Childcare and Maternal Labor Supply – a Cross-Country Analysis of Quasi-Experimental Estimates from 7 Countries

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Abstract

The effect of childcare availability on maternal labor supply varies greatly by institutional context. The evaluation of inter-dependencies is difficult based on single country estimates, as they differ both in their context and empirical methodology. We provide comparable quasi-experimental estimates of the childcare effect for 7 EU countries using harmonized data and the same method, based on country-specific kindergarten eligibility cutoffs and representative labor force data. The effect is highly dependent on the relative level of maternal labor supply compared to that of mothers of older children, which, in turn, is determined by leaves, norms, and labor market flexibility.

Keywords: subsidized childcare, maternal labor supply, institutional context

JEL Codes: H24, J13, J22

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1. Introduction

Previous evidence on the effect of subsidized childcare availability on maternal labor force participation (LFP) suggests that the effect varies greatly among countries due to differences in their institutional contexts, including family policies, labor market flexibility cultural norms for instance (Cascio, Haider, and Nielsen 2015a; Vuri 2016). Yet there is little evidence on exactly how the childcare effect varies with these factors, and policymaking is mostly limited to general targets for childcare coverage – for example, the EU's Barcelona Targets[1] – that are not linked to reforms of other potential limiting factors. This paper provides quasi-experimental estimates of the childcare effect for 7 EU countries (Austria, Czech Republic, France, Greece, Hungary, Italy, Slovakia) with varying institutional contexts, based on harmonized data and the same quasi-experimental methodology. The exogenous variation in childcare availability used for identification comes from country-specific kindergarten eligibility cutoffs around age 3 of children. We evaluate the country-level estimates in light of the cross-country variation in their family policies, labor market flexibility, and cultural norms, paying special attention to what is relevant at the point of estimation within each country. The results allow us to better evaluate differences in childcare effect estimates due to the institutional context by keeping the data quality, estimation method, and child age at measurement fixed across countries with varying contexts. They provide important implications regarding the potential effectiveness of childcare expansion: it needs to be paired with further policy steps in order to be effective, especially in the case of the countries with low childcare availability and maternal labor supply.

Methodologically, recent empirical research on the childcare effect has increasingly turned towards quasi-experimental methods based on policy changes or birthdate-based eligibility cutoffs. This is because childcare effect estimates may be biased due to omitted variables such as the economic development of regions, which affects the number of available childcare seats (through more abundant municipal resources) as well as the labor supply of mothers (through higher expected employment probabilities). While quasi-experimental estimates

[1] The European Union set specific targets for its countries in 2002 and renewed them in the Europe 2020 Strategy, prescribing a 33% coverage rate for children under 3, and a 90% coverage rate for those between 3 and the mandatory school age by 2010 (EC 2013, 2008). While most previous estimates pertain to western countries with relatively supportive environments and already high maternal labor supply rates, little evidence is available from settings with very different institutional contexts, such as the Southern and Central-Eastern European countries. Since most of these countries are significantly behind in fulfilling the targets and expansion places a high financial burden on them, it is important to assess the expected labor market impact accurately given their particular context.

allow for better identification of the childcare effect due to the exogenous source of variation, it is important to note that they are local in nature, and therefore highly dependent on the estimation context, the age of the child at measurement, and the method of estimation. The comparison of single-country estimates is therefore not very informative regarding the causes of the cross-country differences of the childcare effect, as these may stem from methodological as well as contextual differences. A recent study highlights the relevant factors that most probably drive the differences (Cascio, Haider, and Nielsen 2015b), based on a review of single country estimates. First, the labor supply characteristics of mothers by child age are key. Specifically, the relative labor supply of mothers at a given child age, compared to that of mothers with older children, strongly determines the magnitude of the childcare effect. The scope for policy to increase labor supply is higher when the targeted mothers' relative rate is low, since the difference reflects a qualified workforce that is potentially ready to enter the labor market in the short run. Second, interdependencies with other institutional elements - such as child-related leaves, labor market flexibility, and cultural norms - are also important, as these affect labor supply incentives and preferences at a given child age. The effect of childcare expansion may be limited by the lack of job protection, flexible work opportunities, or unfavorable views on early maternal employment and institutionalized childcare. These factors also impact the overall pattern of maternal labor market reactivation process after giving birth by child age.

Quasi-experimental evidence from various countries seems to be in line with these points. No effect or a very small effect was found in the US (Cascio 2009; Fitzpatrick 2010), and France (Givord and Marbot 2015), where maternal employment rates of the treatment groups were already high. A more significant impact was found in Spain (Nollenberger and Rodríguez-Planas 2015), in 1996 Germany (Bauernschuster and Schlotter 2015), and in Hungary (Lovasz and Szabo-Morvai 2013) in settings where pre-treatment maternal employment rates were significantly lower. Some studies discuss the role of the leave system and cultural views in constraining the childcare effect (Givord and Marbot 2015; Nollenberger and Rodríguez-Planas 2015), and that of highly qualified mothers and the lack of childcare alternatives in magnifying it (Bauernschuster and Schlotter 2015). While quasi-experimental studies focus on estimating the causal effect of a single policy, a strand of policy literature analyzes the roles of various family policy elements and cultural norms in shaping maternal LFP based on cross-country comparisons (Boca, Pasqua, and Pronzato 2009; Cipollone, Patacchini, and Vallanti 2014). These show that the availability of childcare - especially under age 3 -, the existence of job-protection and well-paid leave that are neither too short nor too long, flexible job opportunities, and cultural support for maternal employment are correlated with the relatively higher participation and working hours of mothers compared to childless women (Boeckmann, Misra, and Budig 2014). These findings provide a basis for considering which institutional elements to include in the cross-country comparison of the childcare effect.

The uniform data and methodology used in our analysis allow a focused cross-country comparison of the role of the institutional context in determining the childcare effect. We estimate the causal effect of childcare availability for several countries utilizing the exogenous variation due to eligibility cutoffs for precise identification. The analysis combines representative harmonized European Labour Force Survey (EU LFS) data from 7 countries (covering 2005-2012), country-level information on birthdate-based kindergarten enrollment cutoffs and procedures provided by country experts and confirmed using further data sources, and country-specific institutional characteristics based on various data sources, such as the OECD Family Database, and the European Social Survey. As a first step, we discuss the countries' institutional contexts and document the country-level differences in the timing of mothers' labor market return after the birth of a child relative to major changes in family policy elements. The countries show distinct patterns that we use to group them into a few institutional categories, based on which we discuss our expectations of the childcare effect. Next, we estimate the effect on maternal LFP separately for each country, using an IV approach where date of birth serves as an instrument for childcare availability and potential seasonality biases are corrected for. We then compare these estimates in light of the institutional contexts, paying special attention to what is relevant to mothers' decisions at the exact point of estimation, or child age.

This study adds to the literature by being the first to provide harmonized and comparable quasi-experimental estimates of the effect of childcare on maternal labor supply for several countries that represent varying institutional contexts. Although the size and representativeness of the sample of countries analyzed is limited by the requirements of the estimation method, the existence of a cutoff, and data availability, the comparison reveals clear differences in the childcare effect between the groups of countries that point to specific policy implications. The EU countries included in the analysis vary enough in their institutional contexts to provide internationally policy relevant implications. The results show that the childcare effect is the highest in CEE countries, where at this child age, maternal participation is still relatively low compared to that of mothers with older children, and leaves with job protection are just ending. We find less evidence of an impact in Southern EU countries, where leaves end at a much earlier age, and maternal participation at older child ages is low. Western EU countries show some impact, despite the already high maternal participation rates prior to this age. The results suggest that for childcare expansion to have a high impact on maternal labor supply in countries with relatively low childcare coverage and maternal participation, parallel reforms of the leave system and laws related to flexible work and shaping of public opinion are key.

2. The Role of the Institutional Context

To outline how the institutional context affects the quasi-experimental estimates of this paper, we first give a brief overview of the previous empirical findings in the literature on the determinants of maternal labor supply. We review the available evidence on the role of each factor, and consider the possible interactions of childcare availability and other factors. We then discuss the differences in these measures among our sample of countries and those for which previous single-country quasi-experimental childcare effect estimates are available, and group them into more general categories. We derive hypotheses regarding their likely impact on the childcare effect, which we analyze empirically later on. Finally, we present figures depicting the timing of mothers' return to the labor market over the age of their youngest child, highlighting country-level differences, the relationship of maternal participation and the timing of relevant policy changes, and the points at which our estimations are carried out.

2.1. Key institutional characteristics

Previous evidence on the effects of various family policies on maternal labor supply come from three main sources: quasi-experimental evidence, structural estimates, and cross-country analyses. Evidence on the effect of childcare availability from single countries is highly variable. One strand of studies focuses on structural models and generally utilizes regional and time variation for identification. Some support the existence of a childcare effect (Connelly 1992; Del Boca 2002; Haan and Wrohlich 2011; Kimmel 1992; Lokshin 2004), while others find little or no significant impact (Chevalier and Viitanen 2005; Chone, Leblanc, and Robert-Bobee 2003; Ribar 1995). Several recent studies use exogenous variation in childcare availability related to policy changes, or utilize eligibility cutoffs to identify the childcare effect. Some find a significant positive impact (Baker, Gruber, and Milligan 2008;

Bauernschuster and Schlotter 2015; Berlinski and Galiani 2007; Bettendorf, Jongen, and Muller 2015; Gelbach 2002; Givord and Marbot 2015; Haeck, Lefebvre, and Merrigan 2015; Hardoy and Schøne 2015; Lefebvre and Merrigan 2008; Nollenberger and Rodríguez-Planas 2015), while others find no effect (Cascio 2009; Fitzpatrick 2010; Havnes and Mogstad 2011; Lundin, Mörk, and Öckert 2008). Cross-country comparisons also suggest that subsidized childcare availability under age 3 of children is strongly correlated with maternal labor supply (Boeckmann, Misra, and Budig 2014; Budig, Misra, and Boeckmann 2012).

Regarding the leave system, evidence suggests that both the lengths and the benefit amounts of the leaves available to mothers are important factors in determining maternal labor supply. Previous studies suggest that moderately long, well-paid leaves increase maternal LFP (Boeckmann, Misra, and Budig 2014; Keck and Saraceno 2013; Olivetti and Petrongolo 2017). Very short - or non-existent - leaves constrain the opportunities of women to reenter their jobs, and discourage women from higher income households to return to work. On the other hand, very long, low-paying leaves may lead - especially low-skilled - mothers to become detached from the labor market and the depreciation of their skills, as well as increased statistical discrimination against mothers and women (Boeckmann, Misra, and Budig 2014). In our cross-country analysis, we focus on a few aspects of leave policies: the length of paid leave (and job protection) available to mothers, and the amount of the benefit that is available to mothers during the leave. Previous available evidence on the interactions of leaves and childcare availability suggest that non-optimal leaves may restrict the effect of childcare expansion (Geyer, Haan, and Wrohlich 2015), and that the lack of childcare may limit the positive effect of leaves (Cukrowska-Torzewska 2015).

