DISCUSSION PAPER SERIES

No. 9390

DEMOGRAPHIC DIVIDENDS REVISITED

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DEVELOPMENT ECONOMICS and ECONOMIC HISTORY

Centre for Economic Policy Research

www.cepr.org

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CEPR Discussion Paper No. 9390

March 2013

ABSTRACT

Demographic Dividends Revisited*

This paper revisits demographic dividend issues after almost two decades of debate. In 1998, David Bloom and Jeffrey Williamson used a convergence model to estimate the impact of demographic-transition-driven age structure effects and calculated what the literature has come to call the demographic dividend. How do estimates based on these naïve convergence models compare with subsequent and competing OLG models? How much of the (first) demographic dividend is simply a labor participation rate effect, and how much a true growth effect? If there are growth effects, how much of this is based on accelerating human capital accumulation induced by demand side quality-quantity Becker trade-offs versus a co-movement between demographic transitions and exogenous schooling supply side revolutions? Emigration has passed through life cycles much like the demographic transition, and with similar (but lagged) timing. Has emigration actually been driven in part by demography? Has emigration wasted some of the demographic dividend by brain drain? Have within-country rural-urban migrations been driven in part by demographic transitions with different spatial timing? Finally, what has been the lifetime – not just annual -- income inequality impact of demographic transitions?

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Looking Backwards: The Naïve Demographic Dividend Convergence Model

Back in the 1950s, 1960s, and 1970s, pessimists believed that rapid population growth in the Third World was immiserizing because it tended to overwhelm the contributions of technical change and capital accumulation (Coale and Hoover 1958; Ehrlich 1968). Optimists believed that rapid population growth helped an economy capture economies of scale from market size, and promoted both technological and institutional innovation (Kuznets 1967; Boserup 1981; Simon 1981). Research culminating in the late 1980s defeated both views: population growth was shown to have no significant impact on economic growth, positive or negative (Kelley 1988). These studies were typically based on cross-country regressions of income per capita growth on population growth, controlling for a variety of other influences. As Allen Kelley and Robert Schmidt put it:

"Possibly the most influential statistical finding that has shaped the 'population debates' in recent decades is the failure, in more than a dozen studies using cross-country data, to unearth a statistically significant association between the growth rates of population and of per capita output" (1995: p. 543).

This finding was surprising, but it was unclear then whether it arose because population truly had no effect on economic growth or because the test had been badly mis-specified. Work immediately following decomposed population growth into its fertility and mortality components and examined their independent effects on economic growth (Coale 1986; Bloom and Freeman 1986; Barlow 1994; Brander and Dowrick 1994; Kelley and Schmidt 1995). These studies found that measures of fertility, specifically past birth rates, were negatively and significantly associated with economic growth, whereas the effect of mortality was insignificant. These contributions were the direct precursors to the demographic dividend literature which followed in the wake of the Asian Development Bank's *Emerging Asia* conference (1997): it justified the decomposition on the grounds that changes in fertility and mortality could imply very different changes in the age distribution. Population growth attributable to a fall in *infant* mortality and a rise in fertility both had an immediate negative effect on economic growth since there are more mouths to feed. A fall in mortality everywhere across the age distribution could raise the adult labor force, giving an offsetting positive impact. However, we now understand that the

negative demographic effect has a delayed positive impact on economic growth since the economically active population booms two decades later, long after the aggregate population growth effect may have disappeared. This positive effect on economic growth abates as the fertility rate declines, but with a long lag. Figure 1 plots the stylized version of this demographic transition. The population growth rate is implicit the first panel of Figure 1 as the difference between fertility and mortality. The second panel makes the population dynamics explicit: the demographic transition is accompanied by a cycle in population growth *and* the age structure. Figure 1 treats the demographic system as if it is closed, and thus it ignores external migration. This assumption will be relaxed later in the paper.

The East Asian demographic evidence certainly supports Figure 1 (Bloom and Williamson 1997, 1998; Feeney and Mason 2001; Oshima and Mason 2001; Lee 2003; Mason 2007a, 2007b; Bloom and Canning 2008; Mason, Lee, and Lee 2010), but the question back in 1997 was just how big the demographic transition impact on economic growth was. Indeed, how much of the East Asian miracle could it explain?

David Bloom and I (1997, 1998) contributed to this stage of the population debate in four ways.[1] First, like Allen Kelley and Robert Schmidt (1995), we used the empirical convergence model (Barro 1991, 1997) to isolate the effects of demography. Second, we explored the possibility of reverse causality by using a two-stage specification where instruments for population growth were used to account for possible endogeneity. Third, we introduced demography into the growth equations in a theoretically more appealing way than simply by the *ad hoc* addition of birth and death rates, specifically by adding the growth rates of the total population and the economically active population. By doing so, population growth was allowed to affect economic growth by its overall rate *and* by its age structure. The distinction mattered. Fourth, we used these econometric results to assess the extent to which population dynamics could help account for a significant portion of East Asia's economic miracle.

