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a Cross-Country Analysis of Quasi-Experimental Estimates from 7 Countries

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Abstract

Evidence from single country studies suggests that the effect of subsidized childcare availability on maternal labor supply varies greatly by institutional context. We provide estimates of the childcare effect around age 3 of children for 7 EU countries, based on harmonized data and the same quasi-experimental methodology, and evaluate their cross-country variation in light of key institutional factors (leave policies, labor market characteristics, cultural norms). The identification of the childcare effect utilizes birthdate-based kindergarten eligibility cutoffs specific to each country in an instrumental variables approach. We combine data on mothers from the EU-LFS, eligibility cutoffs gathered from country experts and verified using further datasets, and country-level institutional characteristics from various sources. We discuss the role of the context, timing, and the point of estimation. 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 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.

Keywords: subsidized childcare, maternal labor supply, institutional context

JEL codes: H24, J13, J22

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Gyermekellátás és az anyák munkakínálata

– 7 EU ország kvázi-kísérleti becsléseinek összehasonlítása

Szabó-Morvai Ágnes és Lovász Anna

Összefoglaló

Egy-egy országból származó becslések alapján a gyermekellátás hatása az anyák munkakínálatára nagymértékben függ az intézményi környezettől. A tanulmányban 7 európai országban becsüljük meg a hatást, harmonizált adatokon és egységes módszertan révén. Értékeljük a becsült hatásokat az intézményi környezet releváns tényezőinek fényében (távollétek, munkapiaci jellemzők, normák). Az identifikációs stratégiában az óvodai felvétel során felmerülő, országonként egyedi szakadáspontokat használunk ki, amelyek révén a gyerekek születési dátuma instrumentumként szolgál a becslésben. Az EU-LFS anyákra vonatkozó adatait összekötjük az országok szakértői révén gyűjtött óvodai beiratkozásra vonatkozó információkkal, aés országszintű intézményi jellemzőkkel. A szakadáspontokat további adatbázisok révén is validáljuk. Az eredményeket a kontextus, valamint a becslés időzítésének fényében értékeljük. Ezek alapján a gyermekellátásnak Közép-Kelet európai országokban szignifikáns és magas pozitív hatása van az anyák munkakínálatára, ahol az anyák munkakínálata 3 éves kor alatt még nagyon elmarad a későbbitől, és 3 éves kor körül ér véget a szülői távollét. A dél európai országokban az eredmények nem mutatnak jelentős hatást, mivel 3 éves kor után sem növekedik jelentősen az anyák munkakínálata, és a rövid szülői távollét miatt azok az anyák akik szeretnének és tudnak, már visszamentek dolgozni. A nyugati országokban is találunk szignifikáns hatást, a már eléggé magas anyai munkakínálat ellenére.

Tárgyszavak: gyermekellátás, anyák munkakínálata, intézményi kontextus

JEL kódok: H24, J13, J22

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 and cultural contexts (Cascio et al., 2015a; Vuri, 2016). Yet there is little evidence on the interdependencies of childcare availability and other 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 comes from country-specific kindergarten eligibility cutoffs around age 3 of children. Based on these, we estimate the effect of childcare availability on maternal LFP by 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 discuss the country-level estimates in light of the cross-country variation in their institutional, labor market, and cultural environments, paying special attention to the role of the context relevant to the exact point of estimation within each country. The comparison points to clear implications regarding the potential effect of childcare expansion under age 3 in light of country-specific institutional contexts, suggesting that expansion needs to be paired with specific further policy steps in order to be effective in each given setting.

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 the estimated childcare effect 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 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. Therefore, the comparison of single-country estimates is not very informative

[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.

regarding the causes of the cross-country differences of the childcare effect, as these may stem from methodological as well as contextual differences. This study aims to better evaluate differences in childcare effect estimates due to the institutional context by keeping the data quality, measurement method, and child age at measurement fixed across countries with varying contexts.

