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Abstract:

We examine how far fertility trends respond to family policies in OECD countries. In the light of the recent fertility rebound observed in several OECD countries, we empirically test the impact of different family policy settings on fertility, using macro panel data from 18 OECD countries that spans the years 1982 to 2007. Our results confirm that each instrument of the family policy package (paid leave, childcare services and financial transfers) has a positive influence, suggesting that the combination of these forms of support for working parents in a continuum during their children's early years is likely to facilitate parents' choice to have children. Policy levers do not all have the same weight, however: in-cash benefits covering childhood after the year of childbirth and the provision of childcare services for children under age three have a larger potential influence on fertility than leave entitlements and benefits granted around childbirth. Our findings are robust after controlling for birth postponement, endogeneity, time-lagged fertility reactions and for different national contexts, such as economic development, female labour market participation, labour market insecurity and childbearing norms.

Keywords: family policies; fertility; demographic economics; female employment; economics of gender
JEL codes: J11, J13, J16, O11

Introduction

After decades of continuous decline, fertility rates have started to increase again in many OECD countries since the early 2000s. The overall rise is rather limited, with a total fertility rate *(TFR*) that reached a low of 1.63 in 1999 before rising to 1.71 in 2008, on average, in the OECD countries. However, many countries have experienced a more significant “rebound”, notably in Belgium, Denmark, Sweden, Czech Republic, Finland, France, the Netherlands, New Zealand, Norway, Spain, the United Kingdom and the United States. This reversal is arguably one consequence of the “postponement” of childbearing across cohorts: delayed childbearing among the younger cohorts brought down period fertility rates, but this trend was later reversed, mainly in countries where fertility increased significantly among women aged 30 and above and was not counterbalanced by a further reduction at younger ages (Goldstein et al., 2009).

This paper reports on the extent to which the development of government policies towards families with children in the last decades has contributed to these fertility trends. The main novelty of our assessment lies in the effort to consider family policy packages as a whole, and to identify the respective influence of each item of in-cash and in-kind support. An original dataset has been elaborated for this purpose, covering a period from the early 1980s up to the year preceding the ongoing economic crisis.

Before presenting the details of our empirical setting, the next paragraphs outlines the factors which are driving the variations in fertility trends and which explain why the “postponement” process of childbearing has ended in some countries, but not yet in some others. Family policies are key components, along with other variables.

Economic development is a first factor which may affect fertility behaviour, as economic advancement leads to an increase in income per capita. In theory, such an increase might alleviate part of the budgetary constraint that may prevent households from having their desired number of children. In that case, economic advancement would lead to an increase in fertility. However, several factors can drive the relation in the other direction. Becker et al. (1990) argue, for example, that when individual investments in human capital increase, as in a period of rapid technological progress, families find it optimal to have fewer children, and to provide each child with a high level of human capital. This high level of human capital also leads, at the aggregate level, to high rates of economic growth and a fertility decline, as we observed during the demographic transition (Barro and Becker, 1989; Doepke, 2004). In addition, an increase in capital intensity of the economy (possibly due to technological progress) is likely to increase the relative wages of women, who also benefit from the average increase in their educational attainment (Galor and Weil, 1996). Women are thus likely to substitute out of childrearing and into market labour. Both higher wage earnings (and thus savings) and reduced population growth increase the level of capital per worker. Thus, high relative wages for women are both a product of, and a causal factor in, economic growth and fertility decline. This "empowerment" of women has already been identified as one cause of the postponement of family formation (Blossfeld, 1995), and was cited as the key explanation for the decrease in fertility rates in developed countries from the early 1970s to the late 1990s (Hotz et al., 1997).

However, the fertility decrease might occur in a first phase only when the possibility to substitute maternal care by goods or purchased services is limited (Day, 2004). In this case, a subsidy to childcare goods and services is likely to prolong the fertility decline because of the high degree of complementarity between childcare goods and parental time. However, trends might reverse in a second phase once parents have the opportunity to substitute parental (or maternal) care by goods or purchased childcare services. In all, a high rate of subsidy to childcare goods and services will raise the level of fertility but may postpone the onset of a naturally occurring baby bounce-back. In this context, fertility trends are more and more likely to depend on the extent to which policies help households to bear the cost of raising children and to combine work and family life rather than urging parents, and especially women, to choose between children and career development.

This prediction meets the empirical findings that economic development is linked to a decline in fertility rates, but only up to a certain point. Beyond a certain GDP level, further economic development is found to stimulate a slight increase in fertility rates, even after controlling for birth postponement (Myrskyla et al., 2009; Luci and Thévenon, 2010). Economic development only partially explains cross-country differences in fertility trends, however, since countries with comparable GDP per capita levels often have different fertility levels. Luci and Thévenon (2010) show that the fertility rebound has been steeper in those highly developed countries where women's labour market participation has also risen significantly. This suggests that the impact of economic development *per se* is small, unless accompanied by better opportunities for women to combine work with family life (Ahn and Mira, 2002; D'Addio and Mira d'Ercole 2005; Luci and Thévenon, 2010; OECD, 2011).

Family policies provide parents with cash and in-kind resources or with time to care for children. By these means, these policies support families' standard of living, help parents to cope with work and care responsibilities, and may thus help parents to realise their fertility intentions. The basic notions of the economic theory of fertility decision-making can shed light on how policies might influence fertility. Economic theory typically considers fertility as the outcome of a rational decision balancing costs and benefits of children, subject to an income constraint and preferences for children (Becker, 1981). Costs are given by the fact that raising and educating children require income, goods and, especially, time. Moreover, since child raising competes with other time-consuming activities, such as work and leisure, having children incurs not only a direct cost due to the transfer of resources towards children, but also an indirect one due to forgone opportunities (Willis, 1973), In this context, family policies can reduce either the direct or the opportunity component of child costs, depending on the lever used, and thereby making children more “affordable”.

Financial transfers towards families with children are a first lever of family policies which presumably reduce the direct “monetary” cost of raising children. In addition, policies that enable working parents to combine work with childbearing and childrearing might also encourage fertility, whose opportunity cost is thereby reduced (Willis, 1973; Hotz *et al.*, 1997). Employment-protected leave entitlements after childbirth and childcare services which substitute to parental care are thus key policy parameters that are expected to influence fertility. Evidence that family policies help to significantly raise the number of children in completed families is relatively weak, however, while there seems to be more evidence regarding their influence on the timing of births (for a survey, see Sleebos, 2003; Gauthier, 2007; Thévenon and Gauthier, 2011).

Against this background, we assess the contribution of family policies to cross-national variations in fertility trends. The effect on fertility trends of paid leave entitlements, childcare services and financial transfers to families has been analysed for the first time by putting together data on multiple policies for a large set of countries and for a period covering almost three decades. The panel structure of our data gives more information, variability and efficiency in comparison to time-series or cross-sectional data, and allows us to study the dynamics of adjustment. Our analysis is based on observations of 18 OECD countries, for which information on family policies is available from 1982 to 2007. Data series were obtained from combined OECD sources (mainly the Family and Social Expenditures Data Bases). Our contribution is threefold. First, we have broadened our scope with respect to previous findings by considering three main types of policy instruments (cash transfers, parental leave and childcare), whereas earlier studies mostly concentrate on only one or two aspects. Spending in-cash is divided into two sets to separate the support granted around childbirth and the support provided later to cover the cost of raising children. Childcare is divided into spending and coverage. Thus, we can analyse the influence of the mix of different types of family support that supposedly respond to families' needs for time, money and services at childbirth and during the childrearing period. In addition, efforts are made to filter out possible effects on fertility trends of birth postponement and other important factors.

Second, we update previous results by focusing on a time period that covers the recent upswing in fertility rates. A key issue was thus the extent to which policies have contributed to this reversal of fertility trends.

Third, we apply panel data estimation methods that allow controlling for country- and time-invariant variables; this is not possible in time-series or cross-sectional studies. The data structure allows us to disentangle the "causal" impact of policy changes from country-constant characteristics that may affect fertility levels by identifying within-country variations (Fixed Effects model). Moreover, instrumenting current policies with lagged observations serve as a robustness check to control for possible time lags of fertility reactions to policy changes as well as for potential endogeneity of explanatory variables. Finally, we apply a System GMM model to capture dynamics of adjustment and to control simultaneously for endogeneity, non-stationarity and omitted variable bias.

We find that fertility trends are influenced by the long-term support parents receive in-cash but also in-kind, with the provision of childcare services that help parents (especially women) to combine work and family life. By contrast, fertility is found to be not significantly affected by leave policies, considering either the duration of paid leave or the cash amounts received around childbirth in the form of leave benefits or birth grants. Our results confirm the positive influence on fertility of a mix of in-cash and in-kind support and suggest that the development of childcare services has a more significant impact on fertility trends at the aggregate level than policies extending leave entitlements. An increase in fertility seems thus to be happening as a by-product of better opportunities to combine work and family.

The first section sheds light on cross-national differences in family support policies and fertility in OECD countries since the early 1980s. Particular attention is paid to how policies have developed over the period and to the extent of the support package provided to working parents with children below school age. The second section presents our empirical strategy, the third section discusses our results and the concluding fourth section puts our results into perspective.

I. Family policies and fertility in OECD countries: data and trends

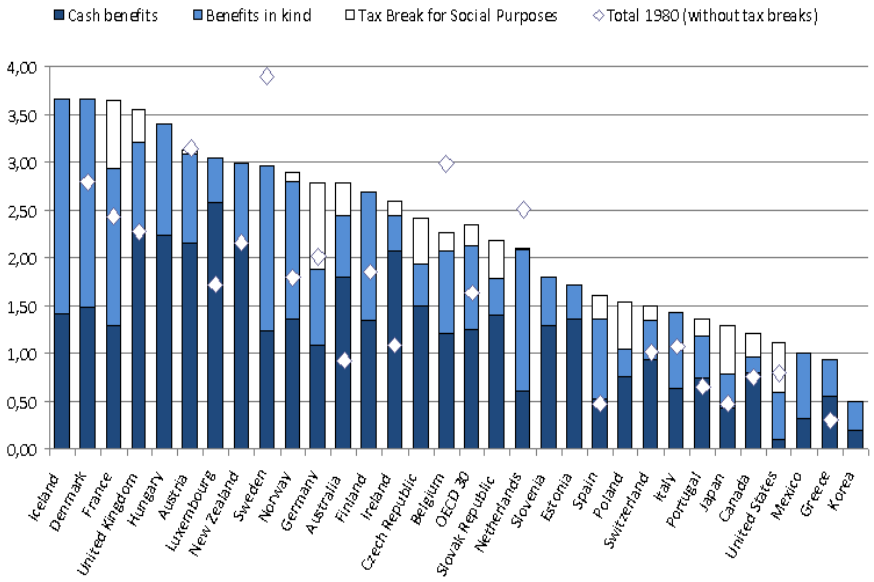
I.1. Increasing expenditures for families

A range of family policies exist that may influence the resources of different household types. These include tax benefits and cash transfers, childcare arrangements, and leave provision. The deployment of family policy instruments varies with each country's approach to policy objectives, in which fertility issues may or may not play a part (Thévenon 2011a; OECD 2011). Nevertheless, global spending for families with children has increased considerably over the past three decades in most OECD countries as a result of growing concerns on the part of governments to promote families' well-being and to reconcile work and family life. Figure 1 shows that the share of GDP spent by governments for families – disregarding expenditures on compulsory education – rose from an average of around 1.6% in 1980 to 2.0-

2.4% in 2007 in the OECD. Yet, cross-country differences in the total amount transferred to families remain large, with Denmark, France, Iceland and the United Kingdom spending over 3.5 % of GDP for families, compared with just over 0.5%, for example, in Korea.

