

## **Recessions and Babies' Health**

**Ainhoa Aparicio  
Libertad González**

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# Recessions and Babies' Health

Ainhoa Aparicio

(Collegio Carlo Alberto)

Libertad González

(Universitat Pompeu Fabra and Barcelona GSE)

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**Abstract:** We study the effect of the business cycle on the health of newborn babies using 30 years of birth certificate data for Spain. Exploiting regional variation over time, we find that babies are born healthier when the local unemployment rate is high. Although fertility is lower during recessions, the effect on health is not the result of selection (healthier mothers being more likely to conceive when unemployment is high). We match multiple births to the same parents and find that the main result survives the inclusion of parents fixed-effects. We then explore a range of maternal behaviors as potential channels. Fertility-age women do not appear to engage in significantly healthier behaviors during recessions (in terms of exercise, nutrition, smoking and drinking). However, they are more likely to be out of work. Maternal employment during pregnancy is in turn negatively correlated with babies' health. We conclude that maternal employment is a plausible mediating channel.

## 1. Introduction

Health at birth has been shown to have important effects on long-term outcomes. Babies born with low weight<sup>1</sup> have slower cognitive development and worse adult health, as well as lower educational attainment and income (*refs*), and the evidence suggests that the link is causal.

Even in rich countries, a significant fraction of babies are born with low birth weight (LBW). For instance, 6.5% of singleton births in the US were LBW in 2006, or 6% in Spain in 2011. Moreover, there is a large degree of inequality in health at birth, and LBW is associated with sociodemographic characteristics. In the US, 15% of black babies were LBW in 2006. In Spain, 4.7% of babies with low-educated parents were LBW in 2010, compared with 7.3% of those with high-educated parents, and 10% of babies born to a single mother. These differences are also apparent in other health measures, such as prematurity and neonatal mortality rates.

There is evidence that recessions increase poverty and income inequality (see Heathcote, Violante & Peri, 2010 for the US or Hospido and Bonhomme, 2012 for Spain).<sup>2</sup> Do they also lead to a worsening of babies' health at birth? If so, recessions could have important long-term consequences for the next generation. Recent work by van den Berg et al. (2006) shows that “an individual born in a recession lives a few years less than an individual born in a boom.” Is this long-term effect already determined at the time of birth?

Why would recessions affect health at birth? A first-order effect could take place via household income. High unemployment and low wages could affect household

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<sup>1</sup> Typically defined as under 2,500 grams (*reference*).

<sup>2</sup> On the other hand, there is also a literature that suggests that adult health improves during recessions (see Ruhm 2000, etc).

consumption, and thus maternal nutrition and health, leading to worse birth outcomes. However, recessions could affect maternal health through other channels, too. For instance, they could affect the time use of mothers-to-be, their working conditions, their mental health, etc. The cycle could also affect the quality of medical care received by women, and even other environmental factors such as air quality (pollution).

We study the effect of the business cycle on birth outcomes in Spain. We exploit very rich birth-certificate data from 1980 to 2010, taking advantage of regional variation across the 50 Spanish provinces. We proxy the point in the cycle by the province unemployment rate (or employment-population ratio), calculated from quarterly Labor Force Survey data. As measures of health at birth, we observe birth weight, weeks of gestation, and neonatal mortality.

Previous work by Dehejia and Lleras-Muney (2004) using a similar strategy for the US found that babies conceived during recessions are born significantly healthier (!), although the channels are unclear and they cannot rule out selection as the main driver. Miller and Urdinola (2010) also find that child mortality is procyclical in Colombia, and they attribute it to changes in maternal time use (after birth). Bhalotra (2010) and Bozzoli and Quintana-Domeque (2013), however, find the opposite effect for India and Argentina, respectively. This suggests that the sign of the effect may vary with the income level of the country, with the first-order effect dominating in poor countries, and possibly interacting with the effect of the cycle on maternal time-use.

We contribute to this literature by using 30 years of data for Spain, a middle-high income country with large regional heterogeneity as well as large fluctuations in unemployment over time. First, in a panel data regression with province and year fixed-effects, we confirm the US finding that babies are born healthier when unemployment is high. This effect is driven by rich regions.

We then proceed to discard that this association is driven by selection (“better” mothers being more likely to conceive during recessions). We do this both by analyzing the effect of the cycle on fertility by observed characteristics of the families, and by exploiting multiple births to the same parents at different points in the cycle.

Finally, we exploit potential behavioral channels. We focus on mothers’ (pre-birth) health-related behaviors and labor force participation. By exploiting multiple waves of the National Health Survey, we conclude that mothers-to-be are not more likely to engage in health-promoting behaviors during recessions, at least in terms of exercise, smoking, drinking and diet. However, we do find that, when unemployment is high in the region, mothers-to-be are significantly less likely to be in the labor force. When controlling for maternal employment in the regressions with parents fixed-effects, the effect of the unemployment rate on newborns’ health disappears. We thus conclude that maternal employment during pregnancy may be an important mediating channel.

The remainder of the paper is organized as follows. We first present the baseline results (in section 2), showing that regional unemployment is associated with healthier newborns, after controlling for region and year fixed-effects. We then (in section 3) evaluate how fertility changes with the cycle and whether composition effects (in observable characteristics of the parents) may plausibly account for the initial association. Section 4 presents the results with parents’ fixed-effects. Then we move on to the analysis of mothers’ health-related behaviors (section 5), and finally, in section 6 we evaluate maternal employment as an additional potential channel. Section 7 concludes with a discussion of the main results and evaluates the plausibility of other potential channels.

## 2. Baseline health results

### 2.1 Data and descriptive statistics

The national unemployment rate from 1980 to 2012 is shown in figure 1, using data from the Labor Force Survey. The lowest historical level was reached in 2007, at 8%, while there are three peaks of high unemployment in 1985 (21%), 1994 (24%) and 2012 (25%). However, the national figures hide even larger regional variation. Figure 2 displays the unemployment rate across the 50 Spanish provinces in 2012. The lowest level is 12.5% (in Guipuzcoa), while the highest is reached in Jaén (37%). Our analysis exploits regional variation in the evolution of the unemployment rate over time. Because of concerns regarding measurement error, we supplement our analysis with the employment-to-population ratio (also calculated with Labor Force Survey data), which is arguably less subject to measurement error.