A recent study highlights the relevant factors that most probably drive the differences (Cascio et al., 2015b), based on a review of a set of single country estimates. First, the labor supply characteristics of mothers by child age are key. The scope for policy to increase labor supply may be limited by an already high rate prior to treatment (childcare coverage increase). At the same time, a high labor supply rate at older child ages reflects the potential labor market readiness of mothers that may increase effectiveness. Second, interdependencies with other institutional elements - such as child-related leaves, labor market flexibility, and cultural norms - are also important. The effect of childcare expansion may be limited by the lack of job protection, flexible work opportunities, or unfavorable views on maternal employment or institutionalized childcare.

Quasi-experimental evidence from various countries is 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 treated 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 provide an analysis of 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 et al., 2009; Cipollone et al., 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 et al., 2014). These findings provide further basis for considering which institutional elements to include in the cross-country comparison of the childcare effect.

We focus on the estimation of the causal effect of childcare availability for several countries, utilizing the exogenous variation due to eligibility cutoffs for precise identification, and the cross-country comparison of the childcare effect estimates in light of their

institutional context. 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 general institutional categories, for which we discuss the potential effect of childcare availability in light of the previous literature. Next, we estimate the country-specific effect of childcare availability on maternal labor supply, using an instrumental variables (IV) method based on the eligibility cutoffs, where birthdate serves as an instrument for childcare availability. We then compare these estimates in light of their institutional contexts, paying special attention to what is relevant to mothers' decisions at the exact point of estimation.

This study is the first to provide harmonized and comparable quasi-experimental estimates of the effect of childcare on maternal labor supply for several countries, which represent varying institutional contexts. Although the size and representativeness of the sample of countries analyzed is limited by the key requirements of the estimation method, the existence of a cutoff and data availability, the comparison reveals clear differences in the childcare effect by institutional context, and therefore, point to specific policy implications. 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 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.

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 examine later on. Finally, we present figures depicting the timing of mothers' return to the labor market over the age of their youngest child, highlighting the country-level differences, the relationship of maternal participation and the timing of relevant family policy changes, and the points at which our estimations are carried out.

2.1 KEY INSTITUTIONAL CHARACTERISTICS

Previous evidence on the effects of 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 et al., 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 et al., 2008; Bauernschuster and Schlotter, 2015; Berlinski and Galiani, 2007; Bettendorf et al., 2015; Gelbach, 2002; Givord and Marbot, 2015; Haeck et al., 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 et al., 2008). Cross-country comparisons also suggest that subsidized childcare availability under age 3 of children is strongly correlated with maternal labor supply (Boeckmann et al., 2014; Budig et al., 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 et al., 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 et al., 2014). In our cross-country analysis, we therefore focus on two aspects of leave policies: the length of paid leave (job protection) available to mothers, and the amount of the benefit that is available to mothers during the leave. The previous evidence available suggest that non-optimal leaves may restrict the effect of childcare expansion (Geyer et al., 2015), and that the lack of childcare may limit positive effect of leaves (Cukrowska-Torzewska, 2015).

The flexibility of labor markets is also an important factor, 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 is 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. The quality (related job protection, social benefits and earnings) of the available part-time jobs also matter (Del Boca, 2002).

Cultural norms are also strongly correlated with maternal outcomes, and unfavorable attitudes towards maternal labor force participation may limit the effectiveness of family policies. Some articles 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 et al., 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 unclear (Kremer, 2007). However, evidence suggests that norms may limit the effectiveness of family policies (Budig et al., 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 common in several of the countries we study, particularly the CEE and southern European countries, due to the presence of a large body of inactive elderly population. 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).

Direct evidence on the interactions of childcare and other factors is scarce. Budig and coauthors (2012) show that cultural attitudes moderate the impact of policies on women's earnings across countries. Cukrowska-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.

