Fertility Changes in Latin America in the Context of Economic Uncertainty

Alicia Adsera

Woodrow Wilson School and Office Population Research, Princeton University and IZA (Bonn)

adsera@princeton.edu

Alicia Menendez

The Irving B. Harris Graduate School of Public Policy Studies, University of Chicago

menendez@uchicago.edu

Abstract

We explore the relation between fertility and the business cycle in Latin American countries taking advantage of the existing cross-country and within-country differences in both fertility and macroeconomic conditions. First, we use a panel of 18 nations for over 45 years to study how different labor market and economic shocks may have affected fertility. Second, we estimate Cox proportional hazard models of transitions to 1st, 2nd, and 3rd births with individual Demographic and Health Survey data from ten countries.
We find that periods of relative high unemployment are associated with lower fertility and with relative postponements of maternity (and to some extent second and third births). In general, women seem to postpone and even reduce childbearing in response to downturns. This behavior is mainly associated to increasing unemployment rather than slowdowns in GPD growth, although we find a positive relationship between first births and growth. Despite that periods of unemployment may be good to have children because opportunity costs are lower, maternity is reduced or postponed, in particular, among the most recent cohort and among urban and more educated women. This is consistent with the idea that, in this context, income effects are dominant.

Correspondence: Alicia Adsera, Woodrow Wilson School, Princeton University, 347 Wallace Hall, Princeton NJ 08544. Email: adsera@princeton.edu. Phone: 609-258 6916; Fax: 609- 258 5974. Financial help from NICHD and the University of Chicago is gratefully acknowledged. We would like to thank seminar participants at European Society of Population Economics, IUSSP and PAA meetings for their comments. This paper was made possible by Grant Numbers P30-HD18288 and T32-HD007302 from the NICHD. Its contents are solely the responsibility of the author and do not necessarily represent the official views of the NIH.

1. Introduction

During the last three decades fertility rates have declined sharply across Latin-American countries and fertility has been delayed in some of them. These decades have also witnessed, in most countries, a high degree of economic and political uncertainty in the form of macroeconomic imbalances, inflation, unemployment, and changes in political regimes. For example, the economic literature refers to the decade of the 1980s as the "lost decade" because of the adverse economic conditions and lack of growth in most Latin American countries during that time.

All these factors are likely to have influenced key household decisions such as childbearing and health and education investments. Previous works have highlighted the direct effect of economic shocks on outcomes such as child health in Colombia (Miller and Urdinola 2007) and human capital accumulation in Peru (Schady 2004). Others have focused on the indirect consequences of the business cycle, through its influence on fertility changes, on health status of adults and children, children's school enrollment and time parents spend with children (Dehejia, Lleras-Muney. 2004, Price 2007) for the US. Here we focus on the association between economic fluctuations and changes in fertility behavior.

The decrease in fertility across Latin-America is explained as part of a long-term decline associated with rising development in the area. At the same time, there may be short-term responses in the timing of births to temporary economic fluctuations. It is difficult to differentiate short run from long-run changes. Previous analysis of the effect of short-term economic changes on demographic variables in Latin-America found mixed results (see Palloni et al (1996); Tapinos, Mason and Bravo (1997).

In this paper we explore the relation between fertility and the economic environment taking advantage of the existing cross-country and within-country differences in both fertility and country conditions. We do this by using both aggregate and micro-level datasets. We undertake two types of analysis to study the evolution of fertility around the declining trend. First, we conduct a macro data analysis where we estimate the changes in total fertility rate (TFR) and age-specific fertility rates (ASFR) around a common trend in a panel data of 18 Latin American countries for over 45 years[1]. Second, we conduct a micro data analysis where we estimate Cox proportional hazard models of transitions to 1st, 2nd, and 3rd births with individual data from ten Latin American countries. In both analysis we find that periods of relative high unemployment are associated with lower TFR and with relative postponements of maternity (and to some extent second and third births). The association with first births is stronger among younger and more educated women, later cohorts (with likely more access to family planning) and those living in urban settings.

The following section describes the recent trends in fertility behavior and economic conditions across Latin America. Next, we lay out some hypotheses about the relation between both sets of variables. A description of the panel data and our aggregate estimates follows. Finally, the analysis of individual data from Demographic and Health Surveys (DHS) for a subset of ten countries closes the paper.

2. Changes in Fertility and Macroeconomic Conditions in Latin America

[1] The period's starting point changes depending on the variables included in the analysis.

Fertility: The recent evolution of fertility and its decline has been very uneven across Latin-American countries. Table 1 presents TFR from 1950 to 2000 for all the countries under analysis. Means and basic statistics for all fertility rates we use can be found in Table 2. Graph 1 shows the evolution of age-specific fertility rates (ASFR) of 25-29 years old since 1960 to the present for a group of selected countries. ASFR are calculated by dividing the number of live births in each age group by the total female population (in thousands) in each age group. The TFR estimates the number of children a woman would bear if she went through her childbearing years exposed to the current age-specific birth rates for women between the ages of 15-49 years. It is obtained by summing the age-specific rates for a given time-point. Synthetic indices such as TFR are a good proxy to the completed fertility of women but may be more imprecise in periods when the younger cohorts of women shift the timing of their fertility to older ages (or vice versa).

Some countries, such as Argentina, Chile, and Uruguay, already displayed a relatively low level of fertility by 1970 and, even though fertility has declined in the following years, the change in fertility rates has not been too sharp. Pantelides (2001) notes that the onset of fertility decline in Uruguay and Argentina took place in the 1920s and 1930s. It happened before all the other Latin American countries and close to the transition in most European countries. Thus, it is not surprising that in Graph 1 the ASFR for women 25-29 years old for Argentina and Uruguay are relatively flat for the period displayed. Chile was the next to experience the transition but it only occurred in the 1960s.

Conversely, other countries underwent a rapid fertility transition during the last forty years. Brazil, Nicaragua and Mexico are among the most prominent. The causes of the rapid Brazilian fertility decline are still under analysis but, importantly, the decline was

not homogeneous across regions and diversity is still widespread (Goldani 2001). In Mexico, the fertility decline did not begin until the seventies and was exceptionally fast (Tuiran et al. 2001). Table 1 shows the TFR in Brazil went from 5.33 in 1970 to 2.46 - close to the levels in Chile and Uruguay- in 1995. Similarly, the TFR in Mexico moved down from 6.73 in 1970 to just fewer than three children by 1995. ASFR for women in their 20s in Brazil and Mexico were halved during the last 30 years (see Graph 1).

Finally, remarkably high fertility rates prevailed in many areas of Latin America by the turn of the century. TFR in 2000 remained at 4.87 in Guatemala, 4.36 in Honduras, and 4.16 in Paraguay. The series of ASFR for women aged 25-29 in Guatemala in Graph 1 is remarkable in the regard; it only presents a slight downward trend throughout the period.

Economic Conditions: During the same period, Latin America also experienced all sorts of economic and political difficulties. Inflation, external debt crisis, income inequality, unemployment, fiscal deficits, high protectionism and market oriented reforms, are some of the main ingredients that dominate the economic scene in the last decades. Nonetheless those shocks have not affected all countries in the same way.

Table 3 shows mean annual rates of GDP per capita growth for the second half of last century. Data were obtained from Economic Commission for Latin America and the Caribbean (ECLAC). While some countries managed to grow at more than 2.5 percent per year (Brazil and Chile, for example) others remained stagnant (Nicaragua) or even showed negative rates of growth (Venezuela). Downward cycles where the domestic product decreases more than 10 percent in just one year are not uncommon. In 1975, Chile had a reduction of 13.8 percent of GDP per capita. A similar contraction was suffered by the Peruvian economy in 1989. More recently, in 2002 and 2003, Venezuela experienced a

decline of 10.5 percent and 11.3 percent of their GDP per capita. Unfortunately the list continues. We can also find periods of high growth, Brazil during the first half of the 1970s, Mexico from 1978 to 1981, Argentina from 1991 to 1995, and Chile for most of the 1990s, among others.

In terms of unemployment, there is a wide variation between Latin American countries. For example, while the Dominican Republic tends to have high levels of unemployment, the official statistics show low rates for Mexico. There is also large variability within countries. An extreme case is the one of Argentina where the unemployment rate increased from 5.8 percent in 1991 to 18.8 percent in 1995 and remained over 10% until recently. Obtaining complete homogeneous series on unemployment rates for the region is difficult. Table 3 presents the period for which data was available for each country. Data on unemployment rates was obtained from a combination of sources including ECLAC, International Labor Organization (ILO) and the Central Bank of Dominican Republic.

Table 3 also shows summary information on inflation rates by country since the 1950s to 2003 (except for Nicaragua where the series only starts in 1970). These data are available from the International Financial Statistics (IFS) published by the International Monetary Found. Traditionally it was the South American countries, such as Argentina, Brazil, Bolivia, Chile, and Uruguay that had been very prone to high inflation while others could be classified as moderate and low inflation economies. However most countries in the region had at some point annual inflation rates higher than 100 percent, and many suffered hyperinflation, such is the case of Argentina, Bolivia, Brazil, Peru and Nicaragua

during the 1980s and beginning of the 1990s. In trying to reduce high inflation, many different stabilization policies were experimented through the years with various results.

