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## Save some, lose some: Biological consequences of an unexpected wage cut

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Save Some, Lose Some: Biological  
Consequences of an Unexpected Wage Cut

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## SAVE SOME, LOSE SOME: BIOLOGICAL CONSEQUENCES OF AN UNEXPECTED WAGE CUT

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# Save Some, Lose Some: Biological Consequences of an Unexpected Wage Cut

Simona Bejenariu<sup>†</sup> and Andreea Mitrut<sup>‡</sup>

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## Abstract

Recent literature exploring fetal shocks has focused on the effects of exogenous, but rather rare and violent events (e.g., military conflicts, natural disasters, terrorist attacks) and found that in utero experience has scaring, life lasting consequences. In this paper we consider the effect of an arguably more common and milder shock generated by a major and unexpected, albeit temporary, wage cut policy that affected all public sector employees in Romania in 2010. Our main findings suggest an overall improvement in the health at birth (as measured by the low birth weight indicator) of the cohorts exposed to the shock. Moreover, we find significant improvements in health at birth exclusively for boys and not for girls. This effect seems to be driven by significant effects of males exposed to the shock early in gestation. Additionally, we also find a decreased male to female ratio at birth for the cohort exposed to the shock. Overall, our results are consistent with the so-called *culling* theory hypothesizing that maternal exposure to significant stress early in gestation selects against male frail fetuses and, as a result of this selection in utero, at birth, one should observe significant improvements in health outcomes in the male cohorts.

**JEL classification codes:** I19, J13, J38, Z18

**Keywords:** wage cut; transitory income shock; neonatal health; selection in utero; Romania

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## 1. Introduction

While unborn children are rarely, if ever, the direct target of the policy makers, they may be among the most affected by policy changes. Understanding whether (and how) economic downturns impact the fetal health is especially relevant in the current political and economic context. Consequently, the main aim of this paper is to explore the effects of a fetal shock caused by a major and unexpected, albeit temporary, wage cut policy that affected all public sector employees in Romania in 2010. To the best of our knowledge, this is the first study using micro-level data that finds evidence in support of the hypothesis that single episodes of economic turbulence may be traumatic enough to cause selection in utero.

Within the framework of the fetal origin hypothesis put forward by Barker (1986), recent evidence shows that, indeed, the in utero experience has scaring, life lasting consequences (see Almond and Currie, 2011a, 2011b for comprehensive reviews of this literature). In particular, in utero shocks, defined broadly as events that alter the fetal environment, give raise to fetal stressors that may induce developmental adaptations in the unborn child as they signal a change in the predicted postnatal environment (Gluckman and Hansen, 2005). Although the effects of these shocks may remain latent until adolescence or adulthood, they are typically already apparent at birth, as reflected by outcomes such as birth weight.<sup>1</sup> For instance, prenatal nutritional restrictions have been shown to deteriorate birth outcomes for children carried to term and increase fetal loss (e.g., Siega-Riz et al., 1996; Siega-Riz et al., 2001; Gluckman and Hansen, 2005; Helgstrand and Andersen, 2005; Almond and Mazumder, 2011), while maternal psychological stress has also been found to impede fetal development and have negative consequences reflected in health outcomes at birth, as well as increase the risk of spontaneous abortion (e.g., Mulder et al., 2002; Maconochie et al., 2007; Camacho, 2008; Beydoun and Saftlas, 2008; Aizer et al., 2009).<sup>2</sup>

However, all these effects observed at birth (and/or later on in life) are, in reality, conditioned on the fetus surviving the pre-birth period. In particular, the selective mortality of the least fit fetuses may yield a positive selection of those that are carried to term, such that shocks suffered during the fetal period may lead to improvements of the observed health outcomes in the

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<sup>1</sup> While birth weight is a crude indicator of fetal health, it is shown to be a strong predictor of human capital and labor market outcomes (see Black et al., 2007; Currie and Moretti, 2007; Royer, 2009; Bharadwaj et al., 2010).

<sup>2</sup> Other sources of in utero insults that may affect fetal health are *infectious diseases* (cf., early-life malaria exposure (Barreca, 2010), seasonal variation in infections (Costa and Lahey, 2005)), *pollution* (automobile exhaust and cigarette smoke (Currie et al., 2011). Chay and Greenstone (2003), Almond (2006), Barreca (2010), Nelson (2010), Currie et al (2011), Kelly (2011) have shown that their negative effects are likely to be large and persistent.

affected cohorts. Recent evidence has shown that, indeed, selection in utero occurs in populations subjected to exogenous stressors and that it is often associated with a decrease of the sex ratio at birth (i.e., the odds of a male birth) (Catalano, 2006). While researchers in different fields seem to agree with the biological explanation that population stressors cause endocrine changes in mothers that will result in an increase risk of early spontaneous abortion (before 20 weeks) of the weakest male fetuses (Hobel et al., 1999; Krackow, 2002; Owen and Mathews, 2003; Catalano et al, 2010), the exact mechanisms behind this culling process are still unclear. The evolutionary explanation hypothesized by Trivers and Willard (1973) - that natural selection extinguishes the weakest male fetuses in an attempt to increase the chance that females in stressful environments will have grandchildren – has probably generated the most controversy and remains highly disputed.

To date, the causal effects of fetal shocks have been inferred by exploring relatively rare and extreme events as exogenous sources of variation: civil and military conflicts (Lumey and Stein, 1997; Catalano, 2003; Mansour and Rees, 2011; Valente, 2011), natural disasters and terrorist acts (Glyn et al, 2001; Catalano et al., 2006; Lauderdale, 2006; Camacho, 2008), pandemics (Almond, 2006). Another, arguably more relevant, source of fetal health shocks are economic phenomena, such as business cycle, unemployment or income shocks. Their effects are harder to disentangle because their timing is usually more diffuse, without a precise onset date, and they may affect fetal health through multiple channels simultaneously (Almond and Currie, 2011a). As such, there is less convergence in the findings of the few existing empirical analyses: some studies find evidence of deteriorating health outcomes at birth (Paxson and Schady, 2004; Burlando, 2010; Lindo, 2011), whereas others find that the effects of improvements in maternal selection and risk related behavior during pregnancy prevail over the scarring effects, the net result being an improvement of the health at birth of exposed children (Dehejia and Lleras-Muney, 2004).<sup>3</sup>

In this paper we explore the effects of an unexpected policy reform in Romania announced in May 7<sup>th</sup>, 2010, entailing a 25% cut in wages of all public sector employees starting with July 1<sup>st</sup>, 2010.<sup>4</sup> To assess the impact of this policy we use the Romanian Vital Statistics Natality files in a simple difference-in-difference framework. In particular, we compare outcomes at birth for children in utero at the time of the policy announcement relative to their peers born 2009, from

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<sup>3</sup> The sex ratio at birth has also been found to respond to economic circumstances (Catalano et al., 2005a; 2005b; 2010).

<sup>4</sup> The cut was initially implemented as a temporary measure for 6 months, until December 2010. In addition to the wage cut the measure also implied the revocation of *all* financial (e.g. the thirteenth salary) and in-kind incentives for the public sector, implying another income reduction of up to 10 percent.

mothers employed in the public sector and their housewives counterpart, the second most numerous groups of mothers after those employed.

The distinct occurrence of the shock eliminates the problem posed by diffused timing and allows us to pursue a clean identification strategy to infer the causal effects of the temporary shock on birth outcomes of children exposed in utero. Even though we cannot clearly disentangle the sharp temporal exposure to stress (May to December) from nutrition intake (August to December), our results support that maternal *stress* was the main channel through which unborn children were affected by the temporary shock. Particularly, our main findings suggest an overall improvement in the health at birth (as measured by the low birth weight indicator) of children exposed to the shock. Moreover, we find significant improvements in health at birth exclusively for boys and not for girls. This effect seems to be driven by significant effects of males exposed to the shock early in gestation. These results, together with indications of a decreased sex ratio at birth, are all consistent with the selection in utero hypothesis and with the medical literature that has established that males are more vulnerable to adverse conditions in utero (see Kraemer, 2000).

Although Almond and Currie (2011a) note that the effects of selective mortality are more likely to dominate the scarring effects in the case of extreme events and in situations where baseline health is poor, we show that stress induced selective fetal mortality may occur in response to relatively milder, policy induced, shocks.

The remainder of the paper is organized as follows: Section 2 depicts the Romanian context in which the policy change occurred, Section 3 presents the potential mechanisms through which a temporary shock may affect birth outcomes, while Section 4 presents the data and the empirical strategy. The main results for the low birth weight indicator, our main outcome of interest, and different placebo and robustness checks are presented in Section 5. Section 6 contains further explorations of the selection issue. Section 7 presents some further results and finally, Section 8 concludes.

## 2. Romanian context

Romania experienced sizable economic insecurity throughout most of its post-communist history: albeit the negative growth rates up until 1999 were replaced by high and sustained growth rates, they were often accompanied by dangerously high inflation rates and significant

public deficit.<sup>5</sup> Thus, the international financial crisis that unfolded in the autumn of 2008, sending most of the world's leading economies in recession, was taken lightly in Romania: politicians invoked a decoupling of the Romanian economy from the world markets, whereas the Governor of the National Bank of Romania declared, in late 2008, that "Romania is rather in a nervous crisis than in an economic one".<sup>6</sup> Public opinion was also moderate in its expectations: the autumn 2008 Euro-barometer showed that more than 70% of respondents anticipated a maintenance or even an improvement in the general economic situation of Romania.<sup>7</sup>

The first political signs of recognition towards the aggravating state of the Romanian economy were in March 2009, when the Government initiated discussions with the International Monetary Fund (IMF). After the signing of a stand-by accord in June 2009, politicians promoted the agreement as an opportunity for state reorganization, but the proposed measures were mild and noncontroversial. However, the political class transmitted throughout the period a confident message in the wake of the presidential elections that were to follow in December 2009. As always, populist measures during an election year did not take long to materialize: among others, the Government spent 1.2 billion RON (1 RON = 0.34 USD, December 2009) on financial incentives for public sector employees instead of implementing the expenses reduction programs agreed upon with the IMF.<sup>8</sup>

After being re-elected in December 2009, the incumbent President declared that "Romania has been affected by the crisis but it is over now; we expect significant growth in the first part of 2010".<sup>9</sup> Nevertheless, early in 2010 the Government adopted a graver attitude towards the worsening economic crisis as the IMF required concrete actions to reduce the significant budget deficit. The Fund cast a new vote of confidence in February when they concluded the second and third review of Romania's economic performance under the Stand-by agreement and decided to proceed with the disbursement of funds, but drew attention on the continued need of fiscal stabilization.

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<sup>5</sup> 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%.

<sup>6</sup> [http://www.euractiv.ro/uniunea-europeana/articles%7CdisplayArticle/articleID\\_15042/Isarescu\\_Romania\\_nuEste\\_in\\_pericol\\_sa\\_fie\\_afectata\\_de\\_criza\\_financiara\\_internationala.html](http://www.euractiv.ro/uniunea-europeana/articles%7CdisplayArticle/articleID_15042/Isarescu_Romania_nuEste_in_pericol_sa_fie_afectata_de_criza_financiara_internationala.html) (in Romanian)

<sup>7</sup> [http://ec.europa.eu/public\\_opinion/cf/](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)"

<sup>8</sup> The Euro-barometer survey conducted in November 2009 reflected a more concerned Romanian citizen regarding the state of the economy, but who was rather confident on the evolution of the financial situation of his household: more than 64% of respondents expected that their financial situation in 2010 will be the same as in 2009. (see Annex 1, Question QA6a from EB72).

<sup>9</sup> <http://www.evz.ro/detalii/stiri/basescu-romania-nu-va-fi-afectata-de-criza-837030.html> (in Romanian)

As such, on March 16<sup>th</sup> 2010, the Prime Minister of Romania presented in front of the Parliament a set of 7 anti-crisis measures that were being implemented, all in the form of economic stimulae aimed at improving the business environment and reducing fiscal evasion;<sup>10</sup> the Prime minister concluded his speech with an optimistic declaration: "I once again say that Romania is on the right track of exiting the economic crisis, of exiting the recession. In 2010 we will exit the economic recession".<sup>11</sup>

In this context, the President's announcement on May 7<sup>th</sup> 2010 that all public sector wages, pensions and unemployment benefits will be cut starting with June 1<sup>st</sup> was completely unexpected and gave rise to widespread social unrest and political dispute. The decision was taken 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 it ever publicly mentioned as a potential policy. The measures, initially involving a 25% cut in wages for all public sector employees together with the revocation of their financial and in-kind incentives, and a 15% cut in all pensions and unemployment benefits, were aimed at re-establishing the budgetary balance and achieving the 6.8% budget deficit target agreed with the IMF.

A disturbing declaration pertaining to the delusive manner in which the governors previously presented the economic status of the country and to the completely unexpected nature of the policy was made by the Finance Minister, one month after the announcement of the austerity measures: "As a Finance Minister I am telling you that we could have lied six more months, we could have borrowed for six months, we could have arranged an accord with the IMF to give us 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".<sup>12</sup> 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, Governmental Responsibility Assumption, circumventing the regular and lengthy law initiation procedures. 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

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<sup>10</sup> (1) subsidies for newly created companies set up by young individuals, (2) restructuring of the fixed profit tax, (3) establishment of a national investment fund, (4) the unification of the fiscal declarations, (5) VAT compensation with mandatory contributions to the state budget, (6) the law on public-private partnerships, and (7) delay of anticipatory profit tax payment.

<sup>11</sup> <http://www.cdep.ro/pls/steno/steno.stenograma?ids=6780&idl=1> (in Romanian)

<sup>12</sup> <http://www.hotnews.ro/stiri-politic-7350294-sebastian-vladescu-era-foarte-usor-mintim-continuare-mai-imprumutam-vreo-sase-luni.htm> (in Romanian)

consideration being adopted by default if the Government is not demitted in the first 3 days by means of an adopted censorship motion.<sup>13</sup> A censorship motion can be initiated by a minimum of 25% of all Parliament members and is adopted if a half plus one of the total number of Parliament members vote in favor.

After the Government assumed responsibility on the Austerity Laws, a censorship motion was initiated by the opposition parties in the Parliament, but due to a tight majority of the governing coalition, the censorship motion was not adopted (though by a very close margin), the Government was not demitted, and the Laws were passed in a slightly modified version.<sup>14</sup> On June 30<sup>th</sup>, the President promulgated the laws which came in effect July 1<sup>st</sup>, with a limited duration of only 6 months, until December 31<sup>st</sup> 2010. However, in January 2011, public sector wages were not restored to their initial level.<sup>15</sup>

The final provisions of the Austerity Law were: (1) the gross quantum of wages, allowances and indemnities, including financial benefits and other income rights, of all public sector employees, are diminished by 25%; (2) unemployment benefits, in pay or forthcoming, are diminished by 15%; (3) the possibility of registration for early retirement or partial early retirement is suspended; (4) maternity leave benefits, in pay or forthcoming, are diminished by 15%. In addition, a series of special allowances and indemnities paid from public finances were reduced by 15 to 25% (e.g., indemnities for participants to the 1989 Revolution, indemnities for members of the Romanian Academy of Science, clergy allowances).<sup>16</sup>

For pregnant women employed in the public sector at the time of the Austerity Law announcement, the income cut was thus three-folded: a decrease in the available income following the wage cut; this cut, in turn, lead to a decrease in the average annual wage which is

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<sup>13</sup> The Parliament can withdraw the trust awarded to the Government by the adoption of 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.

<sup>14</sup> The measure was contested at the Constitutional Court of Romania, which ruled the cutting of the pensions unconstitutional, but approved the 25% cut in all wages of public sector employees and the 15% cut in unemployment benefits. The Law stipulating the cut of the pensions was amended such that only certain types of pensions (military pensions in particular) were to be revised and recalculated.

<sup>15</sup> In December 2010, the Law of Unitary Pay was adopted through Government Responsibility Assumption, which came into effect from January 1<sup>st</sup> 2011, and stipulated, among others, that public sector wages will be increased by only 15% during 2011 relative to the October 2010 levels, and no other financial or in kind incentives will be awarded.

(Source: [http://www.cdep.ro/pls/proiecte/upl\\_pck.project?cam=2&idp=11578](http://www.cdep.ro/pls/proiecte/upl_pck.project?cam=2&idp=11578), in Romanian)

<sup>16</sup>[http://www.dreptonline.ro/legislatie/legea\\_118\\_2010\\_unele\\_masuri\\_necesare\\_vederea\\_restableririi\\_echilibrului\\_bugetar.php](http://www.dreptonline.ro/legislatie/legea_118_2010_unele_masuri_necesare_vederea_restableririi_echilibrului_bugetar.php), in Romanian.

the basis for the calculation of the child care allowance;<sup>17</sup> additionally, the quantum of the child care allowance is reduced by a further 15%.

Even in the context of the financial crisis and the worsening state of the Romanian finances of which the citizens were arguably aware of, it is safe to assume that the measures were perceived as unexpected by the population, both regarding their unprecedented type and certainly their magnitude.<sup>18</sup>

The unexpected nature of the policy change is also reflected in the very sharp drop of the natality rates 9 months and onwards after the announcement date (see Figure 1): in February 2011 the number of births dropped below 15,000 for the first time since 1956, while in May 2011 the number of live births reached a bottom of 13,844 births, the lowest rate ever registered in Romania. These are the expected consequences of any policy that affects the fertility decisions – however, if the policy had been anticipated there should have been observable and gradual deviations from the trend before the actual announcement of the policy change.

### 3. Mechanisms

There are three main mechanisms through which an income shock generated by an unexpected, albeit temporary,<sup>19</sup> cut in a pregnant woman's wage and a reduction in the (subsequent) child care allowance may affect children's outcomes at birth.

#### 3.1. Nutrition and prenatal care

Firstly, an unexpected cut in a pregnant woman's wage may reduce the household disposable income. There are several channels through which a decrease in the household's income may impact the fetal development and children's outcomes at birth.

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<sup>17</sup> The quantum of the maternity leave benefits, to be received the first 2 years after birth, was calculated as 85% of the average taxed income obtained over the 12 calendar months preceding the birth of the child. Thus, women in early pregnancy at the time of the announcement were affected the most.

<sup>18</sup> The unexpected nature is confirmed by the spring 2010 round of the Euro-barometer survey, incidentally conducted in the week following the announcement. As such, there is a surge in the percentage of respondents anticipating a worsening state of the economy, from below 40% to 60%, and a sharp drop in the proportion of respondents anticipating a no change in the state of the economy, from a steady level of more than 30% to less than 20%.

<sup>19</sup> It is important to distinguish between a permanent and a temporary wage cut. The main difference is that transitory changes in wages have, in principal, 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, due to a lower income, it may decrease the demand for children - see e.g., Becker, 1965; Heckman and Walker, 1990). However, even if temporary, households might respond as though these changes were permanent if people are myopic or uncertain about the nature of the changes (Dehejia and Lleras-Muney, 2004).

