Access to Childcare and Second Child Arrival in European Countries

H. d'Albis, P. Gobbi and A. Greulich

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Access to Childcare and Second Child Arrival in European Countries

Hippolyte d'Albis[*] Paula Gobbi[†] Angela Greulich[‡]

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Abstract

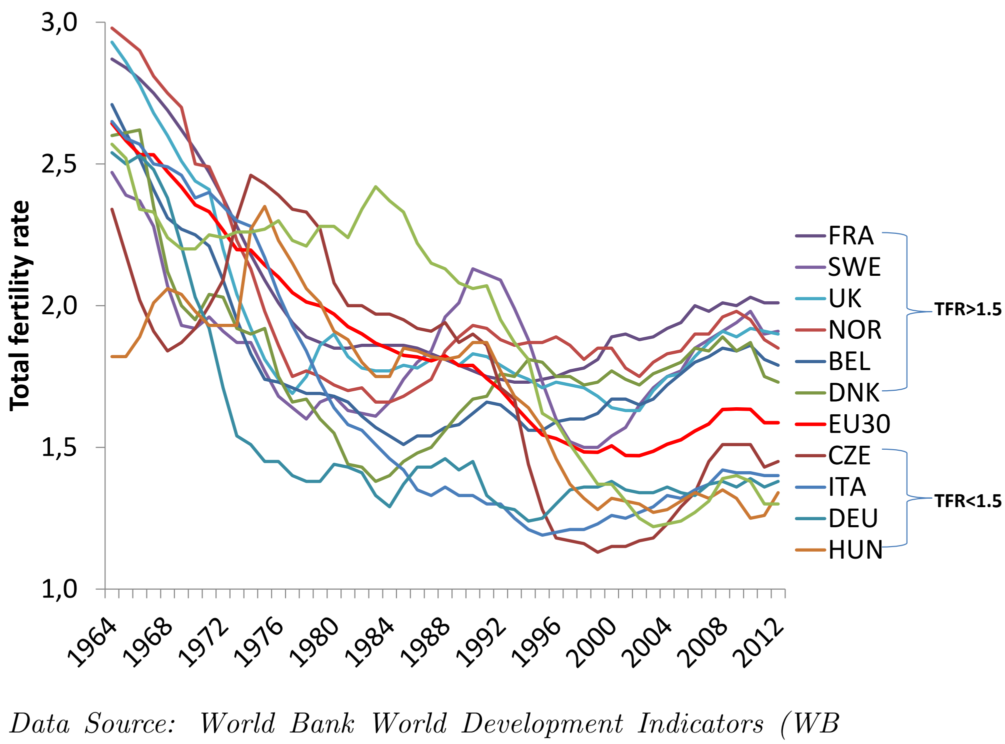
This paper shows that differences in fertility across European countries mainly emerge in the transition from the first to the second child and that childcare services enabling women to work are an important determinant for this transition to occur. The theoretical framework proposed accounts for these two findings: in countries where childcare coverage is low, there is a U-shaped relationship between a couple's probability to have a second child and female potential wage, while in countries with easy access to childcare, this probability is positively related with the woman's potential wage. Both of these implications are confirmed empirically when utilizing the European Survey of Income and Living Conditions (EU-SILC) for estimating a woman's probability of having a second child as a function of education.

Keywords: Childcare, Education, Fertility, Female Employment.
JEL Classification Numbers: J11, J13, J16, 011

[*]Paris School of Economics - University Paris 1, hdalbis@psemail.eu
[†]Université catholique de Louvain, paula.gobbi@uclouvain.be
[‡]Université Paris 1 Panthéon-Sorbonne, angela.greulich@univ-paris1.fr

1 Introduction

Birth rates across European countries have been falling since the 1960s. Although this fall continues unabated in some of these countries today, total fertility rates in a growing number of other highly developed countries have already started to pick-up (Myrskyla, Kohler, and Billari (2009), Hazan and Zoabi (2015), Luci-Greulich and Thévenon (2014)). Figure 1 illustrates that particularly since the 1990s, total fertility rates in some European countries have shown signs of an upsurge, back to replacement levels (notably in France, Sweden, Norway, Denmark, the UK and Belgium), while in others fertility has continued to drop below the European average, stagnating under 1.5 children per woman (as in Italy, the Czech Republic, Germany, Hungary and Poland). This paper contributes to a better understanding of the factors that have made it possible for fertility rates to recover in some countries but not in others.



Data Source: World Bank World Development Indicators (WB WDI), 2014

Figure 1: Evolution of Total Fertility Rates from 1964 to 2012 in Ten European Countries

This reversal of fertility trends in some countries is caused in part by the end of the postponement of childbearing among younger generations (Goldstein, Sobotka, and Jasilioniene (2009) and Bongaarts and Sobotka (2012)). Fertility levels fall initially because women delay the age at which they have their first child, leading to a temporary depression of overall fertility rates. As time elapses, however, the total number of births recovers due to a catch up effect.

However, recent research suggests that fertility differentials between European countries can not be fully explained by differences in birth postponement only. Structural and cultural changes that come with economic development are also likely to affect fertility decisions, not only in terms of timing, but also in terms of quantum (Lesthaeghe (2010) and Goldstein, Sobotka, and Jasilioniene (2009)). Luci-Greulich and Thévenon (2013), for example, show that the rise in fertility rates back to replacement levels occurs only in those highly developed countries where female employment comes hand in hand with economic development, highlighting the importance of structural improvements that allow more and more parents, and particularly mothers, to combine work and family life.

While it has been argued that a below-replacement level fertility may reflect a general preference for low fertility among women and couples, survey data for European countries suggest that it is in fact mostly due to barriers that hinder parents from realizing their desired fertility levels. The surveys actually indicate stable preferences around a two-child family model for both women and men in all European countries, independent of national fertility level. Sobotka (2013) shows that the variation between countries in desired family size is generally low, centering around the two-child ideal in all European countries. Sobotka and Beaujouan (2014) show that the variance across cohorts of adults' responses to the question of "ideal family size" within European countries gets smaller over generations, converging more and more to the average of two. Even low-fertility countries (as measured by completed fertility rates of women aged 45+) such as Poland, the Czech Republic, Slovakia, Bulgaria, Spain, Portugal, Germany and Italy also affirm the same average desired fertility of two children, in line with other European countries (Eurobarometer (2006) and Eurobarometer (2011)). This highlights the gap between intended and realized completed fertility even among low fertility countries, suggesting that there are institutional barriers that push couples towards a lower fertility regime.

This paper sheds light on these barriers. In Section 2, we use the European Survey of Income and Living conditions (EU-SILC) to illustrate the following two facts: *(i)* low and high fertility countries differ mostly in the transition from the first to the second child, suggesting a barrier for the second child's arrival in low fertility countries, and *(ii)* the enrollment rate in childcare activities and female labor-force participation is higher in high-fertility countries than in low ones, suggesting that there are difficulties in combining work and family life in low-fertility countries, and therefore constituting an important barrier for family enlargement.

Section 3 develops a theoretical framework that provides an explanation for the two facts listed above. We built a collective household decision problem in which couples choose their fertility levels, their labor supply and the type of childcare they desire. Men and women can supply childcare out of their own labor time or purchase childcare services from the market at a given price. The mechanism put forward with this setup is that an easier access to childcare (i.e. lower price and higher availability) allows parents to purchase these services instead of providing them themselves, and thus enables both of them to participate more in the labor market. The generated income that can be maintained after the child arrival facilitates the couple's decision in favor of family enlargement.

Our setup suggests that the probability of having a second child in low fertility countries, which are characterized by difficult access to childcare, follows a U-shaped relationship with women's potential wage. Although couples who cannot afford to purchase childcare activities in the private market often resort to having the woman herself perform the care activities, the gradual increase of female wage potential in the market naturally increases the opportunity cost of this personal childcare, and therefore decreases the probability of having a second child. This substitution effect, however, subsides after a certain level of income. Once couples are able to outsource childcare, a higher female wage level allows the couple to buy more time from the market and encourages having a second child. This later positive relationship between female wage and fertility is stems from an income effect that is more clearly seen in high-fertility developed countries, where childcare services are more accessible and female wages are higher, leading to a higher probability of having a second child for all income groups. Easy access to childcare effectively weakens the substitution effect.

These theoretical implications are empirically confirmed in Section 4 for European countries. We estimate women's probability of having a second birth as a function of education (used as a proxy for potential wage) by utilizing the longitudinal module of the EU-SILC (waves 2003-2011). We find first that this probability is higher for all education groups in countries where child care coverage is high. In countries where child care coverage is low, on the other hand, we find a U-shaped pattern between women's education level and the arrival of the second child, whereas this relationship is continuously positive for countries with easier access to childcare

These findings are largely in line with recent studies that have looked at the link between child care, female employment and fertility. In a cross-country analysis for OECD countries, Borck (2014) showed that cultural differences on the perceived quality of external childcare can help explaining cross-countries differences in levels of female labor force participation, child care provision and fertility. Blau and Robins (1988) showed that the price for outsourcing childcare services in the US is negatively correlated with women's decision to both enter the labor market and to purchase childcare services, providing at the same time a theoretical framework that can account for different family types including those who have alternative childcare possibilities. Attanasio, Low, and Sánchez-Marcos (2008) found that a decrease in child care costs could explain the increase in the labor force participation of mothers of young children from the observed 0.47 rate for the cohort born in the 1940s to 0.68 for the cohort born in the 1950s.