The health information about newborn babies is derived from (micro-level) birth-certificate data, made publicly available by the National Statistical Institute. Figure 3 shows the time trends in two measures of infant health: infant mortality (*define*) and the fraction of babies under 2,500 grams of weight at birth. During the 30-year period, infant mortality declined from almost 13 to about 3 babies per 10,000 births, while the fraction of LBW babies increased from less than 3 to more than 7 percent.

Because of the marked long-term trends in the health variables, it is hard to see any correlation with the business cycle. Figure 3 displays, in the same graph, the unemployment rate for the 30 years of analysis, together with each of our six health variables, detrended.<sup>3</sup> The first panel is for the fraction of babies born below 2,500 grams. Except for the initial years, a negative correlation is apparent: the increase in unemployment in the early 1990's coincides with a drop in the fraction of LBW babies,

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<sup>3</sup> We just subtract a linear trend, estimated by OLS.

while then sustained fall in unemployment after 1994 coincides with a substantial increase in LBW. This observation is confirmed by a simple time-series regression analysis, reported in table A1. We regress the six measures of babies' health at the national level on the unemployment rate and a linear trend, for the 30 years of data. The sign is negative for all six measures, statistically significant for three of them. When unemployment is high, there are significantly fewer children with LBW, lower prematurity rates, and lower neonatal mortality. These descriptive results are confirmed in the next section, where the data are analyzed at the regional level.

## **2.2 Econometric specification**

Our baseline specification is simple: we regress several measures of health at birth on the regional unemployment rate, controlling for province and year fixed-effects, using data for the 50 Spanish provinces over 30 years (1981-2010). The specification is the following:

$$y_{it} = \alpha + \beta u_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

Where  $y$  is a measure of newborn babies' health, for babies born in province  $i$  and conceived in year  $t$ . We estimate year of conception by combining (individual-level) information on date of birth and number of gestational weeks at birth. Our measures of babies' health are: the fraction of babies born under 2,500 grams, the fraction under 1,500 gram, the fraction born before the 38<sup>th</sup> gestational week ("prematures"), the fraction who died within 24 hours of labor, the fraction dying between 24 hours and 28 days of labor, and the fraction dying between 29 days and 1 year after birth.

Our main explanatory variable is  $u$ , the unemployment rate (or employment-to-population ratio) in province  $i$  and year  $t$ . We include fixed-effects for province ( $\mu$ ) and year ( $\lambda$ ), and also estimate additional specifications with province-specific linear trends.

The regressions are weighted by the number of births in each cell. Standard errors are clustered at the province level to allow for serial correlation. The number of observations is 1,500 (50 provinces times 30 years).<sup>4</sup>

### **2.3 Results**

Descriptive statistics for all the relevant variables are presented in table 1. There are on average 22,000 births in each province-year cell. More than 5% of babies are LBW, and about 0.6% are born below 1,500 grams. More than a fourth are born at 38 gestational weeks or less, and 0.56% do not survive the first 24 hours. We supplement these outcomes from birth certificate data with information from death certificates. About 0.4% of newborns die between days 1 and 28 of life, and an additional 0.2% die before their first birthday.

Regarding our main explanatory variable, the average province unemployment rate is 16.6%, but there is considerable variation, with a standard error of 7, a minimum of 0 and a maximum of 42%. The average employment-to-population ratio is 44.5%. As for family characteristics, most mothers have between 25 and 35 years of age, 83% are married, and 15% have a high-skill occupation.

Table 2 presents the results of estimating equation 1 for five measures of newborns' health. The first row controls only for province and year fixed effects. All signs are negative, suggesting that high unemployment is associated with fewer underweight babies and lower infant mortality. Two of the five are statistically significant.

The second row adds province-specific linear trends. This increases precision in all specifications. The magnitude of the estimates is sizeable. A 10-point increase in the province unemployment rate is associated with a 7 to 9% increase in the fraction of

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<sup>4</sup> The Labor Force Survey is conducted quarterly, so we can also perform the analysis at the quarterly level. The yearly analysis is more conservative.

babies born below 1,500 grams of weight, and about a 20% decline in mortality during the first 12 months.

In order to analyze whether this effect varies by income, we allow the effect of the cycle to vary with the income level of the region. In particular, we interact the unemployment rate with a dummy for the provinces in the bottom third of the distribution of per capita GDP in 1980. The results are reported in table A2. We find that the positive effect of unemployment on neonatal health is driven by the richer regions, while we cannot reject a zero effect in the poorer regions.

The average health of newborns thus appears to improve during recessions in rich regions (at least at the margin of very negative health outcomes, such as LBW and mortality). This runs counter to our initial hypothesis, and we would like to understand why. The first candidate explanation is changes in composition: perhaps the average characteristics of new parents vary with the cycle. If parents with characteristics associated with healthier babies are more likely to give birth when unemployment is high, that could generate the observed association between the cycle and health.

In a first attempt to deal with this possibility, the last two rows of table 2 include controls for average parental characteristics at the province-year level. We control for mothers' age, marital and immigrant status, and occupation of both parents. The unemployment rate remains significant, and the sign and magnitude of the coefficients is barely affected. This suggests that observable family characteristics do not explain the main effect. In the next section, we confirm this finding by analyzing explicitly the effect of the business cycle on fertility and family characteristics.

### 3. Fertility and composition effects

#### 3.1 The cycle and fertility

Previous literature (*refs*) suggests that fertility declines during recessions. If this is the case, then families who give birth when unemployment is high would be “self-selected”, and their (observable and/or unobservable) characteristics could explain the association between the business cycle and the health of newborn babies.

Figure 5 shows the annual birth rate (number of births per 1,000 population) in Spain between 1980 and 2011. Fertility declined steadily during the 1980’s and early 1990’s, reaching its lowest level, about 9 births per 1,000 people, in 1996. The birth rate then increased for the next decade, reaching a peak at 11.4 in 2008, and falling back down since then.

In order to test whether fertility falls when unemployment is high, we run regressions of the form of equation 1, where the dependent variable is a measure of fertility at the province-year level (either the total number of births, the log, or the birth rate). Results are presented in table 3.

