Compulsory Preschool and Maternal Employment: Evidence from a Half-Day Reform in Romania*

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Abstract

This paper examines the impact of a 2012 educational reform in Romania that introduced compulsory, half-day preparatory classes for six-year-old children. We exploit this reform as a natural experiment to assess whether public provision of part-time childcare can increase maternal labor supply. Using data from the European Labour Force Survey and a difference-in-differences strategy, we find that the reform increased maternal employment by 2.6 to 4.1 percentage points. The effects are most pronounced among women facing greater labor market constraints and are accompanied by modest increases in working hours and earnings. While the provision of part-time childcare facilitated some labor market entry, the effects are concentrated on part-time employment, suggesting that such reforms only partially alleviate caregiving burdens.

Keywords: Government policy; childcare; economics of gender; public policy; time allocation and labor supply

JEL Codes: I28, J13, J16, J18, J22

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1 Introduction

One of the biggest development puzzles to solve is how to address the persistently low labor force participation rate among women, especially among women with children. In general, not even half of women over 15 years of age participate in the labor market (World Bank 2023). Compared to 20 years ago, the average female labor force participation rate has declined globally and the gap relative to male labor force participation rates remains significant, standing at a female-to-male labor force participation ratio of 65 percent. A large body of literature explains the minimal progress in female labor force participation via a child penalty (e.g., Kleven, Landais, and Søgaard (2019); Lundborg, Plug, and Rasmussen (2017); Blundell et al. (2016); Agüero and Marks (2008)).

Several researchers have studied the impact of policies that aimed to address the gender gap in labor force participation, such as tax credits in the UK (Blundell et al. 2016) and the US (Bastian 2020), changes in parental leave policies (Tamm (2019); Bergemann and Riphahn (2010); Baker and Milligan (2010)), and the introduction of universal childcare (Baker, Gruber, and Milligan (2008); Lefebvre, Merrigan, and Verstraete (2009); Havnes and Mogstad (2011); Havnes and Mogstad (2015); Bauernschuster and Schlotter (2015); Herbst (2017)) as well as public childcare (Gelbach (2002)). However, to date, it is not clear which policy options are most effective in increasing women's participation in the labor market and how the optimal design of such policies should look like. Furthermore, because the results of the above-mentioned studies differ across countries and periods studied, the contextual attributes that feed into policy impacts require further examination.

In this paper, we explore the introduction of pre-primary, compulsory, preparatory classes in Romania for six-year-old children in order to assess the impact of childcare services provided by the government on maternal labor supply. We argue that the policy, which was introduced in 2012, resulted in a natural subsidy for childcare by the government, potentially reducing the time constraints of primary caregivers. Based on this rationale, the reform allows us to test one of the principles of economic theory on maternal labor supply, which

centers on households that allocate time between childcare and labor (Fong and Lokshin (1999); Ho and Pavoni (2020)). We expect positive effects of the policy on the labor force participation rate of mothers of six-year-old children.

We contribute to the literature on public childcare and maternal employment by examining an underexplored aspect: whether part-time public childcare is sufficient to increase labor supply. Romania's 2012 childcare reform, which introduced a compulsory, half-day preparatory class for six-year-olds, offers an ideal setting to study this question. In addition, the paper expands existing evidence by focusing on a post-communist, middle-income EU country—a context rarely examined in the literature—and on a specific age group that has received limited attention. While most prior studies focus on full-day programs in high-income settings, our findings offer lessons for middle-income countries grappling with persistent gender gaps and aging populations.

To estimate the impact of the reform, we apply a difference-in-difference estimation strategy and use mothers of three- to four-year-old children as our control group. We rely on data on labor market outcomes from the European Labor Force Survey (EU-LFS), which allows us to determine the age of the youngest child in each household as well as the mother of each child in each household. We use pre-reform data to validate the parallel trends assumption. Importantly, we restrict our treatment group to mothers whose youngest child is six years old because mothers with six-year-old children who also have younger children do not benefit from the reform given that they have to take care of these younger children.

