Demographic Origins of the Great Recession: Implications for China

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Abstract
The demographic dividend, that is, the growth of the working age population aged 16 years relative to younger and older age dependents, has often been cited as a crucial component of the accelerated economic growth experienced by disparate countries and regions at different points in time. Generally less emphasized are the ramifications of this process when it occurs in reverse; that is, when the relative size of the working age population begins to shrink. Related to this is the more subtle effect of changes to the age structure of the overall working age population, which can have compounding or offsetting effects in relation to the demographic dividend noted above. This paper explores how these age-related phenomena were instrumental to both the Great Depression and the Great Recession of 2008. We explore how the generational composition of economic actors and the aging of the baby-boom worker may have played a role in provoking these remarkable recessionary periods. The reversal of the demographic dividend and the aging of the working age population are factors now contributing to the propagation of the global economic downturn, as witnessed in the example of Japan over the past half-century. This paper applies the lessons of the Great Depression, the Great Recession and Japan to offer a forward-looking analysis of the Chinese economy. China is on the precipice of a significant demographic shift whose implications for economic growth are explored.

Key words: age structure, demographic dividend, economic growth, financial crisis, recession

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I. Introduction

The fundamental impulse that sets and keeps the capitalist engine in motion comes from the

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new consumers, the new goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates.

Joseph Schumpeter (1942, pp. 82)

Attempting to understand the sources of long-run economic growth, a vast empirical literature has developed around the augmented Solow–Swan production function, where national output is determined by the accumulation of (and interactions between) physical and human capital, labor supply and technological efficiency (Temple, 1999). Viewed from this framework, the relationship between demographics and economic development is clear. Output growth can be realized through increases in the size of a country’s available labor force as well as in improvements to human capital (Hall and Jones, 1997; Galor and Weil, 2000). What is relatively less explored is the association between changes to a country’s age structure (i.e. the transition from a young to middle-aged to older workforce) and extended periods of declining or expanding economic growth (Malmberg and Sommestad, 2000; Gomez and Hernandez de Cos, 2008a,b). In this respect, the demographic dividend (i.e. the growth of the working age population aged 16–64 years relative to younger and older age dependents) has been cited as a crucial component of the accelerated economic growth experienced by disparate countries and regions at different points in time (Bloom and Williamson, 1998).

The objective of the present paper is to explore how the reversal of such a demographic dividend can lead to lower economic growth and/or stagnation, with specific reference to China, currently in the latter stages of its own demographic maturation. A demographic reversal is defined here as a period of rapid and sustained decline in the working age population (aged 15–64 years) relative to younger (0–14 years) and older age (65+ years) dependents as well as a decline in the share of prime age workers (aged 35–54 years). We will demonstrate how the reversal of the demographic dividend and other age-structure-related phenomena have acted as both impulse factors and propagation mechanisms in the stagnant rates of economic growth observed in many countries since 2008. As an example of the conceptual framework adopted in the present study, we show how changes to population age structure can explain the pattern of economic expansion and contraction observed in Japan over the past 60 years. The analysis then revisits the Great Depression of the 1930s through the lens of the demographic dividend. The proceeding section of the

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1 Growth in the relative size of the working age population (15–64 years) is brought about by a precedent baby-boom period perhaps lasting 10 to 15 years followed by a pronounced and secular decline in birth rates.
paper focuses on the Great Recession of 2008. Finally, given the important relationship between changing demographic age structure and economic output established in the previous sections, we consider the implications of these relationships for China over the coming decades.

II. The Impulse and Propagation Framework

Economic historians have tended to view deep and prolonged economic downturns (such as the Great Depression of the 1930s) through the framework of impulse and propagation. An impulse is a factor understood to have caused an economic downturn, whereas propagation mechanisms are those elements that cause a downturn to persist and perpetuate into a prolonged crisis. As noted by Temin (1989, p. 6), economic forecasts typically contain both a deterministic element that can be predicted with relative accuracy and an exogenous random component, or an “impulse.” The structural characteristics of an economy, which contribute to the deterministic component, in turn, account for how an impulse propagates through the economic system (Temin, 1989). This impulse–propagation framework can be applied fruitfully to the case of Japanese post-war economic development and its demographic origins. We begin by noting that Japan, up until the early 1990s, was the poster child for the so-called economic “growth miracle,” achieving annual real growth rates of output per person of 6.3 percent from 1960 to 1990 (Temple, 1999). Beginning in the early-to-mid-1990s, however, the country entered a period of moribund economic growth that has persisted for almost two decades (Figure 1). What explains such a major reversal of fortune?