Figure 1: Public spending on families

% of GDP, 1980-2007



Note: Countries are ranked in decreasing order of total family benefit spending in 2007. Expenditure includes child payments and allowances, parental leave benefits and childcare support (e.g. spending on childcare and preschool services for children under school age). Spending on health and housing support also assists families, but is not included here. For additional details, see data source.

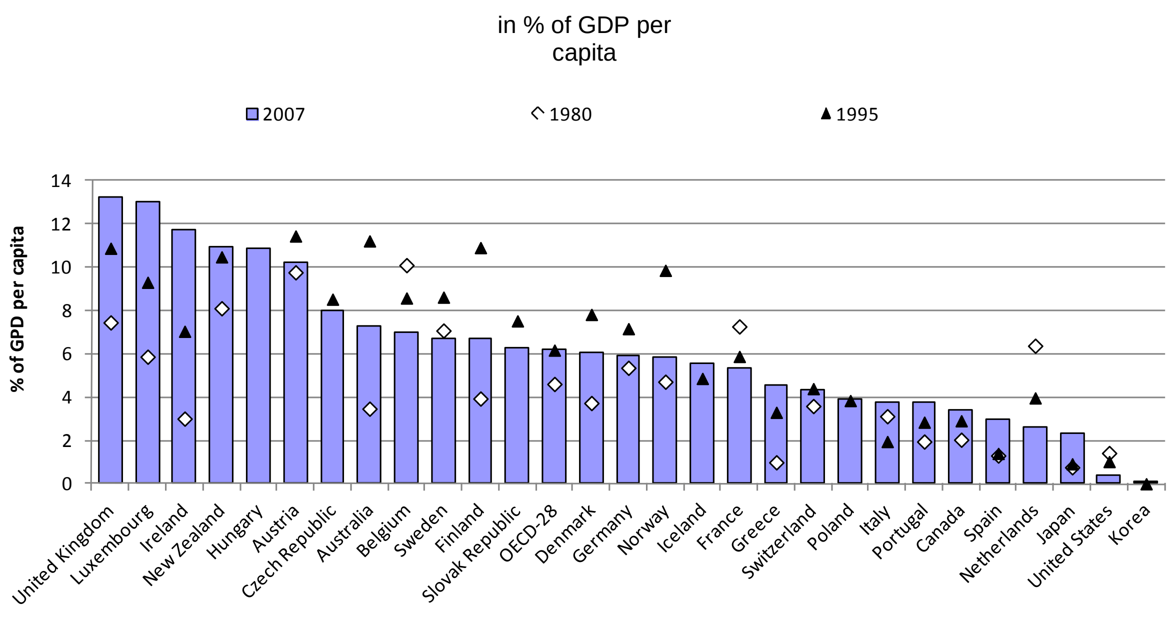
Data source: OECD Family Data Base (2011)

I.2. Financial transfers

The breakdown of spending into broad categories of policy instruments also varies greatly across countries. Financial support can be provided in the form of cash benefits or child-related tax advantages. Cash benefits are twofold: some are paid out after a birth, in the form of birth grants or payments to parents who take leave from employment after a birth. Other benefits are received by parents on a regular basis. They mainly include family allowances, child benefits or working family payments. A number of OECD countries also include one-off benefits such as back-to-school-supplements or social grants (for housing for instance) in this category. Overall, cash payments are often the main group of expenditures, representing 1.25% of GDP on average (Figure 1).

The amounts spent *for each child* relative to GDP per capita provide a more accurate comparison of countries' efforts to support families[1]. Figure 2 shows variations in these amounts rated for children under age 20 (excluding benefits received for childbirth or leave payments). Interestingly, two English-speaking countries appear in opposite positions: the United Kingdom, on the one hand, shows the highest cash expenditure per child, while the United States ranks at the bottom extreme, together with Korea. Even though the average amounts spent per child increased between 1980 and 2007, expenditure has decreased in several countries over the past decades. More precisely, average spending has decreased in about one-third of countries since the mid-1990s.

Figure 2: Spending on cash benefits per child under age 20



Data source: OECD Family Data Base (2011)

[1] The amount spent per child is calculated on the basis of the total number of children under age 20. Since the age limit of children for which a family can receive family benefits varies across countries, it has been set at age 20 to obtain a comparable population basis. Moreover, the levels of family and child benefits are likely to be higher in richer countries, i.e. countries with higher GDP per capita. For this reason, the generosity of support can by more usefully measured by comparing the relative effort made by countries to support families with children, which is given by the proportion of income per capita that countries devote to child benefit. It is also likely that fertility will respond to changes in this relative-to-average income measure over time.

Child-related tax breaks are also quite widespread among OECD countries. Only 6 out of 32 OECD countries do not grant any specific tax deductions to families. Tax-related transfers for families include tax allowances on earned income, tax credits or tax deductions for services such as childcare. A large majority of OECD countries provide such tax breaks, but their relative weight in overall support to families varies quite widely (Figure 1). They are the main levy to support families in the United States and represent a large share of the overall money transferred to families in France and Germany.

I.3. Child-related leave-entitlements

Leave entitlement after childbirth is a second broad category of parental support. Employment is protected during leave, so that parents can resume work after taking time off to care for a newborn infant. Different types of leave entitlement can often be combined. First, working mothers are entitled to a period of maternity leave (or pregnancy leave) around the time of childbirth which protects the health of the working mother and her children and guarantees that she can return to her job within a limited number of weeks after childbirth. The average duration of maternity leave in 2007 was around 19 weeks across the OECD. Maternity leave is paid in almost all cases, except in Australia and the United States where there is no central government legislation on paid leave (See OECD, 2011, indicator PF2.1 for details).[2] Fathers are also entitled to specific paternal leave at the time of childbirth, but these entitlements cover a short period that varies from 5 to 15 days following the birth.

There are larger variations in parental leave entitlements supplementing the basic rights to maternity and paternity leave across the OECD countries. Employed parents are entitled to additional weeks of “parental” and/or “childcare” leave if they want to continue caring for their child beyond the standard period of maternity or paternity leave. These weeks of parental

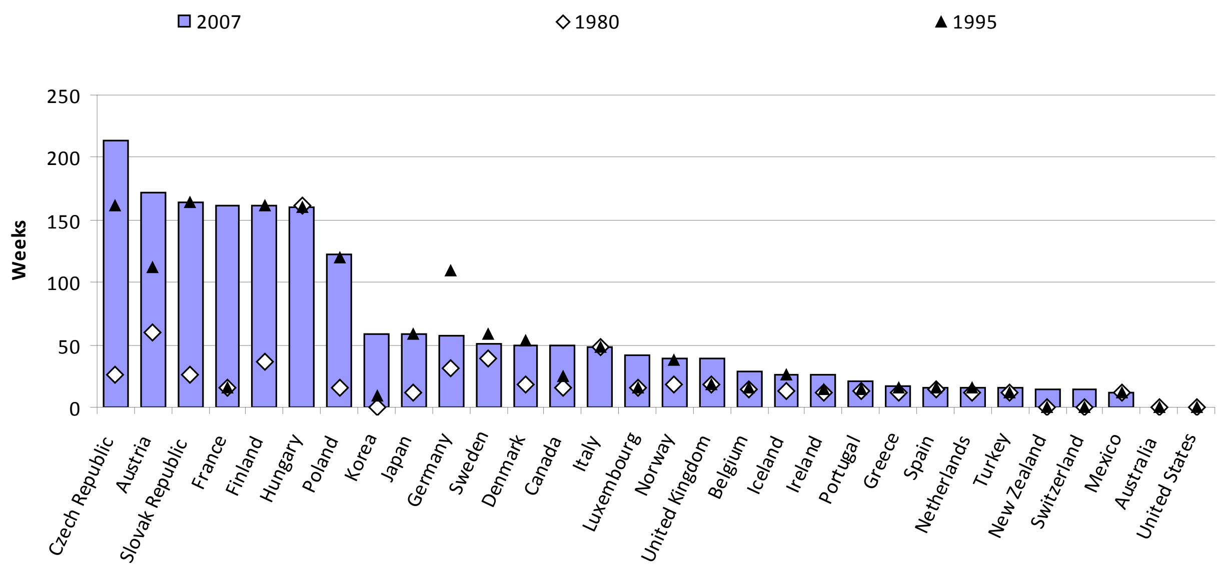
[2] Paid leave was introduced on 1 January 2011 in Australia.

leave are usually taken just after maternity leave, though in some countries they can be taken much later during childhood (often before the child reaches age 8).

Parental leave payment (all kinds of publicly paid parental leave and birth grants) is a key determinant of parental leave uptake. However, as leave payments do not fully replace the leave-taker's salary, and since women very often earn less than their partners, they are more likely than men to take all or the majority of the leave entitlement. Moreover, women most often do so to care for an infant after the end of their maternity leave. In this case, their absence from work may extend over a long period. Thus, for women who were employed before childbirth, the associated opportunity cost of a child due to work interruption becomes quite high. Figure 3 adds *paid* weeks of parental leave to those of maternity leave entitlements, and shows that women can be out of the labour force for 3 years or more in 6 countries (Austria, the Czech Republic, Finland, France for the birth of a second child, Hungary and the Slovak Republic). Total periods of paid leave are much shorter, 1 year or less in the other countries, because periods of paid parental leave are shorter. Differences in payment rates across countries are not reported here, although they are a key parameter of the actual take-up of leave entitlements and of the associated spending by governments.

