaysia
- Philippines
- Thailand
- Vietnam

Elderly Dependency Ratio

Legend:
- Hong Kong, China
- Korea
- Singapore
- Taiwan Province of China
- China
- Indonesia
- Malaysia
- Philippines
- Thailand
- Vietnam

Youth Dependency Ratio

Legend:
- Hong Kong, China
- Korea
- Singapore
- Taiwan Province of China
- China
- Indonesia
- Malaysia
- Philippines
- Thailand
- Vietnam
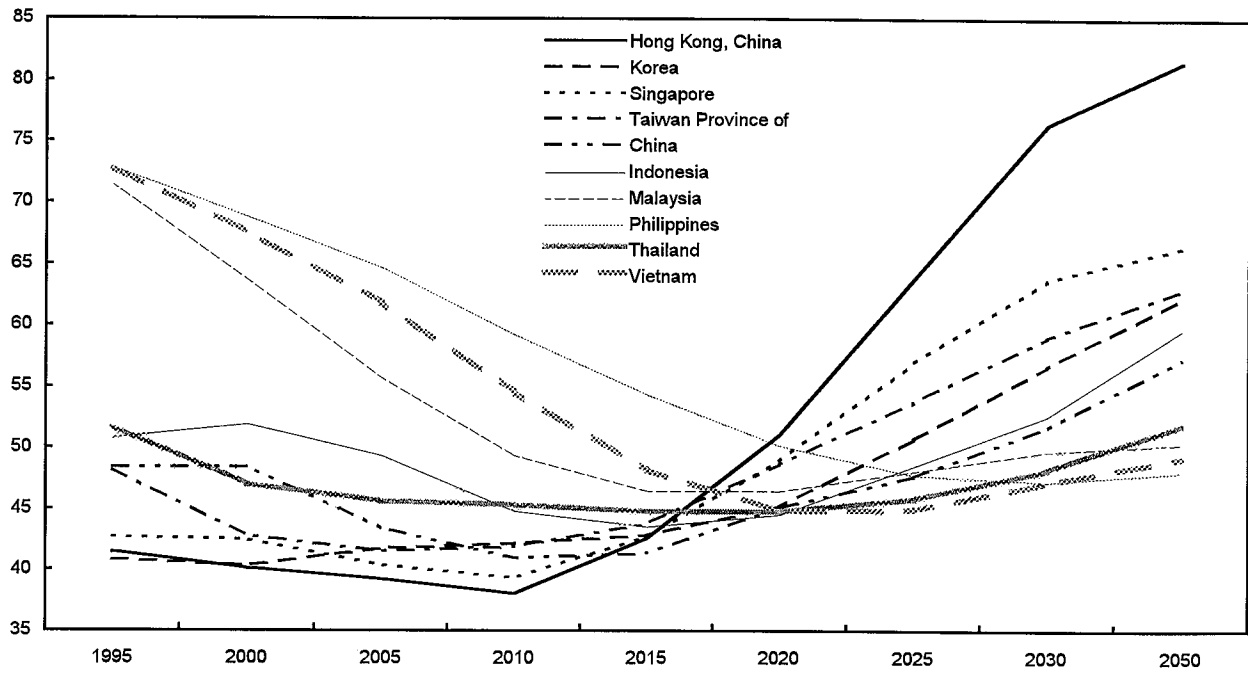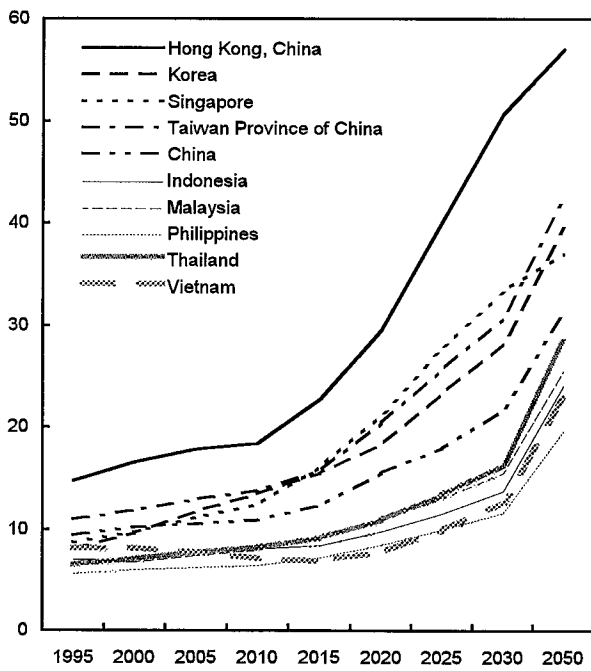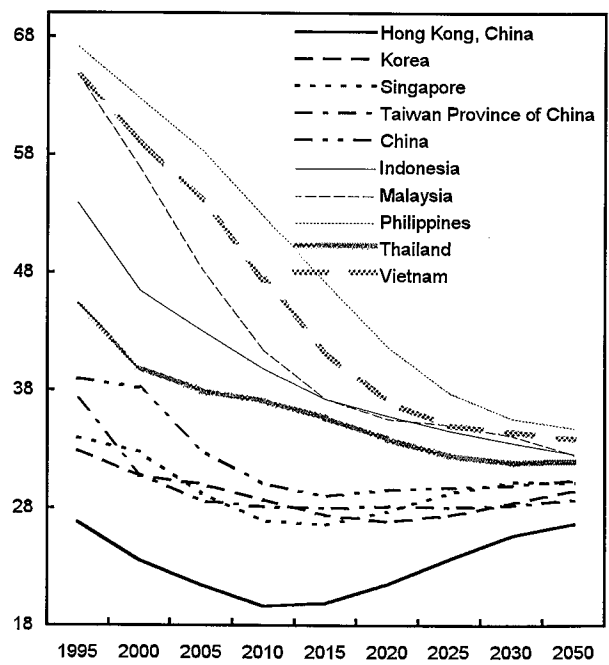
Sources:

expected to be observed in the United States. Thereafter, these trends will be further reinforced.

- The annual growth of **China's** population and its work force has already slowed to about 1 percent, and further deceleration can be projected. The pattern of aging of China's population is similar to that of East Asia, but occurs about 10 years later. **Through 2010**, its overall dependency rate will fall sharply—from almost 50 percent to 41 percent, reflecting an absolute decline in the 0-14 population. **After 2010**, the elderly and overall dependency rates will gradually increase (with a doubling of the former by 2030 relative to current levels and a tripling by the year 2050), although these rates will still be below those in East Asia.

- The aging of the populations of the **Southeast Asian** Tigers is marked by a **first phase**—through about 2020—of a gradual, but quite significant contraction in both the youth and overall dependency rates and a somewhat higher relative growth in the labor force than in the other Tigers. This largely reflects a strong fertility rate that was sustained 20 years longer than other Tigers. During this initial phase, the overall dependency rate is relatively high, primarily because of the relatively high youth dependency rate—ranging from 38 percent in Thailand to 54-58 percent in Philippines and Vietnam, and mirroring the higher fertility rates in most of these countries (in the range of 3-4 through 2012). The decline in the youth dependency rate becomes fairly steep, falling to levels of 33-36 percent by 2020, and the size of the 0-19 population will stabilize in a few countries (viz., Indonesia, Malaysia, and Thailand). In contrast, in others (i.e., Vietnam and the Philippines), the size of the 0-19 population will grow through 2020.

  The **second phase,** beginning **after 2020** will be marked by a rising share of the elderly and overall dependency rates. The former will reach 22-28 percent by the middle of the century, still below the elderly dependency rates that will be observed in East Asia (at about 40 percent) and China (31 percent). As elsewhere, the youth dependency rate and the number of young will stabilize.

III. Impact of Demographic Factors on Private Sector Saving Rates

A. The effect of demographics on private savings: drawing from econometric studies

There is already an extensive econometric literature on private savings behavior, although the analyses vary according to the question that each study has sought to address. Most of the early work (Modigliani and Sterling (1983)) sought to test the life cycle hypothesis (LCH) on consumption/savings behavior. Other authors have tended to focus on explaining cross-country and regional variations in saving rates (Masson et. al. (1995)). There are also numerous studies that have been primarily concerned with explaining specific features of savings behavior. For example, Weil (1994) attempted to reconcile estimates from macro

econometric studies—which tend to show a significant relationship between saving rates and demographic factors—with estimates from micro econometric studies—which, in contrast, seem to suggest that people do not significantly dissave as they get older. Another important focus in the specification of such analyses has been the likely impact of an aging population on saving rates, both from a country and world perspective (see Masson and Tryon (1990) and OECD (1996)).

The purpose of this section is to draw from this literature empirical relationships that can be plausibly used to quantify the effects of demographic change on the saving behavior of the Asian Tigers. Because of the dearth of saving studies devoted to this region (Japan obviously excluded), the paper primarily relies on econometric estimates derived either from industrial country samples or developing country databases where the Asian countries represent only a small part of the full sample.[5]

The basic analytical underpinning for most estimated private savings equations takes account of inter-temporal considerations. In all these models, lifetime wealth, rather than current income, is the primary determinant of savings behavior. However, the degree of consumption smoothing has been qualified by the recognition that individuals face liquidity constraints (Hayashi (1985)) and that they face uncertainty about future income. The influence that government deficits may have on private savings has also been an important consideration in the specification of a number of models. Barro (1974) has argued that if individuals recognize that the financing of current fiscal deficits will eventually have to be borne by the private sector, government dissavings will be completely offset by higher private savings. While some authors (Buiter (1988)) have questioned the extreme findings of Barro, most models appear to accept that there is a high offset of expected future taxes by private savings and that the main determinant of consumption is financial wealth.