The flexibility of labor markets is also an important factor in determining mothers' labor market status, though it lies outside the direct realm of family policies. Empirical evidence so far mainly focuses on the effect of part-time work opportunities on maternal LFP. The employment rate of mothers with young children has been shown to be strongly correlated with the availability of part-time work opportunities: part-time work may provide mothers with a means to strengthen their attachment to the labor market and keep their skills up to date, while allowing for a more gradual separation from their child. Furthermore, the quality (related job protection, social benefits and earnings) of the available part-time jobs also has a significant impact (Del Boca 2002).

Cultural norms have also been shown to be strongly correlated with maternal outcomes, and unfavorable attitudes towards maternal labor force participation may limit the effectiveness of family policies. Studies seek to identify the effect of culture on maternal labor market outcomes in several ways. One study compares migrants with different cultural values, who live in the same economic and institutional setting, finding a significant impact (Fernandez 2007). Other studies use various available indices describing views on child development and female employment, to show that they affect maternal outcomes (Budig, Misra, and Boeckmann 2012; Fortin 2005). The interdependencies of policies and norms have been discussed extensively in social policy studies (Pfau-Effinger 1998), however, the relationship is very difficult to identify empirically, and remains mostly unclear (Kremer 2007). Overall, evidence suggests that norms may limit the effectiveness of family policies (Budig, Misra, and Boeckmann 2012). A 2010 report of the European Commission (Mills et al. 2014) on the evaluation of the fulfillment and effectiveness of the Barcelona childcare targets also notes the importance of norms related to parenthood, institutionalized childcare, and parental preferences at the country level, and the need for these norms to be shaped through raising public awareness.

Finally, the role of alternative childcare options, including private and informal care, is also important to consider. Private childcare plays an important role in some western European countries, but is very scarce and unaffordable to most people in the CEE countries. On the other hand, informal childcare is highly common in several of the countries we study, particularly the CEE and southern European countries, due to the presence of a large inactive elderly population and the relatively low mobility in these countries. Informal childcare may be important in allowing mothers of younger children to work, especially when formal childcare is rationed (Ghysels 2011; Posadas and Vidal-Fernández 2012). This may be especially true in countries where views are generally unsupportive of institutionalized care at young child ages, such as the CEE countries (Saxonberg and Sirovátka 2006).[2]

Though each of these factors have been shown to play a role in determining maternal participation, there is little direct evidence on their interactions with each other, and with childcare availability in particular. Budig and coauthors (2012) show that cultural attitudes moderate the impact of policies on women's earnings across countries. Cukrowska-

[2] The former socialist countries were characterized by a very well developed childcare system, with relatively high nursery school coverage under age 3, which was dismantled following the transition. Nursery schools, however, were not considered pedagogical institutions, but rather healthcare ones, and were not regarded positively by the population.

Torzewska (2015) estimates the effect of various policy measures on maternal employment and wages, based on individual level data from 28 European countries, allowing for the interaction of childcare availability and leave policies. The findings indicate that the impact of leave is dependent on childcare availability: long maternity leaves combined with high childcare coverage lead to a higher gap in the employment of mothers and non-mothers compared to settings where the coverage is low. The study of Geyer and coauthors (2015) from Germany analyzes the combined effect of the expansion of subsidized childcare and a simultaneous reform of the leave system that increased the benefit amount but reduced the length available. It does so using a structural model, as the exogenous variation in the two factors did not occur at the same time. It finds that a combination of parental leave benefits and subsidized childcare can increase maternal labor supply significantly. In this study, we focus on the estimation of the effect of childcare availability, and evaluate how the other relevant factors may impact this effect based on the cross-country comparison of a set of high internal validity, but very local childcare effect estimates.

2.2. Estimation context

2.2.1. **Country-level characteristics**

The sample of countries included in our analysis is determined by data availability and the existence of kindergarten eligibility cutoffs that are necessary for the identification strategy. The final set of 7 EU countries differ significantly in key aspects of their institutional environments, which are likely to influence the effect of childcare availability – specifically, kindergarten eligibility - on maternal labor supply. Table 1 summarizes the factors described in the previous subsection that play a role for maternal LFP. The countries in our analysis are included in the table, as well as further countries from which quasi-experimental evidence is available. The countries are grouped into categories by geographical regions, which are characterized by certain sets of institutional traits that are likely to impact maternal LFP similarly. At the same time, there is variation in the key factors among countries within these regions, which we also discuss.

The CEE countries in our sample exhibit some strong similarities due to their shared socialist institutional and historical heritage (Lovász 2016). CEE countries generally have very low maternal participation rates below age 3 of children, but relatively high rates at older child ages. Formal childcare enrollment shows a similar pattern, with the lowest rates at age 2 of children among the EU countries. CEE countries provide very long leaves to mothers (parents), with job protection and high amounts of cash benefits even at age 3 of children. Family policies therefore clearly encourage mothers to stay home until around this age. The low availability of part-time jobs is also not conducive to mothers' earlier return to work, and informal childcare plays a relatively important role due to the presence of a large inactive elderly population. Views are less supportive of maternal employment compared to western European countries, despite the socialist rhetoric of gender equality, or as a response to it.

Maternal participation rates in the Southern European countries are higher under age 3 of children compared to CEE countries, but their increase is relatively minor as children grow older. Childcare enrollment rates are higher at age 2 as well, and, in the case of Spain, relatively high overall within the EU. Leaves for mothers are much shorter, and very short - 16 weeks - in the case of Spain, and cash benefits received at age 3 of children are significantly lower than in CEE. Part-time work makes up a higher proportion of jobs compared to the CEE, but still lower than what is seen in western EU countries. The southern EU countries are generally characterized by traditional cultural views and gender norms. Although their family policies do not explicitly encourage mothers to stay home, the short leaves, coupled, in some cases, with low childcare availability, and the unsupportive norms eventuate that many mothers do not return to work after having a child, and fall out of the labor market completely.

The countries in the Western EU group are rather diverse in many aspects. Germany and Austria are generally traditional in cultural norms and were historically less supportive of female employment. However, they made significant changes aimed at increasing maternal employment, including the expansion of childcare under age 3, and are characterized by relatively high maternal employment and a high availability of part-time jobs. France and Sweden represent some of the western countries that are most known for supporting gender equality, with Sweden often being cited as a role model in terms of policies supporting maternal employment and gender equality. These western EU countries exhibit the highest maternal participation rates and childcare enrollment rates below age 3 of children, and which are further linked to very flexible labor market opportunities.

The US and Canada are included in the table due to the significant strand of empirical evidence (see Col. 12 in Table 1) on the childcare effect available for these countries. They are generally characterized by relatively high maternal employment under age 3 of children. State support available to mothers is significantly lower, with low formal childcare enrollment at both age 2 and 3, low cash benefit amounts, and very short (or non-existent) leaves. On the other hand, these countries are generally characterized by liberal norms, supportive of gender equality and female employment. The final columns of the table summarize the available quasi-experimental estimates seen in previous studies and the countries analyzed in this paper, indicating the child age at which they were measured, and whether any significant effect was found. The table shows that the majority of the empirical evidence comes from Western European countries or North America, with much less evidence from Southern EU or CEE countries, which have very different institutional contexts, and therefore, likely different potential effectiveness of childcare expansion.

Table 1: Institutional characteristics of the countries in the estimation sample and previous studies

Region	Country	Maternal employment rate (%) at child age …			Childcare enrollment (%) at child age ..		Informal childcare	Child-related leaves			Labor market flexibility	Preferences / norms	Literature		
		0-2	3-5	6-14	2	3		Leave for mothers (weeks)	Total leave - average replacement rate (%)	Cash benefits at age 3 (%)	Share of female part-time in employment (%)	Child suffers	Reference	Age of child at the point of estimation	Effect
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
CEE	Czech Republic	20	70	87	7.0	41.9	24.3	110	51.1	16.4	10.0	.	.	.	.
	Hungary	12	63	75	16.7	60.2	18.9	160	44.5	23.0	9.0	54.7	Lovasz-Szabo-Morvai, 2013	3	+
	Slovakia	15	56	80	6.7	46.4	16.3	164	32.0	17.7	6.0	44.4	.	.	.
Southern EU	Spain	55	57	59	60.4	84.4	9.0	16	100.0	4.0	25.0	46.5	Nollenberger and Rodríguez-Planas, 2015	3	+
	Greece	50	54	59	28.7	49.1	32.5	43	53.9	5.2	12.5	65.3	.	.	.
	Italy	51	53	56	38.4	81.5	18.0	48	52.7	5.2	31.6	61.8	.	.	.
Western EU	Austria	67	74	82	26.5	54.7	18.7	60	85.3	12.6	46.0	54.8	.	.	.
	France	61	74	79	58.0	86.2	7.9	42	44.7	12.1	.	41.0	Givord and Marbot, 2015	pre-school	0
	Germany	52	70	78	.	.	6.1	58	73.4	15.1	47.1	49.8	Bauernschuster and Schlotter, 2015	3	+
	Netherlands	75	75	78	.	.	20.2	16	100	5.8	75.6	44.4	Bettendorf et al., 2015	0-12	0
	Sweden	.	.	.	84.5	87.6	.	60	63.4	7.8	36.3	31.0	Lundin et al., 2008	1-9	0
Americas	Canada	67	72	79	.	46.0	.	17	52.8	.	26.0	57.3[15]	Baker et al., 2008	0-4	+
		67	72	79	.	46.0	.	17	52.8	.	26.0	57.3[15]	Haeck et al., 2015	1-4	+
		67	72	79	.	46.0	.	17	52.8	.	26.0	57.3[15]	Haeck et al.,	5	0

													2015		
		67	72	79	.	46.0	.	17	52.8	.	26.0	57.3[(15)]	Lefebvre and Merrigan, 2008	4	+
	United States	56	62	70	.	66.0	.	0	0.0	4.3	17.0	.	Cascio, 2009	5	0
		56	62	70	.	66.0	.	0	0.0	4.3	17.0	.	Fitzpatrick, 2010	4	0

(1) Employment rate of mothers with youngest child aged 0-2, %. Source: OECD Family database, http://www.oecd.org/els/family/database.htm LMF1.2.C. Maternal employment rates by age of youngest child (2013)

(2) Employment rate of mothers with youngest child aged 3-5, %. Source: OECD Family database, http://www.oecd.org/els/family/database.htm LMF1.2.C. Maternal employment rates by age of youngest child (2013)

(3) Employment rate of mothers with youngest child aged 6-14, %. Source: OECD Family database, http://www.oecd.org/els/family/database.htm LMF1.2.C. Maternal employment rates by age of youngest child (2013)

(4) Own calculations using EU-SILC data for years 2005-2012 based on the methodology of OECD Family Database.