(a) A reduced disposable income may lower the quantity or the quality of food intake of the mother; in turn, a poor nutritional intake in the prenatal period may lead to an insufficient nutritional supply to the fetus, in the form of glucose, amino-acids, oxygen and other nutrients. Such nutritional restrictions may adversely affect the fetal development causing placental dysfunctions, intrauterine growth retardation and reprogramming of the HPA (hypothalamic-pituitary-adrenal) axis, which may be reflected in a higher incidence of low birth weight, preterm delivery and perinatal morbidity (Gluckman and Hansen, 2005; Fowles, 2004; Abrams et al., 2000; Carmichael and Abrams, 1997; Siega-Riz et al., 1996).<sup>20</sup>

Medical evidence indicates that insufficient caloric intake during the 1<sup>st</sup> trimester of pregnancy does not significantly impact the child's birth weight, while reduced nutrition during the 3<sup>rd</sup> semester seems to result in lower birth weight (Grimard and Laszlo, 2010; Stephenson and Symonds, 2002). This is in line with the recommendations for weight gain during pregnancy, of only 1 to 2.5 kg in the 1<sup>st</sup> trimester but 0.4 kg per week during the 2<sup>nd</sup> and 3<sup>rd</sup> trimester (Fowles, 2004). Yet, Almond and Mazumer (2011) look at relatively mild forms of nutritional disruptions as imposed by Ramadan daylight fasting during pregnancy and find a negative impact on neonatal outcomes reflected in lower birth weights, but only for children exposed during the first two trimesters of pregnancy. The estimated effect is, however, small in magnitude and is not reflected in an increase in the incidence of low birth weight (defined as birth weight below 2,500 grams).

The absence of observable effects in birth outcomes, however, does not preclude the long term adverse effects of intra-uterine shocks (Almond and Currie, 2011). For example, individuals exposed in utero in early gestation to the Dutch famine did not present lower birth weights or smaller size but exhibited a significantly higher rate of incidence of coronary heart diseases, diabetes and obesity than non-exposed individuals (see Painter et al., 2005 and Roseboom et al., 2001, for a review of studies on the Dutch famine).

(b) A decrease in household income may also induce a reduction in the consumption of health-damaging goods such as cigarettes and alcohol.<sup>21,22</sup> Ruhm and Black (2002) and Ruhm (2003)

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<sup>20</sup>Another adverse effect of a wage cut is the decrease in consumption of prenatal vitamin supplements, which may result in an insufficient intake of vitamin D, phosphorus, folate, calcium and iron; such deficiencies are associated with preterm birth, low birth weight, impaired bone development and hypoglycemia (see Fowles, 2004 for a review).

<sup>21</sup>The medical literature shows correlations between maternal smoking or alcohol consumption during pregnancy and the increased risk of miscarriage and low birth weight (Harlap and Schiono, 1980; Floyd et al. 1993). Using mother's fixed effects, Tominey (2007) shows that the usually observed correlations between maternal smoking and adverse pregnancy outcomes are due to unobservable characteristics of the mother and that, in fact, maternal smoking has no causal effect on probability of low birth weight, preterm delivery or gestation length.

show that health-related behavioral 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 behavior of white mothers who significantly reduce risky behavior such as smoking and alcohol consumption during pregnancy; these behavioral improvements were sufficiently strong to offset the simultaneous negative selection into motherhood. However, improvements in maternal behavior *during* pregnancy do not necessarily improve neonatal health outcomes: Kabir et al. (2004) found that declining rates of maternal smoking did not lead to reduced incidence of low birth weight. At the same time, the stress caused by the Austerity measures may induce an increase in the consumption of alcohol and cigarettes. Even so, recent medical studies have shown that, albeit excessive alcohol consumption does indeed negatively affect birth outcomes, moderate consumption of alcohol (less than one drink per day) has no detrimental effect on birth outcomes (Jaddoe et al., 2007).

(c) Additionally, a decrease in income may potentially restrict the antenatal medical supervision by lowering the number of prenatal medical visits. Bergsjo and Villar (1997) survey the randomized clinical trials that assess the effectiveness of antenatal care and conclude that prenatal visits do not improve the pregnancy outcomes, even though they may influence mortality through identification and abortion of severely malformed fetuses.<sup>23</sup> Apart from the medical literature, economic studies have identified a positive, albeit small, impact of prenatal care on birth weight, especially in the last trimester of pregnancy, while it seems that prenatal visits during the first trimester are not important (Jewell and Triunfo, 2006; Rous et al., 2004).

(d) Finally, a decrease in wage income may also lower the opportunity cost of leisure and health improving activities such as exercising or bed resting in late or high-risk pregnancies,<sup>24</sup> and may induce a shift in the labor supply of pregnant women from full-time to part time employment. The reduction in the working hours would allow for increased prenatal care beneficial to both the mother and the fetus and would positively influence the children's outcomes at birth (preliminary evidence in Clapp et. al, 2000).

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<sup>22</sup> There is mixed evidence on gender specific effects: Zaren et al. (2000) found that maternal smoking affects male more than female fetuses. A later study by Voigt et al. (2006) concluded that, on the contrary, the negative effect of maternal smoking during pregnancy affects girls significantly more than boys.

<sup>23</sup> Villar et al. (2008) compare antenatal care programs in a randomized trial and also conclude that in the case of low-risk pregnancies a reduction in the number of antenatal care visits is not associated with an increase in the incidence of negative perinatal outcomes.

<sup>24</sup> Bed rest in hospital or at home is widely recommended by medical practitioners in pregnancies with high risk of preterm labor or multiple pregnancies. However, there is no conclusive evidence to support its efficacy and several studies (Crowther, 2000; Sosa et al. 2004) conclude that bed rest cannot be recommended for routine practice.

### 3.2. Prenatal stress

Secondly, an unexpected and significant wage cut, along with the reduction of the child care allowance to be received in the upcoming 2 years, may induce psychological distress due to the financial insecurity it entails (Catalano, 1991; 2005).<sup>25</sup> The psychological stress caused by both the announcement and the wage cut experienced by the mother during pregnancy may influence the fetal development through higher blood cortisol levels, a stress hormone which reach fetus. The exposure to high cortisol levels induces structural adaptations of the fetus, such as changes in the density of glucocorticoid receptors in the neural network and changes in the responsiveness of the HPA axis (Gluckman and Hansen, 2005). These changes have the role to accelerate the maturation of the fetus and insure her survival in a predicted stressful environment, but also modify her ulterior response to stress. Though these predictive adaptive responses are not necessarily reflected in birth outcomes (but may unfold later in development) 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 spontaneous abortion (see Mulder et al., 2002 and Beydoun and Saftlas, 2008 for comprehensive reviews). Interestingly, opposite to the effect of prenatal care and nutrition, the literature shows that early pregnancy exposure to stress is more likely to harm the child's outcomes at birth than stress experienced in late pregnancy. For example Glyn et al. (2001) found that the stress associated with the 1994 earthquake in Northridge California had significantly reduced gestation length for women exposed to the shock during their 1<sup>st</sup> trimester of pregnancy, it had smaller and no effects for women in their 2<sup>nd</sup> and 3<sup>rd</sup> trimesters, respectively.

In addition to the medical literature, there is a small but growing empirical literature in health economics which aims at quantifying the effects of maternal stress on infant birth outcomes by exploiting (quasi-)natural experiments in which stress is generated by some exogenous, albeit rare and violent events. For example, Camacho (2008) finds a significant negative impact of stress induced by landmine explosions on infant birth weight when exposure occurs during the 1<sup>st</sup> trimester of the pregnancy. Similarly, Mansour and Rees (2011) identify a causal relationship between the number of armed conflict fatalities also during the 1<sup>st</sup> trimester of pregnancy and increased probability of low birth weight.

Prenatal maternal stress could, on the other hand, also lead to improved average health outcomes at birth by means of a natural selection mechanism: the *culling theory* postulates that

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<sup>25</sup> It is important to remember that, 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 wage received in July 2010 by the public sector employees was the entitlement for June 2010, thus a full salary.

weaker male fetuses are spontaneously aborted as a response to significant maternal stress more often than female fetuses, through a process called selection in utero. Trivers and Willard's (1973) controversial hypothesis postulates that the selection mechanism preponderantly selects against weaker male fetuses as the reproductive success of a weak son is relatively lower than that of a weak daughter. An alternative explanation for the more frequent abortion of males relative to females is related to their more rapid growth rate during early pregnancy, which makes them more predisposed to abnormalities than female fetuses, thus more exposed to risk of spontaneous abortion. Medical evidence indicates that selection in utero occurs until the 20<sup>th</sup> week of gestation and thus affects only fetuses in their early developmental stages (Hobel et al., 1999, Owen and Mathews, 2003, Catalano 2010).

This selective mortality is reflected in the decrease of the secondary sex ratio (i.e., sex ratio at birth) and in the improvement of the average health level for the male cohort exposed in utero to the stressor. Catalano (2005) finds an inverse relationship between the secondary sex ratio and population stress measured by the daily dose of antidepressants, for the cohort exposed to the stressor in the first trimester of gestation, whereas Catalano et al. (2009) document evidence in support of the *culling theory* through a positive co-movement of the sex ratio and the male infant mortality, net of all trend and seasonal components.

Thus, males born in low sex-ratio cohorts, as a consequence of increased maternal stress during pregnancy, have better health at birth outcomes than males born in high sex ratio cohorts, in which there was no natural selection against frail male fetuses.

### **3.3. Changes in the composition of women who become pregnant**

Thirdly, for women planning a child, the announcement of a temporary wage cut could influence their fertility timing decision and alter the composition of mothers becoming pregnant, which may influence the average birth health outcomes observed in the newborn cohorts.<sup>26</sup> The net effect is however ambiguous and hinges upon the mother's skills depreciation rate and on whether capital markets are perfect or not (Dehejia and Lleras-Muney, 2004). Further, one may hypothesize that low skill women are less likely to have a human capital that depreciates during temporary absences from job in pregnancy and after birth (and assuming that capital markets are perfect) then in low-wage periods we may observe an increase fertility of the low skilled women. Dehejia and Lleras-Muney (2004) find that indeed, in the US, high unemployment caused a positive selection (as measured by education) into motherhood for black women and a negative selection for white mothers. Since we show that the change in policy came

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<sup>26</sup> The temporary nature of the shock should leave the lifetime income unaffected (Dehejia and Lleras-Muney, 2004).

unexpectedly, in our empirical strategy we use the sample of already pregnant mothers at the time of the policy announcement (and will compare them with pregnant mothers during the same period in the previous year).

However, one way through which already pregnant women may react is to terminate their pregnancy using abortion. After the fall of Ceausescu and his regime in December 1989, abortion in Romania became legal up to 12 weeks gestational age. If (among publicly employed) those women from more disadvantaged socio-economic background decide to use abortion, we may find an improvement in the average health outcomes from pregnancies carried out to term. We will address this in our empirical exercise by constraining the sample to children that were in utero and had a minimum gestational age of 12 weeks at the date of the policy announcement.

Overall the theoretical channels reviewed in this section predict an ambiguous effect of the unexpected wage cut on children's outcomes at birth and thus require an empirical analysis where we attempt to disentangle among these channels.

## 4. Data and methodology

### 4.1. Working sample

In our empirical exercise we use the Vital Statistics Natality (VSN) records matched to data from the Romanian Household Budget Survey (RHBS). 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. The RHBS is a national representative survey, covering about 30,000 households each year and contains detailed socio-economic information on all household members; this is the main tool of assessing population consumption, expenditures and revenues in Romania.

The VSN data include: (a) characteristics of the child: day, month and year of birth, gender, ethnicity, whether singleton or a 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, together with detailed information about mother's fertility history such as number of births (children born alive and also fetal deaths), the number of antenatal visits and an indicator for home delivery; (c) characteristics of the father: day, month and year of birth and his occupational status. We limit

our sample to singleton births<sup>27</sup> that were at least 6 weeks gestational age at the time of the policy announcement – 7<sup>th</sup> of May, 2010 and children of the same gestational age in 2009.<sup>28</sup>

Summary statistics for our variables, separately for 2008 (the placebo year), 2009 and 2010 (the comparison years) and by mother's occupational status are found in Table 1. Overall, slightly older, more educated women seem more likely to become mothers in 2010 compared to 2009. This holds for the overall sample, but also separately for the employed and housewives mothers to be. However, despite the apparent positive selection into motherhood (as measured by education), children's outcomes at birth seem, on average, slightly worse off in 2010 relative to 2009. This effect comes mainly from the employed mothers where we find, on average, a negative and significant effect for birth weight and gestation outcomes. This positive selection into motherhood (as measured by education) is largely due to a recognized trend in education: in particular, the number of Romanian women with tertiary education increased drastically (more than doubled) during the last decade (see Figure B1, in Appendix B).<sup>29</sup> This substantial increase in tertiary educated women is also mirrored in the sample of mothers who are more likely to be highly educated - this is clear from Figure 2, where we show the number of employed mothers by education, from 2003 to 2010.

A key variable in our empirical specification is mother's *occupational status*. The VSN records disentangle between the following categories: (1) *employed*, (2) entrepreneur, (3) self-employed in agricultural activities, (4) self-employed in non-agricultural activities, (5) unemployed, (6) housewife, (7) retiree or (8) other situations. Unfortunately, even though the information on mother's occupation is very detailed, it fails to disentangle between mothers working in the *public* or *private* sector.

Since the policy specifically targeted public sector employees and we cannot link different data, we will consider different routes to help us deal with this limitation. We proceed by making use of the RSHB data to estimate the likelihood that an employed woman is working in the public sector. In addition to detailed monthly household consumption and expenditure information, the

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<sup>27</sup> We focus on singleton births, as is the norm in previous literature exploring birth outcomes. This is due to the fact that multiple pregnancies are classified as having higher risk than singleton pregnancies, with children from multiple pregnancies being more likely to be low birth weight.

<sup>28</sup> We select children at least 6 weeks gestational age because younger children at the time of the announcement may be born late January and February 2011. At the moment we don't have information about these children.

<sup>29</sup> Starting with the 1998/99 academic year, in addition to the usual enrollment financed from the state budget, the state universities introduced the so-called distance-learning forms of higher education and allowed each academic year a number of fee-paying places. Also, after the 1994/95 academic year, Romania experienced a massive increase in the number of private universities (from about 20% of total number of enrolled students in 1996/97 academic year to almost 46% of the total number of students in the 2008/09 academic year) (see: <http://www.ibe.unesco.org/International/ICE/natrap/Romania.pdf>, pg. 40-41 and INS, Romania: <http://www.insse.ro/cms/rw/pages/anuarstatistic2009.ro.do>).

RHBS provides information on a wide range of socio-economic characteristics for all household members. The occupational status variable has the same categories as the VSN except for category (1) *employed*, which is divided between the *public - private* sector.

Thus, 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 2009 and 2010 on the restricted sample of employed women aged 16 to 50, and include as explanatory variables all the socio-economic characteristics of mothers that are available in the VSN: mother's age, region of residence, urban or rural area, education (primary, secondary, tertiary), ethnicity (Romanian, Hungarian, other), marital status (married, unmarried) and number of living children (for more details please see Appendix A).<sup>30</sup> We obtain the predicted probabilities at all the combinations of the values of all covariates. Next, each employed mother in the VSN is assigned one of these predicted probability of being employed in the public sector by matching on all mother's observable characteristics used in the estimation; using these conditional probabilities, we split the VSN sample of employed mothers into likely employed in the public and the private sector. Unfortunately, the Romanian Ministry of Labor, Family and Social Protection (MLFSP) does not hold information on the number of births by month or year of birth *and* mother's occupational status. However, at the end of 2010 (October – December), the MLFSP carried out the first National Campaign to identify all women entitled to the child care allowance.<sup>31</sup> The results of this National Campaign showed that, among the employed mothers, 80% were working in the private sector and only 20% in the public sector. Thus, for lack of better information, we use this percentile division to assign employed mothers to the public and the private sector: for each year, mothers with the 20% highest (matched) probabilities belong to the public sector and the rest to the private sector.<sup>32</sup>

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<sup>30</sup> 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. The correlations between our main predicted probabilities and the probabilities obtained on the alternative samples are higher than .9. 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. We show all these results in Appendix A.

<sup>31</sup> 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, including unemployed individuals who were registered to the local employment agencies, students, retirees and other special circumstances. Persons who do not qualify as having earned taxable incomes are not entitled to receive child care allowance – e.g., housewives do not receive this indemnity.

<sup>32</sup> To validate our results we use data from the Romanian Labor Cost Survey in Socio-Economic Units (RLCS) for 2008, 2009 and 2010. This is a nationally representative survey that collects detailed information aggregate at the socio-economic unit (privately or publicly owned) such as the number of employees (separately for men and females), their average monthly salaries, etc. To check the validity of our probability that a woman is working in the public relative to the private sector, we compare these

One concern is that this procedure selects only the highly educated - (secondary and) tertiary education - mothers to be employed in the public sector.<sup>33</sup> This is due to the fact that education is the covariate that has the highest marginal effect on the probability of public employment. With regards to the other characteristics, our sample of publicly employed mothers is balanced and comparable to the sample of employed mothers, as presented in Table 1, the publicly employed (80-20) column.

As further checks of the 80-20 approximation we will employ two more strategies. Thus, we also split the mothers into publicly and privately employed using a similar strategy as above but using the median conditional probabilities instead (the 50-50 approximation). Additionally, we consider the full sample of employed mothers under the assumption that, opposite to publicly employed mothers, those working in the private sector did not suffer any (income) shock during this short time span. Figure 3 confirms that indeed, during 2009-2010, the wages in the private sector remained stable. While this specification will surely underestimate the effect of the policy we will show that, overall, our results are qualitatively robust though, of course, quantitatively they will differ between the specifications. We come back to these issues in the next sections.

The income shock may also affect the pregnant woman via her husband's wage, if he is employed in the public sector. As in the case of employed women, we do not have information on the sector of employment of the employed fathers. Moreover, the VSN does not record the educational level of the fathers, precluding us from employing a similar strategy for obtaining the likelihood of a father being employed in the public sector. We will address this issue in Section 6.1.

## 4.2. Identification strategy

To assess the impact of the unexpected policy change on children's outcomes at birth we rely on a difference-in-difference (DD) specification. As previously mentioned, we consider already pregnant women at the time of the policy announcement - May 7<sup>th</sup>, 2010- and we compare them with pregnant women during the same period in 2009. In particular, our treatment group consists of pregnant women working in the public sector while our control group consists of pregnant housewives. We have chosen housewives as a control group since they are least likely to have been affected by the austerity measures, as they are neither engaged in any income

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probabilities with the RLCS data, by region and year. Reassuringly, we find positive, strongly significant correlations close to 1.

<sup>33</sup> According to the RHBS data, for the period of interest, among the employed women in the public sector who have recently become mothers (have a child younger than 1 year old), the vast majority has tertiary education (more than 82%), while only 2% have primary education. At the same time, among the employed women in the private sector who have recently become mothers, only 40% have tertiary education, and 50% have secondary education.

generating activity, nor are they actively searching for employment.<sup>34</sup> Moreover, they are the second most numerous category, with 42% of all mothers being housewives, comparable in size with the employed mothers category from which we draw our treatment group.<sup>35</sup> Thus, we compare outcomes at birth between children in utero May 7<sup>th</sup> 2010 and May 7<sup>th</sup> 2009, from mothers working in the public sector and housewives, respectively.

Our main infant health measure is the low birth weight indicator (defined as birth weight less than 2,500 grams).<sup>36</sup> Additionally, we will also present results for the premature delivery indicator (defined as gestation less than 37 weeks) and fetal death (still births).