One very important implication of LCH-type models, which is the focus of much of the remaining discussion, is that the demographic profile of a population should be an important factor in influencing the aggregate saving rate. If a large percentage of the population is working, then the savings rate should be high, since these workers should be saving for their consumption needs when they retire. Similarly, if there is a large segment of the population over the retirement age or very young, the saving rate should be lower. This would suggest that aggregate saving rates should be negatively correlated with the overall dependency ratio.

While the theoretical conclusions are clear, the empirical estimates have been mixed. While many authors have found the relationship to be significant and numerically important (e.g., Modigliani and Sterling, Masson and Tryon, others have questioned these findings (Koskela and Viren (1989)). Generally, estimates based on cross-sectional aggregate data have yielded larger and more significant coefficients than those derived from aggregate time series data. The weakness of time series estimates is often attributed to the recognition that

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[5]A useful survey of the literature on Asian saving rates is found in Chandarvarkar (1993).

demographic data are very slow to change, limiting the value of such data in capturing the full range of variability in demographic outcomes. Although the cross-sectional estimates suggest a stronger link between demographic variables and savings, there is no *a priori* reason to expect these relationships to hold unless the saving behavior for all countries were similar. There is also an apparent conflict between macro- and micro-econometric studies. Weil shows that bequests may change the saving rates of the different generations, rendering the latter studies somewhat less meaningful.

The most standard form of the private saving function, based on the LCH model, posits a positive relationship between wealth, the growth in income, and certain demographic variables. In some equation specifications, separate fiscal variables have been added to determine if private savings is subject to Ricardian properties (Masson et. al.), and current income has been added to test for liquidity constraints. For developing countries, foreign savings are often added to the equation, since changes in foreign financing can prove important for countries that are finance-constrained (Schmidt-Hebbel et. al. (1992) and Masson et. al.).

Table 1 summarizes the findings of some recent econometric studies on the relationship between demographic variables and savings. Although there are many other studies, these provide a useful sample that illustrates the wide dispersion of observed estimators. Most authors do find a significant and numerically important relationship between saving rates and demographic variables. Although some authors do not distinguish between the young and elderly dependency ratios, most empirical estimates show that an increase in the elderly dependency rate has a more negative influence on private saving rates than does a corresponding increase in the share of the young.

At one extreme in terms of the quantitative estimates is Masson et. al., who find only a very small impact from changes in demographic variables. However, in contrast to most other studies, in order to include a large number of countries, their study used *derived* savings data and included a large number of other explanatory variables in order to test several hypotheses, which, as they recognize, may have introduced multicollinearity. Almost at the other extreme are Feldstein (1980), using industrial country cross-sectional data, and Horioka (1991), who used time series data for Japan. The largest coefficients for demographic variables emerge from econometric estimates carried out by the authors, using a cross-section time series data base which included only the Tigers (see Annex 1). The other studies reported in Table 1 tend to find that a one percentage point change in the dependency rate results in approximately a one-half of one percentage point change in the saving rate.

None of the empirical literature cited above necessarily stands out above the others as providing the best estimate of the influence of demographic variables on private saving rates. Rather, all of them have benefits and drawbacks. Since only the estimates of Ling and Peng (1996) and those of the authors use data from the Asian countries, in principle they could be considered more apposite than the others. However, the Ling and Peng work is not well documented and cannot be thoroughly scrutinized. Our estimators appear implausibly high and are not likely to be dynamically applicable when one considers their implications for longer-

Table 1: Summary of Coefficients from Econometric Studies on the Relationship of Saving Rates to Demographic Variables

Author	Countries Covered	Coefficient on Elderly Dependency Rate	Coefficient on Youth Dependency Rate	Savings Variable	Database
Feldstein	Industrial Countries	-1.21	-0.77	Private savings	Pooled cross section time series
Masson et al.	High Income, Developing Countries	-0.25 1/	-0.25 1/	Private savings: (National savings yielded smaller effects)	Pooled cross section time series
Weil	Industrial Countries	-0.5	-0.27 2/	Private savings (reconciles difference between micro and macro estimates)	Pooled cross section time series
Horioka 1991	Japan	-1.03	-0.29	Private savings (national savings yielded slightly smaller coefficients)	Time series
Schmidt-Hebbel et al.	10 Developing Countries	-0.48 1/ 2/	-0.48 1/ 2/	Household savings	Cross section
Ling & Peng	East Asia	-0.6	-0.4	Savings	Partial 1996 countries
Modigliani & Sterling 1983	Industrial Countries	-0.51	-0.2	Private savings	Cross section
Heller & Symansky	Asian Tigers	-1.54	-4.4	Private savings	Pooled cross section time series

1/ The youth and elderly ratios were combined together as a single dependency variable in the estimates.
2/ The dependency ratio was defined as a percentage of the total population rather than the same traditional percentage of the "working-age" population.

term projections. Feldstein, Modigliani and Sterling, and Weil all use data from industrial countries. Since the more advanced economies have much more developed pension and medical insurance schemes as well as other safety net type government programs, the behavioral response of the different age groups captured from the studies may not be representative of the behavior of populations in other countries with less developed social insurance schemes. Thus, there may be a significant bias if these coefficients are applied to the Tigers.

In a similar vein, estimates that rely on a wide range of developing countries (Masson et. al. and Schmidt-Hebbel et. al.) may run the opposite risk, both capturing a greater range of social insurance schemes than in Asia (without compensating adjustments to the specifications of the estimating equations), and, equally important, not capturing adequate variability in terms of the observed dependency rates, particularly among the elderly, since historically, many developing countries have had a very small proportion of the population in this category. Finally, Horioka's (1991) estimates are based on Japanese data. Although there are important structural similarities with the Asian economies, the role of government in Japan is more similar to that in the other industrial countries.

In sum, despite these drawbacks, the various studies do provide a sufficient variation in empirical estimates so as to obtain a sense of the potential magnitude of the impact of demographic change on saving rates.

B. Implications of demographics for the aggregate private saving rates of the Tigers

In this section, the effect of the prospective change in the demographic structure of the Asian Tigers on private saving rates is quantified. The *change* in private saving rates from 1995 are shown in Table 2 (as a percent of GDP) and are derived from the studies shown in Table 1.[6] Such changes can be seen as *net reductions or additions* to national saving rates, assuming no change in public sector saving rates. They are partial equilibrium estimates, taking account *only* of the effects of demographic change. Changes in the private saving rate that could arise from changes in other exogenous variables over the medium- and long-term (such as urbanization) are *not* taken into account. Neither are general equilibrium effects captured that would arise from factors that would affect such endogenous macroeconomic variables as income growth and interest rates, and which would be determinants of savings. Finally, Table 2 also ignores policy changes that might be introduced in the wake of a change in saving behavior. Thus, the estimated effects, including the unlikely result of negative saving

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[6]The dependency rates shown in Chart 1 are applied to the coefficients in Table 1. When relevant, the numbers are adjusted to reflect dependency rates as a share of the total population, rather than the working age population.

Table 2: Asian Tigers: Alternative Projections on Marginal Change in the Private Saving Rate due to the Impact of Demographic Factors: 1995-2050, by Econometric Study

(Change in Saving Rates from 1995 as percent of GDP)

Country	National Savings Rate in % of GDP 1995	Econometric Study											
		Feldstein			Horioka			Ling & Peng			Schmidt-Hebbel et al.		
		2010	2025	2050	2010	2025	2050	2010	2025	2050	2010	2025	2050
East Asia													
Hong Kong, China	32.7	1.0	-28.4	-53.3	-1.7	-25.3	-44.4	0.6	-14.0	-26.5	0.9	-4.6	-8.2
Korea	35.2	-3.4	-14.3	-36.3	-4.4	-14.2	-31.7	-1.6	-7.0	-17.9	2.6	3.0	0.9
Singapore	50.3	1.0	-19.3	-31.3	-1.8	-18.2	-28.1	0.6	-9.5	-15.4	2.4	4.7	4.0
Taiwan Province of China	28.0	3.6	-10.8	-33.1	-0.2	-12.5	-30.5	2.0	-5.2	-16.3	0.8	-3.1	-4.9
Average 1/	*34.3*	*-0.5*	*-16.3*	*-37.9*	*-2.7*	*-16.0*	*-33.2*	*-0.2*	*-8.0*	*-18.8*	*1.9*	*0.4*	*-1.8*
China	39.3	5.0	-3.2	-19.8	1.0	-6.1	-20.0	2.7	-1.4	-9.7	1.7	0.2	-2.7
Southeast Asia													
Indonesia	30.3	9.6	9.4	-3.9	3.0	0.9	-11.3	5.0	5.0	-1.5	2.5	3.8	2.4
Malaysia	34.7	16.4	15.1	3.6	5.4	2.0	-9.5	8.6	8.0	2.4	-0.3	-2.2	-5.8
Phillipines	17.8	10.1	17.4	10.5	3.3	4.0	-4.0	5.3	9.1	5.9	4.1	4.4	2.8
Thiland	35.0	4.2	1.5	-16.3	0.6	-3.4	-18.7	2.2	1.0	-7.8	1.4	-1.2	-4.7
Vietnam	21.5	14.5	20.7	8.2	6.0	6.8	-5.4	7.5	10.8	4.7	1.4	1.3	-1.7
Average 1/	*30.7*	*9.4*	*9.4*	*-4.2*	*2.8*	*0.4*	*-12.2*	*4.9*	*5.0*	*-1.6*	*1.8*	*1.2*	*-1.4*
Total 1/	35.2	3.9	-5.1	-23.0	0.0	-8.3	-23.2	2.1	-2.3	-11.2	1.8	0.5	-2.0

