Demography of political economy : the baby-boom generation.

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(Working Paper)

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1. ABSTRACT.

This working paper attributes a (potential) path of per-capita US output to demographic effects of the post-war baby boom. To the extent that the baby-boom generation predominates among age cohorts in the US population, a life-cycle model suggests a secular trend in per-capita GDP that is largely congruent with realized (and realizing) potential economic growth.

2. KEY WORDS: Demography, US, 1945-2046; economic growth; neoclassical growth model; population dynamics

3. JEL CODES: J110, O410

"... the credit of success is claimed by all,

while a disaster is attributed to one alone."

- *Agricola*, Tacitus

1. INTRODUCTION.

A large increase in births is noticeable for the post-war years in the US. Beginning in 1946, it lasts through the first half of the 1960s.[1] It is evident in the number of live births recorded, the birth rate, and the fertility rate. This short-term spike in births affects both US demography, significantly, and models of economic growth, importantly, through the distribution of age cohorts. Following from standard neoclassical models of economic growth, there are clear and recognizable economic effects, based solely on how the distribution of age cohorts in the US changes as the baby-boom generation is born, ages, and expires. This working paper's analysis identifies, rather than quantifies, these effects, and yet produces insights into economic development over the life -time and -cycle of the baby-boom generation.

The structure of this working paper follows: this introduction followed by a highly schematic representation of the baby-boom generation's life cycle and its potential to affect economic development, further analysis of the economic consequences following from the schematic representation, conclusions from this working paper's analysis, all tables and figures cited, a list of references, and a list of the data sources.

2. SCHEMATIC REPRESENTATION.

A large, temporary spike in births generates a cohort, or cohorts, that predominate(s) over other age cohorts demographically. As the cohort(s) age(s) and expire(s), the population's distribution by age

1 See Vital Statistics of the United States.

changes. From many theories of economic growth, this has implications for the path of economic development. Table 1 lists demographic projections for the baby-boom generation.[2] The peaks of the baby-boom generation's working-age population ratio and the number of its years of working experience employed are in years 2006-7.[3] To the extent that the baby-boom generation predominates demographically among the overall population, these projections will affect a model for economic growth, producing corresponding local extrema in (potential) economic growth.

Equation (1) is a simple model for per-capita economic growth:

$$(1) \qquad \frac{Y}{N} = A * H * \left(\frac{K^{\alpha}}{N} * \frac{L^{(1-\alpha)}}{N} \right),$$

where per-capita output “Y/N” is a function of some exogenous technology “A”, an index of human capital “H” of labor employed in production, the per-capita capital employed in production “K/N”, and per-capita employment “L/N”.[4] This function represents a per-capita neoclassical growth model, with a production function type Cobb-Douglas. This model is purposefully simple to limit analysis to the implications from the baby-boom generation's demography. This working paper's analysis will refrain from quantifying the parameters of economic growth, seeking rather to identify approximate periods when parameters are likely to yield changes to economic growth.

Using a simple three-period life cycle characterized by economic inactivity (development and education) in period 1, economic activity (work life) in period 2, and economic inactivity (retirement) in period 3, there are clear implications for a generation's net effect in a path of per-capita output. The first period is interpreted best as a drag on per-capita output, as during this period cohorts are being sheltered, fed, and educated, but these cohorts are not economically active. The second period is interpreted best as a boon to economic development, as cohorts become increasingly both active and

2 The baby boom is defined as cohorts born in years 1946-65 herein.
3 Assignment of ages 20-61 as working herein.
4 This simple model of output represents a model for economic growth when analyzed as a time series.

productive in economic terms. Period 3 represents increasing economic inactivity, and is best interpreted as a drag on economic activity, yet smaller in proportion to the drag in period 1, if one assumes overall population growth in line with the US population.

Inserting this basic information about the baby-boom generation into equation (1), and assuming that the baby-boom generation is a one-time, temporary spike to births, generates a highly schematic projection for economic development shown in Figure 1. Figure 1 shows general times corresponding to life-cycle periods of a generation on the horizontal axis, and the economic effects that result, given both demographic projections in Table 1 and the relative proportion of the baby-boom generation to the overall US population size. The life-cycle period 1 described above is bounded by the times 0 and 1 shown in Figure 1, life-cycle period 2 is bounded by times 1 and 2, and life-cycle period 3 is bounded by times 2 and 3.[5]

The exact timing for each life-cycle period with respect to a cohort, or group of cohorts, is determined only ex-post, from surveys and reports of live births, labor-force participation rates, and morbidity. No attempt is made in this working paper to determine for the baby-boom generation the exact timings corresponding to its life-cycle periods 2 and 3 outlined above; rather, ranges are proposed based on simple demographic projections.[6] It is noteworthy simply to recognize that these periods occur, and to provide ranges for plausible timing of the economic consequences.