Our richest specification is the following equation:

$$y_{icrt} = \alpha + \beta_1 Public_i + \beta_2 Utero2010_i + \beta_3 Public_i Utero2010_i + \gamma X_{ir} + \theta_r + \delta_c + \vartheta_{crt} + \sum_{c=1}^9 \tau_{icrt} + \sum_{c=1}^9 \varphi_{icrt} + \varepsilon_{icrt} \quad (1)$$

where  $i$  indexes a child conceived in month  $c$  by a mother living in region  $r$  in year  $t$ .<sup>37</sup>  $y_{icrt}$  is our outcome of interest;  $Public_i$  is an indicator that equals 1 if  $i$ 's mother works in the public sector and 0 if she is a housewife;  $Utero2010_i$  is an indicator that equals 1 if child  $i$  was in utero in May 7<sup>th</sup> 2010 and 0 if  $i$  was in utero in May 7<sup>th</sup> 2009;  $X_{ir}$  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 (primary, secondary and tertiary), ethnicity (Romanian, Hungarian, Roma and other), marital status, whether living in urban area, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynecological visit, an indicator for home delivery; our main specifications include also 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

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<sup>34</sup> Of course, privately employed pregnant women would have been a more straightforward control group, but due to the lack of information on the exact sector of employed of the working women, we consider housewives as our control group.

<sup>35</sup> The occupational structure of mothers reveals that 47.8% of women 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 stable over the years.

<sup>36</sup> We focus on the low birth weight indicator rather than birth weight per se since low birth weight is a substantially more accurate measure of neonatal health: low birth weight infants (defined as above) are 4 times more likely to die during the first 28 days than infants who weight between 2,500-2,999 grams, and 10 times more likely to die than infants weighting between 3,000-3,499 grams (UNSSCN, 2000). Moreover, the limitations of low birth weight as a summary measure are well understood.

<sup>37</sup> For simplicity, we present results from linear probability regressions. Similar results are obtained with probit models.

of the child birth as recorded in VSN.<sup>38</sup> All these parental characteristics are shown to play a crucial role in determining birth outcomes, as well as for the human sex ratio and the culling mechanism (Gluckman and Hansen, 2005).  $\theta_r$  and  $\delta_c$  are 42 county and 9 conception months fixed effects respectively; with  $\vartheta_{crt}$  we control for female unemployment rate in the month of conception for each county and year of birth;  $\tau_{icrt}$  includes the average consumption expenditures of food at the county level for each gestational month from conception to birth, while  $\varphi_{icrt}$  controls for the average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month  $c$  from conception to birth.<sup>39</sup> Our key coefficient is  $\beta_3$ , which is the DD estimator and it measures the change in outcomes after the announcement (and the cut) relative to before the announcement (and the cut), among women that work in the public sector relative to those that are housewives.

The key identification assumption in a DD framework is that, absent the policy change, the outcomes for the treated and control groups would follow a similar trend. To validate this assumption we show our main outcomes of interest by mother's occupational status, separately for the low birth weight indicator in Figure 9 and for the premature gestation indicator in Figure 10. Additionally, to our knowledge, no other (significant) social or natural event occurred around the time of the announcement of the austerity measures.

In our empirical exercise we also explore the fact that at the time of the announcement (and the wage cut) children were in different gestational stages. Since the VSN data contains the gestational age at birth, in number of weeks, we are able to infer the gestational age at the date of the announcement<sup>40</sup> and, based on this, to split our sample into: (1) children in the 1<sup>st</sup> trimester of gestation (up to 12 weeks) – exposed to only stress in early pregnancy and to both diminished income and stress in later stages -, (2) children in the 2<sup>nd</sup> trimester (13-24 weeks) – no exposure to stress or diminished income during their 1<sup>st</sup> trimester, exposure to stress during their 2<sup>nd</sup> trimester, and to both stress and diminished income in late gestational age -, (3) children in the 3<sup>rd</sup> trimester of gestation (more than 25 weeks) – exposed in late gestation to stress, no in utero exposure to diminished income. This will allow us to understand in which gestational period the in utero shock influences the outcomes at birth of the children exposed and, given the mechanisms described in Section 3, it may shed some light on whether *stress and/or nutrition* is the main transmission channel.

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<sup>38</sup> This information 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 county average. Our results are not sensitive to including or not this sample.

<sup>39</sup> Including separately alcohol consumption and cigars expenditures does not change our results.

<sup>40</sup> 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, due to different lengths of gestation, were in different developmental stages at the time of the announcement.

From an evolutionary perspective, some indirect evidence of the maternal conditions during pregnancy can be obtained by investigating the sex ratio at birth. It is already established in the medical literature that male fetuses are more fragile than females (see e.g., Kraemer, 2000). Thus, the *culling theory* postulates that weaker males are more likely to be spontaneously aborted in early pregnancy, leading to a decrease of the male-to-female ratios and, at the same time, to an improvement in health at birth outcomes for the surviving males. To provide insights into this underlying mechanism we will show our results separately for male and female, and also evidence of the secondary sex-ratio.<sup>41</sup> All these results are presented in Section 5.1.

In Section 5.2 we perform a series of falsification exercises (Section 5.2.1) and robustness checks (Section 5.2.2). Overall, our results are robust to all these exercises. In section 5.3 we provide descriptive evidence, using aggregate consumption data, that alternative mechanisms (as presented in Section 3) are not likely to have played a role in our results. Finally, one possible concern is that mothers may differ in some unobservable traits (e.g., in the way they respond to stress) which could lead to behaviors that might, in turn, affect their children health outcomes. We attempt to address this concern using mothers fixed effects in Section 6.

## 5. Main Results

### 5.1. Low birth weight and sex ratio

#### 5.1.1. Effects on low birth weight outcome

This section presents the baseline results based on Equation 1 for our main outcome of interest, the low birth weight indicator. Table 2 shows the results from the DD estimation for the full sample (Panel A), and also separately for boys (Panel B) and girls (Panel C). In the first two columns of each Panel we show the results for all singleton live births of at least 6 gestational weeks at 7<sup>th</sup> of May (2010 and 2009) in a specification without any control variables except for county of birth indicators (column 1), followed by a specification in which we include all relevant background controls previously discussed (column 2); in columns (3) and (4) we restrict the sample to children in the 1<sup>st</sup> trimester of gestation (<=12 weeks), while in columns (5) and (6) and respectively (7) and (8) we consider children in the 2<sup>nd</sup> (13-24 weeks) and respectively 3<sup>rd</sup> (>=25 weeks) trimester of gestation at the time of announcement. In what follows, for simplicity, we only show the coefficients of the DD strategy: the *Public* treatment

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<sup>41</sup> Ideally, we would like to have data on miscarriages (before the 20<sup>th</sup> week of gestation). This is a common shortcoming in all studies that address this issue. One exception is Valente (2011) who is using survey data from Nepal and retrospective questions about past miscarriages to analyze how exposure to a violent civil conflict impact the health at birth.

dummy, the *Utero2010* indicator and our main coefficient of interest, *Public x Utero2010* which reflects the impact of the policy announcement (and cut) on the probability of low birth weight for children who were in utero at May 7<sup>th</sup> 2010 relative to the children who were in utero at May 7<sup>th</sup> 2009, belonging to mothers employed in the public sector relative to mothers who were housewives.

The overall impact of the policy announcement and cut shown in column (2), Panel A, is negative and significant at the 1% level suggesting an improvement of the low birth weight by 0.7 percentage points (17% of the mean). Other results suggest that, while for all gestational periods the effects are qualitatively robust, the only significant result (at the 5% level) is for children in their 1<sup>st</sup> trimester at the time of the policy announcement. These children were exposed the longest to stress, starting with very early developmental stages. Arguably, they were also exposed to the highest level of stress as their mothers were affected by the cut to a larger extent even relative to other mothers exposed to the same shock (see our discussion in Section 2 on e.g., the calculation of the maternity leave benefits).

Our findings in Panels B and C provide some further clarifications: Panel B shows a significant improvement of the low birth weight for the sample of boys, while we find no significant effect for girls in Panel C. In particular, for the sample of boys in Panel B we find a significant effect at 5% level in column (1) - with no controls - and at the 1% level with full background controls in column (2) of about 1 percentage point (31% of the mean). The effect is even larger, in absolute terms, for the boys that were in the 1<sup>st</sup> trimester of gestation at May 7<sup>th</sup>, 2010: a decrease of 1.9 percentage points of the probability of low birth weight (54% of the mean). A similar effect is also found for boys that were in the 2<sup>nd</sup> trimester of gestation,<sup>42</sup> while the results show no significant effect on boys that were in the 3<sup>rd</sup> trimester of gestation at the announcement date. This latter result shows clearly that stress in late pregnancy has no significant effect on the low birth weight outcome.

To summarize, the findings so far indicate a significant decrease of the probability of low birth weight for boys but not for girls; in addition, the improvement of the low birth weight indicator was only significant for boys that were in early developmental stages, up to 24 weeks of gestation. Yet, recent evidence in human biology and medicine shows convincing, causal evidence that boys are more vulnerable to food shortages than girls, especially in late pregnancy, and this would lead to poor, not better, outcomes at birth (as measured by the low birth weight indicator) (e.g., Eriksson et al., 2010). In line with the biomedical literature (Mulder et al., 2002), this seems to indicate that the main transmission channel was *stress* in early gestation. However, even if we control for the average per capita monthly expenditures in each county during

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<sup>42</sup> Though not presented here, the results are even larger in magnitude if we only consider urban areas.

pregnancy, we cannot completely discard changes in consumption (nutrition, alcohol or smoking) behavior. Due to lack of data on spontaneous abortion, we proceed next to examine the effects on the secondary sex ratio in an attempt to shed more light on the stress and the in utero selection channel.

### **5.1.2. Sex ratio at birth**

Since we have individual birth data we model the sex ratio at birth as the probability of a male birth. Table 3 presents the main results of the DD estimation for the probability of a birth being a boy, using a similar framework as in Equation 1. For the full sample of children who had a gestational age of at least 6 weeks at May 7<sup>th</sup> we find a negative and significant (at the 5% level) effect on the probability of being a boy, of 1.4 percentage points (2.7% of the mean). This implies that indeed, the unexpected policy announcement, caused a significantly lower secondary sex ratio. Additionally, we also find a negative and significant effect (at the 10% level) of about 2.3 percentage points (4.5% of the mean) for the sub-sample of children who were in the 1<sup>st</sup> trimester of gestation at the time of the announcement.<sup>43</sup> Coupled with the previous findings regarding the probability of low birth weight, our results are supportive of the selection in utero hypothesis and the stress channel, inducing spontaneous abortions.

One worry here is the sex selective abortion which could potentially alter our results. While we are not aware of any evidence on sons or daughters preferences in Romania, one way to formally address this concern (in the absence of abortion data) is to look at the pattern of sex ratio for different parities over time. In countries and/or cultures with sex preferences, sex ratios are usually normal at first parity but may change with parity (Almond et al., 2009). Using the 2003-2010 Vital Statistics, we don't find any evidence of sex selection (for any parity >2), neither for the all mother sample, nor for the employed or the housewives samples (all these results are available). Moreover, the child's gender is cannot be detected before 18 gestational weeks whereas abortion is permitted until the 12<sup>th</sup> week of gestation, which makes gender-based selective abortion, in most cases, impossible.

## **5.2. Placebo effects and robustness checks**

### **5.2.1. Falsification exercise**

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<sup>43</sup> Note that in this specification we have also controlled for child's birth weight (for a similar strategy see Almond and Edlund, 2007). However, even without this control we find a significant effect for the sample of children of at least 6 weeks at the time of the announcement, but the significance of the effect for the 1<sup>st</sup> trimester children is lower, being marginally significant (p=.11). Results are available upon request.

In this section we subject our results to a falsification exercise to assert whether the effects that we found so far are indeed attributable to the policy change. Our main exercise entails estimating the same specifications as in Section 5.1 but for children born in 2008 and 2009, assuming that the policy announcement (and the cut) took place in May 7<sup>th</sup>, 2009 (and July 1<sup>st</sup>, 2009, respectively). Since there was no change in the wage policy for the public sector in either of the years nor was there any other disturbance in this sector (such as mass layoffs), we expect that the estimated coefficient on the cross term between the *Public* employment dummy and the *year dummy* to be insignificant. Also, there should be no differential effect on boys and girls, nor should there be significant impacts on different sub-samples based on their gestation stage at the placebo announcement date. Table 4 presents the results for the low birth weight outcome. Overall, we find no significant effects on the cross term for the full sample (in Panel A), nor separately for boys (Panel B) or girls (Panel C).<sup>44</sup>

With this exercise we also shed some more light on the issue of the 80-20 split of the probabilities of mothers employment in the treatment group which, arguably, might have biased our outcomes in the main specification. Since we employ exactly the same methodology to assign employed mothers into public and private employment for 2008, our treatment group also consists of highly educated mothers. However, the estimation results reveal no significant effect on the low birth weight outcome of mothers in the treatment group (relative to housewives) in 2009 relative to 2008. Had the positive effect we identify in our main specification been due to e.g., (unobservable) traits of highly educated mothers, then we should have also found a significant interaction term when comparing 2009 to 2008. Yet, this does not completely eliminate the possibility that the policy in 2010 may have had behavioral consequences affecting the highly educated mothers. We return to this issue shortly.

In Table 7, Panel A we present the results for the sex ratio at birth, corresponding to this falsification exercise. There is no significant change in the probability of a live birth being a boy for mothers employed in the public sector attributable to the placebo announcement.

We also compare outcomes at birth of babies who were in utero at May 7<sup>th</sup> 2010 and babies in utero at May 7<sup>th</sup> 2009, but belonging to mothers categorized as being employed in the private sector, according to the predicted probabilities, and housewife mothers. The DD estimation results, detailed in Appendix C, show no significant effect of the policy change for none of the sub-samples based on gender or gestational age at the time of the announcement.

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<sup>44</sup> For the full sample in Panel A we do find a significant (at the 10 % level), but positive and very small coefficient on the interaction term, indicating a slight worsening in the birth outcome.

Overall, the exercises reported in this section confirm that indeed our main findings in Section 5.1 are due to the policy change announcement (and cut). However, given the lack of better data, one valid concern remains the manner in which we assigned mothers to the public and respectively private sector. It is to this issue that we now turn to.

### **5.2.2. Robustness checks**

So far, given the limited information provided by the Romanian Ministry of Labor, Family and Social Protection, we have used the 80-20 split of the probabilities of mothers employment in the private and the public sector respectively. We recognize that this is somewhat arbitrary so we investigate here the robustness of our results allowing for two different specifications.

First, similar to the 80-20 approximation, we also allow for a median approximation of the employment probabilities (50-50). Overall, these results (available upon request) are very similar to those presented in Section 5.1, though slightly smaller in magnitude.

However, as our main robustness check we repeat the analysis, but on the sample of *all employed* (vs. the housewives) mothers. The main assumption behind this approach is that any effect observable in 2010 vs. 2009 on the full sample of births belonging to employed mothers, regardless of their sector of employment, is driven by changes in outcomes at birth of the publicly employed mothers, since only the wages in the public sector were diminished whereas the wages in the private sector remained stable throughout the period (see Figure 3 for a graphical validity of this assumption).

Table 5 presents the estimation results of the DD specification for the low birth weight outcome in which the treatment group includes the children of *all employed* mothers (in 2010 and 2009), while the control group is defined as before. Although the pattern of our main coefficient of interest is negative, suggesting an improvement in health at birth as in Table 2, we find no significant effect on the full sample (Panel A). For the sample of boys (shown in Panel B) we do find a negative and significant (at 1% level) effect on the probability of low birth weight for all boys of at least 6 weeks gestational in columns (1) and (2), as well as for exposure to stress (and income shock) starting with the 1<sup>st</sup> trimester – in column (4) -. Not surprising, the point estimates here are smaller in magnitude by almost a half than those in our main specification from Table 2. Panel C shows no significant effects on the birth outcomes for girls. Finally, even though the pattern is as expected, we find no evidence of a reduced secondary sex ratio when we consider our treatment group all employed mothers (see Table 7, Panel B).

Overall, reassuringly, these results support the conclusions drawn from the main specifications given that in these checks we are clearly underestimating the effect of the policy on health at birth outcomes.

### 5.2.3 Selection into motherhood

In Section 3.3 we acknowledged the fact that changes in the health outcomes at birth could also be due to changes in the composition of mothers giving birth. Although we consider mothers already pregnant at the time of the policy change announcement (and the cut), we test here whether mothers with different observable characteristics self-selected into pregnancy before the policy change announcement. Thus, we estimate Equation 1 in which the dependent variable reflects the observable maternal characteristics: education, age, marital status and urban residence. Reassuringly, for the publicly employed mothers (80-20 split) the interaction term is not significant for any of the characteristics (results available upon request). This is also true for the sample of *all* employed mothers. However, here we do find that more women with tertiary education were pregnant in May 2010 relative to May 2009, for the full sample, and also separately for the sub-samples of boys and girls.<sup>45</sup> Yet, we find a similar pattern when we compare 2009 and 2008 years (even though for these years we don't find any improvements in the health at birth - all these results are available from the authors-), which seem to suggest that this apparent selection on tertiary education reflects the general trend in education depicted in Figure 2. Additionally, we only observe neonatal health improvements for boys and not for girls from tertiary educated mothers; however, we are not aware of any evidence to support explanations that unobserved characteristics of the highly educated mothers vary systematically with the sex of the fetus.

Finally, another related concern regards selection of pregnant women into unemployment, i.e., the impact on our results had these women been still employed.<sup>46</sup> Estimating Equation 1 on the sample of unemployed women and housewives that were pregnant at May 7<sup>th</sup> 2010 and 2009 for the low birth weight outcome, we find no significant differences in the health outcomes at birth of their children.<sup>47</sup> This leads us to conclude that our results are not biased by maternal selection into unemployment.

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<sup>45</sup> Estimation results are presented in Appendix D

<sup>46</sup> The female unemployment rate rose from 5.8% in 2009 to 6.9% in 2010. However, the public sector was the least affected because one of the main justifications of the Austerity laws was that the 25% cut in the public sector wages was a more equitable measure than mass layoffs from the public sector.

<sup>47</sup> Estimation results are presented in Appendix D

### 5.3 Changes in household consumption patterns, health care and labor supply: descriptive evidence on alternative mechanisms

We continue by showing some descriptive evidence pertaining to the other possible mechanisms outlined in Section 3.1.(a)-(d). Since the RHBS provides detailed information on household consumption expenditures for numerous categories of goods and services, we attempt to understand any possible variations caused by the unexpected policy, particularly in: (a) foodstuff expenditures (a proxy for nutrition); (b) expenditures on alcohol and cigarettes (a proxy for consumption of health damaging goods); (c) healthcare expenditures; (d) the labor supply of publicly employed women.

We construct average per capita monthly expenditures in each county by averaging over the relevant expenditures of the households, in per capita terms, after having adjusted for inflation.<sup>48</sup> Note that these average consumption expenditures have also been used as explanatory variables in our main regressions.

It is important to keep in mind that these are expenditures only, thus they may underestimate the total consumption (especially for alcohol) since own production is not accounted for. We believe that, for our purpose, because these expenditures also account for price changes, they may be regarded as lower bounds: if adjusted per capita expenditures did not drop, then total consumption did not decrease either.

**(a) Foodstuff expenditures:** Figure 4 presents the average per capita foodstuff expenditure for the years 2008, 2009 and 2010. Overall, the expenditures pattern seems quite stable, following a parallel trend. We can, though, notice a small drop in August 2010, the first month in which the public employees received the reduced wages but no persistent decrease after, pertaining to the fact that the measures were announced as temporary.<sup>49</sup> Figure 5 shows the average per capita foodstuff expenditures separately for households with at least one member employed in the public sector, households with at least one member employed in the private sector but no member employed in the public sector, and households with a housewife. Reassuringly, the parallel trend in foodstuff expenditures is still present indicating that households with public sector employees did not change their foodstuff consumption behavior after the announcement

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<sup>48</sup> We deflate the expenditures by the corresponding component of the inflation rate (Core2) for foodstuff expenditure and a special inflation index for alcohol and cigarettes constructed by the National Bank of Romania. Adjusting for the price changes is particularly important in the case of alcohol and cigarettes, since there have been significant increases in the excise tax during the analyzed period.