Country	National Savings Rate in % of GDP 1995	Econometric Study											
		Modigliani			Weil			Masson et al.			Heller & Symansky		
		2010	2025	2050	2010	2025	2050	2010	2025	2050	2010	2025	2050
East Asia													
Hong Kong, China	32.7	-0.5	-12.3	-22.1	-0.2	-5.8	-9.1	0.9	-5.6	-11.3	-1.1	-31.9	-57.3
Korea	35.2	-2.0	-6.7	-15.6	1.2	0.9	-2.0	-0.3	-2.5	-7.3	-5.0	-17.3	-40.3
Singapore	50.3	-0.5	-8.7	-13.7	1.2	1.9	0.1	0.8	-3.6	-6.1	-1.1	-22.5	-35.3
Taiwan Province of China	28.0	0.4	-5.7	-14.8	-0.2	-4.3	-6.4	1.6	-1.4	-6.2	1.1	-14.6	-38.1
Average 1/	*34.3*	*-1.0*	*-7.6*	*-16.3*	*0.6*	*-1.4*	*-4.1*	*0.4*	*-2.8*	*-7.6*	*-2.5*	*-19.6*	*-42.2*
China	39.3	1.0	-2.5	-9.4	0.6	-1.2	-4.4	1.9	0.2	-3.3	2.7	-6.4	-24.3
Southeast Asia													
Indonesia	30.3	2.3	1.6	-4.4	1.2	1.4	-0.8	3.3	3.7	1.2	6.1	4.3	-11.0
Malaysia	34.7	4.0	2.7	-2.8	-1.0	-3.5	-7.2	5.5	5.8	3.9	10.7	7.3	-6.7
Phillipines	17.8	2.5	3.7	0.0	2.0	1.4	-1.2	3.4	6.3	5.4	6.6	9.8	0.5
Thiland	35.0	0.7	-0.9	-8.5	0.3	-2.7	-6.5	1.6	1.5	-2.2	2.0	-2.3	-21.9
Vietnam	21.5	4.0	5.0	-0.8	0.5	-0.4	-4.0	4.6	7.0	4.7	10.5	13.4	-1.5
Average 1/	*30.7*	*2.2*	*1.4*	*-4.7*	*0.6*	*-0.8*	*-3.9*	*3.2*	*3.8*	*1.3*	*5.9*	*3.8*	*-11.9*
Total 1/	35.2	0.5	-3.5	-10.9	0.6	-1.2	-4.2	1.6	-0.1	-3.8	1.5	-9.0	-28.2

1/ Weighted by GDP in 2002.

rates, only indicate the partial effect of demographic change on private saving rates. The findings can be summarized as follows:[7]

Broad regional results - Through 2010, the fall in the youth dependency rate and the minimal increase in the elderly ratio for all of the Tigers should result in a tendency for an increase in private saving rates. Furthermore, through 2025, only in East Asia will demographic factors exert a strong negative influence on private saving rates. In contrast, such factors will tend to either increase private saving rates in Southeast Asia or result in their remaining relatively flat (e.g., in China). GDP-weighted estimates of the average impact for the region as a whole suggest some decline in the overall Tiger private saving rate by 2025, though most estimates would suggest such an effect to be fairly modest (excepting Horioka's estimators). However, thereafter, saving rates will decline across the whole region as the youth dependency rate stabilizes and the rising elderly dependency rate, particularly in East Asia and China, exerts more of an influence.

By author - At one extreme are the results of Feldstein and Horioka, which show the largest savings effects directly related to demographics. In fact, their aggregate effects are very similar; for the Asian tigers as a whole, their estimates imply a decline in private saving rates of 5.1 and 8.3 percent of GDP, respectively, by 2025; and by 23 percent of GDP by 2050. On the other hand, they find some substantial cross-country variation, especially for some of the countries in Southeast Asia (e.g. the effect on savings in Malaysia by 2050 is a positive 3.6 percent of GDP for Feldstein, but -9.5 percent of GDP for Horioka). Interestingly, although Feldstein has the largest parameter estimates, this does not always translate into the largest decline in the saving rate as the population ages. The declining youth dependency rate, which also has a large estimated effect in Feldstein's equation, partially offsets the increasing share of the elderly, resulting in smaller changes in the net private saving rate for Feldstein's estimates as opposed to Horioka's in some countries.

At the other extreme are the results implied by Masson et. al., Schmidt-Hebbel et. al., and Weil, with the change in net private saving rates less than one quarter than would be implied by Horioka's study. The largest individual decline in a country's saving rate derived from the estimates of these latter three studies is 11.3 percent of GDP in Hong Kong, China in 2050 (using the Masson et. al. estimators). This compares with a decline of around 50 percent of GDP using either the Horioka or Feldstein estimates! The change in saving rates based on the empirical work of Modigliani and Sterling, and Ling and Peng are nearly in the middle of the other estimates.

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[7]The authors' estimates, although shown in Table 2, have been excluded from the discussion. They are only meant to be suggestive about the influence of demographic effects as savings. As explained in Annex 1, due partly to data limitations, several important variable are excluded from the regressions and are assumed to be captured in the constant term.

IV. THE IMPACT OF DEMOGRAPHIC AND OTHER FACTORS ON NATIONAL SAVINGS [8]

There are two principal difficulties in focussing strictly on the impact of demographic factors on aggregate private saving rates. First, such an approach omits what could be a crucial impact on public sector savings. Although private savings account for the lion's share of gross savings in most of these economies (see Table 3), public sector savings nevertheless are a significant share of GDP in most of the Tigers, with the principal exception being China, where it is negligible. Moreover, even where gross public sector savings may be low, the current account surplus of the budgetary central government may be in fact higher (with noncentral government public sector savings negative in some cases, such as in the Philippines, Indonesia, and Singapore). Current budget surpluses are about 8 percent of GDP in all of the Southeast Asian Tigers except Vietnam, and reach over 15 percent of GDP in Singapore.

A second bias introduced is that related to the data used in a life-cycle model. One should probably be focusing less on aggregate private savings and more on household savings in the above empirical analyses since it is the individuals and not the corporate sector that are likely to exhibit the largest response to changing demographics. Regrettably, household savings data is weak and largely unavailable for most countries. And while in some countries, the evidence is strong that household savings account for most private savings (e.g., in China), there are other cases, notably in Thailand, where corporate savings are almost two-thirds of private sector savings.

Most assessments of the impact of aging on public sector savings have focussed on calculating the specific implications for expenditure in the key social sectors, viz., health, education, and pensions (see Heller (1989); OECD (1996)). In a companion paper written by Heller (1997), such estimates have been made for the Tigers for the period through 2050. Two scenarios were provided. One focussed on the narrow impact of demographic change, examining specifically the effect of changes in the relative population shares of the key age groups that would have significant consequences for public spending in the social sectors. These initial projections took no account of any possible change in the government's policy orientation in these sectors, neither in terms of the coverage nor character of the programs (other than for adjustments in real wages and benefit levels in each sector as a consequence of real productivity growth in the economy).

The second scenario examined plausible policy changes that one might see introduced in the coming years as these economies mature. Specifically, it was assumed:

• that governments' medical outlays would rise more than proportionately to output, reflecting the rapid change in the composition of illness in these countries toward more

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[8]All the national income data, including savings, used in this paper are taken from the World Economic Outlook data files of the IMF. These data reflect input from the authorities and the IMF staff. Data are available from the authors on request.

Table 3: Asian Tigers -- Sources of Savings by Sector: 1995

(In percent of GDP)

	Gross National Savings Rate	of which: Provident Fund Savings	Gross Private Savings Rate	Gross Public Savings Rate	of which: Central Government Budgetary Current Savings	Provident Fund Asset Holdings
East Asia						
Hong Kong, China	33.8	...	28.5	5.3	...	...
Korea	35.2	...	26.4	8.8	(4.9)	...
Singapore	47.8	(11.2)	37.6	10.2	(15.4)	54.7
Taiwan Province of China	28.2	...	24.8	3.3	...	...
China	41.1	...	41.1	--	0.6	...
Southeast Asia						
Indonesia	34.8	...	28.4	6.4	(8.5)	6.7
Malaysia	32.4	(4.7)	18.3	14.1	(8.9)	45.0
Philippines	19.9	...	16.5	3.4	(8.0)	11.2
Thailand	35.0	...	24.6	10.4	(8.3)	3.6
Vietnam	21.5	...	16.7	4.7	(2.2)	...

- chronic and less infectious diseases (converging to the morbidity pattern of industrial countries), the impact of higher cost medical technologies and practices more prevalent in industrial countries, and the pressures for medical cost inflation that have already begun to emerge in East Asia.[9]

- for those countries where enrollment rates in the tertiary education sector are presently below 20 percent, that governments would increase outlays in the education sector such that the national tertiary enrollment rate would achieve this level (while still maintaining a constant relative role for the government in the sector); and

- that for the Tigers with less than universal pension coverage, governments would introduce some type of social safety net scheme for the elderly that would entail a minimum government transfer to those elderly *not* covered under present public schemes, by an amount equaling 30 percent of per capita income.[10]

These assumptions suggest a fairly ambitious policy agenda and a possibly pessimistic outlook in the medical care sector. Thus, they should be considered to provide an upper-bound estimate of the increased government expenditure that could arise from a combination of aging populations and the effect of policy choices. This is particularly the case, given the region's mixed experience with respect to the role of the public and private sectors in the social sectors (contrast the East Asian Tigers with those of Southeast Asia). The implied *changes* in government outlays are shown in Table 4, and can be compared with the current *level* of the government expenditure share of GDP in these sectors (shown in column (1)). Table 4 also distinguishes between the effects arising from policy changes in the education and medical sectors relative to the added effect of policy changes in the pension sector, simply in order to give a sense of the magnitude of the latter.

Can one assume that these increased expenditure shares would have a correspondingly adverse impact on *national* saving rates? Two assumptions would be needed to make this deductive leap. First, one would need to assume that these changes are equivalent to a change in the government's saving rate, viz., that the current share in GDP of other forms of government consumption, tax and nontax revenues, and social insurance contributions remains unchanged. Second, one would have to assume that there are no offsetting increases in private savings arising from the decline in public sector savings (i.e., a Ricardian effect of zero).

