Austerity Measures and Infant Health. Lessons from an Unexpected Wage Cut Policy*

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Abstract

We investigate the effects on health at birth of a shock generated by a major (25%) and unexpected wage cut austerity measure that affected all public sector employees in Romania in 2010. Our findings suggest an overall *improvement* in health at birth for boys exposed to the shock in early gestation and a decreased sex ratio at birth among early exposed children. These findings are consistent with the *selection in utero theory* hypothesizing that maternal exposure to a significant shock early in gestation preponderantly selects against frail male fetuses, with healthier survivors being carried to term.

JEL classification codes: I19, J13, J38, I38

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1. Introduction

While unborn children are rarely, if ever, the direct targets of policy makers, they may be among the most affected individuals by policy changes. Within the framework of the fetal origin hypothesis put forward by Barker [1990], recent evidence shows that, indeed, disruptions in prenatal conditions, caused by *fetal shocks*,[1] have scarring, life-long consequences (see Almond and Currie [2011a;b] for comprehensive reviews of this literature). Although some developmental insults may remain latent until adolescence or adulthood, they are typically apparent already at birth, reflected by outcomes such as birth weight, gestational length or sex ratio at birth.

While prior work has found that extreme events (e.g., famines, wars, natural disasters)[2] can substantially affect fetal health, little is still known about the effects of shocks induced by economic phenomena. Understanding whether and how economic downturns affect fetal development is especially relevant in the aftermath of the Great Recession, which caused significant economic disruptions and forced governments to impose harsh austerity measures. Public sector wages were frozen in numerous European countries, while others implemented wage cut policies.[3] In this paper we exploit the most drastic wage cut austerity measure implemented in Europe, entailing a 25% cut in wages and in all the additional benefits for *all* public sector employees in Romania starting July 1st, 2010, after being firstly announced on May 7th, 2010. This led to a drop of 60.1 percentage points in the public sector wage premium.[4] This unexpected and major wage cut policy provides an excellent setting to explore the effects of an income shock on health outcomes at birth.

The effects of economic phenomena on fetal environment are, in general, quite difficult to disentangle as their timing is usually diffuse, lacking a precise onset date, and they may affect fetal health through multiple channels simultaneously (Almond and Currie [2011a]). During economic hardship, individuals may reduce expenditures on consumption goods, and nutritional restrictions may affect the unborn child. At the same time, the countercyclical pattern of consumption of health-damaging goods and the decrease of the opportunity cost of health-improving behaviour may offset the negative effects and lead to better infant heath at

[1] *Fetal shocks* are defined broadly as events that alter the fetal environment, and give rise to fetal stressors that may induce developmental adaptations in the unborn child, as they signal a change in the predicted postnatal environment (Gluckman and Hanson [2005]).

[2] C.f. civil and military conflicts (Catalano [2003]; Mansour and Rees [2012]; Valente [2011]), natural disasters (Almond et al. [2009]), terrorist acts (Glyn et al. [2001]; Camacho [2008]) and pandemics (Almond [2006]).

[3] Wage cuts were implemented in: *Romania* (25%, 2010), Czech Republic (10%, 2011), Estonia (6%, 2009-2010), Greece (20%, 2012), Ireland (5%, 2010), Hungary (7%, 2008-2010), Latvia (15%, 2009-2010), Lithuania (15%, 2009-2010), Portugal (5%, 2011), Slovenia (4%, 2011), Spain (5%, 2010).

[4] The public sector wage premium fell from +44.5% in 2009 to –15.6% in 2010 (a loss of 60.1 percentage points) (source: Industrial Relations in Europe 2012 Report, European Commission).

birth. In addition, maternal prenatal stress, caused by the financial insecurity entailed by economic shocks, may have either scarring or culling effects, leading to an ambiguous net effect of economic shocks on health at birth, depending on a wide array of factors. Thus, some studies find evidence of deteriorating health outcomes at birth (Bozzoli and Quintana-Domeque [2013], Paxson and Schady [2004]; Burlando [2010]; Lindo [2011]), whereas others find that the effects of improvements in risk-related behavior during pregnancy and maternal selection prevail over the scarring effects, the net result being an improvement of the health of in utero exposed children (Dehejia and Lleras-Muney [2004]). Additionally, the sex-ratio at birth has also been found to respond to economic circumstances (Catalano et al. [2005a;b]; [2009]). A recent study by Bozzoli and Quintana-Domeque [2013] documents the pro-cyclical effects of economic fluctuations in Argentina on the birth outcomes of children, noting that birth weights are sensitive to macroeconomic fluctuations during the third trimester of pregnancy via the nutritional deprivations channel and during the first trimester of pregnancy via the maternal stress channel. [5]

However, all the effects observed, at birth and/or later on in life are, in reality, conditioned on the fetus surviving the pre-birth period. Medical literature finds that significant prenatal maternal stress, especially during early gestation, may induce a selective mortality of the least fit fetuses through increased miscarriages. This process, known *as selection in utero*, may yield a positive selection of those that are carried to term, visible in an improvement in the health outcomes of the affected cohort, with weak male fetuses significantly more affected than female fetuses (c.f. Hobel et al. [1999], Catalano et al. [2009], Valente [2011]).

This paper contributes to the literature on the impacts of (negative) economic shocks on the health outcomes at birth by exploring a unique austerity measure, unexpected, in its magnitude and timing. The distinct occurrence of the shock eliminates the problem posed by diffuse timing or endogenous income reductions and allows us to pursue a clean identification strategy to infer the causal effects of a temporary income shock on birth outcomes of children exposed in utero. Our findings indicate that maternal exposure to significant fetal stressors may lead to what appears to be selection in utero. This is the first economic study to find evidence consistent with selection in utero induced by economic shocks.[6]

[5] Almond et al. [2011] look at the effect of the Food Stamps Program in the US as a *positive* shock in utero and find improvements in health outcomes at birth.

[6] Evidence of selection in utero induced by economic shocks is provided in epidemiology and demography (e.g., Catalano et al [2009], Catalano [2003]); within economics, Valente [2011] documents selection in utero following civil conflict.

Our main empirical strategy to assess the impact of the unexpected income shock on health outcomes at birth is a simple difference-in-difference (DD) specification. We will focus on women already pregnant at the time of the austerity announcement, in an attempt to mitigate the concern related to the change in the composition of families choosing to conceive. We use the Romanian Vital Statistics Natality files, containing detailed records of all registered births, for the period 2007-2010, and compare outcomes at birth for children *in utero* at the time of the policy belongings to mothers employed in the public sector and housewife (or privately employed) mothers in 2010 relative to earlier years.

Our main findings suggest an overall improvement in health at birth as measured by a 2 percentage point (pp) decrease (29% of the mean) in the probability of low birth weight of children exposed to the shock during their first trimester of gestation. We find significant improvements in health at birth exclusively for boys and not for girls, driven by significant effects of males exposed to the shock starting with very early developmental stages (1^{st} trimester), a decrease of 2.9 pp (49% of the mean) in the probability of low birth weight. This effect is particularly large for boys belonging to highly educated mothers employed in the public sector. We also find indications of a decreased sex-ratio at birth of about 3.3 percentage points (6.5% of the mean) for the same sub-sample of children. Our results hold to a wide series of falsification and robustness tests and to mother's fixed effects specification.

Using complimentary datasets, we investigate the potential mechanisms through which the austerity measures affected health at birth and find evidence which seem to indicate that *selection in utero* due to maternal prenatal stress exposure resulted in a healthier but smaller cohort of boys. Unfortunately we can directly understand whether the fetal stressors are related to stress per se (through increase in cortisol level) and/or higher intake of alcohol or smoking consumption. Overall, our findings are consistent with the medical literature that has established that weaker males are more vulnerable to adverse conditions in utero and that maternal prenatal stress raises the fitness criterion of children in utero.

The remainder of the paper is organised as follows: Section 2 depicts the Romanian context in which the policy change occurred, and presents the data we are using. Section 3 describes the empirical strategy, and presents the main results, followed by several sensitivity checks. In Section 4 we discuss the potential mechanisms through which an income shock may affect birth outcomes and further test these mechanisms in Section 5. Section 6 contains a series of further robustness checks that support our main results. Section 7 concludes.

2. Background and data

2.1. The Romanian context

Romania experienced sizable economic and politic insecurity throughout most of its post-communist history.[7] Thus, the international financial crisis that unfolded in the autumn of 2008 was taken lightly in Romania – politicians invoked a decoupling of the Romanian economy from the world markets, and the public opinion was moderate in its expectations: the autumn 2008 Euro-barometer showed that more than half of respondents anticipated no change or even an improvement in the general economic situation of Romania, with the same attitude prevailing in the 2009 waves of the survey.[8]

The first political signs of the recognition of the deteriorating state of the Romanian economy came in March 2009, when the Government initiated discussions with the IMF. After signing a stand-by accord in June 2009, politicians promoted the agreement as an opportunity for state reorganization, but subsequent proposed measures were mild and noncontroversial. Moreover, the political class transmitted an overall confident message in the lead-up period to the presidential elections of December 2009. After being re-elected, the incumbent President declared that "(…) we expect significant growth in the first part of 2010".[9]

In this context, the President's announcement on the national TV, on May 7th, 2010, that public sector wages and social security benefits would be cut was unexpected and gave rise to widespread social unrest and political dispute. The decision was made by the Government and the President after the latest round of negotiations with the IMF and was not preceded by any discussions in the Parliament or with social partners, nor was publicly mentioned as a potential policy. The measures, involving a 25% cut in wages for *all* public sector employees, the revocation of most of their financial and in-kind incentives and a 15% cut in unemployment, maternity leave benefits and several other social security benefits, were aimed at re-establishing the budgetary balance agreed to with the IMF.[10]

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[7] Although negative growth rates were replaced by high and sustained growth rates beginning in 1999, they were accompanied by high inflation rates and significant public deficit. In 2000, when the GDP growth rate turned positive, the annual inflation rate was over 40%, whereas in 2004, when the GDP annual growth rate reached a peak of almost 9%, the annual inflation rate was still above 10%.

[8] http://ec.europa.eu/public_opinion/cf/:"*What are your expectations for the year to come with respect to the economic situation of your country* (Romania)."

[9] www.evz.ro/detalii/stiri/basescu-romania-nu-va-fi-afectata-de-criza-837030.html (in Romanian). Early in 2010, the Government adopted a graver attitude toward the worsening economic crisis as the IMF required concrete actions to reduce the significant budget deficit. As such, on March 16th, 2010, the Prime Minister presented in front of the Parliament the anti-crisis measures that were being implemented, all as economic stimulus, aimed at improving the business environment and reducing tax evasion.

[10] For pregnant women employed in the public sector at the time of the Austerity announcement (our treatment group), the income cut had a threefold effect: a monthly income drop due to the wage and benefits cut; a decrease in the annual average wage income which would lead to a lower (forthcoming) child care allowance, calculated as 85% of the average income

One month after the announcement of the austerity measures, the Finance Minister gave a speech pertaining to the delusional nature of the government's previous statements on the economic status of the country and on the completely unexpected nature of the policy: "As a Finance Minister I am telling you that we could have lied six more months, we could have borrowed for six months, […] and could have waited six months to see what happens. The fact that what we are doing entails a political risk that nobody imagined a month and a half ago shows a complete responsibility of this Government towards the Romanian citizens".[11] He was dismissed shortly after.

The measures were included in a set of legislative projects drafted by the Government soon after the President's announcement and forwarded to the Parliament to be adopted through a special procedure that circumvented the regular and lengthy law making procedures.[12] After the Government assumed responsibility on the Austerity Laws, a censorship motion was initiated by the opposition parties in the Parliament but because of a tight majority of the governing coalition, the censorship motion was not adopted (though by a very close margin) and the Laws were passed in a slightly modified version. On June 30th, the President promulgated the laws, which came in effect July 1st, with an initial duration of 6 months.[13] In January 2011 public sector wages were not restored to their initial level.[14]

Overall, it is safe to assume that the austerity measures were not anticipated, in both their unprecedented scope and magnitude, or their timing. In our empirical strategy we will focus on women working in the public sector, already pregnant at the time of the austerity announcement, to mitigate the concern related to the change in the composition of families choosing to conceive. Even though the austerity measures were unanticipated, we cannot

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obtained over the 12 calendar months preceding the child birth; a 15% cut in the recalculated child care allowance to be received after birth.

[11] http://www.hotnews.ro/stiri-politic-7350294-sebastian-vladescu-era-foarte-usor-mintim-continuare-mai-imprumutam-vreo-sase-luni.htm (in Romanian)

[12] The Romanian Constitution allows, as an exception, that the Government assumes responsibility for a specific law in front of the Parliament, with the law under consideration being adopted by default if the Government is not dismissed in the first 3 days by means of an adopted censorship motion. The Parliament can withdraw the trust awarded to the Government by adopting a censorship motion, which necessarily means that the Government is dissolved, the law proposed is not adopted and a new Government needs to be invested.

[13] It is important to distinguish between a permanent and a temporary wage cut: transitory changes in wages have no effect on lifetime income or on total fertility (though they may affect the timing of fertility), while a permanent wage cut has an ambiguous effect (it may decrease the relative cost of children which, in turn, may increase the demand for children or, because of a lower income, it may decrease the demand for children; Becker [1965]; Heckman and Walker [1990]). Even if temporary, households might respond as though these changes are permanent if people are myopic or uncertain about the nature of the changes (Dehejia and Lleras-Muney [2004]). This was most likely the case in Romania, with most households perceiving the wage cut as permanent, because of numerous inconsistent enforcement of laws.

[14] In December 2010, the Law of Unitary Pay was adopted through Government Responsibility Assumption, which came into effect from January 1st, 2011, and stipulated, among others, that public sector wages will be increased by only 15% during 2011 relative to the October 2010 levels and that no other financial or in kind incentives will be awarded.
(Source: http://www.cdep.ro/pls/proiecte/upl_pck.proiect?cam=2&idp=11578, in Romanian)

absolutely exclude "written on the wall" effects due to the general economic situation.[15] The possible selections into fertility will be addressed later in the paper.

The European Commission notes a *gender* dimension to this type of austerity measures:[16] whereas men were significantly more affected in the first phase of the economic crisis when the private sector slowed down, the public sector wage cuts affect females significantly more than men due to the structure of the public sector employment. In Romania, the publicly employed women are concentrated in Health, Social Services and Education sectors, and had, even before the austerity cut, lower average wages both relative to the private sector and to other public, male dominated sectors.[17] In addition, recent evidence shows that the insecurity coupled with the economic crisis has worsened the perception of work-related stress in all European countries in general, and in Romania, already ranked high, in particular, making the publicly employed women the most affected by the wage cut, both in monetary and psychological distress terms (see Virga et al. [2012]; ESENER, [2010]).

2.2. The impact of the austerity measures at the household level

To understand the size of the impact of the austerity at the household level, we proceed by making use of the Romanian Household Budget Survey (RHBS), the main tool of assessing population expenditures and revenues, covering about 30,000 households/year containing detailed income and expenditure information at the *household level*. We compare here *households* with at least one publicly employed member and households with no publicly employed member, just before (January-July 2010) and after (August-December 2010) the austerity measures implementation.[18] The results in Table 1 indicate a significant decrease in *household wage* related income of 16.7% and in total *household income* of about 7%.[19] Not surprisingly, the wage related income drop is larger for high-educated households (about 21.7% in column 2) because the high-educated publicly employed households were more likely to attract more wage related income (through bonuses, in-kinds wage related transfers) which were also annulled. Overall, the households affected by the shock seem to have no

[15] At that time Romania experienced an increase in the unemployment rates in the private sector rose from a relatively stable level of 4 to 5% before 2009 to a peak of 8% in March 2010 [Mocanu, 2010].
[16] Industrial Relations in Europe 2010 Report, European Commission.
[17] Source: Statistics Romania.
[18] We have attempted to trace the employed mothers with young children from the RHBS and identify them in the dataset based on their observable characteristics. Unfortunately there are very few such observations to provide these tests for households with (presumably) pregnant women employed in the public sector in 2010 vs. the previous years. The income and consumption data are at the household level, so our figures show, of course, a lower bound of the wage cut impact at the individual level. We show similar results for 2009 as a placebo test.
[19] It is not surprising that the wage drop was not 25% (or higher) as the data provides information at the household level. Also, we show these results only for urban households (see the explanations in the next section).

significant changes in food-related (column 4) or alcohol and cigarettes (column 5) expenditures, but significantly reduce non-food (column 6) and services expenditures (column 7). Finally, column (8) seem to indicate that households react to the wage shock by decreasing the (formal) savings with about 11.9%.