1. Impulse-Propagation and the Demographic Dividend: The Case of Japan 1950–2012

Important exogenous shocks are often cited as explanations for the periods of negative growth observed in Japan. Indeed, as viewed in Figure 1, major events do coincide with large cyclical downturns: for example, three oil shocks (1973, 1981 and 1991), the Kobe earthquake of 1995, the 9-11 terrorist attacks in the USA and the 2011 tsunami. Undoubtedly, each event had an impact on the Japanese economy, but it is only since the 1990s that Japan appears unable to bounce back from short-term adversity. To fully understand the source of prolonged economic decline in Japan over the past two decades, we need to move beyond “impulse” factors and examine the role of demographic change as a propagation mechanism.

As noted by many demographers, the birth rate in Japan has been in decline since 1950, dropping sharply following the baby boom of the 1930s and a short-lived post-war
baby boom lasting from 1947 to 1949. Tied to this decline were huge gains in life expectancy. Today, the average Japanese citizen can expect to live until age 84 (87.4 years for women and 80.6 years for men), which is the highest life expectancy of any country in the world. These two demographic shifts (i.e. fewer youngsters and more older adults) explain why, as of 2008, the death rate has exceeded the birth rate in Japan for the first time in its recorded history (Figure 2).

To appreciate the impact of such an unprecedented demographic shift we need to return to the augmented Solow–Swan production function. The model may be formally written using the now standard approach of Mankiw et al. (1992) as:

Figure 1. Real GDP Growth Japan, 1960–2011

Note: Dotted lines represent average growth rate over the period.

Figure 2. Japan’s Birth Rate, 1950–2008

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\[ y_t = (k_t^{\alpha}h_t^{\beta})A(l_t)^{1-\alpha-\beta}, \]  

where per capita output \((y_t)\) is a function of physical capital \((k)\), human capital \((h)\), technical efficiency \((A)\) and the potential labor supply \((l)\). Changes in the size and structure of a nation’s population affect output in two important ways: (i) through a change in the size of the potential labor supply \((l)\) and (ii) through the changing age composition of the workforce as a population ages, which affects the stock of \((h)\) human capital.

The variable \(\text{WORKING}_{\text{AGE}}\) describes this first effect and refers to the changing proportion of working age persons 15–64 years \((W)\) as a fraction of the total population \((N)\):

\[ \text{WORKING}_{\text{AGE}} = \frac{\sum_{15}^{64} W_t}{\sum_{0}^{64} N_t}. \]  

The second effect, that is, human capital change via changing age composition of the working population, is captured by the variable \(\text{PRIMEAGE}\), which is the share of prime working age persons \((w)\) of 35–54 years as a fraction of the total working age population \((W)\):

\[ \text{PRIMEAGE} = \frac{\sum_{35}^{54} W_t}{\sum_{15}^{64} W_t}. \]  

To understand what these age structure variables imply for economic growth we return to the example of Japan.

(1) The Rising Share of Potential Workers: The First Demographic Dividend

The sharp decline in birth rates following the pre-Second World War (1930–1939) and post-Second World War baby booms (1947–1950 years) resulted in an increase (some 15 years later) in the proportion of working age persons (15–64 years) relative to the entire Japanese population. This encompasses the period 1960 to just prior to the first oil crisis in 1973.

This first demographic dividend meant a significant increase in the country’s relative labor supply, which provided the impulse (and propagation) for the sizable increase in output that began in the 1950s. With few retirees at the time and the downward trend in total fertility rates, the proportion of working age persons relative to the entire dependent Japanese population (those aged 0–14 and 65+ years) continued to rise for nearly three decades, growing fastest from 1960 to 1970, stabilizing from the 1970s to the early 1990s and...
falling again in or around the late 1980s, reversing gains in the relative size of the working age population (15–64 years) from 1995 onward (Figure 3).

Between 1995 and 2010, the percentage of working age persons in the total population actually fell by nearly 6 percentage points (69.4 to 63.7 percent). This translates into an absolute loss of 5.9 million persons aged 15–64 years in the population, which, when viewed from the aggregate production function framework, represents a serious handicap in output gains and puts pressure on the remaining factors (technology, land and human capital) to pick up the slack. Moreover, human capital may not be able to offset falls in WORKING AGE because it is itself dependent on the age structure of the population.

(2) The Rising Share of Prime Age Workers: The Double Demographic Dividend

The second effect of Japan’s demographic dividend resulted from a change in the structure of the working age population: specifically, an increase in the proportion of PRIMAGE workers in the potential labor supply. What does this second effect imply in terms of impulse and propagation factors?