What did we find? Between 1965 and 1990, the working age population in East Asia grew 2.4 percent per annum, dramatically faster than the 1.6 percent rate for the entire population, yielding a 0.8 percent differential. The working age population also grew faster than the entire population in Southeast Asia, but the

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[1] These results were later confirmed in more detail by Bloom *et al.* (2000).

difference was almost half that of East Asia, while in South Asia it was a quarter of the East Asian figure. Combining the coefficients from the estimated growth equations and the growth rates of the working age and total population, Table 1 reports that population dynamics explained between 1.4 and 1.9 percentage points of GDP per capita growth in East Asia (6.11 percent per annum) – the biggest regional effect world-wide -- or as much as a third of the growth miracle $(1.9/6.11 = 0.31)$.[2] If instead the miracle was defined as the difference between current GDP per capita growth -- a transitional rate where population dynamics matter -- and some steady state of 2 percent -- when population is also in steady state and has no impact, then population dynamics explained almost half of the miracle $(1.9/[6.11-2] = 0.46)$. In Southeast Asia, where the fertility decline took place a little later and the infant mortality decline was a little less dramatic, population dynamics still accounted for 0.9 to 1.8 points of economic growth, or, again, as much as half of their less impressive miracle $(1.8/3.8 = 0.47)$. The East Asian countries that benefited most from these demographic events were Korea, Singapore, Taiwan, Hong Kong, Thailand, and Malaysia. It is no coincidence that these Asian tigers attracted most of Paul Krugman's attention when he asserted that the East Asian miracle was driven mainly by high rates of accumulation and labor force growth (Krugman 1994).[3]

Based on the coefficients of the estimated convergence model and the UN 2025 demographic projections, Bloom and I concluded that the future would look quite different (Table 2). In East Asia, the GDP per capita growth attributable to demographic influences was projected to be *negative* between 1990 and 2025, declining from a positive gain of 1.4 to 1.9 percentage points between 1965 and 1990 to a *loss* of 0.1 to 0.4 percentage points up to 2025, a projected retardation of 1.5 to 2.3 percentage points due solely to demographic forces. South Asia was projected to see a 0.8 to 1.4 percentage point growth rate *gain* as it left the "burden" stage of the demographic transition entirely and entered the "gift" or "dividend" stage. Southeast Asia was predicted to register a little smaller demographic dividend (0.6 to 1.1 percentage points): the biggest gainer was projected to be the Philippines while the biggest losers were projected to be Malaysia and Thailand.

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[2] Eight years later, Kelley and Schmidt (2005) also used the convergence model to estimate a figure of 28 percent for all Asia 1960-1995, quite close to our 31 percent for East Asia 1965-1990.

[3] Krugman relied on the results of Alwyn Young (1994a,b) and Jong-Il Kim and Lawrence Lau (1994), but these results were subsequently challenged with much higher total factor productivity growth estimates.

The macro evidence seemed to support the hypothesis that demographic events helped account for the East Asian economic miracle. Figure 2 offers a stylized version of the *demographic dividend hypothesis* where the sustainable growth rate is taken to be about 2 percent per annum. The reader should note, however, that the contribution of the demographic transition to the East Asian economic growth past, present, and future depends on how the miracle is defined. If it is defined as a share of per capita GDP growth between 1960 and 2010 in Figure 2, then it accounts for about a third of the miracle; if it is defined as the surplus over the sustainable rate, then it accounts for almost half; and if it is defined as the increase in growth rates from 1945-1960 to 1960-2010, then it accounts for almost three-quarters. These are very big numbers. Could their size be attributable to the assumptions of the convergence model?

Decomposing the Convergence Model: Participation Rate and Productivity Effects

The demographic dividend literature took a big empirical step forward with a paper by Allen Kelley and Robert Schmidt (2005) which decomposed the growth effects uncovered by the naïve demographic dividend model into its transitory labor participation rate effects and its longer term productivity effects. The first is pure demography: given labor productivity growth, any rise in the activity or labor participation rate (LPR) will raise per capita income growth; furthermore, the impact is transitory, although it may last decades. What about the second part?

Kelley and Schmidt listed some possible channels of impact of demography on productivity growth – scale economies, density, life-cycle savings and investment responses, and human capital accumulation, two of which will be discussed at length below. But they only used the list to motivate a reduced form estimation of the two effects. Their main finding was that demography had no long run impact on productivity growth. It turns out that they spoke too soon.

How Big the Dividend? Computable OLG and Convergence Models

Analysts were suspicious of the size of the demographic dividend estimated with the convergence model because of likely endogeneity problems in the underlying savings and capital accumulation variables (Feyrer 2007; Sánchez-Romero 2012). Thus, a more recent literature has emerged using computable overlapping

generations (OLG) models which focus explicitly on the savings and accumulation response, and the demographic impact is typically estimated to be much smaller. For example, that literature finds only a small demographic impact on Japan's economic growth in the late 20th century (Braun *et al.* 2009). While the OLG estimated impacts are bigger for Taiwan (Lee *et al.* 2000, 2001, 2003) and China (Curtis *et al.* 2011) than for Japan, all of the more recent OLG models seemed to yield smaller demographic dividends than did the original convergence models. But now it appears that they do so mainly by assumption.