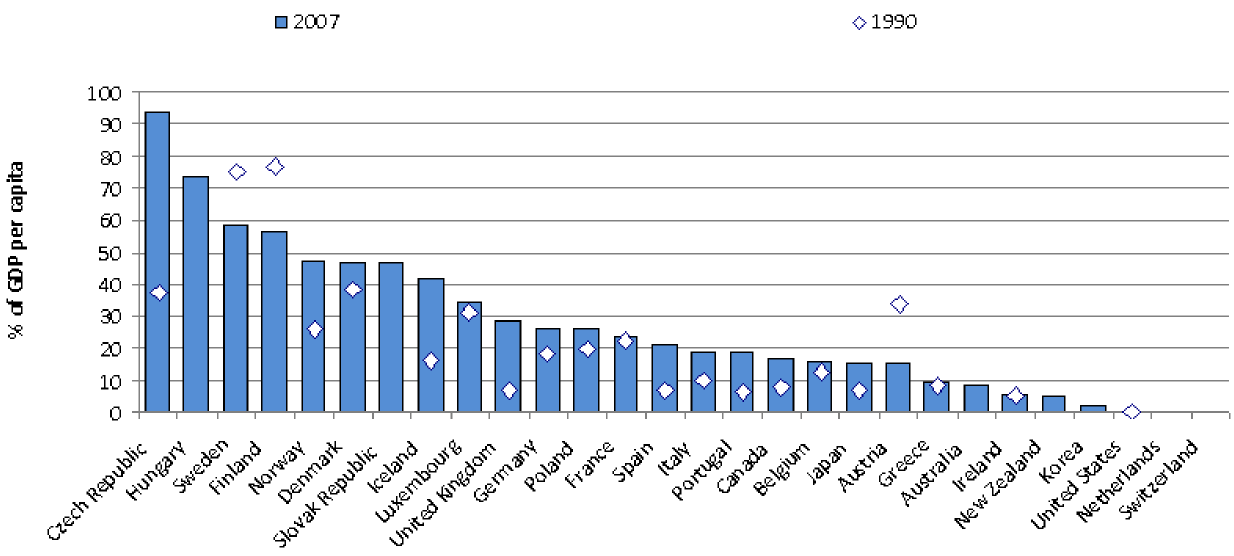
Figure 3 : Childbirth-related leave

Panel A: Number of paid weeks of leave available for mothers



2006 for Italy, 2004 for Portugal. Countries are ranked by number of paid weeks available in 1980. Weeks of maternity and of parental leave that women can take after maternity leave are added. Weeks of “childcare or home-care leave” are also added when relevant.

Panel B: Spending on child-related leave per birth in % of GDP per capita



Data source: OECD Family Data Base (2011)

These differences in duration and payment conditions lead to substantial variations in the amounts of public transfers per child, as illustrated in Figure 3 Panel B. These amounts include the “birth grants” paid in some countries to cover expenses associated with childbirth. Spending per birth relative to GDP per capita is especially high in Czech Republic and Hungary where the parental leave period is comparatively long.

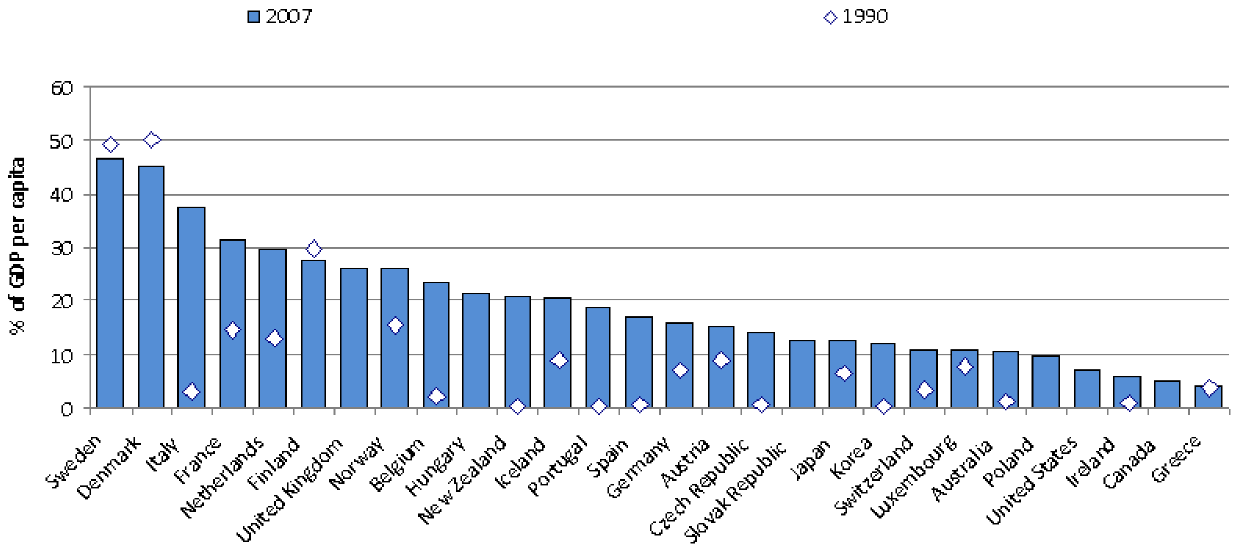
I.4. Childcare services

Finally, childcare services that parents can substitute for personal care may also influence the decision to have children and to combine work and childbearing. Governments play a key role in subsidizing the provision of childcare services, and trends over the past two decades show that some OECD countries have favoured developing in-kind benefits over cash transfers and education spending (OECD, 2011). Nevertheless, at almost 0.9% of GDP on average in the OECD, in-kind expenditures for pre-school children still represent no more than 1/3 of total expenditures for families (Figure 1). Denmark, France, Iceland, Finland and Sweden are the “big” service providers with total in-kind expenditures of over 2% of GDP , i.e. more than twice the OECD average. Denmark, Italy and Sweden are also the three countries with highest expenditures per child under age 3[3] relative to GDP per capita (Figure 4 Panel A).

[3] Expenditures per child are calculated here on the basis of the total number of children under age 3, whether or not they are enrolled in childcare. A more accurate measure would be to consider only those children covered by childcare services, but time series on the number of children enrolled in childcare services are unfortunately not available.

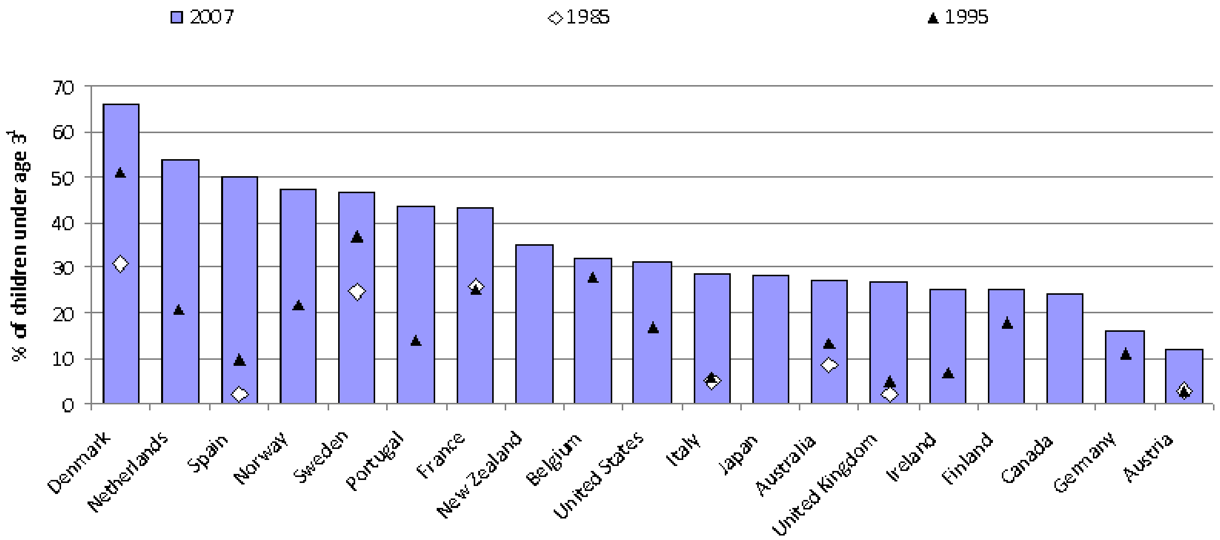
Figure 4: Childcare services for children under age 3

Panel A: Public spending on childcare services per child in % of GDP per capita[1]



2006 for Portugal.
Spending includes childcare and day care services, home help for families, and a suite of family social services.
1) Spending per child is calculated for each year on the basis of all children under age 3, enrolled in childcare services or not.

Panel B: Proportion of children enrolled in formal childcare services[1]



Data source: OECD Family Data Base (2011)
Enrolment rates relate to all children covered by public and private childcare services.

In most countries, the expansion of childcare coverage for children below age 3, as illustrated in Figure 4 Panel B, is one consequence of the increasing investment in childcare services made by governments. Differences in coverage are still large, however, between Denmark, where about 2/3 of under-3s have a place in day care centres, and Germany and Austria, which are at the other extreme. In Austria, care services cover only 12% of pre-school children. Most noticeable is also the relatively high enrolment rate of children in the US, despite the comparatively low public spending in this area. The development of the private sector explains this figure. Conversely, public spending on services per child under age 3 is relatively high in Finland and Italy with respect to total enrolment rates. This points to the absence of a strict linear relation or implication between the level of government spending and the coverage rate. This is not surprising since public investments depend not only on coverage rates, but also on parameters such as quality of services and the number of care hours available.

To sum up, OECD countries have considerably increased their expenditures to support families over the past decades. All types of support have been expanded to some extent: in-cash transfers towards families with children have been increased in many countries since the early 1980s, but the relative share of GDP per capita invested per child has grown at a slower rate since the mid 1990s or has decreased in some countries.