2.2 INSTITUTIONAL 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. In the table the countries in our analysis are included, as well as countries from which quasi-experimental evidence is available. The countries are grouped into categories by geographical regions, which are characterized by certain sets of 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 generally 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 size
		(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[16]	Baker et al., 2008	0-4	+
		67	72	79	.	46.0	.	17	52.8	.	26.0	57.3[16]	Haeck et al., 2015	1-4	+
		67	72	79	.	46.0	.	17	52.8	.	26.0	57.3[16]	Haeck et al., 2015	5	0
		67	72	79	.	46.0	.	17	52.8	.	26.0	57.3[16]	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
(16) 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, Portugal), 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

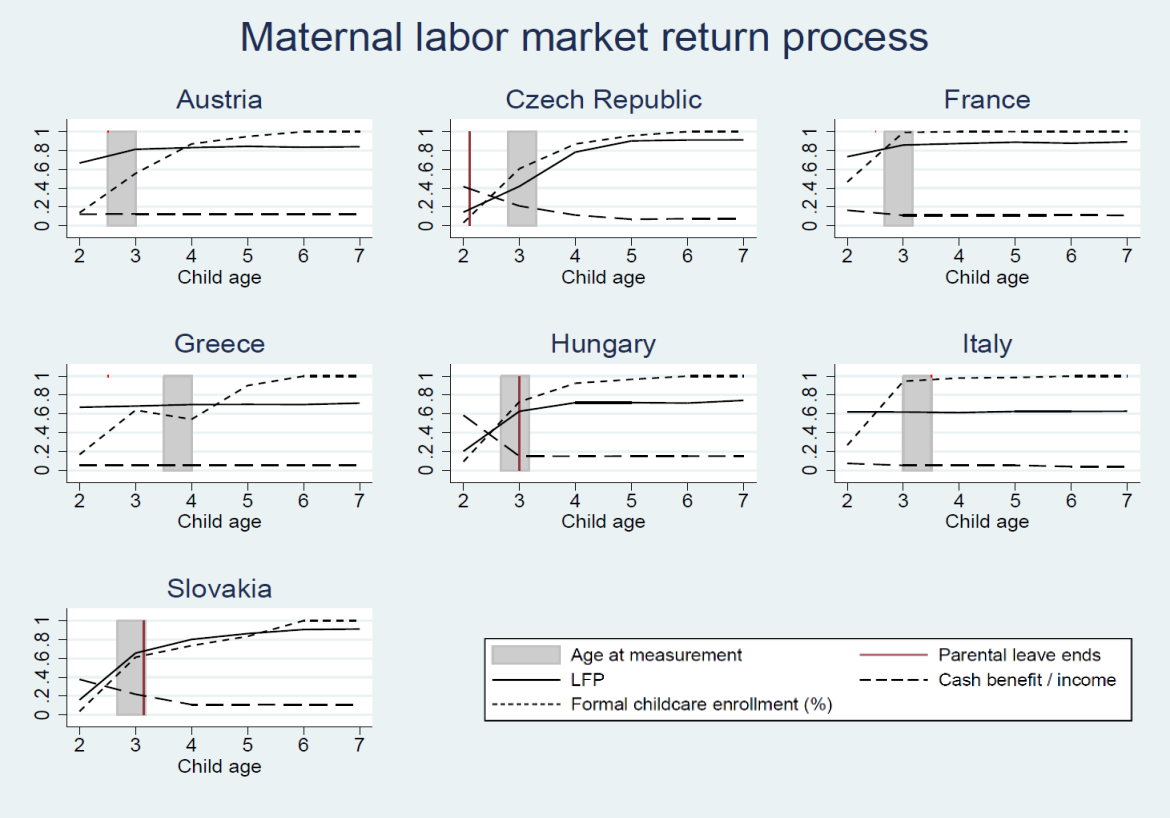
to the long-run "potential" rate (LFP at higher child ages), (b) mothers are able to return to protected jobs, and are not financially or culturally dis-incentivized from doing so, and (c) mothers are able to return gradually with the aid of part-time jobs.

The exact point of estimation in each country depends on the location of the eligibility cutoff, which is itself related to the institutional system, affecting our methodology and the interpretation and external relevance of our estimates. Our analysis focuses on kindergarten eligibility cutoffs around age 3 of children, which exist in several EU countries due to the transition from lower coverage nursery schools to high coverage kindergartens. 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 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 9 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 aspects 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.[2] It is only possible to construct such panel data for countries where data was originally collected as a panel and where the structure of the database is suitable[3], which limits the possible number of countries included in the analysis.