The first two rows use the unemployment rate as the main explanatory variable. All signs are negative, as expected, but precision is low. The last two rows use the employment-to-population ratio, which arguably contains less measurement error. These results confirm that fertility falls significantly during recessions.<sup>5</sup>

We also explore whether fertility is affected differently by income level of the region. The results are reported in table A4. We find that the negative effect of recessions on fertility is again driven by the richer regions.

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<sup>5</sup> We also analyze whether the fertility effect is the result of changes in the number of abortions. The results are presented in table A2. We find that abortions do not increase when unemployment is high. Thus, the fertility effect can be traced to fewer conceptions (not more abortions) during recessions.

### ***3.2 The cycle and parental characteristics***

Next we test whether parents with characteristics associated with healthier babies are more likely to give birth during recessions. In order to do that, first we correlate our observable characteristics (from the birth-certificate data) with the different measures of babies' health. It turns out that mothers aged between 25 and 35, married mothers, and high-skill parents, tend to have healthier babies. The first row of table 4 shows the sign of the correlation between babies' health and each of the observable characteristics of the parents.

Thus, if changes in the composition of the families giving birth (along observable characteristics) were to explain our main finding, it would have to be the case that "better" families are more likely to have a baby when unemployment is high. We test this hypothesis directly by estimating regressions of the form of equation 1, where the dependent variable is the fraction of families in each province-year cell with a mother aged between 25 and 35, a married mother, etc. The results are displayed in table 4.

We find that high unemployment is significantly associated with more mothers who report that the father is unknown, and fewer high-skill parents. The signs are the opposite from the ones that would explain away the (positive) effect of recessions on babies' health. This explains why the magnitude of the coefficient on unemployment tends to remain stable or even increase in table 2 when we include the controls.

We conclude that the positive association between unemployment and babies' health cannot be attributed to the observable characteristics of parents. However, it could still be that parents who give birth during recessions are positively selected along dimensions that we do not observe. We address this possibility in the next section.

#### **4. Results with parents fixed-effects**

The richness of the birth certificate data allows us to rule out selection effects by comparing multiple births to the same parents at different points in the cycle. For each newborn, we use information on his or her parents' month (and year) of birth, as well as the month (and year) of birth of their previous child, to link each baby to his or her siblings.<sup>6</sup>

Table 5 reports the results of estimating the main regressions for the subsample of matched siblings. The first two rows confirm that the main patterns are still present in this subsample: babies' health improves when unemployment is high. The third row displays the results of regressions that now include family fixed-effects (i.e. fixed-effects for each pair of siblings). The last two rows also include province fixed-effects and trends (identified out of families that move across provinces between births). Note that sign, magnitude and precision are barely altered by the inclusion of the family fixed-effects. For instance, the estimated coefficient for unemployment in the regressions for LBW varies between -0,003 and -0,017 in the specifications without the family fixed effects, compared with -0,003 to -0,023 in the within-family regressions.

Thus, even within the same family, babies conceived in high-unemployment periods are born healthier than their siblings conceived during a boom. In the next section, we move on to explore factors that could explain this effect.

#### **5. Maternal health behaviors**

A recent literature finds that adult health tends to improve during recessions (Ruhm, 2000, *etc*), at least in part due to improved health-inducing behaviors. One possible

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<sup>6</sup> We find unique matches for about 44% of the cases. We use this subsample for the analysis in this section.

explanation for our main finding is that (pregnant) women engage in healthier behaviors when unemployment is high.

In order to test this hypothesis, we merge nine waves of the Spanish National Health Survey, covering 1987-2011. We then restrict the sample to women of childbearing age (in the main table, 20 to 40)<sup>7</sup>, select a wide range of measures of health-related behaviors and outcomes, and aggregate the data at the province-year level.

Descriptive statistics are reported in the last panel of table 1. About 42% of the women in the sample smoke, 87% report having consumed alcohol in the previous 2 weeks, and 47% report exercising. Women weigh on average 61 kilograms, and report sleeping an average of 8 hours a night.

We run regressions of the form of equation 1 where the dependent variable is a measure of women's health or health-related behavior, in a given province and year. The results are presented in table 6. Most of the coefficients are statistically insignificant. We only find strong results for smoking. When the unemployment rate is high, the fraction of smokers is also higher.<sup>8</sup> At least in this dimension, women do not appear to engage in healthier behaviors during recessions. We find no consistent effects for drinking. Women do seem to exercise more, weigh less and sleep more in high unemployment periods, but we cannot discard zero effects.

In sum, we do not find strong support for the hypothesis that mothers-to-be engage in significantly healthier behaviors in periods of high unemployment, at least in terms of smoking, drinking, exercising and sleep.

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<sup>7</sup> We explore different age ranges and also restrict the sample to married women in alternative specifications. The main conclusions remain.

<sup>8</sup> The second panel of table 6 shows that the effect of the cycle on smoking is driven by rich regions.

## 6. Maternal employment

Previous research suggests that maternal time use might have important effects on babies' health. In particular, both Bhalotra (2012) and Miller & Urdinola (2010) find that the effect of the business cycle on the time use of mothers (after birth) can explain the relationship between the cycle and infant mortality. However, it is less clear that maternal employment *before birth* (during pregnancy) can have consequences on babies' health. We next explore this possibility.

The data provided in the birth certificates allows us to measure the employment status of mothers before giving birth. Two things are required for maternal employment to explain our results. First, it should be the case that mothers-to-be are less likely to be in the labor force in periods of high unemployment. Second, maternal employment during pregnancy should be negatively related to the health of newborn babies. We proceed to evaluate these two claims.

First, we estimate regressions of the form of equation 1, where the dependent variable is now maternal employment. The results are reported in the first column of table 7. We find that, as expected, mothers are significantly less likely to be employed when unemployment is high.

Second, we evaluate the relationship between babies' health and maternal employment (*explain*).

Finally, we re-run our original regressions for babies' health (with and without family fixed-effects), now controlling for maternal employment. The results are reported in table 7 (columns 3, 5 and 7). Once we control for mothers' labor force participation, there is no significant association between the unemployment rate and any of the measures of babies' health. For instance, the results for LBW show that, when we

control for maternal employment, the magnitude of the coefficients on the unemployment rate fall by a half, and they turn statistically insignificant.