We find that the 2012 reform led to increases in the labor supply of mothers of affected children that ranged from 2.6 to 4.1 percentage points. Estimates from a Changes in Changes (CIC) Model (Athey and Imbens 2006) confirm our results.[1] As expected, the reform led to an increase in the probability of part-time employment among affected mothers. This

[1]We also implemented a triple-difference estimation strategy using variation in pre-reform participation in pre-primary classes across cohorts. While this specification aimed to capture heterogeneity in reform effects by uptake, the results were less stable than our main DiD estimates. This is likely due to limited cross-cohort variation in participation rates, potential measurement error in the third dimension, and a loss of statistical power from the additional layer of interaction.

suggests that while part-time public childcare provision facilitates some labor market participation, it constrains employment on the extensive margin. In other words, the reform only partially offsets the caregiving responsibilities typically borne by mothers. Nevertheless, we observe a modest rise in the average number of hours worked per week, along with a slight increase in average gross employee income. In conclusion, our findings demonstrate that even half-day compulsory preschool can significantly increase maternal employment. This highlights the potential of age-targeted, low-cost childcare reforms to promote gender equality in the labor market, particularly in fiscally constrained settings.

Next, we show that the effects of the reform were largest among women who previously faced greater constraints to labor market participation. Specifically, stronger impacts are observed among women in rural areas, those caring for additional children, the self-employed, and those with greater economic security due to the presence of a spouse or another employed household member. In contrast, women living with an elderly person experienced smaller effects, though the difference is not statistically significant. One possible explanation is that the availability of grandparents for informal childcare may substitute for formal care, as suggested by Bratti, Frattini, and Scervini (2018). Alternatively, women co-residing with elderly dependents may face competing caregiving responsibilities that limit their ability to take advantage of expanded childcare. These patterns of heterogeneity offer an important contribution to the literature on childcare provision and maternal employment. Consistent with our findings, Kimmel (1998) show that childcare price elasticities vary by marital status, highlighting the role of household structure in shaping labor supply responses.

Romania is an especially apt setting for the underlying question, given that gender gaps in labor force participation rates are significantly larger than in most European countries.[2] In addition, the country has seen increasing gender gaps over the last 20 years, mainly driven by declining female labor force participation rates, while the European Union (EU) on average reported decreasing gender gaps in labor force participation (World Bank 2023).

[2]In 2021, Romania's female-to-male labor force participation ratio stood at 66 percent, compared to the EU average of 81 percent (World Bank 2023)

In addition, the participation of women in the workforce is among the lowest in the EU. Finally, there are signs of gender norms around childcare use that could deteriorate female labor market participation. According to data from the World Value Survey (2018) 37.2 percent of Romanians thought that a preschool child does not receive the care they need when their mother is working.

Although these trends alone make for an especially apt country setup, Romania is an especially promising case for study given its communist past and long history of centralized public planning. In the period before the transition to a market economy, Romania was characterized by one of the highest female labor force participation rates in the world, driven in addition by a wide range of government-subsidized childcare programs (Fong and Lokshin 1999). The availability of public childcare services decreased significantly in the post-transition period, with the result that in 2020 the share of households with children below six years old who relied on these services was less than 1 percent (EU-SILC 2020).[3]

Our setting provides a clean policy framework to study the underlying research question. We find no evidence of confounding policies or trends that affected maternal employment of mothers of six-year-olds and of three- to four-year-olds differently. Although the government did introduce several policies that potentially impacted employment decisions, it is unlikely that these policies resulted in different employment dynamics between mothers of six-year-old children and mothers of three to four-year-old children.

Our paper contributes to the economic literature that studies the drivers behind the participation and employment of women in the labor force. In addition, our work relates generally to the literature that analyzes the impact of universal childcare and specifically to the literature on childcare subsidies and costs.[4] Among the studies that relate these two strands are Connelly (1992) who demonstrate that increasing childcare costs significantly decrease maternal labor force participation. Similarly, Herbst and Barnow (2008) show that

[3]We define public childcare service as the share of households with children younger than six years old who spent at least one hour in center-based or day-care centers.

[4]Morrissey (2017) provides a recent review of the literature.

accessibility to childcare in terms of geographic availability significantly influences participation in the female labor force. As a corollary of Connelly (1992), Haan and Wrohlich (2011) demonstrate that increasing childcare subsidies increases the supply and fertility of women. In line with this evidence, Bratti, Frattini, and Scervini (2018) illustrate that greater availability of grandparents for childcare results in an increase of maternal labor supply, as does full-time public childcare for three-year-olds (Nollenberger and Rodríguez-Planas 2015). Givord and Marbot (2015) explore a French reform that expanded childcare subsidies and find rising maternal labor force participation rates, especially among mothers with large families. In contrast, González (2013) shows that increased benefits can decrease maternal labor force participation because formal and informal childcare are subsidies. We argue that our paper connects to this literature because the 2012 educational reform in Romania was equivalent to a public subsidy of childcare.

