Local Economic Conditions and Fertility from the Great Depression through the Great Recession

By Jessamyn Schaller, Price Fishback, and Kelli Marquardt*

How does the business cycle affect fertility? And how has that association changed over time? These questions have attracted the attention of economists and demographers for decades. In fact, a 2011 review article cites nearly 200 studies on the association between economic recession and birth rates in developed countries (Sobotka, Skirbekk and Philipov, 2011). The study of the association between economic conditions and fertility is important for two reasons. First, cyclical fluctuations in birth rates are themselves a subject of inherent interest to researchers and policymakers. Second, the response of birth rates to transitory changes in economic opportunities can shed light on the mechanisms driving fertility decision-making and provide insight into long run secular changes in fertility behavior.

For many years, researchers studied the association between economic conditions and fertility in the United States with national data, using time series methods to differentiate transitory fluctuations in economic conditions and demographic outcomes from secular trends (for example, Ogburn and Thomas 1922, Silver 1965, Macunovich and Easterlin 1988). More recently, following an influential area study of adult mortality by Ruhm (2000), fertility researchers have begun to use panel data methods, including local area and aggregate time effects to address unobservable confounding factors (for example, Currie and Schwandt 2014, Schaller 2016). Due to data availability constraints, panel studies have thus far focused only on recent decades.

In this study, we use newly-compiled data on county-level birth rates in the continental United States spanning eight decades to generate new estimates of the association between local economic conditions and birth rates. Our dataset—the longest US panel dataset ever used to study fertility—allows us to estimate the response of fertility to economic shocks using variation across local areas in the timing and severity of as many as thirteen aggregate US recessions that have occurred since the Great Depression. Our area-study approach controls for potentially-confounding aggregate factors such as the baby boom and advances in contraceptive technology, exploiting local deviations from aggregate time patterns for identification.

The length of our panel permits us to make two additional novel contributions to the literature on economic conditions and fertility. First, we use distributed lag models to estimate mid-run *dynamic* responses of birth rates to economic shocks—responses that are not well-identified in time series and short-panel analyses. Second, we are able to document *changes* in the responsiveness of fertility to local economic conditions over the past 80 years. We do so systematically by using the same data and estimation model and varying the sample time frame.

I. Data and Methodology

The foundation of our historical dataset is the ICPSR dataset, "U.S. County-Level Natality and Mortality Data 1915-2007," created by Bailey, Clay, Fishback, et al. (ICPSR project 33603). We begin our sam-

* Schaller: Robert Day School of Economics and Finance, Claremont McKenna College, 500 East Ninth Street, Claremont CA 91711 (e-mail: jschaller@cmc.edu); Fishback: Department of Economics, University of Arizona, 1130 East Helen Street, Tucson, AZ 85721 (e-mail: fishback@email.arizona.edu); Marquardt: Department of Economics, University of Arizona, 1130 East Helen Street, Tucson, AZ 85721 (e-mail: marquardtk@email.arizona.edu).

ple in 1937[1] and extend the data through 2016 using restricted Vital Statistics Data from the National Center for Health Statistics and population data from the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) program. To minimize bias from changes in sample selection and in key variables over time, we use a balanced panel of 2880 US counties with nonmissing data on births, population, and local economic conditions over the 80 years of our sample. As a proxy for local economic conditions, we use data on real per capita personal income from the Bureau of Economic Analysis (BEA), adjusting for inflation using the consumer price index, CPI 1967=100. State income data are available from BEA for our full sample period and county income is available after 1968.

Because long-run trends in per-capita income (upward) and birthrates (generally downward) may differ across localities, it is important that our empirical specification isolates *deviations* in those series from local long-run secular changes. Our preferred baseline estimating equation is:

$$(1)\quad d.lnbr_{a,t} = \alpha_a + \beta * d.lninc_{a,t} + \gamma_t + \epsilon_{at}$$

where $lnbr_{at}$ is the log birth rate (births per woman aged 15-44) in area (county or state) a in year t, $lninc_{at}$ is the log of real per capita income in area a in year t, and $d.$ is the first-difference operator.[2] In some specifications we include additional lags of income growth in order to better isolate the effects of plausibly-unexpected shocks to local income. α_a is an area fixed effect, which in the first-difference specification captures fixed differences across areas in the average annual growth rate of birth rates (effectively, an area-specific time trend) and γ_t is a year fixed effect, which captures shocks that are shared across all localities. We weight our estimates by the female population denominator and cluster our standard errors by both state and year.