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 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.

[2] 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.

[3] 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.

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, control) (%)	0.73	0.28	0.78	0.68	0.36	0.63	0.32
LFP rate (Q1, treatment) (%)	0.77	0.38	0.83	0.71	0.36	0.62	0.38
LFP rate (Q2, control) (%)	0.74	0.40	0.83	0.67	0.53	0.56	0.55
LFP rate (Q2, treatment) (%)	0.81	0.46	0.86	0.71	0.58	0.62	0.63

3.2 KINDERGARTEN ELIGIBILITY CUTOFFS

To determine in which countries exists a birthdate-based 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. Still, 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 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 the 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 exerts. There is no actual individual-level usage information available 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 is also a very rough 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).[4]

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		EU LFS Reason for inactivity is childcare: Coefficient of T (P-value)
				Birth quarters where difference exists	Mean difference in enrollment rates (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	March 1	September 1, prior to cutoff	3 years old by Sept 1st, or 2.5 year old if spots available	q1-q2	0.12 (0.00)	-0.06 (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)

At the end of this section it is worth to emphasize that determining the country-specific childcare enrollment cutoffs is not at all 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. In this study, we ensure the reliability of the cutoff specification by using three independent sources of information,

[4] 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.

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. We have excluded countries with unverifiable, ambiguous and non-existent cutoffs.

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 of 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. Therefore, 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:

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

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

Note: Here the ambiguity of birth months – mentioned in the data section – is already accounted for. The observations which cannot be undoubtedly categorized into the treatment or the control group are omitted from the estimation.

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:

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

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 (X_{yi}), α_y represents year fixed effects.

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 notably 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:

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

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

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

$$L_{yi} = \beta^s T_{yi} m_{yi} + \alpha_y + X'_{yi}\pi_1 + \pi_3 T_{yi} + \pi_4 m_{yi} + \xi_{yi} \quad (5)$$

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 the characteristics are the same for mothers of children of different ages, except for their childcare possibilities. However, it may well be that the coefficients are in fact different for the original and the comparison sample of mothers. This means that the seasonality-corrected estimates should be considered lower bound estimates, which may differ from the baseline estimates due to either seasonality biases being removed or this 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 (1Q), that is, in the quarter immediately after the September enrollment, as well as two quarters after the treatment (2Q). The 2Q 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 the 4th quarter 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. However, this should not undermine our cross-country comparison of the effect of the institutional context on the childcare effect.

4. RESULTS

4.1 CHILDCARE EFFECT ESTIMATES BY COUNTRY

The estimation results are presented in Table 5, presented separately by region. The top panel in each table gives the estimates for mothers observed in the 4th quarter, soon after the September 1st enrollment date. The lower panel gives the estimates for the 1st quarter, 3 months later. The first two columns within each country's results represent the baseline estimates, without controls 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, without and with controls. Here, the coefficient of the interaction term mT represents the effect of kindergarten eligibility, net of any seasonal effects. Since the seasonality corrected estimates may also differ due to the restriction imposed on the control coefficients, we interpret the two specification's results together, and as providing a range for the childcare effect.

In the CEE countries (Table 5.a), the results generally point to a significant childcare effect, though the countries seem to vary in their enrollment practices. In the Czech Republic, we see a significant positive effect of around 0.1 in the baseline specification in the 4th quarter, which drops slightly to around 0.07 in the seasonality corrected estimates. The inclusion of controls does not significantly change the results, which supports the validity of T as an instrument. There is also a positive childcare effect in the 1st quarter of around 0.07 in the baseline estimates, which falls to 0.05 in the seasonality corrected case and loses its significance. Overall these results show strong evidence of a positive childcare effect of around 0.07-0.1 in the quarter after the September enrollment date, and weaker evidence of a positive effect in the subsequent quarter. Evaluating the results for Hungary in a similar manner, we can say that there is no evidence of an effect in the 4th quarter, and some evidence of an effect of around 0.05 in the 1st quarter. 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 the 4th quarter, and around 0.08-0.11 in the 1st quarter, suggesting either the long lasting effect from the September enrollment date, or be indicative of later enrollment as well. Taken together, the CEE results point to a significant positive childcare effect from kindergarten eligibility around age 3 of children.