Leave entitlements for working parents have also been extended, but parental leave policies vary widely across countries. Overall, two types of leave schemes can be distinguished. First, countries which were pioneers in introducing parental leave entitlements provide comparatively long periods of leave (up to three years) with flat-rate payments, which make a return to the labour market difficult, especially for low qualified women. Second, countries where leave entitlements were introduced later and/or reformed recently offer shorter periods of leave, often combined with earnings-related payments and special incentives for fathers to take up parental leave (Nordic countries, Germany). This second type of leave scheme promotes a combination of work and family life for both parents and encourages mothers to participate in the labour market before and after childbirth. Overall, a polarization between countries can be observed between the two leave schemes over time. Only Germany has radically changed its leave policy scheme from the first to the second type, resulting in a drastic reduction in the number of paid leave weeks from 2007 on (a period not covered in the present study).

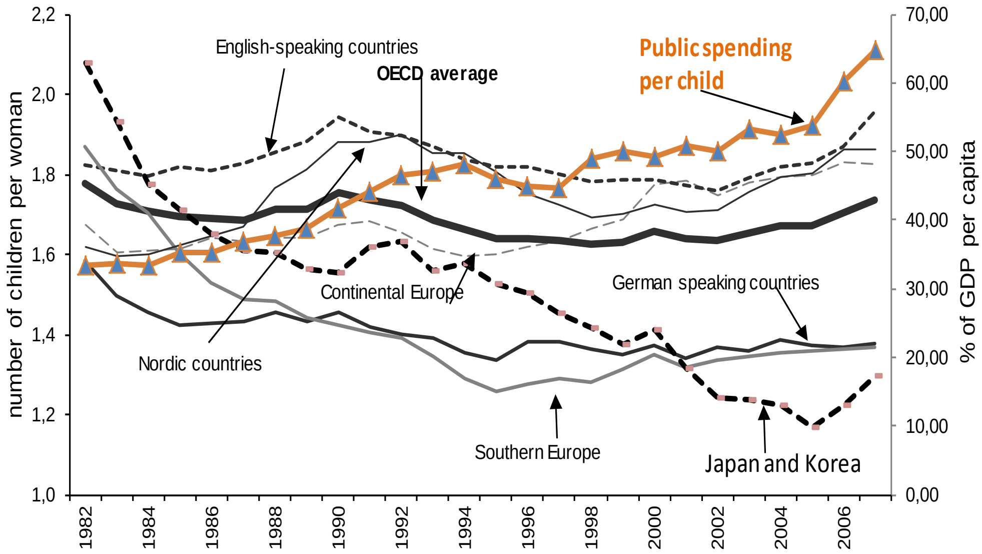
Last but not least, "in-kind" investments have increased considerably over the last decade as a consequence of growing demand for childcare services, giving rise to a large increase in the coverage of childcare services for infants and pre-school children. The percentage of children under the age of three enrolled in formal childcare services still varies widely, however, and is particularly low in German-speaking countries.

Overall, remarkable differences still exist across countries in the way policy instruments are combined to provide support to families. Differences especially concern the extent and form of support provided to working parents with children under age three (Thévenon, 2011a). In that respect, Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden) outdistance the other OECD countries, providing comprehensive support to working parents with very young children (below 3 years of age). English-speaking countries (Australia, Canada, Ireland, United Kingdom New Zealand, and the United States) provide much less in-time and in-kind support to working parents with very young children, while financial support is greater but very much targeted on low-income families and on preschool children. Continental and Eastern European countries form a more heterogeneous group with a more intermediate position. Two exceptions are France and Hungary, which provide relatively generous support for working parents compared with other countries of this group.

Figure 5 shows the fertility trends across OECD countries since the early 1980s. A steep decline can be observed in Japan, Korea, the German-speaking countries and in southern European countries, where fertility still remains low. By contrast, fertility rates have recovered strongly in countries of Continental and Nordic Europe, and in English-speaking countries. Figure 5 also shows that in parallel to the fertility upturn in several OECD countries, average public expenditures for families in OECD countries increased over the same period. In some cases, this rise started to accelerate slightly before the fertility rebound, suggesting that the development of family policies played a positive role. In the following, we empirically assess the influence of these policies on fertility trends in OECD countries.

Figure 5: Total fertility rates and average government spending for families

TFR (left-hand scale) and public spending (right-hand scale)



Geographical areas are defined as follows: Anglophone (Australia, Canada, New Zealand, United Kingdom, United States); Nordic (Denmark, Finland, Norway, Sweden); Continental (Belgium, France, Netherlands); German-speaking (Austria, Germany); Southern Europe (Greece, Italy, Spain). Government spending per child includes expenditures on family benefits, childcare services, leave and other payments made around childbirth. The average is calculated for 18 countries for which data are available, including Denmark, Netherlands, Spain, Norway, Sweden, Portugal, France, New Zealand, Belgium, United States, Italy, Japan, Australia, United Kingdom, Ireland, Finland, Germany, Austria.

1.5. Time series properties and cross-section dependence

Given that fertility and government spending for families both appear to exhibit a positive time trend, we carry out a set of stationarity tests for individual country time-series as well as panel unit root tests (Maddala and Wu, 1999; Pesaran, 2007) before starting our empirical investigations. The test results are reported in tables A2 and A3 in the appendix. Ultimately, in the case of the present data characteristics, and given the caveats of individual country and panel unit root tests, the results show that nonstationarity of fertility and policy variables *in* *levels* cannot be ruled out; however, the assumption of stationarity of *first difference* variables is not rejected in most cases by individual country and panel unit root tests. This suggests that estimations based on first difference variables and on System-GMM procedures suggested by Blundell and Bond (1998) are an accurate way to control for non-stationarity of data series.

We also test for cross-section dependence in data series (the results are presented in table A1 in the appendix). Based on average variable cross-country correlation coefficients and the Pesaran (2004) CD test, our tests provide strong evidence for the presence of cross-section correlation within the sample. In such a case, two-way fixed effects transformation should be able to eliminate all the cross-section dependence in the data *if* policy parameters and the influence of the unobserved common factor(s) are identical across countries (Cloakey et al., 2006). Diagnostics of the regressions residuals are theoretically useful to check whether the required properties of cross-section dependence and stationarity are met or not. However, our data panel is highly unbalanced (Table 1), so we cannot investigate cross-section dependence in further detail with the formal CD and stationarity tests of residuals, as they require the panel to be balanced or only weakly unbalanced.

Table 1: Summary statistics for 18 OECD countries, 1982 - 2007

Variable	Obs	Mean	Std. Dev.	Min	Max
total fertility rate (TFR)	N=518 n=18 T=28	1,69	0,27	1,16	3,23
tempo adjusted fertility rate	N=266 N=13 T=20.4	1,85	0,22	1,34	2,36
spending on cash benefits per child (%GDPpc)	N=517 n=18 T=27.2	5,80	3,40	0,37	14,44
spending per birth around childbirth (%GDPpc)	N=426 n=18 T=22.4	22,07	21,68	0,00	107,36
nb. paid leave weeks	N=551 n=18 T=28.9	36,22	40,62	0,00	172,00
enrolment young children (0-2) in childcare	N=341 n=18 T=17.9	22,20	15,17	0,90	66,00
spending on childcare services per child (0-2) (%GDPpc)	N=440 n=18 T=23.1	15,40	14,64	0,06	53,39

GDP per capita	N=532 n=18 T=28	23138	5593	9610	40533
female employment rate (25-54)	N=500 n=18 T=26.3	65,37	13,11	27,30	89,60
women's avr. working hours	N=357 n=17 T=21	1735,08	168,09	1244,73	2229,13
unemployment rate (25-54)	N=476 n=18 T=25	6,48	3,33	1,16	20,89
labour market protection	N=434 n=18 T=22.8	2,00	1,03	0,20	4,10
share of non-marital births	N=415 n=18 T=21.8	27,27	14,32	1,00	56,00
mean age of mothers at childbirth	N=463 n=18 T=25.7	28,59	1,19	25,97	31,20
mean age of mothers at 1st childbirth	N=359 n=18 T=27.1	27,01	1,42	24,02	30,70

Data Sources: OECD Family, Social Expenditures and Employment Data Bases

II. Empirical Procedure

To estimate the impact of family policies on fertility trends in developed countries, we use five family policy measures as exogenous variables in our empirical analysis. Policy variables were constructed for 18 OECD countries[4], for which information is available over the years 1982 to 2007. Three of the five family policy variables measure public expenditure per child (as detailed in the former section). The first two concern benefits paid to families, divided into two categories to separate the support granted around childbirth from that received at a later stage:

- Spending *per birth* (in % of GDP per capita), including maternity, paternity and parental leave benefits as well as birth grants
- Spending on cash benefits *per child* under age 20 (in % of GDP per capita) (tax transfers and spending for childbirth not included)

[4] Denmark, Netherlands, Spain, Norway, Sweden, Portugal, France, New Zealand, Belgium, United States, Italy, Japan, Australia, United Kingdom, Ireland, Finland, Germany, Austria.

- Spending on childcare services *per child* under age three (in % of GDP per capita)

Two further family policy variables are used to capture leave and childcare policies:

- The number of paid leave weeks, adding maternity leave weeks and the number of parental leave weeks that women are entitled to take after maternity leave *per se*
- Childcare enrolment of children under age 3 (as a percentage of the total number of children of this age group)

For most of our empirical analysis, we use total fertility rates *(TFR)* as endogenous variable. The *TFR* by year and country is the best *available* measure to compare fertility trends between countries. However, total fertility rates are likely to be biased measures of fertility, as they are sensitive to changes in women's mean age at childbearing. Birth postponement is likely to lower this period measure even if the completed family size stays unchanged. In order to control for changes in the timing of childbirth, we control our regression results for increases in mothers' age at childbirth. We also use tempo-adjusted fertility rates (*adjTFR*) besides general *TFR* as endogenous variable.

We empirically test with linear regressions whether our family policy variables are associated with fertility response variables while using information at the country level as well as on the time period level. Formally, we model fertility trends as follows:

$$f_{it} = \alpha_i + \beta * p_{it} + T_t + c_{i.}t + \varepsilon_{it} \qquad [1]$$

where f_{it} stands for fertility and p_{it} stands for our policy variables. T_t stands for period-specific fixed-effect and, $c_i t$ denotes country-specific time trends, α_i stands for country fixed-effects and ε_{it} stands for country and time-specific random shocks. The time controls are important as time-specific fertility trends may bias the estimated impact of family policies on fertility, for example if policies are ramped up when fertility is decreasing rapidly. Family policies may also be ramped up when fertility is high in order to support households' standard of living and to increase the opportunities for women to combine work and family [5]. However, three of our policy variables are measures of public expenditure per child. The per-child measures are, in principle, –not affected by increases in fertility, which limits (but does not eliminate) potential endogeneity problems. Different estimation procedures are run to address the concerns linked to non-stationarity of data series, potential omitted variables and endogeneity.