While the former assumption can be justified in order to isolate the effects of demographic and policy factors in the social sector sphere and to gauge the magnitude of additional fiscal policy adjustments that may be required, the latter assumption would run

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[9]Specifically, a real GDP elasticity of 1.3 was assumed for government medical outlays through the period 20205, with the elasticity then falling to 1.1 between 2025 and 2050.

[10] This would thus exclude Korea, Singapore and Taiwan Province of China—where coverage rates are already relatively high or even universal.

Table 4. Summary Table on Overall Government Expenditure Implications of Aging and Other Related Factors, 1995-2050

(indicates changes in government expenditure as percent of GDP between 1995 and specified years)

Country	Government expenditure in % of GDP 1995	Narrow demographic effect				With increased tertiary enrollments and enhanced medical demand				Increased tertiary enrollments, enhanced medical demand, and expanded pension coverage			
		2010	2025	2035	2050	2010	2025	2035	2050	2010	2025	2035	2050
East Asia													
Hong Kong, China	7.2	-0.1	2.8	4.6	5.6	0.3	3.9	6.0	7.2	4.3	11.2	14.6	16.3
Korea	9.4	1.1	3.9	6.5	8.6	1.7	5.4	8.5	11.0	2.2	6.3	9.5	12.2
Singapore	6.4	0.0	2.5	3.2	3.5	2.3	5.5	6.1	6.5	3.1	7.2	8.3	8.7
Taiwan Province of China	11.0	-0.3	4.1	6.7	10.0	0.0	4.9	7.7	11.2	0.0	4.9	7.7	11.2
Average 1/	*8.5*	*0.2*	*3.3*	*5.3*	*6.9*	*1.1*	*4.9*	*7.1*	*9.0*	*2.4*	*7.4*	*10.0*	*12.1*
China	6.7	0.1	2.3	4.9	6.2	3.3	5.6	8.5	10.5	4.9	8.2	12.2	14.6
Southeast Asia													
Indonesia	3.9	-0.4	-0.1	0.1	1.2	0.1	0.7	0.8	2.2	1.5	2.8	3.7	6.3
Malaysia	9.8	-1.4	0.5	1.8	5.3	0.6	2.5	3.2	6.4	1.4	4.1	5.3	9.3
Philippines	5.5	-0.4	-0.1	0.3	1.8	-0.1	0.7	1.2	3.1	0.8	2.1	3.1	5.8
Thailand	5.5	-0.5	-0.3	-0.1	0.6	-0.2	0.4	0.8	1.8	1.3	2.9	4.3	6.5
Vietnam	5.4	-0.6	-0.2	1.0	2.7	0.3	2.0	3.8	6.5	1.4	3.7	6.2	10.0
Average 1/	*6.0*	*-0.7*	*0.0*	*0.6*	*2.4*	*0.1*	*1.3*	*2.0*	*4.0*	*1.3*	*3.1*	*4.5*	*7.6*

Source: Heller (1997)

1/ Averages weighted by GDP in 2002.

counter to most empirical studies which suggest Ricardian effects of about 0.5 to 0.6 (see Schmidt-Hebbel et. al., Bernheim (1987), and Haque and Monteil (1989)). A Ricardian coefficient of 0.5 was also the result of a recent study on savings in Thailand (Bank of Thailand (1996)).[11] In what follows, it is assumed that only half of the expenditure policy increases reflected in Table 4 reduce national saving rates, in combination with the already projected change in private saving rates. One should also once again emphasize our earlier caveat that the results illustrating the impact of these demographic factors are partial and may reflect the marginal effects.

In constructing an estimate of the *combined* impact on national saving rates, we have sought to limit the number of projections made in order to focus on the basic thrust of the results. Thus, we have used only the studies of Horioka, Ling and Peng, and Weil. Together, these effectively bracket the likely range of estimates on the severity of demographic effects. As noted earlier, Horioka's estimates for Japan exhibit the strongest influence from demographics on private saving rates and thus are the most pessimistic on the effects of an increase in the share of the elderly population on saving rates. In contrast, Weil's work can be considered the most optimistic.[12]

Using the three alternative studies, Appendix Tables 1-3 indicate the *level* of the national saving rate that would result for each country over the period 1995-2050. A comparison is provided of the impact of narrow demographic factors on private sector behavior calculated in the previous section, with what would emerge if one also considers the Ricardian adjusted effect of aging on the public sector saving rate. The former is consistent with a case of no change in public sector savings or one that allows for changes in government savings, but also has a complete Ricardian private savings effect. For the latter, we have calculated the two sets of estimates, one taking account of the additional effects of demographic factors on the public sector's saving rate, the other also taking account of the additional effect of public policies. Table 5 provides a summary of these results for each group of Tigers, indicating the GDP-weighted averages of the adjusted national saving rate levels corresponding to each of the studies.

To a significant extent, the results in Table 5 reflect the broad conclusions that have already emerged from an examination of the change in private saving rates, with the

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[11]Somewhat troubling to this analysis is the empirical findings in several of the studies cited earlier that the coefficient on demographics is larger in equations that use private savings than those that use national savings. This finding would imply that it may not be appropriate to add changes in public savings to changes in private savings to estimate the effect on national savings.

[12]Although Masson et. al.'s results indicate marginally smaller effects on savings from demographics than Weil, the latter study is used because it has distinct coefficients on the elderly and youth dependency rate variables.

**Table 5: Projected Aggregate National Savings Rates of Asian Tigers by Region
Associated with Demographic Change and Some Government Policies, 1995-2050
(In percent of GDP)**

Region	1995	2010			2025			2050		
		Level of National Savings Rate Assuming:								
	National Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate
Using econometric estimators from studies of:										
East Asia										
Horioka	34.3	31.6	31.4	30.5	18.3	16.5	14.9	1.1	-2.9	-5.1
Ling & Peng	34.3	34.1	33.9	33.1	26.4	24.5	22.9	15.6	11.6	9.4
Weil	34.3	35.0	34.7	33.9	32.9	30.1	29.5	30.2	26.3	24.1
China										
Horioka	39.3	40.4	40.4	37.9	33.2	32.0	29.1	19.3	16.2	12.0
Ling & Peng	39.3	42.0	42.0	39.5	37.9	36.7	33.8	29.6	26.5	22.3
Weil	39.3	40.0	40.0	37.5	38.1	36.9	34.0	30.2	25.6	23.5
Southeast Asia										
Horioka	30.7	33.5	33.8	32.9	31.1	31.1	29.6	18.5	17.6	15.0
Ling & Peng	30.7	35.6	35.9	35.0	35.7	35.7	34.2	29.1	28.1	25.6
Weil	30.7	31.3	31.6	30.6	29.9	29.9	28.3	26.8	25.9	23.2
Total										
Horioka	35.2	35.2	35.2	33.7	26.9	25.7	23.5	12.0	9.1	6.1
Ling & Peng	35.2	37.3	37.2	35.8	32.8	31.5	29.6	24.0	21.1	18.1
Weil	35.2	35.8	35.8	34.1	34.0	32.9	30.8	31.0	28.1	25.1

Note: Assumes a Ricardian equivalence effect of 0.5. Averages weighted by 2002 GDP.

quantitative estimates amplified by the adverse developments in the public sector saving rate.[13]
One observes a sequencing in the deterioration of Tiger national saving rates, with the earliest
impact beginning to be felt, at a very modest level, in **East Asia** by 2010, and, to a lesser
extent, in **China**. In contrast, for the **Southeast Asian Tigers**, the significant reduction in the
youth dependency rate results in an increase in their saving rate, particularly for those studies
(viz., Horioka and Ling and Peng) for which the private saving rate is even moderately
sensitive to demographic factors. For the **Tigers** as a group, the aggregate weighted saving
rate barely changes at all through 2010. Indeed, the effect of narrow demographic factors
would appear to result in a very modest increase in the Tigers' aggregate national saving rate.

By 2025, the picture begins to change, even in the context of Weil's more optimistic
scenario. **East Asia** will observe the most significant deterioration in the national saving rate.
Focussing simply on demographic effects, the decline would be *at least* 4 percent of GDP;
Ling and Peng, and Horioka's estimators would suggest a far more serious drop of 8-15
percent of GDP from 2010 levels. China's saving rate also worsens between 2010-2025, from
3 to 8 percent of GDP, depending on the estimates used. In **Southeast Asia**, national saving
rates are projected to fall below the peak achieved in 2010, though the declines are quite
modest (at most 3 percent of GDP). Reflecting the heavy GDP weights of China and East
Asia, the overall national saving rate of the Tigers clearly falls by this point. On the basis of
demographic factors, the drop in the aggregate Tiger national saving rate ranges anywhere
from 3 to 10 percent of GDP, and by slightly more if policy factors are taken into account.
These changes are amplified by around 2 percent of GDP when it is assumed that the
government plays a larger role in providing services that are demographically sensitive.

The most dramatic effects on national saving rates are projected for the period after
2025. For **East Asia**, even the optimistic Weil estimates suggest a further deterioration in the
aggregate saving rate of 5 percent of GDP from 2025 levels by 2050, and a 9 percent of GDP
decline from the present saving rate. Ling and Peng's estimates suggest a 13 percent of GDP
drop after 2025, and Horioka's, a reduction of almost 20 percent of GDP, even excluding the
effect of policy changes. Perhaps even more striking and important, the decline in **China's**
saving rate is equally intense. Even Weil's study suggests a decline of at least 11 percent of
GDP in China's saving rate after 2025. The overall national saving rate of the **Southeast
Asian Tigers** will also begin to decline during this period, although again, the range of
outcomes could be as low as a 4 percent of GDP decline (using Weil) and as high as an 8-13
percent of GDP reduction.