The results from the Southern EU countries (Table 5.b) give weaker evidence of a smaller childcare effect, with insignificant effects in the seasonality corrected specifications. Significant estimates are only found in the baseline estimates in the 1st quarter, and show an effect of around 0.04 for Greece, and around 0.06-0.08 for Italy. The results imply that seasonality may play an important role in maternal participation in this group of countries. Overall, we can say that childcare availability around age 3 may have some impact on maternal labor supply, however, there is no strong evidence supporting it, and its magnitude is lower then what we saw for the CEE sample.

The results for the two Western EU countries (Table 5.c) in our sample point to some positive childcare effects, as well as differences between them. For Austria, we find a strongly significant positive effect of around 0.07-0.08 in the second quarter after treatment, even with the seasonality correction. For France, we find weaker evidence of an effect of around 0.05 in the first quarter after treatment, which loses is slightly below significant (at the 10% level) in the seasonality corrected specifications. The childcare effect appears to be stronger in the case of Austria, which is likely due to the fact that female LFP is still below the rate of

that of mothers with older children around age 3, as well as the fact that childcare availability below age 3, or rather, the availability in nursery schools is significantly lower relative to kindergarten availability compared to what we see in the case of France.

In the case of the other countries as well, 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. In the next section, we next turn to the cross-country analysis of the estimates based on Wald statistics that take the treatment effect into account, and in light of the institutional context at the point of estimation.

Table 5

a. CEE countries

Variables	Czech Republic				Hungary				Slovakia			
	Baseline		Seasonality Corrected		Baseline		Seasonality Corrected		Baseline		Seasonality Corrected	
A: Effect 1 quarter after treatment (1Q)												
T	0.0971***	0.107***	0.0246	0.0346	0.00152	0.000110	-0.0128	-0.0136	0.0614	0.0636*	-0.0326	-0.0296
	(0.00245)	(0.000789)	(0.327)	(0.186)	(0.956)	(0.997)	(0.549)	(0.494)	(0.103)	(0.0987)	(0.212)	(0.257)
m			-0.598***	-0.596***			-0.371***	-0.376***			-0.545***	-0.547***
			(0)	(0)			(0)	(0)			(0)	(0)
m*T			0.0724*	0.0678*			0.0143	0.0125			0.0940**	0.0965**
			(0.0751)	(0.0968)			(0.680)	(0.709)			(0.0403)	(0.0346)
Constant	0.282***	0.290	0.879***	0.876***	0.361***	0.363	0.731***	0.809***	0.323***	0.0625	0.867***	0.824**
	(0)	(0.577)	(0)	(0.00867)	(0)	(0.321)	(0)	(0.000631)	(0)	(0.902)	(0)	(0.0123)
Controls		x		x		x		x		x		x
Observations	985	985	1,712	1,712	1,776	1,776	3,994	3,994	689	689	1,476	1,476
R-squared	0.011	0.071	0.316	0.340	0.000	0.069	0.133	0.220	0.004	0.054	0.271	0.295