<sup>49</sup> In the public sector, wages are received retroactively for the previous month. The austere laws came in effect on July 1st 2010, stipulating a 25% cut in public sector wages starting with July 2010. However, the wage received in July 2010 by the public sector employees was the entitlement for June 2010, thus a full salary. The de-facto wage cut occurred in August 2010, when public employees received the wages for July 2010. We will henceforth refer to August 2010 as the first month with reduced wages.

of the policy change. Overall, in terms of the mechanisms outlined in Section 3.1.(a), it would appear that, at least at the aggregate level, the nutritional intake channel is not relevant.

**(b) Alcohol and cigarettes expenditures:** The average expenditures on alcohol and cigarettes in per adult terms presented in Figure 6 reveal a small drop in July-August 2010, but no sustained downward or upward trend neither before nor after. As such, there is no sign of immediate improvements in behavior the average behavior relating to the consumption of dangerous goods. In Figure 7 we show the average per adult expenditures on alcohol and cigarettes for different types of households. Again there is no obvious change in expenditures for households that experienced the wage cut suggesting that the associated channel described in section 3.1.(b) is not likely to be important. Since we acknowledged that alcohol expenditures may underestimate the actual alcohol consumption due to the widespread practice of consuming home-made alcoholic beverages, Figure 8 presents the total average quantity (in liters) of alcohol products consumed per adult, which includes both purchased and own production alcohol. We observe that most of the variation in the quantity consumed is due to seasonality, and there is no substantial decrease after the announcement or after the actual wage cut. Since we do not have a similar measure for the quantity of tobacco products consumed, we proceed by using the deflated aggregate expenditures on alcohol and cigarettes.

However, these expenditures reflect the behavior of the average individual and not pregnant women. It may very well be the case that pregnant women employed in the public sector did reduce the consumption of health damaging goods after the announcement of the policy or after the actual cut, so given the lack of such individual level data on risky behavior during pregnancy, we cannot totally discard this channel. However, in the light of our previous results, when we observe health improvements for boys only, we note that, to our knowledge, there are no studies that show gender-specific effects of alcohol consumption during pregnancy on neonatal health outcomes<sup>50</sup> - thus we cannot assert whether males would benefit more than females from behavioral improvements in terms of reduced consumption of alcohol and cigarettes during their gestation.

**(c) Healthcare expenditures:** The simple mean difference analysis of healthcare expenditures at household level shows that there have been no significant differences between 2009 and 2010

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<sup>50</sup> Though there are studies that indicate that in terms of long term outcomes (such as schooling and wage earnings), males are more sensitive to alcohol exposure during gestation (e.g. Nilsson, 2008).

for households in which the women were employed in the public sector.<sup>51</sup> Similar findings hold also for the housewives households.

**(d) Labor supply of women employed in the public sector:** Finally, a potential consequence of the decreased wage in the public sector is the decrease in the opportunity cost of leisure, which could materialize in e.g., a switch from full time to part time employment. However, this is very unlikely due to the rigidity of the public sector employment in Romania and to 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). At the same time, women employed in the public sector could have reacted to the significant wage cut by an increased rate of absenteeism, increasing thus their leisure time. The RHBS information on absenteeism does not reveal any significant differences between 2010 and 2009 for the women employed in the public sector.<sup>52</sup>

## 6. Further investigations

### 6.1. Father's employment status

A legitimate concern is related to the employment sector of the father, which may also play a relevant role in the prevalence or intensity of prenatal stress on the mother to be. In particular we want to address the concern that in some households both the mother and the father were affected by the shock if both were working in the public sector. We re-estimate Equation 1 on the restricted sample in which the control group consists of housewives whose partners' occupational category is "other" (thus, arguably, the least affected by the policy announcement and cut),<sup>53</sup> while our treatment group consists of publicly employed mothers with employed partners (thus the households most likely to be affected by the announcement and the cut). As expected, the estimation results presented in Table 6 are similar, though larger in magnitude, than those in Table 2, suggesting that our main specification is not biased by indirect shocks.<sup>54</sup> We thus conclude that controlling for husband's occupational status in the regular fashion is sufficient to capture the household level shocks.

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<sup>51</sup> From 7.3 RON in 2009 (std. dev. 56.6) to 10.3 RON in 2010, (std. dev. 152), 1 RON= 0.3 USD. Healthcare expenditures include expenses on medical consultations, medical tests and laboratory analyses, auxiliary medical services and other medical services. Source: RHBS

<sup>52</sup> In 2009, 5% vs. 6% in 2010 of women employed in the public sector were absent from work in the week preceding the RHBS survey date. The RHBS defines absenteeism as absence from the workplace in the previous week due to legal leave of absence, sick leave, accident, temporary work incapacity, technical unemployment, strike, work conflicts, training, unfavorable meteorological conditions, etc.

<sup>53</sup> About 21% of the fathers have the category "other" as their main occupational status. This category is somehow similar to the mothers' category "housewives" as may include persons not working and not currently looking for a job.

<sup>54</sup> The results are similar when we consider the robustness checks - the 50-50 approximation and all employed mothers with employed fathers.

## 6.2. Mothers' fixed effects

One possible worry is that mothers may differ in some unobserved characteristics, e.g., there might be unobserved traits correlated with stress that affect their behavior and could, in turn, lead to an improvement in the health of the child (see Aizer et al., 2009). One way to control for these unobservable differences and other omitted variable bias is to consider a mother fixed effect approach and compare the children in-utero in May 2010 to their siblings born before that.

To accomplish this task we proceed as follows. From the 2010 Vital Statistics we select all employed and housewives mothers that report having at least another living child except the one born in 2010. Next, we make use of the 2003-2009 Vital Statistics<sup>55</sup> in an attempt to construct the siblings' sample. Unfortunately we don't know the mother personal identification number so we cannot directly link the data. However, we are able to build the siblings' sample since for each birth we know the address of the mother (from the *county* to the *locality/commune/village* level), mother's ethnicity and nationality and, very important, the mother's exact birth date (day, month and year). To assure the precision of our matching we further restrict our sample to married mothers to the same fathers since the Vital Statistics provides information on the exact date of marriage (based on the marital certificate) and also on the father's birth date (day, month and year). Thus, we are left with a sample of 55,715 children belonging to 25,392 mothers.<sup>56</sup>

Table 8 shows our results. Our main variable of interest is the *exposed sibling* dummy which equals 1 if the child was in utero in May 2010 (or, equivalently, the child was born during May-December, 2010) and 0 otherwise. We consider separately the sample of the publicly employed mothers that gave birth in 2010 using the 20-80 approximation in column (1), the sample of housewives mothers in column (2), and finally the full sample of employed mothers in column (3). All our specifications include child-specific characteristics: a gender dummy, pregnancy order, gestation month of the first gynecological visit and calendar month of birth dummies, together with: the age of mother at conception and its square, the age of the father at conception and its square. All our regressions include a linear time trend to control for other changes that may allow mothers' behavior to adapt to e.g., health or education trends.<sup>57</sup> Overall, the siblings

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<sup>55</sup> Thus we restrict the sample to children born no longer than 8 years ago. The reason for not using data collected before 2003 is that the structure of the Vital Statistics has been changed in 2003, and several important socio-economic characteristics of the parents are not available in earlier records.

<sup>56</sup> We are aware that this is a very restricted sample. Also we don't have the total fertility history for all the mothers in this sample.

<sup>57</sup> Additionally, to control for possible changes in education and/or occupational status 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 (available upon request) remain robust to this specification. However,

who were exposed to the shock in utero seem to be less likely to have a low birth weight compared to their unexposed siblings if the mother was employed in 2010, while we find no significant differences among siblings for the housewives sample. This is in line with our hypothesis that the policy change announcement indeed generated a fetal shock.

### 6.3. Likelihood of public employment as explanatory variable

Finally, we assess the policy impact by using the predicted probability of being employed in the public sector as a continuous variable (as detailed in Section 4.1), instead of the binary variable. Thus, we restrict our sample to all employed mothers who were pregnant in at least 6 weeks at May 7<sup>th</sup> 2010 and respectively May 7<sup>th</sup> 2009, and no longer have housewives as a control group. We estimate an analogue of Equation 1, with the predicted probabilities assigned to employed mothers. The coefficient of interest remains the interaction term between the likelihood of being employed in the public sector and the child being in utero in 2010 (as opposed to 2009). For children in utero in 2010 the results presented in Table 9 show that a higher likelihood that the mother is employed in the public sector significantly lowered the probability that the child was born with low birth weight. Overall we find that the effect is, as previously found, driven by the effect on the sub-samples of boys, and in particular boys that were in their second trimester of gestation. There is no significant effect of the likelihood of being employed in the public sector on the probability of low birth weight for the sub-sample of girls. Also, for the sample of 2008-2009 births, there are no significant effects of the mother's likelihood of being publicly employed on the probability of low birth weight, indicating that the results in Table 9 are capturing the effects of the wage policy announced in May 2010 (results available from the authors). These findings, which are robust to the exclusion of all individual control variables, suggest that the health improvements observed at birth for the male cohort may be indeed a result of selection in utero.

## 7. Further Results

### 7.1. Premature delivery

Here we investigate the effect of the policy change on the probability of preterm delivery, defined as birth before the 37th week of gestation, within our main DD specification. The estimation results presented in Table 10 reveal that for the full sample (Panel A) only children who were in the 3<sup>rd</sup> trimester of gestation in May 2010 were likely to be born prematurely. Interestingly, this result seems to be driven by the significant effect (at the 5 % level) for boys

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while the results hold the expected sign, we do not find significant results when we restrict the sample to only boys or to only girls.

(Panel B, column (8)), while we find no significant effect for girls (Panel C). These results clearly identify the short term effect of *maternal stress* (as explained, births between May-July are only potentially affected by stress and not by a diminished income) when it occurs in the last stage of gestation and are consistent with the medical literature (as outlined in the Mechanisms section), but appears to be in contradiction with the results of some the empirical studies that investigate the effects of exogenous stress exposure (e.g., Glyn et al., 2001, found that the stress associated earthquakes had significantly reduced gestation length for women exposed to the shock during their first trimester of pregnancy).

## 7.2. Fetal deaths

The last pregnancy outcome that we investigate is stillbirth, defined as a fetus that is delivered dead after at least 26 weeks of gestation. Table 11 presents the estimation results for a specification analogue to that in Equation 1, where the outcome of interest is an indicator equal to 1 if the birth was a stillbirth. The interaction term between the *Public* and the *Utero2010* dummy is not significant in any of the sub-samples with the exception of the children that were in their 3<sup>rd</sup> trimester of gestation at the time of the announcement, who had a lower probability of being stillborn.<sup>58</sup> We also investigate the probability that a child delivered stillborn is female. Under the assumption that selection in utero had already selected against the weakest male fetuses up to week 24 of gestation, we should not see a significantly increased probability that a stillbirth is male. Table 12 presents the estimation results for the sample of employed mothers vs. housewives.<sup>59</sup> Though none of the coefficients of interest are significant, they have the expected signs, with a higher probability that a still birth is female for children that were in the 1<sup>st</sup> and 2<sup>nd</sup> trimester at the time of the announcement.

## 8. Discussions and conclusions

The present study provides evidence 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 find suggestive evidence that fetal shock generated by economic circumstances may lead to selection in utero via maternal prenatal stress.

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<sup>58</sup> Similar results are obtained for the samples of all employed mothers vs. housewives. The results are not sensitive to the inclusion of birth weight or gestation length as controls.

<sup>59</sup> We use the sample of all employed mothers and not the publicly employed mothers due to the excessively small sample that we obtain when we employ the 80-20 split, and then further divide the sample according to the gestational age at the time of the announcement.

In particular, we can summarize our main results as follows: Firstly, stress appears to be the main channel through which the unexpected wage cut affected outcomes of birth for the exposed children. Our results appear in line with the culling theory, in which maternal exposure to significant stress selects against frail fetuses, with male fetuses significantly more predisposed to spontaneous abortions than female fetuses. Due to lack of data on spontaneous abortions, we attempt to identify the consequences of selection in utero through significant improvements in health outcomes at birth in the male cohorts exposed to the stressor early in gestation. Indeed, we find significantly improved outcomes at birth for the male cohorts exposed to stress during the 1<sup>st</sup> trimester of gestation, and, even though smaller in magnitude, during the 2<sup>nd</sup> trimester of gestation at the time of the announcement. These findings are supported by evidence of a reduced sex ratio at birth for the cohort that was in the 1<sup>st</sup> trimester of gestation at the time of the announcement.

Secondly, the nutrition channel is not supported by our results. Whereas fetal nutritional deprivation would undoubtedly have negative effects on birth outcomes such as the probability of low birth weight, we find significant improvements of these outcomes. It is either that nutritional deprivation did not occur, as suggested by descriptive evidence regarding the consumption patterns before and after the policy change, or the negative effects were offset by the positive effects of selection in utero. The potential existence of these offsetting effects leads us to interpret our results as lower bounds of the effects of maternal stress through selection in utero.

Thirdly, we acknowledge that risky behavior during pregnancy, in the form of alcohol and cigarettes consumption, could act as confounder. However, we only observe health improvements for boys and not for girls, whereas the behavior improvements would equally benefit male and female fetuses. However, part of these concerns are mitigated by the fact that we find similar results in a mother's fixed effects estimation on an, admittedly selected, sample of siblings, adding to our confidence that we are indeed identifying the causal effects of maternal stress.

From a policy perspective, our findings suggest that unexpected policy changes, albeit temporary, may act as sufficiently severe stressors on the population to such an extent that that selective fetal mortality has large effects, even in developed economies where the baseline health is relatively high. Given the scarce evidence, more research is still needed to better understand the possible effects of maternal stress on infant health.

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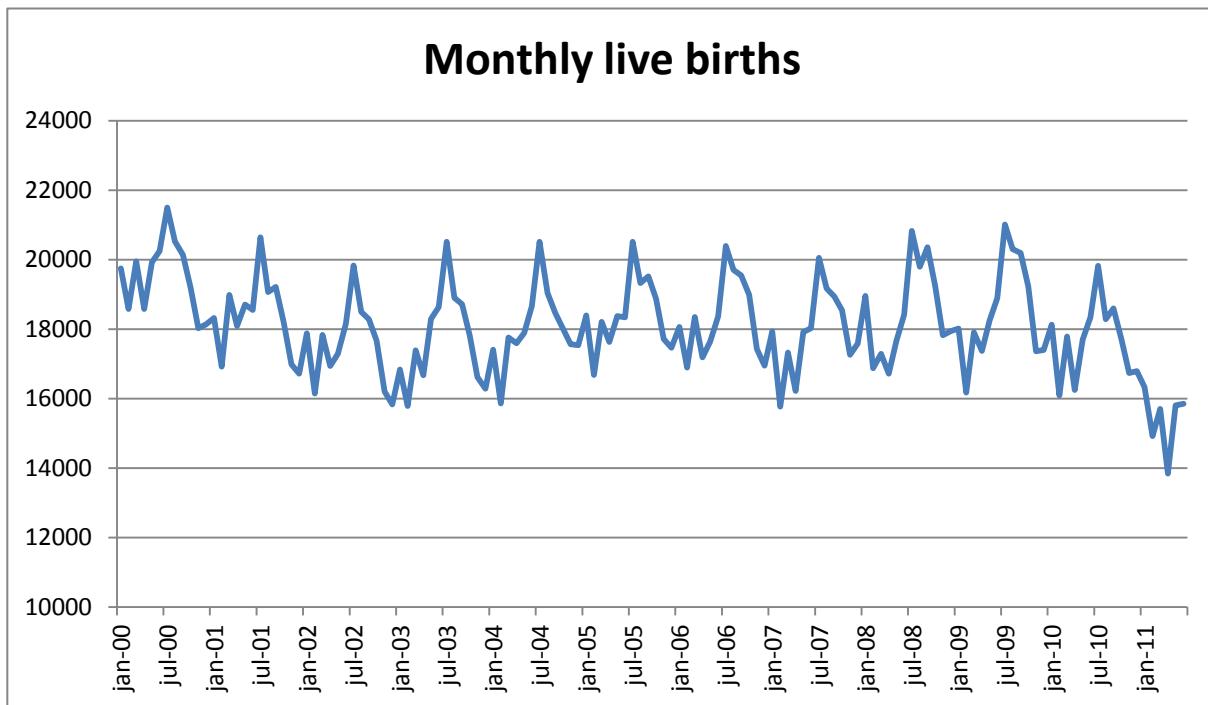
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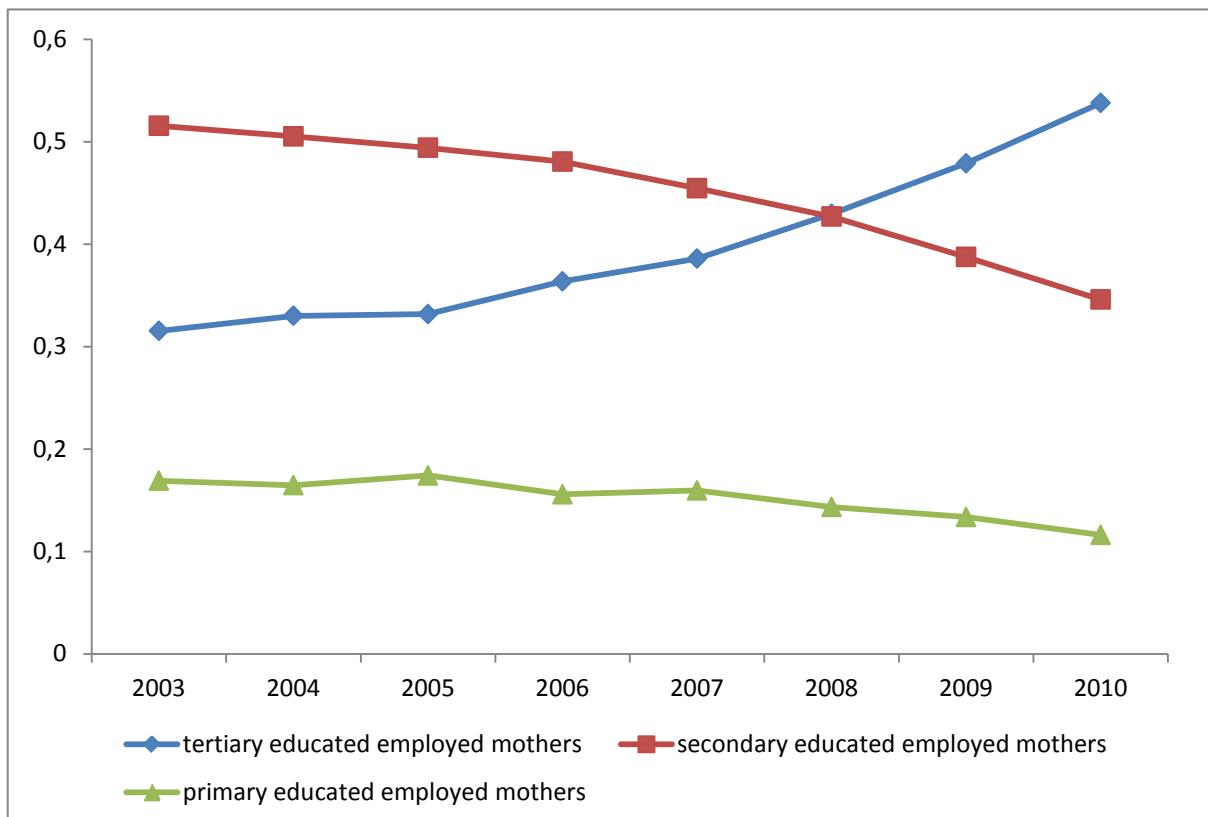
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**Figure 1 - Monthly live births, 2000-2011**