3. Analytical Framework

The basic microeconomic model of fertility (Willis 1973, Becker 1991) identifies a broad set of factors that influence the number of children a woman would have until the end of her fertile years. Households' preferences over the number and quality of children, household members' labor supply decisions, access to family planning and infant mortality are amongst the most relevant. Changes in the preferences of couples toward smaller families, reductions in infant mortality, larger investments per child (Becker 1981) and dual-careers (Butz and Ward 1979, Becker 1981, Galor and Weil 1996) are responsible for the decrease in fertility rates that has accompanied economic development in many nations. The decrease over the last decades in the cost and availability constraints of contraception in most countries has made this move to smaller families and motherhood postponement possible (Goldin and Katz 2002 for the US, Goldani 2001 for Brazil, Pantelides 2001 for Argentina, Parrado 2000 for Venezuela and Colombia, Population Division 2002, Miller 2007 for Colombia, Tuiran et al. 2001 for Mexico).

Fertility and Unemployment

In this paper we explore whether differences in the economic environment where childbearing decisions are made are related in any extent to changes in fertility observed in Latin American countries during recent decades. In particular we study whether fertility responds or not to economic shocks and whether economic booms are accompanied by baby busts or baby booms. Within the standard microeconomic model of fertility,

temporary unemployment shocks reduce women's opportunity cost of time without affecting long-term income in an important way hence substitution effect prevails over any income effect from temporary decreases in earnings. Thus the associated fall in current opportunity costs (in terms of forgone wages) makes unemployment spells good times for childbearing (Becker 1972, Butz and Ward 1979, Galor and Weil 1996, Schultz 1985). However, in the context of structural or permanent unemployment --likely associated with sharp adjustment of expected income and increased uncertainty--, income effects outweigh the lower opportunity costs and fertility follows a procyclical pattern (Ben-Porath 1973, Yule 1906, Silver 1965, Becker 1981, Adsera 2005).

Changes in unemployment and fertility may be related in different ways. First, there may be wage effects that work through labor supply decisions. Maternity may require a short (partial) withdrawal from the market. High unemployment may difficult a subsequent return to the market. In that regard, if labor market experience is very significant for the earnings profile, women may alter the timing of their births. If wages increase with experience (or rise with age) and child-related expenditures are relatively fixed, women may rather postpone childbearing to accumulate human capital early in their career (through either experience and/or education) and guarantee better life-time wage-growth, benefits, and employment (Heckman and Willis 1976). Good working capital markets, though, would temper that result (Vijverberg 1984).

Second, a persistent unemployment spell may have a large negative impact on household permanent income (income effect). This may render childbearing unattractive not only for those directly affected by unemployment but also for those to which it constitutes a threat and who want to secure future employment. Furthermore, this may

affect not only the timing of fertility but total fertility as well. This link between high unemployment and fertility behavior is found in the interwar period and the 1930s depression in both the US and the UK (Becker 1981, Galbraith and Thomas 1941, Murphy 1992). Similarly during the last two decades, European fertility postponement was important in countries where joblessness was prevalent and persistent –particularly among women- such as those in Southern Europe (Adsera 2004, 2005) and even in economies with lower levels of unemployment among individuals affected by the shocks, such as Norway (Kravdal 2002). Likewise in an adverse labor market, parents may choose to invest more per child to improve their future outlook at the cost of reducing the number of children (Becker, Murphy and Tamura 1990, Easterlin 1973).

Long periods of unemployment may also have negative consequences in the marriage market, perhaps due income effects on women and their potential spouses. Household formation may be postponed and with it childbearing. This mechanism has been studied in England and Wales (Yule 1906, Southall and Gilbert 1996); the US (Galbraith and Thomas 1941, Silver 1965); Latin American countries (Palloni et al 1996, Bravo 1997, Ortega and Reher 1997, Rios-Neto and Magno de Carvalho 1997), among others.

When analyzing the fertility response to different types of economic shocks it is natural to wonder whether such response varies by age-group or by education level. Previous analyses with US data have found differences in the response of women of different educational background to changes in unemployment. Perry (2003) shows that college educated women portray procyclical fertility whereas those with high school or less reduce fertility when labor market conditions improve. Dehejia and Lleras Muney

(2004) show that race and education are jointly associated with variation in fertility over the cycle. They find low-skill black (white) women to be less (more) likely to give birth during recessions. Several of the mechanisms above that explain the association between fertility and the business cycle can operate with unusual intensity for women of certain educational backgrounds, and as a result, different economic opportunities. Lower educated women, for example, may face more severe credit constraints in a country with highly imperfect capital markets.[2] Also, the degree of skill depreciation and resulting change in long-life income while outside the labor market may differ across educational backgrounds. In that regard, the skills of highly educated women who expect to access more formal jobs may be at a higher risk than those of others. Finally, how women of different educational background respond to economic shocks may be also mediated by whether they are already mothers at that time and their own age. Older (and more educated) women may be more established in labor market (and possibly more sheltered from unemployment oscillations) than younger low skill women and as a result respond in a different manner to shocks.

Fertility and Growth

The relation between fertility and growth rates can also be either procyclical or countercyclical. Healthy growth rates lead to optimism and may reduce credit constraints but also they may be accompanied with better labor market opportunities that increase the opportunity cost of childbearing. Previous analyses show, for example, procyclical births for Brazil and Chile during the twentieth century using distributed lag analysis (Bravo 1997, Rios-Neto and Magno de Carvalho 1997). Ortega & Reher (1997) observe a

[2] Jappelli (1990) finds that blacks have more restricted access to credit in the US.

procyclical fertility response to changes in GDP in Chile and Argentina since the 1930s with some gradual weakening until the 1970s and a strengthening of the relationship thereafter.[3]

Furthermore, the association of fertility behavior with growth fluctuations does not need to resemble that with unemployment. After recent macroeconomic crises, the economic recovery in some Latin American countries did not translate into a proportional growth of jobs relative to the new economic bonanza. An extreme example of this is the case of Argentina during the early 1990s when record levels of unemployment co-existed with high rates of growth (Altimir and Beccaria 1998, Gonzalez-Rozada and Menendez 2006). If a country is experiencing "jobless growth", higher growth may not result in more opportunities for everyone (UNDP 2003). The InterAmerican Development Bank reports that "by 2000, the median unemployment rate was above 10 percent, and as high as the rates seen in the region during the height of the debt crisis (1983-85), despite the fact that economic activity did not contract nearly as much in the late 1990s as in the 1980s (IADB 2004). Given the long track of high inequality in Latin-American societies and the increase of poverty levels and disparities during the recent economic shocks in some countries, it is possible that the gains from new growth may be unevenly distributed across different groups in society and the highly educated (or the urban population) benefit relatively more than the lower skilled (or rural dwellers).

The debt crisis of the 1980s is a particularly important episode to take into account when evaluating the relation of fertility and economic stability of Latin-American economies during this period. Some researchers have found a decline in the rate of first

[3] Palloni et al. (1996) however find greater heterogeneity of responses in a sample of eleven Latin American countries.

marriage and an acceleration of the fertility decline in Brazil during the early 1980s when the country underwent a foreign debt crisis (Goldani et al, 1989). In our analysis we include period dummies to evaluate whether this result is robust across countries that have been impacted by the same process.

4. Macro-Level Analysis

4.1 Methodology and Data

We use a panel of 18 Latin American nations for over 45 years to study how different labor market and economic shocks may have affected fertility. Our panel includes: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. The dependent variables under analysis are either TFR or ASFR in each country.

To account for the business cycle at each point in time we use information on changes in unemployment rates and GDP per capita growth rates in the immediate past as well as dummy variables for periods of external debt crisis.

To control for other existing economic conditions we include a series of changes in consumer prices and a linear time trend. Similarly to control for the different levels of development across countries and over time we include rate of literacy of the population obtained from United Nations statistics. We expect economic literacy to be negatively associated with number of children. The reason for this is twofold. Access to family planning is likely more extensive in more developed societies with literate women. As access to contraception grows, household formation and childbearing are likely to be

delayed as it has happened in more developed countries (Goldin and Katz 2002). Further, with economic development capital intensity in production increases, the emphasis in physical strength diminishes and the demand for activities where women have a comparative advantage moves upwards (Galor and Weil 1996). Women may trade off children for other less-time-demanding alternatives as they participate more actively in the labor force and the opportunity cost of their time rises.

Most macroeconomic data are available from the late 1950s. However, information on unemployment rates is generally only available starting in the 1970s or 1980s and there are gaps for some of the countries. The sample extends to 2003 for most countries. We present estimations that include all the main covariates and thus only cover a period of 25 to 30 years per country (see Table 3 for the specific period in each case)[4]

Haussman tests indicate random-effects models are inconsistent therefore the unbalanced panel is estimated through fixed-effects with a common time trend for all countries. Alternative specifications not shown here include either country-specific trends or year dummies. The models have also been estimated using either GLS or panel consistent standard errors with similar results.