2.3. Working sample

In our main empirical exercise we use the Vital Statistics Natality (VSN) records for years 2007 through to 2010,[20] as our main dataset. The VSN records cover essentially *all* registered births from the individual birth certificates, with detailed information about the newborn and the socio-economic characteristics of the parents, recorded at the time of the birth: (a) characteristics of the child: day, month and year of birth, gender, ethnicity, whether singleton or multiple birth, birth weight and duration of gestation in number of weeks; (b) characteristics of the mother: day, month and year of birth, occupational status, education, marital status, county and locality of residence, and mother's fertility history: total number of births, number of children born alive, fetal deaths, month of first prenatal check-up and an indicator for home delivery; (c) characteristics of the father: day, month and year of birth and his occupational status.

We restrict our sample to mothers between 16 and 45 years of age, and we exclude multiple births. Our initial sample size is 846,778 births over the period 2007-2010. In the baseline estimations, we will focus in particular on children born from mothers living in *urban* areas accounting for 465,754 of all births. Given the nature of the policy change, there are reasons to expect that effects would be concentrated among urban rather than rural households. Firstly, among the employed women (of fertile age), living in rural areas, only about 8% work in the public sector compared to about 30% of the employed women from urban areas (RHBS). Secondly, we suspect that the wage cut policy affected the rural households much less relative to the urban households because in Romania salary income represents less than 20% of the total household income in rural families, compared to an average of 60% for families living in urban areas (Firici and Thomson [2002]).[21] Even though our empirical analysis will mainly discuss urban households, we will also show that our main results hold

[20] Starting with January 2011, Statistics Romania changed the data registration process for the VSN, and no longer collects information on a wide array of maternal and child characteristics which we use in the current analysis. Therefore, we cannot use the 2011 data.

[21] Agricultural own-production income is estimated as high as 46% for rural households and about 13% for urban households (Firici and Thomson, 2002).

when we look at *all* households. Summary statistics for our main variables for the urban mothers are found in Table 2, column block 1.[22]

A key variable in our empirical specification is the mother's *occupational status*. The VSN records the mother's occupational status using the following categories: employed, entrepreneur, self-employed in agricultural activities, self-employed in non-agricultural activities, unemployed, housewife, retiree, and other situations. However, the *employed* category does not differentiate between *public* and *private* sector of employment.

Because the policy specifically targeted the *public sector* employees, we proceed by making use of the RHBS for the 2007-2010 period. The RHBS records the occupational status for each household member with the same categories as the VSN except that, for the employed members, we also know the sector of employment, whether *public or private*. We start by estimating the simple conditional probability that an employed woman works in the public (vs. the private) sector using the RHBS household data. We estimate a reduced form Probit model separately for each year on the restricted sample of employed women aged 16 to 45, and include as explanatory variables all the socio-economic characteristics of mothers that are available in the VSN: age, region of residence, education (no schooling, primary school, secondary school, high school, technical college, post high-school, higher and above), ethnicity (Romanian, Hungarian, other), marital status, number of living children, father's age and father's occupational status (for more details see Appendix B).[23] We proceed to doing out-of-sample predictions for the VSN dataset and obtain a predicted probability of public employment for each employed mother. In the last step we use the predicted probabilities to split the VSN sample of employed mothers into most and least likely employed in the public sector. To define our treatment group, we make use of information provided by the Romanian Ministry of Labour, Family and Social Protection (MLFSP) regarding the recipients of child care allowance.[24] At the end of 2010, among the employed mothers receiving child care allowance, 20% were working in the public sector and 80% in the private sector.[25] Thus, for lack of better information, we use this percentile split and treat as publicly employed, our

[22] Appendix TableA2 in the Appendix A shows the descriptive statistics for the urban and rural sample.

[23] To check the validity of this method we conduct several robustness checks by using different samples from the RHBS: all employed women (no age restriction) and all employed mothers. We also use an extended specification for the probability estimation, in which we also include other relevant variables available in the RHBS such as type of contract or husband's employment in the public sector; when we assign probabilities of public employment to mothers in the VSN, these additional covariates are analogous to the exclusion restrictions in an IV setting. All our results are robust to the use of these probabilities. Finally, we also combine all years of data, include year fixed effects, and use such prediction to create our distribution. Our results (available upon request) are very similar.

[24] Child care allowance is awarded to either one of the parents who has obtained any form of taxable income in the 12 months preceding the birth of the child. Basically all employed mothers benefit and collect this allowance.

[25] MLFSP informed us that they do not hold centralized information on the number of recipients of child care allowance by the child's month, year and county of birth and mother's sector of employment.

treatment group, the employed mothers with the 20% highest predicted probabilities. We will conduct sensitivity analyses with respect to the choice of the threshold percentile and the assignment into the treatment group.

The main characteristics of the publicly employed mothers (as defined by the 20-80 split) are shown in Table 2, column block 2. Compared to the sample of all employed mothers, shown in column block 3, the publicly employed mothers are, on average, older, more likely to be married and more educated. Reassuringly, this composition matches very well the RHBS data.[26] Relative to all mothers or to all employed mothers, the publicly employed mothers seem to have healthier children as measured by birth weight and gestation length. In column block 4 we show the main characteristics of the housewives mothers, accounting for about 30% of all mothers in urban area.[27] Housewives mothers are, on average, younger, less likely to be married, lower educated and have children with worse outcomes at birth relative to mothers in column blocks 1 to 3.

At this stage we check possible anticipatory effects of the austerity measures. Overall, from Table 2 we observe that employed mothers who give birth later years seem to be better educated (more likely to have higher education) which may due to a positive selection into motherhood, but also because a well-recognised trend in education in Romania.[28] The publicly employed mothers, even though are on average more educated compared to the other occupational categories, in 2010 (relative to 2009 and before) they are less likely to have a higher degree and more likely to only have a post-high school degree, suggesting a negative selection.

To address the issue more formally, in Table 3, for each occupational category we run regressions with mothers' observable characteristics as outcomes. Overall, mothers pregnant on May 7th, 2010 are more likely to be more educated and slightly older. This is also true for the housewives and particularly for the privately employed mother. The effects are significant

[26] Albeit a small sample, among the 230 mothers (with a child one year old or less between 2007 and 2010) employed in the public sector, 77% have high education, while only 6% have secondary education. Among the employed women in the private sector who have recently become mothers (1,102), only 30% have higher education, and 40% have high-school education and 22% have secondary education. This matches very well with the composition we obtain in our treatment group based on the 80-20 split.

[27] The occupational structure of all the mothers reveals that 47.8% of all women (urban and rural) giving birth in 2010 are employed; 42.6%, housewives; 0.15%, business-owners; 1%, self-employed in non-agricultural activities; 0.2%, self-employed in agriculture; 1.8%, unemployed; 0.2%, pensioners; and 6.25%, other situations. This structure is quite stable over the years and the area of residence.

[28] See Appendix A, Figure A1. The significant increase in the number of higher educated individuals is due to the massive increase in the number of private universities. Figure A2 shows that over the 2003-2010 period, while the proportion of employed mothers with primary education is relatively constant across years, there is an increase in the employed mothers with higher education matching the decrease of the employed mothers with secondary education.

and quite large as a percentage change from the mean. However, publicly employed women pregnant at the time of the announcement seem to be less educated (more have only secondary or high school and fewer have a higher education) and they are less likely to be married. Albeit they are statistically significant, the changes relative to the mean are not as large as for the privately employed or for the housewives mothers.[29] Overall, our results tend to show that, even though the austerity measures were most likely unanticipated, the overall economic context has influenced the fertility timing decision of Romanian women and has altered the composition of mothers becoming pregnant. These findings are in line with other studies (see Dehejia and Lleras-Muney [2004] for the US) that show that in turbulent economic times, we may observe an increase fertility of low-skilled women (as measured by education) and a negative selection for the high-skilled ones.[30] However, it is important to note that due to our difference in difference specification, a negative selection in the treatment group and a slight positive selection in the control group would bias the results towards zero and thus the results would not be driven by this selection.

3. Identification and main results

3.1. Identification strategy

To test whether the aforementioned austerity measures changed the outcomes at birth of the children *in utero* at the time of the announcement (May 7th, 2010) relative to children conceived in earlier years, we rely on a difference-in-difference (DD) specification. Our treatment group consists of pregnant women working in the public sector while our control group consists of pregnant housewives[31]. Thus, we compare outcomes at birth between children in utero on May 7th, 2010, and May 7th, before (2009-2007), with mothers working in the public sector and housewives. Housewife mothers as our preferred control group as they are least likely to have been affected by the austerity measures, as they are neither engaged in any income generating activity nor actively searching for employment. Moreover, they are the second most numerous group by mothers' occupational status, after employed mothers.

[29] An alternative way to analyze the selection into fertility issue is to estimate difference in difference regressions comparing the characteristics of the publicly employed mothers with those of the housewife mothers, pregnant at the time of the austerity measures announcement relative to the same period in previous years. In accordance with the previous findings, we find that relative to housewife mothers, publicly employed mothers from urban areas are less educated (lower probability to have higher degree and higher probability to have secondary education), younger, less likely to be married or have an employed husband, and are less likely to give birth to their first child. The results are presented in Appendix Table A3.

[30] The net effect of an economic shock is theoretically ambiguous and hinges upon the mother's skill depreciation rate and on whether capital markets are perfect (Dehejia and Lleras-Muney [2004]). One may hypothesize that low-skilled women are less likely to have a human capital that depreciates during a temporary absence from a job during pregnancy and after birth (and assuming that capital markets are perfect); if so, then in low-wage periods, we may observe an increase fertility of low-skilled women.

[31] Housewife is defined (in VSN) as a person engaged in domestic work such as preparing food, maintenance and home care, domestic industry activities not intended for sale, care and education of children and who does not receive any formal income

Housewives may not be an ideal control group and, even though we use a large set of individual controls, these may not completely adjust for all (unobservable) differences. Thus we will also consider the privately employed mothers as an alternative control group. Privately employed mothers are not our preferred control group because they are also defined based on our 20-80 split. Additionally, we have shown in the previous section a substantial (positive) change in the composition of privately employed women who become pregnant in 2010 which, most likely, will bias our results towards zero.

We measure health birth using the low birth weight indicator, defined as a birth weight less than 2,500 grams.[32] Our baseline specification, estimated through ordinary least squares, is the following:

$$outcome_{imrt} = \alpha + \beta_1 Public_i + \beta_2 Public_i Utero2010_i + \eta_t + \gamma' X_i + \theta_r + \theta_r t + \delta_m + \vartheta_{crt} + \varepsilon_{imrt} \quad (1)$$

where *i* indexes a child born in month *m* by a mother living in county *r* in year *t*; $Public_i$ is an indicator that equals 1 if the mother of child *i* works in the public sector and 0 if she is a housewife (or works in the private sector in an alternative specification). Our key coefficient is β_2, on the interaction between Public and an indicator whether the child was in utero in May 7th 2010. This measures the change in outcomes after the 2010 announcement relative to earlier years, among women that work in the public sector relative to housewives. η_t are year indicators that equals 1 if child *i* was in utero on May 7th in year *t;* X_i is a vector of control variables for maternal and child characteristics: child's gender, mother's age at birth and its square, mother's education, ethnicity, marital status, child's parity, number of children alive, indicator for prenatal control, gestation month of the first gynaecological visit in the current pregnancy and an indicator for home delivery. Our main specifications also include the father's age and its square together with indicators for his employment status (whether employed, entrepreneur, self-employed in agricultural activities, self-employed in non-agricultural activities, unemployed, retiree or other situations) at the time of the child birth.[33] θ_r are 42 county indicators, while $\theta_r t$ are county specific trends; δ_m are months of birth indicators; with ϑ_{crt}, we control for the female unemployment rate in the month of conception

[32] We also used continuous birth weight as an outcome and main results are fairly similar. However, we focus on the low birth weight indicator since it is a more accurate measure of neonatal health and a better predictor for infant health, being the leading cause of neonatal and infant mortality (Stein et al [2006]).

[33] Information for the fathers is available regardless of the mother's marital status. However, it is missing for about 23 percent of the unmarried mothers. For this sample, albeit very small, we have imputed the missing information with the relevant locality average. Our results are not sensitive to including or not this sample.

for each county and year of conception.[34] We cluster the standard errors at the county level (42 clusters).

The key identification assumption in a DD framework is that, absent the policy change, we would not observe any difference in our outcomes between publicly employed mothers and housewives in 2010 relative to earlier years (the parallel trend assumption). To examine the plausibility of this assumption we will add two interaction terms to the baseline model (1): the *Public* indicator interacted with year indicators *Utero2008* and *Utero2009*. A graphical validation is presented in Appendix A, Figure A3.

Because the literature suggests that the effects of in utero shocks may vary according to the stages of gestation, we will explore the fact that at the time of the shock children were in different gestational stages. The VSN data contains the gestational age in number of weeks at birth and we are able to infer the gestational age at the date of the austerity announcement.[35] Using this information, we split our sample into the following categories: (1) children in the 1st trimester of gestation (up to 12 weeks); (2) children in the 2nd trimester (13-24 weeks); (3) children in the 3rd trimester of gestation (more than 25 weeks) at May 7th, 2010. Finally, because medical research established that effects of in utero conditions may depend on the gender of the fetus, we will also show our results separately for boys and girls.

We note that we define treatment status according to mother's occupation. However, indirect shocks may also occur due to fathers employed in the public sector. We address this issue in Section 6.

3.2. Results

Main estimates

This section presents the baseline results from Equation 1 for the low birth weight indicator. Table 4 shows the results for the urban households from the DD estimation for the boys and girls (Panel A) and separately for boys (Panel B) and girls (Panel C).[36] Each three columns of each panel shows the results for children who were in their 1st trimester, 2nd and, respectively, 3rd trimester of gestation at the moment of the austerity shock. For each trimester, we first

[34] Unfortunately, the VSN does not include information on mothers drinking or smoking habits. Including controls for the average expenditures on cigarettes and alcohol, at the county level, for each year and gestational month *c* from conception to birth does not change our results. Same if when we included the average consumption expenditures on food at the county level for each gestational month from conception to birth. Results available.

[35] Having the gestational age in weeks at the time of the announcement allows us to circumvent the problem of comparing children born in the same month but who were in different developmental stages at the time of the announcement due to different lengths of gestation.

[36] Appendix Table A4 shows the results we also include rural households. The results are very much in line with the urban sample, slightly lower in magnitude and significant at a lower level.

show our main coefficient of interest, the interaction term *Public*x*Utero2010,* from a basic specification controlling only for year and county indicators, and county specific trends;[37] next we add our controls; finally, we show the estimated coefficients from the fully interacted model, conditional on pre-treatment dynamics.

Panel A shows that the austerity measures affected only children in their 1st trimester of gestation. The impact of the shock in columns (1)-(2) is negative and significant suggesting an *improvement* of the low birth weight incidence by 2 percentage points (29% of the mean). This may be surprising as these children were exposed to the shock in utero the longest, starting with the very early developmental stages. The magnitude is smaller in column (3) after we control for pre-treatment dynamics. The estimates for the 2009 and 2008 year-specific public indicators are positive and not significantly different from zero suggesting that children born from the publicly employed and housewives mothers do not differ significantly in their evolution of the low birth weight outcome during the pre-treatment years, thus supporting the parallel trend assumption. Our results for children in the 2nd and 3rd trimesters of gestation show a similar pattern, but the magnitude of our main coefficient of interest is much smaller and it is never significant.