3. ANALYSIS.

This section is further divided into 3 sub-sections: labor-related parameters of a simple economic growth model, the remaining capital-related parameters of a simple growth model, and political economy. Analysis follows with respect to the demographic effects of the baby boom for the first two sub-section's topics, with further analysis identifying potential impact on wider political economy in the

5 The period bounded by times 3 and 4 in Figure 1 corresponds to the expiration of the baby-boom generation.
6 Reports and estimates of live births, birth rates, and fertility rates are used.

last sub-section.

(A) Labor-related parameters of a simple economic growth model.

A one-time, temporary increase to the birth rate will affect the employment-population ratio for an economy (i.e., “L/N”) through changes to the population's proportion that is of working age. Given development consistent with a simple economic growth model in equation (1), these effects on per-capita economic growth will be monotonic with respect to the employment-population ratio. Rather than arbitrarily fit a labor parameter for the Cobb-Douglas production function and simulate results, this analysis offers ranges for baby-boom induced local minima and maxima with respect to the employment-population ratio. This has an advantage of providing simple insights about broad trends of economic development, without those insights requiring a complicated and arbitrary parametrization of a model. The only assumption for these conclusions is monotonicity of per-capita GDP with respect to the employment-population ratio. This assumption should be largely uncontroversial.

The three life-cycle phases outlined above are two economically inactive periods interspersed by one active period. Given both the simple function in equation (1) above and the baby boom, this will cause first a reduction in per-capita output relative to a steady state of growth associated with the period preceding the baby boom, next a period of above-trend growth with respect to a steady state, then a period of below-trend growth that slowly returns to a steady state. Figure 1 schematically depicts this.

Figure 2 depicts a mechanism whereby the bulk of this effect in per-capita GDP is generated. As the share of the total population consisting of cohorts of the baby boom grows, so does its potential to determine per-capita GDP. Given the very general life cycle outlined above, and simply bounding work years by the ages of 20 and 61, Figure 2 depicts with a solid line a possible path for the overall US employment-population ratio. Given increasing longevity observed since 1945, the baby boom of the early post-war years serves to offset a decline in the proportion of the population that is of working age

between years 1976 and 2003.[7] Assuming that the population maintains a steady-state growth rate with constant longevity from 2006, the employment-population ratio stabilizes after 2046 with the expiration of the baby-boom generation.[8]

One additional effect of this demographic development is to make labor less scarce during the years when the baby-boom generation is working.[9] This should depress real wages for the period of relative labor abundance.

The path of the employment-population ratio depicted in Figure 2 is one reason for the schematic representation of per-capita GDP depicted in Figure 1. Another is the accumulation of human capital by the baby-boom generation, and its relative size with respect to the total US working population. As this generation gains work experience, it can be assumed that its human capital increases. The simple function in equation (1) solves for greater economic growth with more human capital. Figure 3 depicts several possible paths of the baby-boom generation's human capital. It is scaled as a percent of the maximum experience in years gained for each assumption depicted. The three assumptions depicted are: one, where experience accumulates in years to retirement at age 62; another, where experience is capped for each cohort when it reaches 45 years of age; and another, where human capital is capped at 35 years of age. The range of years when the baby-boom generation's human capital is at its maximum, based on these three assumptions, is the years 2000-7. To the extent that the baby-boom generation predominates among the working-age population, and these assumptions capture human capital amongst this generation, there will be a corresponding effect in economic growth.[10]

(B) Capital-related parameters of a simple economic growth model.