We want to avoid spurious correlation between variables like fertility and unemployment that are likely to be persistent. To that end our analysis uses rates of change (lnx_t-lnx_{t-1}). Some missing values in our series preclude us from using filters like Hodrick-Prescott (HP) for example, but other approaches such as first differences, partial first differences, error correction models, or detrended series yield similar results to the ones presented below.

[4] In the text we comment on some additional estimates where we exclude unemployment rates and are able to use longer series covering more than fifty years.

We use lagged macroeconomic variables to reflect the relevant timing of economic circumstances that might affect fertility decisions. Additionally this softens concerns for endogenity. In the case of unemployment it is unlikely that the conception plans of women some months ahead of pregnancy and childbirth have too much bearing on the year's unemployment previous to a birth, unless we believe that women drop the labor force well ahead.

The analysis of the associations between demographic behavior and aggregate measures of economic performance needs to recognize that those measures encapsulate both individual and aggregate shocks. The coefficient of aggregate measures of unemployment, for example, captures both the negative shocks at the individual level and the increased uncertainty from aggregate economic performance.

4.2 Results

Total Fertility Rate: Table 4 presents three specifications of the estimates of changes in TFR on either two or one lag of the major covariates. Results are fairly similar across columns.

Changes in unemployment are negatively and significantly associated with changes in fertility rates in our cross-country regressions. On its own, the change in unemployment lagged one year is significant (column (2)). The coefficient indicates an elasticity of 0.011. This would imply that an increase of one standard deviation (4.29) in the mean unemployment rate (8.57) would reduce the TFR 0.6 percent.

While the first lag of unemployment change is significant, lags of higher order are not. The high serial correlation in the unemployment series introduces multicollinearity in

the estimates. In that regard, joint test of the first two lags of changes in unemployment are significant and imply a cumulated elasticity of around -0.02 in columns (1) or (3). In estimates not included here, additional unemployment lags are not significantly different from zero and their inclusion does not change our results.[5] Even if significant, the size of the association of changes in the labor market and fertility is certainly small for the population as a whole. However, we posit that the impact may be unevenly experienced across education groups, cohorts or geographic location. Accordingly, we first look at fertility rates for different age groups and, in the following section we use individual data to study fertility behavior of women of different educational background, place of residence and year of birth.

In column (3) we include a dummy variable for the most acute years of the Latin American debt crisis that affected most countries in the area. The coefficient on the dummy is negative and weakly significant at a 10 percent level indicating a potentially temporary slowdown of fertility during that period. Note that this variable suggests an effect of the debt crisis on fertility decision even when we are already including changes in unemployment and product growth rates in our analysis. This result is consistent with previous findings for Brazil (Goldani et al, 1989).

In general per capita growth rates are not statistically significant in the estimates of Table 4. However, when we exclude unemployment variables in column (4) but keep the sample limited to the period for which unemployment is available, the coefficient on the first lag of GDP growth rate is positive and marginally significant only at 9 percent. These

[5] Dehejia and Lleras Muney (2004) also find a negative relationship between lagged unemployment and birth rates for a sample of 96 countries during the period 1980-1999 and the size of the coefficient is larger for developed than for developing countries.

results are only weakly consistent with those of Hill and Palloni (1992) who find a positive response of births to economic growth with a lag in a set of seven Latin American countries.

Age-Specific Fertility Rates: The associations of unemployment and growth rates with changes in TFR that we show in Table 4 seem to indicate a prevalence of income effects over substitution effects in childbearing decisions. However, these are very aggregate results. Table 5 presents estimates for ASFR to tease out whether all age groups are responding to economic changes in the same way or whether unemployment and economic growth affect women in different ways over their life-cycle.

Estimates show that the association between unemployment and fertility is only significant for young ages (women in the 15-19 and 20-24 age groups) when most first births occur in these populations.[6] The coefficient on the first lag of unemployment change is significant and negative for 15-24 year olds and the two first lags are jointly significant. This behavior is similar to that observed among recent cohorts in several European countries, where younger women have postponed maternity in response to high and persistent unemployment (Adsera 2006). Both for teenagers and for women in their early twenties, the cumulated elasticity implied by the coefficients of the two lags of changes in unemployment is around 0.026. If the unemployment rate increases in one standard deviation, the ASFR for these groups will go down 1.3 percent over two years.

Lagged growth is not significant in Table 5 except for a negative coefficient of the second lag in women in their twenties, indicating some countercyclical behavior towards

[6] The mean age at first birth in the DHS individual sample we employ in the following section is 20 years (19 in Guatemala and Nicaragua to 21 in Brazil and Colombia) and 75% of the women are mothers by age 23.

growth, after controlling for unemployment. However, once we exclude unemployment from the sample, the first lag of growth rates is significant and positive for 20-24 years old. Thus, it might be that the part of growth that is collinear with unemployment is driving this finding. This indicates that this age group is the most responsive to economic shocks among all women and that their response is procyclical particularly to changes in employment.

These aggregate results are suggestive of an impact of the economic cycle on fertility decisions, however they have limitations. We turn in the next section to our main analysis using individual data for a subset of Latin American countries.

5. Micro-Level Analysis

5.1 Methodology and Data

We use Demographic and Health Surveys (DHS) available for ten of the countries in our sample to analyze the relationship between changing aggregate economic conditions at the country level and the individual spacing of children of over 100,000 women. The DHS is not produced for all the 18 countries in the previous aggregate panel analysis. We use only the latest DHS available for each country at the time of writing the paper. Countries (and survey years) included in the estimates are Bolivia (1998), Brazil (1996), Colombia (2000), Dominican Republic (2002), Ecuador (1987), Guatemala (1998), Mexico (1987), Nicaragua (2001), Peru (2000), and Paraguay (1990). For most of the countries surveys were conducted from the late 1990s to 2002. Unfortunately the last surveys available for Mexico and Ecuador are from 1987 and, as a result, there is only a

short span of time available to analyze these countries as their unemployment data series only start in 1980.

The timing of the first three births is estimated separately using Cox proportional hazard models. We draw individual fertility histories from the information on birth dates of women and their children in the DHS of each country. The dependent variable in all estimates is years to a birth from either the previous birth or from age 12 in the case of the first birth. We choose to start exposure to first birth at age 12 given the high frequency of teen childbearing we observe in some of the countries under analysis. For women i = 1, 2, …, N who each enter a state (e.g. first birth) at time t=0, the (instantaneous) hazard ratio function for i^{th} woman at time t>0 is assumed to take the proportional hazards form

$$\lambda_{it} = \lambda_0(t) \exp(X'_{it} \beta) \qquad (1)$$

where $\lambda_0(t)$ is the baseline hazard function; exp (.) is the exponential function; X_{it} is a vector of covariates summarizing observed differences between individuals (such as education, or gender of previous children) as well as the aggregate economic conditions of the labor market in the country where they live at time t (measured in years); and β is a vector of parameters to be estimated. We use a grouped robust variance as estimated by Lin and Wei (1989) and cluster the errors within regions in each country. Results are robust to clustering the errors by duration since previous birth (that is, since exposure) alternatively.

Estimates are stratified by birth-cohort to take into account different cohort-trends in fertility and differentiate them from changes in economic conditions. Women are divided in five groups according to their birth year: 1930s-40s; 1950s; 1960s; 1970s and 1980s. Given that economic conditions within each country offer substantial variation over

time, we include country dummies to analyze within-country changes in the timing of fertility as a response to changing economic conditions. Finally, even though the inclusion of country specific time trends does not affect the findings we choose to present a more parsimonious model that includes a common time trend. Estimates in the tables are presented in hazard ratios.[7]

To control for the underlying economic conditions faced by women each year, all the country time-varying macroeconomic variables used in the first set of estimates are included here as covariates in the duration models to each birth. In addition, the models contain a few individual characteristics for each woman such as years of education, her place of residence whether urban or rural, and access to electricity in her dwelling. Information on the woman's previous fertility history such as age at first birth, gender of previous children, and months elapsed between births is included accordingly for each parity order.

5.2 Results

Economic conditions and transitions to births:

Table 6 presents the estimated proportional hazard models to the transition of the first three births for all women in the sample. The first four columns present different models for the transition to motherhood that include two, four or no lags of unemployment

[7] Results are robust to alternative estimation methods. In particular, we have estimated logit models of the likelihood that women (of a given parity) give birth to a child each year controlling for the underlying economic conditions of their countries in each period (including country dummies, time trend and clustering errors by time). Women remain in the sample until a new birth occurs. Results are available from the authors.

rates, per capita growth rates and a debt crisis dummy. Columns (5) and (6) present the basic model with two lags of unemployment for higher parities (second and third births).