For the **Tigers** as a group, the most optimistic estimates (using Weil's estimators)
would suggest that on demographic grounds, the decline in the national saving rate would be
5 percent of GDP between 2025-2050, implying an almost 8 percent of GDP decline from
1995 levels. Horioka's estimators suggest a decline of as much as 26 percent of GDP from
1995 levels! The results derived from using Ling and Peng's equations are less extreme, but

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[13] The marginal effect of demographics on public sector savings is the same in all the studies.

still imply a saving rate reduction from 1995 of 15 percent of GDP as well. Again, these declines would be larger by 2-4 percent of GDP if the public sector took a more active role.

In evaluating these effects, it is interesting to note that the largest saving rate declines are for the East Asian Tigers. In part, this simply reflects the fact that the aging process has proceeded more intensely in these countries. However, this result also reflects the more developed social insurance systems observed in these countries, with thus a larger adverse effect on public sector saving rates (akin to the patterns observed for industrial countries). For China and Southeast Asia, where coverage rates of social insurance programs are far lower and benefit replacement rates much more limited, the implied worsening of the public sectors' financial balances is much lower in the absence of policy changes that would seek to broaden the extent of social insurance commitments. The upshot of this is that if government policy were more active, saving rates would deteriorate more in these regions than in East Asia.

## V. ASIAN TIGER SAVINGS IN A WORLD CONTEXT

A. Projecting the weight of Tiger savings in global savings, 1995-2050

The previous sections provided rough quantitative estimates of the effect that developments in the demographic situation and plausible government policy actions could have for the national saving rates of the Tigers. This raises the question of how such changes might affect global savings. As reflected in Chart 2, the Asian Tigers, despite their high saving rate, accounted for *only* 12 percent of the combined savings of the Tigers and all industrial countries in 1995. Therefore, one might conjecture that even large changes in the saving rates of the Tigers would not have much of an impact on overall world savings. This however would be misleading. When one considers the rapid real growth of the Tigers relative to that of the industrial economies, it becomes readily apparent that the relative weight of the Tigers in the world economy is likely to become far larger by the first quarter of the next century and thereafter. Taking account of their relatively high saving rates and supportive demographics (at least in the next three decades), their weight in world savings is thus likely to become corresponding larger. Thus, it is important to consider whether the potentially adverse effects of the aging of the Tigers on their saving rate might *also* have a significant effect on global savings as one moves to the middle of the next century.

In constructing Chart 2 (also see Appendix Table 4), the following assumptions were made:

- For the industrial countries, the projections of the IMF's *World Economic Outlook* (*WEO*) are used through 2002, and growth thereafter is assumed to continue at the 2002 potential output growth rate;

- For the Asian Tigers, the *WEO* projections are used through 2002, but recent estimates by the ADB (1997) are used for the period 2002-2025. After 2025, it is assumed that the Tigers grow at the same rate as the industrial countries;

Chart 2: Projected Levels and Shares of Savings by Small and Large Industrial Countries and Asian Tigers, under Alternative Assumptions on Savings Behavior and Government Policies
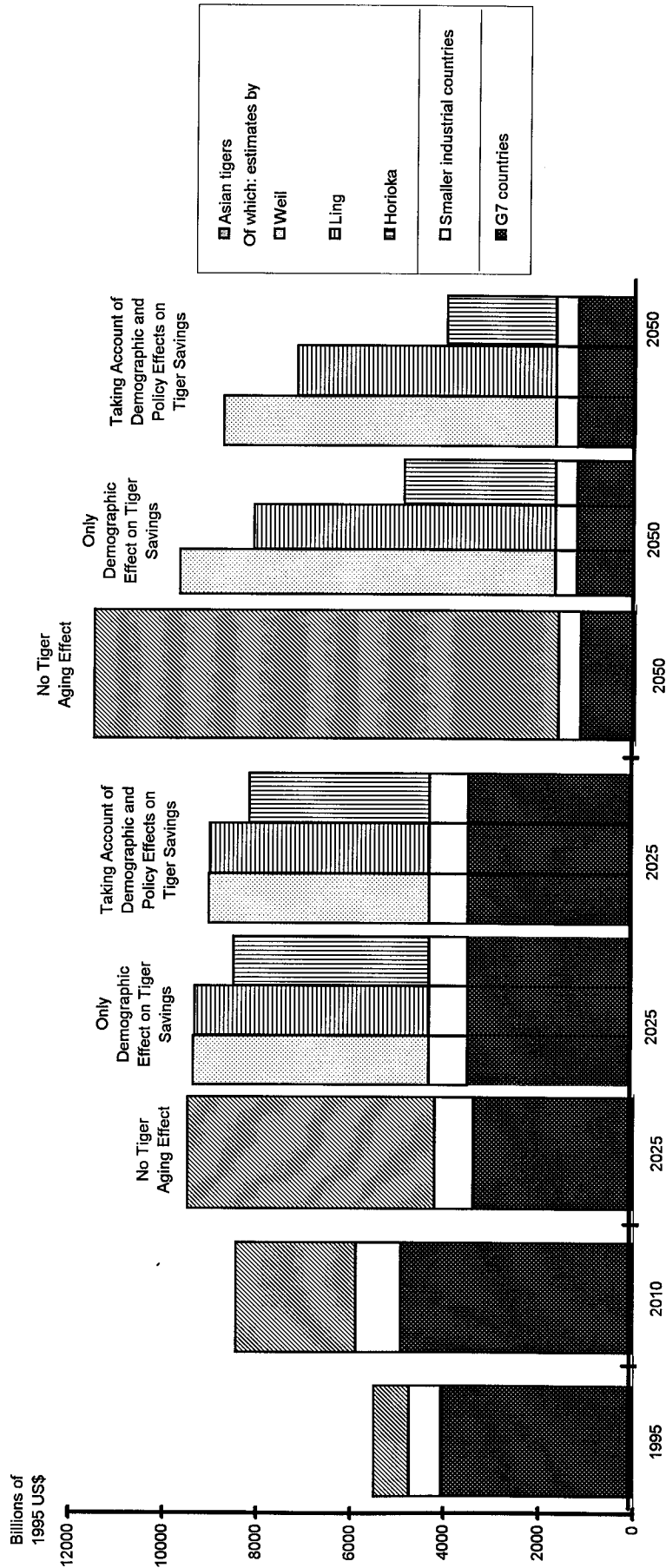
- The initial saving rates of the Asian Tigers are taken from Table 2;

- For the industrial countries, the average of the econometric estimates of Horioka, Modigliani and Sterling, Feldstein, and Masson et. al. (industrial country estimate) is applied to the change in the demographic variables for each of the countries, in order to project the changes in their national saving rates. The same industrial country estimates are then used, no matter which author's estimates are used in assessing the specific impact of demographic change for the Asian Tigers;[14]

- It is assumed that all saving rates are independent of domestic inflation rates and that real exchange rates are constant; and

- Changes in savings for other developing countries and the transition countries are ignored in order to make this analysis more manageable. In 1995, these other countries only accounted for about 13 percent of world savings, and 15 percent of world GDP. Certainly, increased savings from these regions will buoy up the overall *level* of world savings, although given the dramatically lower level of saving rates in these countries, their inclusion would probably lower the observed world saving rate. Although excluding these countries from the analysis might affect the numerical estimates, the general conclusions will still hold.

As becomes readily apparent, the Asian Tigers become increasingly important in the world savings context. The projections shown in Chart 2 and Appendix Table 4 suggest that the absolute real savings level of the combined Tiger and industrial economies will increase by about 60 percent between 1995 and 2010 (from $5.5 trillion to $8.4 trillion in 1995 dollars). Thereafter, the rate of growth of the savings of these two groups of countries will decelerate sharply. Even with *no* assumed adverse effect of aging on Tiger savings, aggregate savings for the two groups will rise by only 10 percent—to roughly $9.5 trillion by 2025 and by no more than 22 percent by 2050, viz., to $11.4 trillion. These trends also reveal the progressive deterioration implied in the global saving rate. Even if one ignores the adverse impact of aging on the Tigers, the aggregate saving rate for these two groups of countries will fall, after 2010, from 20 percent of GDP to 14.7 percent of GDP by 2025. By 2050, the aggregate combined saving rate will fall further to 9.5 percent of GDP.

Factoring in the impact of aging and of government social sector policies on the Tigers further significantly reduces the absolute level of world savings and the aggregate saving rate.

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[14]For the industrial countries, only the marginal impact of demographic factors on net private savings rates is used to reduce their assumed national saving rate level; thus, any additional worsening in the net fiscal position or the impact on saving rates that might arise from nondemographic factors is not considered. Obviously, this is a very crude assumption, although it is interesting that most econometric studies on industrial countries do not show a significant difference between the coefficients obtained using the net private saving rate rather the national saving rate, as the dependent variable.

The *most optimistic* of the estimators—those derived from Weil's study-would suggest that savings levels will peak in 2025 (at $8.8 trillion) and then remain relatively flat thereafter. This would imply a decline in the combined aggregate saving rate from 13.7 percent of GDP in 2025 to only 7.2 percent in 2050. In contrast, Horioka's study would imply absolute savings lower in 2025 than in 2010, with a further drop by more than half by 2050 (to less than $4 trillion). Indeed, the aggregate combined national saving rate would fall to an implausibly low level of 3.2 percent of GDP. The pattern of decline in the absolute level of savings thus occurs *despite* increases in the output of these two groups of economies (by nearly 150 percent by 2025 and by about 400 percent by 2050, relative to 1995). In essence, the effect of the increase in output is overwhelmed by the effect of aging as the saving rate in both the Tigers and industrial countries declines.

Equally of note, the Tigers' share of the combined savings of the two groups of economies rises sharply over the period—to about 30 percent by 2010, and more dramatically thereafter. Even with the most adverse assumptions on the impact of aging on the Tigers' saving rate, the Tigers' share in the combined savings of the two groups rises to almost half by 2025, and to at least 60 percent by 2050. Less adverse effects from aging would imply higher absolute savings by the Tiger economies and a correspondingly greater share, reaching 80 percent.