The results in Panel B indicate a significant decrease of the low birth weight indicator for the sample of *boys* in utero in the 1st trimester on May 7th, 2010; this effect is stable across the columns, of 3.2 percentage points in columns (1)-(2) and 2.9 percentage points in column (3) (49% mean).[38] This apparent positive effect holds even though we have shown in the previous section a negative selection among publicly employed mothers in 2010 (relative to before and also to the other occupational categories), which would render our results as lower bounds of the effect of the policy. Again, the 2nd and 3rd trimesters of gestation indicate qualitatively similar results but much smaller in magnitude and not significant. Finally, the results for girls, in Panel C show no effect of the shock on the low birth weight indicator.

In order to gain a better understanding about the effects at different gestational ages at the time of the shock, we use a moving window approach in which we "glide" the treatment over cohorts defined in 12 weeks periods, instead of trimesters, at May 7th. Figure 1 presents the estimated coefficient of interest for each of the 12 weeks intervals, for all the three samples of interest (all, boys and girls), together with the corresponding standard errors. For the sample

[37] Our results are not sensitive to excluding the county specific trends.

[38] Including all controls in columns (2) and (3) and keeping in mind that a large share of the publicly employed mothers have high education, the *Public* dummy will also actually capture the high education dummy. If we exclude the tertiary education among the controls, the *Public* indicator becomes significant (with a similar magnitude as in column (1)) and the interaction *Public*Utero2010* does not change sign, magnitude or significance.

of boys, the effects are decreasing in absolute value and remain significant up until the cohort who was 11 to 23 weeks at May 7th, which indicates that children in early second trimester were also affected. For girls, the only significant impacts, in the same direction as for the boys, are observed for girls who were between 14-26 up to 17-29 weeks. Overall, boys appear significantly more affected, both in intensity and in number of children affected, with the results indicating a significant decrease of the probability of low birth weight.

Sensitivity analysis

Before we discuss the possible mechanisms in place, we subject our first results to a series of tests to check their robustness. The main concerns will address the definition of our treatment group and the composition of the control group.

a)The treatment group: Sensitivity to definition of treatment group

So far, given the limited information provided by the Romanian MLFSP, we have used the 20-80 percentile split of the probabilities of a mother's employment to define our treatment. To check the sensitivity of the low birth weight indicator with respect to this split, we allow for different definitions of the treatment group based on varying the threshold percentile from the 80th to the 50th (i.e., employed mothers with predicted probabilities above the threshold percentile are included in the treatment group). Figure 2 confirms that our results, especially for the boys in the 1st trimester of gestation at the time of the shock, are not sensitive to different thresholds though and remain negative and significant at 5%, but increasingly biased towards 0 as we misclassify the treatment and include more privately employed mothers.

b) Are the treatment and control groups similar enough?

One possible concern is that housewives mothers are not an ideal control group to the employed mothers as they may react differently to different shocks and the rich controls included in our regressions may not totally adjust for all differences. We address this issue in several ways.

First, because publicly employed mothers have a high educational level, and that recent evidence seems to indicate that economic shocks on pregnant women may have a different impact according to the mother's SES (see Bozzoli and Quintana-Domeque [2013]), we compare only mothers (public and housewives) with high education (high school and above). Our results, presented in Table 5, show that the improvement of the low birth weight indicator we uncovered earlier is driven by the boys belonging to highly educated mothers. [39] However,

[39]Additionally, we have also used a simple matching strategy (nearest neighborhood and 1-to-1 matching, no replacement) based on pre-treatment characteristics. The low birth weight indicator is quite similar to our baseline estimates, even though less precisely estimated. Results available upon request.

we cannot do the same comparison for low educated mothers because of an extremely low share of low educated mothers in the treated group (<1%).

Secondly, we use as an alternative control group the *privately employed mothers* defined as mothers with the predicted probabilities below the 80th percentile, while keeping the same definition as in the main specification for the publicly employed mothers. Reassuringly, the results in Table 6 have a similar pattern as our main outcomes in Table 4, especially for the children in the 1st trimester at the time of the shock, but they are smaller magnitude given the (large) positive selection into fertility in the private sector.[40]

4. Exploring the underlying mechanisms

In this section we attempt to explain our seemingly counterintuitive results by investigating the potential mechanisms in place. There are *three* main mechanisms through which an income shock generated by an unexpected cut in a pregnant woman's wage may affect children's outcomes at birth: (1) selection into motherhood, (2) nutrition and prenatal care, and (3) prenatal maternal stress.

4.1. Selection into fertility and abortions

In this paper, we try to mitigate some concerns related to changes in the composition of pregnant publicly employed women by using the fact that the Romanian austerity measures were unexpected, and by looking at the sample of already pregnant mothers at the time of the announcement. We have shown in Section 2 that some selection into fertility occurred prior to the announcement because of the overall economic situation but, given the nature of the selection, the size and direction of these selections do not invalidate our main results.

Also, already pregnant women may react to the austerity measures by terminating their pregnancy using abortion. Abortion in Romania is available up to 12 gestational weeks. Although we do not have individual data on abortion procedures, we investigate whether the quarterly aggregate number of abortions increased significantly after the wage cut announcement.[41] Reassuringly, we find no significant increase in the total number of abortions, but we must acknowledge that the abortion data is not available by women's employment status.

[40]We have also conducted a falsification test where we compare our control groups: the privately employed vs. the housewives mothers. The results (available) show no significant differences between these two groups for the low birth weight indicators.

[41] We use data from the Romanian Ministry of Health and estimate a panel fixed effects model in which our dependent variable is county-by-quarter number of abortions and control for county time trends, seasonality and a dummy indicating post-announcement quarters, quarter 3 and quarter 4 in 2010. The results are available.

Because our main findings concern only boys in utero, one may worry that sex selective abortion could potentially alter our results. While we are not aware of any evidence on gender preferences in Romania, one way to formally address this concern is to examine the pattern of sex-ratio for different child parities over time. In cultures with sex preferences, sex-ratios are usually normal at first parity but may change with parity (Almond et al. [2009]). Using the VSN data we find no indication of sex-selection across years or across occupational categories. Finally, our results on low birth weight hold for a parity larger than 2. Moreover, in Romania the child's gender cannot be detected before 18 gestational weeks using routine investigations whereas abortion is permitted until the 12th week of gestation, which makes gender-based selective abortion, in most cases, impossible.

4.2. Nutrition and prenatal care

Prenatal nutrition

A reduced disposable income may lower the quantity or the quality of food intake of the mother which, in turn, may lead to an insufficient nutritional supply to the fetus. Such nutritional restrictions may adversely affect the fetal development, and are often reflected in a higher incidence of low birth weight, preterm delivery and perinatal morbidity (Gluckman and Hanson [2005]; Abrams et al. [2000], Fowels [2004]).[42] Importantly, insufficient caloric intake seems to result in a lower birth weight only in *late pregnancy*, during the 3rd trimester (Stephenson and Symonds [2002]); boys seem, on average, more vulnerable to food shortages than girls (Eriksson et al. [2009]). Almond et al. [2011] show that, in the US, pregnancies exposed to the Food Stamp Program three months before birth resulted in an increased birth weight. Bozzoli and Quintana-Domeque [2013] find worsening health outcomes at birth for children exposed in the 3rd trimester to negative economic fluctuations in Argentina, and only for children of low educated mothers who were likely credit constrained. Yet, Almond and Mazumer [2011] look at relatively mild forms of nutritional disruptions imposed by Ramadan daylight fasting during pregnancy and find a negative impact on birth weights, but only for children exposed during the first two trimesters of pregnancy.

From this evidence, it is safe to conclude that possible nutritional restrictions suffered by the fetus would lead to worsening (or unchanged) weight at birth, whereas we find improvements in birth weight. Additionally, we show in Table 1, column (4) that there were no significant

[42] Nutritional restrictions during the prenatal period are not necessarily reflected in lower birth weights: for example, individuals exposed in utero in early gestation to the Dutch famine did not present lower birth weights but higher rate of incidence of coronary heart diseases, diabetes and obesity as compared to non-exposed individuals (Painter et al. [2005]; Roseboom et al. [2001]).

change in foodstuff expenditures following the wage cuts. Overall, we may safely conclude that the nutrition channel is not consistent with by our results.

Health damaging goods

A decrease in household income may also induce a reduction in the consumption of health-damaging goods, such as cigarettes and alcohol, and medical literature shows that maternal smoking or alcohol consumption during pregnancy correlate with the increased risk of miscarriage and low birth weight (Floyd et al. [1993]). Ruhm and Black [2002] and Ruhm [2003] show that health-related behavioural improvements, in the form of decreased consumption of alcohol and cigarettes, have a counter-cyclical pattern and the average health level improves during recessions. Dehejia and Lleras-Muney [2004] find significant improvements in infant health outcomes at birth due to changes in individual behaviour of white mothers who significantly reduced smoking and alcohol consumption during pregnancy. These behavioural improvements were sufficiently strong to offset the simultaneous negative selection into motherhood.

Unfortunately, information on mothers smoking or drinking habits is not included in the VSN. Evidence from RHBS in Table 1 shows no change in alcohol and cigarettes expenditures per capita induced by the austerity measures. Of course, these expenditures reflect the behaviour of the average individual/households and not pregnant women.

Even if behavioural improvements did occur, we observe significant changes for boys only, in their 1st trimester of pregnancy (from high-SES mothers, presumably well informed) and, to our knowledge, it has not been determined that boys would benefit more than females from behavioural improvements (in early gestation). We argue the behavioural improvements of pregnant mothers is not likely to be the main channel through which the austerity measures influenced health at birth, though we can certainly not dismiss its role.

Instead, Nilsson (2013) finds that boys exposed early in utero to an increase in the availability of alcohol in Sweden were the most negatively affected at birth as measured by a reduced share of males, which indicates that boys highly exposed to alcohol were more likely to be spontaneously aborted. If pregnant women reacted to the austerity-induced shock by increasing alcohol intake (especially before pregnancy recognition), we may also explain our results through increased spontaneous abortions of the weakest male fetuses. We will verify this shortly.

Prenatal care

A decrease in wage may also lower the opportunity cost of leisure and health-improving activities (bed rest in high-risk pregnancies), and may induce a shift in the labour supply of pregnant women from full- to part-time employment. The reduction in working hours would allow for increased prenatal care and would positively influence children's outcomes at birth (Clapp et. al [2000]). This behaviour is unlikely due to the rigidity of the public sector employment in Romania and the very limited opportunities of part time public employment in general: less than 1% of public sector employees have a part-time contract (source: RHBS).[43],[44]

Finally, a wage cut may potentially restrict the antenatal medical supervision by lowering the number of prenatal medical visits. However, in Romania, prenatal care is free of charge and is available to all pregnant women irrespective of their employment status.

4.3. Prenatal stress

An unexpected and significant economic shock may induce psychological distress due to the financial insecurity it entails. Indeed, 2010 survey evidence indicates a higher stress, particularly related to inadequate wages, among the staff in the public vs. the private Romanian sector (Spielberger et al. [2010]). The psychological stress caused by the austerity shock experienced by the pregnant women may influence the fetal development through higher levels of cortisol, a stress hormone that reaches the fetus.[45] The exposure to high cortisol levels induces structural adaptations in order to accelerate the maturation of the fetus and ensure her survival in a predicted stressful environment,[46] but also to modify her ulterior response to stress (Gluckman and Hanson [2005]). Though these predictive adaptive

[43] At the same time, women employed in the public sector could have reacted to the significant wage cut by an increased rate of absenteeism, thus increasing their leisure time. The RHBS information on absenteeism does not reveal any significant differences between 2010 and 2009-2007 for women employed in the public sector. Another related, but inapplicable concern, is pregnant women changing occupational status or sector of employment after the wage cut. From the RHBS we see a very high degree of persistence in the occupational status, with approx. 99% women having the same occupational status as in the last 12 months (both for employed and housewife mothers); moreover, there is no significant change before and after the wage cut announcement in the share of housewives that used to be employed in the prior 12 months. Regarding the change in sector of employment, it is unlikely given that i) even after the wage cut, the average public sector wages remained higher than private sector wages, ii) the unemployment rates in the public sector were high and rising and iii) employment rates in the public sector were stable over the entire period.

[44] We also check if women who were on the margin of leaving the labor force due to, for instance, a problematic or a first-child pregnancy (or both), are more likely to exit the labor force and become housewives when the wage cut occurs. We test whether the number of housewife mothers significantly changes in 2010 for the first born children and for births that signal a problematic pregnancy: very preterm birth (before the 32nd gestational week) and very low birth weight (a birth weight less than 1,500 grams) and find no such effect.

[45] It is important to clarify that in our experiment, during the first 3 months following the May 2010 announcement, mothers-to-be were exposed to *stress*, and only starting August 2010, they were exposed to both *stress* and *a reduced income*. This is because the de-facto wage cut occurred in early August 2010, when public employees received the wages for July 2010.

[46] E.g., changes in the density of glucocorticoid receptors in the neural network and changes in the responsiveness of the HPA (hypothalamic-pituitary-adrenal) axis (Gluckman and Hanson [2005]).

responses are not necessarily reflected in birth outcomes (but may manifest later), numerous medical studies have identified a direct link between prenatal stress exposure and increased incidence of preterm delivery and low birth weight or increased risk of a miscarriage (see Mulder et al. [2002], Maconochie et al [2007], Beydoun and Saftlas [2008] for comprehensive reviews).

In addition to the medical literature, there is a growing interest among economists to quantify the effects of maternal stress on infant birth outcomes by exploiting natural experiments in which stress is generated by exogenous, albeit rare and violent, events. The evidence shows that *early* pregnancy exposure to stress is more likely to harm a child's outcome at birth. Camacho [2008] finds a negative impact of stress induced by landmine explosions on infant birth weight when exposure occurs during the 1st trimester of the pregnancy, while Mansour and Rees [2012] identify a causal relationship between the number of fatalities in an armed conflict that occur during the 1st trimester of pregnancy and increased probability of low birth weight.[47] Bozzoli & Quintana-Domeque [2013] find increased low birth weight incidence due to negative macroeconomic fluctuations for children in the 1st trimester which they attribute to maternal stress, occurring both to high and low educated mothers.

Selection in utero?

Previously presented evidence suggests that prenatal stress scars survivors, leading to worse health outcomes at birth. However, prenatal maternal stress could also lead to improved average health outcomes at birth by means of a natural selection mechanism, whereby prenatal maternal stress raises the fitness criterion required to avoid spontaneous abortion. In particular, the theory of selection in utero hypothesises that weaker fetuses are spontaneously aborted because of significant maternal stress, and that the weak male fetuses are being aborted more often than weak female fetuses. Trivers and Willard's [1973] hypothesis postulates that the selection mechanism preponderantly selects against weaker male fetuses, as the likelihood of reproductive success of a weak male is relatively lower than that of a weak female. An alternative explanation for the more frequent miscarriage of males relative to females is related to males' more rapid growth rate during early pregnancy, which makes males more predisposed to abnormalities than female fetuses and thus more exposed to risk of spontaneous abortion. Medical evidence indicates that *selection in utero* affects fetuses in

[47] On the other hand, Aizer et al. [2009] use cortisol levels during pregnancy in a mother fixed effects strategy and find no negative effects of maternal prenatal stress on health at birth, although they find significant negative effects on other long term outcomes.

their early developmental stages (Hobel et al. [1999], Owen and Mathews [2003], Catalano et al [2009]).

The selective mortality mechanism is reflected in a decrease of the sex-ratio at birth *and* in the improvement of the average health level for the male cohort exposed in utero to the stressor. Catalano et al. [2012] find an inverse relationship between maternal cortisol levels during pregnancy and male cohort size and conclude that elevated maternal stress culls cohorts by "raising the fitness criterion", thus resulting in healthier males. Catalano et al. [2009] show that mass layoffs predict lower secondary sex ratios as a consequence of significant maternal stress during pregnancy due to adverse economic conditions that preponderantly selects against weak male fetuses. Sanders and Stocker [2011] show that gender ratios at birth can be used to infer fetal death rates of males, which are more vulnerable to maternal stress. Valente [2011] finds evidence of selection in utero due to maternal conflict exposure.

Our results so far indicate significant *improvements* in health at birth of *male* cohorts exposed to the shock in early gestation. In the next section we proceed to check whether selection in utero is our mechanism in place.