Results show that, in the basic model that includes two unemployment lags, last year's unemployment is associated with a lower hazard to a birth. Twice lagged unemployment is not significant on its own, although both lags are again jointly significant for the first three births. We simulate the proportion of women that have become mothers by age 25 using the model in column (1) and by changing the unemployment rate while keeping all other variables at the mean. Around 74 percent of women in a country are mothers by age 25 if we assume that the first two lags of unemployment are 5 percent. This figure is only 71.5 percent are if the unemployment rate stands at 12 percent.

To further understand the dynamics of this relationship, whether long or short term, we include four lags of the country's unemployment rate in a model of transition to motherhood in column (2). Estimates confirm a short term negative association with unemployment but also portray a rebound in first births after the fourth lag of unemployment. This finding seems to imply that even if an unemployment hike may temporarily depress current first births, it only partly delays them.

An extra point of GDP per capita growth rates increases the hazard rates to first births between 6 and 11 percent. In column (3) when we exclude unemployment from the model, the coefficients of growth per capita income remain unchanged. Thus women facing periods of growth seem to be more optimistic in their motherhood plans, other things being the same. This result does not extend to higher parities in Table 6.

In column (4) we check whether transitions to maternity are sensitive to particularly acute economic changes. We introduce a dummy for the most severe years of

the debt crisis in Latin America (1983 and 1984). Unemployment continues to be negatively associated to the speed to first births whereas economic booms seem to boost them. Periods of debt crisis are accompanied with delays of maternity.

As expected, estimates in Table 6 show that the level of women formal education is significantly and negatively associated with transitions to first births. Interestingly in the Latin-American context this negative association between education and the timing of children continues in births of higher order. Elsewhere researchers have found that in OECD countries, more educated women enter motherhood the latest but tend to cluster the first two births together possibly to take advantage of economies of scale from childcare provision or to make the most of the time they spend outside of the labor force (Adsera 2006). The fact that this relationship does not hold in these countries may indicate that the childcare options and their associated costs as well as the labor market women face are very different from those women face in richer nations. Alternatively, the less educated in Latin America may pool births of different order much closer together than the more educated because of lack of access to proper family planning. This concern is minimal in more developed contexts.

Similarly, country literacy levels are associated with slower transitions to the first three births. Rural residence is not related to transitions to first births, but shows a positive and significant association on higher order births. Access to electricity, used as a rough measure of wealth, is associated with longer time to a birth, particularly in high order births.

In the first part of the paper we found some differences across age groups when we analyzed ASFR and their relationship to economic performance. First, we want to see

whether these associations are similar across age or educational groups and, second, whether across those groups the strength of the association depends on the particular covariate employed, either unemployment or economic growth. In the following subsections we re-estimate the models for different educational groups and cohorts.

Differences across education groups: We divide the sample in two groups of women: those with less than seven years of schooling (around 40 percent of the sample), and those with seven or more. Additionally we present separate results for the highly educated group: those with more than twelve years of schooling (fewer than 15 percent of the sample). Table 7 presents the distribution of educational attainment across countries for women included in the sample. Two important facts can be observed in these data. First, in some countries such as Paraguay and Guatemala (in 1987) over two thirds of adult women had less than seven years of education. Second, in some countries such as Bolivia or Peru, educational inequalities are particularly large: on the one hand, around 15 percent of the population has at least some post secondary education, but, on the other, around 40 percent or more have less than seven years of schooling. Fertility behavior is very different across education groups. Simulations of transitions to first birth, evaluated at the means, indicate that more than 50 percent of women with less than 7 years of education are mothers at age 19. In contrast, women with more than high school only reach similar levels at around 26 or 27 years of age.

Results also show a different relation of timing in fertility and of labor market conditions and growth. Table 8 presents the hazard ratio estimates for different education groups. In column (1), we observe that the second lag of unemployment is negatively associated with transitions to maternity among the less educated, and that last year's

unemployment is jointly significant with the second lag. In additional estimates not presented here we observe a catch up after four periods similar to that in column (2), Table 6. Thus, even if unemployment may temporarily delay the fertility of those with less than seven years of schooling and its impact may last more than one period, it does not seems to have important long run effects for this group.

Among women with seven or more years of schooling the association is more contemporaneous and stronger than for the less educated as only previous year unemployment is associated with delays in childbearing plans. Within this group, in the face of an adverse labor market, women with at least some tertiary education seem to postpone maternity the most (column (3)). Simulations show that more educated women delay motherhood more than low educated women when unemployment increases. For example, assuming unemployment is 5 percent, 52.75 percent of women with less than seven years of formal education had at least one child by age 19. If unemployment is instead 8 percent, the percentage of mothers is reduced in 1.2 percentage points by the same age to 51.5 percent. Unemployment rates of 12 percent reduced an additional 1.5 percentage points. For highly educated women unemployment has a larger effect. At a rate of 5 percent, almost 55.9 percent of women had a baby by age 27. However if the unemployment rate is either 8 or 12 percent the percentage goes down to 54.2 and 51.9 percent respectively. This implies reductions of 1.7 and 2.3 percentage points (at a much older age).

Possibly those with more than secondary education expect to be able to get a good job that matches their skills and are concerned both about the signal maternity sends to potential employers and about the depreciation of their skills while out of the labor force.

Those loses may be relatively smaller among women with fewer skills and ambitions in the labor market. However, over time, once the more educated women are established in the labor market they may be more sheltered from further economic downturns. They might have landed in more stable and protected positions in the labor market and their skills may render them less susceptible to fast turnover in the event of a slowdown. Further, earnings-age profiles are likely to be steeper for women with higher levels of education[8]. Earlier years in the labor market may be more important for their long-term wages whereas those of low skill women may not depend as much on experience.

Periods of positive growth in per capita income significantly boost fertility both of the less educated and of those with secondary and tertiary education when pooled together. However, we do not find any significant relationship between economic bonanza and timing to maternity when we restrict the sample to women with post-secondary education.

In the case of second and third births, the relative strength of these associations across education groups somewhat reverses. For the less educated the negative coefficient of lagged unemployment in the models of second birth is sizable and the two first unemployment lags are also jointly significant for the third birth. For the pooled group of women with more than six years of studies, unemployment hikes are associated with later second births but the two year combined relationship is null or ambiguous for third. However, when we restrict the estimates to women with tertiary education we do not find any significant negative association of joblessness and timing to higher parities.

By contrast, the coefficients of growth rates for the second and third births are only significant and positive among the most educated. Conceivably this might reflect the fact

[8] See for example Card and DiNardo (2002), Heckman et al. (1998) and Connolly and Gottschalk (2006).

that college-educated women may be already more sheltered in the labor market. After having postponed childbearing until obtaining a more stable position in the labor market, they may be less subject to the short-term fluctuations than the less educated women. On the other hand, if we believe that the benefits of growth in per capita income may be unevenly distributed, particularly in the very unequal Latin-American societies, it is not surprising that growth boosts the fertility of the more educated.

So far in our discussion we have assumed that women are active participants in the labor market. However, in the event that women are not active participants, the same procyclicality observed, particularly, in the case of first births can result from shocks to the household income through the spouse's labor market situation. In that regard the arguments laid out before can apply to the spousal income if we believe that there is a high degree of assortative mating in these unequal societies. Thus the fact that more educated women are more sensitive to unemployment in their early stages childbearing than later in their life cycle may be related to their spouses' opportunities and/or ambitions when first entering the market.[9]

Differences across cohorts: The surveys employed in the analysis include many different cohorts of women: from those who just turned 12 recently to those who have already past their childbearing years at the time of the interview. During these years, education, access to health services and to family planning, and the role of women in the labor market have steadily changed in most of these countries. Younger cohorts may have

[9] This is particularly relevant if, as Goldin (1995) notes there is a U-shaped relationship of economic development and female labor force participation in the world-wide cross country sample, and as Mammen and Paxson (2000) note central and South American economies lie near the bottom of that U-shape. It would be interesting to pursue this line separately by country according to their development level. However, recent research disputes that this is the pattern in Latin America (Ureta et. al. 2001).

lived through more economic turbulences (during the mid and late 1980s and 1990s) than older cohorts but conceivably they may have had better access to family planning than the latter. In that regard they may have had better tools to regulate their fertility along the cycles than their mothers.[10] Unfortunately the DHS does not provide retrospective information on access and knowledge of family planning. We can only observe whether women currently know and have ever used some modern contraceptive methods but it is impossible to gather when they learnt about them or used them. Among some mothers contraceptive learning may have possibly happened at childbirth in the hospital.

Table 9 presents proportional models of the transition to the first three births separately for women born before 1960 and for those born in 1960 and after.[11] We find that childbearing decisions of younger cohorts seem to follow more closely economic cycles than those of older ones. Higher unemployment periods (economic booms) are significantly associated with delays (rushes) to the first three births among those born in 1960 or later. The coefficient of the first lag of growth is significant, positive and sizable for the first two births and the two first lags of growth enter jointly significant in the model of third births. The hazard ratio indicates substantial delay of births in the presence of high unemployment even for the third birth. In simulations of the transition to the first birth among those born in 1960 or later we find that 50 percent of women are mothers at age 21 if unemployment rates stand at 5 percent but that this proportion decreases to 48.5 and 46.6 if the unemployment rates hike to 8 and 12 percent respectively.