The reasons for these developments should be obvious. First, the Tiger economies are assumed to grow *more than twice as fast* as the industrial countries. Thus, the already low saving industrial countries diminish in their importance for global savings relative to the high saving rate Tigers. Second, the projections suggest a very sharp decline in the saving rate of the industrial countries beginning as early as 2010 (from 20 percent in 1995 to under 17 percent), but more sharply in succeeding decades—to 8 percent by 2025 and only 1.5 percent by 2050! In contrast, the saving rate of the Tigers *increases* through 2010, and the adverse effect of aging on their saving rate only begins to occur later, with a lag of 15-20 years. Moreover, since the saving rate of the Tigers *start* at such a high level, even the most adverse of the econometric estimators would not suggest that their overall saving rate would drop to as low a level as in the industrial countries. Together, these two factors account for much of the change in their relative shares of savings. This explains the increasing share for the Tigers, *even though their saving rates are also declining*. As indicated in the previous sections, it is not because the Asian Tigers are contributing more to world savings, but rather, their saving rates are higher than the industrial countries, these rates are projected to decline more slowly, and their output growth rates are larger.

How important are demographic factors in this story? As noted in Section IV, through 2010, the demographic effects are negligible. If anything, such factors will enhance the role of the Tigers in world savings, as the declining youth dependency rate and stable elderly dependency rate increase overall Tiger saving rates. Indeed, the absolute level of savings by the Tigers is projected to triple in the next fifteen years. Demographic factors begin to have an adverse impact thereafter, but again by 2025, the degree of impact very much depends on which econometric study one uses. This will, in effect, determine whether the savings of the Tigers rise by 50 or 80 percent in absolute terms. Moreover, while these differences may

determine whether aggregate savings of the Tigers and industrial countries rise or fall slightly, the relative importance of Tiger savings in the global context remains unmistakable (at basically half of the combined savings of the two groups).

Far more uncertain is the next quarter century *after* 2025. Here the uncertainty of what could happen to Tiger savings will determine the magnitude of the decline in the global saving rate and in the level of world savings. Ignoring any change in government policy with respect to the social sector, and using Horioka's estimators, the projections suggest that Tiger savings fall by 16 percent; using Weil's estimates, although Tiger saving rates drop, absolute savings *rises* by 75 percent. With government social sector policies, absolute savings of the Tigers would be lower in both the Horioka or Weil scenarios (by about $1 trillion). The uncertainty is such that aggregate savings of the Tigers and industrial countries together could either fall in absolute terms by only a modest amount or fall by more than half over the period. Thus, how the Asian Tiger economies respond to the aging of their populations, both in their saving behavior and in their social sector policy choices, will be important in the context of what is nevertheless a pessimistic global savings prognosis.

B. Some macroeconomic conjectures on the implications of these projections

No matter what set of estimates are used, these numbers suggest a significant change in both the distribution, and more importantly, the level of world savings. Are such projections of a significant decrease in the supply of savings over the medium to long run, realistic and, if so, should they be a source of concern, either for the Tigers or for the global economy (or both)?[15] From a narrow perspective, for the Tigers, one could, in principle, simply see the ultimate decline in savings as the inevitable result of the operation of a life cycle model with consumption smoothing. High savings rates now are thus appropriate, given that a high share of the labor force is in its productive working years. Subsequent decumulation of capital would be the converse appropriate macroeconomic posture, as the labor force stabilizes or shrinks and a rising share of the population dissaves in their elderly years.

Yet such a perspective would be highly simplistic, neglecting the factors propelling both the recent demand for savings in these economies for investment and the sources of future investment demand. These include the role of investment in realizing the potential of modern technology, in deepening the capital intensity of production processes, in furthering the structural transformation of these Asian economies toward the industrial and service sectors, in extending and modernizing public infrastructure, and in redressing the costs of past (and preventing future) environmental degradation (e.g., environmental emission standards). Although Horioka & Feldstein (1980) have argued that a country's domestic investment rate is largely constrained by its domestic savings rate, in a rapidly globalizing world, a high ex ante domestic demand for investment may not be wholly limited by such constraints. Ex ante investment and savings imbalances may not be simply reflected in higher domestic interest

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[15]It should be noted that this study's results echo the broad results of a recent study by the OECD (1996) on global savings.

rates, as foreign saving flows may play an equilibrating role. However, from a global perspective, the level of world savings will undoubtedly be a constraint on world investment, or in more popular terms, a "shortage of savings" may emerge. However, such an ex ante divergence will most certainly induce equilibrating changes in interest rates and income.

A fortiori, at a global level, one would need to know more about the nature of the global demand function for investment before expressing alarm at these savings projections. Many alternative scenarios could be postulated. For example, if the investment level needed for realizing growth objectives were to drop with the aging of the population of a significant part of the world, the decline in savings may not be as worrisome. And here the quality of conjectures about the future—already sketchy with respect to savings—becomes even more uncertain, and certainly outside the scope of this paper. Some studies suggest that population aging—reflected in a slowing or decreasing labor force—will be associated with a similar slowing in the growth of demand for capital and even possibly a plausible decline in investment demand.[16] It is also possible that future investment needs may partially be satisfied by the nature of future technological innovations, which would also lessen the demand for savings.

But while scenarios suggesting that demographic factors would retard investment could be increasingly apposite for industrial countries over the next half century, they appear less relevant for most developing countries and transition economies and only begin to be relevant for some of the Tigers after 2025 (and for others not until the middle of the century). Moreover, as noted, this is only one possible scenario—there are a number of factors which could generate an increased demand for investment in the nonindustrial countries. In other words, while our study reaffirms the results of other studies which suggest an ex ante reduction in the supply of global savings, as one moves into the middle of the next century, it is difficult to judge how this will match the likely change in the ex ante demand for investment.

Equally, there has been no attempt in this paper to analyze the possible consequences of an ex ante imbalance in savings and investment demand at a global level.[17]

For purposes of this discussion therefore, we will simply restrict ourselves to speculating on the possible outcomes which may flow from some alternative plausible scenarios. One such scenario, covering the period to 2010, sees the industrial countries modestly drawing down their accumulated savings, while their investments, responding to a slowing of population growth, also begin to decline. Meanwhile, savings remain high in Asia, especially in China and Southeast Asia, buoyed perhaps by high private savings rates and supportive demographics. Investment demand is assumed to also remain robust, as the Asian

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[16]See Masson and Tryon (1990), Cutler, Poterba, Sheiner, and Summers (1990), and OECD (1996) for general equilibrium analyses.

[17]Empirical studies that attempt to project future global investment needs are sparse, and most of the long term projections to date have focused on the industrial countries.

Tigers continue to catch up to the industrial countries, meet infrastructural needs, and redress past environmental damage. This scenario also sees the rest of the world having substantive investment needs that will likely far outstrip their savings contributions.

Were such a scenario to play out, this period could be characterized by modest overall differences in aggregate savings and investment demands, but substantial regional differences. As a group, the industrial countries may even begin to export capital, as the baby boomers increase their savings in their most productive working years and demand for investment slows with the anticipation of a more slowly growing labor force. For the Tigers as a group, despite high saving rates, investment needs may limit capital exports. But for the developing world, current account deficits could continue to draw on foreign savings. Provided the imbalances were sustainable, they may be accommodated by modest shifts in relative interest and exchange rates.

Looking further ahead to the period between 2010 and 2025, one can begin to postulate scenarios which incorporate starker differences between ex ante savings and investment. Thus, one could see industrial countries drawing down their accumulated savings (with possibly large external current account deficits), while the Tigers could experience only modest declines in their saving rates, even though they continue to experience robust—but slowing—investment demand in order to finalize the "growth catch-up" with the industrial countries. At the same time, other developing and transition countries could still have strong demands for investment, reflecting both continued rapid population growth and relatively low per capita incomes. Under this scenario, then, an ex ante shortfall in the supply of global savings could develop, with associated adjustments in relative interest and exchange rates between the different blocs of countries.[18]

Following the aging-driven scenarios to their conclusion, one could see the possibility of a considerable "shortage" of ex ante savings after 2025. Although this scenario would see the growth in investment demand abate at the same time, some of our projections indicate that the decline in the saving rate, and even in savings itself, would appear so extensive that the decline would far outpace any foreseen decline in investment. Indeed, world savings rates could decline to levels that are not likely to meet replacement needs. The change could be most dramatic for the Tigers. Indeed, it is not totally implausible to envisage that the industrial countries and the Asian Tiger economies will switch their earlier roles, with the latter countries experiencing more significant current account deficits, with attendant implications for relative interest and currency pressures.

However, these scenarios are not without forces that would tend to produce compensating macroeconomic adjustments. The ex ante shortage of savings is likely to result in adjustments in world interest rates which could redistribute savings and investment over

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[18]For the industrial countries, one could thus see the perils of a portfolio diversification strategy, as the sale of accumulated assets occurs in a depreciated currency relative to the currencies for which repatriation is required.

time. In particular, it would be reasonable to anticipate that interest rates would be relatively lower during the prospective high savings periods (through 2010) which would tend to discourage savings and encourage investment. Conversely, after 2010, interest rates could rise, encouraging savings and resulting in some smoothing of savings relative to our earlier estimates.

The numerical importance of such effects would depend on the interest elasticity of savings and investment. In one recent study, Masson and Tryon (1991) use MULTIMOD, the IMF's world econometric general equilibrium model, to gauge the importance of demographics on world savings and interest rates. Using estimated demographic effects very similar to Feldstein, they found that by 2025, the world interest rate would rise by about 250 basis points. Although the ex ante impact of demographics on savings is thus similar to the estimates provided in this paper, the ex post change in savings and investment would be significantly more muted because of this interest rate response.