II. Full Sample Results

We estimate Equation 1 at the county level from 1968 forward and at the state-level for our full sample period. These results, presented in Table 1, characterize the general association between per-capita income growth and birth rates in our sample at the two levels of aggregation.

We begin by estimating our baseline equation at the county level for the post-1968 sample. The coefficient on county per capita income growth is 0.14. With log-differenced variables on each side of the equation, this implies that a one percentage-point increase in the income growth rate is associated with roughly a 0.14 percentage-point increase in birth rate growth in the following year. This effect is virtually unchanged when we add additional lags of income growth in column 2. Allowing the aggregate time effects to differ by state (in column 3) causes the coefficient to fall by 30 percent, but it remains positive and statistically significant. Next we estimate the effects of changes in state-level per capita income. When we include both county- and state-level income growth in the same regression for the post-1968 period (column 4), we find that both variables have positive and statistically significant effects.[3] Finally, we estimate the effects of state per capita income for our full sample period (1937-2016), again finding a positive and significant coefficient.

The results in Table 1 are strong confirmation of procyclical fertility, which has been the modal conclusion in the existing literature on the association between fertility and the economy. Using the longest area panel dataset that has been compiled for the United States, and carefully controlling for secular trends and aggregate shocks, we find that when counties experience unusually high county or state per-capita in-

[1] This is when births counts by county of maternal residence become available.

[2] We have additionally estimated models with birth rates (in levels) on the left-hand side and models that have levels on both sides and include area-specific time trends. Both alternative specifications generate similar results.

[3] This finding consistent with the results of Lindo (2015), who documents larger effects of state economic conditions on two health outcomes—mortality and birthweight.

Table 1— Association Between Per-Capita Income Growth and Growth in the Birth Rate

	(1)	(2)	(3)	(4)	(5)
County Per Capita Income Growth Rate	0.127***	0.132***	0.0915***	0.0961***	
	(0.0218)	(0.0205)	(0.0148)	(0.0165)	
State Per Capita Income Growth Rate				0.154***	0.209***
				(0.0394)	(0.0387)
Sample Start Year	1968	1974	1974	1974	1943
Additional Lags	No	Yes	Yes	Yes	Yes
State-by-Year Fixed Effects	No	No	Yes	No	No

come growth rates, those counties experience faster growth in their birth rates over the next year.

A key advantage of our historical dataset is that we are able to estimate the *dynamic* response of local birth rates to economic shocks using panel data techniques. Our dynamic analysis explores how economic shocks transmit not only to contemporaneous birth rates, but also to *future* birth rates through delayed direct effects, postponement, or harvesting (shifting births from the future to the present). The effects of contemporaneous economic shocks on future birth rates are important for our understanding of how the demographic effects of economic downturns unfold over time and can provide insight into whether the reduction in births that occurs during a recession is permanent or merely reflects postponement of births to subsequent years.

We estimate a distributed lag model at the state level for our full sample period, adding additional lags of per capita income growth to Equation 1 and plotting them together in Figure 1. So that each coefficient we consider has a sufficient number of lags for identification, we include 14 lags of income growth in the estimating equation and only display the first ten.

Figure 1 shows dynamic effects of a shock to state per capita income on state birth rates. The figure suggests that the cumulative effects of a positive income shock are increasing for at least four years after a shock: the effect is largest in the first year after the income shock and remains positive and statistically significant for another three years. The coefficients only show a very slight rebound effect after year 6, which implies that the increase in births after a local income shock is not merely a shift of births forward in time. Instead, it is an overall increase in births for that cohort. This is consistent with the findings of Currie and Schwandt (2014), who show sustained effects of economic downturns on lifetime fertility.