We start with a pooled Ordinary Least Squares (OLS) regression with time dummies and country-specific time trends that are assumed to capture the influence of the other unmeasured factors. Robust standard errors are reported to circumvent the potential heteroscedasticity of standard errors due to variations in population size of women of reproductive age across countries.

In the next step, we disentangle the impact of policy changes over time from country-constant characteristics that affect fertility levels by applying a two way Fixed Effects estimator[6] which adds country-specific dummy variables to the time dummies and the country specific time trends.

The introduction of country-constants (country-specific dummy variables) produces the same effect as when performing regressions in deviations from country means. This differencing process eliminates unobserved country-specific variables that are constant over time. The FE estimator thus reduces the risk of omitted variable bias (OVB) and also controls for the fact

[5] The model was also tested without these time trends but the results did not change dramatically. We present the results that include the time trends since their coefficient are statistically significant for most countries.

[6] We compare the fixed effects model to a random effects (RE) model, which captures both within and between-country variation. The RE estimator subtracts a fraction of averages from each corresponding variable and therefore also controls for unobserved country heterogeneity. If the number of observations is large, the RE model is more efficient than the OLS and the FE model, but only on the assumption that the unobserved effects are uncorrelated with the error term. If this is the case, unobserved country-specific variables that are constant over time are captured by an additional residual and the estimators are unbiased and asymptotically consistent. We use a Hausman (1978) test to invalidate the hypothesis that the unobserved country effects are not correlated with the error term in the RE model. For our data, the fixed effect specification is better than a random effects specification for controlling for unobserved country-heterogeneity.

that fertility can be set at different levels across countries. By cutting out country-heterogeneity, the FE estimator focuses on within-country variations and therefore allows identifying a *causal* effect of policy settings on fertility. We also perform a Between Effects estimator (BE) based on time averages of each variable for each country in order to compare within- and between-country variations[7].

The country and time fixed effects estimation with country-specific time trends proves to be the regression model best able to capture the impact of family policies on fertility. We nonetheless apply a series of robustness tests including controls for reverse causality between fertility and the policy variables (endogeneity), for time lagged reaction of fertility response to policy variation, for dynamics of adjustment and for non-stationarity:

In order to control for endogeneity, we introduce lagged exogenous variables into our country and time fixed effects estimation with country-specific time trends. We perform an IV-regression in two steps by using time-lagged observations as instruments for current observations for those policy variables that are most likely to be endogenous (child care expenditure, child care enrolment). The use of lagged exogenous variables lessens the risk of obtaining biased and inconsistent estimators due to reverse causality between the endogenous and the exogenous variables. For example, TFR observed in 2007 cannot impact child care expenditure in 2006. At the same time, it is likely that variations in fertility resulting from changes in child care expenditure appear time-lagged. Of course, the use of time-lagged variables represents only a “second best” option for controlling for endogeneity, as this procedure cannot completely rule out a potential estimation bias caused by reverse causality. The best option would be to substitute each family policy variable by a proper instrumental

[7] Estimation with a Mean Group estimators (MG) would also, in theory, better capture the heterogeneous influence of policies on fertility trends across countries (Pesaran and Smith, 1995). However, since our panel is relatively short and especially unbalanced, the standard errors obtained with this procedure are quite high and probably overestimated (Cloakey *et al.*, 2001). T-statistics might be affected, while the pooled and fixed effects estimators have an efficiency advantage over the mean group estimator in small T samples. For this reason, we do not report the results of MG estimation. They are available on request.

variable that is highly correlated with the family policy variable but not correlated with fertility. As variables which meet these requirements are not available, we make do with lagged observations as instruments for current policy observations. At the same time, the use of lagged exogenous variables allows us to account for possible time delays in fertility responses to policy changes. We therefore estimate our models with one-year lags as well as with five-year lags to see how far the timing of policy implementation corresponds to the timing of fertility change.

Moreover, the impact of family policies on fertility is likely to depend on the countries' initial fertility level, as assumed, for example, by Gauthier and Hatzius (1997) and D'Addio and Mira d'Ercole (2005). The fertility equation is then re-written with the lag of the dependent variable included as a regressor accounting for the "dynamics of adjustment". Since our panel is relatively small (n=18) and short (T=18) when series on childcare enrolment rates are included, the estimation of a fixed-effect model with lag dependent variables is likely to produce biased coefficients as the lagged variable is correlated with the error term (Nickell, 1981). A System GMM estimation of the dynamic equation is carried out to address this issue. It also helps to control for endogeneity and omitted variable bias, and limits the risk of spurious regressions due to non-stationarity (Blundell and Bond 1998). To do so, the System GMM estimator combines a set of first-differenced equations with equations in levels as a "system", and uses different instruments for each estimated equation simultaneously. This involves the use of lagged levels of the exogenous variables as instruments for the difference equation, and the use of lagged first-differences of the exogenous variables as instruments for the levels equation. The use of lagged exogenous variables is useful to limit inconsistencies raised by possible endogeneity, while difference variables control for omitted (time-constant) variables as well as for non-stationarity (see the discussion of the time-properites of data in the Appendix)[8]. These controls are imperfect, however, as lagged levels are likely to be poor instruments for differences, and differences are likely to be weak instruments for levels. Moreover, the use of so many instruments produces a risk of model over identification. In order to reduce the number of instruments, we apply the System GMM estimator to reduced data which contain only observations of every 5 years (1985-2005), highlighting long-term variations. We report the statistics of the Sargan test of over-identifying restrictions and the Sargan difference statistics. As the System GMM model combines several important constraints, we keep the two-way fixed effects model with country-specific time trends as preferred estimation model.

Finally, we control the two-way fixed effects model with country-specific time trends for potential side-effects and birth postponement. We therefore introduce a series of control variables among the regressors, as policy settings and fertility can also be influenced by the economic and institutional context. We start by adding the log of GDP per capita (measured at purchasing power parity in constant 2005 US $) and its squared term to the five policy variables. This procedure allows controlling for a convex impact of economic development on fertility, as suggested by Luci and Thévenon (2010). In a second step, we control for female employment rates (women aged 25-54). We also add female average working hours to compensate for the fact that women's full-time equivalent employment rates are not available for large parts of our sample. We control for these variables, as the measured impact of family policies on fertility risks will be biased if policies affect female employment and women's working hours, which are correlated with fertility. For the same reason, we add unemployment rates (ages 25-54) and a measure for employment protection, which allows controlling for the labour market context. Finally, we add the share of non-marital births as a

[8] Regression diagnostics (correlogram, Dickey Fuller 1979) suggest that all time series are difference stationary, implying that System GMM controls for non-stationarity (spurious regression) by the integration of first-differenced equations.

proxy for changes and differences in gender and family norms. The addition of control variables certainly causes multicollinearity problems. A correlation between exogenous variables implies that interpreting the estimated coefficients becomes difficult, as we cannot ascribe the change in the endogenous variable to a certain determinant. However, we are primarily interested in the sign and significance of the estimated coefficient of our five policy variables and not in quantifying the estimated impact of our control variables on fertility. As we consider the economic context, women's emancipation and societal norms as important factors for fertility, we prefer to reduce the risk of an omitted variable bias (OVB) by putting up with multicollinearity. At the same time, we abstain from introducing further control variables (one might think, for example, of access to and costs of housing and health care as other important determinants of fertility) to not further increase the problem of multicollinearity (and endogeneity) as well as to not further reduce the number of observations.

To control for birth postponement, we finally add two different measures of mothers' age at childbirth to the regressors, and we substitute our endogenous variable TFR with tempo-adjusted fertility rates (*adjTFR*). The tempo-adjusted fertility rate is intended to measure fertility levels within a given period in the absence of postponement (Bongaarts and Feeney, 1988; Sobotka, 2004). By weighting *TFR* by changes in women's mean age at childbirth, this adjusted measurement focuses on the quantum-component of fertility changes. However, *adjTFR* only corresponds to a pure quantum measure of fertility on the assumption of uniform postponement of all stages, i.e. an absence of cohort effects (Kohler and Philipov, 2001). Consequently, *adjTFR* only controls imperfectly for tempo effects.

III. Regression results

Table 2 shows the regression results for the OLS[9]-, country-fixed effects, country- and time-fixed effects and between effects estimation models. Country-specific (linear) trends are included and statistically significant for most countries. Results for the other variables are not much changed when trends are removed, however.

Table 2: The impact of family policies on fertility: static setting for 18 OECD countries (1982-2007)

Endogenous variable:	**total fertility rate (*TFR*)**				
Type of regression:	Pooled OLS	Time Fixed Effects	Time & Country Fixed Effects	Time & Country Fixed Effects	Between Effects
Regressors:					
spending on cash benefits per child (%GDPpc)	0.0185** (2.72)	0.0304*** (4.32)	0.0424*** (4.70)	0.0457*** (4.66)	0.0251 (1.74)
spending per birth around childbirth (%GDPpc)	0.00136 (1.39)	0.00206 (1.96)	0.00438*** (4.42)	0.00426*** (4.30)	0.00319 (0.57)
nb. paid leave weeks	-0.0000603 (-0.22)	-0.0000944 (-0.47)	-0.0000193 (-0.08)	-0.0000934 (-0.37)	-0.00209 (-0.88)
enrolment young children (0-2) in childcare	0.000868 (0.68)	-0.00254 (-1.78)	0.00675*** (3.78)	0.00678*** (3.85)	0.00997 (1.00)
spending on childcare services per child (0-2) (%GDPpc)	-0.000709 (-0.67)	-0.000973 (-0.82)	0.00279 (1.54)	0.00303 (1.68)	-0.00593 (-0.66)
ln(GDP per capita)				0.388 (1.22)	
country specific time trends	yes	Yes	yes	yes	no
time dummies	no	Yes	yes	yes	no
country dummies	no	No	yes	yes	no
constant	1.484*** (27.33)	1.474*** (13.05)			1.383*** (7.19)
N	274	274	274	274	274
nb. of countries[¥]:	18	18	18	18	18

[9] As regression diagnostics suggest that heteroscedasticity is a possible issue in our data, we also use the OLS estimator with "heteroscedasticity-consistent" standard errors. Compared to the regression results of column 1, the use of heteroscedasticity-consistent standard errors changes the t-statistics only marginally and leaves the estimated coefficients and their significance unchanged (results available on request).

time period:	1982-2007	1982-2007	1982-2007	1982-2007	1982-2007
R^2:	0.843	0.872	0.999	0.999	0.439 (between)
R^2 adj.:	0.829	0.845	0.999	0.999	0.206

t statistics in parentheses, * p<0.05, ** p<0.01, *** p<0.001. Robust standard errors in brackets.
¥*Denmark, Netherlands, Spain, Norway, Sweden, Portugal, France, New Zealand, Belgium, United States, Italy, Japan, Australia, United Kingdom, Ireland, Finland, Germany, Austria.