It makes no sense to dwell excessively on which of these alternative scenarios will predominate since there seems to be no end to the other equally difficult-to-handle developments which could impact on policy makers. Rather, the important task of policy makers is to (i) improve the information that is available so that markets can anticipate better and (ii) let market signals be heard so that individuals, companies, and governments themselves now begin to make the adjustments to savings and investment that are needed.

VI. CONCLUSIONS AND FURTHER THOUGHTS

The results of the study suggest that the world phenomenon of aging populations may well place significant pressures on world savings as we move beyond the first decades of the next century. Ceteris paribus, aging could see both a progressive decline in the savings rate of the industrial countries as well as a fall in their share in world output. The high saving rate Asian Tigers, because of their increased weight in the world economy, could increasingly account for a far more substantial share of world savings and indeed, their saving rate performance may buoy up world saving rates at least over the medium term. However, the aging of the Tigers' populations will not substantially change this prognosis and, because it comes later than in the industrial economies, will eventually reinforce this pressure. One important point to emerge is that aging could lead to a sharp drop in Tiger saving rates by the first quarter of the century and thus adversely and significantly contribute to the overall outlook for global savings after 2025. The adjustment to this change in savings could have significant global implications that would entail important macroeconomic adjustments.

While one can easily paint scenarios which show worrisome outcomes from the aging process, it is important to recognize that such scenarios mechanistically apply past patterns of behavior to projected demographic trends. Neither assumption is necessarily reliable. There is much we do not know or understand and much statistical and other information which we would need to gather to improve the market's understanding of the issues. The remainder of this section seeks to highlight an agenda of issues deserving of such study.

First, much uncertainty exists as to the impact of demographic factors on savings and there is a need for a much better understanding of the other forces determining savings in the Tiger economies. Certainly, the factors influencing household savings behavior must be an important starting point for attention. In this context further work is needed to understand the behavioral impact of government policies. Determinants of household savings behavior outside the formal social insurance sector would be particularly important to clarify. It is interesting to note that only a small part of aggregate Tiger savings is associated with provident funds or pension fund assets. Even in Singapore, the Central Provident Fund accounts for less than a quarter of gross national savings. In most of the Tigers, provident fund type assets are less than 10 percent of GDP, and savings in these schemes are negligible relative to the overall saving rate.

Numerous questions could be posed. How much of China's high private saving rate reflects the fact that the three quarters of China's population not employed in the formal urban sector lack any significant available pension system framework? Will the introduction of social insurance schemes, particularly defined contribution schemes or provident funds, increase national saving rates or merely rechannel private savings to these more institutionalized public sector systems?[19] Alternatively, will the perception of a heavier social safety net type of commitment by the State result in a lower private saving rate (with the perception that the need for such savings is reduced)? Or, will there be a Ricardian perception of the higher ultimate taxes entailed, resulting in a higher private saving rates to offset the expected reduction in budgetary savings?

The uncertainty on the factors determining savings, however, also extends to the components of private savings. Indeed, demographic factors will likely have different effects on private savings depending on the source and nature of the savings. A recent study by the Bank of Thailand (1996) suggests that the nonhousehold sector has played an important role in contributing to its high private saving rate. Such savings have largely been from the private corporate sector (including multinational corporations). Much clearer analysis and data collection are required to assess how much of private savings in the Tiger economies arises from the household sector as opposed to the corporate sector, and to fully understand the factors influencing the latter.

The response of budgetary savings to the prospective aging of the population is also particularly relevant. Currently, relatively high government saving rates—at 9 percent of GDP—are, at the margin, an important factor differentiating the strong national savings performance of the Tigers relative to most other economies. They are also important in terms of *offsetting* dissavings of other parts of the public sector (notably in the public enterprise sector). Yet it is precisely these budgetary savings which are likely to be most sensitive to the impact of aging and other important factors which would result in increased social sector

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[19]The evidence does not appear strong that such pension schemes increase national saving rates. This result emerged both for a recent paper by Husain (1995) and by Mackenzie et. al., (1997, forthcoming).

spending in the Tigers (particularly in the medical care and pensions spheres—see Heller (1997)). Such financial pressures could be quite strong.

It is difficult to be prescriptive as to the right balance that should be struck as between public and private solutions to meet the coming policy challenges, all of which raise complex allocative and distributional issues. Much policy experimentation is already underway, not only in the East Asian countries, but increasingly in China and Southeast Asia as well. Most policies appear to combine significant reliance on private sector initiatives, a heavy government regulatory role, and limited "safety net" provisions. However, with population aging and increasing elderly dependency ratios, the capacity of traditional familial support mechanisms may be increasingly taxed, enhancing the possibility that some public sector initiatives may be introduced of a safety net, rather than a forced "insurance" or "mandatory savings," character. It may prove politically unacceptable if too large a share of the elderly in the rural and informal urban sectors fall below the poverty threshold or are unable to obtain minimally acceptable medical care. Such distributionally-oriented initiatives could erode budgetary savings, as indicated in the above projections.

Finally, the study begs the obvious question of whether government policies should seek to influence aggregate saving rates in the face of the prospect of aging populations (recognizing the Ricardian limitations of such strategies). Prima facie, since national saving rates are already very high in the region (with the exception of Vietnam and the Philippines), one might question whether it would be desirable to suggest a further increase in saving rates. Yet several considerations should provoke a deeper response to this question.

First, the observed saving rates may provide a misleading picture on the magnitude of Asian Tiger national saving rates. In particular, Tiger saving rates are typically shown *gross* of depreciation measures; net saving rates may be in fact significantly lower if one had a true measure of depreciation (given the pace of investment in many countries and the underspending of governments on operations and maintenance). Moreover, the region's fast-paced growth strategy has implied significant environmental costs, which the ADB has recently been suggested to amount to several percentage points *annually* of GDP (ADB (1997)). Strictly from an accrual accounting framework, recognition of such costs would also reduce measured net saving rates

Second, although aggregate saving rates are high and would appear to be consistent with a life cycle accumulation story for addressing the future financial needs posed by an aging population, the data do not allow a determination of whether there is a good match between the groups within the society that are accumulating capital and which will realize future potential capital income streams *and* those members of the working age population that are aging and who may be in need of such capital income sources in their elderly years. What would be the implications if such a significant mismatch were to be the case?

Certainly, high savings and investment rates in the economies would still contribute to a rise in aggregate labor productivity and in the wage incomes of future working generations, facilitating their capacity to absorb some of the financing needs of the future elderly

population (either directly as family members or as taxpayers). But in a world where the ownership of the capital stock, and thus capital income, is very unequal in its distribution, or held externally, pensioners may not receive a significant share of capital incomes (as is more the case in those industrial countries with significant funded pension schemes). In the absence of an ability to tax capital incomes or spread the burden beyond the wage earning population, financing the needs of the total elderly population would then perforce have to rely on the more limited capacity arising from those assets that had been built up by the elderly, from intra familial transfers (from the smaller number of dependents per elderly), and in the willingness of general taxpayers to absorb the burden of intergenerational transfers.

This discussion of course is highly conjectural. The data required to assess the share of household savings generated by households and the government, rather than private corporations, is largely unavailable for most of the Tigers, and thus the Thailand case, which suggested a limited role played by the household sector, may be unusual. Yet impressionistic evidence by knowledgeable scholars suggest that concerns about significant inequalities in the distribution of wealth may be well founded for at least some of the Tigers. Again, substantially more work is necessary to ascertain the facts on the distribution of wealth.

However, if the distributional concerns raised above are valid, and the economy as a whole acts in a Ricardian fashion, then an increase in government savings could leave national saving rates relatively unchanged while still dealing effectively with intergenerational equity issues. At the same time, public policies that now effectively tax savings built up in mandatory saving schemes (e.g., by implicit taxation of their yields or by restrictions on their portfolio choices) would need to be modified to ensure that households receive a market-related yield on their savings. Greater efforts may be necessary to ensure that capital incomes are subject to a fair level of taxation. For some of the Tigers, addressing significant inequalities in the distribution of wealth may need to become a policy issue that receives greater attention.

A final desideratum in deciding whether savings rates should be increased is to assess whether current rates of return justify increased saving rates. If the true social rate of return on investments in the Tiger economies is higher than the market interest rate, then policies to further increase national saving rates might be desirable.

Estimation of Tigers' Saving Rates

Most of the empirical work on savings equations has focused on industrial countries. Although there are a several studies that estimate savings behavior in developing countries, most of that work utilized a sample of countries that do not necessarily share similar characteristics. This might result in parameter estimates that are not applicable to the Tigers. In developing countries, there tends to be a large variation in the role of government, level of industrialization and the use of technology, and characteristics of labor markets, all of which can alter the response of savings to demographics and other determinants of savings. Ling and Peng (1996), as part of the wider OECD study on global savings, provided a set of estimates that dealt exclusively with data from the Asian countries. Although parameter estimates were given in their study, very limited documentation was provided. In particular, there was no statistical information that allowed one to evaluate the quality of those estimates.

In order to gauge the relevance for the Asian Tigers of savings estimates cited in Table 1 of the main text, some very preliminary estimates of savings behavior in this region are presented below. They should only be viewed as suggestive since the sample is relatively small and the equation formulation very simplistic. The savings rate is hypothesized to be a function of growth rates and dependency rates. No account is taken of other demographic variables or wealth. The equations are estimated from a sample of pooled time-series cross sectional data from 1990 through 1996. Several variations of the basic equation are tested including adding a dummy variable for each country to capture country specific differences in savings rates; also, the youth and elderly dependency rates were included individually and as an aggregate construct. Also, both national and private savings have been used as dependent variables in the estimation.

The results are shown in Annex Table 1 and can be summarized as follows:

(1) The coefficients on the dependency ratios are larger when private savings is used as the dependent variable than when national savings is used (compare equations 1 vs 2).[20] This is consistent with the findings of Masson et. al. and Horioka. However, this is a counter-intuitive result, since it implies that unlike the private sector, the public sector increases its saving rate with an increase in the dependency rate (or that the Ricardian offset is greater than one). This implies that it may not be appropriate to add the demographic effects of changes in public savings to changes in private savings as an estimate of national savings. The other equations reported below concentrate on private savings.