5. Exploring further the main mechanism: selection in-utero?

The evidence from Section 4 seems to indicate that selection in utero, caused by in-utero maternal stress and/or increased alcohol intake, may explain our apparent positive effect on birth weight. Because we do not have data on miscarriages, a common problem in the literature, we proceed to examine the effects on the secondary sex-ratio.

Sex-ratio at birth

Similar to other studies with individual level data, we model the sex-ratio at birth as the probability of a male birth. Panel A of Table 7 presents the results of the DD estimation for the probability of a live birth being a male, using a similar framework as before, while Panel B show results for the high educated mothers. The overall effect on the probability of a child being a boy, in Panel A, for the children who were in the 1st trimester of gestation at the time of the shock is negative and significant in columns (1) and (2) with a magnitude of about 3.3 percentage points (6,5 % of the mean), and marginally significant (p-value=0.105) in column (3), when we include the pre-treatment dynamics. This effect seems to be driven by the high-educated mothers (in Panel B), who were 4.5 percentage points less likely to have a boy if they were in their 1st trimester at the time of the shock.

Figure 3 presents the sensitivity of the results on the probability of a male birth to the definition of the treatment group, analogue to Figure 2. For children who were in the first

trimester at the time of the announcement, the results remain significant at the 10% significance level for all definitions of the treatment group (ranging from above 80th percentile to above the median of the predicted probability of public employment).
Additionally, we have also checked the robustness of these results when using the privately employed mothers as an alternative control group. The results (shown in Appendix A, Table A4) are not statistically significant and they are much lower in magnitude.[48]

To summarize, for the children who were in the 1st trimester of gestation at the time of the policy change announcement, i.e., the most exposed to the shock, we find improvements in the health at birth outcomes for males but not for females and a reduced probability of a male birth. These results are driven by the effects on the children of highly educated publicly employed mothers. This evidence fits the *selection in utero hypothesis*, which postulates that significant maternal prenatal stress causes weaker males to be spontaneously aborted in early pregnancy. As such, in the light of the three main potential mechanisms through which the austerity measures could affect health at birth outcomes, we conclude that the effects we observe are largely (while maybe not entirely) caused prenatal maternal stress, via selection in utero.

The fact that we find no significant effect for girls may imply that girls are substantially more robust. Another possibility is that lower-tail boys are weaker than lower-tail females, but the median boy is stronger than the median girl, such that the effects on both the tail and the median of the female birth weight distribution leads to an insignificant effect for girls.

6. Further sensitivity checks

Finally, we attempt to address two concerns that may potentially bias our results, one related to the mothers' unobservable characteristics and one concerning possible indirect effects at the household level through fathers working in the public sector. Overall, the results using these specifications point in the same direction as our main results.

6.1. Mothers' fixed effects

One concern is that mothers may have different unobserved characteristics correlated with their stress response that may affect their behaviour and could, in turn, lead to an

[48] We also looked whether we find a smaller *cohort size* for males in utero in 2010 vs. 2009 and before. We calculate the cohort size at locality level by gender and gestational stage at the time of the austerity measures announcement, for publicly employed and housewife mothers (about 998 clusters). Next, we simply compare the log(boys) for the publicly employed mothers, separately for each trimester and the effect for the 1st trimester is negative and significant [-0.188*(0.100)], while for the 2nd and 3rd is not significant[-0.034(0.096) and 0.084(0.108)]. When we consider the housewives sample the effects are, for each trimester, respectively: -0.016(0.056); -0.072*(0.036); 0.019(0.041). The effects for girls for the publicly employed are also negative and similar in magnitude as those for boys but not significant.

improvement in the health at birth of their child (Aizer et al. [2009]). One way to control for these unobservable differences and other time invariant omitted variables is to use mother fixed effects and compare the children in utero on May 7th, 2010, to their elder siblings.

To construct the sibling sample we first select all employed and housewives mothers from the 2010 VSN that report having at least one more child. Next, we make use of the 2003-2009 VSN files in an attempt to construct the siblings' sample.[49] Unfortunately, Statistics Romania did not provide us the mothers' personal number and we cannot directly link the data but we do have information on the mother's place of residence, mother's ethnicity and the mother's exact date of birth (day, month and year). To increase the precision of our matching, we further restrict our sample to children belonging to mothers married to the *same* fathers, by exploiting the fact that the VSN provides information on the exact date of marriage (based on the marital certificate) and the father's birth date (day, month and year). Thus, we obtain a selected sample of 60,931 children belonging to 25,392 mothers.

In Table 8 our main variables of interest is the *exposed sibling* indicator, which equals 1 if the child was in utero on May 7th, 2010 and 0 if the child was an elder sibling, for the *selected* sample of married mothers, to the same father and having at least two children in 2010, who are either publicly employed (columns 1-3), or housewives (columns 4-6). In Panel A we look at the low birth weight outcome and in Panel B at the probability of the youngest child to be a boy.[50] Our controls include child-specific characteristics, the age of parents at conception, and a linear (or quadratic) time trend to control for other changes that may allow mother's behaviour to adapt to e.g., health or education trends.[51] The first two columns for each occupational category are sibling DD estimates, and the third column is the mother FE specification. For the publicly employed mothers (columns 1-3), the results are quite stable and indicate that the siblings who were exposed to the austerity shock in utero seem less likely to have a low birth weight compared to their unexposed siblings (Panel A); however, we find no effect on the probability of the exposed child to be a boy (Panel B). For the housewives mothers, the results in columns (1) and (2), Panel A indicate also an improvement in the low birth weight indicator (albeit smaller in magnitude than for the public mothers), but the result turn out smaller and not significant once we include family fixed effects indicators.

[49]The reason for not using data collected before 2003 is that the structure of the VSN files has been changed in 2003, and several important socio-economic characteristics of the parents are not available in earlier records.

[50] Here we show the results for the occupational status (whether employed or housewives) in 2010, but the results are similar if we restrict the sample to *always employed* and *always housewives*.

[51]Additionally, to control for possible changes in education over time within the same household, we also include the level of education and the occupational status of the parents at the time of each birth. The results remain robust to this specification. While the results hold the expected sign, we do not find significant results when we restrict the sample same-sex siblings.

6.2. Income shocks through father's employment status

Finally, the employment sector of the father may also influence the (intensity of the) perceived shock. Our prior is that households may have been more severely affected by the policy if both parents were employed in the public sector. According to data in RHBS, about 30% of publicly employed women and only 8% of housewife women are married to a publicly employed man. Unfortunately, from the VSN, we do not have information on the sector of employment of the employed fathers, and neither do we have the other covariates which would allow us to proceed in an analogue manner to mothers and obtain their predicted probabilities of public employment. Thus, we compare households with publicly employed mothers with employed fathers vs. households with housewives and fathers with an occupational status other than employed, e.g. business owner, self-employed in agriculture. The estimation results, presented in Table 9 for the low birth weight indicator and Table 10 for the probability of a male birth, suggest that our main specification is not biased by indirect shocks. Thus, we may argue that controlling for husband's occupational status in the regular fashion is sufficient to capture the household level shocks.

7. Conclusions

The present study shows that prenatal exposure to economic shocks can influence the birth outcomes of the in utero cohorts. Using a major and unexpected wage cut policy that affected all public sector employees in Romania in 2010, we investigate the effects of negative income shocks on outcomes at birth. Our results suggest that economic shocks may lead to selection in utero, in which maternal exposure to significant fetal stressors (e.g., stress, alcohol consumption) selects against frail fetuses, with male fetuses significantly more predisposed to spontaneous abortions than females. We infer this "culling" process after detecting significant improvements in health outcomes at birth in the male cohorts exposed to the stressor early in gestation, coupled with evidence of a reduced sex-ratio at birth for the cohort that was in the 1st trimester of gestation at the time of the announcement and a reduced size of that particular male cohort.

From a policy perspective, it is important to understand the mechanisms through which such income shocks affect unborn children. If prenatal nutrition, prenatal care or selective abortions would be the main mechanism in place, policymakers could potentially reverse the effect through programs such as food stamps. However, if the main mechanism is the one which we seem to identify, mainly a biological response to severe stressors, then there is less

scope for reversing the policy impact, and this needs to be taken into consideration when such drastic measures are implemented.

Our findings suggest that unexpected policy changes, albeit temporary, may act as sufficiently severe stressors on the population to such an extent that selective fetal mortality may has large effects, even in developed economies where the baseline health is relatively high. Given the medical evidence on the latent effects of prenatal exposure to stressors, if these apparently healthier children were "culled" through such a mechanism, they may show adverse outcomes later on during their lifetimes.

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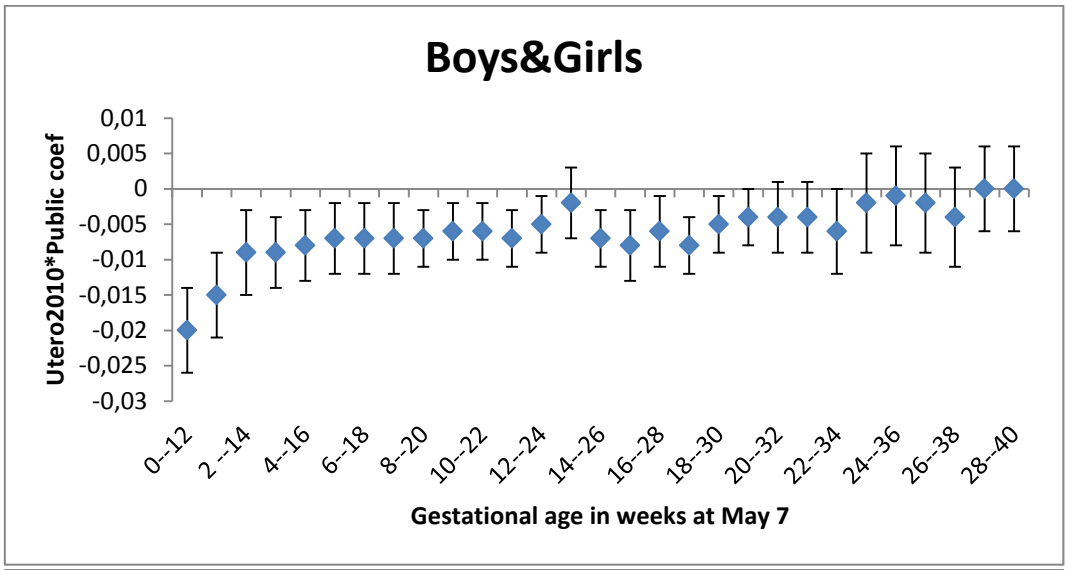
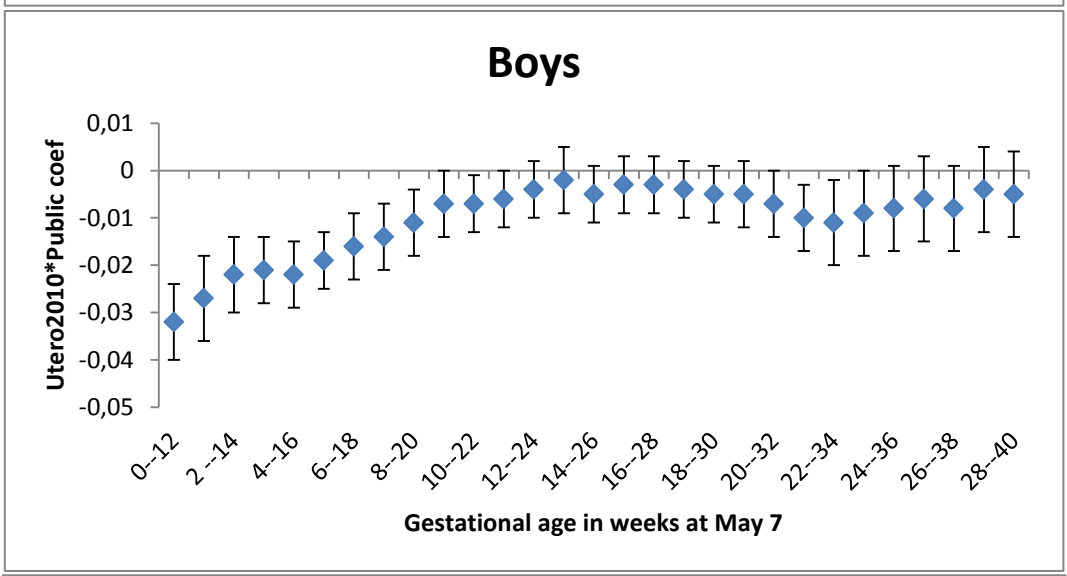
Figure 1. Low birth weight, treated cohorts defined here using a gliding window of 12 gestational weeks





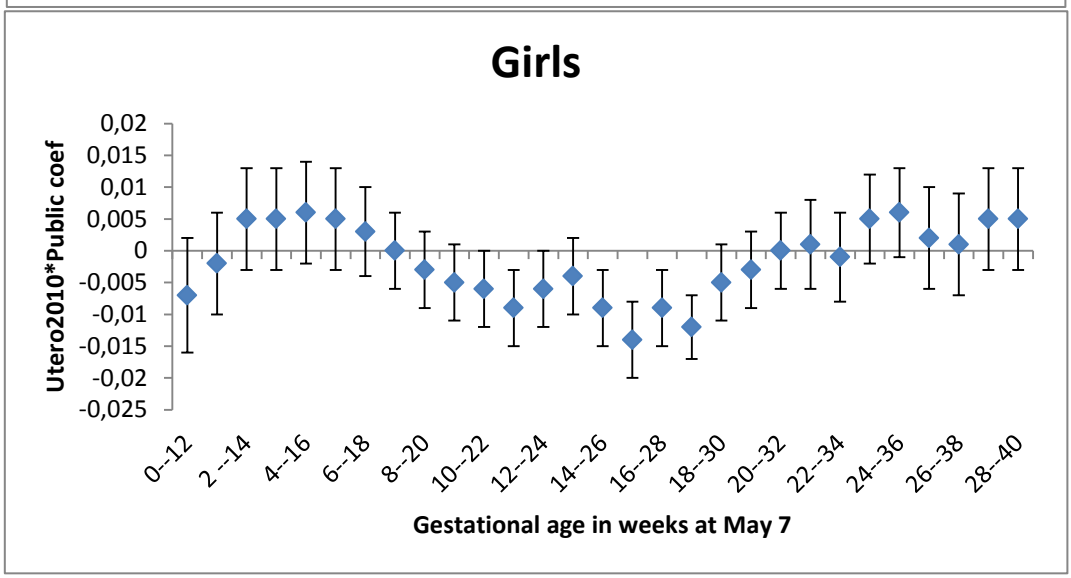


Figure 2. Sensitivity to the definition of the treatment group, Low birth weight: the figure shows the point estimates and the 95% confidence interval for the parameter of interest, the PublicxUtero2010 interaction term as we vary the threshold percentile of the predicted probability