More recently, Hazan and Zoabi (2015) also found that wage inequalities among US women lead to a U-shaped relationship between women's education and fertility. Schoonbroodt (2014) provided estimates for childcare costs paid by parents in the United States, where she showed in particular that during traditional working hours, women spend three times more of their time in childcare than men. In Quebec, Baker, Gruber, and Milligan (2008) showed that an increase in female labor force participation followed the introduction of universal childcare. Similarly, using data on Swedish households, Gustafsson and Stafford (1992) showed that public childcare led to higher female labor market participation and that a lower cost of childcare services positively affects the use of of these services if seats for children in these facilities are not rationed. Finally, for Germany, Bick (2015) showed that a large fraction of part-time working mothers would work full-time if they had better access to subsidized childcare, and Wrohlich (2011) showed that increasing the availability of child care has a greater effect on maternal employment than reducing the fees of these services.

This papers provides new elements to literature. Empirically, it shows that the passage from the first to the second child is the key difference in fertility behaviour between low and high fertility countries in Europe. High fertility countries also have a higher female labor force participation. The institutional difference behind these facts that we can observe is the availability of childcare services across countries. Most of the literature is also empirical, we hence provide a theoretical framework that accounts for the facts and outlines the mechanisms. Two implications derive from the theory, and are robust in the data. First, in countries where child care coverage is low the probability to have a second child is U-shaped with respect to female education. This is in line with Hazan and Zoabi (2015). And second, in countries where child coverage is high, education increases the probability of having a second child.

2 Family Size, Childcare and Female Employment in Europe

In this section, we show that the fertility difference between low and high fertility countries is mostly due to the transition from the first to the second child. Parents in high fertility countries have an easier access to childcare, which facilitates the combination of work and family life and thus favors both female employment and child arrival.

2.1 Low and High Fertility Countries: Differences in the Transition from the First to the Second Child

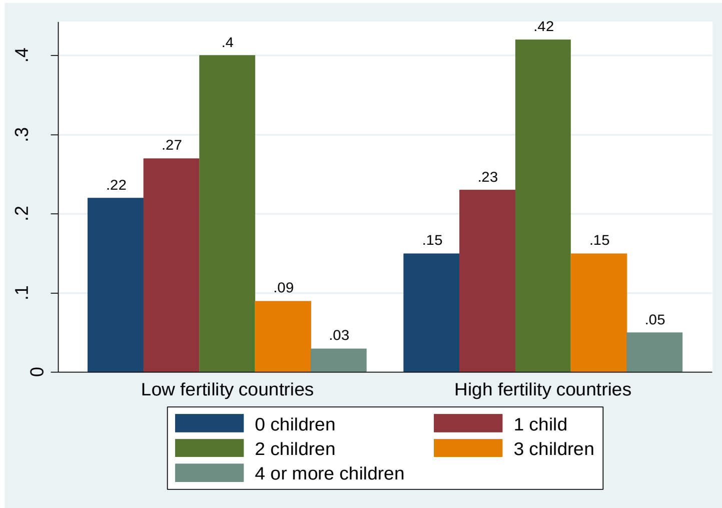
We use the 2011 cross-sectional wave of the EU-SILC to understand whether fertility differences across European countries are due to differences in starting a family or to enlarging the family size[1].

We base our calculations on the fertility rate for women aged 38 to 44 years old (i.e. the cohorts of 1967-1973). Women at younger ages are excluded to avoid biases in our measures due to tempo effects. Women at older ages are also excluded because the EU-SILC reports a decreasing number of children per woman for older ages, as these children move out of their parents' homes and can no longer be observed. Due to this partial capture of children that live in the household only, as reported in the EU-SILC, these calculated "approximate" completed fertility rates (ACFR) are somewhat downward biased. Despite this bias, this approximate measure provides a country ranking that is similar to the unbiased completed fertility measured by the Human Fertility Data Base (wave 2012, cohort 1970).[2] The EU-SILC is thus also used for our fertility analysis because it provides a large country coverage, an international comparability of socioeconomic measures and follow-up of individuals (used later in Section 4)[3].

[1]Both of these factors can can lead to fertility differences across countries. Differences in starting a family can be seen in countries where a number of women have two children while others stay childless (dichotomous fertility behavior). Differences due to difficulties in increasing the family size can be seen in low fertility countries where indeed most women are mothers (and childlessness is low), but few have children of higher rank of three or more children (homogeneous fertility behavior).

[2]For the majority of countries, the classification into high or low fertility regimes also stays the same when using the period measure of total fertility rates (World Bank World Development Indicators, 2011). Exceptions include some Eastern European countries (Czech Republic, Slovenia, Hungary, Slovakia, Poland), which have completed fertility rates above the EU average and total fertility rates below EU average, suggesting the importance of birth postponement for younger women (tempo effect). Schmertmann et al. (2014) predict that the quantum measure of completed fertility rate will be below average for cohorts born after 1970 in these countries.

[3]For a detailed discussion of measurement biases of fertility with SILC, see Dasre and Greulich (2015).



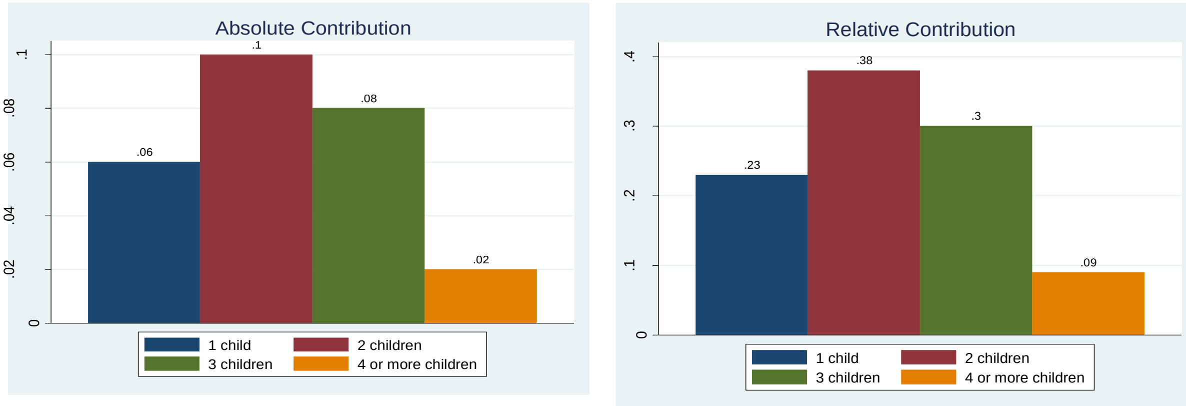
Data Source: EU-SILC 2011

Figure 2: Distribution of Women Aged 38 to 44 over Fertility Parities.

The data shows an average ACFR of 1.61 children per woman across the EU-SILC countries for the 2011 wave. Countries with rates below this average are Germany, Spain, Italy, Switzerland, Bulgaria, Portugal, Luxembourg, Belgium, Latvia, Greece, Austria and Estonia. Countries above this average rate are: the United Kingdom, the Netherlands, Lithuania, Denmark, France, Norway, the Czech Republic, Finland, Poland, Slovenia, Slovakia, Sweden, Hungary and Iceland. Figure 2 shows the distribution of women over fertility parities. The data suggest that in both high and low fertility countries, having two children is the most frequent situation for women aged 38 to 44 years old. More precisely, 62% of women in high fertility countries have two or more children, compared to 52% of women in low fertility countries. This lower proportion of women with at least two children comes hand in hand with higher proportions of childless women and of women having one child only.

To determine which is the fertility rank that is the most responsible for the ACFR gap between low and high fertility countries we proceed as follows. First, we calculate for each group of countries the proportion of women having at least n children ("cumulative frequencies"). The sum of these cumulative frequencies yields the ACFR of each country group ("calculation of components by rank"). Then, we calculate the difference in the cumulative frequencies between low and high fertility countries. These differences sum up to the absolute difference in ACFR between the two country groups. The ACFR in high fertility countries equals 1.73 whereas it is 1.46 in low fertility countries; the absolute fertility difference between the two groups is thus 0.26 children.