(5) Own calculations using EU-SILC data for years 2005-2012 based on the methodology of OECD Family Database.

(6) Own calculations using EU-SILC data for years 2005-2012 based on the methodology of OECD Family Database.

(7) Full-rate equivalent total paid leave for mothers (weeks). OECD Family database, http://www.oecd.org/els/family/database.htm PF2.1.A. Summary of paid leave entitlements (2015)

(8) Average replacement rate (%): proportion of previous earnings replaced by the benefit over the length of the paid leave entitlement for a person earning 100% of average national earnings. OECD Family database, http://www.oecd.org/els/family/database.htm PF2.1.A. Summary of paid leave entitlements (2015)

(9) Cash benefits and tax breaks at the child age of 3, relative to the median working age income, %. Source: Source: OECD Family database, http://www.oecd.org/els/family/database.htm

(10) Part-time employment as a % of all employment, 20-64 year-old females, 2013. Data source: Eurostat, http://ec.europa.eu/eurostat/data/database

(11) European Values Study, http://www.europeanvaluesstudy.eu/; Pre-school child suffers with a working mother. 0: Strongly disagree; 100: Agree strongly. Sample: 20-50 year-old females, waves 1999-2001 and 2008-2010

(14) "0": No significant effect or very small effect; "-": Significant negative effect; "+": Significant positive effect

(15) A pre-school child is likely to suffer if both parents are employed (0 - disagree strongly; 100 - agree strongly, rescaled) (1999). Source: Canadian Attitudes on the Family, http://www.imfcanada.org/sites/default/files/Canadian%20Attitudes%20on%20the%20Family.pdf

2.2.2. Timing and the point of estimation

Our study contributes to the discussion regarding childcare policies by providing comparable estimates from countries with a wider variety of settings. The comparison of the estimates also needs to take the point of estimation into account, as the incentives and constraints mothers face, and thereby the magnitude of the childcare effect, differs not only by country, but also by child age within countries. Most of the studies from Western Europe and the US found little or no evidence of a childcare effect, measuring at child ages (Table 1, Col. 13) at which maternal participation is already high relative to that of mothers with older children or females. In such settings, the potential for childcare policies to have an impact is low due to the already high rates. The three previous studies from settings where maternal participation is relatively low at the point of estimation, from Spain (Nollenberger and Rodríguez-Planas 2015), Hungary (Lovasz and Szabo-Morvai 2013), and Germany (Bauernschuster and Schlotter 2015), however, all point to a significantly higher childcare effect.

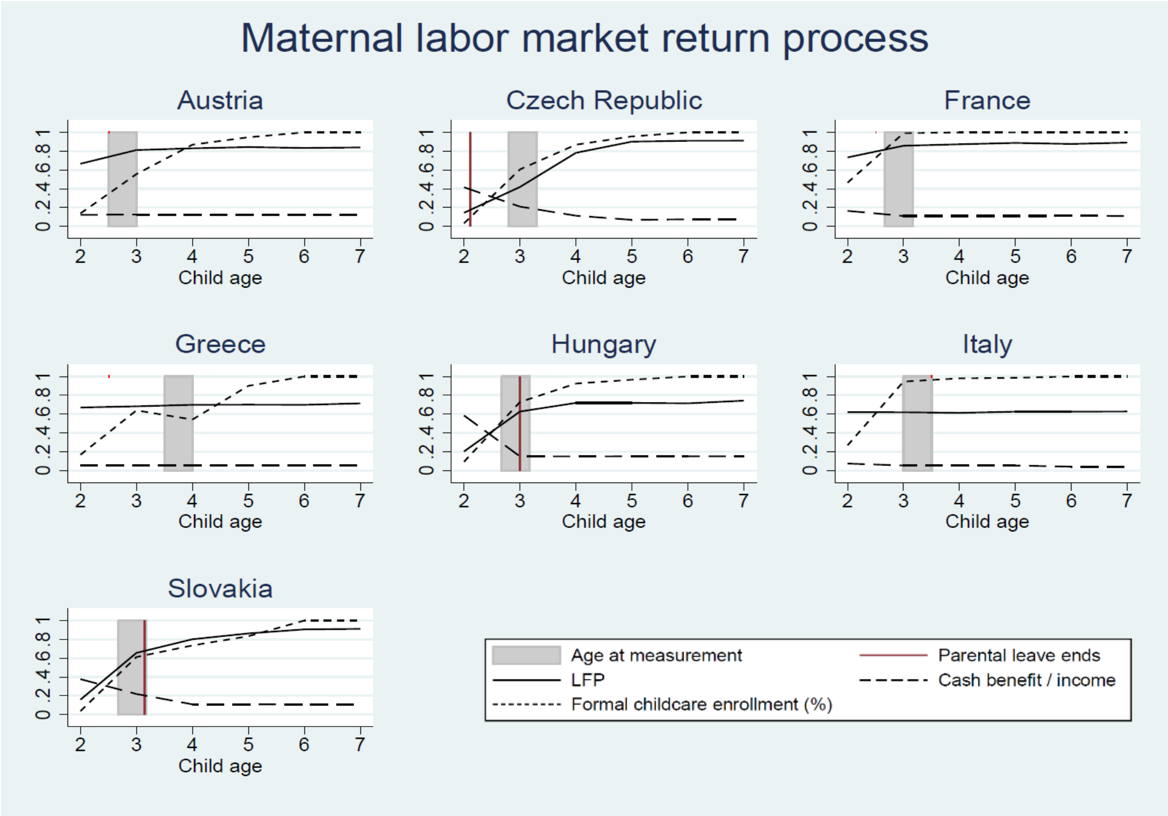
Figure 1 depicts the country-level variation in the timing of mothers' return to the labor market following the birth of their child for the sample of EU countries analyzed in this study, based on the EU-LFS data used in the analysis. It shows that the dynamics of mothers' return to the labor market as a function of the age of their youngest child is rather dispersed. The CEE countries (Czech Republic, Hungary, Slovakia) show the lowest rates under age 3 of children – in line with institutions that do not support employment under age 3 – but high rates at older child ages. The evolution of maternal LFP appears to be closely correlated with the evolution of childcare enrollment, and negatively correlated with the amount of cash benefits received related to the child. Maternal participation rates in the southern countries (Greece, Italy), on the other hand, are relatively stable as children age, with no significant increase when childcare enrollment increases. The two western countries in our sample (Austria, France) show higher maternal employment rates at all child ages, with a small increase around the time when childcare enrollment increases.

The figure also highlights the timing of important changes in the most relevant institutional factors, as well as the point of estimation of the childcare effect for each country in our analysis. Based on the country and child age level institutional characteristics and the point of estimation, we can form some hypotheses regarding its expected magnitude. The magnitude of the childcare effect is dependent on the characteristics at the point of measurement, but also on traits relevant at earlier and later ages, i.e. the overall characteristics of the institutions. The childcare effect in a given country at a given child age is likely to be higher if (a) there is an underutilized, qualified, and willing workforce of mothers available, i.e. if maternal participation is still low at the point of estimation relative to the long-run “potential” rate (LFP at higher child ages), (b) mothers are able to return to protected jobs, and are not financially or culturally dis-incentivized from doing so, and (c) mothers are able to return gradually with the aid of part-time jobs.

The location of the cutoff point and thus the point of estimation in terms of child age is relatively stable across countries. Our analysis focuses on kindergarten eligibility cutoffs around age 3 of children, which exist in several EU countries as a border between the lower coverage nursery schools and the high coverage kindergartens (Table 1, Cols 4-5). However, the labor market characteristics of mothers at the point of estimation – including their relative labor supply compared to their long-run rate - depend on the institutional system of each country, affecting the interpretation and external relevance of our estimates. For the CEE countries (Czech Republic, Hungary, Slovak Republic), leave is just ending or ended recently and cash benefits drop significantly at the child age when the eligibility cutoff affects mothers. At this point, maternal participation rates are still well below those of mothers with older children, but as children age, they rise markedly. This suggests that in our estimations, increased childcare availability around age 3 is likely to have a high impact in these countries, as there is a readily available maternal workforce, financial incentives and cultural norms encourage mothers to return to work around this age, and their jobs are still protected, making their return easier.

In the Southern EU countries (Italy, Greece), leave and job protection have ended long before the point of estimation, and maternal participation is at a low level, though not relative to rates seen for mothers of older children. Childcare availability is therefore expected to have a lower impact, since mothers who were willing and able to return to work had likely already done so using informal childcare arrangements and flexible work opportunities, so the willing and able unutilized workforce is likely to be smaller. For the Western EU countries in our sample, leaves of medium length have already ended as well, and cash benefits are also low around age 3. Although maternal participation rates are already high, they still show some growth after age 3 of children, suggesting that some unutilized workforce is still present at the child age when they are included in our analysis. Childcare availability may therefore still have an impact despite already high participation rates, though the magnitude is expected to be lower compared to CEE countries with larger potential workforces.

Figure 1: Maternal return to the labor market following childbirth by country (2005-2012)



Note: The LFP rates are calculated from EU-LFS data, and the child age reflects the age of the youngest child in the household. Formal childcare enrollment rates are based on EU-SILC information and the calculation method follows that of the OECD Family Database. The information regarding cash benefits comes from the OECD Family Database and reflect the total family cash benefit spending of each country at a given child age as a proportion of the median working-age household income. The graphs are based on yearly data in terms of child age.

3. Data and Methodology

The analysis of the effect of childcare availability on the participation of mothers is based on individual-level EU LFS data from 7 countries. The sample of countries is determined by (a) the availability of birth date and age information on the youngest child of mothers in the EU LFS dataset, and (b) the existence of a kindergarten eligibility cutoff. We first describe the details of these two conditions and the resulting estimation sample, then describe the instrumental variable approach used to estimate the childcare effect.