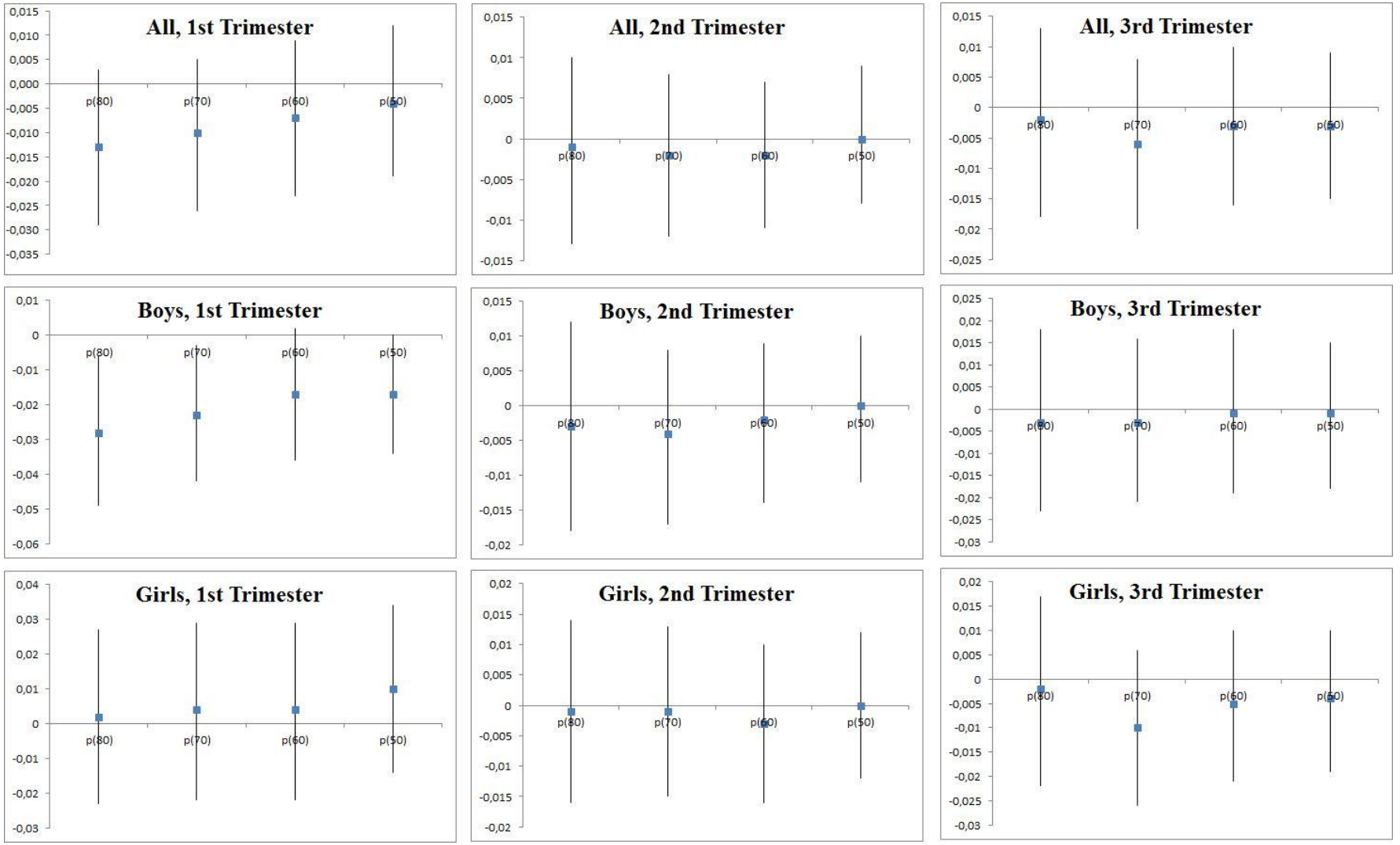


Figure 3. Sensitivity to the definition of the treatment group, Probability of a male birth outcome: the figure shows the point estimates and the 95% confidence interval for the parameter of interest, the Public*x*Utero2010 interaction term as we vary the threshold percentile of the predicted probability

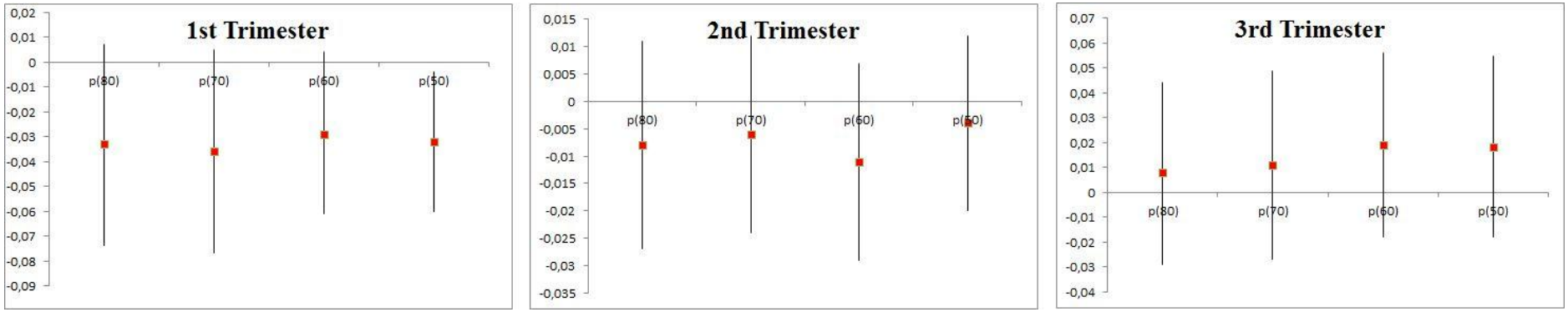


Table 1. Household income and expenditures pattern

	(1) Log HH wage income	(2) Log HH wage income (high educated HH)	(3) Log HH income	(4) Log Foodstuff expenditures per capita	(5) Log Alcohol and cigarettes expenditures per capita	(6) Log Non-foodstuff expenditures per capita	(7) Log Expenditures on Services	(8) Log (formal) savings
Panel A: 2010								
Public*after	-0.167*	-0.217**	-0.070***	-0.017	-0.043	-0.062**	-0.051*	-0.119**
	(0.095)	(0.104)	(0.022)	(0.018)	(0.080)	(0.030)	(0.028)	(0.057)
after	0.077	0.159	0.013	0.219***	0.508***	0.138***	-0.106***	-0.011
	(0.095)	(0.131)	(0.019)	(0.020)	(0.071)	(0.038)	(0.025)	(0.032)
public	2.395***	2.133***	0.121***	-0.008	-0.015	-0.014	0.032	0.003
	(0.151)	(0.156)	(0.028)	(0.027)	(0.122)	(0.046)	(0.034)	(0.058)
Controls	yes	yes	yes	yes	yes	yes	yes	yes
HH no	14,328	7,789	14,328	14,328	14,328	14,328	14,328	14,328
R-squared	0.688	0.699	0.587	0.385	0.209	0.186	0.399	0.048
Panel B: 2009								
Public*after	-0.040	-0.004	-0.049	-0.001	0.023	0.014	0.040	0.002
	(0.060)	(0.082)	(0.030)	(0.016)	(0.082)	(0.041)	(0.029)	(0.050)
after	-0.068	0.096	0.073***	0.248***	0.431***	0.216***	-0.107***	0.088**
	(0.072)	(0.103)	(0.019)	(0.017)	(0.071)	(0.044)	(0.029)	(0.040)
public	2.259***	2.121***	0.175***	0.028	0.004	0.116**	0.125***	-0.014
	(0.127)	(0.131)	(0.036)	(0.024)	(0.125)	(0.052)	(0.042)	(0.086)
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Observations	14,598	7,869	14,598	14,598	14,598	14,598	14,598	14,598
R-squared	0.699	0.697	0.611	0.371	0.206	0.180	0.369	0.054

Notes: All dependent variables in columns (1)-(7) are in logs. *Public* =1 when at least one adult in the household is employed in the public sector, and 0 if no household member is employed in the public sector. The sample does not include households where the head is unemployed. *After* = 1 for households income/expenditures during June-December of the respective year, and 0, for January-May. 1 USD=3 RON. Alcohol and cigarettes expenditures are deflated with a specific indicator calculated by the National Bank of Romania to account for inflation and changes in the special excise taxes that apply to alcohol and cigarettes. The sample includes only urban households, as this is our group of interest in the next sections. Controls include: household head gender, education, age, no of kids, household occupational composition, county indicators and indicators for the month for which the income/expenditures are reported. *Source*: Authors' calculations using 2009-2010 Romanian Household Budget Surveys. Clustered standard errors at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2. Descriptive statistics, working sample (urban households, fertile age mothers)

		All (1)				*Publicly employed* (20-80) (2)*				*Employed (3)*				*Housewives (4)*			
		2007	**2008**	**2009**	**2010**	**2007**	**2008**	**2009**	**2010**	**2007**	**2008**	**2009**	**2010**	**2007**	**2008**	**2009**	**2010**
Mother's characteristics at childbirth																	
Age		27,582	27,704	27,925	28,241	32,854	33,488	34,078	33,686	28,919	29,128	29,340	29,644	25,11	24,973	25,181	25,451
Education	Secondary	0,287	0,284	0,262	0,242	0,003	0,015	0,006	0,02	0,105	0,09	0,082	0,07	0,596	0,592	0,584	0,573
	High-school	0,397	0,372	0,351	0,324	0,001	0	0,001	0,003	0,421	0,388	0,346	0,303	0,363	0,363	0,358	0,355
	High education	0,316	0,345	0,387	0,434	0,996	0,984	0,993	0,977	0,474	0,523	0,573	0,628	0,041	0,045	0,058	0,072
Married		0,774	0,764	0,766	0,769	0,950	0,936	0,911	0,881	0,897	0,892	0,893	0,893	0,57	0,552	0,547	0,544
Ethnicity:	Romanian	0,932	0,929	0,934	0,932	0,971	0,966	0,954	0,966	0,943	0,946	0,950	0,949	0,911	0,903	0,91	0,906
	Hungarian	0,045	0,043	0,040	0,040	0,022	0,034	0,038	0,027	0,052	0,048	0,045	0,045	0,031	0,03	0,029	0,028
	Other	0,023	0,028	0,026	0,027	0,008	0,000	0,008	0,008	0,005	0,005	0,004	0,006	0,058	0,067	0,061	0,066
Prenatal control		0,868	0,867	0,834	0,789	0,943	0,932	0,879	0,816	0,926	0,921	0,881	0,818	0,798	0,81	0,791	0,764
No. of births		1,599	1,586	1,594	1,608	1,605	1,657	1,704	1,809	1,438	1,429	1,431	1,440	2	2,022	2,042	2,077
No. of living children		1,604	1,588	1,593	1,608	1,610	1,662	1,703	1,808	1,443	1,432	1,430	1,440	2,008	2,023	2,039	2,077
Hospital delivery		0,990	0,987	0,983	0,985	0,999	0,999	0,999	0,999	0,999	0,998	0,998	0,998	0,988	0,988	0,989	0,991
Child's characteristics at birth																	
Girl		0,485	0,480	0,484	0,487	0,492	0,485	0,488	0,495	0,484	0,478	0,482	0,489	0,487	0,484	0,489	0,48
Birth weight		3230,040	3238,739	3233,877	3224,180	3315,247	3318,813	3305,611	3292,180	3284,204	3294,707	3282,664	3273,225	3136,077	3149,135	3149,45	3141,317
Low birth weight		0,064	0,059	0,061	0,065	0,043	0,045	0,048	0,049	0,051	0,047	0,049	0,050	0,094	0,09	0,09	0,094
Gestation duration (weeks)		38,884	38,791	38,780	38,765	38,886	38,728	38,707	38,690	38,946	38,842	38,844	38,806	38,776	38,698	38,696	38,699
Premature delivery		0,070	0,070	0,072	0,068	0,057	0,061	0,063	0,063	0,059	0,059	0,058	0,058	0,088	0,088	0,089	0,084
No. observations		**76697**	**79517**	**79894**	**76160**	**9827**	**10219**	**10437**	**9801**	**48257**	**49803**	**50789**	**48867**	**22216**	**22228**	**21860**	**20128**

Notes: Mean values for pregnancies in utero at May 7th, in each corresponding year, that resulted in live births. Source: Authors' calculations using the VSN files for 2007, 2008, 2009 and 2010. * "Publicly employed (20-80)" refers to the women classified as publicly employed based on their predicted probabilities of working in the public sector, 20-80 split (see Section 4 for a detailed description).

Table 3. Selection into fertility

	(1) Secondary education or less	(2) High school education	(4) Higher education	(5) Age	(7) Married	(8) Unemployed father
All						
utero_2010	-0.007***	-0.026***	0.033***	0.166***	-0.097***	0.010***
	(0.002)	(0.002)	(0.001)	(0.008)	(0.002)	(0.001)
Observations	312,268	312,268	312,268	312,268	86,432	312,268
R-squared	0.035	0.025	0.073	0.031	0.036	0.030
Publicly employed						
utero_2010	0.032***	0.0004**	-0.033***	0.341***	-0.019***	0.002***
	(0.001)	(0.000)	(0.001)	(0.031)	(0.001)	(0.000)
Observations	40,284	40,284	40,284	40,284	40,284	40,284
R-squared	0.022	0.007	0.025	0.060	0.016	0.013
Privately employed						
utero_2010	-0.045***	-0.132***	0.177***	0.861***	0.015***	0.008***
	(0.001)	(0.003)	(0.003)	(0.012)	(0.001)	(0.001)
Observations	157,167	157,167	157,167	157,167	157,167	157,167
R-squared	0.028	0.049	0.076	0.016	0.013	0.019
Housewives						
utero_2010	-0.034***	0.008***	0.025***	0.013	0.037***	-0.097***
	(0.002)	(0.002)	(0.001)	(0.021)	(0.002)	(0.002)
Observations	86,432	86,432	86,432	86,432	86,432	86,432
R-squared	0.026	0.020	0.014	0.011	0.017	0.036

Each cell reports the estimated coefficient on the observable mothers' characteristics from an OLS regression. All regressions include child's month of birth, county specific indicators, (linear) time trends and county specific trends. We only consider children born in urban areas that were in utero May-December 2007-2010. Standard errors are clustered at the county level.

Table 4. Low birth weight. Publicly employed vs. Housewives mothers

	1st Trimester			*2nd Trimester*			*3rd Trimester*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All									
public_utero2010	-0.015**	-0.020***	-0.014*	0.003	-0.004	-0.002	0.001	-0.000	-0.001
	(0.007)	(0.006)	(0.008)	(0.005)	(0.004)	(0.006)	(0.007)	(0.006)	(0.008)
public_utero2009			0.014			0.004			0.000
			(0.009)			(0.006)			(0.005)
public_utero2008			0.004			-0.001			-0.003
			(0.008)			(0.006)			(0.006)
public	-0.047***	-0.005	-0.011	-0.046***	-0.017***	-0.018***	-0.040***	-0.016***	-0.015***
	(0.004)	(0.009)	(0.010)	(0.003)	(0.005)	(0.006)	(0.004)	(0.004)	(0.005)
Observations	27,401	27,401	27,401	57,318	57,318	57,318	41,997	41,997	41,997
R-squared	0.145	0.329	0.330	0.093	0.261	0.261	0.016	0.141	0.141
Panel B: Boys									
public_utero2010	-0.032***	-0.032***	-0.029**	0.001	-0.003	-0.004	-0.003	-0.005	-0.002
	(0.008)	(0.008)	(0.011)	(0.008)	(0.006)	(0.008)	(0.009)	(0.009)	(0.010)
public_utero2009			0.007			-0.001			0.006
			(0.009)			(0.009)			(0.008)
public_utero2008			0.001			-0.000			0.002
			(0.010)			(0.008)			(0.007)
public	-0.034***	0.001	-0.002	-0.039***	-0.016***	-0.016*	-0.033***	-0.017**	-0.019**
	(0.005)	(0.009)	(0.012)	(0.004)	(0.005)	(0.008)	(0.004)	(0.007)	(0.008)
Observations	13,949	13,949	13,949	29,502	29,502	29,502	21,640	21,640	21,640
R-squared	0.162	0.357	0.357	0.104	0.280	0.280	0.015	0.147	0.147
Panel C: Girls									
public_utero2010	0.002	-0.007	0.002	0.005	-0.005	-0.002	0.006	0.005	-0.001
	(0.010)	(0.009)	(0.012)	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)	(0.010)
public_utero2009			0.021			0.008			-0.007
			(0.014)			(0.008)			(0.008)
public_utero2008			0.004			-0.002			-0.009
			(0.015)			(0.008)			(0.008)
public	-0.061***	-0.009	-0.018	-0.053***	-0.018**	-0.021**	-0.048***	-0.015*	-0.010
	(0.005)	(0.013)	(0.018)	(0.004)	(0.008)	(0.010)	(0.005)	(0.008)	(0.010)
Observations	13,452	13,452	13,452	27,816	27,816	27,816	20,357	20,357	20,357
R-squared	0.136	0.309	0.309	0.086	0.246	0.246	0.021	0.138	0.138
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year&County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynaecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