Figure 3 shows the sources that contribute to the difference in the cumulative frequencies



Data Source: EU-SILC 2011

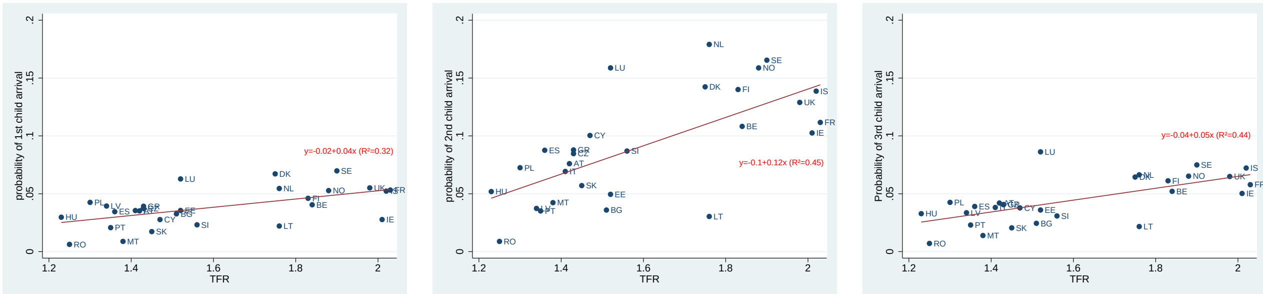
Figure 3: Contribution of Fewer Women Aged 38 to 44 Having at Least n Children in Low Fertility Countries to the Fertility Gap between High and Low Fertility Countries

and the fertility gap between high and low fertility countries, in absolute (left panel) as well as in relative (right panel) terms. For the absolute difference of 0.26 children per women, 0.06 children are explained by fewer women having at least one child, 0.10 children by fewer women having at least two children, 0.08 children by fewer women having at least three children and 0.02 children by fewer women having at least four children. In low fertility countries, the fact that fewer women aged 38-44 years old have at least one child accounts for 23% of the gap in ACFR between high and low fertility countries. Similarly, the fact that fewer women have at least two children accounts for 38% of this gap, that fewer women have at least three children for 30%, and that fewer women have at least four children for 9%. These calculations show that the barrier for the arrival of the second child in low fertility countries contributes almost two times more to the fertility gap than the barrier for the arrival of a first child. Low fertility in Europe emerges thus mainly due to a barrier to the second child's arrival, followed by a barrier to the third child's arrival. A barrier for the first child's arrival contributes to less than one fourth of the fertility gap between high and low fertility countries.

In order to see if the barrier for the second child's arrival is important also for younger cohorts, we compare our findings based on the ACFR for women aged 38 to 44 years old to a period measure of fertility for women aged 15 to 44 years old[4]. The period measure that we use is the probability of a child's arrival of rank n. For this, we use the longitudinal database of the EU-SILC[5]. We observe during the period that 5% of women aged 15-44

[4]Appendix A shows the results for another period measure of fertility, based on the EU-SILC cross-sectional database.

[5]Waves 2003 to 2011; rotational panel with a follow-up of individuals for a maximum period of four years.



Data sources: arrival probabilities EU-SILC 2003-2011; TFR WB WDI 2011

Figure 4: Probability of Child Arrival of Rank 1 (left), 2 (center) and 3 (right) vs. TFR

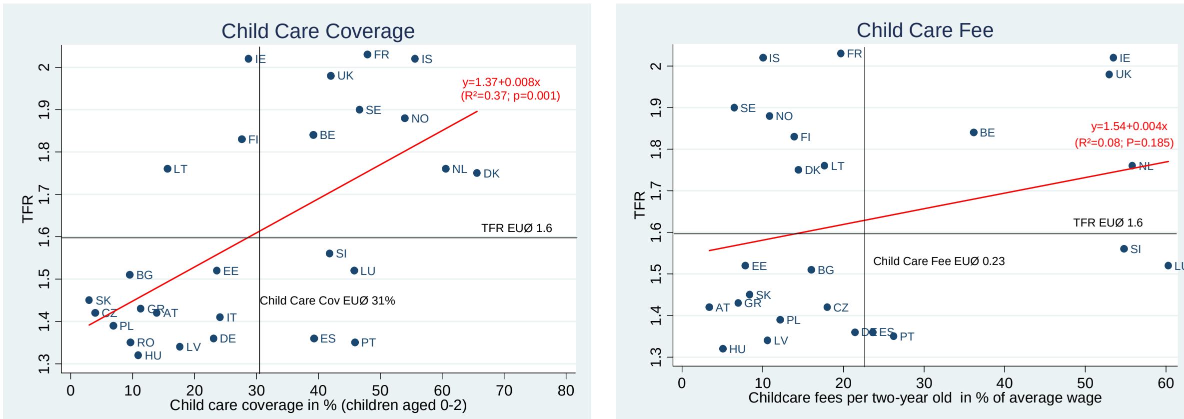
years old have a first child, 10% of them have a second child and 5% of them have a third child. Figure 4 plots each country's average probability of observed arrival of a child of rank one, two and three for women aged 15-44 years old against the country's total fertility rates (TFR). The probability to observe a child's arrival is higher in high fertility countries for all ranks. Figure 4 reveals a separation of European countries in two clearly distinguishable fertility regimes, low versus high ones, with low versus high probabilities of a child's arrival. The difference between the two regimes is most striking for a second child arrival (middle panel of Figure 4), which is not only due to a level effect. In low fertility countries, the probability of a second child arrival is 66% lower than in high fertility countries, against 40% for the probability of first and third child arrival. This reinforces our assumption of an important barrier for the second child's arrival in low fertility countries.

Fertility differences between countries, therefore, are mainly the result of fewer women having at least two children in low fertility countries. The proportion of childless women is also higher in low fertility countries, but childlessness contributes to a lesser extent to low fertility rates than the lower transition from the first to the second child. In the next part of this section, we suggest that access to childcare that enables a combination of work and family life for parents is an important factor contributing to differences in fertility among European countries.[6]

2.2 Access to Childcare and Female Employment

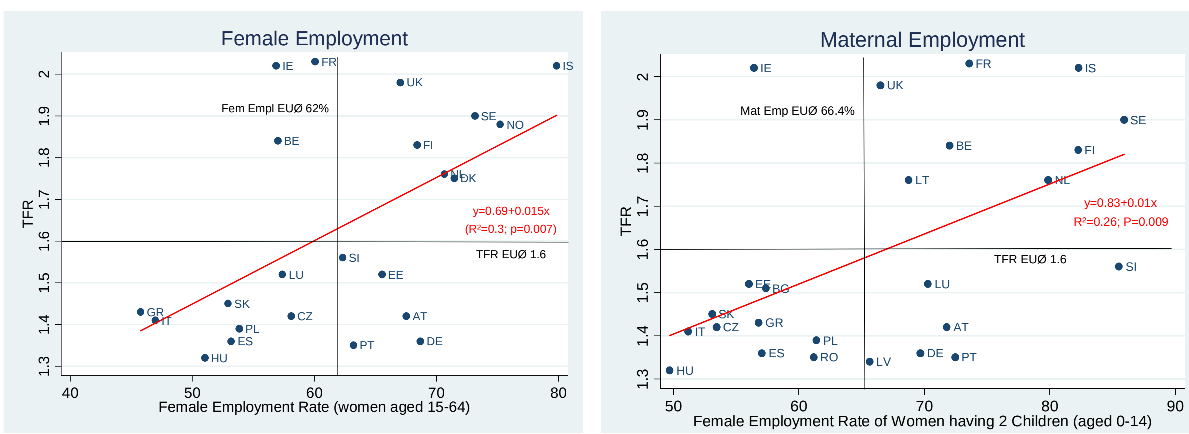
In this section we highlight the following observations: first, access to childcare is easier in high fertility countries, and second, female employment is higher in high fertility countries. This section uses data from the OECD Family Database (FDB).

[6] Differences across childcare systems in Europe are explained in Del Boca (2015).



Data sources: TFR WB WDI (2011),
Child care coverage: Average enrollment rate of children aged under three years of age in formal childcare, OECD Family Data Base (2012).
Child care fees: Childcare fees per two-year old attending accredited early-years care and education services in percentage of average wage, OECD Family Data Base (2012).

Figure 5: Child Care Coverage against TFR (left) and Childcare Fees against TFR (right).



Data sources: TFR WB WDI (2011),
Female Employment Rate (women aged 15-64), OECD Familiy Data Base (2010),
Female Employment Rate (women aged 15-64 having two children aged 0-14), OECD Family Data Base (2010).

Figure 6: Female Employment Rate against TFR (left) and Female Employment Rate of Women Having Two Children against TFR (right).