A recent and impressive paper by Miguel Sánchez-Romero (2012) shows that there is actually little difference between the computable OLG and the early convergence model results when applied to Taiwan's late 20th century history: Sánchez-Romero finds that demography accounts for 22 percent of Taiwan's per capita output growth 1965-2005. Why the difference between Sánchez-Romero and Lee *et al.*? Both are using computable OLG models, but one adds an important reality missing from the other. Typically, the computable OLG models get their result by performing counterfactual experiments fixing birth and death rates at those prevailing at the start of the period examined. In contrast, and more correctly, Sánchez-Romero fixes birth and death rates at the levels prevailing a generation before. The former underestimates the demographic impact; the latter reports for Taiwan 1965-1990 that 25 percent of per capita income growth is explained by demography, much closer to the Kelley-Schmidt 28 percent estimate for Asia, and the Bloom-Williamson 31 percent estimate for East Asia.

Thus, it appears that the difference in the estimated growth impact of the demographic transition on Taiwan's performance is much the same whether the convergence or the OLG model is employed. What remains is to determine whether the result for Taiwan generalizes to East and Southeast Asia.

<center>**Channels of Dividend Impact: Savings and Physical Capital Accumulation**</center>

Savings, Investment and Accumulation

Since the key to the Kelley-Schmidt productivity impact of the demographic dividend must lie largely with accumulation responses, the life-cycle savings model and related literature has pursued this connection for Asia ever since Ansley Coale and Edgar Hoover (1958) wrote about dependency burdens a half century ago. An

anecdotal fact illustrates the point: In the early 1970s, Korean authorities were concerned by their country's heavy dependence on Japanese investment financing and commissioned World Bank papers to explore why Korea saved "so little" (Williamson 1979). By the late 1980s, Korea had doubled its savings rate, and its current account balance share in GDP had swung from -8.0 percent (net capital inflow) to +3.2 percent (net capital outflow). Over the same period, the Korean dependency rate fell by more than 12 percentage points, a huge decline. Was the correlation spurious, or was demography driving some of the accumulation boom and its financing? The subsequent literature was thus motivated by the following questions: How much of the impressive rise in East Asian savings rates across the late 20th century could be explained by the equally impressive decline in dependency burdens? How much of the fall in external capital dependency in East Asia since the 1970s could be explained by the same demographic forces?

Over the past two decades, the literature has assigned a large role to the demographic transition in explaining accumulation-driven productivity gains underlying the East Asian miracle. Saving and investment rates can both be driven by demography, each tracing out an inverted-U. The explanation for the saving rate trend would be the famous life-cycle model with high saving rates in the middle of the demographic transition where mature adults dominate.[4] The explanation for the investment rate trend would be the impact of big working adult shares generating large investment shares, and thus accumulation rates, in the middle of the demographic transition. *Prediction 1*: If the saving rate inverted-U is more dramatic than that of investment, then net capital import shares, or foreign capital dependency, would be big early and small in the middle of the transition. *Prediction 2*: If, in contrast, the investment inverted-U is more dramatic than that for savings, then net capital import shares would be small early and big in the middle of the transition. Theory cannot discriminate between the two predictions, but empirical work can. The earliest work to pursue the assessment for East Asia found the following (Higgins and Williamson 1997; Higgins 1998; Williamson and Higgins 2001): rising fertility and falling infant mortality had a profound impact on East Asian saving rates, investment rates and foreign capital dependency over the half century following 1950. Much of the impressive rise in East Asian saving rates after the late 1960s could be explained by the equally impressive decline in youth dependency burdens. Furthermore, the evidence supported Prediction 1: the countries that kicked the foreign capital

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[4] Life cycle trends in income and saving has been well documented in the literature, much of it for Asia (Mason *et al.* 2008: p. 12; Mason and Kinugasa 2008: p. 390).

dependency habit first and fastest were the countries where the youth dependency burden fell first and most dramatically. Much of the contrasting foreign capital dependency between South and East Asia could be explained by the size of the youth dependency burden and its persistence. All of this implied that demography could explain a large share of the East Asian miracle through accumulation and Kelley-Schmidt productivity effects.

These early studies made many assumptions along the way: that more abundant world savings supplies did not alter capital's incentive to seek new Asian opportunities, although it certainly did; that world capital markets stayed equally open throughout the half century, although they certainly did not; that the life-cycle model was an appropriate explanation for savings behavior; and that the demographic transition was exogenous to accumulation performance. Subsequent work has explored the importance of these assumptions at length, but never in a really persuasive way.

Using an OLG model with fixed household size and exogenous interest rates, we are told that demography explains almost none of Japan's national savings rate (Hayashi and Prescott 2002; Chen *et al.* 2006, 2007), but using an OLG model with endogenous interest rates and variable household size, we are told that demography has a positive effect (Braun *et al.* 2009). Using an OLG model with fixed interest rates and youth dependency, we are told that demography matters for Taiwan's saving rate experience since 1960 (Lee *et al.* 2000, 2001, 2003). More recently, and again using the OLG model with fixed interest rates, we are told that most of China's high saving rates are driven by demography (Curtis *et al.* 2011). These assumptions matter.

What about World Capital Markets?

Of all these assumptions invoked, I think the financial capital open economy assumption, or what the analysts call the *interest rate assumption*, is the most important, and the most poorly understood. If the interest rate is taken as exogenous, then we are assuming an economy open to world capital markets, where financial capital is allowed to flow freely across borders, the world interest rate prevails locally, and domestic saving offers no constraint on domestic investment. We are also asked to assume that the world borrowing rate facing East and Southeast Asia was constant over the late 20th century although it certainly was not. Instead, their emerging market borrowing rates converged on the OECD rates (Obstfeld and Taylor 2004; Mauro *et al.* 2006).