Table 5. Low birth weight. Publicly employed vs. Housewives mothers, High educated mothers

	1st Trimester			*2nd Trimester*			*3rd Trimester*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All									
public_utero2010	-0.020**	-0.024**	-0.011	0.006	-0.001	0.007	-0.004	-0.007	-0.006
	(0.009)	(0.009)	(0.011)	(0.006)	(0.006)	(0.007)	(0.008)	(0.009)	(0.010)
public_utero2009			0.012			0.013*			0.001
			(0.011)			(0.007)			(0.009)
public_utero2008			0.025*			0.009			0.001
			(0.013)			(0.008)			(0.009)
public	-0.010**	-0.012	-0.025**	-0.017***	-0.015***	-0.022***	-0.012***	-0.013***	-0.014*
	(0.004)	(0.007)	(0.011)	(0.003)	(0.005)	(0.007)	(0.004)	(0.004)	(0.007)
Observations	14,088	14,088	14,088	29,619	29,619	29,619	21,272	21,272	21,272
R-squared	0.139	0.319	0.319	0.083	0.247	0.247	0.010	0.122	0.122
Panel B: Boys									
public_utero2010	-0.040***	-0.040***	-0.025*	0.008	0.003	0.011	-0.008	-0.010	-0.012
	(0.012)	(0.011)	(0.014)	(0.008)	(0.007)	(0.008)	(0.011)	(0.011)	(0.014)
public_utero2009			0.015			0.011			-0.003
			(0.013)			(0.008)			(0.010)
public_utero2008			0.028*			0.012			-0.005
			(0.015)			(0.010)			(0.011)
public	-0.001	-0.005	-0.019*	-0.016***	-0.014**	-0.022***	-0.005	-0.007	-0.005
	(0.006)	(0.008)	(0.012)	(0.004)	(0.006)	(0.008)	(0.005)	(0.006)	(0.008)
Observations	7,161	7,161	7,161	15,243	15,243	15,243	10,888	10,888	10,888
R-squared	0.173	0.356	0.356	0.102	0.280	0.280	0.013	0.139	0.139
Panel C: Girls									
public_utero2010	0.006	-0.001	0.010	0.004	-0.005	0.003	0.001	-0.004	0.002
	(0.013)	(0.013)	(0.015)	(0.009)	(0.009)	(0.010)	(0.011)	(0.012)	(0.013)
public_utero2009			0.010			0.016			0.007
			(0.018)			(0.010)			(0.013)
public_utero2008			0.022			0.006			0.009
			(0.020)			(0.012)			(0.013)
public	-0.020***	-0.019**	-0.030*	-0.019***	-0.016**	-0.023***	-0.020***	-0.019***	-0.024**
	(0.006)	(0.009)	(0.016)	(0.004)	(0.006)	(0.008)	(0.005)	(0.007)	(0.011)
Observations	6,927	6,927	6,927	14,376	14,376	14,376	10,384	10,384	10,384
R-squared	0.120	0.295	0.295	0.071	0.222	0.222	0.017	0.117	0.118
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year&County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynaecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

Table 6. Low birth weight. Publicly employed vs. Privately employed mothers

	1st Trimester		*2nd Trimester*			*3rd Trimester*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All									
public_utero2010	-0.010**	-0.016***	-0.010	0.005	-0.002	-0.004	0.003	0.001	0.003
	(0.004)	(0.004)	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)	(0.004)	(0.005)
public_utero2009			0.008			-0.005			0.005
			(0.008)			(0.006)			(0.004)
public_utero2008			0.009*			-0.002			0.000
			(0.005)			(0.006)			(0.004)
Public	-0.004*	-0.007***	-0.013***	-0.005**	-0.009***	-0.007	-0.007***	-0.008***	-0.010***
	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.005)	(0.002)	(0.003)	(0.003)
Observations	41,370	41,370	41,370	89,591	89,591	89,591	66,490	66,490	66,490
R-squared	0.127	0.320	0.320	0.088	0.244	0.244	0.006	0.119	0.119
Panel B: Boys									
public_utero2010	-0.021***	-0.023***	-0.014	0.000	-0.008	-0.011	-0.000	-0.003	-0.001
	(0.007)	(0.008)	(0.010)	(0.007)	(0.005)	(0.008)	(0.005)	(0.005)	(0.006)
public_utero2009			0.010			-0.007			0.005
			(0.011)			(0.007)			(0.007)
public_utero2008			0.016**			-0.003			0.001
			(0.006)			(0.008)			(0.006)
Public	0.004	-0.001	-0.010	-0.002	-0.008**	-0.005	-0.004	-0.006*	-0.008
	(0.003)	(0.005)	(0.008)	(0.004)	(0.003)	(0.007)	(0.003)	(0.003)	(0.005)
Observations	21,324	21,324	21,324	46,330	46,330	46,330	34,409	34,409	34,409
R-squared	0.155	0.340	0.340	0.100	0.259	0.259	0.008	0.126	0.126
Panel C: Girls									
public_utero2010	0.003	-0.008	-0.006	0.010**	0.004	0.003	0.005	0.005	0.007
	(0.007)	(0.006)	(0.007)	(0.004)	(0.004)	(0.006)	(0.004)	(0.005)	(0.007)
public_utero2009			0.006			-0.003			0.005
			(0.009)			(0.006)			(0.008)
public_utero2008			0.000			-0.001			-0.000
			(0.008)			(0.006)			(0.007)
Public	-0.012***	-0.013*	-0.015**	-0.009***	-0.010***	-0.009*	-0.010***	-0.010**	-0.012
	(0.003)	(0.007)	(0.006)	(0.002)	(0.003)	(0.005)	(0.003)	(0.005)	(0.007)
Observations	20,046	20,046	20,046	43,261	43,261	43,261	32,081	32,081	32,081
R-squared	0.106	0.307	0.307	0.079	0.233	0.233	0.006	0.117	0.117
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year&County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

Table 7. Probability of a live birth being male. Publicly employed vs. Housewives mothers

	1st Trimester			*2nd Trimester*			*3rd Trimester*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All mothers									
public_utero2010	-0.030**	-0.033**	-0.034	-0.009	-0.009	-0.007	-0.008	-0.006	0.003
	(0.014)	(0.014)	(0.020)	(0.009)	(0.008)	(0.009)	(0.011)	(0.011)	(0.017)
public_utero2009			0.011			-0.002			0.015
			(0.025)			(0.012)			(0.014)
public_utero2008			-0.014			0.008			0.013
			(0.022)			(0.010)			(0.020)
public	0.007	0.016	0.017	-0.005	-0.004	-0.006	-0.007	-0.006	-0.016
	(0.007)	(0.013)	(0.020)	(0.005)	(0.011)	(0.013)	(0.007)	(0.010)	(0.015)
Observations	27,401	27,401	27,401	57,318	57,318	57,318	41,997	41,997	41,997
R-squared	0.004	0.020	0.020	0.002	0.021	0.021	0.002	0.024	0.024
Panel B: High-educated mothers									
public_utero2010	-0.042**	-0.045***	-0.057*	-0.017	-0.019	-0.028*	0.003	-0.000	0.007
	(0.018)	(0.017)	(0.029)	(0.013)	(0.013)	(0.015)	(0.013)	(0.014)	(0.018)
public_utero2009			-0.003			-0.020			0.007
			(0.032)			(0.015)			(0.019)
public_utero2008			-0.032			-0.005			0.013
			(0.032)			(0.017)			(0.024)
public	0.010	0.003	0.015	-0.007	-0.010	-0.002	-0.004	0.000	-0.006
	(0.009)	(0.012)	(0.024)	(0.008)	(0.008)	(0.013)	(0.006)	(0.007)	(0.014)
Observations	14,088	14,088	14,088	29,619	29,619	29,619	21,272	21,272	21,272
R-squared	0.006	0.028	0.028	0.003	0.028	0.028	0.004	0.029	0.029
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year&County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Controls include: birth weight, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

Table 8. Mother Fixed Effects

	Publicly employed mothers (1)	Publicly employed mothers (2)	Publicly employed mothers (3)	Housewives mothers (4)	Housewives mothers (5)	Housewives mothers (6)
Panel A: Low birth weight						
Exposed sibling	-0.033**	-0.036**	-0.039**	-0.014**	-0.015**	-0.003
	(0.011)	(0.012)	(0.016)	(0.004)	(0.004)	(0.005)
Controls	no	yes	yes	no	yes	yes
Family FE	no	no	yes	no	no	yes
Month of birth FE	yes	yes	yes	yes	yes	yes
Time Trend	yes	yes	yes	yes	yes	yes
Observations	3,189	3,189	3,189	28,208	28,208	28,208
No of groups			1,819			12,565
R-squared	0.004	0.009	0.001	0.001	0.005	0.001
Mean dep. var.	0.041	0.041	0.041	0.064	0.064	0.064
Panel B: Probability of a male birth						
Exposed sibling	0.010	0.018	0.011	0.010	0.007	-0.003
	(0.032)	(0.034)	(0.045)	(0.011)	(0.011)	(0.012)
Controls	no	yes	yes	no	yes	yes
Family FE	no	no	yes	no	no	yes
Month of birth FE	yes	yes	yes	yes	yes	yes
Time Trend	yes	yes	yes	yes	yes	yes
Observations	3,189	3,189	3,189	28,208	28,208	28,208
No of groups			1,819			12,565
R-squared	0.002	0.005	0.001	0.001	0.002	0.006
Mean dep. var.	0.532	0.532	0.532	0.506	0.506	0.506

Notes: All regressions are based on the urban sample; in columns (1)-(3) we consider publicly employed women that gave birth in 2010, in column (4)-(6) we show the housewives mothers giving birth in 2010. The controls are: a gender dummy, pregnancy order, gestation month of the first gynaecological visit; parents characteristics: the age of mother at conception and its square, the age of the father at conception and its square; calendar month of birth dummies and a time trend. These specifications are based on the mother's status at the time of birth in 2010. Source: Authors' calculation using the 2003-2010 Vital Statistics. Robust standard errors shown in parentheses. ** p<0.05.

Table 9. Low Birth weight. Publicly employed with employed husbands vs. Housewives with husbands with occupational status different from employed

	1st Trimester			*2nd Trimester*			*3rd Trimester*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All									
public_utero2010	-0.011	-0.017**	-0.005	0.002	-0.008	-0.010	0.002	-0.001	0.002
	(0.009)	(0.008)	(0.010)	(0.007)	(0.005)	(0.008)	(0.009)	(0.008)	(0.010)
public_utero2009			0.022*			0.001			0.006
			(0.012)			(0.008)			(0.007)
public_utero2008			0.008			-0.008			0.001
			(0.009)			(0.006)			(0.006)
public	-0.071***	-0.033*	-0.044**	-0.062***	-0.041***	-0.039***	-0.056***	-0.044***	-0.046***
	(0.007)	(0.020)	(0.021)	(0.005)	(0.011)	(0.012)	(0.006)	(0.013)	(0.015)
Observations	17,537	17,537	17,537	36,121	36,121	36,121	26,044	26,044	26,044
R-squared	0.159	0.354	0.355	0.109	0.283	0.283	0.024	0.155	0.155
Panel B: Boys									
public_utero2010	-0.029**	-0.029**	-0.019	-0.001	-0.008	-0.013	0.002	-0.002	0.009
	(0.012)	(0.012)	(0.012)	(0.010)	(0.007)	(0.011)	(0.012)	(0.011)	(0.013)
public_utero2009			0.015			-0.005			0.017**
			(0.012)			(0.010)			(0.008)
public_utero2008			0.010			-0.011			0.011
			(0.012)			(0.012)			(0.008)
public	-0.053***	-0.010	-0.019	-0.057***	-0.030**	-0.024*	-0.051***	-0.057***	-0.067***
	(0.007)	(0.022)	(0.024)	(0.006)	(0.012)	(0.013)	(0.005)	(0.017)	(0.018)
Observations									
R-squared	8,919	8,919	8,919	18,413	18,413	18,413	13,324	13,324	13,324
Panel C: Girls									
public_utero2010	0.008	-0.002	0.010	0.005	-0.009	-0.008	0.001	0.001	-0.004
	(0.016)	(0.013)	(0.019)	(0.008)	(0.008)	(0.010)	(0.009)	(0.009)	(0.012)
public_utero2009			0.027			0.007			-0.005
			(0.021)			(0.011)			(0.010)
public_utero2008			0.002			-0.006			-0.008
			(0.016)			(0.009)			(0.009)
public	-0.090***	-0.052**	-0.063**	-0.067***	-0.053***	-0.053***	-0.061***	-0.031	-0.026
	(0.009)	(0.024)	(0.029)	(0.006)	(0.016)	(0.017)	(0.009)	(0.020)	(0.021)
Observations	8,618	8,618	8,618	17,708	17,708	17,708	12,720	12,720	12,720
R-squared	0.152	0.337	0.337	0.102	0.264	0.265	0.030	0.156	0.156
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year&County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynaecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

Table 10. Probability of a male birth. Publicly employed with employed husbands vs. Housewives with husbands with no activity

	1st Trimester			*2nd Trimester*			*3rd Trimester*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
public_utero2010	-0.031	-0.032*	-0.035	-0.001	0.001	0.006	-0.015	-0.009	-0.020
	(0.020)	(0.018)	(0.021)	(0.013)	(0.012)	(0.016)	(0.013)	(0.014)	(0.022)
public_utero2009			0.007			-0.001			-0.013
			(0.029)			(0.014)			(0.015)
public_utero2008			-0.017			0.017			-0.017
			(0.023)			(0.013)			(0.020)
public	0.008	-0.029	-0.026	-0.006	-0.021	-0.027	-0.005	-0.001	0.010
	(0.009)	(0.033)	(0.036)	(0.006)	(0.025)	(0.025)	(0.008)	(0.033)	(0.035)
Observations	17,537	17,537	17,537	36,121	36,121	36,121	26,044	26,044	26,044
R-squared	0.005	0.024	0.024	0.002	0.021	0.021	0.003	0.025	0.025
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year&County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Controls include: birth weight, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynaecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

Appendix A – not for publication

Table A1 Descriptive statistics, urban and rural sample

		All				*Publicly employed* (20-80)*				*Housewives*				*Employed*			
		2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010	2007	2008	2009	2010
Mother's characteristics at childbirth																	
Age		26,631	26,740	26,916	27,203	31,881	32,292	32,789	31,870	24,965	24,901	25,056	25,250	28,424	28,628	28,833	29,162
Education	Secondary	0,440	0,432	0,409	0,389	0,005	0,012	0,009	0,020	0,700	0,695	0,682	0,674	0,157	0,142	0,130	0,114
	Highschool	0,361	0,348	0,340	0,322	0,001	0,001	0,001	0,006	0,279	0,283	0,289	0,289	0,448	0,420	0,382	0,340
	Higher ed.	0,199	0,22	0,251	0,289	0,995	0,987	0,99	0,974	0,021	0,022	0,03	0,037	0,394	0,438	0,488	0,546
Urban		0,547	0,551	0,552	0,559	0,786	0,734	0,724	0,594	0,354	0,354	0,347	0,350	0,734	0,731	0,734	0,742
Married		0,745	0,733	0,729	0,728	0,949	0,937	0,920	0,904	0,627	0,606	0,595	0,587	0,891	0,885	0,886	0,886
Ethnicity:	Romanian	0,917	0,914	0,920	0,918	0,956	0,948	0,942	0,941	0,903	0,901	0,909	0,905	0,930	0,931	0,937	0,936
	Hungarian	0,049	0,049	0,046	0,046	0,036	0,050	0,049	0,052	0,035	0,033	0,032	0,031	0,064	0,063	0,058	0,058
	Other	0,034	0,037	0,034	0,037	0,008	0,001	0,009	0,007	0,062	0,066	0,059	0,064	0,006	0,006	0,006	0,006
Prenatal control		0,848	0,850	0,821	0,790	0,934	0,928	0,877	0,826	0,805	0,813	0,791	0,775	0,914	0,911	0,877	0,824
No. of births		1,822	1,808	1,818	1,833	1,580	1,609	1,670	1,726	2,178	2,196	2,210	2,246	1,505	1,496	1,502	1,508
No. of living children		1,826	1,809	1,816	1,833	1,585	1,613	1,669	1,726	2,181	2,195	2,206	2,245	1,512	1,500	1,500	1,508
Hospital delivery		0,985	0,983	0,982	0,983	0,999	0,999	0,998	0,998	0,983	0,982	0,984	0,984	0,998	0,997	0,997	0,997
Child's characteristics at birth																	
Girl		0,486	0,483	0,485	0,487	0,491	0,482	0,488	0,493	0,487	0,486	0,487	0,487	0,484	0,479	0,483	0,488
Birth weight		3206,466	3215,966	3217,471	3207,870	3315,183	3323,001	3308,198	3299,508	3144,569	3155,117	3161,942	3151,450	3278,428	3289,368	3281,505	3271,363
Low birth weight		0,071	0,068	0,067	0,071	0,044	0,043	0,047	0,047	0,091	0,089	0,086	0,090	0,053	0,049	0,050	0,052
Gestation duration (weeks)		38,859	38,763	38,772	38,764	38,908	38,772	38,753	38,761	38,787	38,693	38,717	38,723	38,949	38,839	38,850	38,819
Premature delivery		0,077	0,077	0,077	0,074	0,056	0,057	0,061	0,059	0,088	0,090	0,088	0,085	0,061	0,061	0,059	0,060
No. observations		140250	144256	144782	136331	13403	13982	14201	13284	62818	62709	62909	57588	65743	68117	69168	65881

Notes: Mean values for pregnancies in utero at May 7th, in each corresponding year, that resulted in live births. Source: Authors' calculations using the VSN files for 2007, 2008, 2009 and 2010. * "Publicly employed (20-80)" refers to the women classified as publicly employed based on their predicted probabilities of working in the public sector, 20-80 split (see Section 4 for a detailed description).