The left panel of Figure 5 plots the total fertility rate (TFR) in each European country against the average enrollment rate of children under three years of age in formal childcare. We see that the correlation is significantly positive. Low fertility countries with a TFR below the European average of 1.6 also have a child care coverage below the European average of 31%, while high fertility countries tend to have a coverage rate above the average. Exceptions to this general observation are Luxembourg, Slovenia, Spain, Portugal, Finland, Lithuania and Ireland. The right panel of Figure 5 shows the correlation between childcare fees per two-year old child who is attending accredited early-years care and education services (in percentage of the national average wage) with respect to the national TFR. The correlation is insignificant, with a positive slope only due to some country outliers like Ireland and the UK, which have high fertility rates and relatively high child care fees at the same time. For the majority of observations, child care fees are not significantly lower in high fertility countries. Child care fees are particularly low in most Eastern European countries, but in this region, child care coverage is also very low, with only 10% of children up to two years old enrolled in formal child care. This suggests that in low fertility countries, difficulties in access to childcare emerge due to insufficient availability of childcare rather than due to too high costs.

The left panel of Figure 6 shows that in countries with fertility levels above average, female employment rates are higher (for women aged 15 to 64 years old). This significantly positive relation remains when focusing on women having two children aged 0-14 (Figure 6, right panel).

Female employment and child care coverage are thus positively correlated with fertility in European countries. Since the passage from the first to the second child is an important determinant of national fertility levels as illustrated in the previous section, the results of this section so far suggest that having access to child care that enables parents, and in particular women, to combine work with family life is crucial for the decision to have a second child.

The following section depicts the mechanisms behind a couple's decision in favor of having more children, and in particular in favor of the second child, by taking into account the access to childcare and women's potential wages. Subsequently, we test our model with EU-SILC data by estimating women's probability of having a second child as a function of women's wage options. We compare high and low fertility countries which differ in the access to childcare.

3 The Model

In this section we develop a micro-economic model which allows us to derive theoretical relationships between the variables discussed in Section 2: fertility, child care access and female labor market participation. We treat fertility firstly as a continuous decision variable to derive the general mechanisms, and then more specifically as a discrete variable in order to show the model's implications for the probability of having a second child.

3.1 A General Framework

The economy is populated by couples composed of a man and a woman, respectively denoted by $i = m, f$. Each parent is endowed with one unit of time that is divided between childcare, t_i and work, $1-t_i$. A child needs $\phi > \bar{\phi}$ units of childcare, that can be supplied by either of the parents or outsourced and a fixed time cost $\bar{\phi} \geq 0$ that can only be supplied by the mother[7]. Parents differ in their wages, w_i. Consumption goods and children are public goods in the household. Couples, therefore, cooperatively choose consumption, c, the amount of childcare time supplied by each individual, t_i, the amount of childcare time that is outsourced, t_n, and the number of children to have, n.

The cost of outsourcing childcare is denoted by p. This includes the market cost of the service but also the time cost for the parent to search for the right person and replace this person in case of absence. We could think of this outsourcing cost as $p = \epsilon p_s + (1-\epsilon)p_m$ where ϵ is the share of individuals who have access to childcare services at a subsidized price p_s and $(1-\epsilon)$ as the remaining share that has access to a higher, market price p_m. This allows the model to account for an excess demand of childcare services due to the limited access to subsidized childcare - which is often the case for European countries, especially those with low fertility rates.

Denoting $\beta \in (0,1)$ as the parental preference for children relative to consumption, the maximization problem of a couple is the following:

$$\max_{c,t_f,t_m,t_n,n} \ln c + \beta \ln n, \tag{1}$$

subject to

$$c = \left[1 - (t_f + \bar{\phi})n\right] w_f + (1 - t_m n)w_m - pt_n n, \tag{2}$$

[7] In Appendix B, we show that the mechanisms made explicit in this benchmark model also hold if we introduce a good cost for children instead of a time cost.

$$\phi = t_f + t_m + t_n, \tag{3}$$

$$1 - (t_f + \bar{\phi})n \geq 0, \tag{4}$$

$$1 - t_m n \geq 0, \tag{5}$$

and $t_f \geq 0$, $t_m \geq 0$, $t_n \geq 0$. The Lagrangian of this problem is:

$$L = \ln c + \beta \ln n + \lambda t_f + \mu t_m + \nu t_n + \varphi \left[1 - (t_f + \bar{\phi})n\right] + \gamma \left[1 - t_m n\right], \tag{6}$$

where (λ, μ, ν) are the Kuhn-Tucker multipliers associated to the non-negativity constraints imposed on (t_f, t_m, t_n) while (φ, γ) are those imposed on conditions (4) and (5). The first order conditions with respect to (t_f, t_m, n) are:

$$\begin{aligned} -\frac{n\left(w_f - p\right)}{c} + \lambda - \nu - n\varphi &= 0, && (7) \\ -\frac{n\left(w_m - p\right)}{c} + \mu - \nu - n\gamma &= 0, && (8) \\ -\frac{(t_f + \bar{\phi})w_f + t_m w_m + p\left(\phi - t_f - t_m\right)}{c} + \frac{\beta}{n} - \varphi(t_f + \bar{\phi}) - \gamma t_m &= 0. && (9) \end{aligned}$$

Moreover, the optimal solution satisfies:

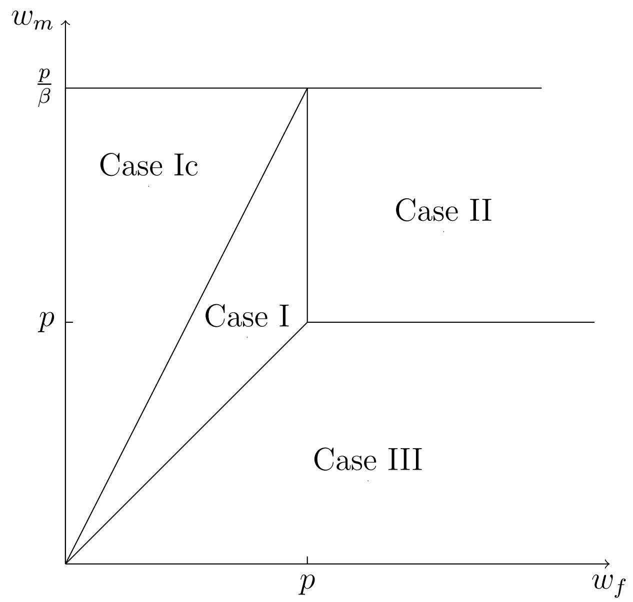
$$\lambda t_f = \mu t_m = \nu t_n = \varphi \left[1 - (t_f + \bar{\phi})n\right] = \gamma \left[1 - t_m n\right] = 0, \tag{10}$$

as well as equations (2) and (3).

Depending on the values of (w_m, w_f, p), the optimal solution can belong to one of the three main cases described below. The left panel of Figure 7 illustrates when each of the three cases arise, with respect to w_f, w_m, and p.

Case I. The woman supplies all the childcare: $t_f = \phi$ and $t_m = t_n = 0$. In this case, condition (10) implies $\lambda = \gamma = 0$ and $n \leq 1/\left(\phi + \bar{\phi}\right)$. The latter inequality means that either the woman is not working and reaches the maximal fertility level given by her time constraint or she is working part-time and chooses a lower fertility level. Using conditions (7), (8) and (9), we obtain,

$$n = \frac{1}{\left(\phi + \bar{\phi}\right)} \qquad \text{if} \qquad w_f \leq \beta w_m \leq p. \tag{11}$$



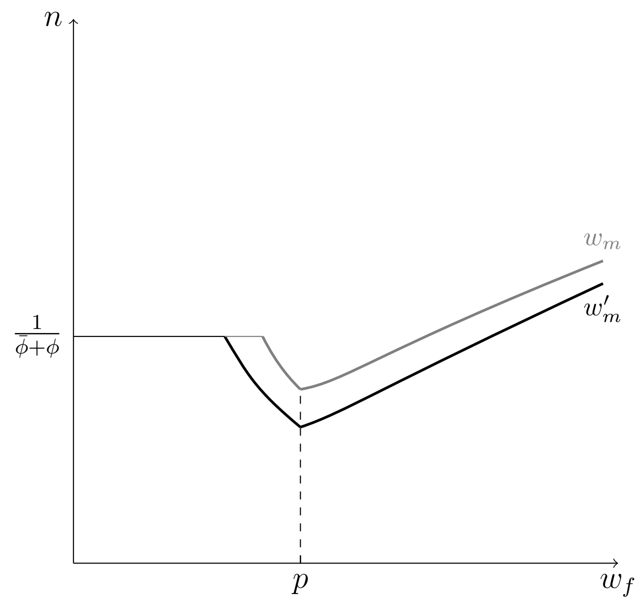


Figure 7: Left: Possible Cases with Respect to w_f, p, and $w_m \in [0, p/\beta]$; Moreover, $\bar{\phi} > \phi\beta/(1+\beta)$. Right: Relationships between n and w_f for $w_m \in (p, p/\beta)$, $w_m > w_m'$, and $\beta\phi > \bar{\phi}$.