The time and country fixed effects regression with country-specific linear time trends show the most significant results. Columns 3 and 4 show that the null-hypothesis stating no impact of family policy settings on fertility can be rejected for three of our five policy variables. The results suggest a positive impact on fertility of income support over childhood, as measured by spending on cash benefits per child[10]. This is also the case for spending per birth around childbirth (leave and birth grants) and childcare enrolment. Expenditure on childcare per child has no significant impact on fertility when both childcare variables are included simultaneously in the regression. Regressions not reported here show that the two childcare coefficients do not change in sign or significance when either childcare enrolment or childcare expenditure are included separately.

The OLS regression in column 1 explains 84% of the overall variation. The FE regressions have a much higher goodness of fit because of the introduction of time- and country-specific effects. A FE regression with only country dummies obtains a goodness of fit of 12% , i.e. 12% of the variations can be explained by between-country variations (results not shown here). Between country-variations account for 44% (column 5), while the adjusted R^2 only amounts to 21%. Adjusted R^2 represents a corrective for R^2, because R^2 automatically increases with the number of estimated coefficients (i.e. the number of exogenous variables in the estimation equation). Adjusted R^2 penalizes an addition of explanatory variables if they have no real explanatory power. The insignificance of the estimated coefficients along with

[10] We also use an alternative variable which measures income from child benefits including tax allowances for a single-earner couple earning 100% of average earnings. We find a significantly positive impact of this expenditure measure on fertility. However, this variable is only available for a limited number of countries and time periods, and the significance is lower in comparison with spending on cash benefits per child (p<0.05).

the high R^2 and the relatively low adjusted R^2 indicate that unobserved country-specific effects explain most of the fertility variance in the Between Effects model. We therefore consider the BE model to be inappropriate for our empirical analysis. We try to capture these country effects by adding control variables in a later step (table 4). Even though within-country variations of family policies and fertility are smaller to between-country variations, only the Fixed Effects models produce significant coefficients of policy variables, indicating that variations of policies over time within a country are more appropriate than policy differences between countries to explain the fertility variations in our data set. For this reason, we consider the time- and country- Fixed Effects model with country-specific linear time trends as the most appropriate for the purpose of our analysis. Moreover, as the FE model captures only within-country variations, this model is more appropriate than the OLS or BE model for disentangling the "causal" impact of policy changes over time from country-constant characteristics. Finally, the FE model reduces a potential omitted variable bias by eliminating country-specific variables that are constant over time.

In order to take time effects fully into account and to further control for potential endogeneity, we now introduce time-lagged exogenous variables in the two-way Fixed Effects model with country-specific time trends. We instrument child care expenditure and child care coverage with its lagged levels. We also present a System GMM estimation, which not only controls for endogeneity (along with omitted variable bias and non-stationarity), but also for dynamics of adjustment (by introducing a lagged endogenous variable among the regressors). The results are presented in table 3. Columns 1 and 2 present the Fixed-Effects results with both childcare variables integrated as lags, while column 1 includes a one-year lag and column 2 a five-year lag. Column 3 presents the System GMM estimation with lagged TFR among the exogenous variables, based on data containing only observations for every five years (in order to significantly reduce the number of instruments).

Table 3: The impact of family policies on fertility: time lags and dynamic setting for 18 OECD countries (1982-2007)

Endogenous variable:	total fertility rate (*TFR*)		
Type of regression:	2SLS (1)	2SLS (2)	System-GMM (3)
Regressors:			
spending on cash benefits per child (%GDPpc)	0.0364***	0.0341***	0.0139**
	(4.98)	(4.16)	(3.01)
spending per birth around childbirth (%GDPpc)	0.00583***	0.00529***	- 0.00094
	(4.99)	(3.64)	(- 0.81)
nb. paid leave weeks	0.000402	-0.000168	- 0.0000974
	(1.69)	(-0.77)	(- 0.23)
enrolment young children (0-2) in childcare	0.00912***	0.0133***	0.00414**
	(5.48)	(3.72)	(2.66)
spending on childcare services per child (0-2) (%GDPpc)	0.00592	0.00661	0.0017
	(1.95)	(1.38)	(0.89)
lag [TFR]			0.713**
			(11.87)
country specific time trends	yes	yes	no
time dummies	yes	yes	yes
country dummies	yes	yes	no
constant			0.269**
			(2.62)
N	253	195	59
nb. of countries: ¥	18	18	18
time period:	1982-2007	1982-2007	1985, 1990, 1995, 2000, 2005
Sargan (p-value):			0.035
Sargan-Difference (p-value):			0. 078
Instruments for first differences equation:			L1 of all exogenous variables
Instruments for levels equation:			D1 of all exogenous variables

t statistics in parentheses, * p<0.05, ** p<0.01, *** p<0.001

¥Denmark, Netherlands, Spain, Norway, Sweden, Portugal, France, New Zealand, Belgium, United States, Italy, Japan, Australia, United Kingdom, Ireland, Finland, Germany, Austria.

(1) Two stage least squared (with 1-year lags of child care variables as instruments) and with time and country dummies
(2) Two stage least squared (with 5-year lags of child care variables as instruments) and with time and country dummies
(3) System GMM (on 5 -year obs.) with lagged TFR among exogenous variables

Columns 1 and 2 show that spending on cash benefits, spending per birth and child care enrolment are still positively correlated with fertility when controlling for endogeneity. Moreover, column 2 of table 3 shows an increased coefficient for childcare enrolment in comparison to column 1 in table 3 and column 3 and 4 in table 2. This suggests a time-delayed response of fertility to changes in the supply of child care facilities. This time-delay tends to exceed one year, which is rather intuitive as fertility changes take at least nine months to be realized.

The System GMM results confirm a positive impact of spending on cash benefits and child care enrolment for fertility. Spending per birth becomes insignificant, while lagged levels of fertility capture most of the fertility variations. The control for dynamics of adjustment lessens the informative value of the model intending to capture the impact of family policies on fertility, so we decided to continue our estimations without controlling for the dynamics of adjustment. Moreover, the relatively small p-values of the Sargan tests (not significantly higher than 0.05) suggest that our model is over-identified. In addition, as our data base is limited to 5-year observations, the number of observations is very small, so we prefer to continue robustness checks with the Fixed Effects specification.

As the BE results in table 2 indicate that unobserved country-specific variables do play an important role for fertility variations, we now add further control variables to the two wayFE specification with country-specific time trends, country- and time dummies. These control variables account for the main factors of fertility besides family policies (economic development, women’s emancipation, the labour market context, societal norms). Table 4 presents the regression results.

Table 4: The impact of family policies on fertility: addition of *control variables*

Endogenous variable:	**total fertility rate (*TFR*)**					
Type of regression:	Country & Time FE	Country & Time FE	Country & Time FE	Country & Time FE	Country & Time FE	Country & Time FE
Regressors:						
spending on cash benefits per child (%GDPpc)	0.0451***	0.0371***	**0.0191****	0.0252***	0.0194**	0.0298***
	(4.57)	(4.07)	**(3.04)**	(3.89)	(2.84)	(3.86)
spending per birth around childbirth (%GDPpc)	0.00420***	0.00507***	**0.00292***	0.00231*	0.00285*	0.00163
	(4.20)	(3.83)	**(2.29)**	(2.01)	(2.16)	(1.18)
nb. paid leave weeks	-0.0000504	-0.000167	**0.000463***	0.000430*	0.000514*	0.000620*
	(-0.19)	(-0.65)	**(2.09)**	(2.08)	(2.24)	(2.51)
enrolment young children (0-2) in childcare	0.00658***	0.00473*	**0.00889*****	0.00672**	0.00860***	0.00789***
	(3.83)	(2.21)	**(4.11)**	(3.12)	(3.60)	(4.08)
spending on childcare services per child (0-2) (%GDPpc)	0.00305	0.00332	**0.00259***	0.00277*	0.00255	0.00178
	(1.69)	(1.87)	**(2.07)**	(2.35)	(1.89)	(1.17)
ln(GDP per capita)	-6.743					
	(-0.80)					
ln(GDP per capita)²	0.358					
	(0.84)					
female employment rate (25-54)		**0.0158****	**-0.000267**	-0.00586	-0.000678	-0.00326
		(3.23)	**(-0.06)**	(-1.47)	(-0.16)	(-0.60)
women's avr. working hours			**-0.000629****	-0.000767***	-0.000621**	-0.000630*
			(-2.73)	(-3.65)	(-2.70)	(-2.50)
unemployment rate (25-54)				-0.0149***		
				(-3.82)		
labour market protection					0.0178	
					(0.73)	
share of non-marital births						0.00767
						(1.75)
country specific linear time trends, country dummies and time dummies	yes	yes	yes	yes	yes	yes
N	274	268	228	228	222	191
nb. of countries:	18 [1]	16 [2]	16 [2]	16 [2]	16 [2]	14 [3]
time period:	1982-2007	1982-2007	1982-2007	1982-2007	1982-2007	1982-2007

For all specifications, all significant policy variables turn out to have a positive impact on fertility. Furthermore, column 1 of table 4 shows a convex impact of economic development on fertility– a result which is in line with Luci and Thévenon (2010). This confirms a minimum in the association between GDP per capita and TFR, implying that an increase in GDP per capita decreases fertility for low levels of GDP per capita and increases fertility from higher GDP-levels on. In our model, however, GDP turns out to be insignificant, as family policies seem to capture most of the fertility variations. Luci and Thévenon (2010) find also that fertility upturns are observed only in OECD countries where female labour market participation is associated with economic development. This is why we substitute GDP with female employment in the next step.