If, instead, the interest rate is taken to be endogenous, then we are asked to assume an economy completely closed off from world capital markets, where capital does not flow across borders at all, domestic savings constrains d0mestic investment, and domestic saving and investment jointly determine the local interest rate. Some of these papers make the open economy assumption, some make the closed economy assumption, but none – as far as I know -- explore the wide reality in between and how it changed over time. Indeed, it is rare that we are told how much the assumption matters. Taiwan is an exception. Between 1965 and 1990, Sánchez-Romero (2012) reports that when the economy is assumed to have been open to capital flows, demography accounts for 25 percent of per capita output growth, and when it is assumed to have been closed, demography accounts for 'only' 17.2 percent.[5] In open economies, domestic savings is not a constraint on accumulation, and thus booming working adult shares have a bigger impact on investment, accumulation and growth. Where is the literature that shows us that Asian economies open to world capital markets had bigger demographic effects than those closed? Perhaps more to the point, Asian capital markets were mostly closed before the 1970s, while they have been mostly open since. Thus, where is the literature that shows us that Asian economies had bigger demographic effects before the 1970s than afterwards? The empirical problem underlying the last research question is, of course, that stages of capital market integration and stages of demographic transitions have been correlated in Asia over the past half century.

A Second Demographic Dividend?

The early convergence and OLG models assumed older and retired workers dis-saved, and thus that the demographic dividend evaporated as the demographic transition moved in to its last stages. Some now think that the dividend persists. Why? The Asian data show that individuals consume much more than they produce well in to old age (Mason *et al.* 2008; Mason and Kinugasa 2008: p. 390). Of course, this could be explained by massive inter-generational transfers within families, but it might also be explained by higher rates of saving for old age by mature working adults. There are at least three plausible reasons why current mature working adults might have higher saving rates than the previous generation thus raising aggregate saving rates late in the demographic transition. First, greater expected longevity would encourage that result. While the naïve demographic transition

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[5] However, Sánchez-Romero does not explore an open economy assumption where Third World borrowing rates fall, a characterization that comes closer to world capital market integration fromr the 1970s onwards.

models stress the initial decline in child mortality, improvements in health environments also raise life expectancy at age 40 or 50, and those effects become increasingly important as the transition evolves. Second, mortality becomes less uncertain as disease is suppressed in poor countries. Lower uncertainly about life expectancy would also encourage more saving by mature working adults. Third, as family size declines, the spatial mobility of children rises, and retirement years increase, parents may be much less certain about the old-age support they can expect from their children, offering another incentive for mature working adults to save even more. If these forces do indeed raise the saving rates of mature working adults, then they could create a *second demographic dividend*.

All of this is certainly plausible, and it has been confirmed for Asia where greater longevity has raised saving rates across all adult groups (Bloom and Canning 2003). But China, South Asia, and Southeast Asia are not far enough advanced with their demographic transition to offer the required evidence for assessing the magnitudes of a second demographic transition.[6] All the Asian evidence comes from Taiwan, Korea, and Japan. Ronald Lee and Andrew Mason find very large second dividends for Taiwan (Mason and Lee 2007; Mason *et al.* 2010) which they argue is consistent with the micro studies of Taiwan (Deaton and Paxson 2000). For a sample of 25 European countries plus Australia, New Zealand, the United States, Japan, Korea, Malaysia, and Thailand, the estimates of second dividends are large. Indeed, the two (saving rate) dividends are estimated to have been about equal: "declining child dependency led to a rise in saving rates by 6.9 percentage points [while] improvements in adult survival led to a rise in saving rates by 6.7 percentage points (Mason and Kinugasa 2008: p. 398)."[7]

Whether these second dividend magnitudes will hold up for China, South Asia, and Southeast Asia cannot yet be asserted, but that future looks likely.

Channels of Dividend Impact: Human Capital Accumulation and Vintage Effects

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[6] Between 2000 and 2005, the population growth rate in ASEAN was 1.39 and 1.62 in India, while it was only 0.14 in Japan, 0.46 in Korea, and 0.54 in Taiwan. In 2000, the youth dependency rates were (in %): ASEAN 41.8 and India 45.1 versus Japan 20.5, Korea 28.9, Hong Kong 23.7, and Taiwan 29.7. In 2000, the population shares 65 and older were (in %): ASEAN 4.9 and India 4.6 versus Japan 17.2, Korea 7.4, Hong Kong 11, and Taiwan 8.1. Mason *et al.* (2010: Tables 1.1, 1.2, and 1.4).

[7] For an elegant and impressive extension of their views, see Lee and Mason (2011).