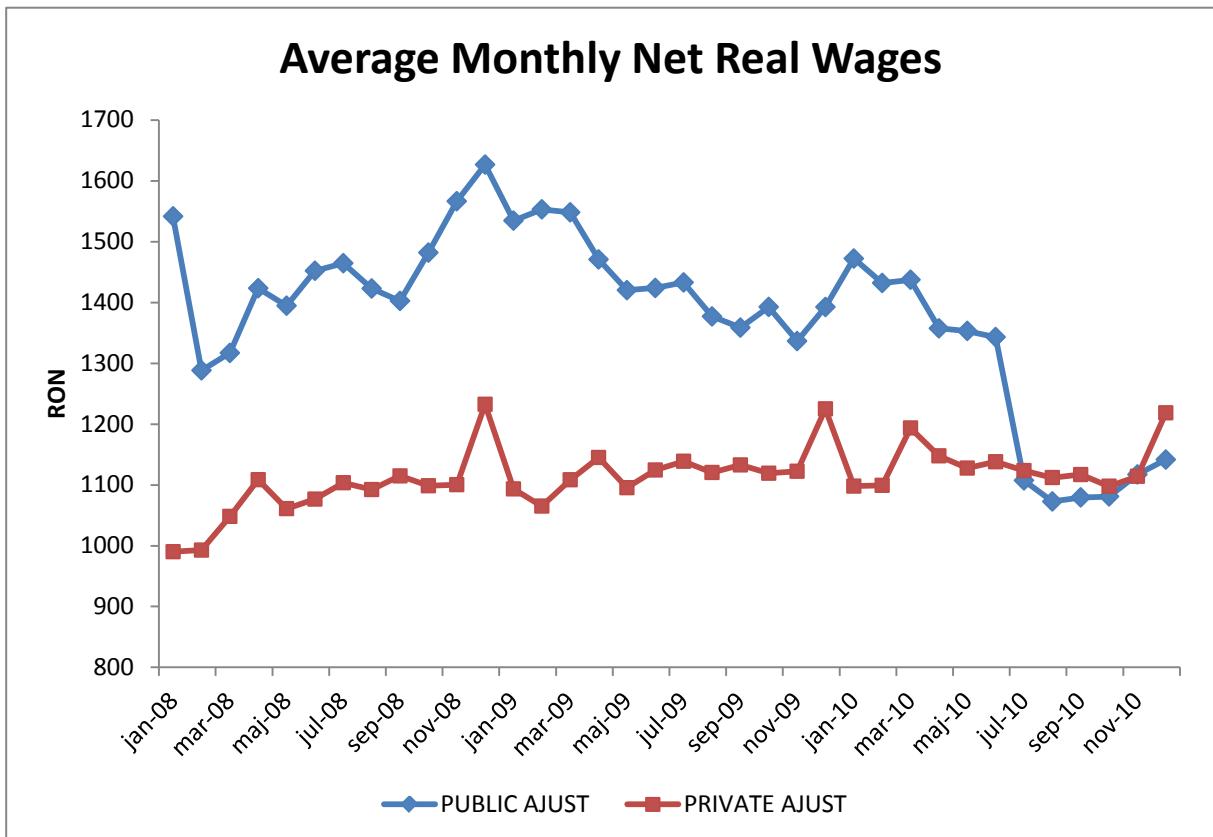
Source: Authors' calculations using 2000-2011 Vital Statistics Natality data

**Figure 2 - Educational level for the employed mothers**



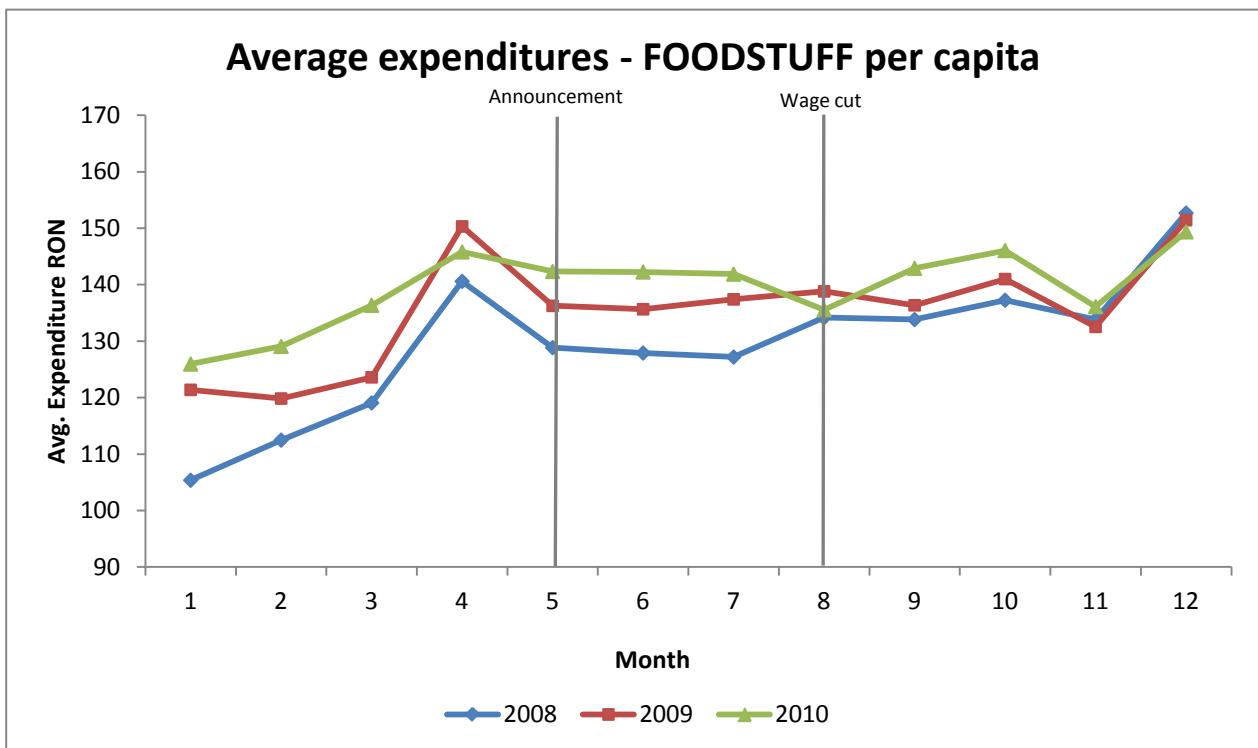
Source: Authors' calculations using 2003-2010 Vital Statistics Natality data

Figure 3 Average Monthly Net Real Wages by Sector, 2008-2010



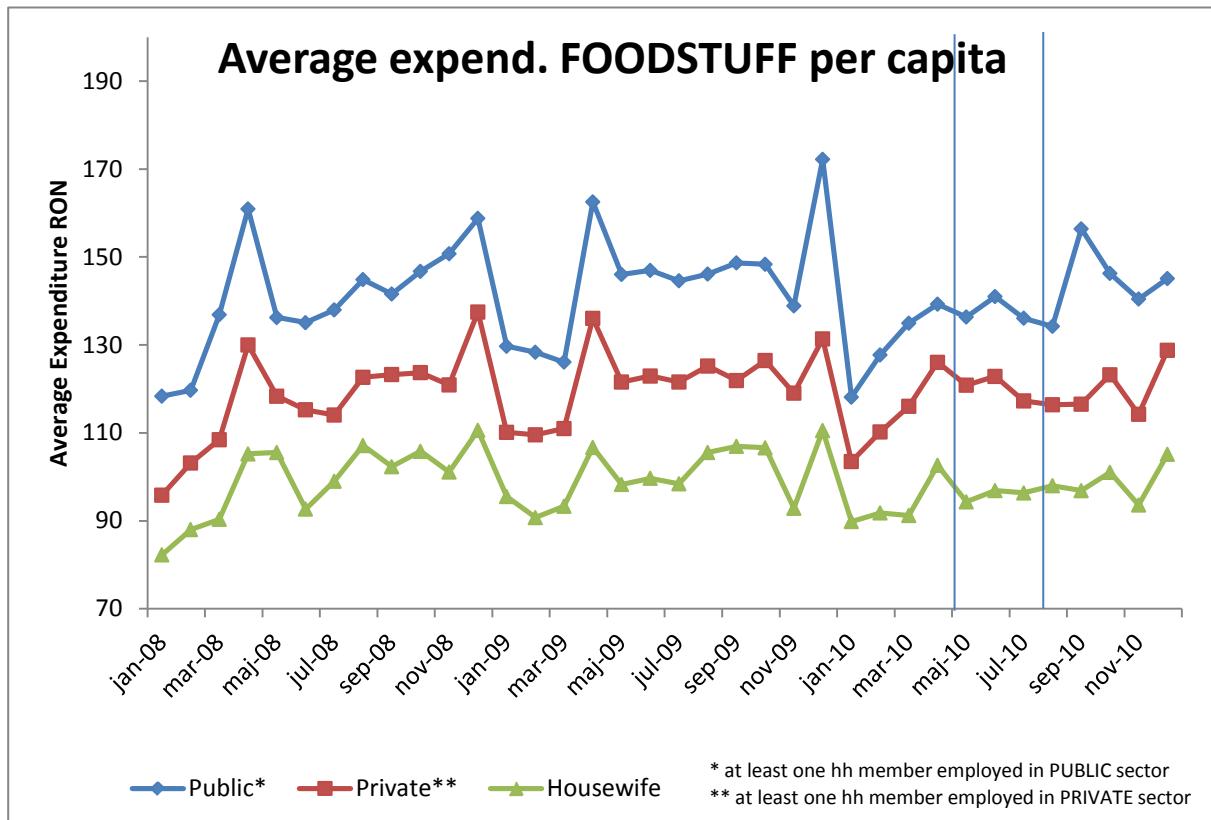
Source: Authors' calculations using 2008-2010 Romanian Labor Cost Survey data. 1 RON=0.3 USD

Figure 4 Average per capita expenditures for food items



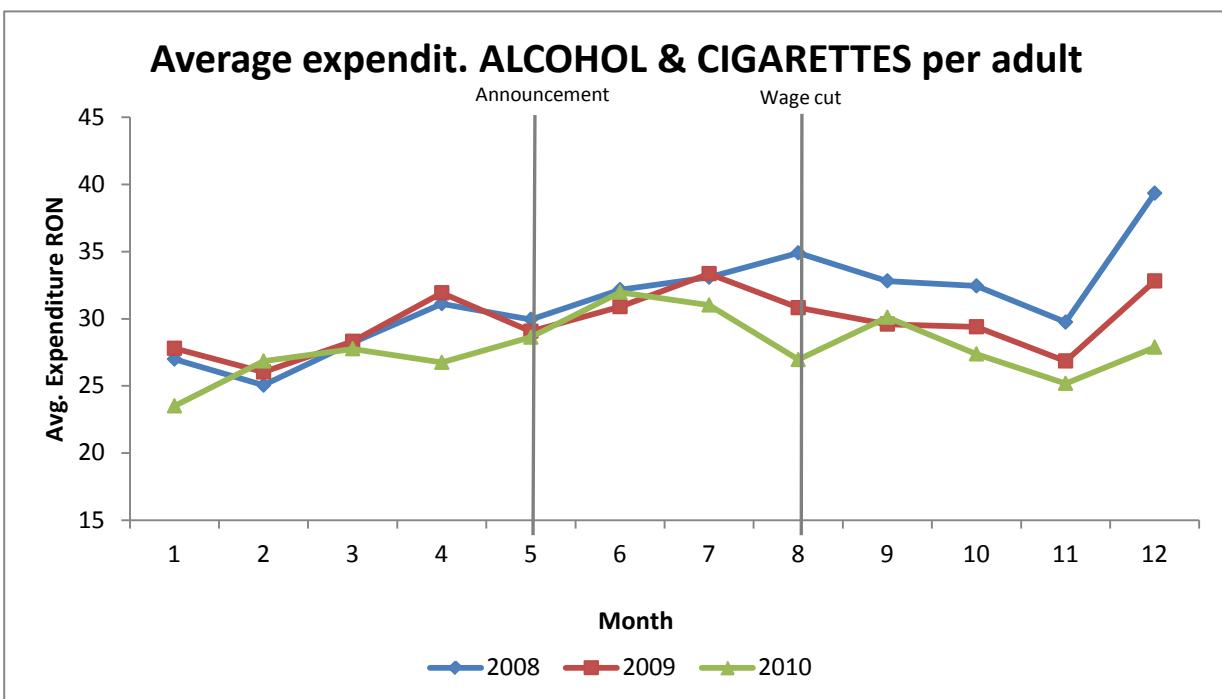
Source: Authors' calculations using 2008-2010 Romanian Household Budget Survey data. 1 RON=0.3 USD

Figure 5 Average per capita expenditures for food items, for different types of households



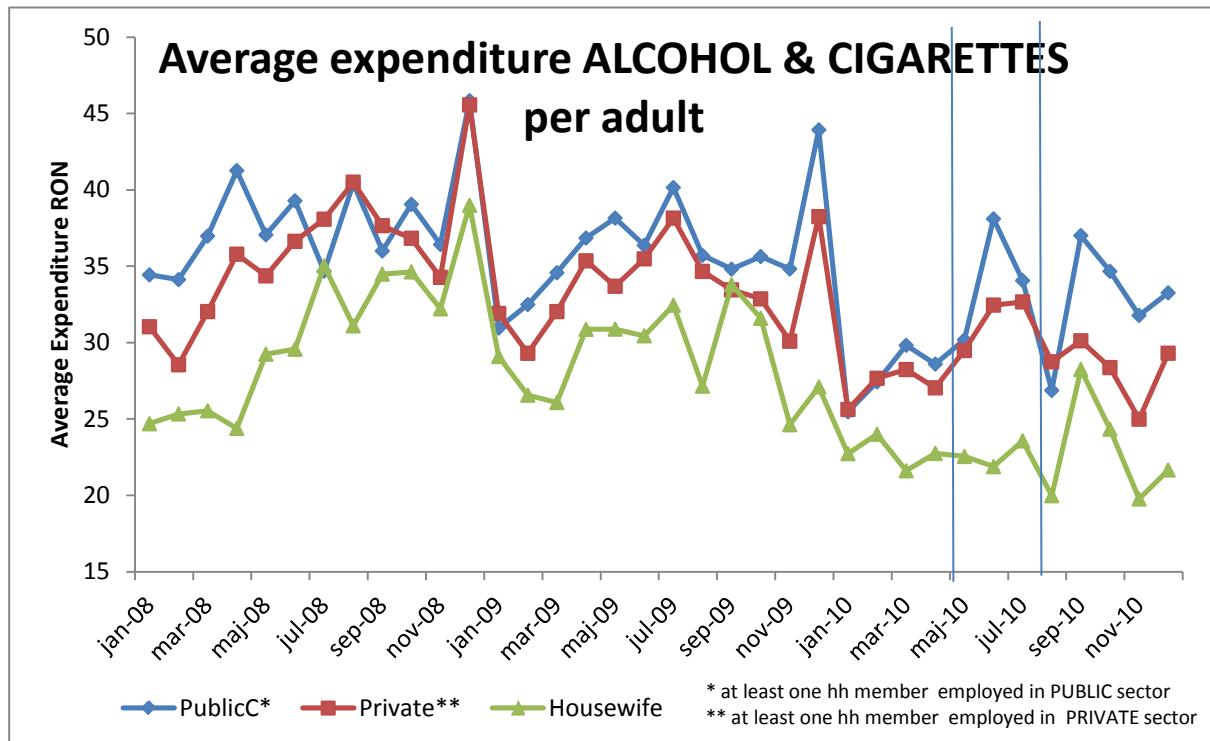
Source: Authors' calculations using 2008-2010 Romanian Household Budget Survey data. 1RON=0.3USD

Figure 6 Average per adult expenditures for alcohol and cigarettes



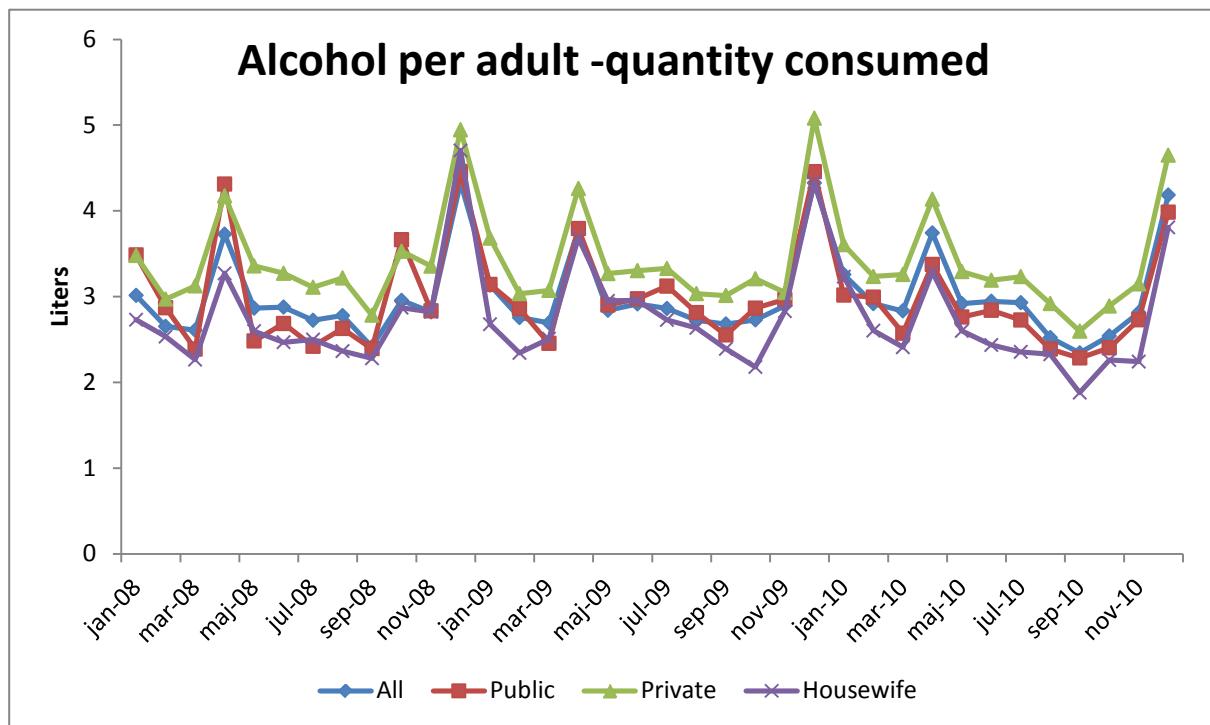
Source: Authors' calculations using 2008-2010 Romanian Household Budget Survey data. 1RON=0.3USD

Figure 7 Average per adult expenditures for alcohol and cigarettes, for different types of households