Conversely, fertility can have an interior solution that is equal to

$$n = \frac{\beta (w_f + w_m)}{(1+\beta)(\phi + \bar{\phi}) w_f} \qquad \text{if} \qquad \beta w_m \leq w_f \leq \min\{p, w_m\}. \tag{12}$$

In Case I, the wage of the woman is lower than both the wage of the man and the cost of outsourcing childcare. The woman reaches the maximal fertility level when her wage is lower than βw_m, whereas she chooses a lower level of fertility when it is above. Both the constrained and unconstrained cases (denoted Case Ic and Case I, respectively) are represented in the left panel of Figure 7.

When the optimal fertility is interior, we notice that an increase in the wage of the man positively affects the couple's fertility ($\partial n/\partial w_m > 0$) while an increase in the woman's wage affects it negatively ($\partial n/\partial w_f < 0$).

Case II. All the childcare is outsourced: $t_n = \phi$ and $t_m = t_f = 0$. In this case, condition (10) implies $\nu = \gamma = 0$ and $n \leq 1/\bar{\phi}$. We notice that due to outsourcing possibilities, the maximal fertility level is higher than in Case I. Using conditions (7), (8) and (9), we obtain,

$$n = \frac{1}{\bar{\phi}} \qquad \text{if} \qquad p \leq \frac{\beta w_m - w_f}{(1+\beta)\frac{\phi}{\bar{\phi}}}. \tag{13}$$

Conversely, fertility can have an interior solution that is equal to

$$n = \frac{\beta\left(w_f + w_m\right)}{\left(1+\beta\right)\left(\bar{\phi} w_f + \phi p\right)} \qquad \text{if} \qquad \frac{\beta w_m - w_f}{\left(1+\beta\right)\frac{\bar{\phi}}{\phi}} \leq p \leq \min\left\{w_f, w_m\right\}. \tag{14}$$

A couple will outsource childcare when the cost of buying the service is not too high (below the wage of each spouse). If the cost is low, the maximal fertility level is then reached and when it increases, the fertility is more likely to be interior. In the left panel of Figure 7, where it is assumed that $w_m \leq p/\beta$, only the unconstrained case is represented.

When the optimal fertility is interior, we notice that the wage of the man still has an income effect on fertility, $\partial n/\partial w_m > 0$. However, an increase in the wage of the woman has both income and substitution effects, due to the childbearing time, $\bar{\phi}$. We obtain:

$$\frac{\partial n}{\partial w_f} \geq 0 \Leftrightarrow \phi p - \bar{\phi} w_m \geq 0. \tag{15}$$

If $\bar{\phi}$ is relatively low compared to the time that is outsourced, then the income effect dominates the substitution effect and, then, $\partial n/\partial w_f > 0$. Note that a marginal increase in the male's wage increases fertility more than a marginal increase in the female's wage, $\partial n/\partial w_m > \partial n/\partial w_f$. This is due to the fixed cost in terms of childcare $\bar{\phi}$ supported by the woman.

Case III. The man supplies all the childcare: $t_m = \phi$ and $t_n = t_f = 0$. In this case, conditions (10) and $\phi > \bar{\phi}$ imply $\mu = \varphi = 0$ and $n \leq 1/\phi$. Conditions (7), (8) and (9) can be used to obtain,

$$n = \frac{1}{\phi} \qquad \text{if} \qquad w_m \leq \left[\beta - \left(1+\beta\right)\frac{\bar{\phi}}{\phi}\right] w_f \leq p, \tag{16}$$

and,

$$n = \frac{\beta\left(w_f + w_m\right)}{\left(1+\beta\right)\left(\bar{\phi} w_f + \phi w_m\right)} \qquad \text{if} \qquad \left[\beta - \left(1+\beta\right)\frac{\bar{\phi}}{\phi}\right] w_f \leq w_m \leq \min\left\{w_f, p\right\}. \tag{17}$$

Case III is exactly symmetric to Case I for $\bar{\phi} = 0$. By adding the fixed cost specific to women, we see that the constrained case is less likely. In the left panel of Figure 7, we assumed that $\bar{\phi} > \phi\beta/\left(1+\beta\right)$, which implies that it is only the unconstrained case that is represented.

In Case III, an increase in the wages of both the woman and the man entails income and substitution effects. If the childbearing time is larger than the childrearing time, then an

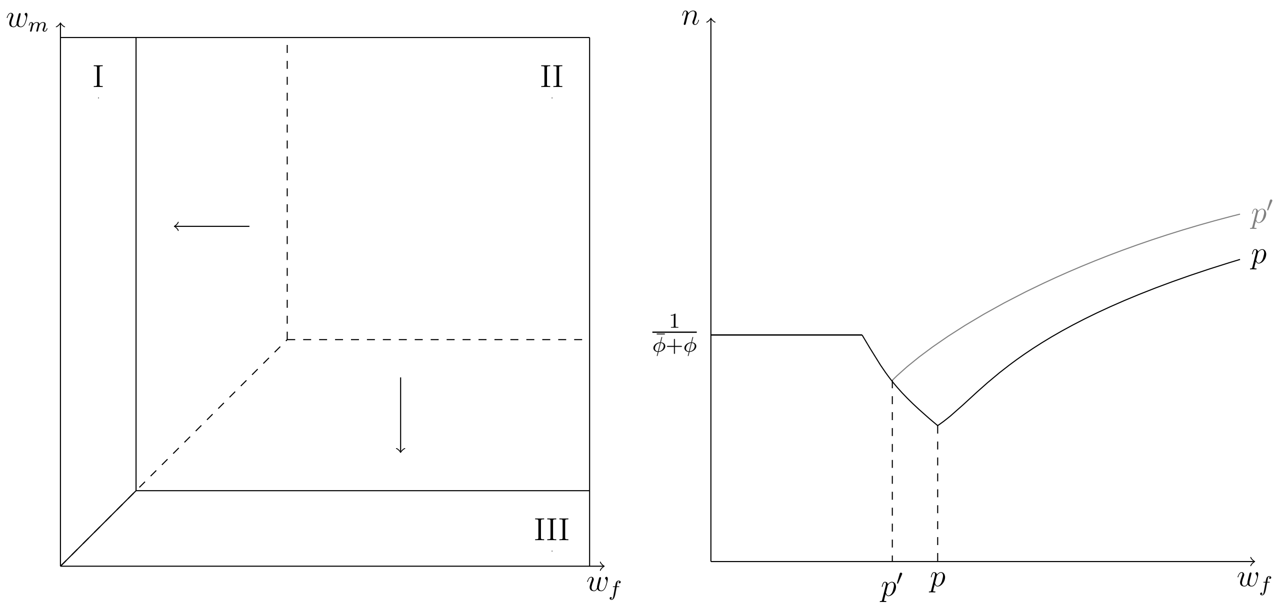


Figure 8: Left: Possible Cases with Respect to a Decrease in p. Right: Relationship between n and w_f for $w_m \in (p, p/\beta)$, $p > p'$, and $\beta\phi > \bar{\phi}$.

increase in the man's wage has a positive effect on fertility whereas an increase in the woman's wage has a negative effect. The opposite case is seen when childbearing time is less than childrearing time.

The right panel of Figure 7 shows the relationship between fertility and the wage of the woman and assuming that the wage of the man satisfies $w_m \in (p, p/\beta)$ and that $\beta\phi > \bar{\phi}$. It illustrates a situation in which fertility and female wages have a U-shaped relationship. We see initially that fertility does not change with the wage of the woman, corresponding to the constrained fertility of Case I. Then, for $w_f \in [\beta w_m, p]$, fertility decreases with the wage as the opportunity cost of rearing a child increases, corresponding to the interior solution for the fertility of Case I. Finally, couples outsource part of the childcare and, given our parameter restrictions, fertility increases with the wage as the income effect dominates the substitution effect. Fertility eventually converges to $\beta/\left(1+\beta\right)\bar{\phi}$. The right panel of Figure 7 also shows the impact of a decrease in the wage of the man. We notice that the U-shape is more pronounced.

Figure 8 illustrates the effect of lowering the average price of childcare (or allowing more couples to have access to childcare services). A lower price increases the region in which Case II appears, where all childcare is outsourced, because couples can more easily purchase childcare. The effect of a lower p on fertility is positive for women with higher wages (those who are in Case II), for whom the opportunity cost to raise children is large. The U-shape is less pronounced.

We now turn to the analysis of the decision to have a second child when fertility is treated as a discrete variable.

3.2 The Decision of Having a Second Child

To focus on the transition from the first to the second child, we modified the general model as structured above by considering that n is discrete rather than continuous. As the utility function is increasing and concave with respect to n, a couple will have two or more children if the indirect utility when $n = 2$ is higher than the indirect utility when $n = 1$.

Let us assume that the parameter restrictions are such that we are either in Case I, where the woman supplies all the childcare, or in Case II where all the childcare is outsourced ($w_m > w_f$), and that the fertility is interior ($w_f > \beta w_m$). Let $\bar{u}_n^{\kappa}$ denote the indirect utility of having n children and being in Case $\kappa = \text{I}$ or $\kappa = \text{II}$. For $w_f = p$, we can check that $\bar{u}_n^{\text{I}} = \bar{u}_n^{\text{II}}$.