Variables	Czech Republic				Hungary				Slovakia			
	Baseline		Seasonality Corrected		Baseline		Seasonality Corrected		Baseline		Seasonality Corrected	
B: Effect 2 quarters after treatment (2Q)												
T	0.0631*	0.0743**	0.0179	0.0136	0.0492*	0.0491*	0.00153	0.00232	0.0790**	0.0986**	-0.0121	-0.00548
	(0.0840)	(0.0355)	(0.508)	(0.638)	(0.0889)	(0.0758)	(0.956)	(0.928)	(0.0483)	(0.0135)	(0.721)	(0.874)
m			-0.508***	-0.506***			-0.194***	-0.201***			-0.303***	-0.306***
			(0)	(0)			(0)	(0)			(0)	(0)
mT			0.0452	0.0588			0.0477	0.0463			0.0911*	0.107**
			(0.319)	(0.192)			(0.233)	(0.218)			(0.0823)	(0.0406)
Constant	0.396***	0.575	0.904***	0.441	0.533***	0.783**	0.727***	0.572**	0.555***	0.397	0.857***	0.451
	(0)	(0.277)	(0)	(0.214)	(0)	(0.0190)	(0)	(0.0333)	(0)	(0.494)	(0)	(0.238)
Controls												
Observations	907	907	1,513	1,513	1,681	1,681	2,999	2,999	627	627	1,088	1,088
R-squared	0.004	0.102	0.243	0.284	0.002	0.125	0.032	0.154	0.006	0.065	0.084	0.120

b. Southern EU countries

Variables	Greece				Italy			
	Baseline		Seasonality Corrected		Baseline		Seasonality Corrected	
A: Effect 1 quarter after treatment (1Q)								
T	0.0243	0.0289	0.0304	0.0349	-0.0145	0.0151	0.0905*	0.101**
	(0.284)	(0.184)	(0.196)	(0.117)	(0.790)	(0.764)	(0.0924)	(0.0461)
m			0.00208	-0.00436			-0.00459	-0.0200
			(0.927)	(0.841)			(0.933)	(0.704)
m*T			-0.00610	-0.00503			-0.105	-0.109
			(0.852)	(0.871)			(0.170)	(0.118)
Constant	0.681***	0.133	0.679***	0.160	0.631***	0.896	0.635***	0.613
	(0)	(0.707)	(0)	(0.548)	(0)	(0.273)	(0)	(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
B: Effect 2 quarters after treatment (2Q)								
T	0.0399*	0.0424*	0.0562**	0.0598**	0.0634*	0.0826**	0.123***	0.0804**
	(0.0844)	(0.0608)	(0.0321)	(0.0177)	(0.0713)	(0.0149)	(0.000731)	(0.0131)
m			0.0106	0.00114			0.0196	0.000831
			(0.666)	(0.961)			(0.579)	(0.979)
m*T			-0.0163	-0.0170			-0.0595	-0.0125
			(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)	(0.0442)	(0)	(0.509)	(0)	(0.178)	(0)	(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

c. Western EU countries

Variables	Austria				France			
	Baseline		Seasonality Corrected		Baseline		Seasonality Corrected	
A: Effect 1 quarter after treatment (1Q)								
T	0.0366	0.0489	-0.00398	-0.00933	0.0503*	0.0491*	-0.000581	-0.00297
	(0.228)	(0.114)	(0.862)	(0.680)	(0.0810)	(0.0806)	(0.978)	(0.886)
m			-0.114***	-0.134***			-0.106***	-0.121***
			(3.02e-05)	(1.06e-06)			(9.37e-05)	(6.81e-06)
m*T			0.0405	0.0584			0.0509	0.0521
			(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)	(0.114)	(0)	(0.000851)	(0)	(0.704)	(0)	(0.000856)
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
B: Effect 2 quarters after treatment (2Q)								
T	0.0726**	0.0721**	-0.00543	-0.0146	0.0288	0.0295	-0.0283	-0.0307
	(0.0131)	(0.0125)	(0.843)	(0.589)	(0.287)	(0.265)	(0.302)	(0.260)
m			-0.0934***	-0.100***			-0.0586**	-0.0688**
			(0.00136)	(0.000627)			(0.0324)	(0.0133)
m*T			0.0780*	0.0861**			0.0571	0.0575
			(0.0516)	(0.0289)			(0.138)	(0.117)
Constant	0.738***	0.664	0.832***	1.072***	0.834***	0.181	0.893***	0.156
	(0)	(0.102)	(0)	(0.000153)	(0)	(0.725)	(0)	(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

4.2 CROSS-COUNTRY ANALYSIS OF THE CHILDCARE EFFECT ESTIMATES CONTEXT

Table 6 provides a summary of our main findings for each country, with coverage rates used to calculate a proxy of the treatment effect, and the Wald statistic indicating the magnitude of the childcare effect in each country that takes the treatment magnitude (coverage difference) into account. The findings for the CEE countries give strong evidence of a relatively large positive childcare effect. This is 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 are able to return to jobs that have been protected until this time. So, the institutional context at the child age where we estimate the childcare effect should enable a large impact, which is what we find.