First, a higher proportion of prime age workers (35–54 years) results in greater capital accumulation. The life cycle model of consumer behavior (Guiso et al., 2002; Miligan, 2005) suggests that individuals will standardize consumption over their lifetime, meaning that young workers (15–34 years) borrow while older workers (35–64 years) tend to save. Furthermore, prime age workers are also more likely to be earning higher incomes (the “Mincer” effect) given their higher endowment of human capital derived from the optimization of formal education and experience that occurs during PRIMAGE (Lemieux, 2006; Gomez 2013).
Second, given their high levels of human capital, prime age workers are theoretically more productive relative to younger workers and, thus, the increased numbers of this age group in the mid-to-late stages of a demographic dividend translates into greater output, compounding the effects of also having relatively more working age persons in the overall population.

Finally, an economy with a larger share of workers aged 35–54 years spends fewer resources on agency costs (e.g. close monitoring and supervisory activities are much lower for 35+ years than for workers aged 15–29 years and lower agency costs are related to positive economic performance (Sah and Stiglitz, 1986; Gomez and Foot, 2003; Foot and Gomez, 2006).

These three second-order effects resulting from an increase in PRIMAGE, combined with the first-order effect of the expansion of the potential labor supply denoted by WORKING_AGE, together produce what may be referred to as the period of the “double demographic dividend,” observed in Japan from roughly 1970 through to 1990.

Given that the first-order and second-order effects of a decrease in fertility thus far are related to positive economic growth, we have yet to account for the prolonged economic decline observed in Japan. This is because larger shares of working age persons and prime age workers are not permanent endowments. Prolonged declines in the number of births (coupled with virtually no immigration) eventually means that there are also fewer younger workers adding to the labor supply, translating into fewer workers and prime age workers in the longer term. The capacity for an economy to sustain positive growth indefinitely through a demographic dividend is limited by the fact that the dependency ratio eventually rises and the stock of prime age workers is not being replenished. The shift from a “vibrant and relatively young working age population to one that is older and perhaps less resilient to economic shocks” is often a difficult adjustment for economic agents. Japan, up until 1989, only had 11.6 percent of the population 65 years or older, one of the lowest shares in the world. By 2007, however, the number of 65+ years had nearly doubled to 21.2 percent, making Japan one of the “greyest” countries on Earth.

Some authors have argued that once the older baby-boom workforce retires, having a working age population, albeit smaller in size, made up of relatively more younger workers, may lead to an increased rate of technological adoption (Weinberg, 2004) and improved innovation (Simon, 1986; Ermish and Joshi, 1987; Shimer, 2001; Jones, 2003). The interaction between a young workforce and technology provides a propagation mechanism for renewed economic growth, but is likely insufficient, in and of itself, to counteract the diminishing returns caused by a shrinking of the overall working age population and the subsequent falls in the prime age workforce. One study estimates the optimal ratio of prime age persons (35–54 years) relative to younger workers (15–34 years) to be 0.950 (roughly one young worker for every prime age worker), after which point economic growth is negative (Gomez
and Hernandez de Cos, 2008a). Japan has long passed that marker. The shrinking of the labor supply and the subsequent decline in the relative proportion of prime age workers can be referred to as the period of the double demographic “hangover” that began around 1990. Therefore, the Japanese case provides an excellent example of the positive and negative effects of demographic change as well as the long-run and short-run effects of baby booms and sharp busts on economic growth. The generality of the Japanese case is illustrative because, apart from India and parts of Africa, similar post-war population boom–bust trajectories have occurred around the world.2

III. Demographic Roots of the Great Depression, 1929–1939

Many economists, beginning with Keynes (1936), have argued that the Great Depression resulted from a combination of macroeconomic (as opposed to microeconomic) events, in particular attempts to restore and maintain the gold standard in industrialized countries following the First World War. Temin (1989) posits that the issues surrounding the gold standard and the international deflation that ensued were propagation mechanisms for the Great Depression, whereas the shock of the First World War itself and the international instability that followed were the impulses behind this historic period. Although monetary and fiscal policies undoubtedly contributed to the Great Depression, what is less often mentioned is the role played by demographics (Barber, 1978, 1995). In particular, age structure change of the kind experienced by Japan in the 1990s, and now being experienced in the USA and Europe, played a role in the prolonged slump that mired most of the developed world more than 70 years ago.

The first thing to note is that the problem in the 1930s was secular (not cyclical) stagnation, a state characterized by declining population, high unemployment and low levels of investment resulting in decreasing aggregate demand and stationary or even negative periods of economic growth. This fact was well recognized by economists prior to and during the Great Depression. Alvin Hansen, for example, linked falling population to secular stagnation, emphasizing that the decrease in the USA’s population growth was partly responsible for the diminishment of investment outlets, such as residential construction and infrastructure, as well as decreases in demand for public services and consumer goods (Hansen, 1938, 1939).