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[20] Although not shown, national savings equations comparable to equations 3 and 4 had insignificant demographic coefficients. In fact, in the national savings equation of 3, the coefficient on elderly demographics had the incorrect sign.

(2) In all of the estimated equations of private sector savings shown below, the demographic variables are correctly signed, although there is some variation depending upon which form of the equation is used.

(3) The estimated importance of demographics on private savings is greatly enhanced when the youth and elderly dependency rates are estimated separately as opposed to when they are combined together (equation 3 vs 4). In fact, the total dependency rate is insignificant in equation 4. This finding is in contrast to Masson et. al. who stated that, owing to problems with demographic data, there was no additional explanatory power when the two rates were included separately.

(4) Including separate country specific constants substantially increases the overall fit of the equation, while only marginally lowering the coefficient on the demographic variables (equations 2 vs 3). However, this form of the equation substantially lowers the significance of all the explanatory variables and the impact of output growth becomes insignificantly different from zero.

Since this paper is concerned with the nexus between savings and demographics, as long as the youth and elderly dependency effects are treated separately, it makes very little difference which of the various forms of the equation are used. Generally, all versions show demographic effects that are greater than in most other studies.

Table 1: Estimated Determinants of Savings for the Asian Tigers: 1990–95

	Constant	Growth	Total Dependency	Elderly Dependency	Youth Dependency	R^2	SER
1. National saving	0.52 (9.45)	0.56 (2.50)	...	-0.94 (-4.27)	-0.49 (-8.25)	0.64	0.043
2. Private saving	0.62 (10.22)	0.89 (3.59)	...	-1.32 (-5.39)	-0.54 (-8.05)	0.69	0.047
3. Private saving	1/	0.03 (0.24)	...	-0.89 (-1.92)	-0.23 (-1.48)	0.99	0.014
4. Private saving	1/.	0.04 (0.36)	-0.15 (-0.99)	...	...	0.99	0.014

1/ Separate constants are estimated for every country

**Appendix Table 1: Asian Tigers—Projected Aggregate National Savings Rates by Country
Associated with Demographic Change and Some Government Policies, 1995-2050
(In percent of GDP)**

	1995	Using Econometric Estimators from Horioka Model								
		Level of National Savings Rate Assuming:								
		2010			2025			2050		
Country	National Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate
East Asia										
Hong Kong, China	32.7	31.0	31.1	28.9	7.4	6.0	1.8	-11.7	-14.5	-19.9
Korea	35.2	30.7	30.1	29.6	21.0	19.1	17.9	3.4	-0.9	-2.7
Singapore	50.3	48.6	47.7	46.2	32.2	26.2	24.0	22.3	13.4	11.1
Taiwan Province of China	28.0	27.8	27.9	27.8	15.5	13.4	13.1	-2.5	-7.5	-8.1
Average 1/	*34.3*	*31.6*	*31.3*	*30.5*	*18.3*	*16.1*	*14.5*	*1.1*	*-3.6*	*-5.7*
China	39.3	40.4	40.4	37.9	33.2	32.0	29.1	19.3	16.2	12.0
Southeast Asia										
Indonesia	30.3	33.3	33.5	32.5	31.2	31.2	29.8	19.0	18.4	15.8
Malaysia	34.7	40.1	40.8	39.3	36.7	36.4	34.5	25.2	22.5	20.1
Philippines	17.8	21.1	21.3	20.7	21.9	21.9	20.8	13.8	12.9	10.9
Thailand	35.0	35.6	35.8	34.9	31.7	31.8	30.2	16.3	16.0	13.0
Vietnam	21.5	27.5	27.8	26.8	28.3	28.4	26.5	16.1	14.7	11.1
Average 1/	*30.7*	*33.5*	*33.8*	*32.8*	*31.1*	*31.1*	*29.6*	*18.5*	*17.6*	*14.9*
Total 1/	35.2	35.2	35.2	33.7	26.8	25.6	23.5	12.0	8.8	5.8

1/ Averages weighted by GDP in 2002.

Appendix Table 2: Asian Tigers--Projected Aggregate National Savings Rates by Country
Associated with Demographic Change and Some Government Policies, 1995-2050
(In percent of GDP)

	1995	Using Econometric Estimators from Ling & Peng Model								
		Level of National Savings Rate Assuming:								
		2010			2025			2050		
Country	National Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate
East Asia										
Hong Kong, China	32.7	33.3	33.4	31.2	18.7	17.3	13.1	6.2	3.4	-2.0
Korea	35.2	33.5	32.9	32.4	28.1	26.2	25.0	17.2	12.9	11.1
Singapore	50.3	50.9	50.0	48.5	40.8	34.8	32.6	34.9	26.0	23.7
Taiwan Province of China	28.0	30.0	30.1	30.0	22.9	20.8	20.5	11.8	6.8	6.2
Average 1/	*34.3*	*34.1*	*33.8*	*33.0*	*26.4*	*24.1*	*22.5*	*15.6*	*11.0*	*8.8*
China	39.3	42.0	42.0	39.5	37.9	36.7	33.8	29.6	26.5	22.3
Southeast Asia										
Indonesia	30.3	35.3	35.5	34.5	35.3	35.3	33.9	28.8	28.2	25.6
Malaysia	34.7	43.3	44.0	42.5	42.7	42.4	40.5	37.1	34.4	32.0
Philippines	17.8	23.1	23.3	22.7	27.0	27.0	25.9	23.7	22.8	20.8
Thailand	35.0	37.3	37.5	36.6	36.0	36.1	34.5	27.2	26.9	23.9
Vietnam	21.5	29.0	29.3	28.3	32.2	32.3	30.4	26.1	24.7	21.1
Average 1/	*30.7*	*35.6*	*35.9*	*34.9*	*35.7*	*35.7*	*34.2*	*29.1*	*28.1*	*25.5*
Total 1/	35.2	37.3	37.2	35.8	32.8	31.5	29.5	24.0	20.8	17.8

1/ Averages weighted by GDP in 2002.

Appendix Table 3: Asian Tigers--Projected Aggregate National Savings Rates by Country Associated with Demographic Change and Some Government Policies, 1995-2050
(In percent of GDP)

| | 1995 | Weil Model — Level of National Savings Rate Assuming: | | | | | | | | |
| | | 2010 | | | 2025 | | | 2050 | | |
Country	National Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate	No change in Public Savings Rate	Narrow Demographic Effect on Public Savings Rate	Including both Demographic and Policy Effects on Public Savings Rate
East Asia										
Hong Kong, China	32.7	32.5	32.6	30.4	26.9	25.5	21.3	23.5	20.7	15.3
Korea	35.2	36.4	35.8	35.3	36.1	34.2	33.0	33.2	28.9	27.1
Singapore	50.3	51.5	50.6	49.1	52.2	46.2	44.0	50.4	41.5	39.2
Taiwan Province of China	28.0	27.9	28.0	27.9	23.7	21.6	21.3	21.7	16.7	16.1
Average 1/	*34.3*	*35.0*	*34.7*	*33.8*	*32.9*	*30.7*	*29.1*	*30.2*	*25.6*	*23.5*
China	39.3	40.0	40.0	37.5	38.1	36.9	34.0	34.9	31.8	27.6
Southeast Asia										
Indonesia	30.3	31.5	31.7	30.7	31.7	31.7	30.3	29.5	28.9	26.3
Malaysia	34.7	33.7	34.4	32.9	31.2	30.9	29.0	27.5	24.8	22.4
Philippines	17.8	19.8	20.0	19.4	19.2	19.2	18.1	16.6	15.7	13.7
Thailand	35.0	35.4	35.6	34.7	32.3	32.4	30.8	28.6	28.3	25.3
Vietnam	21.5	21.9	22.2	21.2	21.1	21.2	19.3	17.5	16.1	12.5
Average 1/	*30.7*	*31.3*	*31.6*	*30.6*	*29.9*	*29.9*	*28.3*	*26.8*	*25.9*	*23.2*
Total	35.2	35.8	35.8	34.3	34.0	32.7	30.6	31.0	27.9	24.9

1/ Averages weighted by GDP in 2002.

Appendix Table 4: Projected Levels and Shares of Savings by Small and Large Industrial Countries and Asian Tigers, under Alternative Assumptions on Savings Behavior and Government Policies

Region	1995	2010	2025 (In billions of 1995 US$)			2050 (In billions of 1995 US$)		
			No Tiger Aging Effect	Only Demographic Effect on Asian Tiger Savings	Taking Account of Demographic and Policy Effects on Asian Tiger Savings	No Tiger Aging Effect	Only Demographic Effect on Asian Tiger Savings	Taking Account of Demographic and Policy Effects on Asian Tiger Savings
(1) G7 Countries	4046	4907	3379	3379	3379	1146	1146	1146
(2) Smaller Industrial Countries	683	986	820	820	820	457	457	457
(3) Asian Tigers								
Horioka	762	2554	5271	4103	3785	9772	3161	2280
Ling & Peng	762	2554	5271	4924	4606	9772	6310	5429
Weil	762	2554	5271	4952	4634	9772	7860	6979
Combined Savings (=1+2+3)								
Horioka	5490	8429	9470	8302	7984	11375	4763	3883
Ling & Peng	5490	8429	9470	9123	8805	11375	7913	7032
Weil	5490	8429	9470	9151	8833	11375	9462	8581
Combined Savings Rate			(In percent of GDP)			(In percent of GDP)		
Horioka	22.5	20	14.7	12.9	12.4	9.5	4	3.2
Ling & Peng	22.5	20	14.7	14.2	13.7	9.5	6.6	5.9
Weil	22.5	20	14.7	14.2	13.7	9.5	7.9	7.2

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