Columns 2 and 3 present estimates of the impact on family policies while controlling for women's labour market participation. These estimates actually give the most important insight into the drivers of fertility presented in this paper. Column 2 shows that employment rates for women (aged 25 to 54) are positively correlated with TFR, while childcare enrolment is barely significant. Once we add women's average working hours to the control variables (column 3), however, childcare enrolment becomes a lot more significant, and childcare expenditure and the number of paid leave weeks also become significant. At the same time, financial transfers lose their importance for fertility. The fact that women's working hours are negatively correlated with fertility reveals that work-life balance policies such as childcare services and parental leave are important for fertility once women enter paid work. Even though financial transfers seem to be less important in comparison to work-life balance policies for women who work and want children at the same time, they are still relevant. This suggests that it a mix of different family policies is the most efficient way to support families with children, as the needs of parents and children are very heterogeneous, not only between countries, but also between groups within countries.

Finally, adding further control variables to the exogenous variables does not change our conclusions. A mix of work-life balance policies and financial support is confirmed to be the most effective strategy to enable parents to realize their fertility intentions. Labour market insecurity, as measured by unemployment, has a significantly negative impact on fertility. This suggests that most households require financial security and a predictable future to start a family or to have more children, as underlined by Adsera (2011) and Sobotka et al. (2011).

Labour market protection and the share of non-marital births are both found to be positively correlated with fertility rates, even though the coefficients are not significant. Both coefficients become significant after female employment and female working hours are dropped, while the significance of family policy parameters does not change (results not shown here).

In the last step, we control for birth postponement by empirical investigations presented in table 5. We apply the two-way fixed effects model with country-specific time trends while keeping female employment and women's working hours as control variables. We add the mean age of mothers at childbirth and at first childbirth as control variables, and we substitute the endogenous variable TFR by tempo-adjusted fertility rates.

Table 5: Control for birth postponement

Endogenous variable:	*TFR*		tempo adj. *TFR*
Type of regression:	Country & Time FE	Country & Time FE	Country & Time FE
Regressors:			
spending on cash benefits per child (%GDPpc)	0.0174**	0.0225*	0.0498***
	(3.17)	(2.50)	(4.05)
spending per birth around childbirth (%GDPpc)	0.00373**	0.00350*	-0.000737
	(3.18)	(2.45)	(-0.57)
nb. paid leave weeks	0.000277	0.000385	-0.000395
	(1.37)	(1.47)	(-1.09)
enrolment young children (0-2) in childcare	0.0109***	0.00882***	-0.00157
	(6.50)	(3.89)	(-0.80)
spending on childcare services per child (0-2) (%GDPpc)	0.00261*	0.00296	0.00334*
	(2.15)	(1.30)	(2.06)
female employment rate (25-54)	-0.00682	0.00585	0.0109
	(-1.59)	(1.07)	(1.62)
women's avr. working hours	-0.000664**	-0.000493*	-0.000174
	(-3.00)	(-2.03)	(-0.75)
mean age of mothers at childbirth	-0.243***		
	(-5.50)		
mean age of mothers at 1st childbirth		-0.0744***	
		(-3.51)	
Country-specific linear time trends, country dummies and time dummies	yes	yes	yes
N	210	174	120
nb. of countries:	16[1]	16[1]	11[2]
time period:	1982-2007	1982-2007	1982-2007

t statistics in parentheses, * p<0.05, ** p<0.01, *** p<0.001

[1] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, New Zealand, Norway, Portugal, Spain, Sweden, UK

[2] Austria, Denmark, Finland, Ireland, Italy, Japan, Norway, Portugal, Spain, Sweden, USA

The higher the mean age of mothers at childbirth, the lower the total fertility rates. All significant policy variables keep their positive sign even when controlling for birth postponement. Once again, a combination of financial transfers and work-life balance policies is likely to encourage fertility. Childcare enrolment loses its significance when TFR is substituted with tempo-adjusted fertility rates. However it would be imprudent to conclude that childcare coverage influences the timing of births more than the fertility "quantum", because the use of tempo-adjusted fertility rates as endogenous variable considerably reduces the number of observations, since for 7 out of 18 OECD countries, this variable is not available. As this concerns countries in which the recent fertility rebound has been quite large (such as France, the Netherlands, New Zealand, Belgium or the UK), estimation results based on tempo-adjusted fertility rates have only limited explanatory power.

IV. Discussion

How do our results corroborate previous findings? In order to answer this question, we compare our findings to those of recent cross-national key studies which provide some assessments of the impact of family policies on fertility trends in economically advanced countries[11]. The findings of these studies differ for reasons such as the use of different fertility indicators and different policy variables, as well as different geographical and period coverage. Since we use a comprehensive range of policy markers, our results help to understand some of the contradictory results obtained by former studies. The interpretation of our result is limited, however, by the fact that variations in TFR are a consequence of both changes in fertility timing and in the total number of children, and tempo-adjusted fertility rates provide debatable estimates of variations in fertility "levels". Comparing our results to those of other studies using other measures gives a clearer picture of the scope and limits of our own results. By doing so, some general conclusions on policy effectiveness can be drawn.

[11] We review here only studies based on cross-national data, but many micro-level studies for single countries are available. For a more complete review, see Sleebos (2003) or Thévenon and Gauthier (2011).

Table 6 summarises the key results of the most recent cross-national studies analysing the effect on fertility patterns of family policies in the areas of financial support, parental leave and childcare[12]. Three studies – Gauthier and Hatzius (1997), Adsera (2004) and D'Addio and d'Ercole (2005) – are directly comparable to our study as they use the same measure of fertility – total fertility rates. Hilgeman and Butts (2009) use a different fertility measure, the number of children ever born for women aged 18-45. Kalwij (2010) uses retrospective data on fertility history to differentiate the influence of policies on the timing of births and completed family size.

Family policy characteristics are also captured with different indicators. A first difference lies in the way the generosity of financial support for families is measured. D'Addio and d'Ercole (2005) use the difference in net disposable income of a single earner family with two children and average earnings compared to those of a childless household with same earnings to approximate the financial support received by families. This covers family support provided by tax allowances as well as by cash benefits (although variations across different household types are not accounted for). By contrast, both Gauthier and Hatzius (1997) and Kalwij (2010) only consider family cash benefits. Gauthier and Hatzius (1997) measure the generosity of family benefits as a percentage of average wages, while Kalwij (2010) considers the average amount of public expenditures per child below age 16 for employed women. In our study, we use both approaches and obtain similar results for both measures of financial support.

[12] The list of key contributions could easily be extended if our aim was to survey the literature, which is beyond the scope of the present paper. In general, the evidence suggests that while family benefits do significantly reduce the direct and indirect costs of children, their effect on fertility per se is limited. Furthermore, while family benefits have an effect on the timing of births, their effect on the final fertility choices of individuals is contested (Thévenon and Gauthier, 2011).

Table 6: Comparison of results of cross-national studies

		Gauthier and Hatzius (1997)	Adsera (2004)	D'addio and Mira d'Ercole (2005)	Hilgeman and Butts (2009)	Kalwij, 2010		Present study
Explained variable		or 3 and more children separately)	Total fertility rates	Total fertility rates	Achieved fertility at age 18-45	Timing of birth	family sizee	Total fertility rates
Country and period – methodology		22 OECD countries 1970-1990 - Panel data methods	28 OECD countries 1960-1997 - Panel data methods-	16 OECD countries 1980-1999 - Panel data methods	20 OECD countries, 1995-2000 waves of European or World Value Surveys – cross-sectional multilevel approach	16 European countries - Event history analysis Information on individual fertility history from the European Social Survey 2004		OECD countries 1982-2007 – Panel data methods
Childcare provisions	*Enrolment rates*				Positive	Not included		Positive
	Spending per child	-	-	-	-	No effect	Positive	Positive
	Spending per child (all leave included)	-	-	-	-	Positive	No significant effect	Positive
Leave entitlements	*Payment rate of maternity leave*	Negative but statistically insignificant	-	Positive	Not significant	-		-
	Duration	Positive but statistically insignificant	Positive	Negative	Negative	Not included		Positive
Financial transfer		Positive	-	Positive	-	No effect	No effect	Positive

Besides our study, three other studies consider the duration of paid leave entitlements (Gauthier and Hatzius, 1997; D'Addio and d'Ercole, 2005; Hilgeman and Butts, 2009). Hereby, D'Addio and d'Ercole (2005) as well as Gauthier and Hatzius (1997) consider maternity leave only, whereas our study also takes into account the number of weeks of maternity and parental leave. Leave payment conditions are also assessed differently: replacement rates during maternity leave are taken into account by Gauthier and Hatzius (1997) and D'Addio and d'Ercole (2005). Kalwij (2010) considers only the average leave-related expenditure per child below age one, while in our study we sum the annual expenditures per child for maternity and paternity leave, for parental leave and for birth grants.

Finally, only 3 studies include information about childcare services. Kalwij (2010) includes childcare expenditures (consistent with his expenditure-based approach), while Hilgeman and Butts (2009) test the impact on fertility of enrolment of children below age 3 in formal childcare. Our study includes both childcare expenditure and enrolment.

The results of the cited studies are quite diverse but some general conclusions can be drawn. The present study, like those of Gauthier and Hatzius (1997), and D'Addio and Mira d'Ercole (2005), finds that cash transfers have a positive effect on fertility. We also find that the average amount of cash benefits granted in the period after the year of childbirth has a large positive impact on TFR. This impact is confirmed when adjusted-tempo fertility rates are taken into account to control for changes in the timing of births, suggesting that these cash benefits impact not only the timing of births but also have a quantum effect on fertility. This finding contradicts Kalwij (2010), who finds no significant effect of gross public family spending per child for European countries, either on the probability of having children or on completed family size.

Results regarding the influence of leave entitlements also vary across studies, which is not unexpected given the potentially ambiguous effect of these entitlements on fertility. On the one hand, these entitlements support household income and labour market participation around the time of childbirth, which has a positive effect on fertility. However, as entitlements are often conditional on employment, they encourage men and women to postpone childbirth (which has a negative effect on overall fertility) until they have established themselves in the labour market. This ambiguity is likely to explain the variable results reported in Table 5. Similarly to Adsera (2004), we find that an increase in paid leave duration has a positive impact on fertility rates once we control for female employment and female working hours. Gauthier and Hatzius (1997) find a similar positive but not statistically significant result. Controversially, D'Addio and Mira D'Ercole (2005) find a negative impact, but their model does not control for the development of childcare services for children below 3 years of age. However, leave duration tends to be longer in countries where the provision of childcare services, which parents can substitute for parental care, is less developed. In these circumstances, it is very likely that the identified negative impact of leave duration captures partially the impact of a shortage of childcare services for very young children. In all, we find that the effect of the duration of leave entitlements is small.