We all agree that human capital accumulation is an important driver of growth, so how might it be connected to the demographic transition? There are two possibilities. First, and following Gary Becker (1960, 1981) and H. Gregg Lewis (Becker and Lewis 1973), there may be a quality-quantity tradeoff working at the family level – more kids and lower investment per kid versus fewer kids and higher investment per kid. This would clearly be a force endogenous to the demographic transition: a low-quality child cohort (produced under conditions of high fertility and big families) implies weak vintage effects when that cohort enters the labor force a decade or two later; a high-quality child cohort (produced under conditions of low fertility and small families) implies a big vintage effect when the cohort enters the labor force a decade or two later. And if those cohorts are themselves big, the vintage effect is even bigger. Second, there is the possibility of an independent co-movement between public spending on these investments and the size of the youth cohorts. If a public schooling-health revolution coincides with the demographic transition, and if that revolution impacts quality of the new kids, we have what might be called a quasi-endogenous effect. Without the public schooling-health revolution, the vintage effects of the demographic transition will be weak and limited to the demand side Becker effects, but with it they will be strong and pushed by the supply side. In any case, both of these forces imply vintage effects – average human capital per worker rises as the well-schooled young workers replace the poorly-schooled older workers.

Endogenous Schooling from the Demand Side: Quality versus Quantity

The best work documenting the endogenous quality-quantity human capital effects coming from fertility declines in the second stage of the demographic transition, at least for Asia, have been produced by Andrew Mason, Ronald Lee, and their collaborators. The cross-section correlation between total public and private human capital investment per child and the total fertility rate is striking (Mason *et al.* 2010: Figure 1.8): Taiwan, Japan, and Korea are later in the demographic transition with high investment per child and low fertility rates; India, Indonesia, and the Philippines are earlier in the demographic transition with low investment per child and higher fertility rates; and Thailand is in the middle. Lee and Mason (2009) have shown these quality-quantity correlations could have a powerful impact on human capital accumulation and growth. Although independent East Asian evidence certainly seems to support the Becker demand side connection (Montgomery *et al.* 2000; Jun 2013), Lee and Mason never identify the source of the correlation the observe across Asia. Was it quality-

quantity family effects that would be so clearly associated with demographic transitions, or was it something else? In addition, their measures of investment per child do not control for schooling quality, and when parents demand more schooling for their children, it may generate crowding and rising teacher (and other schooling) costs and thus more spending, but maybe not more quality-adjusted schooling. This is exactly what T. Paul Schultz (1987) found for a large sample of countries 1960-1981, and what I found for a smaller sample (but which included Japan, South Korea, Hong Kong, Malaysia, the Philippines, and Thailand: Williamson 1993: p. 154): controlling for other relevant variables, the relative price of teachers had a strong negative impact on schooling. Why should we care? Because positive public supply side forces should lower the relative schooling price while demand side forces should raise it. The behavior of the relative cost of schooling (and health) might help untangle the demand and supply side forces. Where is the literature that explores this important issue?

In short, while other studies have confirmed the quality-quantity trade-off in micro data, Lee and Mason are dealing with macro data (and magnitudes across countries and over time) and we are not yet sure how much of the correlation they observe is driven by private family schooling demands, and how much by public schooling supplies. The differences will influence interpretation.

Schooling from the Supply Side: Demographic Transitions and Public Schooling Revolutions

Taiwan was a schooling leader in Asia, and it illustrates the supply side point:

"In 1944, the constitution of the Republic of China established 6 years of compulsory education, and this period was extended to 9 years in 1968. As a result, the proportion of illiterate … changed from 40% in 1940 to almost [zero] in 1970" (Sánchez-Romero 2012: fn 2; citing Huang 2001).

Obviously, when Taiwan passed from the youth dependency phase of the demographic transition to the young adult worker and the mature adult worker phases (1950-2000: Mason *et al.* 2010: Tables 1.2 and 1.3) the co-movement of the early public schooling revolution raised average worker schooling later due to these powerful vintage effects. The Asian public schooling revolution examples can be easily multiplied (Williamson 1993).[8] Indeed, the evidence shows that since 1950 East Asia has made a bigger commitment to schooling, and with a

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[8] The best paper covering the 19th and early 20th century (primary) schooling revolution in the now-advanced countries is by Richard Easterlin (1981). The reference to the post-WW2 Asian schooling revolution is mainly secondary education.

steeper rise in that commitment, than anywhere else in the Third World. Why is that so, and why is it correlated with a more dramatic demographic transition? Is it public supply side political economy at work, or is it private demand side quality-quantity trade-offs at work? The recent neo-institutional contributions of Daron Acemoglu and James Robinson (e.g. 2006) and Stanley Engerman and Kenneth Sokoloff (e.g. 2012) would suggest low inequality and broad political participation might explain it. We need far more research on this question.

Emigration: Muting the Dividend's Impact by Brain Drain

Emigration Life Cycles

Countries typically pass through a migration transition, or what might be called an *emigration life cycle*, driven by income differences between the low-wage sending country and high-wage host countries, modernization and economic growth at home, and, of course, the sending country's experience with its demographic transition. These emigration life cycles have been used by economic historians to describe European emigration from the 1840s to World War 1, where at first country emigration rates rose steeply from very low levels, after which the rise began to slow down as the emigration rates reached a peak and subsequently fell to low levels again. These historical emigration life cycles can be seen in aggregate country emigration rates, regional emigration rates within countries, and rural-urban emigration rates within countries (Hatton and Williamson 2005b: Ch. 4).