## **7. Discussion and conclusions**

Using birth certificate and Labor Force Survey data for Spain between 1980 and 2010, we have shown that the health of newborn babies appears to improve (on average) during recessions. This is not the result of selection in parental characteristics (observed or unobserved). We also do not find evidence that mothers-to-be engage in healthier behaviors when unemployment is high. However, they are more likely to be out of the labor force, which in turn is associated with better outcomes for babies.

There could still be additional channels underlying the positive association between the unemployment rate and babies' health. For instance, since fertility is lower during recessions, it is possible that pregnant women receive better quality medical care as a result, both during pregnancy and labor. In order to explore this possibility, we estimate regressions such as equation 1, where the dependent variable is the fraction of women giving birth in a hospital (versus at home or somewhere else), or the fraction of women giving birth with the assistance of a health professional. Both these variables are available in the birth certificate data. Table A5 shows the results. When unemployment is high, the fraction of women giving birth somewhere other than in a hospital decreases, as well as the fraction not assisted by a health professional. Finally, the health survey data asks women how many minutes they had to wait during their last doctor visit, and the third column of table A5 shows that average wait times are lower during recessions (although these results are very imprecise). These results suggest that congestion in the health system during booms could also explain part of the results.

One could still come up with additional channels that could contribute to our main effect. For example, periods of lower economic activity could result in less pollution and better air quality, which in turn could affect babies' health positively. A recent literature shows that air quality during pregnancy can have important health effects for newborns (*refs*).

This work contributes to previous literature showing that, at least in rich countries (or regions), babies' health is countercyclical. We believe we can plausibly discard that this is due to selection effects, and we provide some evidence suggesting that maternal employment during pregnancy can be a potentially relevant mediating factor.

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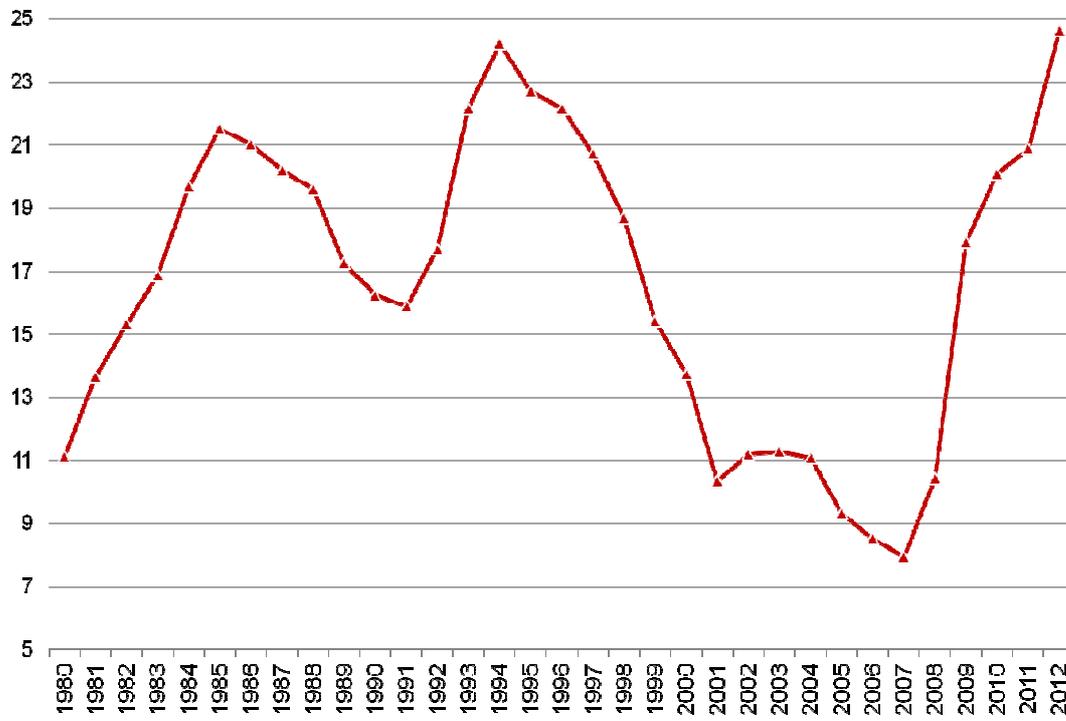
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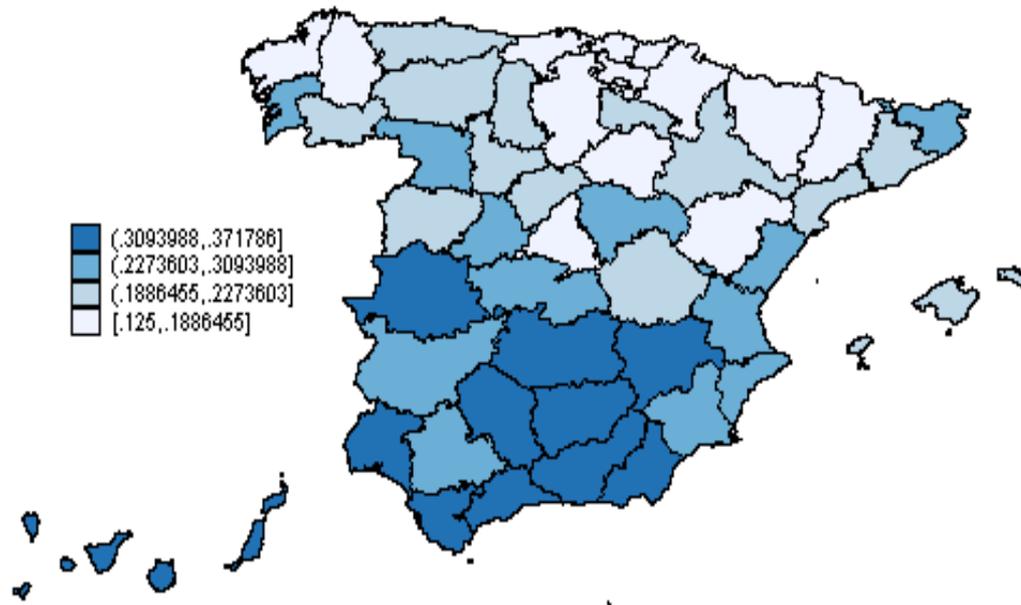
## Tables and figures