Assuming a fixed relationship between capital and labor based on some exogenous technology,

7 Assignment of ages 20-61 as working herein.
8 Immigration is ignored explicitly.
9 See Yoo (1994).
10 Assumption is monotonicity of per-capita GDP with respect to human capital of labor employed.

there will be a corresponding effect in demand for investment as the demographic changes in (A) above occur. As more cohorts of the baby-boom generation come “on line” into the work force, investment is required to maintain a capital-labor ratio commensurate with an exogenous technology. This increase in demand for investment should stimulate growth in GDP during years when the baby-boom generation enters the work force. It is brought about by relative capital scarcity, leading to a higher return to capital, during these years. This is a further explanation for the path of economic growth depicted schematically in Figure 1, where in the second life cycle of the baby-boom generation, depicted between times 1 and 2, per-capita GDP increases.

As the baby-boom generation reaches retirement, demand for investment should fall. This is because less capital is needed to be replaced, assuming an exogenous technology with a fixed relationship between capital and labor. This is another explanation for declining per-capita GDP depicted schematically in Figure 1, between times 2 and 3.

(C) Political economy.

The demographic simulation of the baby-boom generation, and the path of per-capita GDP represented schematically in Figure 1, have wider ramifications. The path of per-capita GDP is inversely related to a tax burden required to fund any given set of government programs. To the extent that the baby-boom generation requires government-supplied infrastructure and education during its formative, non-earning years, the burden of taxation on a predecessor generation(s) in the work force is increased. Additionally, assuming that demand for government-supplied social benefits are an increasing function of the non-working-age population, an increase in demand for these benefits further burdens the predecessor generation(s) with taxes to fund social programs.

As the baby-boom generation comes “on line” and per-capita GDP rises, per-capita tax burden needed to fund an established set of government programs decreases. Further, since the proportion of

the population that is not working age falls during the baby-boom generation's work years, the corresponding demand for government-supplied social benefits falls, further reducing the tax burden necessary to fund government social programs. This trend reverses as the baby-boom generation enters retirement and the proportion of the working-age population falls. Overall, a largely inverse relationship with respect to the schematic representation of economic growth during the baby-boom generation's lifetime, depicted in Figure 1, is plausible for a per-capita tax burden necessary to fund any given set of government programs.

4. CONCLUSIONS.

This section is divided into 4 sub-sections: explanations, predictions, areas for further study, and a summary. The time-frames given are meant only as approximations based on the very simple assumptions made above.

(A) Explanations.

1. There is a drag on per-capita GDP between the years 1946 and 1975 because the baby-boom generation is not (largely) working.
2. As the baby-boom generation comes “on line” into the work force, there is an increase in per-capita GDP due strictly to an increase in labor supply. Real wages are depressed as labor becomes increasingly abundant.
3. Capital is increasingly scarce as the baby-boom generation comes “on line”, given an exogenous technology, spurring growth of capital through higher return to capital.
4. Based on the US demographic simulation, the employment-population ratio plateaus between 1985 and 2003. Further, from the three scenarios depicted in Figure 3, and to the extent that the baby-boom generation predominates among the work force, there is a

local maximum for human capital sometime between 2000 and 2007. The coincidence of these two maxima is sometime between the years 2000-3. Given the simple economic growth model in equation (1), there should be a demographically-produced peak in per-capita growth between these years.

5. The tax burden required to fund a given set of government programs is artificially low during the years when the baby-boom generation is in the work force. This allows for large reductions to taxes during the 1980s, and it explains the good fiscal position of government in the late 1990s.
6. To the extent that leaders in an organization are successful when taking credit for any success realized, there is pressure to take credit for these secular, demographic effects in per-capita GDP during the mid-to-late 1980s, and throughout the 1990s. Therefore, there is little motivation to attribute greater per-capita GDP growth to secular, demographic trends.
7. Little support for immigration between 1985 and 2006 because labor is relatively abundant.

(B) Predictions.

1. Downward pressure on per-capita GDP as the baby-boom generation retires from the work force.
2. Upward pressure on real wages as labor becomes relatively scarce when the baby-boom generation retires from the work force.
3. Downward pressure on capital investment and return to capital, given and exogenous technology, as capital becomes relatively more abundant with the retirement of the baby-boom generation.

4. Increased tax burden to fund, and increased demand for, a given set of government programs, as the proportion of the working-age population falls due to baby-boom retirement.
5. For organizational reasons, acceptance of a demographic explanation is more likely if the drag on per-capita GDP is large as the baby-boom generation retires. A secular reason of demographics to explain lower economic growth is useful to leaders who wish to minimize responsibility.
6. Growing support for immigration, to the extent that immigrants are relatively young and of working age, in order to increase the employment-population ratio. Competition, both intra- and international, for these immigrants will intensify among economies with aging populations. Polities that are unsuccessful in this competition may seek to restrict relocation by their respective working-age populations.