Since these emigration life cycles are so pervasive in the historical data, it is hardly surprising that we also have seen them in the Third World since the 1950s (Hatton and Williamson 2005a, 2011; Williamson 2014). While similar to 19th century European emigration patterns, the more recent Third World country emigration life cycles cover shorter time periods. One oft-cited example is South Korea where emigration rose steeply to a peak in 1982 and subsequently declined just as quickly. Similar patterns have been observed for other Asian countries and it is tempting to associate these more compressed emigration life cycles with economic miracles and accelerated demographic transitions. While emigration life cycles have been examined for individual countries, they have also been explored at more aggregative continental levels, although the expectation is that the aggregate life cycles should less dramatic. After all, some countries start and complete their emigration life cycles early while others start and finish later, tending to partially smooth out the aggregate

regional experience. Still, Asia[9] reached peak emigration rates in 1980-84, even though some countries reached peaks early, like South Korea and Taiwan, while others much later, like Indonesia and the Philippines (Hatton and Williamson 2011: Table 1).

This brief survey raises three questions. First, are emigration life cycles country-specific special cases or do they reflect some common laws of motion? Second, if they do reflect some common laws of motion, what are the shared economic and demographic fundamentals driving them? In particular, while we certainly see the correlation – emigration life cycles following a decade or two after the first stage of the demographic transition – exactly what role does the demographic transition play? Third, are the demographic forces powerful enough to account for at least some of the observed brain drains, and, if so, are the drains big enough to mute some of the demographic dividends?

Modern economic analysis of international migration uses the framework first set out by Larry Sjaastad (1962) and refined by George Borjas (1987, 1994), Barry Chiswick (2000), and others. Thus, the emigration decision is characterized as depending on the economic gain from migration net of its costs, the latter including waiting time (influenced by short run labor market conditions in host countries) and queues related to host country admission criteria (and illegal migration costs). Since young adults have the most to gain from long distance moves, they record by far the highest emigration rates. Thus, when young adult cohorts are big during the second stage of the demographic transition, aggregate emigration rates rise, *ceteris paribus*. Since capital markets facing most poor households are imperfect or even absent, the demand to emigrate is constrained by poverty. But those constraints are released over time as growth miracles at home create the incomes necessary to finance more emigrants,[10] and as remittances and in-kind help from previous (and increasing) emigrant stocks resident abroad rises. As growth miracles unfold, they generate two competing forces on the upswing of the emigration life cycle: first, poverty rates fall, making it easier for families to finance the moves of their children, helping release the poverty constraint on emigration; but second, miracle growth implies catching up with the leaders, thus reducing the gains from the move. The first dominates early in the emigration cycle, and the second

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[9] Asia is defined here very broadly to include East Asia, Southeast Asia, South Asia, the Middle East and North Africa.
[10] Uninformed observers often think that successful development at home will keep young adults from emigrating. On the contrary, the big income gaps between sending and host countries are still big, and now families have more resources to finance the next emigrant.

dominates later in the cycle. Schooling matters as well. As the educational attainment of young cohorts rise, their ability to exploit market opportunities abroad rises as well. Emigration may also be constrained by host country immigration policy and perturbed by civil strife at home, but these events are more random. So goes the theory, but the econometric facts support the theory.

Emigration Life Cycle Fundamentals

Recent research has identified the main drivers of Third World emigration rates after the 1960s, the start of the great boom in world migration (Martin and Taylor 1996). The best evidence is for sending country emigration to the United States (Hatton and Williamson 2011). While changing immigration policy, civil strife at home, and other exogenous events have mattered, it's the underlying demographic and economic fundamentals that explain the common emigration life cycle experience across sending countries. First, the US migrant stock effect made the most important contribution to the boom up to the 1990s, reflecting both the importance of family reunification in US immigration policy and the previous impact of economic and demographic fundamentals on migration flows which then got embedded in the current migrant stock, thus raising current flows. Indeed, were it not for the migrant stock effect, Asian emigration rates would have fallen steeply after 1990-4 rather than merely dropping slightly. Second, the birth cohort effect played an important role in the downturn after 1990-4 in Asia.[11] Third, education catch-up also played an important role everywhere in the Third World, augmenting emigration rates, but it was especially powerful in Asia, where the schooling revolution was most dramatic. Fourth, while there was certainly per capita income growth catch-up in Asia, the growth miracles were not fast enough to reduce significantly the income gap with the US, and thus it contributed little to the emigration boom. Finally, while statistically significant, the diminished poverty trap did not contribute as much to either the emigration boom to 1990-94, or the decline thereafter.

Brain Drain and Wasted Demographic Dividends?

Perhaps it's obvious that emigration of well-schooled young adults diminishes the demographic dividend. True, some have shown that emigration of well-schooled young adults raises the expected rate of

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[11] The same was true of Latin America, but not Africa (where the demographic transition is lagging behind).

return to schooling for the next younger cohort left behind.[12] Since this raises schooling rates, it offers a partial offset to the drain (Cervantes and Guellec 2002; Williamson 2007; Docquier and Rapoport 2012). Others have argued that remittances offset the brain drain losses (Fajnzylber and Lopez 2007; Guiliano and Ruiz-Arranz 2009), but the assessment ignores potential damage created by Dutch disease on manufacturing jobs or that household's use of those remittances to finance yet another child's emigration producing more drain. Any assessment of the brain drain and demographic transition connection is made even more complicated by the powerful role of emigrant migration stocks abroad pulling even more young well-schooled adults abroad long after demography had its first order effect on emigration. As far as I know, the connection has not yet been assessed empirically.