Similarly, Keynes (1937, p. 100), recognizing the fundamental relationship between

2 Countries experiencing baby booms followed by rapid busts include: France (1946–1974); the UK (1946–1974); Canada (1947–1964); Finland (1945–1950); Germany (1955–1967); New Zealand (1945–1961); Australia (1946–1969); and the USA (1945–1966).

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demography and economic growth, raised the now famous rhetorical question: “What will you do when you have built all the houses, roads, town halls, electric grids, water supplies and so forth, which the stationary population of the future can be expected to require?” Evidently, Keynes was noting the significant growth in population over the 19th century and into the beginnings of the 20th century as the impulse for unprecedented increases in aggregate demand driven by private investment. Nobel laureate J. R. Hicks (1939) further suggested that the entire industrial revolution might have simply been a secular boom resulting from sustained demographic changes. In a memorable passage, Hicks (1939, p. 302) states: “one cannot repress the thought that perhaps the whole Industrial Revolution ... has been nothing else but a vast secular boom, largely induced by the unparalleled rise in population.” From these examples it is clear that leading economists of the 1930s accepted the secular stagnationist argument, based on declining population.

If population growth was a primary impetus for long-run economic prosperity, then it is only logical that population decline would provide the impulse and propagation for economic deterioration. The USA, for example, as illustrated in Figure 4, experienced a notable population bust preceding the Great Depression in the period from 1914 to 1929. Barber (1995) links this demographic decline to the housing market bust of the late 1920s and then to the Great Depression. Using US National Accounts data he shows how gross private investment (in constant dollars) fell from 16 percent of gross national product (GNP) in 1929 to only 2 percent by 1932, a major fall that happened quite quickly and equated to a 58-percent drop in total GNP over the 3-year period. Therefore, the role of demographics as an impulse for the Great Depression is seen in the relationship between

Figure 4. US Birth Rate, 1910–2009

prior birth rate declines and subsequent reduced personal investment (Barber, 1978).

The negative population growth that preceded the Great Depression also resulted, as was the case in Japan, in important second-order effects that further eroded economic fortunes. The baby bust in the years prior to the Great Depression (1914–1920) meant that the proportion of prime age workers (i.e. workers aged 35–54 years) was initially high throughout the early-to-mid-1920s, fuelling greater consumption, investment and savings that funneled into the stock market. However, the boost provided by this second-order demographic dividend began to decrease prior to the 1930s, as prime age workers shifted into older age and began leaving the labor force, with fewer new entrants to replenish the labor supply. Similar to the case of Japan, decreases in the proportion of prime age workers served to exacerbate the falls in consumer demand and labor supply, given both the high human capital endowments and consumption/savings patterns of this prime-age cohort (e.g. Bloom et al., 2003).

With the onset of the Great Depression, spending on services and consumer goods began to fall sharply, thereby displacing workers previously employed in those sectors. The changing nature of production away from durable goods and weak consumer confidence were additional propagation mechanisms that deepened the Great Depression and that had their origins in a reversal of the demographic dividend (McLaughlin and Watkins, 1939). Keynes (1937), in this regard, observed that the consumer behavior of a relatively wealthy nation, in particular the increased proportion of income spent on services, generates greater economic growth in the short run, but would lead to unemployment in the long run in the absence of sustained population growth.

IV. Demographic Sources of the Great Recession, 2008–2012

Having established a framework to better understand the relationship between the demographic dividend and economic growth, the current section will briefly examine the demographic impulses and propagation mechanisms of the Great Recession of 2008. While the causes of the 2008 global recession may be numerous and complex, this analysis will focus primarily on

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3 These age-related aspects of the Great Depression were captured at the time by yet another leading economist of the day, James Meade. Although they were observing the fallout of demographic decline from the perspective of the UK, Meade and Howson (1988), nevertheless, accurately pointed out that in almost every industry prior to the 1920s, the number of new labor market entrants was rising and that this made the economy more flexible and dynamic. Contrasted with the situation of the late 1930s in which the working population of the country had stabilized and was soon actually to decline, this implied that that the economic system would be much more rigid.
those factors related to demographics, in particular changes in age structure.

1. Demography, Financial Crime and the Bernie Madoff Effect

There is a widely held perception that white-collar crime and unethical behavior in the financial sector (and within other industries as well) contributed to the recession of 2008. In The Honest Truth about Dishonesty, behavioral economist Dan Ariely (2012) examines various conditions that might increase the probability of unethical behavior. In one chapter he discusses the so-called “Madoff experiment” in which participants who observed their peers cheating on a test without reprisal were twice as likely to cheat as compared to the control condition. Ariely suggests that similar behavioral phenomena may have propelled the US financial crisis.

