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Baby busts and baby booms: The fertility response to shocks in dynastic models ☆

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ABSTRACT

While there has been a substantial effort to understand the Demographic Transition alongside the transition to sustained economic growth, fertility fluctuations have not been analyzed in the business cycle literature. This paper builds a model of fertility choice with dynastic altruism, age-structured population and aggregate productivity shocks. We show that, under reasonable parameter values, fertility is pro-cyclical and that, following a shock, fertility continues to cycle. Applied to the U.S. experience in the 20th century, the Great Depression generates a baby bust of 58% of that seen in the U.S. in the 1930s, followed by a Baby Boom of 77% of that seen in the U.S. in the 1950s. As observed in U.S. estate data, the model predicts that small cohorts receive relatively large per child transfers from parents. Finally, statistical analysis across countries in the 1930s and 1950s further supports our theory.

1. Introduction

While economists have developed models of business cycles to understand fluctuations in macroeconomic variables at least since the seminal papers by Brock and Mirman (1972) and Kydland and Prescott (1982), the analysis of fertility fluctuations has been omitted from this research agenda. Similar to the attempt at understanding the Demographic Transition alongside the transition to sustained economic growth (for seminal papers, see Becker and Barro, 1988 and Barro and Becker, 1989), understanding fertility fluctuations alongside business cycles is important for similar reasons (see e.g., Lucas, 2002). This paper therefore combines business cycle theory with the theory of fertility choice. We first derive theoretical results in a simple model. We then assess the quantitative importance of the mechanisms in a more comprehensive model, applied to the particularly dramatic fertility fluctuations in the U.S. over the course of the 20th century.

The fertility fluctuations in the U.S. during the 20th century can be summarized as follows. In the first part of the century, fertility rates continued a decrease that demographers associate with the Demographic Transition. This drop started in the mid 19th century: Total Fertility Rates (TFR) fell from 5.7 to 3.0 children per woman over the period from 1850

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to 1925. In the years that followed, there was an even more abrupt drop during the years of the Great Depression from 3.0 to 2.1. Indeed, women in their prime fertility years during the Great Depression had, on average, only 2.2 children in their entire lifetime. These women, born between 1905 and 1915, had fewer children than any previous cohort. Following this, fertility rebounded significantly during the 1950s and early 1960s, the Baby Boom. At its peak, TFR reached 3.6, while Cohort Fertility (CFR) showed a similar, but smaller, increase up to 3.2. Only in the 1970s did fertility return to the levels seen in the 1930s.

To analyze this event as well as fertility fluctuations more generally, we build a model of fertility choice à la Barro–Becker with aggregate productivity shocks. In addition to the stochastic component, the model extends existing Barro–Becker type models to include multiple periods of productive life.

In a simple version of the model, we assume that labor is the only factor of production. Here, we show that fertility is procyclical provided that there is sufficient curvature in the period utility function, or that the goods costs of children are large enough, relative to time costs. In addition, the policy function for current fertility as a function of past fertility is negatively sloped around the steady state. We find that the dynamics of adjustment following a movement off a balanced growth path is one of dampened oscillations. Putting these two effects together, a large negative income shock is met with a contemporaneous reduction in fertility, followed by a Baby Boom a generation later. Thus, the Great Depression (or any other similarly large negative income shock) would trigger a baby bust, followed by a Baby Boom a generation later.

These basic mechanisms are best understood as variants of standard effects of growth models—namely, the desire to smooth consumption—and of models à la Barro–Becker, where the number and well-being of children are non-separable in the utility of the parent. To gain some intuition about the mechanism, note that in Barro–Becker type models, parents care about their own consumption stream and a composite good including the number of children and their expected lifetime utility. While fertility is chosen today, the only way to affect children's utility is through a transfer chosen in the future that affects the children's choice of consumption and fertility. Now, suppose the current shock is lower than average. Then, to equalize the marginal utility of own consumption today and expected marginal utility from the composite good, the parent decreases fertility today. In the future, the parent compensates for low fertility by giving higher transfers to each child, which increases fertility of the next generation above its steady state value. We then proceed to show that low intertemporal elasticity of substitution and more than one period of productive life are essential for our mechanism.

The simple model highlights the main mechanisms. To assess their quantitative importance, however, we add several relevant features. First, we allow for alternative investments (besides children), namely, physical and human capital. While physical capital is homogeneous, human capital is embodied in people and therefore age-specific, just like labor. Depending on parameter values, the presence of alternative investments may curb or exacerbate the fertility response to the contemporaneous shock. After a period of low fertility due to a negative shock, dampened oscillations follow for similar reasons as before. Second, since the size of transfers depends on the relative income across cohorts, we allow for exogenous productivity growth. Third, we also introduce a period of retirement to allow for reasonable life lengths and savings motives.

We use a calibrated version of this model to simulate the size of the contemporaneous and delayed response of fertility to productivity shocks. After calibrating to U.S. averages between 1991 to 2010, we find that the contemporaneous response to a 1 percent deviation in productivity is about 1.1 percent, while the elasticity one period later is -0.8. This implies that the response of (completed) fertility to a 'standard recession' (say, productivity is 5 percent below trend for 2 years) is relatively small—of the order of 0.025 children per woman with a subsequent Baby Boom of slightly smaller size.

Realistically, it seems unlikely that fertility decisions are affected by quarter to quarter fluctuations in productivity (as addressed in the business cycle literature). Rather, a prolonged boom or bust is required to prompt large fertility effects. Indeed, we find that the reduction in fertility implied by the model as a response to the 13 percent decrease in productivity during the Great Depression is 58 percent of the observed pre-WWII baby bust in Total Fertility Rates (TFR). Moreover, the subsequent endogenous fluctuations in fertility triggered by this bust, in conjunction with the productivity boom in the 1950s and 1960s, captures about 77 percent of the post-WWII Baby Boom in TFR.

One testable implication of the mechanism is that small cohorts should get larger per child transfers from their parents. Data on private intergenerational transfers for this time period are hard to come by. Though imperfect, we use estate data from Piketty and Saez (2001, 2003) and find that, as predicted by the theory, the small cohort born in the 1930s received much larger transfers per recipient than did the large cohort born in the 1950s.

Many other demographers and economists have studied the Baby Boom, but they have focused on different channels. First, some have put forth the idea that the Baby Boom was a consequence of low fertility during the Great Depression—i.e., the Baby Boom was 'catching up.' However, completed fertility (CFR) was low for both the women immediately preceding and immediately following the Baby Boom and hence, this cannot be true at the level of the individual mother. It can, in principle, hold across cohorts in a dynastic model. This distinction is relevant in our analysis and is one of our motivations for studying a dynastic model. In a similar context, catching up at the individual level appears to be important in response to wars. For example, Vandenbroucke (2014) analyzes the effect of WWI on income and fertility in France. He finds catching up at the individual, rather than dynastic level.

Second, one of the key hypotheses put forward by economic demographers for these large and opposite swings in fertility is known as the 'Easterlin hypothesis,' see Easterlin (1961, 1968, 1978, 1987). In a nutshell, the idea behind this hypothesis is that fertility was exceptionally low during the Great Depression because of the large negative shock to incomes, emphasizing differences between expected lifetime income relative to 'material aspirations formed in childhood.' Then, due in substantial part to the fact that fertility had been so low during the 1930s, the Baby Boom occurred. The mechanism