(C) Areas for further study.

Sophisticated estimates of US demography can pinpoint more precisely the local extrema in the employment-population ratio resulting from the baby boom. The demographic simulation analyzed herein is meant to provide only rough approximations of these years. Further, estimates of the baby boom's net economic effect in per-capita GDP could be obtained by parameterizing a model for economic growth. This working paper's analysis refrains specifically from this activity, simply because complex parameters can be chosen to demonstrate almost any effect.

(D) Summary.

The demographics of the post-war baby boom can explain much about economic development in the US from 1946-2046. The baby-boom generation acts first as a drag to per-capita GDP through

1975, then increasingly spurs economic growth sometime into the 2000s. Both the employment-population ratio and the baby-boom generation's human capital employed peek in the 2000s. The baby boom then acts as an economic drag from 2006-7, until the generation expires or is no longer demographically significant. The overall trend of US economic development is not incongruent with this demographic explanation.

Depending how economic agents respond when the baby-boom generation enters and leaves the work force, additional analysis can be supported. For example, to the extent these demographic forces are significant and economic/political agents do not explicitly recognize them, decisions about investment and economic policy are based on incorrect assumptions. If demography can explain to a large degree the economic good times of the 1980s and 1990s, actions taken based on incorrect assumptions such as “Laffer” curves or a “new” economy will deliver unanticipated results. These unanticipated results require later corrections. Similarly, if economic growth is depressed for a time as the baby-boom generation retires, decisions based on incorrect assumptions about why economic growth slows will also deliver unanticipated results.

Organizational leaders may increasingly rely on demography as an explanation for economic development if the drag on per-capita GDP is large as the baby-boom generation retires from the workforce. Whereas success has many fathers, failure is an orphan.[11] Explaining reduced economic growth by way of a secular, demographic trend, could prove useful to organizational leaders who seek to deflect accusations of inefficiency.

Ideological positions may be supported by these demographic trends as the baby-boom generation retires, whereas demographic arguments were scarce during the period of secular reduction to the tax burden beginning in the 1980s. To the extent that this demographic trend explains reduced tax burden to fund a given set of government programs during the baby-boom generation's working years, it was largely ignored it. Required adjustments to a smaller employment-population ratio consistent with

11 A proverb.

longer life spans were postponed, therefore, by the baby-boom generation's demographic effects.

5. TABLES AND FIGURES.

(A) TABLE 1.

TABLE 1: Demographics of Baby-Boom Cohorts*

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040
Max. Age	4	14	24	34	44	54	64	74	**80**	**80**
Avg. Age	2	7	14	24	34	44	54	64	**72**	**78**
Min. Age	0	0	5	15	25	35	45	55	65	75
Employment Ratio** (% of N_{Boom})	0	0	22	73	100	100	83	32	0	0
Experience-years** (% of Max.)	0	0	1	16	45	77	92	46	0	0

* Baby boom defined as observed spike in live births from years 1946 to 1965. Each cohort is assumed to exhibit no morbidity until death at 80 years of age.

** Assumptions that economic activity begins at 20 years of age and retirement occurs at 62. Maximum employment-population ratios of baby-boom generation occur in years 1985-2006; maximum of experience-years occurs in 2007.

(B) FIGURES 1-3.

FIGURE 1: Baby-boom Effect on per-capita GDP
(Schematic Representation)