Moreover, let us define W^{I} and W^{II} the female wage thresholds such that $\bar{u}_1^{\text{I}} = \bar{u}_2^{\text{I}}$ and $\bar{u}_1^{\text{II}} = \bar{u}_2^{\text{II}}$ respectively. We have,

$$W^{\text{I}} := \frac{w_m}{(\phi + \bar{\phi})\lambda - 1} \qquad \text{and} \qquad W^{\text{II}} := \frac{w_m - \lambda p \phi}{\bar{\phi}\lambda - 1}, \tag{18}$$

where $\lambda := \left(2^{\beta+1} - 1\right) / (2^{\beta} - 1)$. We saw that in the case where the woman supplies all the childcare, fertility decreases with the woman's wage. In this discrete variable setting, this relationship is given through the following inequality,

$$\bar{u}_2^{\text{I}} \geq \bar{u}_1^{\text{I}} \Leftrightarrow w_f \leq W^{\text{I}} \tag{19}$$

Moreover, provided that fixed costs are sufficiently large, and more precisely provided that,

$$(\bar{\phi} + \phi) \in \left(\frac{1}{\lambda}, \frac{1+\beta}{\beta} \frac{1}{\lambda} \right), \tag{20}$$

the threshold W^{I} is larger than βw_m. This implies that $\bar{u}_2^{\text{I}} > \bar{u}_1^{\text{I}}$ if the woman's wage belongs to $\left(\beta w_m, W^{\text{I}}\right)$. Since $\partial \bar{u}_1^{\text{I}} / \partial w_f > \partial \bar{u}_2^{\text{I}} / \partial w_f$ for all $w_f > 0$, $\bar{u}_2^{\text{I}}$ and $\bar{u}_1^{\text{I}}$ will cross once for $w_f = W^{\text{I}}$.

In the case where childcare is outsourced, fertility increases with the woman's wage, which could be expressed here as,

$$\bar{u}_2^{\mathrm{II}} \geq \bar{u}_1^{\mathrm{II}} \Leftrightarrow w_f \geq W^{\mathrm{II}} \tag{21}$$

Provided that $\bar{\phi}\lambda < 1$, the condition for $W^{\mathrm{II}} > W^{\mathrm{I}}$ becomes,

$$p > \frac{w_m}{(\bar{\phi} + \phi)\lambda - 1} \tag{22}$$

Then, the condition to obtain $\partial \bar{u}_2^{\mathrm{II}} / \partial w_f > \partial \bar{u}_1^{\mathrm{II}} / \partial w_f$ is $\phi p > w_m \bar{\phi}$, which (as we have seen in the previous section) implies that fertility increases with the woman's wage. This latter condition is compatible with the previous one provided that p is sufficiently large.

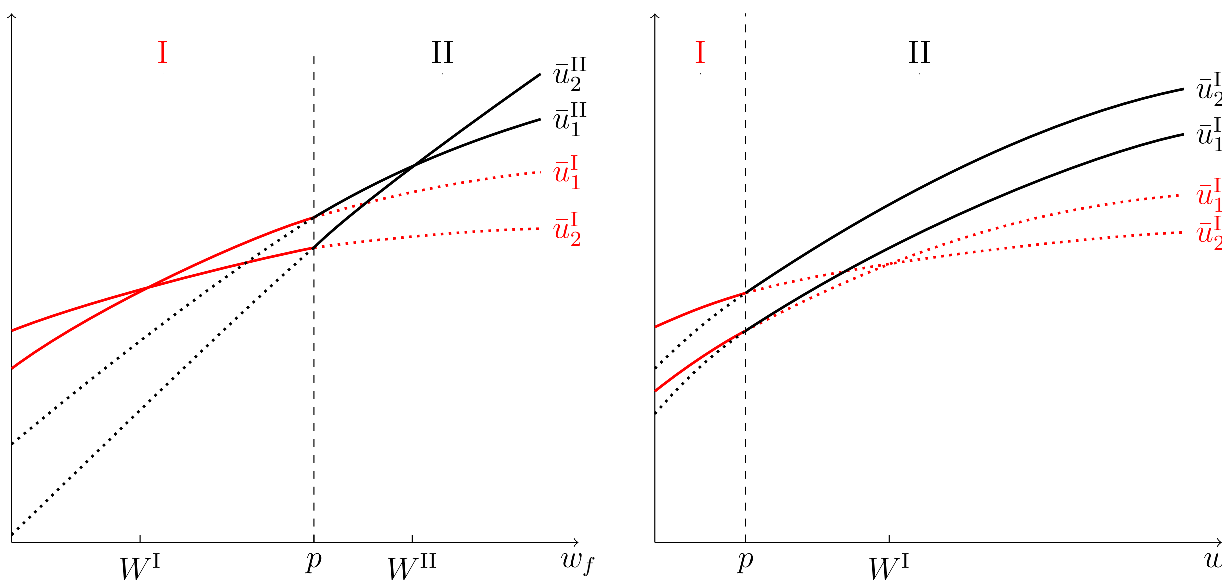


Figure 9: Indirect Utilities of Having One or Two Children, case I in red and case II in black, with a Large p (left) and and a Small p (right).

Figure 9 shows $\bar{u}_1^{\mathrm{I}}$, $\bar{u}_2^{\mathrm{I}}$, $\bar{u}_1^{\mathrm{II}}$ and $\bar{u}_2^{\mathrm{II}}$ with respect to w_f and for a large p (left panel) and a small p (right panel). The left panel of Figure 9 illustrates a situation in which the utility of having two children is larger for women with low or high wages than the utility of having only one child. Conversely, women with middle wages have one child. For $w_f < p$, the couple is in Case I in which the woman supports all the childrearing. For $w_f < W^{\mathrm{I}}$, $\bar{u}_2^{\mathrm{I}} > \bar{u}_1^{\mathrm{I}}$ so that the couple will have (at least) two children. When $W^{\mathrm{I}} \leq w_f < p$; $\bar{u}_1^{\mathrm{I}} \geq \bar{u}_2^{\mathrm{I}}$ and the couple will have one child. This is because for a woman with low wage, being out of the labor market entails a low cost. As her wage increases, however, this cost increases and as each child costs her $\phi + \bar{\phi}$ units of time, it is optimal for the couple to have less children.

For $w_f \geq p$, the couple has enough income to be in Case II where it outsources childrearing. For $p \leq w_f \leq W^{\mathrm{II}}$ the couple has one child ($\bar{u}_1^{\mathrm{II}} \geq \bar{u}_2^{\mathrm{II}}$) because the marginal cost of an extra child is larger than the utility gains. The cost of an extra child includes an increase in the opportunity cost of childbearing for the woman and a higher amount to pay for childrearing services. For $w_f > W^{\mathrm{II}}$; $\bar{u}_2^{\mathrm{II}} > \bar{u}_1^{\mathrm{II}}$ and the couple will have at least two children. This is due to the income effect of the increase that allows for the purchase of more childcare services in the market.

The right panel of Figure 9 shows the effect of decreasing the price of external childcare on the indirect utilities. In such configuration $\bar{u}_2^{\mathrm{II}} > \bar{u}_1^{\mathrm{II}}$ for all w_f. A lower female wage will allow the couple to reach Case II, where they can outsource childcare. Moreover, the figure also shows that couples will enter Case II before the substitution effect of the female wage becomes too large. This explains why the indirect utility of having two children always dominates the indirect utility of having one.

The two panels of Figure 9 illustrate the differences in fertility patterns with respect to female wage for low (left panel) and high (right panel) fertility countries. The next section provides some evidence on the relationship between the probability of having a second child in relation to female wages for our set of European countries.

4 Empirical Application of the Model

We estimate a woman's probability of having a second child using a binary logit regression model while taking into account the characteristics of women, their partners and the general household, as the following,

$$P(y = 1|X) = \frac{\exp\{\beta X'\}}{1 + \exp\{\beta X'\}} \tag{23}$$

where $y \in \{0, 1\}$ is a dummy variable for the 2nd child's arrival, X denotes the various characteristics taken into account and β the estimated coefficient of these variables. Our main determinant of interest is the mother's education level, which serves as a proxy for their potential wage. The education level as well as all control variables are observed for the year previous to the potential arrival of a second child. This time delay allows us to reduce a possible endogeneity bias.

We use the longitudinal data set of the EU-SILC covering survey years 2003 to 2011 for 19 countries. We distinguish between two groups of countries for which we run separate regressions: a first group of countries with child care coverage for children aged 0 to 2 years old that is below the European average of 31% and at the same time total fertility rates below the European average of 1.6 children per women, and a second group with child care coverage and total fertility rates above these averages (as identified in Figure 5)[8].