Figure 1. National unemployment rate, Spain 1980-2012



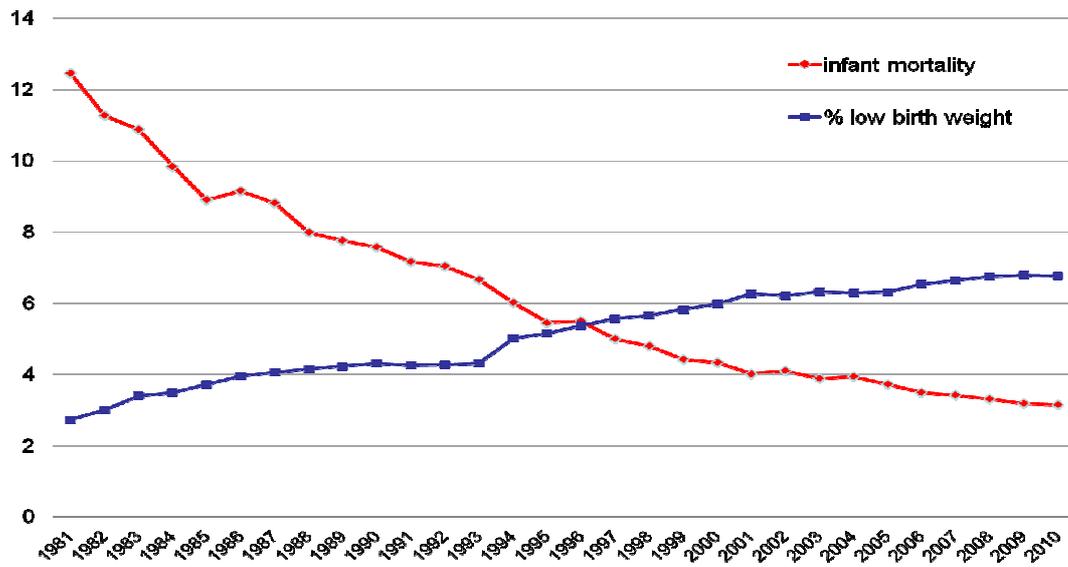
Source: Spanish Labor Force Survey (2<sup>nd</sup> quarter)-

Figure 2. Unemployment rate by province, Spain 2012



Source: Spanish Labor Force Survey 2012 (2<sup>nd</sup> quarter).

Figure 3. Neonatal health, Spain 1980-2010



Source: Vital statistics, National Statistical Institute ([www.ine.es](http://www.ine.es)).

Figure 4. Unemployment rate and newborn babies' health, 1981-2010

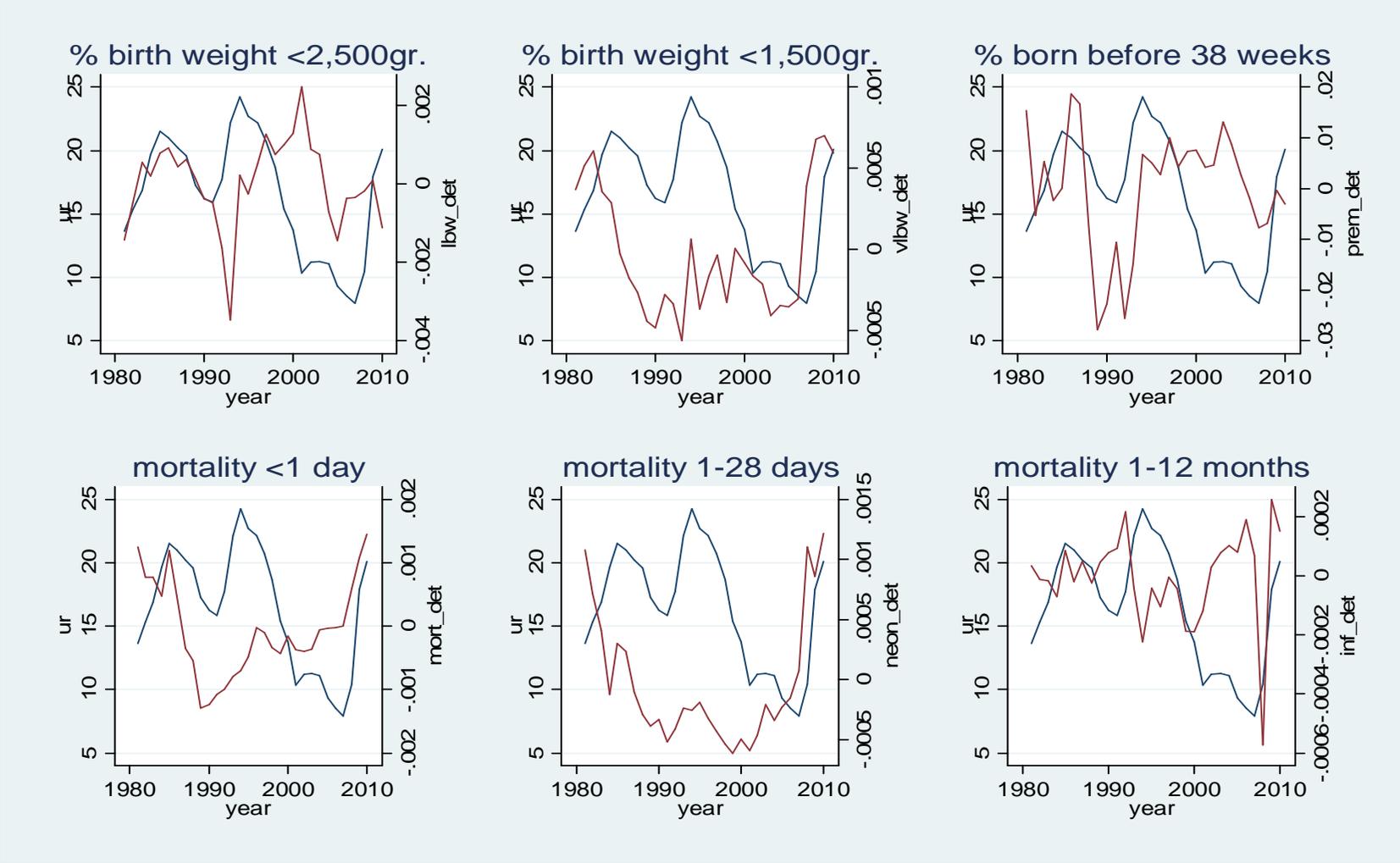
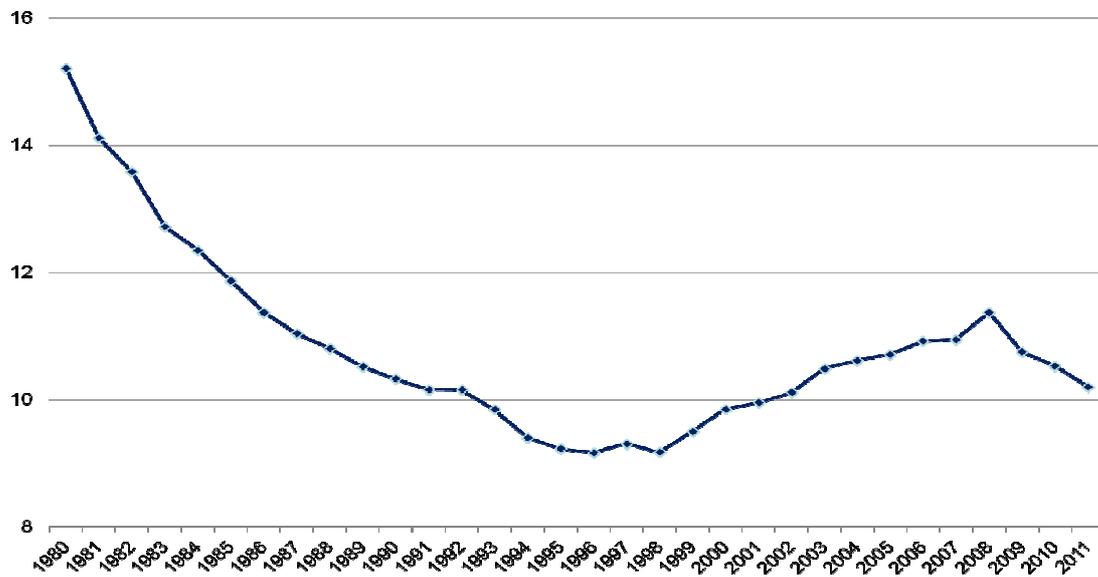