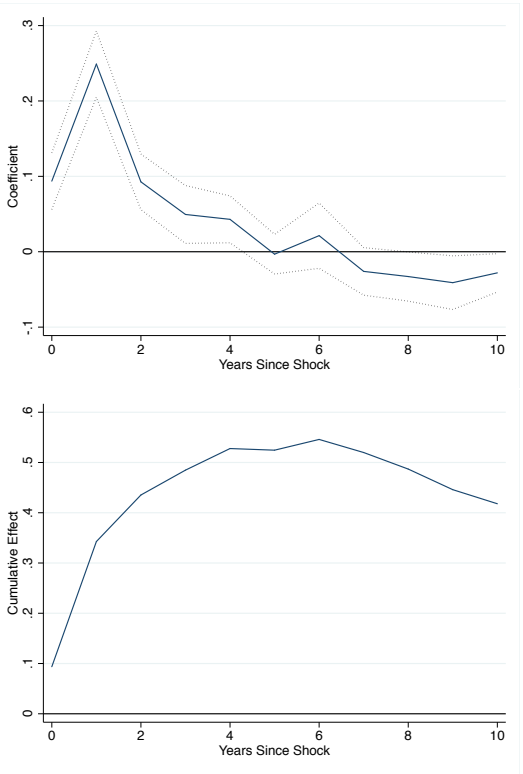

Figure 1. : Dynamic Effects, State Level

III. Changes in Birth Rate Cyclicality

Finally, we take advantage of our long panel and examine changes in the response of birth rates to local economic shocks over time. Since the earliest days of the literature on economic conditions and fertility, researchers have been interested in documenting changes in the cyclicality of birth rates in the US (for example, Silver 1965 and Macunovich and Easterlin 1988). In a theoretical paper, Butz and Ward (1979), proclaimed that the association between birth rates and economic opportunities would in fact change sign, becoming negative in the latter half of the 20th century as women increasingly became active participants in the labor market. However, subsequent studies have been unable to empirically document the "emergence of countercyclical fertility" that Butz and Ward predicted would occur (for example, Macunovich 1995). To our knowledge, no recent study has systematically examined changes in the association between economic conditions and fertility over a long period using modern microeconometric techniques.

Our dataset allows us to estimate changes in the association between economic conditions and birth rates over a long period using a consistent panel data approach. To study changes in the coefficient over time, we borrow a simple strategy from Ruhm (2015), who studies changes in the association between unemployment and mortality: we estimate the association between local per capita income and fertility for a rolling set of 30-year windows and plot the results.

Figure 2 shows the estimated coefficient on the one-year lagged change in log per capita state income for rolling 30-year samples that span the period from 1942 through 2016. Notably, every coefficient is positive and statistically significant. In other words, increases in per capita income are associated with increases in birth rates in every possible 30-year sample window—there has been no period of countercyclical fertility. There have, however, been substantial changes in the strength of the association between local income and local birth rates

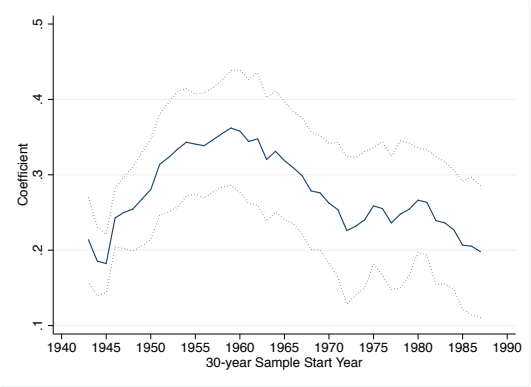

Figure 2. : Changes Over Time, State Level

over time. In particular, we find that the response of fertility growth to state income growth is increasing in the early years of our sample, starting at around 0.25 in the earliest 30-year sample (1947 through 1976) and increasing steadily to a peak around 0.35 in the 1960-1989 sample period. After that, the response diminishes, flattening out around 1972, and then falling further with each sample that starts after 1980.