3.1. Dataset and variables

To apply our empirical approach, we utilize individual-level information on mothers' labor market activity and family status. In the EU LFS dataset, the exact day and month of birth of the youngest child are excluded for data security reasons, only the age (in years) of the youngest child in the household is observed, thus the quarter of birth is not directly observable in the data. However, when we observe at least 4 quarters of observations in a row, we can infer the quarter of birth by observing when their age changes. For the countries included in the analysis, we are able to construct a stochastic panel of at least 4 quarters by linking household observations over quarters. We utilize a linking procedure to link household observations over time, for each country where the data was originally collected as a panel dataset. Linking is based on exact matches (or logical increases/decreases) of 56 variables describing the household level characteristics, household composition, and individual characteristics of certain members of the household, like year of completing highest level of education. We then derive the birth month of the youngest child by observing in which quarter (wave) their age changes, and assigning the interview month when the older age is first observed as the quasi birthdate.[3] It is only possible to construct such panel data for countries where data was originally collected as a household panel and where the structure of the database is suitable,[4] which limits the possible number of countries included.

Once birth dates are derived for the youngest child observed in each household, we identify the mothers of the youngest child using the parent codes available in the dataset. We limit our sample to these mothers, those aged 20-50, and those who were born in the given country and are therefore more likely to share the country-specific beliefs and values. We utilize data for the years 2005-2012, for which the key variables are observed and harmonized for all of the countries in our sample. For each mother, we observe individual-level labor force participation, employment, other labor market characteristics, demographic characteristics such as age and education, family status and characteristics of their spouse, household level characteristics regarding their composition and dwelling, and the region of their household in

[3] Households differ in their month of observation within the quarter. When we observe a change in the youngest child's age between two quarters, we know that the birthdate of the child lies between the two interview months. We assign the month of the latter interview to the child as the month of birth, so the month of birth of each child is either in the month assigned, or in the two previous months. As a result, birth dates are known to a quarterly precision, and we have birth data with a monthly frequency. We take this into consideration when determining our treatment and control groups around the eligibility cutoff by excluding the 3-month birth date groups overlapping treatment and control birth periods.

[4] For instance, some countries submit samples of the national LFS quarterly, but some of them submit only once a year which prevents the linking process.

some countries. We also observe the birthdate of their youngest child, which is used to classify them into treatment (kindergarten eligible) and control groups, as described next. Table 3 depicts some descriptive statistics of the resulting dataset for the overall sample and the treatment and control groups respectively.

Table 2: Descriptive statistics of the sample by country (2005-2012)

	Austria	Czech Republic	France	Greece	Hungary	Italy	Slovakia
Mother's education:							
Lower secondary (%)	0.10	0.09	0.15	0.19	0.20	0.36	0.10
Upper secondary (%)	0.71	0.76	0.46	0.51	0.57	0.49	0.73
Tertiary (%)	0.19	0.15	0.39	0.29	0.24	0.14	0.17
Marital status:							
Widowed (%)	0.04	0.08	0.03	0.03	0.07	0.03	0.04
Single (%)	0.29	0.16	0.39	0.01	0.20	0.05	0.11
Married (%)	0.66	0.75	0.58	0.96	0.73	0.92	0.86
Mean age of mothers (years)	32.95	31.60	33.10	34.41	31.80	33.91	30.54
Number of observations	1046	985	1140	1953	1776	488	689
LFP rate (Q1[a], control) (%)	0.73	0.28	0.78	0.68	0.36	0.63	0.32
LFP rate (Q1[a], treatment) (%)	0.77	0.38	0.83	0.71	0.36	0.62	0.38
LFP rate (Q2[b], control) (%)	0.74	0.40	0.83	0.67	0.53	0.56	0.55
LFP rate (Q2[b], treatment) (%)	0.81	0.46	0.86	0.71	0.58	0.62	0.63

Notes: (a) Q1: Individuals observed 1 quarter after the treatment. (b) Q2: Individuals observed 2 quarters after the treatment.

3.2. Kindergarten eligibility cutoffs

To determine which have a birthdate-based kindergarten eligibility cutoff, we surveyed experts from each potential country, asking for detailed information regarding kindergarten enrollment rules, practices, and their changes over time. Experts were compensated for their contribution in order to ensure a high quality of answers.

The issue of determining cutoffs for each country and each year in our sample is not straightforward for several reasons. First, in most countries, actual practice differs from what is required in the legislature, or the law only states minimum requirements, and what is realized depends highly on the supply and demand for childcare spots in the given location at the given time. For example, in Hungary, the legislature states that children born prior to September 1st in a given year must be accepted into kindergarten, while those born after may be accepted as long as spots remain available. In a previous study (Lovasz and Szabo-Morvai 2013), more detailed enrollment data is used to show that the effective cutoff during the time period studied (1998-2009) was actually January 1st: children born up to that date were generally accepted into kindergarten, while those born after had to wait until next September. Experts were asked to discuss such flexibilities in the legal cutoff specifications as well as real-life practices, but the determination of the exact effective birthdate cutoff that is needed to provide exogenous variation in childcare availability remained difficult. Second, information on the current legislation and especially on current real-life practices is easier to obtain than retrospective information. Although experts were asked to provide enrollment details by year, such data is also likely to be less precise. Finally, effective cutoff dates are also likely to vary regionally. For example, in large cities, where demand for childcare is relatively high, spots are likely to fill up closer to the legal cutoff, while in low population areas, children born much later may be able to enroll. We cannot account for such variation in our definition of the cutoff.

To minimize the chance of cutoff date misspecification, we turn to external data sources to verify the information received from the country experts. There is no individual-level information on actual childcare usage in the EU LFS dataset, which could be used to directly determine the eligibility cutoff, which is also why we are only able to derive reduced form estimates in our analysis. We do, however, verify the eligibility cutoffs for as many countries as possible, using some further data sources with birthdate and childcare enrollment-relevant information. First, we use EU-SILC data on actual childcare enrollment and quarter of birth information to compare the enrollment rate means by birthdate group over various ages of children. The categorization of birthdate groups based on birth quarter is not exactly the same as what we use in our analysis, and not all quarters are observed in every country, which limits the test. However, the comparison of the birth quarters available does provide evidence on the existence of any discontinuity in childcare enrollment. Second, we use EU-LFS data on the mother's response to a survey question asked only from those not participating in the labor market, regarding the reason for their inactivity. We analyze whether there is a significant difference by birthdate group (defined the same way as in our estimation) in the likelihood of "looking after children or incapacitated" being given as the main reason. This measure also serves as a proxy for childcare enrollment, however, if we observe significant differences in the response rates by birthdates – even when controlling for individual and household characteristics – it also provides some indirect evidence verifying the existence of a cutoff.

In both tests, we assess whether significant differences exist at the cutoff expected based on the country expert responses, as well as whether differences can be seen after any other calendar dates. Table 3 summarizes the information used to determine the eligibility cutoffs for each country, including the results of these tests. For the EU-SILC enrollment test, the table gives the largest value seen among the mean differences in enrollment rates between birth groups over the child ages of 2 to 5. For most countries, we do not see significant differences elsewhere indicating other cutoffs, with the exception of Hungary, which also shows a smaller but still significant difference at January 1st. In case of the EU-LFS test, we run a regression of the treatment and the control group defined by the effective cutoff date on the reason for not participating on the labor market. In Table 3 we report the coefficient and significance from this regression.

The effective cutoff date refers to the cutoff used in our analysis, which is verified by at least two of the three independent data sources. The effective cutoff date differs from the legal minimum requirement in several cases, due to the possibility of enrolling further children as long as capacity allows. In the case of several countries, the tests show that children with birthdates after September 1st were allowed to enroll in kindergarten up to the later birthdates of January 1st (Czech Republic) or March 1st (Hungary, Slovakia, France).[5] It is important to emphasize that, although it is key to the quasi-experimental analysis, determining the country-specific childcare enrollment cutoffs is clearly not straightforward. In most countries, the exact legislative rules can be overridden for the system to remain flexible enough and to account for regional and timely variations in childcare demand and supply. We therefore ensure the reliability of the cutoff specification by using the three independent sources of information, expert information, EU-SILC and EU-LFS data and include only countries in which at least two of the three sources confirm the cutoff date. Despite the benefit of further variation in institutional context, some potential countries that meet the other data requirements are excluded from the analysis due to unverifiable or ambiguous cutoffs.

[5] The March 1 cutoff corresponds to having turned 2.5 years old by September 1st, which, in the case of Hungary, has been an increasingly common rule of thumb used by kindergartens in admissions, leading to a change in the law in 2010 specifically allowing it.

Table 3: Country cutoff details and sources of information

Country	Effective cutoff date	Enrollment date	Expert information: the child can be enrolled in kindergarten if she is …	EU-SILC: Birth quarters where largest enrollment difference exists	EU-SILC: Mean difference in enrollment rates (P-value)	EU LFS: Reason for inactivity is childcare: Coefficient of T (P-value)
Czech Republic	January 1	September 1, prior to cutoff	3 years old by Sept 1st, or younger if spots available	q4-q1	0.23 (0.00)	-0.09 (0.01)
Hungary	January 1 (2005-2009), March 1 (2010-2012)	September 1, prior to cutoff	3 years old by Sept 1st, or younger if spots available, 2.5 year old from 2010	q4-q1 q1-q2	0.12 (0.00)	-0.08 (0.02)
Slovakia	March 1	September 1, prior to cutoff	3 years old by Sept 1st, or younger if spots available	N/A	N/A	-0.05 (0.06)
Greece	May 1	September 1, after cutoff	30 months old on Sept 1st, or younger if spots available	q1-q3	0.21 (0.01)	*-0.02* *(0.19)*
Italy	May 1 (2005-2006) September 1 (2007-2012)	September 1, after cutoff	to 2006: 3 years old by May 1st, after 2006: 3 years old by September 1st	q2-q4	0.24 (0.00)	*-0.04* *(.12)*
Austria	May 1	September 1, prior to cutoff	30 months old on Sept 1st, or younger if spots available	q1-q2	0.15 (0.01)	-0.05 (0.06)
France	March 1	September 1, prior to cutoff	3 years old by January 1st, or younger if spots available	N/A	N/A	-0.01 (0.09)

3.3. Empirical specification

In our empirical analysis, we estimate the childcare effect for each country, based on an eligibility cutoff-based IV methodology similar to what was used previously in an analysis focusing on Hungary (Lovasz and Szabo-Morvai 2013). The basic idea of the methodology, inspired by Angrist and Krueger (1991), is to use the birthdate of the child for the identification of the childcare effect. Mothers whose children are born before the kindergarten eligibility cutoff are eligible for kindergarten, while those born after the cutoff are only eligible for nursery school, which has significantly lower coverage in each country included in the analysis (cf. Table 1 Cols 4 and 5). Birthdate is therefore highly correlated with childcare availability, and, as long as it can be considered random – which we will discuss further in the next section – it is exogenous to maternal labor supply. By using the birthdate as an instrument, we can remove bias due to endogeneity in childcare availability, which may arise due to omitted variables such as the economic development of regions, which affects the number of available childcare seats (through more abundant municipal resources) as well as the labor supply of mothers (through higher expected employment probabilities).