Figure 5. Birth rate (annual number of births per 1,000 people), Spain 1980-2011



Source: National Statistical Institute ([www.ine.es](http://www.ine.es)).

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Province	25	14	1	50
<b>Birth certificate data (N=30*50=1500)</b>				
Year of conception	1,996	9	1981	2010
Number of births	22018	20940	612	77201
% low birth weight	0,0519	0,0151	0,0124	0,0932
% very low birth weight	0,0059	0,0020	0	0,0162
Prematurity (38 weeks or less)	0,2234	0,0975	0,0392	0,9062
Early neonatal mortality (24h.)	0,0056	0,0029	0	0,0212
% mothers <25	0,1956	0,0948	0,0414	0,4599
% mothers 25-35	0,6738	0,0699	0,4499	0,8254
% mothers >35	0,1306	0,0521	0,0573	0,2972
% mothers married	0,8271	0,1113	0,3911	0,9819
% no info on father	0,0178	0,0095	0,0001	0,0776
% mothers high skill ocup.	0,1508	0,0644	0,0172	0,3752
% fathers high skill ocup.	0,1772	0,0684	0,0497	0,4280
% both parents high skill	0,0832	0,0415	0,0100	0,2319
<b>Death certificate data (N=30*50=1500)</b>				
Neonatal mortality (1-28 days)	0,0041	0,0021	0	0,0144
Post-neonatal mortality (up to 1 year)	0,0020	0,0010	0	0,0074
<b>Abortions data (N=991)</b>				
Number of abortions	1444	2658	48	22126
<b>Labor Force Survey data (N=30*50=1500)</b>				
Unemployment rate	0,1663	0,0744	0,0000	0,4203
Employment to population ratio	0,4448	0,0730	0,2684	0,6299
<b>National Health Survey data (N=9*50=400)</b>				
Year	1999	8	1987	2011
Smoking	0,4165	0,0887	0	0,8571
Drinking	0,4928	0,1632	0	1
Exercise	0,4525	0,1598	0	1
Weight	61,24	2,833	51,5	76
Hours of sleep	7,6369	0,2866	6,27	9

Table 2. Baseline health results: the effect of the cycle on low birth weight and infant mortality (1981-2010)

Dependent variable	% born below 2500 grams	% born below 1500 grams	Mortality 1-12 months	Mortality 1-28 days	Mortality <1 day
<i>All mothers</i>					
Unemployment rate	-0,01115 (0,00921)	-0,00432 *** (0,00145)	-0,00142 * (0,00078)	-0,00238 (0,00173)	-0,00935 (0,00578)
Unemployment rate (province trends)	-0,02851 *** (0,00823)	-0,00512 *** (0,00140)	-0,00085 (0,00074)	-0,00261 ** (0,00125)	-0,00617 * (0,00332)
Unemployment rate (controls)	-0,01438 * (0,00855)	-0,00386 ** (0,00149)	-0,00155 ** (0,00073)	-0,00228 (0,00166)	-0,00689 (0,00514)
Unemployment rate (controls and province trends)	-0,01516 * (0,00812)	-0,00364 ** (0,00149)	-0,00104 (0,00078)	-0,00234 * (0,00121)	-0,00506 * (0,00271)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. Micro data from birth and death certificates is aggregated by province and year (30 years, 50 provinces: N=1500). The unemployment rate is calculated at the province-year level from the Labor Force Survey for the second quarter of each year. Birth and death outcomes are matched to the unemployment rate by estimated year of conception. All regressions include year and province fixed effects. Regressions are weighted by the number of births in the province and year. Controls include % of mothers under 25 and over 35, % of mothers married, % with no info on the father, % mothers in high skill occupation, % fathers in high skill occupation, and % both parents in high skill occupations. Robust standard errors clustered by province are in parentheses.