[10] Miller (2007) for example shows how the expansion in the Profamilia family planning explains in part recent fertility decline in Colombia as well as the delayed transition to maternity matched with increases in educational investment.

[11] We have run our models partitioning the data at different dates from 1959 to 1965 and obtained similar results.

Conversely, transition to maternity and to a second birth is unrelated to changes in unemployment or growth for women born before 1960. Moreover, their transition to thirds births appears to be countercyclical in relation to unemployment shocks but ambiguous in the presence of economic booms.

In models in Table 9, rural residence is not related to transitions to first births for younger cohorts and it is negative for older women. However, it shows a positive and significant association with higher order births for both cohort groups. Access to electricity and years of education are associated with slower transitions to any birth. Still the size of the coefficients and the t-statistics are smaller for those born before 1960. This is likely related to lower prevalence of family planning among women of older cohorts regardless of their socio-economic background as well as the smaller sample size of this group.

Rural versus Urban Fertility: Fertility transition has often been conceived as a diffusion process that starts in urban settings and moves to rural settings over time (UN Population Division 2002).Whether women live in a rural or an urban setting probably affects access to family planning and, as a result, it constrains childbearing decisions in a similar way as differences in educational background and birth cohort do. Additionally, children in rural areas are more likely to have an important role as economic contributors to the household wellbeing and as source of support to their parents in old age. Finally, economic fluctuations may affect urban and rural groups differently. Marichal (1989) notes that the Latin American recessions during the early 1980s may have hit relatively more the urban working class - whose incomes suffered massively and were more dependent on government spending- than rural workers. Table 10 presents the estimated model of transitions to different parities separately for women living in the city and for

those in a rural setting. Women living in the city seem to be more responsive to changes in unemployment than those in a rural area. In particular, the hazard ratio for the one-year unemployment lag in the transition to any of the first three births is significantly under one and smaller among those in urban settings than among those in rural areas. For the latter only the second lag is significant in the first birth (though both are jointly significant); the first lag for the second birth and none in the third.

With regard to changes in economic growth, the picture is more ambiguous but in general economic expansions are associated with earlier maternity for all women.

6. Conclusions

In this paper we explore whether cross-country differences in the economic environment where childbearing decisions are made are related to changes in Latin-American fertility. We find a positive association between the business cycle and changes in total fertility rates and age-specific fertility rates. In general, women seem to postpone and even reduce childbearing in response to downturns. This behavior is mainly associated to increasing unemployment rather than slowdowns in GPD growth, although we find a positive relationship between first births and growth. High unemployment is, in general, associated with low rates of growth; however this does not need to be the case all the time. As we mentioned before, the Latin American experience of the last fifty years shows periods of high growth with increasing unemployment and also episodes of stagnation with relatively low unemployment. Changes in fertility rates are linked to the unemployment cycle. Despite that periods of unemployment may be good to have children because opportunity costs are lower, maternity is reduced or postponed, in particular, among the

most recent cohorts. This behavior is consistent with the idea that, in this context, income effects are dominant when unemployment goes up.

The relationship between fertility rates and unemployment is not homogeneous across groups of women. We find a stronger association of adverse economic circumstances and delayed maternity among urban, younger, and more educated women. The association of unemployment and transition to second or third births, however, is somewhat stronger for the least educated. Recent cohorts -not surprisingly- also show more a robust correlation.

Whether these associations are specific to the severity of the economic turbulences that Latin American countries have undergone during the last decades remains to be seen. Our results point to more responsive childbearing behavior in women of recent cohorts. As easy access of family planning progressively extends to the entire population and as increasingly educated Latin American women aim to more stable jobs (in the formal sector) the timing of childbearing may become even more tied to the economic fortunes of the country. However, whether women's (or households) response remains mostly procyclical, as observed here, or countercyclical (as women bear more children in periods of lower opportunity costs) may hinge on the acuteness and persistence of the economic shocks these countries undergo in the future and, as a result, on whether substitution or income effects prevail.

REFERENCES

Adsera, Alicia (2004). "Changing Fertility Rates in Developed Markets. The Impact of Labor Market Institutions," *Journal of Population Economics* 17: 17-43.

_____. (2005). "Vanishing Children: From High Unemployment to Low Fertility in Developed Countries," *American Economic Review* 95 (2): 189-19.

_____. (2003) "Where Are the Babies? Labor Market Conditions and Fertility in Europe," Working Paper, Population Research Center, University of Chicago 2003-08 (also IZA Discussion Paper 1576)

Altimir, Oscar and Luis Beccaria (1998) Efectos de los cambios macroeconomicos y de las reformas sobre la pobreza urbana en Argentina. In *Politica macroeconomica y pobreza en America Latina y el Caribe*, ed. Enrique Ganzua, Lance Taylor and Samuel Morley. Madrid: BID/CEPAL?PNUD, Grupo Mundi-Prensa.

Bajraj, Reynaldo; Jorge Bravo and Georges Tapinos (1997) "Economic Adjustment and Demographic Responses in Latin America: An Overview" in *Demographic Responses to Economic Adjustment in Latin America*, Tapinos, Mason and Bravo (Eds.), Oxford University Press, New York.

Becker, Gary, (1960) "An Economic Analysis of Fertility," *Demographic and Economic Change in Developed Countries*, NBER conference series 11, 209-231.

_____, (1991) *A Treatise on the Family*. Harvard University Press, Cambridge, Mass.

Ben Porath, Yoder (1973) "Short-terms fluctuations in Fertility and Economic Activity in Israel", Demography, 10 (May): 185-204.

Bravo, Jorge (1997) “Demographic Consequences of Economic Adjustment in Chile” in *Demographic Responses to Economic Adjustment in Latin America*, Tapinos, Mason and Bravo (Eds.), Oxford University Press, New York.

Butz William P. and Ward, Michael P. (1979) The Emergence of Countercyclical U.S.Fertility, *American Economic Review*, 69(3): 318-28.

Card, David and John .E. DiNardo (2002) Skill-Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles. *Journal of Labor Economics* 20(4): 733-83.

Connolly Helen and Peter Gottschalk, (2006) "Differences in Wage Growth by Education Level: Do Less Educated Workers Gain Less from Work Experience?," Boston College Working Papers in Economics 473, Boston College Department of Economics

ECLAC Economic Commission for Latin America and the Caribbean Statistical yearbook for Latin America and the Caribbean, United Nations (Various Issues)

Dehejia, Rajeev and Adriana Lleras-Muney. (2004) “Booms, Busts and Babies Health”, *Quarterly Journal of Economics* 119 (3): 1091-1130.

Easterlin, Richard (1973) Relative economic status and the American fertility swing. In *Family Economic Behavior: Problems and Prospects*, ed. E.B. Sheldon, Philadelphia: Lippincott.

Galbraith, Virginia L; Dorothy S. Thomas, (1941) Birth Rates and the Interwar Business Cycles, *Journal of the American Statistical Association* Vol. 36, No. 216: 465-476

Galor, Oleg and David Weil. (1996). The Gender Gap, Fertility and Growth. *American Economic Review* 86, 374-387.

Goldani, A.M., S.D. McCracken and S.W. Pullum (1989) “Demographic Change and Stability in Brazil during a Period of Economic Crisis”, Population Association of America, Baltimore, MD, March 30-April1.

Goldani, Ana Maria (2001), “What will happen to Brazilian Fertility?” in *Completing the Fertility Transition*, Department of Economic and Social Affairs, Population Division, United Nations.

Goldin, Claudia, (1995) "The U-Shaped Female Labor Force Function in Economic Development and Economic History" in T. Paul Schultz, ed., *Investment in Women's Human Capital and Economic Development*, University of Chicago Press, 1995.

Goldin, Claudia and Lawrence Katz. (2002) The Power of the Pill: Oral Contraceptives and Women’s Career and Marriage Decisions. *Journal of Political Economy* 110, 730-70.

Gonzalez-Rozada, Martin and Alicia Menendez (2006) Why Have Urban Poverty and Income Inequality Increased so Much? Argentina 1991-2001, *Economic Development and Cultural Change* 55 (1).

Heckman, J. and R. Willis, (1976) “Estimation of a Stochastic Model of Reproduction: An Econometric Approach”, in Terleckyj, N. (ed.) *Household Production and Consumption* Columbia University Press, New York.

Heckman, J. J., L. Lochner and C. Taber (1998) “Explaining Rising Wage Inequality: Explorations with a Dynamic General Equilibrium Model of Labor Earnings with Heterogeneous Agents, *Review of Economic Dynamics* 1 (1), 1-58.

Hill K. and A. Palloni (1992) “Demographic Responses to Economic Shocks: The Case of Latin America”. (with K. Hill). Pp. 411-438 in *The Peopling of the Americas,* Vol. 3. Liege: IUSSP.