The income received for childbirth in the form of payments associated with leave or birth grants also affects fertility behaviour, as pointed out by the different studies. D'Addio and Mira d'Ercole (2005) find a positive impact of maternity leave payments on fertility rates, while Gauthier and Hatzius (1997) find an insignificant impact. Our study, which combines a comprehensive measure of different kinds of payments received for childbirth, finds a small positive effect of leave payments on fertility. This small influence is likely to illustrate a timing effect on childbearing, as suggested by Kalwij (2010) who finds that leave-related expenditures impact the timing of births but not completed fertility levels.

Evidence from cross-country and national studies almost invariably points to a positive effect of formal childcare on fertility patterns. Kalwij (2010) finds that childcare subsidies have no effect on the timing of births, but do have a positive effect on second and higher-order births and completed family size. Hilgeman and Butts (2009) find a significant effect of childcare enrolment on the total number of children ever born for women aged 18-45 in the early 2000s.[13] We also find a strong positive effect of childcare provision on fertility. This highlights the important role of childcare services in avoiding a conflict between childbearing and labour market participation for mothers. We find that not only family policy instruments but also female employment is positively correlated with fertility. The finding of a negative impact of female working hours on fertility suggests that possibilities to combine work and family life play an important role in women's decision to have children once they are actively participating in the labour market.

Moreover, when combining family policies with female employment and women's working hours, we find that all policy instruments (paid leave, childcare services and financial transfers) have a cumulative positive influence on fertility, suggesting that a continuum of support, especially for working parents, during early childhood is likely to facilitate parents' choice to have children. Nordic European countries and France are examples of this mix. Policy levers do not have similar weight, however. We find that in-cash and in-kind benefits covering the first year after childbirth have a larger potential influence on fertility than leave entitlements and benefits for childbirth.

Certain unobserved factors may influence fertility behaviour by enhancing the effectiveness and coherence of the family policy mix (Thévenon, 2011b). These factors ensure that the policy instruments *comprehensively* support parents' work-life balance, for example by

[13] National studies for Nordic countries corroborate the positive effect of childcare on fertility rates (Rindfuss *et al.*, 2010). They also find that reductions in the cost to parents of affordable good-quality childcare can have a substantial effect on fertility rates, especially when childcare provision is widespread (Mörk, *et al.*, 2009).

avoiding a gap in the sequence of support between the expiry of leave entitlements and the provision of childcare services, by providing childcare services that match parents' working hours, or by guaranteeing a stability of policies over time. Our results suggest that a comprehensive family policy mix is likely to have important quantum effects on fertility, i.e. parents do not only change the timing of childbirth, but they actually decide to have *more* children. However, the controls for birth postponement applied in this paper are imperfect. More accurate controls are necessary to be able to identify the pure quantum effect of family policies. Combining macro data with individual observations facilitates these controls. Micro data can reveal when, *in a life cycle perspective*, family policies encourage parents to have (additional) children. How family policies are linked to age-specific fertility is left to future exploration.

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APPENDIX

A1. Cross-section dependence in the data

In this section we investigate the potential for cross-section dependence in the data. In table A1 we report the Pesaran (2004) Cross-section Dependence (CD) test statistics. This test is based on the average of the pairwise correlation coefficients between all country series ($\hat{\rho}_{ij}$). The CD statistics is defined in the case of unbalanced panel as follows :

$$CD = \sqrt{\left(\frac{2}{N((N-1)}\right)}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\sqrt{T_{ij}\hat{\rho_{ij}}}\right)$$

Where T_{ij} is the number of observations used to estimate the correlation coefficient between the series in country i and j and CD $\sim N(0,1)$ for $T_{ij}>3$ and sufficiently large N under the null assumption of cross-section independence. This test is robust to the presence of nonstationary processes, parameter heterogeneity or structural breaks, and was shown to perform well even in small samples (Moscone and Tosetti, 2009).

Table A1 Cross-section Dependence

	TFR	Cash benefits	Childcare spending
Variables in levels			
Average correlation	0.16	0.06	0.35
p-value	0.00	0.00	0.00
Variables in first differences			
Average correlation	0.20	0.05	0.07
p-value	0.00	0.05	0.00
AR regression residuals (2-way Fixed Effects)			
Average correlation	-0.05	-0.04	-0.02
p-value	0.00	0.01	0.08

H0 : cross-section independence of data series.

The first rows of table A1 investigate the variable series in levels. Average correlation varies considerably across the variables, but the cross-section independence is rejected at $p < 0.01$ for all variables. The next rows show the average correlations for the data in first differences which give a similar rejection of the cross-section independence of data series. Finally, the last rows report CD statistics and the mean correlations across countries for the residuals from autoregressions run for each variable with country and time fixed effects. We use an AR(2) regression model to reduce serial correlation that should not be confused with cross-section correlation. The correlations and cross-section dependence statistics are then based on the residuals from these AR regressions. The cross-section average correlations of the residuals are low but the CD tests do not suggest that they are all cross-section independent.

A2. Time-series properties of the data

In this section we report results relating to the time-series properties of the data. Since the time dimension of the panel is limited (T range from 18 to 28 depending on variables), we first carry out Augmented Dickey-Fuller tests for the variable series within each individual country (Dickey and Fuller, 1979). The time-series unit root test rejection frequencies for variables in levels and in first differences are shown in table A2 where we report the share of countries (in %) for which the null hypothesis (nonstationarity) is rejected.

For the large majority of countries the ADF tests for the variables in levels cannot reject nonstationarity, and the tests of trend stationarity give similar results. Conversely, the tests suggest that data series are difference stationary for a large majority of countries – though the proportion is lower for the spending in childcare services[14]. In these circumstances, differencing variables may be accurate to get stationary series and to avoid spurious regressions.

Table A2 Time-series unit root tests – rejection frequency

	TFR	Leave	Cash benefits	Childcare spending
Testing for levels-stationarity				
ADF test without trend	16	5	11	0
Testing for trend-stationarity				
	TFR	Leave	Cash benefits	Childcare spending
ADF test with trend	11	5	5	11
Testing for difference-stationarity				
ADF test with drift	84	89	95	63

The share of countries (out of N =) for which the respective unit root test is rejected at 5% level of significance is reported in the table. All unit root tests for variables in levels contains an intercept term and three lags to account for possible serial correlation in the estimated equation. ADF refers to the augmented Dickey-Fuller test, which has the null hypothesis of nonstationarity.

Next we apply panel unit root tests to the data. These were developed to make use of the desirable property of increased power from pooling the results of many low-powered country unit root tests. Note that rejection of the unit root null hypothesis does not imply that the panel is stationary, but rather that the variables series do not follow a unit root process *in all countries*. Table A3 presents the results for the Maddala and Wu (1999) panel unit root test and for the Pesaran (2007) test assuming cross-section dependence between countries. For both tests, the null assumption is that all the data series follows a unit root process, so that they are non-stationary.

For all variables except the TFR, the non-stationarity for all country series is strongly rejected for all specifications. The results for the TFR are more mixed, with the Maddala-Wu tests (and Levin-Lin-Chu and Im-Pesaran-Shin tests not reported here) rejecting the null assumption, while the Pesaran (2007) test suggests that all TFR level series are nonstationary. Since cross-section dependence between data series is also suggested (section above), we are more confident with these latter results.

[14] It needs to be emphasized that country-specific unit root tests suffer from low power, in particular in the case where the persistence in the variable is high – i.e. in the case when the test matters most (Harris, 1994).

Here again the test results are very similar to those applied to individual countries, with a high acceptance of the null assumption that all variables *in level* are nonstationary. Conversely, the assumption that first difference variables are non-stationary in all countries is rejected by the data.

Table A3 Panel unit root tests

Maddala & Wu (1999) unit root test

	TFR		Leave		Cash benefits		Childcare spending	
Variables in levels :ADF equation contains intercept								
Lags	χ^2	*p*	χ^2	*p*	χ^2	*p*	χ^2	*p*
0	101.2	0.00	16.4	0.99	18.7	0.99	22.7	0.95
1	52.6	0.03	14.9	0.99	32.3	0.64	129.5	0.00
2	82.5	0.00	17.3	0.99	33.7	0.57	22.2	0.96
Variables in levels : ADF equation contains intercept & trend								
	TFR		Leave		Cash benefits		Childcare spending	
Lags	χ^2	*p*	χ^2	*p*	χ^2	*p*	χ^2	*p*
0	18.0	0.99	8.9	1.00	26.1	0.88	31.45	0.68
1	26.4	0.87	9.00	1.00	33.2	0.59	85.3	0.00
2	49.4	0.06	9.1	1.00	44.2	0.16	21.1	0.97
Variables in first differences : ADF equation contains drift								
	TFR		Leave		Cash benefits		Childcare spending	
Lags	χ^2	*p*	χ^2	*p*	χ^2	*p*	χ^2	*p*
0	222	0.00	254	0.00	263	0.00	276	0.00
1	88.3	0.00	119	0.00	148	0.00	186	0.00
2	80.3	0.00	71.6	0.00	109	0.00	76.1	0.00

Pesaran (2007) test

	TFR		Leave		Cash benefits		Childcare spending	
Variables in levels :ADF equation contains intercept								
Lags	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*
0	0.07	0.53	4.7	1.00	4.0	1.00	0.4	0.65
1	0.32	0.62	4.8	1.00	1.5	0.93	0.8	0.78
2	-0.04	048	5.6	1.00	4.0	1.00	1.5	0.94
Variables in levels : ADF equation contains intercept & trend								
	TFR		Leave		Cash benefits		Childcare spending	
Lags	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*
0	2.6	0.99	5.3	1.00	1.7	0.96	-0.06	0.47
1	3.2	0.99	4.9	1.00	1.2	0.89	0.21	0.58
2	5.1	1.00	5.3	1.00	2.5	0.99	2.5	0.99
Variables in first differences : ADF equation contains drift								
	TFR		Leave		Cash benefits		Childcare spending	
Lags	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*	$\overline{Zt}$	*p*
0	-7.8	0.00	-3.9	0.00	-8.0	0.00	-6.7	0.00
1	-3.3	0.00	-1.7	0.04	-4.2	0.00	-3.1	0.00
2	0.3	0.62	2.6	0.99	-1.4	0.07	2.5	0.99

The null assumption is nonstationarity in *all* countries' variable series, the alternative stationarity in *some* countries' variable series.

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