Beneath the Macro: Rural-Urban Migration and Income Gaps

Oddly enough, it's hard to find a single paper in the literature that breaks the demographic transition down in to rural and urban component parts. We know that the richer, better educated, more progressive, and female-job friendly cities lead the poorer, less educated, more conservative, and less female-job friendly rural areas in the demographic transition. Postwar child mortality in Asia fell first in the cities, and, with a lag, fertility rates fell there first as well. Where the rural lag behind urban has been big, we should see three things (*ceteris paribus*): big migrations to the cities pushed by young adult gluts in the countryside; rising rural inequality driven by the same glut; and rising wage gaps also driven by the same glut. If the analyst just compares the size of youth cohort age shares in urban and rural areas, she will downplay these forces since rural-urban migration tends, at least partly, to equilibrate. So, one has to look at the rural-urban fertility and child mortality differentials a couple of decades earlier to properly assess impact.

I have said that these rural-urban differences in the timing and magnitudes should have country-wide inequality implications (within regions, between regions, and country-wide). These will be explored in the next section, but here I will simply repeat the prediction that a glut of young adults who stay in rural areas will lower wages and incomes, and raise rural-urban wage and income gaps.

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[12] That is, expected rates of return to schooling are raised by the possibility of emigration to high-wage countries (confirmed by older emigrating siblings).

Anyone interested in rural-urban migrations in Asia, and their distributional implications, should pay attention to rural-urban differences with their demographic transition experiences – especially for the Philippines, Indonesia, Thailand, and China. As far as I know, nobody has yet done so.

The Demographic Transition and Inequality Connection

The cohort size hypothesis is simple enough: fat age cohorts tend to get lower rewards and thin age cohorts get higher rewards. When the fat cohorts lie in the middle of the age-earnings curve where life-cycle income is highest, this labor market glut lowers income in the middle, thus tending to flatten the age-earnings curve and earnings inequality is moderated. When instead the fat cohorts are young or old ages, this kind of labor market glut lowers incomes at the two tails of the age-earnings curve thus tending to augment earnings inequality. This demographic hypothesis has a long tradition in the United States starting with the entry of the baby boomers into the labor market when their big numbers created poorer job prospects (Easterlin 1980), and the impact was surveyed not too long ago (Lam 1997: pp. 1023-4 and 1044-52; Macunovich 1998). All such studies have shown that relative cohort size has had an adverse supply-side effect on the relative wages of the fat cohort in the United States since the 1950s.

What about the world more generally, and Asia in particular? If the cohort size hypothesis helps explain United States (and European) post-war experience with earnings inequality, it might do even better elsewhere. After all, there is far greater variance in the age distribution of populations between countries than there has been over time in the United States. More to the point, the post-WW2 demographic transition in Asia and the rest of the Third World has generated much more dramatic changes in relative cohort size than did the baby boom in the US and the OECD. In addition, the post-WW2 OECD countries were already urbanized, so the postulated rural-urban inequality effects discussed in the previous section would have been far weaker there than should have been true of Asia and the rest of the Third World. As far as I know, nobody has yet explored this last hypothesis in the literature.

One study (Williamson 2001; Higgins and Williamson 2002) used a world panel data base of 92 countries to explain the Deininger-Squire (1996) income inequality Gini coefficients from the 1960s to the 1990s. The explanatory variables were: older labor force cohort size defined as the proportion of the adult

population (taken to be persons 15-69) who are ages 40-59; a measure of openness; and GDP per capita entered non-linearly to capture Kuznets Curve effects. The results were statistically significant and robust. More importantly, the analysis assigned the biggest influence to demographic-transition-induced cohort size effects. Indeed, compared with the East and Southeast Asian countries,[13] inequality in Africa and Latin America in the 1990s was much higher, bigger by 7.2 points in Africa and by 10.8 points in Latin America. If Africa had the same demographic mix as East and Southeast Asia, inequality would have been lower by 3.6 points, cohort size accounting for about half of the difference between the two regions. If Latin America had the same demographic mix as East and Southeast Asia, inequality would have been lower by 3.1 points, cohort size accounting for almost a third of the difference between the two regions. The study also showed that cohort size effects (rising mature labor force shares) should serve to lower inequality by more than 8 percentage points between the early 1990s and 2025, suggesting that these demographic changes will be a powerful force promoting reduced inequality: the Gini coefficient for East and Southeast Asia was projected to fall from a relatively low 39.2 to a still lower 31.5 by 2025, after which it should stabilize.

Harry Oshima and Andrew Mason also explored some of these issues for Asia, but their most novel contribution, at least to me, was their stress on inequality of years of life (Oshima and Mason 2001: 404-5). Some time ago, Simon Kuznets (1976) stressed that it was inequality of lifetime earnings that we should be measuring. Since child and adult mortality are powerfully influenced by poverty in very poor countries, low incomes and low life expectancy are correlated. Thus, lifetime incomes must have been much more unequal than annual incomes in most of Asia during the 1950s and 1960s. But if a fall in child mortality early in the demographic transition favors the poor (perhaps because it is driven mainly by public intervention), then it should offer another source of more egalitarian lifetime incomes. If a fall in adult mortality later in the demographic transition also favors the poor, it should be a source of more egalitarian lifetime incomes. Oshima and Mason report a very steep decline in the inequality of years lived by East Asians during the post-WW2 era (something we also see across countries in the 20th century), contributing to much more egalitarian lifetime incomes. These trends are likely to continue in the near future, and they need more of our attention.