Table 3. The effect of the business cycle on fertility, 1981-2010

Dep. var.	N. of births	Log n. of births	Birth rate
Unemployment rate	-3846 (2687)	-0,333 (0,319)	-0,003 (0,0022)
Unemployment rate (province trends)	-73 (3409)	-0,008 (0,160)	-0,0032 ** (0,0013)
Employment-to-population ratio	15073 *** (5413)	2,114 *** (0,253)	0,0079 *** (0,0023)
Employment-to-pop. ratio (province trends)	3964 (3520)	0,655 *** (0,142)	0,0065 *** (0,0014)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. Micro data from birth certificates is aggregated by province and year (30 years, 50 provinces: N=1500). The unemployment rate and the employment-to-population ratio are calculated at the province-year level from the Labor Force Survey for the second quarter of each year. Birth outcomes are matched to the labor market variables by estimated year of conception. All regressions include year and province fixed effects. Robust standard errors clustered by province are in parentheses.

Table 4. The business cycle and the characteristics of families giving birth, 1981-2010

Dependent variable	% mothers 25-35	% married mothers	% unknown father	% high-skill mother	% high-skill father	% high-skill parents
Expected sign	+	+	-	+	+	+
Unemployment rate	0,123 (0,074)	0,022 (0,050)	0,018 (0,014)	-0,139 ** (0,055)	-0,104 * (0,056)	-0,11 *** (0,036)
Unemployment rate (province trends)	-0,059 ** (0,026)	0,048 (0,037)	0,028 ** (0,011)	-0,118 * (0,061)	-0,084 (0,058)	-0,057 * (0,034)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. Micro data from birth certificates is aggregated by province and year (30 years, 50 provinces: N=1500). The unemployment rate is calculated at the province-year level from the Labor Force Survey for the second quarter of each year. Birth outcomes are matched to the labor market variables by estimated year of conception. All regressions include year and province fixed effects. Robust standard errors clustered by province are in parentheses.

Table 5. The effect of the cycle on babies' health: results with parents' fixed-effects

	% born below 2500 grams	% born below 1500 grams	Mortality <1 day
<u>Mothers with more than 1 child (with same father)</u>			
Unemployment rate (province fixed-effects)	-0,0026 (0,0093)	-0,0016 (0,0012)	-0,0018 (0,0013)
Unemployment rate (province fixed-effects and trends)	-0,0167 ** (0,0069)	-0,0027 (0,0013)	-0,0015 * (0,0008)
Unemployment rate (parents fixed-effects)	-0,0235 ** (0,0103)	-0,0019 (0,0012)	0,0008 (0,0008)
Unemployment rate (parents and province fixed effects)	-0,0033 (0,0086)	-0,0010 (0,0011)	-0,0019 (0,0013)
Unemployment rate (parents and province fixed effects and province trends)	-0,0156 ** (0,0067)	-0,0019 + (0,0011)	-0,0017 ** (0,0007)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. Micro data from birth certificates is aggregated by province and year (30 years, 50 provinces: N=1500). The unemployment rate is calculated at the province-year level from the Labor Force Survey for the second quarter of each year. Birth and death outcomes are matched to the unemployment rate by estimated year of conception. All regressions include year fixed effects. Regressions are weighted by the number of births in the province and year. Robust standard errors clustered by province are in parentheses.

Table 6. The effect of the cycle on mothers' health behaviors

Dependent variable	Smoking	Drinking	Exercise	Weight	Hours of sleep
Unemployment rate	0,243 * (0,127)	0,109 (0,273)	0,099 (0,242)	-1,243 (3,670)	0,582 (0,400)
Unemployment rate (province trends)	0,328 * (0,185)	-0,096 (0,312)	0,029 (0,421)	-1,430 (4,523)	0,442 (0,610)
Unemployment rate	0,366 *** (0,126)	-0,033 (0,383)	0,300 (0,263)	-0,890 (3,074)	0,628 (0,414)
UR*Poor regions	-0,330 ** (0,127)	0,383 (0,312)	-0,458 ** (0,175)	-0,947 (4,568)	-0,124 (0,446)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Micro data from National Health Surveys (1987, 1993, 1995, 1997, 2001, 2003, 2006, 2011) for women aged 20-40 is aggregated by province and year (50 provinces, 8 years, N=400). The unemployment rate is calculated at the province-year level from the Labor Force Survey for the second quarter of each year. In the top panel, each coefficient comes from a separate regression. In the bottom panel, the two coefficients in each column come from the same regression. "Poor regions" is an indicator for the provinces in the lowest third of the distribution of per capita income in 1980. All regressions include year and province fixed effects. Robust standard errors clustered by province are in parentheses.

Table 7. The cycle, babies' health, and maternal employment during pregnancy

	Maternal employment	% born below 2500 grams	% born below 2500 grams	% born below 1500 grams	% born below 1500 grams	Mortality rate	Mortality rate
<u>All mothers</u>							
Unemployment rate (province fixed-effects)	-0,1166 (0,191)	-0,0118 (0,0093)	-0,0089 (0,011)	-0,0044 *** (0,0015)	-0,0041 ** (0,002)	-0,0056 * (0,0028)	-0,0058 ** (0,003)
Unemployment rate (province fixed-effects and trends)	-0,4219 *** (0,0964)	-0,0278 *** (0,0083)	-0,0163 ** (0,0077)	-0,0049 *** (0,0014)	-0,0032 ** (0,0014)	-0,0059 ** (0,0026)	-0,0046 + (0,0029)
<u>Mothers with more than 1 child (with same father)</u>							
Unemployment rate (province fixed effects and trends)	-0,3515 *** (0,0804)	-0,0167 ** (0,0069)	-0,0085 (0,0065)	-0,0027 ** (0,0013)	-0,0022 * (0,0013)	-0,0015 * (0,0008)	-0,0011 (0,0008)
Unemployment rate (parents fixed effects and trends)	-0,3263 *** (0,0954)	-0,0156 ** (0,0067)	-0,0094 (0,0058)	-0,0019 + (0,0011)	-0,0014 (0,0011)	-0,0017 ** (0,0007)	-0,0014 * (0,0007)
<b>Employment as control</b>		No	Yes	No	Yes	No	Yes

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. Micro data from birth certificates is aggregated by province and year (30 years, 50 provinces: N=1500). The unemployment rate is calculated at the province-year level from the Labor Force Survey for the second quarter of each year. Birth and death outcomes are matched to the unemployment rate by estimated year of conception. All regressions include year fixed effects. Regressions are weighted by the number of births in the province and year. Robust standard errors clustered by province are in parentheses.