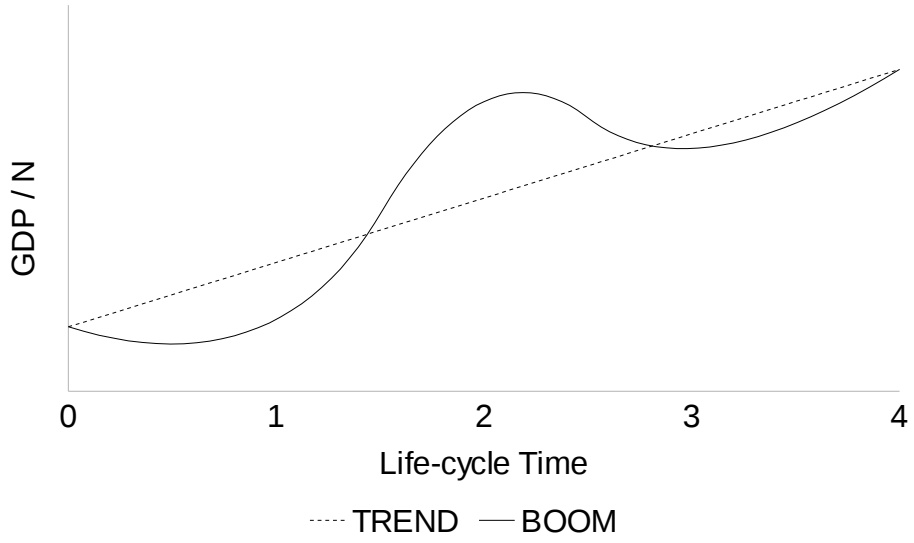


FIGURE 2: Baby-boom Demographic Simulation
(1945-2046)

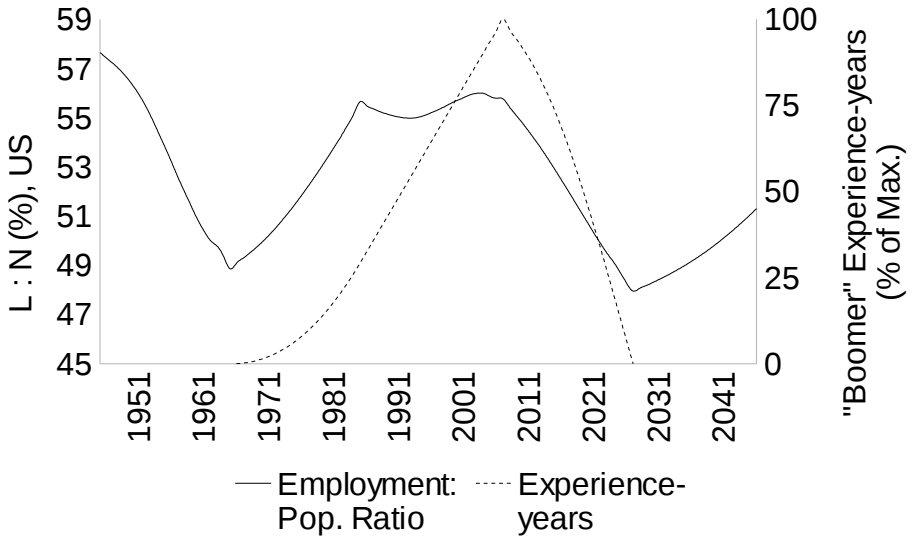
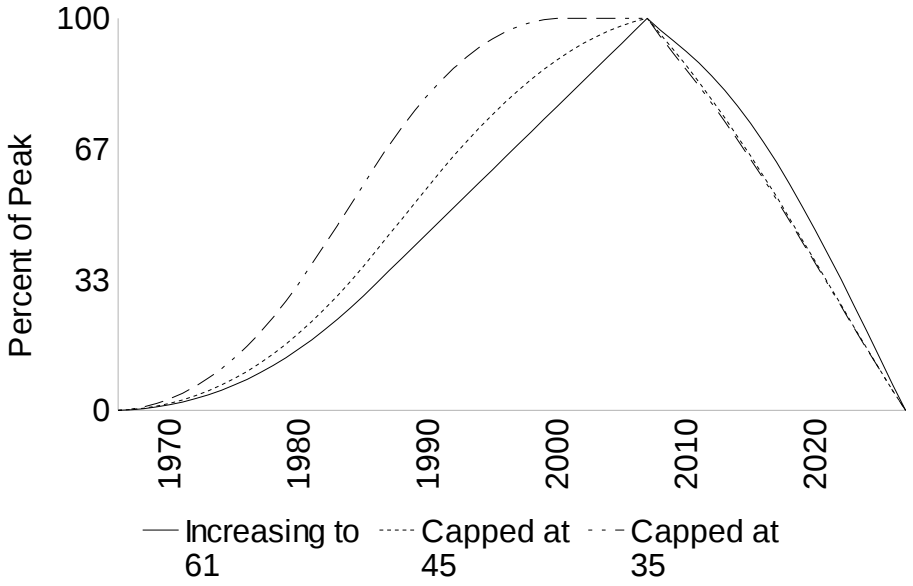


FIGURE 3: Baby-"boomer" Human Capital Employed



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