Agenda

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[13] China, Hong Kong, Indonesia, Japan, Malaysia, Philippines, South Korea, Taiwan, and Thailand.

It seems to me that there are many unanswered questions involving the impact of the demographic transition on country economic performance. Estimates of the first and second demographic dividend seem only to scratch the surface. We need to learn much more about the schooling, emigration and inequality connections as well as rural-urban dynamics.

The demographic transition matters!

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Table 1: Contribution of Demographic Change to Economic Growth 1965-1990
(Source: Bloom and Williamson 1998, Table 6)

Regions	Average Growth: Real GDP per Capita (%)	Average Growth: Population (%)	Average Growth: Economically Active Population (%)	Average Growth: Dependent Population (%)	Estimated Contribution, 1965-90 (four model specifications)			
					(1)	(2)	(3)	(4)
Asia	3.33	2.32	2.76	1.56	1.04	1.64	.86	.73
East Asia	6.11	1.58	2.39	.25	1.71	1.87	1.60	1.37
Southeast Asia	3.80	2.36	2.90	1.66	1.25	1.81	1.07	.91
South Asia	1.71	2.27	2.51	1.95	.66	1.34	.48	.41
Africa	.97	2.64	2.62	2.92	.14	1.10	-.07	-.06
Europe	2.83	.53	.73	.15	.43	.52	.39	.33
South America	.85	2.06	2.50	1.71	1.03	1.54	.87	.74
North America	1.61	1.72	2.13	1.11	.94	1.34	.81	.69
Oceania	1.97	1.57	1.89	1.00	.74	1.14	.62	.53

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Table 2: Contribution of Demographic Change to Future Economic Growth 1990-2025
(Source: Bloom and Williamson 1998, Table 7)

Regions	Projected Growth: Population (%)	Projected Growth: Economically Active Population (%)	Projected Growth: Dependent Population (%)	Estimated Contribution (four model specifications)			
				(1)	(2)	(3)	(4)
Asia	1.36	1.61	.99	.61	.99	.50	.43
East Asia	.43	.20	.87	-.40	-.14	-.44	-.38
Southeast Asia	1.29	1.66	.63	.83	1.10	.73	.62
South Asia	1.65	2.11	.90	1.02	1.38	.90	.77
Africa	2.40	2.78	1.88	.98	1.63	.73	.68
Europe	.17	-.004	.48	-.32	-.16	-.34	-.29
South America	1.50	1.87	.94	.82	1.15	.71	.60
North America	1.28	1.33	1.21	.21	.645	.11	.10
Oceania	1.08	.93	1.37	-.22	.24	-.31	-.26

Figure 1. The stylised demographic transition

Demographic transition

Population
growth rate

Birth rate
Death
rate

Birth rate
Death rate

Time

Population growth and the age structure

Share
working

Birth rate
minus
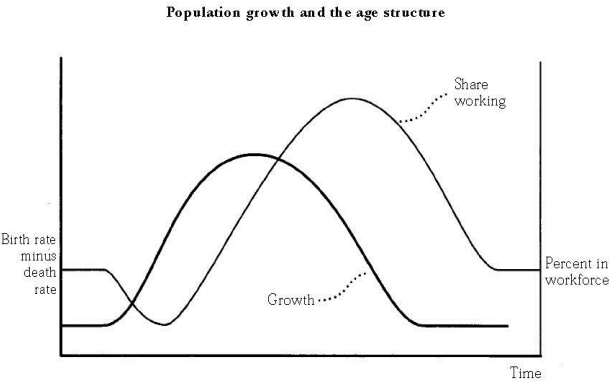death
rate
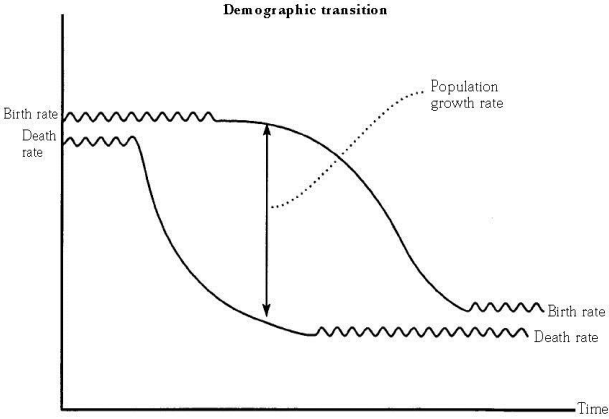
Percent in
workforce

Growth

Time

Figure 2.

Economic growth and the demographic transition, East Asia

Growth rate of real GDP per capita

Economic
"miracle"

Other
transitional
forces

Economic
"miracle"

Demographic "gift"

Youth
demographic
"burden"

Sustainable
growth

c. 1945   c. 1960   c. 2010   c. 2025

Time