Table A2. Selection into fertility, DiD specification

VARIABLES	(1) Secondary education or less	(2) High school education	(3) Higher education	(4) Age	(5) Married	(6) Unemployed father
pub80_utero10	0.045***	0.009	-0.055***	-1.196***	-0.028**	-0.008**
	(0.011)	(0.009)	(0.005)	(0.281)	(0.012)	(0.004)
pub80_utero09	0.020**	0.003	-0.023***	-0.055	-0.011	-0.005
	(0.009)	(0.009)	(0.003)	(0.274)	(0.010)	(0.004)
pub80_utero08	0.018**	-0.001	-0.017***	0.304	0.006	-0.004
	(0.009)	(0.008)	(0.004)	(0.218)	(0.008)	(0.005)
Public	-0.587***	-0.361***	0.948***	12.865***	0.382***	-0.011***
	(0.010)	(0.009)	(0.003)	(0.440)	(0.016)	(0.003)
Observations	126,716	126,716	126,716	126,716	126,716	126,716
R-squared	0.312	0.163	0.833	0.250	0.157	0.054

Notes: Controls include: child gender, gestational age at birth in weeks; 42 county dummies, 9 month of birth dummies, birth year fixed effects and county specific time trends. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

Table A3. Low birth weight: Publicly employed vs. housewives mothers, full sample

	1st Trimester			*2nd Trimester*			*3rd Trimester*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All									
public_utero2010	-0.009*	-0.015***	-0.009	0.004	-0.002	-0.004	-0.001	-0.002	-0.002
	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)
public_utero2009			0.011			-0.002			0.003
			(0.007)			(0.004)			(0.004)
public_utero2008			0.004			-0.004			-0.004
			(0.007)			(0.004)			(0.004)
Public	-0.047***	-0.012*	-0.017**	-0.045***	-0.012***	-0.010***	-0.040***	-0.016***	-0.016***
	(0.003)	(0.007)	(0.007)	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)	(0.005)
Observations	64,593	64,593	64,593	135,298	135,298	135,298	100,987	100,987	100,987
R-squared	0.134	0.318	0.318	0.088	0.251	0.251	0.014	0.140	0.140
Panel B: Boys									
public_utero2010	-0.020***	-0.020***	-0.015*	-0.001	-0.006	-0.005	-0.000	-0.002	-0.004
	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.005)	(0.007)	(0.006)	(0.008)
public_utero2009			0.010			0.002			0.001
			(0.007)			(0.006)			(0.006)
public_utero2008			0.006			0.000			-0.008*
			(0.007)			(0.005)			(0.005)
Public	-0.036***	-0.007	-0.012	-0.038***	-0.012***	-0.013**	-0.036***	-0.019***	-0.017**
	(0.005)	(0.009)	(0.011)	(0.003)	(0.004)	(0.006)	(0.003)	(0.005)	(0.007)
Observations	33,095	33,095	33,095	69,371	69,371	69,371	51,865	51,865	51,865
R-squared	0.143	0.332	0.332	0.100	0.267	0.267	0.013	0.145	0.145
Panel C: Girls									
public_utero2010	0.002	-0.009	-0.004	0.010**	0.002	-0.004	-0.001	-0.002	0.000
	(0.008)	(0.007)	(0.009)	(0.005)	(0.004)	(0.006)	(0.005)	(0.005)	(0.007)
public_utero2009			0.011			-0.007			0.005
			(0.011)			(0.006)			(0.006)
public_utero2008			0.003			-0.009			0.000
			(0.013)			(0.006)			(0.006)
Public	-0.058***	-0.016*	-0.021*	-0.052***	-0.011*	-0.006	-0.044***	-0.012**	-0.014*
	(0.005)	(0.008)	(0.012)	(0.004)	(0.006)	(0.007)	(0.004)	(0.006)	(0.007)
Observations	31,498	31,498	31,498	65,927	65,927	65,927	49,122	49,122	49,122
R-squared	0.130	0.306	0.306	0.079	0.238	0.238	0.016	0.136	0.136

Notes: Controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

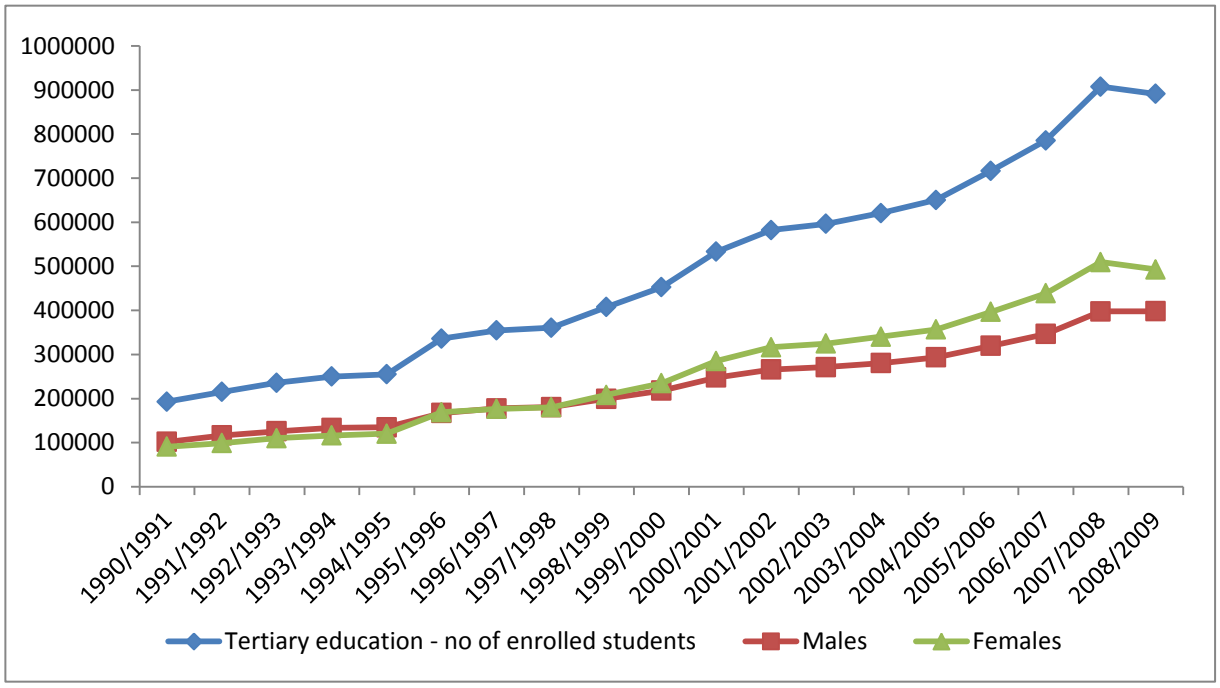
Table A4. Probability of a birth being male: Publicly employed vs. Privately employed mothers

	1st Trimester			*2nd Trimester*			*3rd Trimester*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
public_utero2010	-0.000	-0.005	-0.000	0.008	0.007	0.007	-0.010	-0.012	-0.015
	(0.010)	(0.011)	(0.012)	(0.010)	(0.009)	(0.011)	(0.009)	(0.008)	(0.012)
public_utero2009			0.007			-0.001			-0.008
			(0.024)			(0.011)			(0.011)
public_utero2008			0.007			0.000			-0.001
			(0.021)			(0.009)			(0.015)
Public	-0.008	-0.008	-0.013	-0.009*	-0.015**	-0.015*	-0.006	0.000	0.003
	(0.006)	(0.008)	(0.014)	(0.005)	(0.006)	(0.008)	(0.006)	(0.008)	(0.012)
Observations	41,370	41,370	41,370	89,591	89,591	89,591	66,490	66,490	66,490
R-squared	0.002	0.026	0.026	0.001	0.025	0.025	0.001	0.030	0.030
Controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Year&County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, mother's education dummies, ethnicity dummies, marital status dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynecological visit, an indicator for home delivery, father's age and its square, father's employment status dummies; 42 county dummies, 9 month of birth dummies; female unemployment rate in the month of conception for each county and year of birth. Robust standard errors clustered at the county level shown in parentheses. *** p<0.01, ** p<0.05, * p<0.

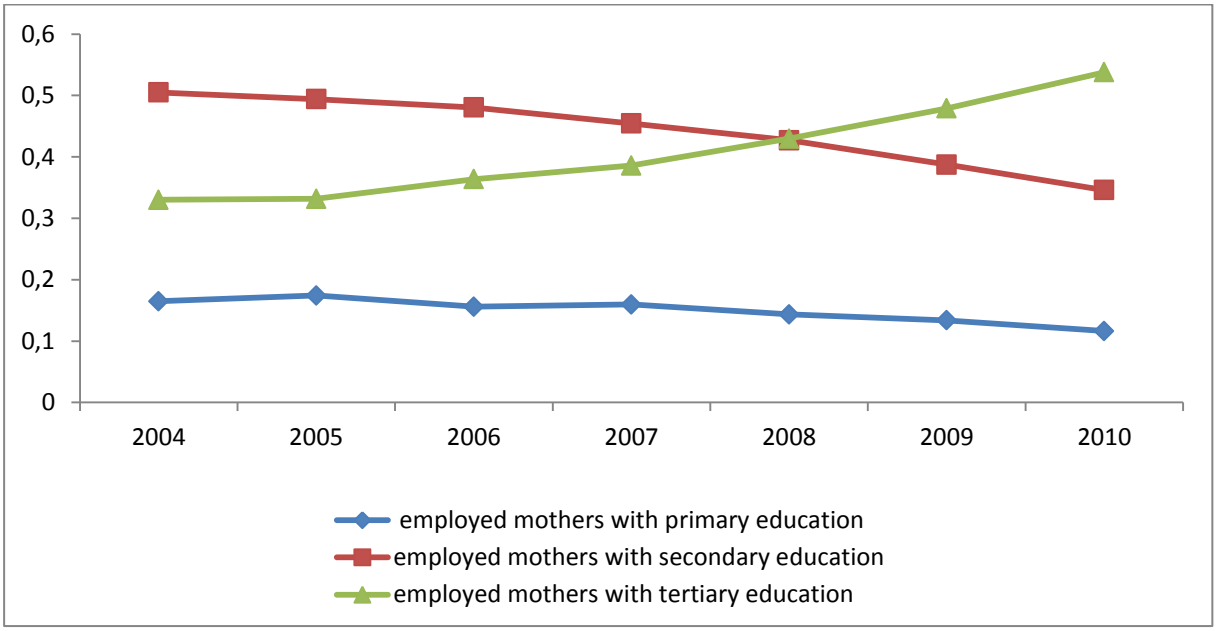
Figures

Figure A1. Higher education enrollment in Romania



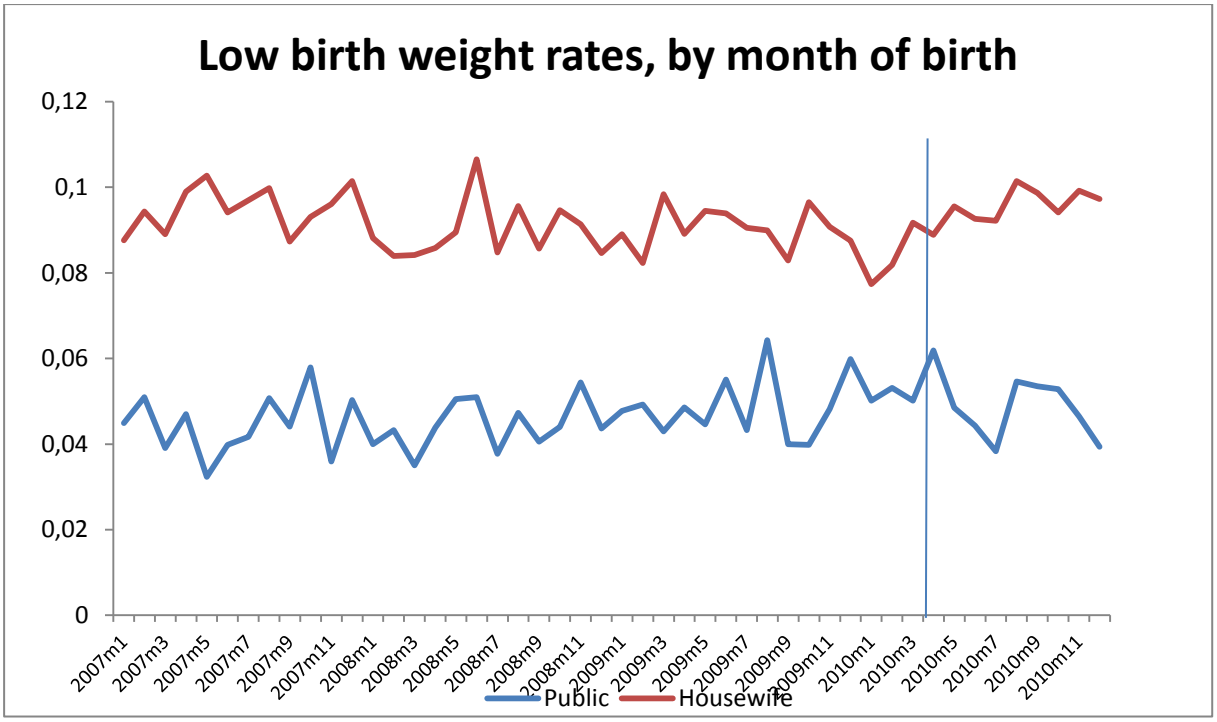
Source: Statistics Romania.

Figure A2. Educational level of employed mothers



Source: Authors' calculations using the 2004-2010 Vital Statistics Natality data.

Figure A3. Low birth weight incidence, by month of birth



Source: Authors' calculations using VSN files, 2007-2010

Appendix B - Not for publication

The likelihood of maternal employment in the public sector

Employment in the public sector is the key variable in our identification strategy. However, the Vital Statistics Natality (VSN) files, contains information only on the employment status of the mother without specification of the sector, i.e., private or public. We address this problem by using the Romanian Household Budget Survey (RHBS), a nationwide representative survey which provides detailed socio-economic information on every member of the household, to construct a characteristics-based likelihood of employment in the public sector for each mother. The RHBS has the same employment categories as VSN, but further disentangles between public and private sector.