Due to small sample sizes and the above-mentioned constraints on birthdate data, we define the instrument used in our analysis as follows. The treatment variable is defined as:

$$T_i = \begin{cases} 1 \quad if \qquad cutoff\ date - 5\ months\ \leq b_i \leq cutoff\ date \\ 0 \quad if \qquad cutoff\ date \leq b_i \leq cutoff\ date + 5\ months \end{cases} \qquad (1)$$

where b_i is the youngest child's date of the birth, and the cutoff date varies by country (see Table 3). Because of the huge differences between availability of kindergarten and nursery, treatment mothers have a significantly higher probability of being able to enroll their children in childcare compared to control mothers.

In order for the estimated treatment effect to be unbiased, we need sorting by birthdate (into groups) to be random, so that the groups differ only in terms of kindergarten eligibility status. The selection of mothers into birthdate groups can be regarded random if the window around the cutoff is narrow enough: mothers of children born on December 31 can be assumed to be very similar to mothers of children born on January 1. However, the wider windows of 5 months around the cutoff used in our analysis - which are needed to ensure a large enough number of observations - mean that we need to consider certain possible sources of bias more carefully. Other age-related changes can lead to significant differences between the groups, because the average age of children in the two groups differs significantly. Figure 1 showed that in several countries, other significant changes occur around the child age at our point of estimation: parental leave ends at age 3 of children in the CEE countries, and correspondingly, views regarding institutional childcare change as well. This means that due to the 5 month group windows, the treatment and control groups differ significantly in mean age when observed at a given point in time, and may be affected differently by these further factors in addition to the difference in their kindergarten eligibility.

In order to separate these other effects from the childcare effect, we define the estimation sample so that we include mothers in the treatment and control groups when their children are the same age. This sampling design ensures that child age, and therefore any further age-related characteristics - for example, child development or preferences regarding separation from the child - will be the same on average in the two groups. Table 4 summarizes the birth months included in the treatment and control groups, the months when each group is observed in the sample, and their age when they are observed for each cutoff used in the analysis.

Table 4: Description of the birth and observation dates and child ages of the sample

Cutoff	Birth months (treatment)	Birth months (control)	Enrollment date (treatment and control)	Observation months (treatment)	Observation months (control)	Child age at observation (treatment and control)
September 1st	4-8	9-1	Sept 1st (at age 3)	10-12	3-5	3y2m-3y8m
January 1st	8-12	1-5	Sept 1st (prior to age 3)	10-12	3-5	2y10m-3y4m
March 1st	10-2	3-7	Sept 1st (prior to age 3)	10-12	3-5	2y8m-3y2m
May 1st	12-4	5-9	Sept 1st (prior to age 3)	10-12	3-5	2y6m-3y
May 1st	12-4	5-9	Sept 1st (post age 3)	10-12	3-5	3y6m-4y

To estimate the causal effect of childcare availability on maternal labor supply, we turn to IV estimation, where treatment (T) is an instrument for childcare availability. We estimate reduced form regressions separately for each country of the following form:

$$LFP_{yi} = \beta T_{yi} + \alpha_y + X'_{yi}\pi + \xi_{yi} \quad (2)$$

where subscripts indicate yearly (y), and individual (i) variation, and LFP_{yi} is the labor force participation dummy for individual i. The equation adjusts for a set of individual controls (X_{yi}), and α_y represents year fixed effects. Controls include education, age, age squared, marital status, and region.

The parameter β captures the effect of belonging to the treatment group on the LFP probability. It can be interpreted as representing how much more active mothers are if they are eligible for kindergarten rather than nursery school, which has significantly lower coverage. Since these rates differ by country, we interpret the magnitude of the childcare effect estimates based on their mean differences. This allows for a rudimentary analysis of the magnitude of the effects using a Wald estimator of the following form:

$$\beta^W = \frac{E(LFP_{yi}|T_{yi}=1) - E(LFP_{yi}|T_{yi}=0)}{E(C_{yi}|T_{yi}=1) - E(C_{yi}|T_{yi}=0)} \quad (3)$$

Since we do not directly observe enrollment in the EU LFS data, we proxy the country-specific childcare availability measures of the treatment and the control groups with the childcare enrollment rates of 3 and 2-year-olds respectively (reflecting country averages of kindergarten and nursery school enrollment rates).

In the setup presented so far, the treatment and the control groups differ in terms of both their dates of birth and dates of observation, which may introduce seasonal bias of various forms. First, the quarter of birth may be associated with various individual characteristics (Bound and Jaeger 1996). They cite a study that finds, for instance, that parents with higher incomes tend to have spring babies (Kestenbaum 1987). Second, child development may differ by season of birth, which may influence the mother's willingness to separate from the child. For instance, one study shows that health status and birth weight depend on the season of birth even after controlling for the characteristics of the mother (Currie and Schwandt 2013). The third possible bias is related to the different dates of observation of the groups. The seasonal variation of labor demand affects the actual and expected probability of employment, and thereby, the labor supply of mothers.

To remove possible seasonal bias from the measured effect, we estimate a second set of equations in which expand the sample with reasonably close labor market substitutes: mothers of children aged 4-6 years (separated into treatment and control groups based on the same cutoff date), and run a difference in differences (DID) regression. In the comparison sample, the treatment group as well as the control group has access to kindergarten, thus their childcare availability is the same. As a result, the comparison groups should be affected by the seasonal effects, but not the treatment effect, allowing us to separate out the seasonal factors. We construct a variable indicating the original and the comparison sample:

$$m_{yri} = \begin{cases} 1 & if\ 3 \leq a_{yri} < 4 \\ 0 & if\ 4 \leq a_{yri} < 6 \end{cases} \tag{4}$$

where a_{yri} indicates the age of the youngest child.

We then run the following reduced form regression separately for each country:

$$L_{yi} = \beta^{s} T_{yi} m_{yi} + \alpha_{y} + X'_{yi}\pi_{1} + \pi_{3} T_{yi} + \pi_{4} m_{yi} + \xi_{yi} \tag{5}$$

where the estimated effect of treatment, corrected for seasonality, is given by β^{s}, the coefficient of the interaction term. It is important to note that, in addition to removing seasonal effects that are common to the main sample and the comparison group, results from this specification may also differ because it imposes a restriction on the model that the coefficients of further characteristics (controls) are the same for mothers of children of different ages. It may well be that the coefficients are, in fact, different for the original and the comparison sample of mothers, so the seasonality-corrected estimates may differ from the baseline estimates due to either seasonality biases being removed or the restriction on the other coefficients in the equation.

In each country, we run the estimation with the baseline and the seasonally corrected specifications, with and without controls. We measure the effect one quarter after the treatment (Q1), that is, in the quarter immediately after the September enrollment, as well as two quarters after the treatment (Q2). The Q2 results may represent longer-term effects, however, they may also be indicative of the flexibility of the September 1st enrollment date. For some countries, experts noted that enrollment is allowed year round, depending on availability. It is therefore not possible to tell whether any significant effects observed in Q2 are due to longer term effects on maternal labor supply of enrollment in September, or shorter term effects due to enrollment later in the year.

Finally, we perform further robustness checks to verify the results. We estimate placebo cutoff regressions for mothers of 3 year olds, based on other months besides the actual cutoff. As there should not be any sharp differences in childcare eligibility elsewhere, group membership (T) defined based on other months should not have an impact on participation. We also estimate the equations with the actual cutoffs, but for samples of mothers of children of different ages: at age 2, 4, 6, and 6. Again – once seasonality biases are controlled for using a comparison group – there should not be any significant effects, as childcare availability should not differ singificantly by birthdate group at other child ages besides 3. Additionally, we re-estimate the seasonality corrected equations with comparison groups composed of mothers with different child ages. This should not affect the results, if seasonality biases that we want to control for are common to the different child age groups. The results of these tests point to the robustness of the results presented next.

4. Results

4.1. Childcare effect estimates by country

The estimates of the childcare effect around age 3 by country are presented separately for each group of countries in Table 5. The top panel in each table gives the estimates for treatment mothers observed in the quarter after the treatment (Q1), right after the September 1st enrollment date. The lower panel gives the estimates for the second quarter after the treatment (Q2), 3 months later. The relevant control groups are observed at dates that ensure that on average, the age of the youngest child be the same as it is in the treatment group. The first two columns within each country's results represent the baseline estimates, without and with controls, respectively. Here, the coefficient in our focus is that of the variable T, indicating the effect of having a child with a birthdate before the cutoff, and therefore being eligible for kindergarten (treatment). The next two columns present the seasonality corrected results, also without and with controls. Here, the coefficient of the interaction term mT represents the effect of kindergarten eligibility around age 3, net of any seasonal effects. The coefficient of m, the dummy indicating mothers with children around age 3, represents the difference in participation that is due to having a 3 years old child compared to having an older youngest child (aged 4-6). This is closely related to the idea of the relative labor supply rate discussed earlier: a high coefficient of m suggests that around age 3, a lot of mothers who are potentially ready to work have not yet returned to the labor market. The coefficient of T captures seasonal effects (birthdate effects) that are common to mothers of 3-year-olds and the comparison group of mothers with older children, which we want to exclude from the childcare effect estimates.

In the CEE countries (Table 5.a), the results generally point to a significant childcare effect. In the Czech Republic, we see a significant positive effect of around 0.1 in the baseline specification in Q1, which drops slightly to around 0.07 in the seasonality corrected estimates. There is also a positive childcare effect in Q2 of around 0.07 in the baseline estimates, which falls to 0.05 in the seasonality corrected case and loses its significance. Evaluating the results for Hungary in a similar manner, we can say that there is no evidence of an effect in Q1, but there is evidence of an effect of around 0.08 in Q2. This could be in line with a second enrollment date after September 1st. For Slovakia, we see strong evidence of an effect of around 0.06-0.09 in Q1 and around 0.08-0.11 in Q2, suggesting either a long-lasting effect from the September enrollment date, or later enrollment as well. The inclusion of controls does not significantly change the results in any specification, which supports the validity of T as an instrument. The coefficient of T does not indicate significant age-independent seasonality in any of the CEE countries. However, the seasonality correction does affect the magnitude of the estimates slightly, and makes the estimate become significant in the case of Hungary. Taken together, the CEE results point to a significant positive childcare effect of 0.07-0.1 due to kindergarten eligibility around age 3 of children.