There is a subtle but important connection between these kinds of unethical behaviors and demography. It starts with the observation that those responsible for much of the fraudulent and unethical behavior were in positions of power and influence inside the financial establishment; hence, they would have been in their 50s and early 60s at the onset of the financial crisis, exactly the post-Second World War baby boom cohort born between 1946 and 1960. In their younger days, the same baby boom cohort created a substantial increase in the population aged 15–29 years and in so doing also provided a sizeable violent crime wave that peaked in the late 1980s (Farrington, 1986; Levitt, 2004). Since the last of the baby-boom cohort exited its 20s in the early 1990s, violent crime has fallen yearly on a national basis in almost every country that experienced a similar post-war baby boom.

Age-related crime profiles highlight crime activity through the lifecycle. Figure 5 plots the age–crime profiles for the UK in the late 1980s. Property crimes decrease with age, whereas fraudulent and gambling crimes increase with age and are most likely to be committed by individuals in their 30s and 40s. One way of interpreting these numbers is to assume that if there was a large cohort of young criminals in the 1980s engaging in one kind of crime

![Figure 5. Age–crime Profiles for Burglary, Fraud, and Gambling](source: Steffensmeier (1989))
(burglary), this may have created a breeding ground for fraudulent crimes to become ubiquitous some 20 years later. It is not necessary, of course, for the same individuals who committed the crimes in their youth to then commit white collar crimes in adulthood, although, as Farrington (1986) demonstrates, this is not implausible. The results of Ariely’s (2012) experiments suggest that important peer effects influence unethical behavior, implying that the large number of finance executives entering their peak years for fraudulent crime extended their (minority) behavior to the banking–finance culture of the time and, thus, made those younger and more susceptible to influence prone to unethical behavior as well (the many email exchanges referring to investment bank clients as “Muppets” speaks to this effect).  

2. “Silent” Effects of Demographic Dividends on Irrational Exuberance

Economic actors rarely identify the source of economic growth as residing in something as mundane as population growth. This is why a second demographic impulse for the Great Recession may be found in the misattributed economic optimism shared by economic actors prior to 2008. The reasons for this misattributed optimism are complex but, ultimately, are linked to the “short-term” nature of political and business decision-making and the long-run nature of demographic effects. As economist and demographer David Foot (2009, p. 34) suggests, “Changing demographics occur very slowly, and we’ve moved increasingly towards short term incentives in the political and economic system.” Similarly, Keynes (1937) captures the human tendency to want to see the future as an unchanging continuation of the past. He also demonstrates that, particularly in times of economic prosperity, there exists the desire to believe that the status quo will be indefinite. History viewed over longer periods teaches us otherwise, yet this was the mentality that prevailed prior to the Great Depression and was, once again, the ethos that drove the behavior of leading economic actors in the run up to the Great Recession of 2008.

There is, in fact, a strong parallel between Keynes’ observations of what happened in the 1930s and the so-called “Loadstar” US economy of the 1990s and 2000s (Freeman, 2000). Keynes (1937, p. 10) very presciently writes of how business expectations, being based much more on present than on prospective demand, respond (unknowingly) with optimism to a period of increasing population, because demand “will in general tend to exceed, rather than fall short of, what was hoped for.” However, in an era of declining population, “demand tends to be below what was expected … [and] a pessimistic atmosphere may ensue.” Despite

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4 This aspect of culturally-accepted unethical and fraudulent behavior was confirmed in Greg Smith’s 2012 expose Why I Left Goldman Sachs: A Wall Street Story.

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steady declines in the US population following the post-war baby boom, over the past two
decades Americans remained confident that economic prosperity would remain uninterrupted
and, in so doing, ignored important contemporary demographic realities.

It is as if Keynes was peering into the future when the USA, in the lead-up to the dot.com
bubble, came to be referred to as the “Goldilocks economy.” In an analogy borrowed from
the famous children’s fairytale, it was suggested that the USA had become an economy
able to achieve uninterrupted growth while maintaining low inflation, unemployment and
low interest rates, by creating a (regulatory light) climate for investment that was “just
right” (i.e. not too heavy nor too lax). Many believed, for various reasons owing to
information technology and low-cost Chinese imports, that conditions of low inflation, low
unemployment and high growth would continue in perpetuity.