Some countries joined the database later than others. Moreover, some specific years may influence the probability of deciding for or against a second child. Therefore, we introduce year-fixed effects in all our regressions. We also introduce country-fixed effects in order to focus on within-country variation.

The sample is restricted to women aged 15 to 44 years old who already have one child at the beginning of the observed period. Due to the relatively short follow-up period of four years, for each woman, two years at most are integrated in the model which correspond to the years prior to the potential arrival of a second child, and we control for this number of "events" (or "person-years").

The probability of having a second child varies considerably across countries, as already illustrated in Figure 4. The weighted average for the probability of the second child's arrival in our first group of countries is 0.07, while it amounts to 0.17 for the second group where child care coverage and total fertility rates are high.

Besides women's education level, we include a series of control variables in order to isolate the impact of women's potential wage on the decision of having a second child from other determinants. More importantly, we include information on the woman's partner in our model. We control for the presence of a partner and the couple's marital status. We also observe the partner's education level as well as the couple's joint labor income in the year previous to the arrival of the potential second child[9]. In addition, we control for the woman's age and the age and sex of the first child.

For education, income and age, we create several categories in order to capture non-linear impacts. We construct three categories for the education level of women and their partners in the data (by highest ISCED level attained), namely: *low education* for pre-primary, primary and lower secondary education, *medium education* for upper secondary and post-secondary non-tertiary education and *high education* for tertiary education[10]. Household labor income

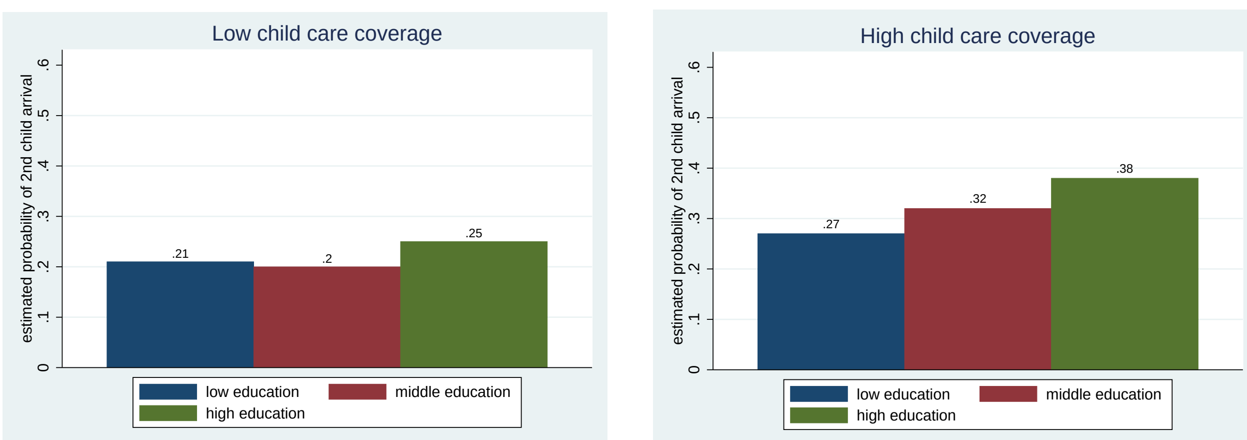
[8]First group consists of Hungary, Greece, Romania, Bulgaria, Austria, Slovakia, Czech Republic, Poland, Estonia, Italy and Latvia (note that Germany is not covered by the longitudinal data base), while the second group consists of the Netherlands, France, Iceland, Belgium, Norway, the United Kingdom, Denmark and Sweden.

[9]We do not control for activity status in order to reduce multicollinearity.

[10]Grouping the initial six education categories into three categories allows us to obtain a sufficiently large number of observations for each category. For low fertility countries, we observe 16% of women with low

contains the woman's plus, if in a couple, the partner's gross employee income, as well as their benefits from self-employment, observed for the whole year before the potential arrival of a second child. Three categories are created for household wage income, collating thirds created separately for each country.

Figure 1 presents the regression results (regressions with robust standard errors) of a woman's probability of having a second child as a function of education. For countries with low child care coverage, a woman's probability of having a second child is lowest among medium-educated women. Women with high education levels have a significantly higher probability of having their second child, whereas women with low education levels also have a higher probability, even though the difference is not significant between middle and low education levels[11]. This result holds when controlling for partner education and household labor income. For countries with high child care coverage, a woman's probability of having a second child is significantly increasing with education, with low-educated women having the lowest probability of second child. This also holds when controlling for the partner's education and household labor income.



Data source: EU-SILC LT (2003-2011), women aged 15-44.

Figure 10: Estimated probabilities of 2nd child arrival according to woman's education, countries with difficult vs. easy access to childcare.

We now quantify the estimation results by transforming the logit coefficients into estimated

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education level, 61% with medium and 23% with high education levels, whereas the distribution in high fertility countries is 12%, 46% and 42% respectively.

[11]Note however that when distinguishing between six education categories instead of only three, lowest-low educated women have the highest probability of second child arrival among all low educated women in low fertility countries (estimated probabilities: pre-primary 51%, primary 33%, lower secondary 25,6%), and the difference between pre-primary educated women and women with upper secondary education is significant on a 10% level. This reinforces our finding of a U-shaped pattern, but we abstain from presenting these results as lowest-low educated women present only a very small minority of women (below 1%).

	Countries with low child care coverage[1]		Countries with high child care coverage[2]	
Woman's education:				
Low education	0.0775	0.0719	-0.234+	-0.242+
	(0.69)	(0.63)	(-1.53)	(-1.59)
Middle education (upper and post secondary)	*Ref.*	*Ref.*	*Ref.*	*Ref.*
High education (tertiary)	0.274**	0.264**	0.278**	0.291***
	(3.04)	(2.90)	(3.16)	(3.30)
Partner education:				
Low education	-0.0434	-0.0408	-0.339*	-0.346**
	(-0.39)	(-0.36)	(-2.57)	(-2.61)
Middle education (upper and post secondary)	*Ref.*	*Ref.*	*Ref.*	*Ref.*
High education (tertiary)	0.250**	0.232*	0.173*	0.193*
	(2.62)	(2.35)	(1.98)	(2.12)
Couple's joint labour income:				
First tercile	-	0.0955		0.0114
		(1.12)		(0.12)
Second tercile	-	*Ref.*	-	*Ref.*
Third tercile	-	0.135+		-0.0780
		(1.48)		(-0.79)
Woman's age:				
15-24	0.214	0.208	0.207	0.197
	(1.85)	(1.80)	(1.20)	(1.14)
25-34	*Ref.*	*Ref.*	*Ref.*	*Ref.*
35-45	-1.364***	-1.374***	-0.909***	-0.898***
	(-12.28)	(-12.30)	(-8.41)	(-8.27)
Age of first child:				
0	-1.350***	-1.346***	-2.122***	-2.123***
	(-9.53)	(-9.49)	(-14.85)	(-14.86)
1-2	*Ref.*	*Ref.*	*Ref.*	*Ref.*
3-6	-0.0889	-0.0897	-0.447***	-0.442***
	(-1.09)	(-1.09)	(-4.76)	(-4.71)
7+	-1.042***	-1.043***	-2.382***	-2.378***
	(-8.74)	(-8.64)	(-12.11)	(-12.08)
Sex of first child:				
Female	-0.00294	0.0000155	-0.00594	-0.00782
	(-0.04)	(0.00)	(-0.08)	(-0.10)
Year fixed effects	*yes*	*yes*	*yes*	*yes*
Country fixed effects	*yes*	*yes*	*yes*	*yes*
"Second event" fixed effects	*yes*	*yes*	*yes*	*yes*
Intercept	-1.378***	-1.444***	-0.749*	-0.754*
	(-5.56)	(-5.68)	(-2.57)	(-2.55)
Number of observations	13990	13990	5915	5915
Number of events	1014	1014	997	997
Proportion of 2nd child arrival	0.073	0.073	0.169	0.169
Pseudo R^2	0.14	0.14	0.19	0.19

robust standard errors in parentheses; + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

[1] Low child care coverage: TFR<1,6 & child care coverage (age 0-2)<0.31: HU GR RO BG AT SK CZ PL EE IT LV

[2] High child care coverage: TFR>1,6 & child care coverage (age0-2)>0.31: NL FR IS BE NO UK DK SE

Data Source: EU-SILC LT 2003-2011 (women aged 15 to 44)

Table 1: Estimated Probability of Second Child Arrival.

probabilities[12]. Figure 10 illustrates the estimated probabilities, which are valid for women whose characteristics correspond to the reference categories (women who are married to a middle educated partner, who are aged 25 to 34 years old and who have a first child that is male and aged one or two years old). Once again, a woman's probability of having a second child is higher for all education groups in countries where child care coverage is high. On the other hand, in countries where child care coverage is low, we find a U-shaped pattern between women's education and the arrival of the second child. This relationship is positive for countries with easy access to childcare.