The results for the two Western EU countries (Table 5.b) in our sample point to some positive childcare effects, as well as differences between them. For Austria, we find no evidence of an effect in Q1. The table shows a strongly significant positive effect of around 0.07-0.09 in Q2, which remains significant following the seasonality correction. For France, we find weaker evidence of an effect of around 0.05 in Q1, which loses its significance even at the 10% level in the seasonality corrected specifications. No effect is shown in Q2. Neither Western EU country shows evidence of seasonality playing a significant role, the coefficient of T is very small, and highly insignificant in all seasonality corrected specifications. The estimates also do not change due to the inclusion of the controls. Overall, the results for Austria point to a significant positive effect of 0.07-0.08, but provide weak evidence of an effect for France.

Table 5.a: CEE countries

	Czech Republic				Hungary				Slovakia			
	Baseline		Seasonality Corrected		Baseline		Seasonality Corrected		Baseline		Seasonality Corrected	
Q1: 1 quarter after treatment												
T	0.097	0.107	0.025	0.035	0.033	0.028	-0.037	-0.041	0.061	0.064	-0.033	-0.003
	(0.002)	(0.001)	(0.327)	(0.186)	(0.269)	(0.326)	(0.136)	(0.176)	(0.103)	(0.099)	(0.212)	(0.257)
m			-0.598	-0.596			-0.301	-0.317			-0.545	-0.547
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
mT			0.072	0.068			0.070	0.077			0.094	0.097
			(0.075)	(0.097)			(0.071)	(0.037)			(0.040)	(0.035)
Constant	0.282	0.290	0.879	0.876	0.438	0.051	0.739	1.164	0.323	0.063	0.867	0.824
	(0.000)	(0.577)	(0.000)	(0.009)	(0.000)	(0.891)	(0.000)	(0.000)	(0.000)	(0.902)	(0.000)	(0.012)
Controls		x		x		x		x		x		x
Observations	985	985	1,712	1,712	1,605	1,605	3,243	3,243	689	689	1,476	1,476
R-squared	0.011	0.071	0.316	0.340	0.001	0.099	0.074	0.184	0.004	0.054	0.271	0.295
Q2: 2 quarters after treatment												
T	0.063	0.074	0.018	0.014	0.029	0.045	-0.026	-0.032	0.079	0.099	-0.012	-0.005
	(0.084)	(0.036)	(0.508)	(0.638)	(0.319)	(0.119)	(0.362)	(0.226)	(0.048)	(0.014)	(0.721)	(0.874)
m			-0.508	-0.506			-0.145	-0.170			-0.303	-0.306
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
mT			0.045	0.059			0.055	0.073			0.091	0.107
			(0.319)	(0.192)			(0.177)	(0.058)			(0.082)	(0.041)
Constant	0.396	0.575	0.904	0.441	0.585	0.989	0.730	0.824	0.555	0.397	0.857	0.451
	(0.000)	(0.277)	(0.000)	(0.214)	(0.000)	(0.005)	(0.000)	(0.001)	(0.000)	(0.494)	(0.000)	(0.238)
Controls												
Observations	907	907	1,513	1,513	1,592	1,592	2,879	2,879	627	627	1,088	1,088
R-squared	0.004	0.102	0.243	0.284	0.001	0.104	0.016	0.127	0.006	0.065	0.084	0.120

Notes: Robust p-values in parentheses, stars indicate significance as: $p<0.01$, $p<0.05$, $p<0.1$.

Table 5.b: Western EU countries

	Austria				France			
	Baseline		Seasonality Corrected		Baseline		Seasonality Corrected	
Q1: 1 quarter after treatment								
T	0.037	0.049	-0.004	-0.009	0.050	0.049	-0.001	-0.003
	(0.228)	(0.114)	(0.862)	(0.680)	(0.081)	(0.081)	(0.978)	(0.886)
m			-0.114	-0.134			-0.106	-0.121
			(0.000)	(0.000)			(0.000)	(0.000)
mT			0.041	0.058			0.051	0.052
			(0.286)	(0.116)			(0.157)	(0.142)
Constant	0.732	0.755	0.846	1.008	0.779	-0.178	0.885	0.916
	(0.000)	(0.114)	(0.000)	(0.001)	(0.000)	(0.704)	(0.000)	(0.001)
Controls		x		x		x		x
Observations	1,046	1,046	2,223	2,223	1,140	1,140	2,391	2,391
R-squared	0.002	0.048	0.015	0.064	0.004	0.082	0.015	0.081
Q2: 2 quarters after treatment								
T	0.073	0.072	-0.005	-0.015	0.029	0.030	-0.028	-0.031
	(0.013)	(0.013)	(0.843)	(0.589)	(0.287)	(0.265)	(0.302)	(0.260)
m			-0.093	-0.100			-0.059	-0.069
			(0.001)	(0.001)			(0.032)	(0.013)
mT			0.0780	0.0861			0.057	0.058
			(0.052)	(0.029)			(0.138)	(0.117)
Constant	0.738	0.664	0.832	1.072	0.834	0.181	0.893	0.156
	(0.000)	(0.102)	(0.000)	(0.000)	(0.000)	(0.725)	(0.000)	(0.689)
Controls		x		x		x		x
Observations	1,042	1,042	1,993	1,993	897	897	1,629	1,629
R-squared	0.007	0.046	0.009	0.046	0.002	0.155	0.004	0.126

Notes: Robust p-values in parentheses, stars indicate significance as: p<0.01, p<0.05, p<0.1.

Table 5.c: Southern EU countries

	Greece				Italy			
	Baseline		Seasonality Corrected		Baseline		Seasonality Corrected	
Q1: 1 quarter after treatment								
T	0.024	0.029	0.030	0.035	-0.015	0.015	0.091	0.101
	(0.284)	(0.184)	(0.196)	(0.117)	(0.79)	(0.764)	(0.092)	(0.046)
m			0.002	-0.004			-0.005	-0.02
			(0.927)	(0.841)			(0.933)	(0.704)
mT			-0.006	-0.005			-0.105	-0.109
			(0.852)	(0.871)			(0.17)	(0.118)
Constant	0.681	0.133	0.679	0.16	0.631	0.896	0.635	0.613
	(0.000)	(0.707)	(0.000)	(0.548)	(0.000)	(0.273)	(0.000)	(0.328)
Controls		x		x		x		x
Observations	1,953	1,953	3,768	3,768	488	488	924	924
R-squared	0.001	0.117	0.001	0.112	0	0.325	0.008	0.25
Q2: 2 quarters after treatment								
T	0.040	0.042	0.056	0.060	0.063	0.083	0.123	0.080
	(0.084)	(0.061)	(0.032)	(0.018)	(0.071)	(0.015)	(0.001)	(0.013)
m			0.011	0.001			0.020	0.001
			(0.666)	(0.961)			(0.579)	(0.979)
mT			-0.016	-0.017			-0.060	-0.013
			(0.641)	(0.610)			(0.239)	(0.785)
Constant	0.673	0.776	0.663	0.203	0.561	0.649	0.542	0.126
	(0.000)	(0.044)	(0.000)	(0.509)	(0.000)	(0.178)	(0.000)	(0.722)
Controls		x		x		x		x
Observations	1,926	1,926	3,389	3,389	1,227	1,227	2,356	2,356
R-squared	0.002	0.108	0.003	0.109	0.004	0.253	0.009	0.247

Notes: Robust p-values in parentheses, stars indicate significance as: p<0.01, p<0.05, p<0.1.

The results from the Southern EU countries (Table 5.c) provide even less evidence of a childcare effect, with significant estimates (0.04 for Greece and 0.06-0.08 for Italy) in the baseline specifications, and insignificant estimates in the seasonality corrected specifications. The results imply that seasonality plays an important role in the maternal participation of these groups of mothers: the coefficients of T are highly significant and positive in all cases. This suggests that there are participation differences by birthdate groups that are common to mothers of 3 and 4-6-year-olds, and are therefore not due to differences in kindergarten eligibility. Once this effect is controlled for, the estimates suggest that for Southern EU countries, childcare availability around age 3 cannot be shown to have a significant impact on maternal labor supply.

Table 6 provides a summary of our preferred seasonality corrected estimates with controls, for the quarter before treatment (Q0), and one and two quarters after (Q1 and Q2). Some clear patterns emerge from a comparison of the regions and countries. No significant difference by birthdate is found prior to treatment, in Q0, in any of the countries, which further supports the robustness of the cutoff-based method. The coefficients of *mT*, i.e. the childcare effect estimates, reflect what was discussed above: a significant positive impact in the case of the CEE countries and Austria, positive but insignificant effects for France, and no significant effect for the Southern EU countries.

Looking at the coefficients of *m*, the dummy indicating mothers of 3-year-olds, we see patterns in line with what we saw in Figure 1. The coefficients are significant and highly negative in the CEE countries, reflecting the high growth of maternal participation rates following age 3, and therefore, a high pool of mothers who are qualified and potentially ready to work at the point of estimation. The coefficients are still significant but much lower in magnitude in the Western EU countries, in line with some further growth in maternal participation after age 3. In Southern EU countries, the insignificant coefficients reflect the flatness of maternal participation over child ages seen earlier, suggesting that mothers who return to work after having a child have already done so prior to age 3 of their child.

The patterns seen in the coefficients of *m* are closely related to the findings regarding the childcare effect: it is the highest in countries where the relative labor supply of mothers at the given child age is still low, and lowest (or zero) in countries where it has already reached its long-run rate. Of course, the relative participation rate at a given child age is shaped by the institutional context relevant at and prior to the point of estimation. We next discuss the role of the context in this light.