The Great Recession, however, revealed the glaring errors in these economic
forecasts. Offering a criticism of modern macroeconomics, Stiglitz (2011) cites how the
failure to foresee or even allow for the possibilities of “bubbles” should be viewed as
an important propagation mechanism for the events that followed 2008. The various
bubbles that formed throughout the late 1980s and through to the 1990s and beyond
(e.g. dot.com, housing, commodities and gold) clearly provided propagation mechanisms
that served to deepen the eventual recession. What is being argued here is that changes
to demographic age structure, primarily of the working age population over this time
period, was a primary (albeit silent) determinant propagating the bubble mentality.
Consider that by the late 2000s most persons participating in financial markets and
making housing investments had no direct connection to the Great Depression. They
were the boomers born during the post-Second World War period and were now in
their prime working age, when earning, savings and spending are all typically maximized
(as seen in Figure 6).

Figure 6. US Earning and Spending Profiles by Age, 2005

![Figure 6. US Earning and Spending Profiles by Age, 2005](source: National Transfer Accounts (2003) www.ntaccounts.org.)
3. Demographic Dividend, Life-cycle Behavior and Financial Markets

With interest rates at record lows, investors in the 2000s were looking for alternate investment opportunities to achieve high returns. An excessive supply of loanable funds created pressure on financial institutions to find ways of delivering high returns. Fuelled by an over-exuberance rooted in the success of new investment possibilities (e.g. Internet, mobile telephony and information technology) and based on the life cycle model of consumer behavior noted earlier, one would expect that the bursting of this kind of “bubble economy” was inevitable.

Individuals borrow when they are young, save by pouring money into pensions when they have reached maximum earnings during prime age, and then draw on their accumulated savings to support their retirement (see Figure 7, dotted line). Given the aging of the US population, the bubbles of the 1980s and 1990s were fed by the massive increases in prime age workers and were destined to burst as those individuals were, by the late 2000s, entering into the near-retirement phase of life. Workers at the tail-end of their careers no longer invest with the same intensity (or appetite for risk) and, instead, begin to shift to safer financial investments and also begin to draw on previous investments to support retirement (Figure 7, solid line).

Geanakoplos et al. (2004) study the relationship between these demographic regularities and the stock market in a cyclical model that includes baby booms and busts, such as what

Figure 7. US Pension Spending and Interest/Dividend Income by Age, 2011

![Graph showing pension spending and interest/dividend income by age, 2011.](source)


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5 Itself a function of massive capital flows entering financial markets from large boomer-fuelled pension funds and China entering its own one-child policy-induced prime-age saving peak.

6 It is interesting that it was the triple-A rated mortgage backed securities that were bought up in droves by older boomers in the mid-to-late 2000s and that proved to be highly risky, but were sold as "safe" investment vehicles with high returns to otherwise savvy older investors and their pension funds.

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occurred throughout the last century in the USA. Examining stock price to equity ratios over a period of nearly 120 years, the authors found that the equity premium lowered when the cohort of prime age persons (those most likely to save) was a smaller portion of the overall population. In addition, without an increasing number of births to replenish the “stock” of prime age workers, this phenomenon was found to worsen during the initial fallout from a baby boom (such as occurred in the USA when young people flooded into schools and later into the labor market through the late 1950s into the early 1980s). There is then a 20-year window when equities and other assets (such as housing) ramp up as the large baby-boom cohort enters into its peak earnings and savings age range (30 to 55 years). There is finally another fall in equities in an aging population when those baby-boomers start to move past their prime age and plan for their retirement.

According to Geanakoplos et al. (2004) not only did the historical record predict that the slowing down (and eventual shrinking) of the prime age workforce would burst the housing and stock market “bubble economy,” it also resulted in a shrinking of the labor supply as individuals preparing for retirement entered the period of their life when they began to withdraw from the workforce. This is the sting at the tail end of all demographic dividends.

V. Implications for China

The pattern of population aging witnessed over the past half century in countries such as Japan (i.e. boom, bust and echo followed by a prolonged period of low fertility) is now common across most OECD nations. It is for this reason that the relationship between demographics and economic growth discussed in this paper provides a useful framework for envisaging future growth trajectories in countries that are at different stages of demographic transition. China is at a different stage of economic development and would normally not be included in the same group as the OECD countries; however, China has experienced marked economic growth over the past three decades and, also, crucially, enacted policies (i.e. the one child program) that sped up what would otherwise have been a slower demographic transition. China, demographically and economically speaking, has vaulted into the same club as older aged Europe and the more slowly maturing USA.