IADB (2004) *Good Jobs Wanted: Labor Markets in Latin America*, Economic and Social Progress Report, Inter-American Development Bank . Washington DC.

IMF, International Financial Statistics (various issues).

Jappelli, Tullio (1990) “Who is credit constrained in the US economy”, *Quarterly Journal of Economics* 60: 219-234.

Kirk D (1946) *Europe's Population in the Interwar Years*, League of Nations, Princeton University Press, Princeton.

Kravdal, Oystein. (2001). The High Fertility of College Educated Women in Norway. *Demographic Research* 5.

_____. (2002) “The Impact of Individual and Aggregate Unemployment on Fertility in Norway,” *Demographic Research*, Vol. 6, Article 10

Mammen K. and C. Paxson (2000) Women’s Work and Economic Development, *Journal of Economic Perspectives* 14 (4): 141-164.

Marichal, C. (1989) *A Century of Debt Crises in Latin America*, Princeton, NJ: Princeton University Press.

Mason, Andrew (1997) “The Response of Fertility and Mortality to economic Crisis and Structural Adjustment Policy during the 1980s: A Review” in *Demographic Responses to Economic Adjustment in Latin America*, Tapinos, Mason and Bravo (Eds.), Oxford University Press, New York.

Miller, Grant (2007) Contraception as Development? New Evidence from Family Planning in Colombia, manuscript, Stanford University.

Miller, Grant and B. Piedad Urdinola (2007) "Time versus Money in Child Health Production: The Case of Coffee Price Fluctuations and Child Survival in Colombia", working paper.

Murphy, M. (1992) "Economic Models of Fertility in Post-war Britain: A Conceptual and Statistical Re-interpretation", Population Studies 46: 235-58.

Ortega, Jose Antonio and David Reher (1997) "Short-term Economic Fluctuations and Demographic Behaviour: Some Examples from Twentieth-Century South America in *Demographic Responses to Economic Adjustment in Latin America*, Tapinos, Mason and Bravo (Eds.), Oxford University Press, New York.

Pantelides, Edith Alejandra (2001), "Completing the Fertility Transition: The Case of Argentina" in *Completing the Fertility Transition*, Department of Economic and Social Affairs, Population Division, United Nations.

Palloni, Alberto, Kenneth Hill, Guido Pinto Aguirre (1996) Economic Swings and Demographic Changes in the History of Latin America, *Population Studies* Vol. 50, No. 1: 105-132)

Parrado, Emilio (2000) Social change, population policies, and fertility decline in Colombia and Venezuela, *Journal Population Research and Policy Review*, Volume 19, Number 5.

Price, Joseph. (2008). "Parent-Child Quality Time: Does Birth Order Matter?" *Journal of Human Resources* 43(1): 240–265.

Rios-Neto, Eduardo and Jose Alberto Magno de Carvalho (1997) “Demographic Consequences of Structural Adjustment: The Case of Brazil” in *Demographic Responses to Economic Adjustment in Latin America*, Tapinos, Mason and Bravo (Eds.), Oxford University Press, New York.

Schady, N. (2004) Do Macroeconomic Crises Always Slow Human Capital Accumulation? *World Bank economic Review* 18 (2): 131-154

Schultz, T.P. (1985) Changing World Prices, Women's Wages, and the Fertility Transition: Sweden, 1860-1910, *Journal of Political Economy* 93 (6): 1126-1154.

Silver, Morris (1965)Births, Marriages, and Business Cycles in the United States, Journal of Political Economy Vol. 73, No. 3, pp. 237-255

Southall H, Gilbert D (1996) A good time to wed?: marriage and economic distress in England and Wales, 1839-1914, *Economic History Review* 49:35-57.

Tapinos, Georges; Andrew Mason and Jorge Bravo (1997) *Demographic Responses to Economic Adjustment in Latin America*, Oxford University Press, New York.

Tuiran, Rodolfo;Virgilio Partida, Octavio Mojarro and Elena Zuniga (2001) “Fertility in Mexico: Trends and Forecast” in *Completing the Fertility Transition*, Department of Economic and Social Affairs, Population Division, United Nations.

U.N.D.evelopment Program (1993) *Human Development Report*, Oxford.

U.N. Population Division (2002) “Fertility Levels and Trends in Countries with Intermediate Levels of Fertility”. In *Completing the Fertility Transition*, Department of Economic and Social Affairs, Population Division, United Nations.

Ureta, Manuelita, Edwards, Alejandra Cox and Duryea, Suzanne, (2001) "Women in the LAC Labor Market: The Remarkable 1990's" William Davidson Institute Working Paper Series No. 500.

Vijverberg W (1984) Discrete Choices in a Continuous Time Model: Life-Cycle Time Allocation and Fertility Decisions. In Schultz TP, Wolpin K(ed.) Research in Population Economics}, vol. 5, JAI Press, Greenwich, CT 51-85.

Ward, Michael P.; William P. Butz, (1980) Completed Fertility and Its Timing, Journal of Political Economy Vol. 88, No. 5, pp. 917-940

Yule, G. Udny. (1906) On the Changes in the Marriage- and Birth-Rates in England and Wales during the Past Half Century; with an Inquiry as to their Probable Causes., Journal of the Royal Statistical Society Vol. 69, No. 1, pp. 88-147

Table 1. Total Fertility Rates across Latin America

Country	1950[1]	1960[2]	1970[3]	1980[4]	1990	1995	2000
Argentina	3.20	3.10	3.10	3.50	2.97	2.62	2.42
Bolivia	6.75	6.67	6.54	5.53	4.89	4.36	3.66
Brazil	5.93	6.06	5.33	4.09	2.56	2.46	2.13
Chile	5.1	4.81	3.28	2.47	2.55	2.24	2.07
Colombia	6.76	6.76	4.65	3.60	2.92	2.87	2.69
Costa Rica	6.21	7.29	4.94	3.63	3.17	2.83	2.52
Dominican Republic	7.22	5.30	6.67	4.33	3.33	3.16	3.00
Ecuador	6.90	7.04	6.30	4.51	3.76	3.36	3.00
El Salvador	6.06	6.81	6.62	5.34	3.84	3.62	3.38
Guatemala	7.16	6.90	6.53	6.04	5.30	5.12	4.87
Honduras	7.05	6.05	5.98	6.44	5.28	4.84	4.36
Mexico	6.17	6.62	6.73	4.57	3.33	2.95	2.66
Nicaragua	.	.	7.21	6.14	5.17	4.15	3.23
Panama	5.05	5.76	4.99	3.63	2.88	2.72	2.64
Paraguay	.	.	5.83	5.06	4.61	4.37	4.16
Peru	.	.	.	4.70	3.76	3.39	2.80
Uruguay	.	2.95	3.00	2.66	2.53	2.37	2.16
Venezuela	.	6.60	5.68	4.13	3.62	2.94	2.51

[1]Year is 1953 for Chile, Colombia, Costa Rica, and Honduras, 1954 for Panama, and 1955 for Mexico. [2] year is 1961 for Argentina, 1963 for Colombia and Uruguay. [3] year is 1973 for Colombia, 1971 for Nicaragua and 1972 for Paraguay. [4] Year is 1982 for Ecuador

Table 2. Total Fertility Rate and Age Specific Fertility Rates

Variable	Mean	Std.Dev	Min	Max	Obs
TFR	3.6	1.0	2.1	6.7	381
ASFR 1519	90.2	27.2	40.2	168.9	368
ASFR 2024	184.7	46.3	90.4	303.3	368
ASFR 2529	175.7	40.7	106.3	331.4	368
ASFR 3034	133.8	36.9	78.6	283.6	368
ASFR 3539	86.4	35.7	38.4	189.9	368
ASFR 4044	36.0	20.1	12.2	91.8	368
ASFR 4549	7.2	5.2	0.7	21.7	368