IV. Discussion

In this paper, we characterize the association between aggregate economic conditions and aggregate birth rates in the US from 1937 through 2016. Using county and state fixed effects models, we find a strong positive association between local per capita income growth and subsequent growth of area birth rates. Estimates of the dynamic response of birth rates with a distributed lag model show that the effects of an economic shock on birthrates are not merely contemporaneous, but in fact grow over time—the increase in birth rates is largest one year after an economic shock and remains positive for four years before rebounding slightly.

In light of recent data showing a steep fertility decline during and after the Great Recession, one might be tempted to infer that fertility is now more responsive than ever to changes in economic conditions. However, when we estimate changes in the responsiveness of birth rates to local economic conditions with rolling 30-year windows, we find that the responsiveness rose to a peak in the 1960-1990 window and has declined ever since. In fact, estimated elasticities in

sample windows that include the Great Recession are similar to those in the windows starting in the 1940s, when hormonal birth control was not yet available and the birth rate was sixty percent higher.

Space limitations prevent an in-depth discussion of the economic and social factors contributing to these changes is left to future work. We speculate that the changes in coefficients that we see over time likely reflect two major factors. First, there were major changes in birth control technology over our sample period that led to improvements in women's ability to control the timing of their fertility (Goldin and Katz, 2002; Bailey, 2006). At the same time, there were changes in the makeup of maternal cohorts over time, in terms of their social and cultural upbringing, their educational attainment, and their expected lifetime labor force participation.

Considering these two factors, it is not surprising that the period of maximum responsiveness is the 1960-1990 sample period. During that period, most women gained an ability to control the timing of their fertility that earlier cohorts did not have, but also were still likely to rely on their husbands as primary earners. Across subsequent cohorts, as women became more educated, and more active in the labor market, improvements in local economic conditions increasingly began to reflect improvements in women's own economic opportunities. Thus, it is likely that the effects of changes in the opportunity cost of women's time began to counteract the income effects, reducing the cyclicality of birth rates across the latter half of the 20th century and into the 21st century.

REFERENCES

Bailey, Martha J. 2006. "More power to the pill: the impact of contraceptive freedom on women's life cycle labor supply." *The quarterly journal of economics*, 121(1): 289–320.

Butz, William P, and Michael P Ward. 1979. "The emergence of countercyclical US fertility." *The American Economic Review*, 318–328.

Currie, Janet, and Hannes Schwandt. 2014. "Short-and long-term effects of unemployment on fertility." *Proceedings of the National Academy of Sciences*, 111(41): 14734–14739.

Goldin, Claudia, and Lawrence F Katz. 2002. "The power of the pill: Oral contraceptives and women's career and marriage decisions." *Journal of political Economy*, 110(4): 730–770.

Lindo, Jason M. 2015. "Aggregation and the estimated effects of economic conditions on health." *Journal of Health Economics*, 40: 83–96.

Macunovich, Diane J. 1995. "The Butz-Ward fertility model in the light of more recent data." *Journal of Human Resources*, 229–255.

Macunovich, D.J., and R.A. Easterlin. 1988. "Application of Granger-Sims Causality Tests to Monthly Fertility Data, 1958-1984." *Journal of Population Economics*, 1: 71–88.

Ogburn, William F, and Dorothy S Thomas. 1922. "The influence of the business cycle on certain social conditions." *Journal of the american statistical association*, 18(139): 324–340.

Ruhm, Christopher J. 2015. "Recessions, healthy no more?" *Journal of Health Economics*, 42: 17–28.

Schaller, Jessamyn. 2016. "Booms, Busts, and Fertility Testing the Becker Model Using Gender-Specific Labor Demand." *Journal of Human Resources*, 51(1): 1–29.

Silver, Morris. 1965. "Births, Marriages, and Business Cycles in the United States." *Journal of Political Economy*, 73(3): 237–255.

Sobotka, Tomáš, Vegard Skirbekk, and Dimiter Philipov. 2011. "Economic recession and fertility in the developed world." *Population and development review*, 37(2): 267–306.