In terms of its economic success, the movement from a planned economy is often cited as the key factor (impulse) behind China’s economic performance (e.g. Modigliani and Cao, 2004). However, another important reason for China’s accelerated long-run growth lies in the size of the working age population and its composition over the past 30 years. Kick-started by its one-child policy that between 1980 and 2000 lowered the share of young people in the population, China’s share of working age persons rose by 13.3 percentage points. Contrast this with India, which in 1980 was similar to China in most aggregate measures but whose working population
Looking more closely at the numbers, we see in Figure 8 that the crude birth and death rates for China since 1990 show the sharp pronounced decline in births that actually began in the 1980s. In Figure 9 we show what implications this had (and is projected to have) on the age structure of the country. From 1990 to 2010, China has benefited from the double demographic dividend brought about by the fast and dramatic decline in births; that is, the increase in both the share of the working age population (aged 15–64 years) and the prime age workforce (the share aged 30–54 years). However, this period of the double demographic dividend is ending and will be followed by a steep decline in both demographic age groups, starting in 2015 for the working age share and followed by the prime age share in 2020.

Since changes in the size and structure of the labor supply have profound first and
second-order effects on output, the increase in the size of the labor force as well as the larger share of prime age workers means that the growth of the Chinese economy over the past two and half decades has been directly related to the demographic dividend. One channel by which this demographic dividend contributed to China’s economic growth is savings. Modigliani and Cao (2004) apply the life cycle hypothesis to the high savings rates in China and show that a rapid decrease in young workers relative to prime age workers spurred a drastic increase in personal capital accumulation in the 1990s. This clearly served China well in its early stage of market reforms and economic development, predicated as it was on large capital investments and export-led growth.

Moving into the future, however, the concern is that growth based primarily on high savings and exports is not sustainable (Deer and Song, 2012). As prime age workers move past their peak savings and earnings years and begin exiting the labor force, and without sufficient population growth to support the formation of new and continually maturing workers, savings rates will decline and output will decrease or stagnate. This phenomenon was observed in most parts of the world prior to the Great Depression, in Japan in the 1990s, and in the USA and other developed economics in the period leading up to the Great Recession. It is doubtful that any country, even China with its vast size, will escape the same pressures.

Financial market watchers are now noting these demographic trends and communicating them to their clients (Kapur et al., 2012). Their forecasts paint a gloomy picture for future economic growth in China. If all market participants start believing in these assessments then expectations may well snowball and accentuate the “real” negative economic fallout from a reversal of the demographic dividend. Fortunately, however, population aging is predicable, measurable and subject to a degree of policy intervention (i.e. the removal of the one-child policy, improved health care for an aging workforce and increased immigration). Again, Keynes (1937) has some important lessons for a country like China about to enter a stationary period of population growth. He counters the Malthusian concerns over overpopulation with a potentially even greater villain, unemployment. Specifically, Keynes warns of the potentially devastating effects of long-term unemployment endemic to stationary economies that lack sufficient population growth to sustain aggregate economic growth.

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7 This resulted from a dramatic baby bust following the imposition of the one-child policy. High savings were also a function of a related socio-cultural shift whereby fewer older individuals were relying on familial support throughout retirement (Modigliani and Cao, 2004).

8 A 2012 Deutsche Bank report states: “The rolling peaks in the working-age population ratio over the past few decades creates havoc as it passes through key economics–Japan first in 1990, then USA and Western (and Eastern) Europe in mid-2005, and possibly China in the coming few years. When coupled with deleveraging, labour immobility and fractured bank balance sheets that accompany the loss in property values, the impact on growth and employment was devastating.” (Kapur et al., 2012).
demand. Similar to the example of Japan in the 1990s and 2000s, collapsed effective demand and high unemployment are of particular concern.

Keynes, however, offers a solution and suggests that the worst effects brought about by demographic decline can be avoided with progressive policies and gradual (as opposed to short-term, irrational) adjustments in expectations. In particular, he states (1937, p. 15) that if there emerges “a gradual evolution in our attitude towards accumulation, so that it shall be appropriate to the circumstances of a stationary or declining population, we shall be able, perhaps, to get the best of both worlds,” by which he means full employment of economic resources and a proper reordering of societal priorities away from capital accumulation towards other social goals.9

China, therefore, has a once-in-a-generation opportunity. China can take advantage of the lessons of the past in a way that nations at a similar stage of economic and demographic development have not. Without a centralized state apparatus that can set the course for development many decades ahead, countries elsewhere are (and have always been) at the mercy of short-run and blinkered thinking. China, in contrast, can lay the foundations for long-run adjustments of the kind recommended by Keynes (i.e. equalizing incomes and recalibrating economic growth expectations of what “fast growth” means in an aging society) and communicate them to economic actors in anticipation of the worst effects. Much like a well-known and slow-moving typhoon approaching shore, nations have the capacity to move people and resources to where they are less at risk; in this case preparing, as well as shielding, society from the conditions that follow from the ending of a demographic dividend.