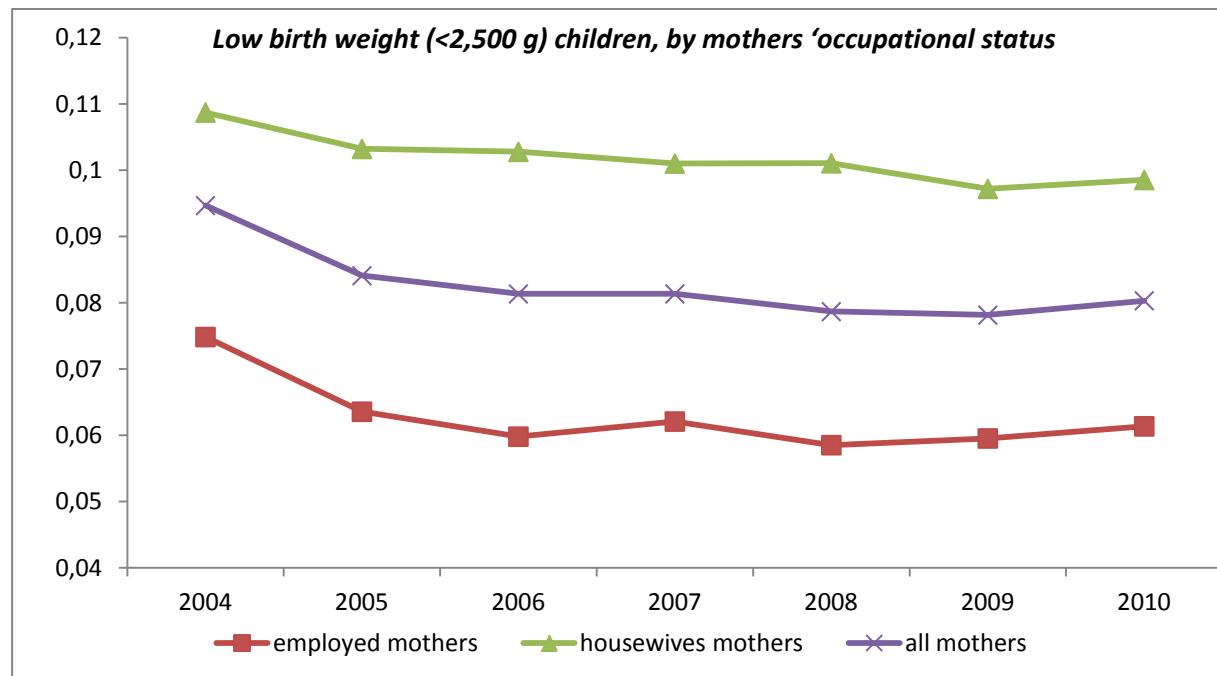
Source: Authors' calculations using 2008-2010 Romanian Household Budget Survey data. 1RON=0.3USD

Figure 8 Average per adult quantity of alcohol consumed



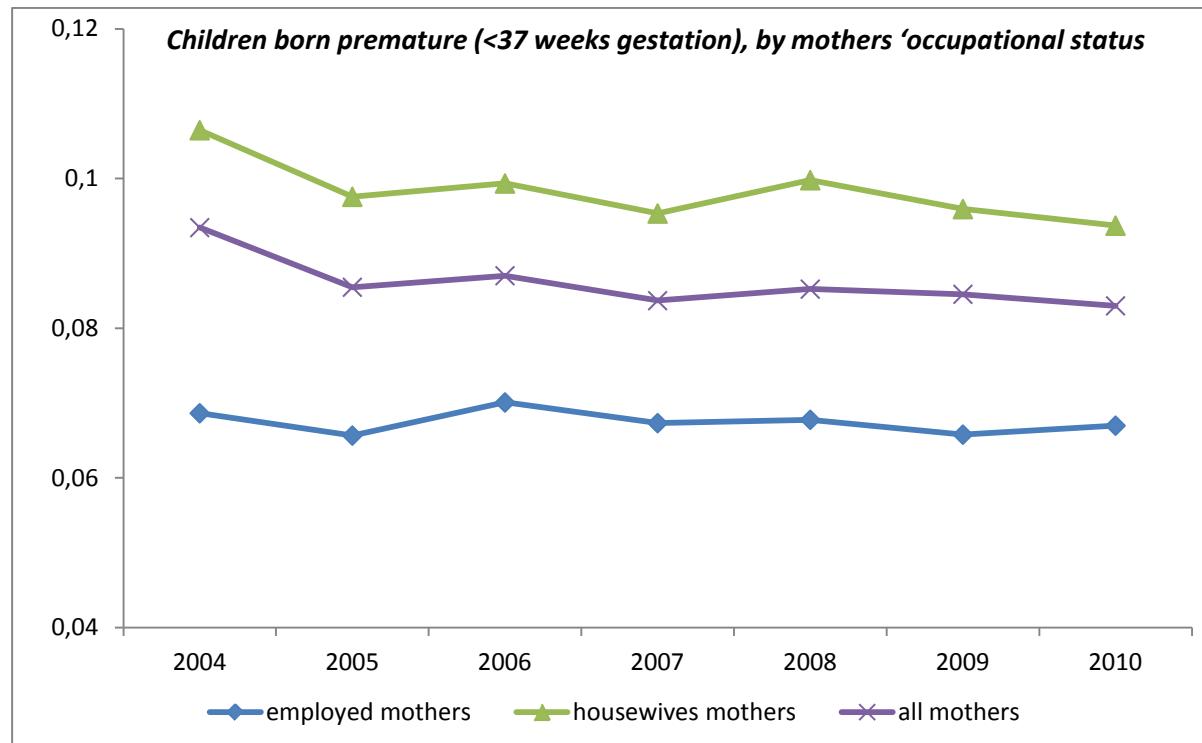
Source: Authors' calculations using 2008-2010 Romanian Household Budget Survey data.

Figure 9 Low birth weight (<2500 g) occurrence, by mother's occupational status



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

Figure 10 Children born premature (<37 weeks of gestation), by mothers' occupational status



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

Table 1 Descriptive statistics- Live births sample

VARIABLES	All			Employed			Housewives			Publicly employed* (20-80)		
	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
<b><u>Mother's characteristics at birth:</u></b>												
Age	27.21	26.93	27.21	29.148	28.88	29.19	25.32	25.06	25.26	32.30	32.47	32.64
Education: Primary	0.432	0.412	0.393	0.142	0.131	0.115	0.696	0.684	0.676	0.000	0.003	0.001
Secondary	0.347	0.338	0.321	0.419	0.382	0.34	0.281	0.287	0.286	0.000	0.000	0.000
Tertiary	0.222	0.25	0.286	0.439	0.487	0.544	0.023	0.029	0.037	1.000	0.997	0.999
Urban	0.551	0.55	0.557	0.73	0.733	0.734	0.354	0.348	0.35	0.726	0.699	0.614
Married	0.732	0.726	0.725	0.885	0.886	0.885	0.603	0.59	0.585	0.930	0.932	0.923
Ethnicity: Romanian	0.912	0.906	0.905	0.927	0.924	0.925	0.900	0.893	0.89	0.950	0.930	0.950
Hungarian	0.049	0.046	0.046	0.065	0.059	0.058	0.034	0.033	0.031	0.046	0.058	0.040
Roma and others	0.038	0.048	0.049	0.082	0.016	0.015	0.066	0.073	0.079	0.004	0.012	0.010
Antenatal control	0.85	0.818	0.787	0.911	0.875	0.822	0.813	0.787	0.772	0.913	0.886	0.852
No. of births	1.808	1.832	1.85	1.505	1.514	1.52	2.188	2.22	2.261	1.526	1.558	1.608
No. of live births	1.748	1.818	1.839	1.496	1.504	1.513	2.072	2.204	2.247	1.526	1.552	1.604
Hospital delivery	0.984	0.982	0.982	0.997	0.999	0.997	0.983	0.983	0.984	0.999	0.998	0.999
<b><u>Children's characteristics at birth:</u></b>												
Girl	0.482	0.484	0.488	0.48	0.482	0.488	0.485	0.486	0.488	0.479	0.484	0.496
Gestation (weeks)	38.827	38.801	38.798	38.896	38.881	38.856	38.763	38.746	38.755	38.838	38.833	38.810
Premature delivery	0.068	0.073	0.07	0.053	0.056	0.057	0.080	0.084	0.082	0.048	0.052	0.049
Birth weight	3225.27	3218.76	3209.81	3298.64	3285.36	3275.26	3164.65	3162.17	3152.71	3330.09	3321.07	3310.11
Low birth weight	0.063	0.068	0.071	0.045	0.05	0.051	0.084	0.087	0.089	0.039	0.042	0.041
<b>Observations</b>	<b>139,400</b>	<b>142,210</b>	<b>133,399</b>	<b>65,940</b>	<b>67,595</b>	<b>64,010</b>	<b>60,508</b>	<b>62,083</b>	<b>56,743</b>	<b>13,678</b>	<b>13,681</b>	<b>13,098</b>

Mean values for pregnancies of at least 6 weeks gestational age at May 7<sup>th</sup>, in each corresponding year, that resulted in live births. Source: Authors' calculations using the VSN files for 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 2 Low Birth weight; Publicly employed vs. Housewives, 2009 - 2010**

Low Birth weight	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: ALL</b>								
Public	-0.040*** (0.003)	-0.008** (0.003)	-0.044*** (0.005)	0.001 (0.006)	-0.043*** (0.004)	-0.007 (0.006)	-0.036*** (0.003)	-0.013** (0.005)
Utero2010	0.003 (0.002)	-0.001 (0.005)	0.005 (0.004)	-0.018 (0.012)	0.004 (0.003)	-0.009 (0.009)	0.001 (0.002)	0.009 (0.011)
Public*	-0.005* (0.003)	-0.007*** (0.002)	-0.012** (0.006)	-0.014** (0.006)	-0.005 (0.005)	-0.006 (0.004)	-0.002 (0.004)	-0.006 (0.005)
Utero2010								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	143,097	143,097	27,532	27,532	67,297	67,297	48,268	48,268
R-squared	0.007	0.215	0.009	0.249	0.008	0.246	0.008	0.133
<b>Panel B: BOYS</b>								
Public	-0.036*** (0.003)	-0.010*** (0.003)	-0.037*** (0.008)	0.000 (0.008)	-0.038*** (0.005)	-0.006 (0.007)	-0.034*** (0.004)	-0.020*** (0.006)
Utero2010	0.004* (0.002)	-0.000 (0.005)	0.008* (0.005)	-0.004 (0.015)	0.007* (0.004)	-0.001 (0.008)	-0.000 (0.003)	-0.003 (0.009)
Public*	-0.010** (0.004)	-0.010*** (0.003)	-0.018** (0.008)	-0.019** (0.007)	-0.014** (0.005)	-0.012** (0.006)	-0.001 (0.008)	-0.004 (0.007)
Utero2010								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	73,355	73,355	14,202	14,202	34,439	34,439	24,714	24,714
R-squared	0.007	0.227	0.010	0.261	0.009	0.259	0.007	0.144
<b>Panel C: GIRLS</b>								
Public	-0.045*** (0.003)	-0.006 (0.005)	-0.050*** (0.006)	0.002 (0.012)	-0.047*** (0.005)	-0.009 (0.008)	-0.038*** (0.005)	-0.007 (0.009)
Utero2010	0.001 (0.002)	-0.002 (0.007)	0.002 (0.006)	-0.031* (0.015)	0.001 (0.004)	-0.017 (0.013)	0.001 (0.004)	0.022 (0.018)
Public*	-0.000 (0.003)	-0.005 (0.003)	-0.007 (0.009)	-0.009 (0.009)	0.004 (0.006)	0.001 (0.006)	-0.003 (0.006)	-0.009 (0.007)
Utero2010								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	69,742	69,742	13,330	13,330	32,858	32,858	23,554	23,554
R-squared	0.008	0.204	0.010	0.240	0.009	0.236	0.010	0.126

**Notes:** Full Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Mean  $Y_{ijrt}$  (>6weeks): .074 (all); .066 (boys); .084 (girls). Source: Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 3. Probability of a live birth being male; publicly employed vs. housewives, 2009-2010**

Boy	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public	0.004 (0.005)	0.016* (0.010)	0.003 (0.010)	0.040** (0.019)	0.008 (0.007)	0.022 (0.015)	-0.001 (0.007)	-0.007 (0.016)
Utero2010	-0.002 (0.003)	-0.008 (0.007)	0.011 (0.007)	0.013 (0.023)	-0.006 (0.004)	-0.013 (0.016)	-0.003 (0.005)	-0.019 (0.013)
Public*	-0.013* (0.007)	-0.014** (0.007)	-0.021 (0.014)	-0.023* (0.014)	-0.008 (0.009)	-0.009 (0.009)	-0.016 (0.011)	-0.017 (0.011)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	143,097	143,097	27,532	27,532	67,297	67,297	48,268	48,268
R-squared	0.000	0.019	0.001	0.023	0.001	0.017	0.001	0.021

Notes: Background controls include: child gender, gestational age at birth in weeks, birth weight in grams; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Mean  $Y_{ijit}$  (>6weeks): .51. Source: Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 4 Low Birth weight; Publicly employed vs. Housewives, 2008 - 2009**

Low Birth weight	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: ALL</b>								
Public	-0.047*** (0.003)	-0.009** (0.004)	-0.051*** (0.005)	-0.008 (0.008)	-0.051*** (0.004)	-0.004 (0.007)	-0.041*** (0.004)	-0.015*** (0.005)
Utero2009	-0.003 (0.002)	-0.002 (0.002)	0.002 (0.005)	0.002 (0.004)	-0.005 (0.003)	0.000 (0.002)	-0.004 (0.003)	-0.004 (0.003)
Public*	0.007** (0.003)	0.005* (0.003)	0.008 (0.007)	0.007 (0.006)	0.008 (0.005)	0.003 (0.005)	0.005 (0.005)	0.006 (0.004)
Utero2009								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	148,680	148,680	28,969	28,969	70,624	70,624	49,087	49,087
R-squared	0.007	0.221	0.008	0.258	0.008	0.250	0.007	0.138
<b>Panel B: BOYS</b>								
Public	-0.041*** (0.003)	-0.014*** (0.004)	-0.043*** (0.006)	-0.009 (0.010)	-0.044*** (0.005)	-0.008 (0.007)	-0.037*** (0.005)	-0.024*** (0.007)
Utero2009	-0.003 (0.003)	-0.004 (0.002)	-0.000 (0.007)	-0.004 (0.005)	-0.004 (0.004)	-0.001 (0.003)	-0.003 (0.003)	-0.006* (0.003)
Public*	0.005 (0.004)	0.003 (0.004)	0.007 (0.010)	0.006 (0.008)	0.006 (0.007)	0.001 (0.006)	0.002 (0.006)	0.005 (0.006)
Utero2009								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	76,570	76,570	14,897	14,897	36,446	36,446	25,227	25,227
R-squared	0.006	0.228	0.008	0.261	0.008	0.261	0.007	0.144
<b>Panel C: GIRLS</b>								
Public	-0.054*** (0.004)	-0.003 (0.006)	-0.060*** (0.007)	-0.006 (0.011)	-0.058*** (0.005)	0.000 (0.010)	-0.045*** (0.006)	-0.005 (0.008)
Utero2009	-0.003 (0.003)	0.000 (0.003)	0.005 (0.005)	0.010* (0.006)	-0.006 (0.004)	0.001 (0.003)	-0.004 (0.004)	-0.003 (0.004)
Public*	0.009** (0.004)	0.007* (0.004)	0.010 (0.009)	0.008 (0.009)	0.010 (0.006)	0.005 (0.005)	0.007 (0.007)	0.007 (0.005)
Utero2009								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	72,110	72,110	14,072	14,072	34,178	34,178	23,860	23,860
R-squared	0.009	0.214	0.011	0.258	0.009	0.241	0.011	0.135

*Notes:* Full Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth. Mean  $Y_{ijit}$  (>6weeks): .074 (all); .065 (boys); .084 (girls). *Source:* Authors' calculations using 2008-2009 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5 Low Birth weight; All Employed vs. Housewives, 2009 - 2010**

Low Birth weight	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: ALL</b>								
Employed	-0.037*** (0.003)	-0.007** (0.002)	-0.040*** (0.004)	-0.007* (0.004)	-0.038*** (0.004)	-0.006 (0.004)	-0.033*** (0.002)	-0.008*** (0.002)
Utero2010	0.003 (0.002)	0.000 (0.005)	0.005 (0.004)	-0.015 (0.009)	0.004 (0.003)	-0.008 (0.009)	0.001 (0.002)	0.013 (0.009)
Employed*	-0.001	-0.003	-0.004	-0.007* (0.004)	-0.002 (0.003)	-0.003 (0.003)	0.002 (0.003)	-0.001 (0.003)
Utero2010	(0.002)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	246,893	246,893	47,075	47,075	115,923	115,923	83,895	83,895
R-squared	0.008	0.209	0.009	0.249	0.008	0.238	0.008	0.127
<b>Panel B: BOYS</b>								
Employed	-0.032*** (0.003)	-0.005* (0.003)	-0.034*** (0.005)	-0.007 (0.005)	-0.033*** (0.004)	-0.004 (0.004)	-0.029*** (0.003)	-0.007** (0.003)
Utero2010	0.004** (0.002)	-0.000 (0.005)	0.008* (0.005)	-0.009 (0.013)	0.007* (0.004)	-0.005 (0.007)	-0.000 (0.003)	0.002 (0.007)
Employed*	-0.005** (0.003)	-0.006*** (0.002)	-0.008 (0.006)	-0.010** (0.004)	-0.008** (0.003)	-0.006 (0.004)	-0.001 (0.004)	-0.003 (0.004)
Utero2010	(0.003)	(0.002)	(0.006)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	126,876	126,876	24,220	24,220	59,464	59,464	43,192	43,192
R-squared	0.007	0.223	0.009	0.263	0.008	0.252	0.008	0.134
<b>Panel C: GIRLS</b>								
Employed	-0.042*** (0.003)	-0.008** (0.003)	-0.047*** (0.006)	-0.006 (0.007)	-0.044*** (0.005)	-0.008 (0.005)	-0.037*** (0.004)	-0.008** (0.004)
Utero2010	0.001 (0.002)	0.001 (0.006)	0.003 (0.006)	-0.021** (0.010)	0.001 (0.004)	-0.011 (0.012)	0.001 (0.004)	0.024 (0.015)
Employed*	0.003 (0.003)	-0.000 (0.003)	-0.002 (0.008)	-0.005 (0.008)	0.004 (0.004)	-0.000 (0.004)	0.004 (0.004)	0.001 (0.005)
Utero2010	(0.003)	(0.003)	(0.008)	(0.008)	(0.004)	(0.004)	(0.004)	(0.005)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	120,017	120,017	22,855	22,855	56,459	56,459	40,703	40,703
R-squared	0.009	0.198	0.011	0.237	0.009	0.226	0.010	0.121

**Notes:** Full Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Mean  $Y_{ijgt}$  (>6weeks): .063 (all); .056 (boys); .071 (girls). **Source:** Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 6 Low Birth weight; Publicly employed with employed husbands vs. Housewives with husbands with no activity, 2009 - 2010**