The model presented in Section 3 allows us to develop some intuition for a better understanding of the patterns that are revealed by our empirical analysis. The empirical results correspond to the model's prediction of a U-shaped relationship between a couple's probability of having a second child and the woman's potential wage in countries with high (institutional) costs of childcare, i.e. low access to childcare (left panel of Figure 5). The model also predicts that an easier access to child care leads to a higher probability of having a second child for women of all educational categories.

5 Conclusion

Fertility differences across European countries are mainly due to differences in the transition from having the first child to the second. Women in countries with high fertility rates have both a higher probability of having a second child and at the same time participating in the labor market. This paper shows that the possibility to outsource childcare has a positive effect on the transition from the first to the second child for a household.

Our theoretical framework illustrates the mechanism behind this observation, robust to European survey data. In countries with low child care coverage, the probability of the second child's arrival is reduced for all education levels and the relationship between female education, as a proxy for potential wage, and having a second child is U-shaped. In contrast, countries with high child care coverage tend to have a higher probability of having a second child for all women, and education increases the probability of the second child's arrival.

This pattern suggests that middle-educated women substitute labor market participation for having a second child in countries with low access to childcare, while they succeed in combining work and having a second child in countries with easy access to childcare. A

[12]Probability of second child arrival: $P(Y = 1|X) = e^L/(1+e^L)$ where L contains the estimated coefficients and e is Euler's constant.

higher probability of having a second child represents the main contribution to the fact that total fertility rates are higher in some European countries and low in others.

The mechanism shows that accessible childcare (low fees, but especially high availability) allows for the purchase of childcare service for all income groups. This seems to increase the probability of having a second child, as outsourcing childcare allows women to participate in the labor market while having children at the same time. When parents, and especially mothers, do not have to chose between work and child care, the arrival of the second child is more likely, and parents can bear direct childcare costs more easily (income effect).

A difficult or hindered access to childcare, on the other hand, will push middle-educated women to substitute work for having children. Low educated women have a higher probability of having a second child in comparison to middle educated women, as they have relatively low opportunity cost in terms of foregone income. Middle-educated women having already one child are likely to decide against a second child in order to maintain the family income. A second child would urge women to stop or reduce their working activities.

In contrast, highly educated women have the highest probability of having a second child probably because they can afford purchasing child care from the private market and are thus less dependent on access to subsidized childcare offered by the state.

This work can be extended in several directions. In particular, exploring the determinants of child care availability could be a promising research project.

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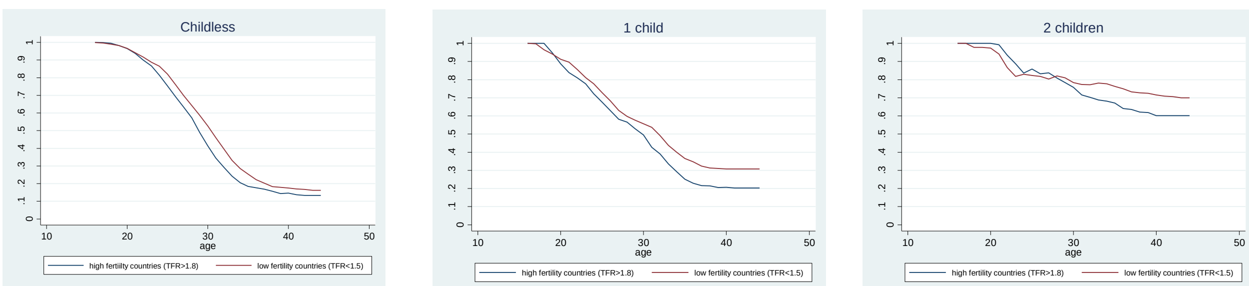
A Period fertility using the EU-SILC cross-sectional database

Based on the EU-SILC cross-sectional database, wave 2011, we calculate the number of children per woman for women aged 15 to 44 years old by distinguishing between low fertility countries (where total fertility rate is < 1.5 and high fertility countries (where total fertility rate is > 1.8). This allows us to see examine how the probability of staying childless, or with one child or two children, decreases more rapidly in high fertility countries compared to low ones[13].

Figure 11 shows the Kaplan Meier survival curves for the two groups of countries[14]. We see firstly and not surprisingly that the survival probabilities of staying childless, or with only one child or with only two children decrease with the womans's age. In accordance with the previous results, we see that at the end of their childbearing period, women in low fertility countries have a higher probability to stay either childless, or with only one child or with only two children in comparison to high fertility countries. These differences increase with the woman's age, in particular for the second and third panel, but the differences are present also for much younger ages. In high fertility countries, the woman's probability of staying childless and of staying with one child only is lower for all ages from the age 20 onwards, while women have a lower probability to stay with only two children from age 28 onwards. The highest relative difference between low and high fertility countries is found for the survival probability of staying with only one child.

[13]Note that the age-specific probabilities are not calculated retrospectively for a specific cohort that has already completed family formation. As we observe different cohorts at a given period of time, the probabilities could be biased due to tempo effects.

[14]In order to construct the Kaplan-Meier survival curves, we proceed in four steps. First, we compute the probability of having 1, 2, 3, 4^+ children for women aged 15-44 years. Second, we recover the transition probabilities (weighted means for high and low fertility countries). Third, we construct the survival probabilities (1-transition probabilities). And fourth, we compute a 3-year moving average on the survival probabilities to smooth out fluctuations between age groups.



Data sources: survival probabilities EU-SILC 2011; TFR WB WDI 2011

TFR<1.5*: CZ, HU, IT, PT, DE, SK, GR, AT, PL, ES and LV*

TFR≥ 1.8*: IS, FR, BE, SE, UK, NO and FI*

Figure 11: Kaplan Meier Survival Curves, Women Aged 15-44

B Extension with Goods Cost for Children

Here we show that introducing a good cost for children in the budget constraint does not change the qualitative predictions of the theory.

Assuming all else equal as in Section 3.1, the budget constraint faced by couples can now be written as,

$$(2+\alpha n)c = (1-(t_f+\bar{\phi})n)w_f + (1-t_m n)w_m - pt_n n$$

where α represents the share of consumption that each child needs.

The three cases that were identified are then modified as shown below. In particular, we derived the optimal interior n in each case.

I. The woman supplies all the childcare. If $\mu, \nu > 0$ and $\lambda = 0$; $t_m, t_n = 0$,

$$n^{\mathrm{I}} = \frac{\alpha(\beta-1)(w_f+w_m) - 2(1+\beta)(\bar{\phi}+\phi)w_f}{2\alpha\beta\left(\bar{\phi}+\phi\right)w_f} + \frac{\sqrt{\left((2(\bar{\phi}+\phi)+\alpha)w_f+\alpha w_m\right)\left(\alpha(\beta-1)^2(w_f+w_m)+2(1+\beta)^2(\bar{\phi}+\phi)w_f\right)}}{2\alpha\beta\left(\bar{\phi}+\phi\right)w_f}$$

II. All of the childcare is outsourced. If $\lambda, \mu > 0$ and $\nu = 0$; $t_f, t_m = 0$, $t_n = \phi$,

$$n^{\mathrm{II}} = \frac{\alpha(\beta-1)(w_f+w_m) - 2(1+\beta)(\bar{\phi}w_f+\phi w_m)}{2\alpha\beta\left(\bar{\phi}w_f+\phi w_m\right)} + \frac{\sqrt{\left((2\bar{\phi}+\alpha)w_f+(2\phi+\alpha)w_m\right)\left(\alpha(\beta-1)^2(w_f+w_m)+2(1+\beta)^2(\bar{\phi}w_f+\phi w_m\right)}}{2\alpha\beta\left(\bar{\phi}w_f+\phi w_m\right)}$$

III. The man supplies all the childcare. If $\lambda, \nu > 0$ and $\mu = 0$; $t_f, t_n = 0$, $t_m = \phi$,

$$n^{\mathrm{III}} = \frac{(\beta-1)\alpha(w_f+w_m) - 2(1+\beta)(\bar{\phi}w_f+p\phi)}{2\alpha\beta\left(\bar{\phi}w_f+p\phi\right)} + \frac{\sqrt{\left(2\bar{\phi}w_f+(w_f+w_m)\alpha+2p\phi\right)\left((\beta-1)^2\alpha(w_f+w_m)+2(1+\beta)^2(\bar{\phi}w_f+p\phi)\right)}}{2\alpha\beta\left(\bar{\phi}w_f+p\phi\right)}$$

For the parameter values given above, and $\alpha = 0.4$ the mechanisms suggested in Section 3.1 and the relationship between fertility and female wage shown in Figure 8 do not change when adding a cost of children in terms of goods.

Institut de Recherches Économiques et Sociales
Université catholique de Louvain

Place Montesquieu, 3
1348 Louvain-la-Neuve, Belgique

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