So what can (or should) China do? The first major short-run change should be “psychological,” much as Keynes warned his contemporaries in the late 1930s: stop obsessing over high rates of economic growth when your national capacity for such gains is severely hampered due to demographic shifts.

The major medium-term policy implication emerging from the relationship between demographics and output decline witnessed in Japan and the USA suggests an abandonment

9 The full quote merits citing here (Keynes, 1937, p. 15): “Yet there will be many social and political forces to oppose the necessary change. It is probable that we cannot make the changes wisely unless we make them gradually. We must foresee what is before us and move to meet it half-way. If capitalist society rejects a more equal distribution of incomes and the forces of banking and finance succeed then a chronic tendency towards the under-employment of resources must in the end sap and destroy that form of society. However, if, on the other hand [there emerges] a gradual evolution in our attitude towards accumulation, so that it shall be appropriate to the circumstances of a stationary or declining population, we shall be able, perhaps, to get the best of both worlds – to maintain the liberties and independence of our present system, whilst its more signal faults gradually suffer euthanasia as the diminishing importance of capital accumulation and the rewards attaching to it fall into their proper position in the social scheme.”

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of any policy that directly limits, or indirectly reduces, birth rates as such measures would negatively affect economic growth in the long run. Allowing for more natural demographic transitions, with women educated and relief provided to working families in need of childcare options, would be helpful in this regard.

In the longer term, investments in technologies that allow for a more productive workforce as well as policy measures aimed at improving overall health to extend the working lives of the prime age period may prove beneficial (Kapur et al., 2012). In the very long term, and applying similar but more subtle policy intervention, shifting economic investments away from areas that favor younger market participants (e.g. the building of subsidized sports stadiums) to those that favor the old (leisure centers with universally-designed access and amenities) would help to raise productivity by tailoring supply and consumption to the composition of the population.

One area of expenditure that may well yield positive externalities and economic multipliers in an aging society is urban renewal and the creation of healthy cities. Increased spending on urban amenities and public health care and other services related to human wellness would serve to stimulate the economy in two ways: directly through the injection of capital into the economy by creating new employment opportunities and increased aggregate demand; and indirectly, by contributing to the health and mobility of an increasingly older population, enabling individuals to maximize their time in the labor market and to minimize dependency on family members and other social services.

VI. Conclusions

This paper has established a framework for understanding the important way in which a demographic dividend contributes to economic growth. With an increase in the size of a country’s labor supply as well as a growing number of prime age workers, output increases both directly and indirectly. The relationship between age structure and economic growth is arguably underappreciated; however, the examples presented in this paper clearly demonstrate how significant periods of economic prosperity and recession are inextricably linked to changes in population growth.

These findings are in contrast to the Malthusian ethos that prescribes limiting population growth as a necessary condition for economic prosperity; and, although it is still a generally held belief in development circles (and not all together wrong for countries starting at low levels of income and with high fertility rates), it can be seen as short-sighted and theoretically unwarranted in high income countries (e.g. Keynes, 1937). The Malthusian belief is also not sensitive to the important links between economic activity and population age structure witnessed over the past century in OECD countries (e.g. Macunovich, 2009). Mature
populations, where a larger proportion of the workforce is in their prime age (roughly 30–54 years), have contributed to unprecedented growth in many nations. However, as baby booms have transitioned into long-run baby busts (with fertility rates often well below replacement levels), it appears that the demographic dividend has paid out. Without renewed population growth contributing to the labor supply, countries cannot realistically expect sustained output gains of the kind witnessed in the post-war period.

An understanding of the relationship between demographics and economic growth is of particular importance to China as it is on the cusp of a significant transition in the age structure of its population. Because China is in the fortunate position of still enjoying unprecedented economic success, it has the opportunity to be forward-looking and act in anticipation of the end of the demographic dividend. Adjusting agent expectations regarding future economic growth patterns to more accurately reflect demographic realities, as well as allowing for the emergence of more natural patterns in fertility rates will help China mitigate the dramatic economic decline that typically follows a population bust. Furthermore, investments that seek to improve health and shift consumption patterns to accommodate an older population will bolster aggregate demand and extend the working life, and, thereby, lengthen the period considered to be prime age.

Seizing upon market opportunities brought about by the large-scale aging of the population and, likewise, adjusting growth prospects for an era of low fertility could be the basis for an adjustment to the reversal of the demographic dividend. The reversal of the demographic dividend occurred in Japan in the 1990s, is occurring in Europe and America now and will be occurring in China over the next decade. Those countries that ignore the demographic lessons of the past are destined to repeat the policy disasters of the present.

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