Low Birth weight	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: ALL</b>								
Public	-0.044*** (0.004)	-0.014* (0.008)	-0.043*** (0.005)	0.021 (0.014)	-0.044*** (0.007)	-0.020 (0.012)	-0.044*** (0.005)	-0.027 (0.018)
Utero2010	0.001 (0.004)	-0.003 (0.008)	0.002 (0.006)	-0.001 (0.016)	0.004 (0.006)	-0.003 (0.015)	-0.003 (0.004)	-0.012 (0.015)
Public*	-0.005 (0.004)	-0.009*** (0.003)	-0.015** (0.007)	-0.023*** (0.007)	-0.005 (0.007)	-0.006 (0.006)	0.002 (0.005)	-0.005 (0.006)
Utero2010								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	62,879	62,879	12,390	12,390	29,614	29,614	20,875	20,875
R-squared	0.012	0.224	0.015	0.256	0.012	0.261	0.015	0.139
<b>Panel B: BOYS</b>								
Public	-0.038*** (0.005)	-0.016 (0.012)	-0.035*** (0.009)	0.039* (0.020)	-0.039*** (0.006)	-0.006 (0.017)	-0.040*** (0.005)	-0.066*** (0.023)
Utero2010	0.005 (0.005)	0.003 (0.010)	0.010 (0.009)	0.017 (0.024)	0.007 (0.007)	0.002 (0.018)	-0.001 (0.005)	-0.016 (0.013)
Public*	-0.011** (0.005)	-0.013** (0.005)	-0.022** (0.010)	-0.025*** (0.009)	-0.014* (0.008)	-0.013* (0.007)	0.001 (0.008)	-0.003 (0.008)
Utero2010								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	32,290	32,290	6,394	6,394	15,227	15,227	10,669	10,669
R-squared	0.012	0.231	0.021	0.271	0.013	0.271	0.014	0.141
<b>Panel C: GIRLS</b>								
Public	-0.051*** (0.006)	-0.012 (0.010)	-0.053*** (0.008)	0.010 (0.024)	-0.050*** (0.009)	-0.036** (0.015)	-0.050*** (0.009)	0.008 (0.017)
Utero2010	-0.003 (0.005)	-0.008 (0.010)	-0.006 (0.010)	-0.021 (0.022)	0.001 (0.007)	-0.007 (0.017)	-0.005 (0.007)	-0.005 (0.025)
Public*	0.002 (0.005)	-0.004 (0.004)	-0.007 (0.012)	-0.020 (0.013)	0.004 (0.008)	0.002 (0.008)	0.003 (0.008)	-0.007 (0.009)
Utero2010								
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	30,589	30,589	5,996	5,996	14,387	14,387	10,206	10,206
R-squared	0.013	0.219	0.019	0.254	0.014	0.255	0.021	0.144

*Notes:* Full Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Mean  $Y_{icjt}$  (>6weeks): .077 (all); .064 (boys); .074 (girls). Source: Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 7 Probability of a live birth being male–falsification and robustness checks**

Boy	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: Publicly employed vs. Housewives, 2008-2009</b>								
Public	0.006	0.007	0.000	0.012	0.013	0.012	-0.002	-0.005
	(0.005)	(0.010)	(0.011)	(0.022)	(0.008)	(0.013)	(0.009)	(0.020)
Utero2009	-0.001	-0.003	-0.005	-0.011	-0.002	-0.002	0.002	0.000
	(0.003)	(0.003)	(0.008)	(0.011)	(0.004)	(0.005)	(0.005)	(0.005)
Public*	-0.003	-0.001	0.007	0.009	-0.009	-0.007	0.001	0.004
Utero2009	(0.008)	(0.008)	(0.014)	(0.015)	(0.012)	(0.012)	(0.013)	(0.012)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	148,680	148,680	28,969	28,969	70,624	70,624	49,087	49,087
R-squared	0.000	0.020	0.002	0.021	0.001	0.020	0.001	0.021
<b>Panel B: All Employed vs. Housewives, 2009-2010</b>								
Employed	0.002	0.002	0.000	0.000	0.005	0.005	-0.001	-0.001
	(0.003)	(0.004)	(0.008)	(0.010)	(0.004)	(0.005)	(0.005)	(0.005)
Utero2010	-0.002	-0.005	0.011	0.010	-0.006	-0.002	-0.003	-0.007
	(0.003)	(0.006)	(0.007)	(0.018)	(0.004)	(0.013)	(0.005)	(0.009)
Employed*	-0.004	-0.004	-0.011	-0.013	-0.003	-0.005	-0.001	0.002
Utero2010	(0.005)	(0.005)	(0.011)	(0.010)	(0.005)	(0.005)	(0.007)	(0.007)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	246,893	246,893	47,075	47,075	115,923	115,923	83,895	83,895
R-squared	0.000	0.021	0.001	0.023	0.000	0.020	0.001	0.024

Notes: Full Background controls include: child gender, gestational age at birth in weeks, birth weight in grams; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month.

Source: Authors' calculations using 2008-2010 Vital Statistics Natality files. Mean  $Y_{icjt}$  (>6weeks): .515 (Panel A); .513 (Panel B). County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 8. Mother fixed effects**

	Publicly employed mothers (20/80)	Housewives mothers	Employed mothers
<i>Low Birth Weight</i>	(1)	(2)	(3)
<b>Exposed sibling</b>	-0.022* (0.012)	-0.010 (0.010)	-0.026** (0.011)
Child specific characteristics	YES	YES	YES
Mather & Father characteristics	YES	YES	YES
Time Trend	YES	YES	YES
Observations	7,065	29,141	26,574
No of groups	3,440	12,700	12,692
R-squared	0.003	0.001	0.001
Mean dep. var.	0.029	0.064	0.040

Notes: All regressions are estimated using the fixed-effect estimator, and we include child specific characteristics: a gender dummy, pregnancy order, gestation month of the first gynecological visit and calendar month of birth dummies, parents characteristics: the age of mother at conception and its square, the age of the father at conception and its square, and a time trend. These specifications are based on the mother's status at the time of birth in 2010. In particular, in column (1) we consider all employed women that gave birth in 2010, in column (2) we consider the publicly employed women that gave birth in 2010 using the specification 50-50, while in column (3) we consider the 20-80 specification. Finally, in column (4) we consider the housewives mothers giving birth in 2010. Source: Authors' calculation using the 2003-2010 Vital Statistics. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 9**

Low Birth weight	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: ALL</b>								
Predicted probab.	-0.025*** (0.006)	0.019** (0.009)	-0.035** (0.016)	0.020 (0.075)	-0.028*** (0.009)	0.012 (0.020)	-0.020** (0.009)	0.023 (0.019)
Utero2010	0.006*** (0.002)	0.004 (0.005)	0.003 (0.006)	0.003 (0.027)	0.007** (0.003)	-0.009 (0.011)	0.007* (0.004)	0.021*** (0.008)
Predicted probab.*	-0.013** (0.006)	-0.013** (0.006)	-0.006 (0.017)	0.023 (0.030)	-0.012 (0.010)	-0.011 (0.011)	-0.014 (0.013)	-0.017 (0.012)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	130,535	130,535	24,648	24,648	61,589	61,589	44,298	44,298
R-squared	0.002	0.201	0.004	0.028	0.002	0.228	0.003	0.115
<b>Panel B: BOYS</b>								
Predicted probab.	-0.020*** (0.006)	0.013 (0.016)	-0.026 (0.019)	0.004 (0.044)	-0.019* (0.010)	0.035 (0.024)	-0.023** (0.009)	-0.007 (0.023)
Utero2010	0.006** (0.003)	0.003 (0.005)	0.007 (0.008)	-0.002 (0.015)	0.009** (0.004)	-0.007 (0.011)	0.000 (0.004)	0.010 (0.008)
Predicted probab.*	-0.019** (0.008)	-0.019** (0.008)	-0.021 (0.021)	-0.019 (0.022)	-0.028** (0.012)	-0.030** (0.012)	-0.000 (0.016)	-0.002 (0.013)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	67,190	67,190	12,623	12,623	31,701	31,701	22,866	22,866
R-squared	0.002	0.217	0.005	0.273	0.003	0.246	0.003	0.121
<b>Panel C: GIRLS</b>								
Predicted probab.	-0.031*** (0.009)	0.024 (0.016)	-0.045** (0.020)	0.048 (0.046)	-0.038*** (0.011)	-0.015 (0.037)	-0.019 (0.015)	0.051 (0.035)
Utero2010	0.007** (0.003)	0.005 (0.006)	-0.000 (0.007)	-0.000 (0.014)	0.004 (0.005)	-0.011 (0.013)	0.015** (0.006)	0.032** (0.013)
Predicted probab.*	-0.006 (0.009)	-0.006 (0.010)	0.008 (0.023)	0.004 (0.020)	0.006 (0.016)	0.009 (0.020)	-0.028 (0.018)	-0.030 (0.019)
Controls	No	Full	No	Full	No	Full	No	Full
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	63,345	63,345	12,025	12,025	29,888	29,888	21,432	21,432
R-squared	0.002	0.190	0.007	0.234	0.003	0.216	0.003	0.114

*Notes:* Full Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. *Source:* Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 10 Probability of Premature delivery, Publicly employed vs. Housewives, 2009-2010**

Premature delivery	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: ALL</b>								
Public	-0.031*** (0.003)	-0.014*** (0.004)	-0.037*** (0.007)	-0.018* (0.010)	-0.034*** (0.004)	-0.014** (0.006)	-0.025*** (0.003)	-0.011* (0.006)
Utero2010	-0.003 (0.002)	-0.048*** (0.010)	-0.004 (0.005)	-0.012 (0.015)	0.000 (0.004)	-0.008 (0.009)	-0.006** (0.002)	-0.031*** (0.010)
Public*								
Utero2010	0.001 (0.003)	0.002 (0.002)	-0.001 (0.008)	0.001 (0.008)	-0.003 (0.004)	-0.002 (0.004)	0.006* (0.003)	0.005* (0.003)
Controls								
Region ctrl								
Obs.	143,097	143,097	27,532	27,532	67,297	67,297	48,268	48,268
R-squared	0.008	0.026	0.011	0.029	0.010	0.025	0.006	0.030
<b>Panel B: BOYS</b>								
Public	-0.028*** (0.004)	-0.013*** (0.004)	-0.031*** (0.009)	-0.015 (0.017)	-0.030*** (0.004)	-0.008 (0.008)	-0.027*** (0.003)	-0.019*** (0.007)
Utero2010	-0.003 (0.003)	-0.042*** (0.010)	-0.004 (0.007)	-0.007 (0.020)	0.000 (0.004)	-0.003 (0.013)	-0.007** (0.003)	-0.031** (0.012)
Public*								
Utero2010	0.002 (0.004)	0.004 (0.003)	-0.001 (0.012)	0.000 (0.013)	-0.004 (0.005)	-0.004 (0.005)	0.013** (0.005)	0.012** (0.005)
Controls								
Region ctrl								
Obs.	73,355	73,355	14,202	14,202	34,439	34,439	24,714	24,714
R-squared	0.008	0.025	0.012	0.031	0.010	0.024	0.007	0.031
<b>Panel C: GIRLS</b>								
Public	-0.034*** (0.004)	-0.016*** (0.006)	-0.042*** (0.009)	-0.021 (0.013)	-0.037*** (0.006)	-0.022** (0.009)	-0.024*** (0.005)	-0.002 (0.008)
Utero2010	-0.003 (0.003)	-0.054*** (0.011)	-0.004 (0.006)	-0.020 (0.014)	-0.000 (0.005)	-0.013 (0.011)	-0.005 (0.003)	-0.031*** (0.010)
Public*								
Utero2010	-0.001 (0.004)	0.001 (0.005)	-0.002 (0.013)	0.002 (0.013)	-0.002 (0.006)	-0.001 (0.006)	-0.000 (0.005)	-0.001 (0.005)
Controls								
Region ctrl								
Obs.	69,742	69,742	13,330	13,330	32,858	32,858	23,554	23,554
R-squared	0.009	0.029	0.013	0.032	0.012	0.029	0.006	0.033

**Notes:** Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Mean  $Y_{icjt}$  (>6weeks): .072 (all); .070 (boys); .074 (girls). Source: Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1\*\*\*

**Table 11 Probability of Stillbirth –Publicly employed vs. Housewives, 2009 - 2010**

Low Birth weight	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: ALL</b>								
Public	-0.002*** (0.001)	-0.000 (0.001)	-0.002** (0.001)	-0.001 (0.002)	-0.004*** (0.001)	-0.000 (0.001)	-0.001 (0.001)	0.000 (0.001)
Utero2010	-0.000 (0.000)	0.001 (0.002)	-0.001 (0.001)	-0.006** (0.002)	-0.001 (0.001)	0.002 (0.003)	0.000 (0.001)	-0.000 (0.002)
Public*	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.001)	-0.000 (0.001)	0.001 (0.001)	-0.000 (0.001)	-0.002** (0.001)	-0.002** (0.001)
Utero2010								
Controls	No	Full -	No	Full -	No	Full -	No	Full -
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	143,586	143,586	27,632	27,632	67,567	67,567	48,387	48,387
R-squared	0.002	0.281	0.004	0.316	0.002	0.317	0.002	0.210
<b>Panel B: BOYS</b>								
Public	-0.003*** (0.001)	0.001 (0.001)	-0.004*** (0.001)	-0.003 (0.002)	-0.004*** (0.001)	0.000 (0.002)	-0.000 (0.001)	0.003* (0.002)
Utero2010	-0.001 (0.001)	0.000 (0.002)	-0.001 (0.001)	-0.009** (0.004)	-0.001 (0.001)	0.003 (0.003)	0.000 (0.001)	0.001 (0.003)
Public*	0.000 (0.001)	-0.001 (0.001)	0.002 (0.002)	0.002 (0.002)	0.001 (0.001)	-0.000 (0.001)	-0.003* (0.001)	-0.002* (0.001)
Utero2010								
Controls	No	Full -	No	Full -	No	Full -	No	Full -
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	73,626	73,626	14,261	14,261	34,580	34,580	24,785	24,785
R-squared	0.002	0.287	0.005	0.340	0.003	0.308	0.002	0.231
<b>Panel C: GIRLS</b>								
Public	-0.002** (0.001)	-0.001 (0.001)	0.000 (0.001)	0.001 (0.003)	-0.003*** (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.003 (0.002)
Utero2010	-0.000 (0.001)	0.002 (0.002)	0.000 (0.001)	-0.003 (0.002)	-0.001 (0.001)	0.001 (0.003)	0.000 (0.001)	-0.001 (0.002)
Public*	-0.001 (0.001)	-0.001 (0.001)	-0.003 (0.002)	-0.002 (0.001)	0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.002 (0.001)
Utero2010								
Controls	No	Full -	No	Full -	No	Full -	No	Full -
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	69,960	69,960	13,371	13,371	32,987	32,987	23,602	23,602
R-squared	0.002	0.275	0.004	0.291	0.003	0.330	0.003	0.189

Notes: “Full-“ Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynecological visit, an indicator for home delivery; 42 county dummies, 9 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Mean  $Y_{ijrt}$  (>6weeks): .0031 (all); .0037 (boys); .0031 (girls). Source: Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1\*\*\*

**Table 12 Probability of a still birth being male, Employed mothers vs. Housewives, 2009 - 2010**

<i>Girl</i>	> 6 weeks		1st Trim		2nd Trim		3rd Trim	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public	-0.045 (0.042)	0.021 (0.044)	-0.085 (0.120)	0.141 (0.183)	0.052 (0.061)	0.127* (0.073)	-0.130 (0.101)	-0.051 (0.139)
Utero2010	-0.009 (0.055)	-0.039 (0.122)	-0.085 (0.122)	-0.080 (0.568)	0.003 (0.087)	-0.065 (0.236)	-0.062 (0.096)	0.043 (0.258)
Public*	0.052	0.041	0.077	-0.147	-0.057	-0.063	0.170	0.071
Utero2010	(0.066)	(0.070)	(0.169)	(0.235)	(0.115)	(0.118)	(0.133)	(0.160)
Controls	No	Full -	No	Full -	No	Full -	No	Full -
County ctrl	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	861	861	180	180	457	457	224	224
R-squared	0.057	0.105	0.186	0.374	0.091	0.177	0.167	0.311

Notes: "Full -" Background controls include: child gender, gestational age at birth in weeks, birth weight in grams; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area dummy, child's parity, number of children alive, number of antenatal visits, gestation month of the first gynecological visit, an indicator for home delivery; 42 county dummies, 9 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. No control for father's characteristics, not available in the VSN for the stillborn children. Mean  $Y_{icjrt}$  (>6weeks): .445. Source: Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Appendix A

### 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.

#### **A1. Main specification**

##### **A1.1 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 16-50, included in the 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 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:

$$\begin{aligned} \text{Prob}(\text{Public sector employment}_i | \text{Employed}) \\ = \Phi(\beta_1 \cdot \text{age} + \beta_2 \cdot \text{married} + \beta_3 \cdot i.\text{ethnicity} + \beta_4 \cdot i.\text{educ} + \beta_5 \cdot i.\text{urban} + \beta_6 \\ \cdot i.\text{region\_d} + \beta_7 \cdot \text{age}_{\text{squared}} + \beta_8 \cdot \text{educ} \cdot \text{urban} + \beta_9 \cdot \text{number\_children}) \end{aligned}$$

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

The estimation results for the 3 year are presented in Appendix Table 1.

**Appendix Table 1**

VARIABLES	(1)	(2)	(3)
	2008 Public2008	2009 Public2009	2010 Public2010
age	0.095*** (0.029)	0.096*** (0.014)	0.090*** (0.028)
1.married	0.022 (0.066)	-0.030 (0.051)	0.059* (0.030)
2.educ	0.055 (0.098)	-0.183 (0.117)	-0.109 (0.098)
3.educ	1.276*** (0.121)	0.906*** (0.067)	1.203*** (0.118)
2.etnic	-0.084 (0.068)	-0.013 (0.158)	-0.158** (0.080)
3.etnic	-0.251 (0.186)	0.279** (0.133)	0.139 (0.142)
1.urban	-0.143 (0.195)	-0.098 (0.164)	-0.220 (0.188)
1.region	0.101*** (0.021)	0.190*** (0.049)	0.093*** (0.022)
2.region	0.000 (0.019)	0.004 (0.050)	0.052** (0.024)
3.region	-0.146*** (0.019)	-0.020 (0.051)	-0.154*** (0.031)
4.region	0.011 (0.024)	0.055 (0.047)	0.202*** (0.024)
5.region	-0.133*** (0.016)	-0.173*** (0.039)	-0.165*** (0.025)
6.region	-0.238*** (0.013)	-0.218*** (0.022)	-0.089*** (0.014)
7b.region	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
8.region	-0.200*** (0.027)	-0.204*** (0.050)	-0.133*** (0.026)
c.ge#c.age	-0.001** (0.000)	-0.001*** (0.000)	-0.001* (0.000)
2o.educ#0b.urban	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)

2.educ#1.urban	0.008 (0.191)	-0.032 (0.160)	0.079 (0.193)
3o.educ#0b.urban	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
3.educ#1.urban	-0.383** (0.181)	-0.303** (0.148)	-0.373*** (0.141)
no_children	0.040*** (0.015)	0.023** (0.011)	0.057*** (0.021)
Constant	-2.977*** (0.493)	-2.822*** (0.256)	-2.881*** (0.426)

Observations 2,578,170 2,497,040 2,343,627

Note: Column (1) presents the estimation results from the Probit regression using a Maximum likelihood estimator. Column (2) presents the marginal effects of the variables estimated at their mean. Region-clustered robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### A1.2 Postestimation: predicted probabilities

Based on the estimated coefficients, we obtain the predicted probabilities of public employment at all the possible combinations of the values of all covariates used in the estimation. We obtain a total of 50400 predicted probabilities<sup>60</sup>. We then use these probabilities to assign each *employed* mother in the VSN a probability of employment in the public sector, by using a perfect match on her observable characteristics, i.e. all the variables that were used as covariates in the Probit estimation.