Table 3. Economic Conditions

GDP per capita – Rates of Growth 1951-2003					**Unemployment Rates**					**Annual Inflation Rates**		**Literacy Rates**	
	Mean	Std. Dev.	Min	Max	Years	Mean	Std. Dev.	Min	Max	Years	Mean	Years	Mean
Argentina	0.95	4.96	-11.7	9.1	1970-2004	8.33	5.48	2.0	19.6	1949-2003	183.9	1950-2002	93.45
Bolivia	0.51	3.52	-12.2	5.5	1981-2003	6.86	2.10	3.1	11.6	1949-2003	270.5	1950-2001	61.58
Brazil	2.57	3.79	-6.3	11.3	1976-2001	4.92	2.42	1.8	9.6	1960-2003	285.2	1960-2000	71.04
Chile	2.05	4.50	-13.9	9.0	1975-2003	9.17	3.96	4.4	19.6	1950-2003	50.4	1950-2002	89.47
Colombia	1.75	1.95	-5.6	5.4	1975-2002	11.37	3.38	7.6	20.5	1949-2003	16.1	1950-2002	79.49
Costa Rica	1.88	3.81	-9.9	12.7	1976-2004	5.81	1.40	3.8	9.4	1951-2003	11.6	1951-2002	89.04
Dom. Rep.	2.54	4.61	-13.8	13.7	1960-2004[1]	18.65	4.97	6.4	35.0	1949-2003	9.5	1950-2002	70.47
Ecuador	2.13	5.44	-9.7	30.4	1974-2004[2]	8.65	2.58	4.4	15.1	1952-2003	20.2	1952-2001	76.86
El Salvador	0.93	3.56	-11.3	8.9	1985-2004[3]	8.21	2.37	6.2	16.9	1949-2003	8.3	1950-2002	61.32
Guatemala	1.10	2.49	-5.8	6.4	1980-2003[4]	5.90	3.64	1.5	14.0	1949-2003	7.5	1950-2002	49.33
Honduras	0.65	3.06	-9.1	8.0	1980-2004[5]	7.80	2.20	4.0	12.1	1949-2003	7.7	1950-2001	56.51
Mexico	2.02	3.02	-7.8	7.5	1980-2004	3.80	1.19	2.2	6.6	1949-2003	21.4	1950-2000	76.28
Nicaragua	0.10	6.25	-28.7	12.3	1980-2003	9.69	4.75	2.3	17.8	1970-2003	814.7	1950-2001	55.44
Panama	2.16	4.13	-17.6	12.2	1970-2003[6]	11.28	3.34	5.8	16.3	1949-2003	2.0	1950-2002	81.89
Paraguay	1.42	3.27	-5.8	7.9	1979-2003	6.83	2.71	2.2	14.7	1949-2003	17.9	1950-2001	81.93
Peru	0.98	4.54	-14.1	10.8	1980-2004	8.20	1.44	4.8	10.1	1949-2003	242.9	1961-2002	78.69
Uruguay	0.85	4.30	-13.3	8.2	1980-2004	11.17	2.97	6.7	17.0	1949-2003	42.5	1963-2002	95.05
Venezuela	-0.27	4.47	-11.3	7.9	1975-2004	9.97	3.58	4.6	18.0	1949-2003	16.2	1950-2002	77.23

Sources. GDP per capita: ECLAC; Inflation: IMF; Unemployment: ILO, ECLAC, and Central Bank of Dominican Republic.
Missing information for: [1]1985 and 1989; [2]1976 and 1978-79; [3]1987; [4]1999-01; [5]2000; [6] 1980-81 and 1990.

Table 4. Total Fertility Rate: unemployment and growth

	(1)	(2)	(3)	(4)
	Δ ln TFR	**Δ** ln TFR	**Δ** ln TFR	**Δ** ln TFR
Δ ln Literacy	-0.016	-0.029	-0.007	-0.104
	(-0.112)	(-0.195)	(-0.0488)	(-0.74)
Δ ln Unemployment (t-1)	-0.012	-0.011	-0.011	
	(-2.089)	(-2.026)	(-1.920)	
Δ lnUnemployment (t-2)	-0.007		-0.006	
	(-1.299)			
GDPpc growth (t-1)	0.000	0.000	-0.000	0.0006
	(0.200)	(0.271)	(-0.228)	(1.68)
GDPpc growth (t-2)	-0.000		-0.000	-0.000
	(-1.079)		(-1.309)	(-0.22)
Debt Crisis 1983-84			-0.010	
			(-1.851)	
Joint significance of unemp. vars (p-value)	2.92		2.37	
	(0.055)		(0.096)	
Observations	335	354	335	335
Number of countries	18	18	18	18

Unbalanced Panel, fixed effects. It includes two lags of inflation rates, country dummies and a time trend.

Table 5. Change in Logs of Age-Specific Fertility Rate: unemployment and growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Δ F1519	**Δ**F2024	**Δ**F2529	**Δ**F3034	**Δ** F3539	**Δ** F4044	**Δ** F4549
Δ ln Literacy	-0.070	-0.025	0.082	0.103	0.086	0.014	0.109
	(-1.353)	(-0.798)	(0.908)	(1.204)	(1.076)	(0.166)	(0.593)
Δ ln Unemp (t-1)	-0.018	-0.017	-0.006	-0.001	-0.006	-0.007	-0.001
	(-2.201)	(-3.070)	(-1.142)	(-0.0839)	(-0.656)	(-0.814)	(-0.0185)
Δ ln Unemp (t-2)	-0.008	-0.009	-0.004	-0.001	0.002	-0.011	-0.036
	(-0.761)	(-1.679)	(-0.619)	(-0.194)	(0.231)	(-1.362)	(-1.465)
GDPpc growth (t-1)	-0.000	0.000	0.000	0.000	-0.000	0.001	0.001
	(-0.324)	(0.373)	(0.477)	(0.370)	(-0.271)	(0.763)	(0.687)
GDPpc growth (t-2)	0.000	-0.001	-0.001	-0.001	0.001	-0.000	-0.000
	(0.469)	(-2.026)	(-1.788)	(-1.200)	(0.529)	(-0.0570)	(-0.169)
Joint significance of unemp. vars (p-value)	3.12 (0.046)	6.10 (0.002)	0.73 (0.482)	0.02 (0.979)	0.26 (0.771)	1.14 (0.321)	1.10 (0.333)
Observations	324	324	324	324	324	324	324
Countries	18	18	18	18	18	18	18

Note: Unbalanced Panel, fixed effect. It includes two lags of inflation rates, country dummies and a time trend.

Table 6. Proportional Hazard Models of Transitions to births of different order.

	First	First	First	First	Second	Third
Woman						
Years of Education	0.912	0.912	0.912	0.912	0.973	0.958
	(62.67)	(59.84)	(62.55)	(62.66)	(18.83)	(22.59)
Rural	0.993	0.992	0.993	0.993	1.163	1.156
	(0.44)	(0.43)	(0.44)	(0.44)	(10.70)	(8.74)
Access to Electricity	0.915	0.904	0.916	0.915	0.871	0.836
	(5.01)	(5.13)	(4.77)	(4.81)	(9.04)	(10.40)
Country						
Literacy Rate	0.961	0.952	0.970	0.961	0.996	0.994
	(7.17)	(8.22)	(5.95)	(7.23)	(0.76)	(0.98)
Unempl.(t-1)	0.988	0.987		0.988	0.984	0.988
	(4.21)	(4.00)		(4.24)	(5.58)	(3.24)
Unempl.(t-2)	0.998	0.991		0.998	1.002	1.003
	(0.84)	(2.22)		(0.78)	(0.82)	(0.99)
Unempl.(t-3)		0.997				
		(0.87)				
Unempl.(t-4)		1.012				
		(4.13)				
Gdp pc rate_1	1.007	1.009	1.008	1.006	1.002	0.999
	(4.56)	(5.05)	(5.36)	(3.82)	(1.39)	(0.59)
Gdp pc rate_2	0.999	0.998	1.002	0.999	0.996	1.002
	(0.47)	(1.22)	(1.09)	(0.53)	(2.60)	(1.31)
Debt Crisis 1983-84				0.960		
				(2.09)		
Joint significance of	57.45	89.72	__	57.19	57.38	16.56
unemp. vars (p-value)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Observations	705921	620970	705921	705921	212651	204621

Hazard ratios from Cox proportional hazard model stratified by women's birth cohort (1930s-40s; 1950s; 1960s; 1970s and 1980s). Robust z statistics in parentheses. It includes two lags of inflation rates, country dummies, time trend, age at first birth (for 2nd and 3rd births), months between 1st and 2nd birth (for 3rd birth) and gender of previous children.

Table 7. Women's education in the DHS sample

	Years of Education		
	Less than 7	7 or more	13 or more
Bolivia (1998)	46%	54%	14%
Brazil (1996)	55%	45%	5%
Colombia (2000)	42%	58%	11%
Dominican Rep. (2002)	36%	64%	13%
Ecuador (1987)	55%	45%	9%
Guatemala (1998)	82%	18%	2%
Mexico (1987)	56%	44%	7%
Nicaragua (2001)	60%	40%	7%
Paraguay (1990)	67%	33%	5%
Peru (2000)	39%	61%	16%

Table 8. Proportional Hazard Models of Transitions to births of different order by Education Groups