Table 6: Summary of seasonality corrected estimates with controls, Q0-Q2

	CEE								
	Czech Republic			**Hungary**			**Slovakia**		
	Q0	**Q1**	**Q2**	**Q0**	**Q1**	**Q2**	**Q0**	**Q1**	**Q2**
T	0.008	0.035	0.014	-0.025	-0.041	-0.032	0.022	-0.029	-0.005
	(0.655)	(0.186)	(0.638)	(0.198)	(0.176)	(0.226)	(0.431)	(0.257)	(0.874)
m	-0.632	-0.596	-0.506	-0.381	-0.317	-0.170	-0.514	-0.547	-0.306
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(6.14e-10)	(0.000)	(0.000)	(0.000)
mT	0.042	0.068	0.059	-0.041	0.077	0.073	-0.027	0.097	0.107
	(0.157)	(0.096)	(0.192)	(0.181)	(0.037)	(0.057)	(0.521)	(0.034)	(0.041)
Constant	0.379	0.876	0.441	0.370	1.164	0.824	0.130	0.824	0.451
	(0.170)	(0.008)	(0.214)	(0.068)	(0.001)	(0.001)	(0.667)	(0.012)	(0.238)
Observations	2,410	1,712	1,513	4,405	3,243	2,879	1,541	1,476	1,088
R-squared	0.466	0.340	0.284	0.242	0.184	0.127	0.299	0.295	0.120
	Western EU								
	Austria			**France**					
	Q0	**Q1**	**Q2**	**Q0**	**Q1**	**Q2**			

T	0.022	-0.008	-0.016	0.001	-0.004	-0.031
	(0.472)	(0.713)	(0.541)	(0.955)	(0.839)	(0.260)
m	-0.121	-0.134	-0.101	-0.168	-0.123	-0.0687
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.013)
mT	-0.013	0.057	0.087	0.003	0.053	0.057
	(0.747)	(0.125)	(0.026)	(0.924)	(0.131)	(0.118)
Constant	0.741	0.970	1.186	0.344	0.873	0.037
	(0.032)	(0.001)	(0.000)	(0.259)	(0.001)	(0.913)
Observations	1,898	2,220	1,992	2,434	2,389	1,630
R-squared	0.058	0.064	0.045	0.113	0.082	0.126
	Southern EU					
	Greece			**Italy**		
	Q0	**Q1**	**Q2**	**Q0**	**Q1**	**Q2**
T	-0.001	0.034	0.059	-0.042	0.101	0.080
	(0.984)	(0.117)	(0.017)	(0.313)	(0.046)	(0.013)
m	-0.019	-0.004	0.001	-0.031	-0.021	0.001
	(0.432)	(0.841)	(0.961)	(0.429)	(0.687)	(0.984)
mT	0.039	-0.005	-0.017	0.017	-0.108	-0.012
	(0.293)	(0.871)	(0.610)	(0.754)	(0.121)	(0.787)
Constant	0.480	0.160	0.203	0.377	0.363	0.449
	(0.122)	(0.548)	(0.509)	(0.486)	(0.557)	(0.210)
Observations	2,803	3,768	3,389	1,444	925	2,357
R-squared	0.130	0.112	0.109	0.244	0.252	0.247

4.2. Cross country analysis: the role of institutions

The interpretation of the magnitude of the childcare effect estimates is dependent on the difference in nursery school and kindergarten availability (coverage), i.e. the treatment effect. We therefore turn to statistics that take the treatment magnitude into account, shown in Table 7. It provides the childcare effect estimates, coverage rates used to calculate a proxy of the size of the treatment magnitude, and a Wald statistic indicating the magnitude of the childcare effect in each country that takes the magnitude (coverage difference between the treatment and the control group) into account. The coverage rates used in the calculation are meant to proxy the childcare availability of the groups as precisely as possible given data constraints: we use the enrollment of 2-year-olds in nurseries for the control group, and the kindergarten enrollment of 3-year-olds for the treatment group. Based on these, the difference in childcare availability, or treatment magnitude is the highest (around 0.4) in the CEE countries and Italy, somewhat lower in Austria and Greece (around 0.28), and the lowest in France (0.2).

The findings for the CEE countries provide strong evidence of a relatively large positive childcare effect. This is in line with our expectations, based on their institutional characteristics and the point of estimation (Table 1 and Figure 1). At this child age, maternal labor supply is still relatively low compared to that of mothers with older children, so there is a large qualified workforce potentially ready to work. Leaves end at this time, so the financial incentives for staying home decrease. Cultural norms are also supportive of mothers' return to the labor market at this child age, in line with the signals given by the institutional system. At the same time, mothers can return to jobs that are still protected. So, the institutional context at the child age where we estimate the childcare effect leads to a large impact.

For the Western EU countries, the statistics point to a similarly large childcare effect once treatment magnitude is taken into account, though the strength of the evidence varies. These findings suggest that although the two Western EU countries – especially France – already exhibit higher maternal participation, childcare availability is still a factor that affects the labor supply of some mothers. Even at this age, there are mothers who are potentially able to work, but constrained by the lack of childcare opportunities.

For the Southern EU countries, we find no evidence of a childcare effect around age 3. This can be explained by the fact that in these countries, maternal participation does not grow much further after this child age. This is related to the short length of the leaves: job protection and financial leave benefits ended long before age 3 of their child, and mothers who are willing and able to work have already returned to the labor market. Furthermore, relatively traditional norms do not particularly support maternal employment even at older child ages. Childcare availability therefore has less of an impact at our point of measurement at age 3.

Table 7: Estimated childcare effect magnitudes by country

Region		**CEE**			**Western EU**		**Southern EU**	
Country		**Czech Republic**	**Hungary**	**Slovakia**	**Austria**	**France**	**Greece**	**Italy**
Seasonality corrected childcare effect	T	0.07	0.08	0.11	0.08	0.05	-0.02	-0.01
	P-value	0.09	0.04	0.04	0.02	0.14	0.61	0.79
Childcare statistics	Nursery school enrollment rate at age 2[1]	0.07	0.17	0.07	0.26	0.29	0.58	0.38
	Kindergarten enrollment rate at age 3[2]	0.42	0.60	0.46	0.55	0.49	0.86	0.81
	Difference in childcare availability	0.35	0.43	0.4	0.28	0.2	0.28	0.43

Magnitude of effect	Wald estimate	0.20	0.19	0.28	0.29	0.25	-0.07	-0.02

Notes: [1] [2] Own calculations on enrollment rates for 2- and 3-year-olds in formal childcare and pre-school services based on EU SILC data. The data generally include children in center-based services, organized day care and pre-school (both public and private) and those who are cared for by a professional childminder, and exclude informal services provided by relatives, friends or neighbors. Exact definitions may, however, differ slightly across countries.

Keeping not only the country-level institutional context, but the point of estimation (age 3) in mind, it is important to note that the policy implications for expansion under and over age 3 are not straightforward. However, some important points can be made that are relevant to the evaluation of EU-prescribed childcare targets for under and over age 3 of children. Overall, we can say that childcare expansion is potentially the most effective if the timing of the end of job protection and leave payments in terms of child age coincides with the increase in childcare availability.

In CEE countries, further expansion above age 3 is likely to have a positive effect on maternal participation, as mothers are incentivized to return to work and yet some childcare shortage still remains, though it is relatively low. The availability of childcare under age 3 is much further from the targets, and therefore subject to policy debates. Our estimates suggest that expansion has the potential to have a large impact due to the availability of a qualified workforce suggested by the maternal LFP rates at older child ages. On the other hand, our estimates pertain to a child age where leaves are just ending, and cultural norms change regarding whether mothers should stay home to care for their child. The effectiveness under age 3 may therefore be constrained by the long leaves and unsupportive cultural norms, as mothers may not be as willing to return, or encouraged by their environment to do so. Childcare expansion under age 3 should be coupled with a reform of the leave system, aimed towards shorter, better paid leaves that encourage greater paternal involvement, and the shaping of cultural views to be more open to institutional childcare under age 3 of children. Additionally, a greater availability of flexible, part-time work may also aid mothers who may be willing to separate from their child and return to work more gradually to decide to participate in the labor market.

Based on the results, childcare expansion in the Western EU countries may also have a significant positive impact, despite already relatively high participation rates. It appears that even at age 3, some mothers are effectively constrained by the lack of childcare opportunities. Expansion under age 3 may have an impact because maternal participation is still somewhat below the rate of mothers with older children, and, depending on the country, cultural norms are less likely to constrain the effectiveness. On the other hand, countries such as Austria – with relatively traditional views – must also shape views to avoid this constraint.

In the Southern EU countries, the potential effect of childcare expansion is limited by the low growth rate of maternal participation over child age, which is why we find a small or no impact around age 3. At age 3, childcare does not appear to be the factor that effectively constrains maternal participation. Longer leaves with longer job protection periods coupled with childcare expansion under age 3 may give more mothers an opportunity to return to the labor market after having a child. At the same time, the willingness and ability of mothers to return to work - as well as family policies themselves - are affected by cultural views that are unsupportive of maternal employment, so changing these must also be a key element of effective policies.

5. Conclusion

This study estimates the effect of childcare availability on maternal labor supply for 7 European countries with different institutional contexts, and utilizes this variation to learn about the interdependencies of childcare and other factors. We provide comparable, quasi-experimental estimates – based on eligibility cutoffs – using harmonized data and a unified methodology. The results suggest that the childcare effect is the highest in CEE countries, where at this child age, maternal participation is still relatively low compared to that of mothers with older children, and paid leaves with job protection are just ending. We find less evidence of an impact in Southern EU countries, where leaves end at a much earlier age, and maternal participation at older child ages is low. Western EU countries also show some impact, despite the already high maternal participation rates prior to this age.

Specific policy implications are derived from the results in light of the EU Barcelona targets for childcare expansion under age 3. For CEE countries, childcare expansion under age 3 has a high potential positive impact on maternal LFP, however, it should be coupled with a reform of the leave system, aimed towards shorter, better paid leaves that encourage greater paternal involvement and the shaping of cultural views. In Southern EU countries, expansion has a lower potential impact due to many mothers permanently leaving the labor market after having a child. Longer leaves with longer job protection periods, coupled with childcare expansion under age 3 may give more mothers an opportunity to return to the labor market after having a child. Western EU countries may also have a significant positive impact, despite already relatively high participation rates.

References

Angrist, Joshua D., and Alan B. Krueger. 1991. “Does Compulsory School Attendance Affect Schooling and Earnings?” *The Quarterly Journal of Economics* 106 (4): 979–1014. doi:10.2307/2937954.

Baker, Michael, Jonathan Gruber, and Kevin Milligan. 2008. “Universal Child Care, Maternal Labor Supply, and Family Well- Being.” *Journal of Political Economy* 116 (4): 709–45. doi:10.1086/591908.

Bauernschuster, Stefan, and Martin Schlotter. 2015. “Public Child Care and Mothers’ Labor supply—Evidence from Two Quasi-Experiments.” *Journal of Public Economics* 123 (March): 1–16. doi:10.1016/j.jpubeco.2014.12.013.

Berlinski, Samuel, and Sebastian Galiani. 2007. “The Effect of a Large Expansion of Pre-Primary School Facilities on Preschool Attendance and Maternal Employment.” *Labour Economics* 14 (3): 665–80. doi:10.1016/j.labeco.2007.01.003.