For the Southern EU countries, we find weaker evidence of a childcare effect around age 3 that disappears in the seasonality corrected specification, and, even in the baseline version, estimates are of smaller magnitude based on the Wald statistics. A lower or non-existent childcare effect around age 3 can be explained by the fact that in these countries, maternal participation does not grow much further after this child age. This pattern is related to the short length of the leaves: job protection and financial leave benefits ended a long time ago, and mothers who were willing and able to have returned to the labor market already. It is also related to relatively traditional norms that do not particularly support maternal employment even at older child ages. Do to these factors, childcare availability has less of an impact at our point of measurement at age 3.

For the Western EU countries, we find evidence of a relatively large childcare effect, though the magnitude and the strength of the evidence varies. In Austria, estimates are significant in all specifications, while for France, they are slightly below significance in the seasonality corrected version. This is in line with differences in their context: Austria is much more traditional culturally and childcare availability under age 3 is relatively low, while France exhibits relatively higher maternal participation and childcare enrollment even prior to age 3 of children, due to the very supportive cultural norms and policies. Overall, 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.

Table 6

Summary of the childcare effect estimates, treatment magnitude, and Wald statistics by country

Region		**CEE**			**Southern EU**		**Western EU**	
Country		**Czech Republic**	**Hungary**	**Slovakia**	**Greece**	**Italy**	**Austria**	**France**
Baseline	*T*	0.11	0.05	0.09	0.04	0.08	0.07	0.05
	P-value	0	0.07	0.01	0.06	0.01	0.01	0.08
Seasonality corrected	*T*	0.07	0.05	0.11	-0.02	-0.01	0.08	0.05
	P-value	0.09	0.21	0.04	0.61	0.79	0.02	0.14
Childcare statistics	*Nursery school enrollment rate at age 2*[1]	0.07	0.17	0.07	0.58	0.38	0.26	0.29
	Kindergarten enrollment rate at age 3[2]	0.42	0.6	0.46	0.86	0.81	0.55	0.49
	Difference in childcare availability	0.35	0.43	0.4	0.28	0.43	0.28	0.2
Baseline	*Wald estimate*	0.31	0.12	0.23	0.14	0.19	0.25	0.25
Seasonality corrected	*Wald estimate*	0.20	0.12	0.28	-0.07	-0.02	0.29	0.25

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 in mind, it is important to note that the policy implications for expansion under and over age 3 are not straightforward. However, some points that are useful from a policy-making perspective can be made. In light of the EU-prescribed childcare targets for under and over age 3 of children, we next evaluate what our estimation results tell us regarding the potential effect of childcare expansion. Our estimation is carried out around age 3 of children.

In CEE countries, further expansion above age 3 is likely to have a positive effect on maternal participation, however, the availability over age 3 is not too low relative to the target. The availability of childcare under age 3 is much further from the targets, and subject to debate. 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 therefore be coupled with a reform of the leave system, aimed towards shorter, better paid leaves that encourage greater paternal involvement. These changes should be coupled with steps taken to change the cultural views to be less resistant to institutional childcare under age 3 of children. Additionally, a greater availability of flexible, part-time work could also help mothers who may be willing to separate from their child and return to work more gradually to decide to participate in the labor market.

In the Southern EU countries, the potential effect of childcare expansion is limited by the relatively low rate of maternal employment at older child ages – and female employment overall – which is why we find a small or no impact around age 3 as well. 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.

Based on the results, childcare expansion in the Western EU countries in our sample 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 address cultural views in order to avoid this constraint.

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 – from several countries 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 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.

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