Appendix. Additional tables

Table A1. The effect of the cycle on babies' health: Time-series regressions (1981-2010)

	% born below 2500 grams	% born below 1500 grams	Prematurity rate	Mortality 1-12 months	Mortality 1-28 days	Mortality <1 day
<u>All mothers</u>						
Unemployment rate	-0,1061 * (0,0561)	-0,0318 (0,0200)	-1,495 *** (0,3920)	-0,0628 (0,0396)	-0,067 ** (0,0327)	-0,00113 (0,0071)
Employment-to- pop. ratio	0,1855 ** (0,0854)	0,0366 (0,0328)	2,5790 *** (0,5869)	0,0767 (0,0640)	0,0848 (0,0532)	-0,0018 (0,0102)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. Coefficients and standard errors are multiplied by 1,000 for readability reasons. Micro data from birth and death certificates is aggregated year (N=30). The unemployment rate and the employment-to-population ratio are calculated from the Labor Force Survey for the second quarter of each year. Birth and death outcomes are matched to the unemployment rate by estimated year of conception. All regressions include a linear trend. Regressions are weighted by the number of births in the province and year.

Table A2. The effect of the cycle on babies' health by income of the region

	% below 1500 gr.	Mortality<1 day	Mortality 1-28 days
Unemployment rate	-0,00625 *** (0,00171)	-0,0143 ** (0,0058)	-0,0032 * (0,0017)
UR*Poor regions (in 1980)	0,00299 * (0,00163)	0,011 *** (0,0029)	0,0023 * (0,0013)
Unemployment rate (province trends)	-0,0061 *** (0,00210)	-0,00708 ** (0,0035)	-0,003 ** (0,0014)
UR*Poor regions	0,00276 * (0,00159)	0,00186 (0,0018)	0,0012 (0,0013)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Micro data from birth and death certificates is aggregated by province and year (30 years, 50 provinces: N=1500). The unemployment rate is calculated at the province-year level from the Labor Force Survey for the second quarter of each year. Birth and death outcomes are matched to the unemployment rate by estimated year of conception. "Poor regions" is an indicator for the provinces in the lowest third of the distribution of per capita income in 1980. All regressions include year and province fixed effects. Regressions are weighted by the number of births in the province and year. Robust standard errors clustered by province are in parentheses.

Table A3. The effect of the business cycle on abortions, 1987-2010

	N. of abortions	Log n. of abortions	Abortion rate
Unemployment rate	-569 (1428)	0,762 (0,627)	0,729 (0,9670)
Unemployment rate (province trends)	-559 (529)	0,072 (0,440)	-0,73 (0,509)
Employment rate	10860 * (5593)	3,776 *** (0,990)	4,596 *** (1,216)
Employment rate (province trends)	623 (793)	0,452 (0,609)	1,326 * (0,6940)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. Micro data from number of abortions is aggregated by province and year (N=xxx). The abortion data are taken from Johnston's Archive (<http://www.johnstonsarchive.net/>). The unemployment rate and the employment-to-population ratio are calculated at the province-year level from the Labor Force Survey for the second quarter of each year. All regressions include year and province fixed effects. Robust standard errors clustered by province are in parentheses.

Table A4. The effect of the cycle on fertility and abortions by income of the region

	Birth rate	Abortion rate
Unemployment rate	-0,0081 *** (0,0024)	0,6531 (1,3308)
UR*Poor regions (in 1980)	0,0107 *** (0,0019)	0,1422 (1,1376)
Unemployment rate (province trends)	-0,0068 *** (0,0010)	-1,3381 ** (0,5061)
UR*Poor regions	0,0063 *** (0,0015)	1,1249 * (0,5616)

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Micro data from birth certificates and abortions is aggregated by province and year. The abortion data are taken from Johnston's Archive (<http://www.johnstonsarchive.net/>). The unemployment rate and the employment-to-population ratio are calculated at the province-year level from the Labor Force Survey for the second quarter of each year. Birth outcomes are matched to the labor market variables by estimated year of conception. "Poor regions" is an indicator for the provinces in the lowest third of the distribution of per capita income in 1980. All regressions include year and province fixed effects. Robust standard errors clustered by province are in parentheses.

Table A5. The business cycle and quality of medical assistance at birth

Dependent variable	% hospital births	% assisted births	wait time last doctor's visit
Unemployment rate	0,496 ** (0,198)	0,032 ** (0,013)	-37 (27)
(% effect of 10p. Δ in ur)	5,2%	0,3%	
Unemployment rate (province trends)	0,217 ** (0,089)	0,012 (0,007)	-48 (53)
	2,3%		
Unemployment rate (controls)	0,292 ** (0,136)	0,022 ** (0,009)	-41 (29)
	3,1%	0,2%	
Unemployment rate (controls and province trends)	0,144 * (0,081)	0,002 (0,006)	-56 (57)
	1,5%		

(\* significant at 90%; \*\* significant at 95%; \*\*\* significant at 99%)

Notes: Each coefficient comes from a separate regression. The first two columns use micro data from birth certificates, aggregated by province and year (30 years, 50 provinces: N=1500). The third column uses micro data from the National Health Survey, also aggregated by province and year (8 years, 50 provinces: N=400). The unemployment rate is calculated at the province-year level from the Labor Force Survey for the second quarter of each year. All regressions include year and province fixed effects. Regressions are weighted by the number of births (or women, in the third column) in the province and year. Robust standard errors clustered by province are in parentheses.