	First			Second			Third		
Years of Education	**0-6**	**7+**	**13+**	**0-6**	**7+**	**13+**	**0-6**	**7+**	**13+**
Woman									
Years of Education	0.962	0.856	0.883	0.989	0.969	0.970	0.962	0.966	0.972
	(11.57)	(50.31)	(10.36)	(3.45)	(9.69)	(2.16)	(10.40)	(7.22)	(1.40)
Rural	0.965	1.041	1.194	1.131	1.175	1.192	1.131	1.174	1.371
	(1.94)	(1.60)	(3.02)	(7.89)	(6.28)	(2.95)	(6.38)	(5.12)	(3.18)
Access to Electricity	0.910	0.801	0.795	0.889	0.846	0.885	0.857	0.738	0.914
	(4.91)	(6.66)	(2.29)	(7.03)	(4.93)	(1.18)	(8.27)	(7.36)	(0.54)
Country									
Literacy Rate	0.960	0.942	0.966	0.992	0.991	0.972	0.994	0.986	1.006
	(5.71)	(7.04)	(1.82)	(1.46)	(1.08)	(1.56)	(0.83)	(1.32)	(0.21)
Unempl.(t-1)	0.995	0.980	0.978	0.985	0.984	0.990	0.995	0.979	0.972
	(1.35)	(4.73)	(2.22)	(4.18)	(3.35)	(0.99)	(1.30)	(3.05)	(1.53)
Unempl.(t-2)	0.991	1.000	1.001	1.000	1.002	1.007	0.995	1.017	1.037
	(2.48)	(0.02)	(0.11)	(0.06)	(0.41)	(0.64)	(1.31)	(2.56)	(2.14)
Gdp pc rate_1	1.008	1.007	1.003	1.001	1.005	1.012	1.000	0.998	0.999
	(4.14)	(3.05)	(0.72)	(0.47)	(1.93)	(2.33)	(0.23)	(0.65)	(0.19)
Gdp pc rate_2	1.000	0.999	1.000	0.997	0.996	0.996	1.000	1.007	1.010
	(0.13)	(0.27)	(0.03)	(1.80)	(1.48)	(0.90)	(0.16)	(2.40)	(1.49)
Joint significance of	29.28	50.16	10.87	38.89	20.82	1.01	14.70	9.35	4.66
unemp. vars (p-value)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.604)	(0.001)	(0.009)	(0.097)
Observations	260923	444998	124224	100930	111721	27752	104367	100254	23632

Hazard ratios from Cox proportional hazard model stratified by women's birth cohort (1930s-40s; 1950s; 1960s; 1970s and 1980s). Robust z statistics in parentheses. It includes two lags of inflation rates, country dummies, time trend, age at first birth (for 2nd and 3rd births), months between 1st and 2nd birth (for 3rd birth) and gender of previous children.

Table 9. Proportional Hazard Models of Transitions to births of different order by Age Cohorts

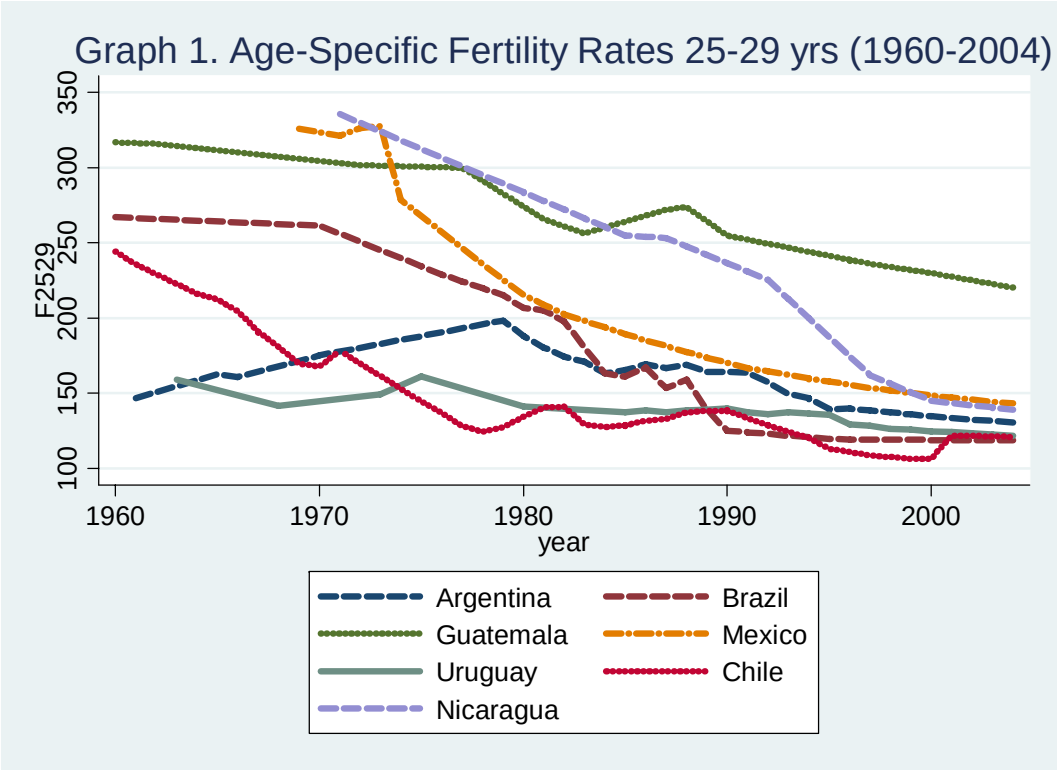
	First		Second		Third	
	1960+	**Before 1960**	**1960+**	**Before 1960**	**1960+**	**Before 1960**
***Woman*:**						
Years of Education	0.904	0.953	0.965	0.995	0.954	0.965
	(61.68)	(15.01)	(21.35)	(1.79)	(21.17)	(10.97)
Rural	1.001	0.904	1.153	1.186	1.149	1.187
	(0.05)	(2.78)	(9.09)	(5.65)	(7.08)	(5.85)
Electricity	0.932	0.961	0.876	0.894	0.830	0.849
	(3.60)	(0.81)	(7.97)	(2.99)	(9.56)	(4.73)
Country						
Literacy Rate	0.960	0.990	0.984	1.106	0.974	1.095
	(7.50)	(0.30)	(3.08)	(4.85)	(3.79)	(4.52)
Unempl.(t-1)	0.983	1.001	0.982	0.996	0.984	1.017
	(4.87)	(0.20)	(5.11)	(0.69)	(3.41)	(2.55)
Unempl.(t-2)	1.003	0.993	1.002	0.999	1.002	1.011
	(0.76)	(1.10)	(0.48)	(0.13)	(0.52)	(1.65)
Gdp pc rate_1	1.009	0.997	1.005	0.999	1.003	0.995
	(5.09)	(0.69)	(3.18)	(0.33)	(1.48)	(1.33)
Gdp pc rate_2	0.999	1.001	0.998	0.997	1.004	1.007
	(0.51)	(0.17)	(1.22)	(0.96)	(1.75)	(2.11)
Joint significance of unemp.	54.73	1.26	65.95	0.78	28.00	21.29
vars (p-value)	(0.000)	(0.533)	(0.000)	(0.678)	(0.000)	(0.000)
Observations	633697	72224	165187	47464	135792	68829

Hazard ratios from Cox proportional hazard model stratified by women's birth cohort (1930s-40s; 1950s; 1960s; 1970s and 1980s). Robust z statistics in parentheses. It includes two lags of inflation rates, country dummies, time trend, age at first birth (for 2nd and 3rd births), months between 1st and 2nd birth (for 3rd birth) and gender of previous children.

Table 10. Proportional Hazard Models of Transitions to births – Rural vs. Urban

	First		Second		Third	
	Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
Woman						
Years of Education	0.925	0.906	0.978	0.972	0.966	0.957
	(32.02)	(53.96)	(9.60)	(15.8)	(10.74)	(18.3)
Electricity	0.953	0.769	0.883	0.825	0.848	0.791
	(2.27)	(6.53)	(6.74)	(6.12)	(8.48)	(6.48)
Country						
Literacy Rate	0.947	0.966	0.995	0.996	1.007	0.983
	(6.96)	(4.62)	(0.81)	(0.60)	(0.97)	(1.99)
Unempl.(t-1)	0.996	0.984	0.988	0.983	0.991	0.987
	(1.09)	(4.17)	(3.14)	(4.57)	(1.83)	(2.68)
Unempl.(t-2)	0.990	1.001	1.002	1.001	1.003	1.004
	(2.53)	(0.29)	(0.60)	(0.33)	(0.62)	(0.72)
Gdp pc rate_1	1.009	1.006	1.004	1.000	1.001	0.997
	(3.79)	(3.16)	(1.87)	(-0.23)	(0.60)	(1.07)
Gdp pc rate_2	1.001	0.999	0.998	0.995	1.000	1.004
	(0.26)	(0.60)	(1.13)	(2.47)	(0.11)	(1.52)
Joint significance of unemp.	27.51	37.07	18.56	40.97	4.93	12.01
vars (p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.085)	(0.002)
Observations	229626	476295	70386	142265	67621	137000

Hazard ratios from Cox proportional hazard model stratified by women's birth cohort (1930s-40s; 1950s; 1960s; 1970s and 1980s). Robust z statistics in parentheses It includes two lags of inflation rates, country dummies, time trend, age at first birth (for 2nd and 3rd births), months between 1st and 2nd birth (for 3rd birth) and gender of previous children.


Graph 1. Age-Specific Fertility Rates 25-29 yrs (1960-2004)
F2529
100
150
200
250
300
350
1960
1970
1980
1990
2000
year
Argentina
Brazil
Guatemala
Mexico
Uruguay
Chile
Nicaragua