B1. Main specification: Probit estimation

We use a reduced form Probit model to estimate the probability of being employed in the public sector, conditional on being employed in a wage job, for women aged 16 to 50. Our sample consists of the employed women aged 16-45, included in the 2007, 2008, 2009 and 2010 RHBS. The dependent variable is the sector of employment (1 if publicly employed, 0 if privately employed).We include as explanatory variables all the characteristics that are also available in the VSN, as we will employ of out sample predictions on the VSN sample to assign each mother a predicted probability of public employment based on all her observable characteristics. We estimate the specification separately for each of the years of interest so as to capture the potential changes in the employment in the public sector. We cluster the standard errors at region level and use the corresponding household frequency weights. Our main specification of the reduced form model of public employment is:

global z "varsta varsta2 i.stciv i.scm i.etnic i.urban i.regiune nnv i.scm#i.urban vtata i.acttata"

$$Prob(Public\ sector\ employment_i | Employed) = \Phi(\beta_1 \cdot age + \beta_2 \cdot married + \beta_3 \cdot i.ethnicity + \beta_4 \cdot i.educ + \beta_5 \cdot i.urban + \beta_6 \cdot i.region\_d + \beta_7 \cdot age_{sqared} + \beta_8 \cdot educ \cdot urban + \beta_9 \cdot number\_children + \beta_{10} \cdot husbans's\_age + \beta_{11} \cdot i.husband's\_ocupation)$$

where:

Public sector employment: binary variable, 1 if employed in the public sector

age: age of mother at birth of child

married: binary variable, 1 if married

i.ethnicity: categorical variable for ethnicity, 1 if Romanian, 2 if Hungarian, 3 if Other ethnicity

i.educ: categorical variable for educational level, 1 if primary, 2 if secondary, 3 if tertiary

i.urban: binary variable for area of residence, 1 if urban area

i.region: categorical variable for macro-region of residence

number_children: number of children belonging to the mother

husband's_age husband's age

husband's_occupation categorical variable for husband's occupational status

The estimation results for the 4 year are presented in Table B1.

Table B1 Reduced form Probit estimation, main specification

VARIABLES	(1) 2007	(2) 2008	(3) 2009	(4) 2010
age	0.135***	0.073*	0.136***	0.055
	(0.033)	(0.039)	(0.035)	(0.041)
Age squared	-0.002***	-0.001	-0.002***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
married	0.101	0.098	0.051	-0.010
	(0.077)	(0.085)	(0.087)	(0.071)
divorced	-0.113	0.071	-0.005	0.084
	(0.077)	(0.102)	(0.107)	(0.100)
widdowed	0.164	0.098	-0.193	0.071
	(0.213)	(0.176)	(0.232)	(0.260)
Secondary school	-0.376	-0.256	-0.148	-0.074
	(0.406)	(0.320)	(0.325)	(0.546)
Professional school	-0.692*	-0.365	-0.589*	-0.452
	(0.411)	(0.323)	(0.319)	(0.532)
High school	-0.227	0.033	-0.181	-0.032
	(0.404)	(0.320)	(0.333)	(0.524)
Post high school	0.710	0.920***	0.413	1.181**
	(0.447)	(0.351)	(0.359)	(0.591)
Higher	1.332***	1.331***	0.947***	1.339**
	(0.418)	(0.304)	(0.328)	(0.534)
Other situations	-0.645	-0.453	-0.423	
	(0.692)	(0.842)	(0.609)	
Hungarian	-0.174**	-0.041	-0.016	-0.137
	(0.084)	(0.072)	(0.112)	(0.103)
Other	0.281	-0.423*	0.254	0.103
	(0.177)	(0.219)	(0.163)	(0.188)
Urban	0.020	0.646	0.174	0.562
	(0.421)	(0.557)	(0.387)	(0.732)
Region 2	-0.203**	-0.163	-0.208**	-0.085
	(0.081)	(0.110)	(0.091)	(0.108)
Region 3	-0.191*	-0.296**	-0.223**	-0.279**
	(0.114)	(0.140)	(0.099)	(0.114)
Region 4	-0.001	-0.172	-0.090	0.059
	(0.130)	(0.148)	(0.096)	(0.135)
Region 5	-0.197**	-0.290	-0.342***	-0.261**
	(0.093)	(0.188)	(0.118)	(0.127)
Region 6	-0.234**	-0.399***	-0.362***	-0.123
	(0.109)	(0.112)	(0.123)	(0.112)
Region 7	-0.210**	-0.143	-0.188**	-0.095
	(0.098)	(0.119)	(0.094)	(0.143)
Region 8	-0.517***	-0.381***	-0.412***	-0.220**
	(0.078)	(0.106)	(0.062)	(0.094)
Number of children	0.057**	0.057**	0.060***	0.113***
	(0.026)	(0.025)	(0.023)	(0.027)
2o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
2.scm#1.urban	0.232	-0.709	-0.192	-0.793
	(0.454)	(0.555)	(0.430)	(0.729)
3o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
3.scm#1.urban	-0.069	-0.762	-0.098	-0.562
	(0.440)	(0.561)	(0.381)	(0.735)
4o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
4.scm#1.urban	-0.126	-0.793	-0.353	-0.675

	(0.421)	(0.557)	(0.387)	(0.759)
5o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
5.scm#1.urban	-0.122	-0.809	-0.089	-0.639
	(0.483)	(0.568)	(0.435)	(0.790)
6o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
6.scm#1.urban	-0.904**	-1.338**	-0.689*	-1.296*
	(0.460)	(0.526)	(0.400)	(0.716)
7o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
7o.scm#1o.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Husband's age	0.007	0.003	0.007	0.008
	(0.005)	(0.004)	(0.004)	(0.005)
Employed husband	-0.132	-0.048	-0.151	0.092
	(0.085)	(0.084)	(0.097)	(0.084)
Entrepreneur husband	-0.503**	-0.590**	-0.319	0.115
	(0.235)	(0.246)	(0.274)	(0.218)
Self employed in non-agriculture husband	-0.106	-0.112	-0.117	0.039
	(0.136)	(0.119)	(0.143)	(0.121)
Self employed in agriculture husband	-0.097	0.100	0.059	0.316**
	(0.166)	(0.138)	(0.165)	(0.134)
Unemployed husband	-0.113	-0.013	-0.206	0.101
	(0.115)	(0.128)	(0.153)	(0.103)
Pensioner husband	-0.005	-0.033	-0.132	0.091
	(0.134)	(0.134)	(0.111)	(0.219)
Other situations husbad	-0.255	0.113	-0.044	0.517**
	(0.289)	(0.388)	(0.235)	(0.206)
				(0.000)
Observations	2,156,214	2,205,766	2,156,058	2,041,875

B2. Robustness checks

B2.1 Probit estimation, RHBS sample of all employed women, no age restriction

As a robustness check of the above Probit specification we estimate a specification on the entire sample of employed women included in the 2007-2010 RHBS, without the age restriction previously imposed. This could entail significant differences if women above the fertile age (45 in our case), are overly represented in the public sector.

We generate the predicted probabilities of being employed in the public sector using all observable characteristics, i.e., at all the combinations of the values of the covariates. We take region 3 as example. For region 3, year 2010, the pairwise correlation between the predicted probabilities of public employment based on the restricted sample of employed women of fertile age and the predicted probabilities of public employment based on the entire sample of employed women is 99.45%, significantly different from 0 at 1% significance level.

For region 3, year 2010, the pairwise correlation between the actually assigned (to the employed mothers in the VSN) predicted probabilities based on the restricted sample of employed women of

fertile age and the actually assigned predicted probabilities based on the entire sample of employed women is 99.61%, significantly different from 0 at 1% significance level.

We are thus reassured that the predicted probabilities based on the restricted sample of fertile age employed women are not a biased measure of the true probability of being employed in the public sector.

B2.2 Probit estimation, RHBS sample of mothers

A potential threat to our main probability estimation strategy (in we assign each employed mother in the VSN a probability of working in the public sector based on the probabilities estimated for women of fertile age) is that the probabilities of public employment for women of fertile age (but that are not necessarily mothers) are not representative for the probabilities of public employment for mothers. This could be due to the existence of unobservable characteristics that determine both the selection into motherhood and the selection into public sector employment.

To address this problem we estimate the probability of being employed in the public sector on the restricted sample of mothers included in the 2007-2010 RHBS. Thus, we obtain the probability of public employment conditional on being an *employed mother* in the fertile age.

We use the same household level data from RHBS, from which we select only mothers with at least one child under the age of 1 at the date of the survey.[52] Since the number of employed mothers with children under 1 included in the survey is much smaller than the number of employed women in the fertile age, we do not estimate different probabilities of public employment for each year, but rather estimate an average probability of public employment over the period 2007-2010. Our restricted sample includes 883 employed mothers, each weighed with the corresponding frequency weight.

We estimate the same specification using the above presented reduced form Probit model, and generate predicted probabilities in a similar manner.

For region 3, year 2010, the pairwise correlation between the predicted probabilities based on the sample of employed women and the predicted probabilities based on the sample of employed mothers is 81,46%, significant at 1% significance level; the pairwise correlation between the actually assigned (to the employed mothers in the VSN) predicted probabilities based on the restricted sample of employed women of fertile age and the actually assigned predicted probabilities based on the sample of employed mothers is 73.69%.

[52] We have data only on employment status in the past year. By selecting mothers with children less than 1 year as opposed to mothers with older children we reduce the possibility of including in the sample mothers that changed the sector of employment after the birth of her children and before the survey.

B2.3 Probit estimation, exclusion restriction

As a third robustness check, we have estimated the probability of being employed in the public sector conditional on being employed using an extended Probit specification. As opposed to our main strategy where the covariates included in the Probit estimation are the mother characteristics that are also available in the VSN, we have estimated a reduced form equation in which we include all relevant variables available in the RHBS. We thus include as additional variables such the type of employment contract (permanent or temporary), the in kind benefits received at the workplace (such as telephone or company car), and a dummy variable for the husband's employment in the public sector. Since we continue to assign probabilities to the mothers in the VSN only on their observable characteristics included in the VSN, these additional covariates are analogous to the exclusion restrictions in an IV setting.

Our extended specification of the reduced form model of public employment is:

$$Public\ sector\ employment_i = \beta_1 \cdot age + \beta_2 \cdot married + \beta_3 \cdot romanian + \beta_4 \cdot hungarian + \beta_5 \cdot i.educ + \beta_6 \cdot i.urban + \beta_7 \cdot i.region + \beta_8 \cdot age_{sqared} + \beta_9 \cdot educ \cdot urban + \beta_{10} \cdot childern16 + \beta_{11} \cdot elder65 + \beta_{12} \cdot part\ time + \beta_{13} \cdot benefits + +\varepsilon_i$$

where:

Public sector employment: binary variable, 1 if employed in the public sector

married: binary variable, 1 if married or concubine

Romanian (Hungarian): binary variable, 1 if of Romanian (Hungarian) ethnicity

i.educ: categorical variable for educational level, 1 if primary, 2 if secondary, 3 if tertiary

i.urban: binary variable for area of residence, 1 if urban area

i.region: categorical variable for macroregion of residence

parttime: binary variable, 1 if on a part time employment contract

benefits: binary variable, 1 if in kind benefits (company telephone, car, etc) are provided in addition to the monetary wage

The estimation results obtained using a Maximum Likelihood estimator are presented in Table 2B below.

Table B2 Reduced form Probit estimation, extended specification

VARIABLES	(1) 2007	(2) 2008	(3) 2009	(4) 2010
Age	0.056	0.085**	0.141***	0.056
	(0.039)	(0.039)	(0.037)	(0.039)
Age2	-0.000	-0.001	-0.002***	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Not married	-0.013	0.096	0.044	-0.013
	(0.072)	(0.083)	(0.089)	(0.072)
Divorced	0.089	0.060	-0.018	0.089
	(0.098)	(0.105)	(0.106)	(0.098)
Widdowed	0.053	0.123	-0.200	0.053
	(0.258)	(0.171)	(0.239)	(0.258)
Secondary school	-0.142	-0.285	-0.150	-0.142
	(0.514)	(0.319)	(0.328)	(0.514)
Professional school	-0.511	-0.362	-0.565*	-0.511
	(0.496)	(0.321)	(0.318)	(0.496)
High school	-0.108	0.000	-0.173	-0.108
	(0.493)	(0.319)	(0.329)	(0.493)
Post high school	1.098**	0.901***	0.484	1.098**
	(0.538)	(0.348)	(0.359)	(0.538)
Higher	1.233**	1.275***	0.931***	1.233**
	(0.503)	(0.304)	(0.324)	(0.503)
Other situations	0.000			0.000
	(0.000)			(0.000)
Hungarian	-0.111	-0.049	-0.004	-0.111
	(0.105)	(0.074)	(0.111)	(0.105)
Other	0.082	-0.409*	0.278*	0.082
	(0.190)	(0.217)	(0.158)	(0.190)
Urban	0.504	0.668	0.267	0.504
	(0.744)	(0.563)	(0.398)	(0.744)
Region 2	-0.099	-0.162	-0.213**	-0.099
	(0.112)	(0.112)	(0.086)	(0.112)
Region 3	-0.284**	-0.265**	-0.222**	-0.284**
	(0.113)	(0.133)	(0.091)	(0.113)
Region 4	0.024	-0.205	-0.131	0.024
	(0.134)	(0.155)	(0.104)	(0.134)
Region 5	-0.244**	-0.253	-0.301**	-0.244**
	(0.123)	(0.178)	(0.118)	(0.123)
Region 6	-0.129	-0.377***	-0.334***	-0.129
	(0.112)	(0.116)	(0.117)	(0.112)
Region 7	-0.105	-0.102	-0.179**	-0.105
	(0.151)	(0.128)	(0.090)	(0.151)
Region 8	-0.246**	-0.408***	-0.432***	-0.246**
	(0.098)	(0.111)	(0.059)	(0.098)
Number of children	0.109***	0.054**	0.055**	0.109***
	(0.026)	(0.025)	(0.022)	(0.026)
2o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
2.scm#1.urban	-0.755	-0.701	-0.256	-0.755
	(0.736)	(0.554)	(0.439)	(0.736)
3o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
3.scm#1.urban	-0.498	-0.746	-0.157	-0.498
	(0.750)	(0.560)	(0.391)	(0.750)
4o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
4.scm#1.urban	-0.603	-0.758	-0.409	-0.603
	(0.769)	(0.559)	(0.396)	(0.769)
5o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
5.scm#1.urban	-0.551	-0.797	-0.194	-0.551
	(0.784)	(0.576)	(0.442)	(0.784)
6o.scm#0b.urban	0.000	0.000	0.000	0.000

	(0.000)	(0.000)	(0.000)	(0.000)
6.scm#1.urban	-1.216*	-1.296**	-0.752*	-1.216*
	(0.727)	(0.527)	(0.417)	(0.727)
7o.scm#0b.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
7o.scm#1o.urban	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Husband's age	0.008	0.003	0.007*	0.008
	(0.006)	(0.004)	(0.004)	(0.006)
Employed husband	0.093	-0.052	-0.144	0.093
	(0.086)	(0.085)	(0.099)	(0.086)
Entrepreneur husband	0.067	-0.655***	-0.382	0.067
	(0.226)	(0.250)	(0.273)	(0.226)
Self employed in non-agriculture husband	0.055	-0.124	-0.126	0.055
	(0.124)	(0.121)	(0.144)	(0.124)
Self employed in agriculture husband	0.341**	0.114	0.066	0.341**
	(0.138)	(0.137)	(0.165)	(0.138)
Unemployed husband	0.127	-0.043	-0.189	0.127
	(0.109)	(0.130)	(0.156)	(0.109)
Pensioner husband	0.100	-0.054	-0.119	0.100
	(0.227)	(0.132)	(0.109)	(0.227)
Other situations husbad	0.481**	0.087	-0.023	0.481**
	(0.208)	(0.399)	(0.244)	(0.208)
In kind benefits	-0.509***	-0.344***	-0.462***	-0.509***
	(0.103)	(0.070)	(0.076)	(0.103)
Part time contract	-0.392	0.412	0.301	-0.392
	(0.346)	(0.285)	(0.249)	(0.346)
Observations	2,041,875	2,205,766	2,156,058	2,041,875