Bettendorf, Leon J. H., Egbert L. W. Jongen, and Paul Muller. 2015. “Childcare Subsidies and Labour Supply — Evidence from a Large Dutch Reform.” *Labour Economics* 36 (October): 112–23. doi:10.1016/j.labeco.2015.03.007.

Boca, Daniela Del, Silvia Pasqua, and Chiara Pronzato. 2009. “Motherhood and Market Work Decisions in Institutional Context: A European Perspective.” *Oxford Economic Papers* 61 (suppl_1). https://ideas.repec.org/a/oup/oxecpp/v61y2009isuppl_1pi147-i171.html.

Boeckmann, Irene, Joya Misra, and Michelle J. Budig. 2014. “Cultural and Institutional Factors Shaping Mothers’ Employment and Working Hours in Postindustrial Countries.” *Social Forces*, December, sou119. doi:10.1093/sf/sou119.

Bound, John, and David A. Jaeger. 1996. “On the Validity of Season of Birth as an Instrument in Wage Equations: A Comment on Angrist & Krueger’s.” Working Paper 5835. National Bureau of Economic Research. http://www.nber.org/papers/w5835.

Budig, Michelle J., Joya Misra, and Irene Boeckmann. 2012. “The Motherhood Penalty in Cross-National Perspective: The Importance of Work–Family Policies and Cultural Attitudes.” *Social Politics: International Studies in Gender, State & Society* 19 (2): 163–93. doi:10.1093/sp/jxs006.

Cascio, Elizabeth U. 2009. “Maternal Labor Supply and the Introduction of Kindergartens into American Public Schools.” *Journal of Human Resources* 44 (1): 140–70. doi:10.3368/jhr.44.1.140.

Cascio, Elizabeth U., Steven J. Haider, and Helena Skyt Nielsen. 2015a. “The Effectiveness of Policies That Promote Labor Force Participation of Women with Children: A Collection of National Studies.” *Labour Economics* 36 (October): 64–71. doi:10.1016/j.labeco.2015.08.002.

———. 2015b. “The Effectiveness of Policies That Promote Labor Force Participation of Women with Children: A Collection of National Studies.” *Labour Economics* 36 (October): 64–71. doi:10.1016/j.labeco.2015.08.002.

Chevalier, Arnaud, and Tarja K. Viitanen. 2005. “The Causality between Female Labour Force Participation and the Availability of Childcare.” SSRN Scholarly Paper ID 687702. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=687702.

Chone, Philippe, David Leblanc, and Isabelle Robert-Bobee. 2003. “Female Labor Supply and Child Care in France.” SSRN Scholarly Paper ID 462429. Rochester, NY: Social Science Research Network. http://papers.ssrn.com/abstract=462429.

Cipollone, Angela, Eleonora Patacchini, and Giovanna Vallanti. 2014. “Female Labour Market Participation in Europe: Novel Evidence on Trends and Shaping Factors.” *IZA Journal of European Labor Studies* 3 (1): 1–40.

Connelly, Rachel. 1992. "The Effect of Child Care Costs on Married Women's Labor Force Participation." *The Review of Economics and Statistics* 74 (1): 83–90. doi:10.2307/2109545.

Cukrowska-Torzewska, Ewa. 2015. "She Cares and He Earns? The Family Gaps in Poland." Working Paper 2015–32. Faculty of Economic Sciences, University of Warsaw. https://ideas.repec.org/p/war/wpaper/2015-32.html.

Currie, Janet, and Hannes Schwandt. 2013. "Within-Mother Analysis of Seasonal Patterns in Health at Birth." *Proceedings of the National Academy of Sciences* 110 (30): 12265–70. doi:10.1073/pnas.1307582110.

Del Boca, Daniela. 2002. "The Effect of Child Care and Part Time Opportunities on Participation and Fertility Decisions in Italy." IZA Discussion Paper 427. Institute for the Study of Labor (IZA). https://ideas.repec.org/p/iza/izadps/dp427.html.

EC. 2008. "European Commission - PRESS RELEASES - Press Release - Childcare Services in the EU." October 3. http://europa.eu/rapid/press-release_MEMO-08-592_en.htm.

———. 2013. "Barcelona Objectives." European Commission. http://ec.europa.eu/justice/gender-equality/files/documents/130531_barcelona_en.pdf.

Fernandez, Raquel. 2007. "Women, Work, and Culture." NBER Working Paper 12888. National Bureau of Economic Research, Inc. https://ideas.repec.org/p/nbr/nberwo/12888.html.

Fitzpatrick, Maria Donovan. 2010. "Preschoolers Enrolled and Mothers at Work? The Effects of Universal Prekindergarten." *Journal of Labor Economics* 28 (1): 51–85. doi:10.1086/648666.

Fortin, Nicole M. 2005. "Gender Role Attitudes and the Labour-Market Outcomes of Women across OECD Countries." *Oxford Review of Economic Policy* 21 (3): 416–38. doi:10.1093/oxrep/gri024.

Gelbach, Jonah B. 2002. "Public Schooling for Young Children and Maternal Labor Supply." *American Economic Review* 92 (1): 307–22. doi:10.1257/000282802760015748.

Geyer, Johannes, Peter Haan, and Katharina Wrohlich. 2015. "The Effects of Family Policy on Maternal Labor Supply: Combining Evidence from a Structural Model and a Quasi-Experimental Approach." *Labour Economics* 36 (October): 84–98. doi:10.1016/j.labeco.2015.07.001.

Ghysels, Joris. 2011. "The Provision of Informal Childcare by European Grandparents: Constraints versus Selective Preferences." Working Paper 1108. Herman Deleeck Centre for Social Policy, University of Antwerp. https://ideas.repec.org/p/hdl/wpaper/1108.html.

Givord, Pauline, and Claire Marbot. 2015. "Does the Cost of Child Care Affect Female Labor Market Participation? An Evaluation of a French Reform of Childcare Subsidies." *Labour Economics* 36 (C): 99–111.

Haan, Peter, and Katharina Wrohlich. 2011. "Can Child Care Policy Encourage Employment and Fertility?: Evidence from a Structural Model." *Labour Economics* 18 (4): 498–512. doi:10.1016/j.labeco.2010.12.008.

Haeck, Catherine, Pierre Lefebvre, and Philip Merrigan. 2015. "Canadian Evidence on Ten Years of Universal Preschool Policies: The Good and the Bad." *Labour Economics* 36 (October): 137–57. doi:10.1016/j.labeco.2015.05.002.

Hardoy, Inés, and Pål Schøne. 2015. "Enticing Even Higher Female Labor Supply: The Impact of Cheaper Day Care." *Review of Economics of the Household* 13 (4): 815–36.

Havnes, Tarjei, and Magne Mogstad. 2011. "Money for Nothing? Universal Child Care and Maternal Employment." *Journal of Public Economics,* Special Issue: International Seminar for Public Economics on Normative Tax Theory, 95 (11–12): 1455–65. doi:10.1016/j.jpubeco.2011.05.016.

Keck, Wolfgang, and Chiara Saraceno. 2013. "The Impact of Different Social-Policy Frameworks on Social Inequalities among Women in the European Union: The Labour-Market Participation of Mothers." *Social Politics: International Studies in Gender, State & Society*, May, jxt005. doi:10.1093/sp/jxt005.
Kestenbaum, B. 1987. "Seasonality of Birth: Two Findings from the Decennial Census." *Social Biology* 34 (3–4): 244–48.
Kimmel, Jean. 1992. "Child Care and the Employment Behavior of Single and Married Mothers." *Upjohn Institute Working Papers*, January. doi:10.17848/wp93-14.
Kremer, Monique. 2007. *How Welfare States Care: Culture, Gender and Parenting in Europe*. Amsterdam University Press. http://www.jstor.org/stable/j.ctt46mvjz.
Lefebvre, Pierre, and Philip Merrigan. 2008. "Child-Care Policy and the Labor Supply of Mothers with Young Children: A Natural Experiment from Canada." *Journal of Labor Economics* 26 (3): 519–48.
Lokshin, Michael. 2004. "Household Childcare Choices and Women's Work Behavior in Russia." *The Journal of Human Resources* 39 (4): 1094–1115. doi:10.2307/3559040.
Lovász, Anna. 2016. "Childcare Expansion and Mothers' Employment in Post-Socialist Countries." *IZA World of Labor*, December. doi:10.15185/izawol.319.
Lovasz, Anna, and Agnes Szabo-Morvai. 2013. "Does Childcare Matter for Maternal Labor Supply? Pushing the Limits of the Regression Discontinuity Framework." Budapest Working Papers on the Labour Market 1313. Institute of Economics, Centre for Economic and Regional Studies, Hungarian Academy of Sciences. https://ideas.repec.org/p/has/bworkp/1313.html.
Lundin, Daniela, Eva Mörk, and Björn Öckert. 2008. "How Far Can Reduced Childcare Prices Push Female Labour Supply?" *Labour Economics* 15 (4): 647–59.
Mills, Melinda, Patrick Präg, Flavia Tsang, Katia Begall, James Derbyshire, Laura Kohle, Celine Miani, and Stijn Hoorens. 2014. "Use of Childcare in the EU Member States and Progress towards the Barcelona Targets: Short Statistical Report No. 1."
Nollenberger, Natalia, and Núria Rodríguez-Planas. 2015. "Full-Time Universal Childcare in a Context of Low Maternal Employment: Quasi-Experimental Evidence from Spain." *Labour Economics* 36 (C): 124–36.
Olivetti, Claudia, and Barbara Petrongolo. 2017. "The Economic Consequences of Family Policies: Lessons from a Century of Legislation in High-Income Countries." Working Paper 23051. National Bureau of Economic Research. http://www.nber.org/papers/w23051.
Pfau-Effinger, B. 1998. "Gender Cultures and the Gender Arrangements: A Theoretical Framework for Cross National Gender Research" 11(2): 147–66.
Posadas, Josefina, and Marian Vidal-Fernández. 2012. "Grandparents' Childcare and Female Labor Force Participation." IZA Discussion Paper 6398. Institute for the Study of Labor (IZA). https://ideas.repec.org/p/iza/izadps/dp6398.html.
Ribar, David C. 1995. "A Structural Model of Child Care and the Labor Supply of Married Women." *Journal of Labor Economics* 13 (3): 558–97.
Saxonberg, Steven, and Tomáš Sirovátka. 2006. "Failing Family Policy in Post-Communist Central Europe." *Journal of Comparative Policy Analysis: Research and Practice* 8 (2): 185–202. doi:10.1080/13876980600682089.
Vuri, Daniela. 2016. "Do Childcare Policies Increase Maternal Employment?" *IZA World of Labor*, March. doi:10.15185/izawol.241.