Example:

- a) An employed mother, that gave birth in 2010, in region 5, not married, of Romanian ethnicity, aged 39, living in an urban area, with higher education, with only 1 living child (the child that is currently registered in the birth record), has a predicted probability of employment in the public sector of 0.4569. Since the 80<sup>th</sup> percentile of the predicted probabilities of public employment in 2010 is 0.4554, she is classified as publicly employed.
- b) An employed mother, that gave birth in 2010, in region 5, married, of Romanian ethnicity, aged 22, living in an rural area, with secondary education, with 4 living children (including the child that is currently registered in the birth record), has a predicted probability of employment in the public sector of 0.0899. Since the 80<sup>th</sup>

<sup>60</sup> 35 possible values for age\*2 possible values for 'married'\*3 possible values for 'ethnicity'\*3 possible values for 'education'\*2 possible values for 'urban'\*8 possible values for 'region'\*5 possible values for 'number\_children'=50,400 predicted probabilities

percentile of the predicted probabilities of public employment in 2010 is 0.4554, she is classified as privately employed.

## ***A2. Robustness checks***

### ***A2.1 Probit estimation, RHBS sample of all employed women, no age restriction***

As a robustness check of the Probit specification which we use (on the restricted sample of fertile age -16-50- employed women), we estimate the same Probit specification on the entire sample of employed women included in the 2008-2010 RHBS, without the age restriction previously imposed. This could entail significant differences if women above the fertile age, 50 in our case, are overly represented in the public sector. (Indeed, simple descriptive statistics show that 45% of employed women over the age of 50 work in the public sector, whereas of the employed women under the age of 50, only 30% are employed 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.

### ***A2.2 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 2008-2010 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<sup>61</sup>. 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 2008-2010. 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, i.e. at all possible combinations of values of the covariates region, age, education, urban region, and number of live children.

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%.

### **A2.3 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

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<sup>61</sup> We have data only on employment status in the past year. By selecting mothers with children under 1 year of age 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.

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 preferred specification of the reduced form model of public employment is:

*Public sector employment<sub>i</sub>*

$$\begin{aligned}
 &= \beta_1 \cdot age + \beta_2 \cdot married + \beta_3 \cdot romanian + \beta_4 \cdot hungarian + \beta_5 \cdot i.educ + \beta_6 \\
 &\quad \cdot i.urban + \beta_7 \cdot i.region + \beta_8 \cdot age_{squared} + \beta_9 \cdot educ \cdot urban + \beta_{10} \cdot children16 \\
 &\quad + \beta_{11} \cdot elder65 + \beta_{12} \cdot fulltime + \beta_{13} \cdot permanent + \beta_{14} \cdot benefits + \beta_{15} \\
 &\quad \cdot husband\_public + \varepsilon_i
 \end{aligned}$$

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

*children16*: number of children under 16 years of age living in the household

*elder65*: number of elderly over 65 years of age living in the household

*fulltime*: binary variable, 1 if employed on a full-time position

*permanent*: binary variable, 1 if on a permanent employment contract

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

*husband\_public*: binary variable, 1 if husband or concubine is employed in the public sector

The observational unit is the employed woman, aged 16 to 50.

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

Appendix Table 2

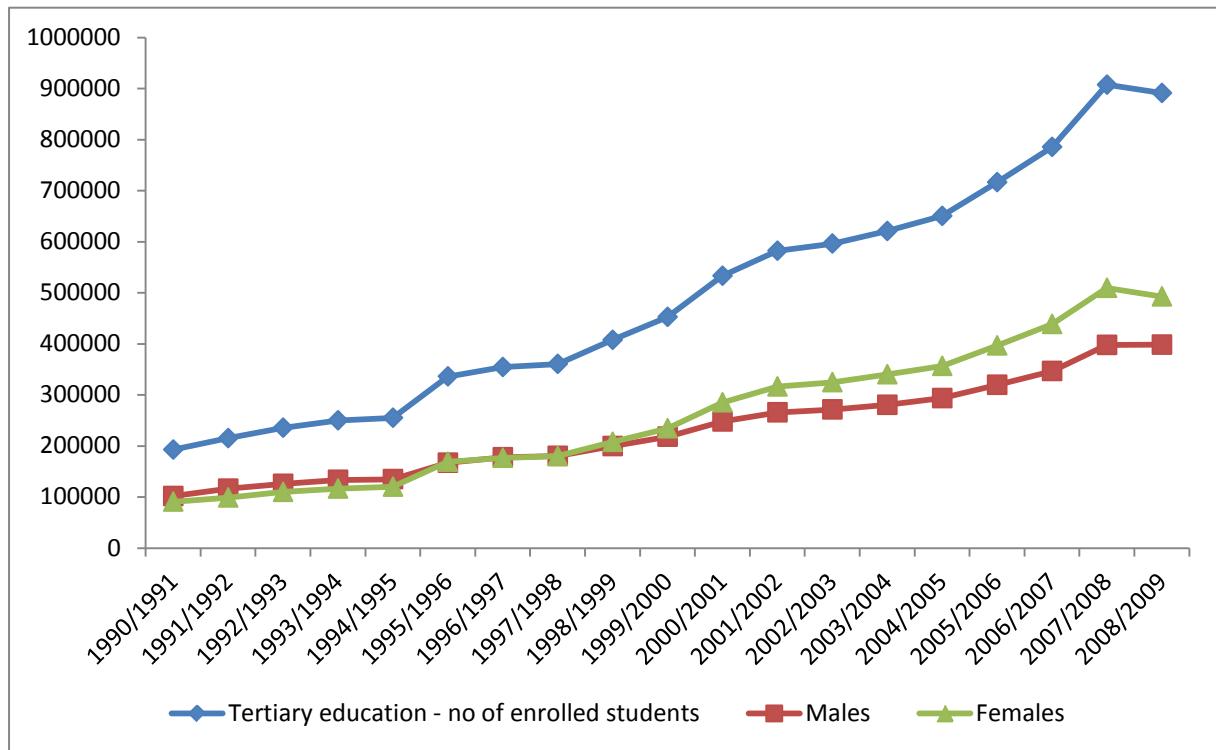
VARIABLES	(1)	(2)	(3)
	2008 Public2008	2009 Public2009	2010 Public2010
age	0.0753*** (0.00696)	0.0840*** (1.42e-05)	0.0686** (0.0250)
married	-0.193*** (0.000666)	-0.259*** (4.99e-10)	-0.126** (0.0250)
romanian	0.209 (0.248)	-0.172 (0.283)	-0.242 (0.148)
hungarian	0.173 (0.402)	-0.141 (0.259)	-0.361 (0.101)
2.educ	-0.00439 (0.967)	-0.267** (0.0189)	-0.119 (0.196)
3.educ	1.113*** (0)	0.764*** (0)	1.092*** (0)
1.urban	-0.142 (0.468)	-0.132 (0.454)	-0.215 (0.260)
1.region	0.0589** (0.0198)	0.165*** (0.000545)	0.0686*** (0.00175)
2. region	-0.0792*** (0.000797)	-0.0478 (0.347)	0.0184 (0.464)
3. region	-0.143*** (0)	0.00718 (0.882)	-0.143*** (6.62e-07)
4. region	-0.0506* (0.0565)	0.0168 (0.729)	0.133*** (7.40e-07)
5. region	-0.179*** (0)	-0.175*** (2.15e-06)	-0.157*** (0)
6. region	-0.289*** (0)	-0.222*** (0)	-0.0548*** (6.75e-05)
8. region	-0.224*** (0)	-0.181*** (0.000106)	-0.163*** (0)
c.age#c.age	-0.000632 (0.107)	-0.000726*** (0.00657)	-0.000506 (0.257)
2.educ#1.urban	-0.0134 (0.944)	0.0119 (0.942)	0.0587 (0.753)
3.educ#1.urban	-0.367** (0.0473)	-0.266** (0.0428)	-0.347** (0.0337)
kids16	0.0840*** (0.00911)	0.0591** (0.0287)	0.0861*** (0.000945)
elder65	0.163*** (0.00529)	0.0485 (0.698)	0.0842 (0.195)
fulltime	0.186* (0.0727)	-0.204 (0.314)	0.118 (0.538)
permanent	-0.249*** (0.00234)	0.0952 (0.594)	-0.183 (0.282)
telephone	0.0800 (0.650)	-0.565*** (0.000897)	-2.124*** (5.77e-09)
husband_public	0.947*** (0)	0.936*** (0)	0.870*** (0)
Constant	-2.744*** (2.46e-08)	-2.297*** (3.23e-10)	-2.200*** (6.53e-06)
Observations	2,606,722	2,529,393	2,377,303
R-squared			
Pseudo R-squared	0.1506	0.1484	0.1540

Robust pval in parentheses; \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Source: Authors' calculations using 2008-2010 RHBS data

## Appendix B

Figure B1 Tertiary education enrollment in Romania



Source: Authors' calculation; INS, Romania.

## Appendix C

In our second falsification exercise, we compare outcomes at birth of babies in utero at May 7<sup>th</sup> 2010 and babies in utero at May 7<sup>th</sup> 2009, but belonging to mothers employed in the private sector and housewife mothers. Since the austerity measures concerned the public sector only there should be no significant effect of the policy change announcement on the outcomes at birth of children belonging to privately employed mothers (relative to housewives). The DD estimation results reported in Table C1 below show no significant effect of the policy change for the full sample (Panel A), for none of the sub-samples based on gestational age at the time of the announcement (columns (1)-(4)). A similar result is obtained in Panel C for girls, where none of the interaction terms turn out significant. However, for boys, in column (1) of Panel B, we find a negative significant (at the 5% level) coefficient estimate on the interaction term for boys of at least 6 weeks gestational age at the time of the announcement. Admittedly, this raises some concerns about the manner in which we assign mothers into public and private sector, since this result may be driven by the fact that there are mothers who work in the public sector but who we classify as privately employed. This concern is alleviated by the fact that the coefficient estimates on the interaction terms are insignificant, by a safe margin, in all the sub-samples based on gestation trimesters (columns (2) –(4)).

The estimation results for the probability of a girl birth corresponding to this falsification exercise are presented in Appendix Table C2, Panel I. The coefficient estimate on the interaction term is never significant, indicating that the policy change announcement (and cut) had no effect on the probability of a female birth to mothers employed in the private sector relative to housewives, in 2010 relative to 2009.

Overall, the exercises reported in this section confirm that indeed our main findings in Section 5.1 are due to the policy change announcement (and cut). However, given the lack of better data, one valid concern remains the manner in which we assigned mothers to the public and respectively private sector. It is to this issue that we now turn to.

Appendix Table C1 Low Birth weight; Privately employed vs. Housewives, 2009 vs 2010

<i>Low Birth Weight</i>	> 6 weeks (1)	1st Trim (2)	2nd Trim (3)	3rd Trim (4)
<b>Panel A: ALL</b>				
Private	-0.007*** (0.003)	-0.008* (0.004)	-0.006 (0.004)	-0.008*** (0.003)
Utero2010	-0.000 (0.005)	-0.021** (0.010)	-0.006 (0.008)	0.013 (0.010)
Private*Utero2010	-0.002 (0.002)	-0.006 (0.005)	-0.003 (0.003)	0.001 (0.003)
Controls	Full	Full	Full	Full
Observations	221,095	42,149	103,393	75,553
R-squared	0.208	0.249	0.236	0.126
<b>Panel B: BOYS</b>				
Private	-0.005* (0.003)	-0.008 (0.005)	-0.005 (0.004)	-0.006* (0.003)
Utero2010	-0.001 (0.005)	-0.014 (0.015)	-0.004 (0.008)	0.002 (0.007)
Private*Utero2010	-0.005** (0.002)	-0.008 (0.005)	-0.005 (0.004)	-0.002 (0.004)
Controls	Full	Full	Full	Full
Observations	113,687	21,707	53,012	38,968
R-squared	0.221	0.262	0.251	0.135
<b>Panel C: GIRLS</b>				
Private	-0.009** (0.004)	-0.008 (0.007)	-0.008 (0.005)	-0.010** (0.004)
Utero2010	0.001 (0.006)	-0.027** (0.010)	-0.008 (0.012)	0.025 (0.016)
Private*Utero2010	0.001 (0.003)	-0.003 (0.009)	-0.000 (0.004)	0.003 (0.005)
Controls	Full	Full	Full	Full
Observations	107,408	20,442	50,381	36,585
R-squared	0.197	0.238	0.223	0.120

*Notes:* Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Mean  $Y_{icjrt}$  (>6weeks): .07 (all); .063 (boys); .078 (girls). *Source:* Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Appendix Table C2

	> 6 weeks (1)	1st Trim (2)	2nd Trim (3)	3rd Trim (4)
<i>Girl</i>				
Private	-0.007* (0.004)	-0.006 (0.010)	-0.009* (0.005)	-0.004 (0.006)
Utero2010	0.009 (0.008)	-0.016 (0.019)	0.002 (0.015)	0.016 (0.010)
Private*Utero2010	0.002 (0.005)	0.011 (0.011)	0.003 (0.006)	-0.005 (0.008)
Controls	Full	Full	Full	Full
Observations	221,095	42,149	103,393	75,553
R-squared	0.000	0.002	0.001	0.002

Notes: Background controls include: child gender, gestational age at birth in weeks, birth weight in grams; mother's age at birth and its square, 3 mother's education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Source: Authors' calculations using 2008-2010 Vital Statistics Natality files. Mean  $Y_{icjt}$  (>6weeks): .484 (Panel I); .485 (Panel II); .485 (Panel III). County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Appendix D

Appendix Table D1 : Tertiary education; Employed mothers vs. Housewives, 2009-2010

<b>Tertiary education</b>	>6weeks (1)	Trim I (2)	Trim II (3)	Trim III (4)
<b>PANEL A: ALL</b>				
Employed	0.252*** (0.015)	0.264*** (0.017)	0.260*** (0.016)	0.235*** (0.015)
Utero2010	0.014** (0.005)	0.021* (0.012)	0.024*** (0.009)	0.009 (0.013)
Employed*Utero2010	0.041*** (0.006)	0.027*** (0.007)	0.040*** (0.006)	0.050*** (0.006)
Observations	246,893	47,075	115,923	83,895
R-squared	0.377	0.385	0.380	0.371

### PANEL B: BOYS

Employed	0.250*** (0.016)	0.265*** (0.019)	0.259*** (0.017)	0.231*** (0.015)
Utero2010	0.015** (0.006)	0.007 (0.015)	0.022* (0.012)	0.013 (0.018)
Employed*Utero2010	0.045*** (0.006)	0.026*** (0.007)	0.046*** (0.008)	0.053*** (0.008)
Observations	126,876	24,220	59,464	43,192
R-squared	0.377	0.387	0.378	0.372

### PANEL C: GIRLS

Employed	0.254*** (0.015)	0.264*** (0.016)	0.261*** (0.015)	0.239*** (0.015)
Utero2010	0.012* (0.007)	0.037** (0.017)	0.027** (0.011)	0.004 (0.011)
Employed*Utero2010	0.036*** (0.007)	0.026** (0.011)	0.035*** (0.007)	0.046*** (0.008)
Observations	120,017	22,855	56,459	40,703
R-squared	0.378	0.385	0.382	0.371

*Notes:* Dependent variable: Tertiary education of mother. Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. *Source:* Authors' calculations using 2009-2010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1\*\*\*

Appendix Table D2 Tertiary education; Employed mothers vs. Housewives, 2008-2009

<i>Tertiary education</i>	>6weeks (1)	Trim I (2)	Trim II (3)	Trim III (4)
<b>PANEL A: ALL</b>				
Employed	0.221*** (0.015)	0.223*** (0.016)	0.227*** (0.016)	0.211*** (0.014)
Utero2009	0.004* (0.002)	0.006 (0.004)	0.003 (0.004)	0.003 (0.003)
Employed*Utero2009	0.040*** (0.005)	0.049*** (0.006)	0.039*** (0.007)	0.037*** (0.008)
Observations	254,231	49,148	120,344	84,739
R-squared	0.345	0.358	0.348	0.335
<b>PANEL B: BOYS</b>				
Employed	0.223*** (0.016)	0.222*** (0.017)	0.231*** (0.018)	0.212*** (0.015)
Utero2009	0.005* (0.003)	0.001 (0.006)	0.003 (0.005)	0.006* (0.003)
Employed*Utero2009	0.036*** (0.007)	0.049*** (0.008)	0.033*** (0.009)	0.033*** (0.009)
Observations	131,359	25,231	62,351	43,777
R-squared	0.343	0.359	0.344	0.333
<b>PANEL C: GIRLS</b>				
Employed	0.219*** (0.014)	0.223*** (0.017)	0.223*** (0.014)	0.211*** (0.015)
Utero2009	0.003 (0.002)	0.012* (0.006)	0.003 (0.004)	0.001 (0.004)
Employed*Utero2009	0.044*** (0.005)	0.049*** (0.010)	0.045*** (0.007)	0.041*** (0.009)
Observations	122,872	23,917	57,993	40,962
R-squared	0.348	0.358	0.352	0.337

*Notes:* Dependent variable: Tertiary education of mother. Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. *Source:* Authors' calculations using 2008-2009 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1\*\*\*

Appendix Table C3 Low Birth Weight: Unemployed vs Housewives, 2009-2010

<i>Low Birth Weight</i>	>6weeks (1)	Trim I (2)	Trim II (3)	Trim III (4)
<b>Panel A: ALL</b>				
Unemployed	-0.006 (0.006)	-0.002 (0.012)	-0.011 (0.008)	0.002 (0.012)
Utero2010	-0.002 (0.005)	-0.028** (0.013)	-0.005 (0.009)	0.009 (0.012)
Unemployed*Utero2010	0.007 (0.008)	0.005 (0.017)	0.008 (0.011)	0.001 (0.015)
Controls				
Observations	121,100	23,427	56,531	41,142
R-squared	0.210	0.247	0.241	0.130
<b>Panel B: BOYS</b>				
Unemployed	0.002 (0.008)	0.013 (0.016)	-0.006 (0.012)	0.004 (0.013)
Utero2010	-0.002 (0.006)	-0.014 (0.017)	0.002 (0.009)	-0.007 (0.009)
Unemployed*Utero2010	-0.002 (0.010)	-0.019 (0.025)	-0.005 (0.016)	0.011 (0.015)
Controls				
Observations	62,098	12,121	28,868	21,109
R-squared	0.222	0.257	0.254	0.141
<b>Panel C: GIRLS</b>				
Unemployed	-0.013 (0.010)	-0.021 (0.021)	-0.016 (0.012)	0.003 (0.016)
Utero2010	-0.001 (0.007)	-0.043** (0.018)	-0.011 (0.013)	0.026 (0.020)
Unemployed*Utero2010	0.014 (0.011)	0.033 (0.024)	0.019 (0.016)	-0.012 (0.020)
Controls				
Observations	59,002	11,306	27,663	20,033
R-squared	0.201	0.239	0.231	0.125

Notes: Background controls include: child gender, gestational age at birth in weeks; mother's age at birth and its square, 3 maternal education dummies, 3 ethnicity dummies, marital status dummy, urban area 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 calendar month of conception dummies; female unemployment rate in the month of conception for each county and year of birth; average consumption expenditures of food at the county level for each gestational month from conception to birth, average expenditures of cigarettes and alcohol, at the county level, for each year and gestational month. Source: Authors' calculations using 2009-20010 Vital Statistics Natality files. County-clustered robust standard errors shown in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1\*\*\*

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