Our paper is most closely related to the work of Fitzpatrick (2010) who explores the introduction of universal preschool in three US states to assess the impact of childcare on maternal labor supply. In contrast to our findings, this author demonstrates negligible impacts on maternal labor supply. These differences could be due to the compulsory setup in the case of Romania, as well as due to age differences in the children targeted. The children impacted in Romania were older than those impacted by the reform in the United States.

In addition, our work is related to previous studies analyzing the impact of children on the labor market outcomes of women. For example, Hardoy, Schøne, and Østbakken (2017) show that the within-couple gender gap in management positions increases significantly with the arrival of the firstborn child and Angelov, Johansson, and Lindahl (2016) generate similar evidence for the within-couple gender gap in earnings. Others have studied the effect of childbirth on the gender pay gap (Costa Dias, Joyce, and Parodi (2021); Sevilla and Smith (2020); Azmat and Boring (2021)). More recently, the literature on the impacts of the COVID-19 pandemic has discussed the influence of unequal care distribution on unequal employment outcomes for men and women (Alon et al. (2020); Del Boca et al. (2020); Farré

et al. (2020)). Our study offers support for this linkage by showing that care responsibilities might indeed reduce female labor force participation and employment, and that addressing this trade-off could result in an increase in maternal employment rates.

2 Institutional Background and Program Description

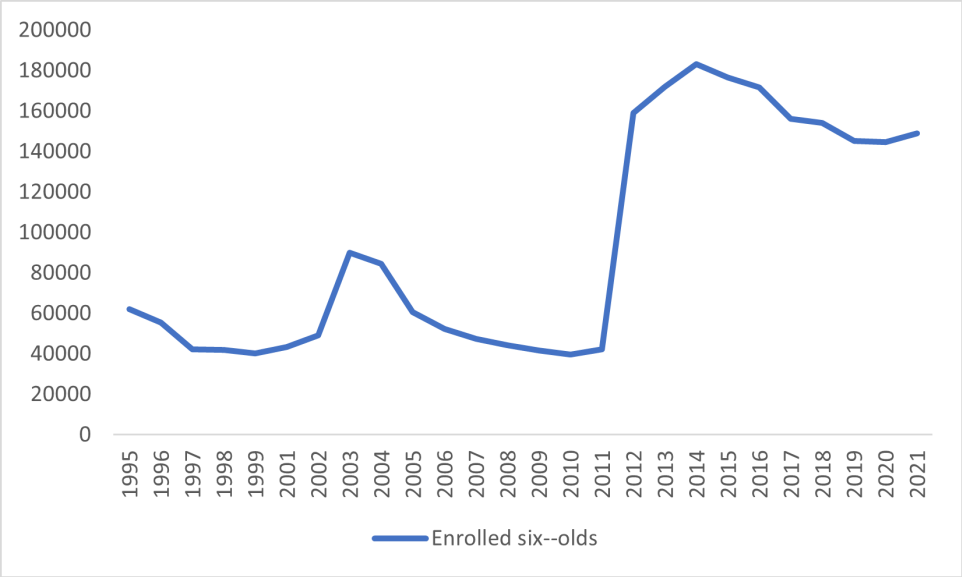
Pre-primary education is voluntary in Romania. Compulsory education traditionally started at the age of seven with the start of primary school (Ministry of Education 2016) with children needing to be seven years old by the start of the school year or by the end of the given calendar year if their level of development was appropriate. In 2012, the Romanian government introduced a preparatory school year into its primary education system to better customize and prepare children for school. From then on, children who have turned six at the beginning of the school year must be enrolled in preparatory classes. A child who turns six by the end of the given calendar year can participate in these classes by request of their parents if the child shows evidence of appropriate socio-emotional development levels.[5]

The reform aimed to improve school readiness and reduce early grade repetition and to reduce educational inequality, particularly in rural and disadvantaged communities. Its goal was to standardize early education and align with EU and OECD education norms. Implicitly, it created a form of state-subsidized childcare for six-year-olds — particularly important in a context of low formal childcare coverage for younger children. The reform introduced free, age-specific public care for six-year-olds for the first time. This effectively reduced the time and financial burden of childcare for families, particularly mothers.

Most preparatory classes take place during the morning within school buildings (Langa 2015). According to research by Langa (2015), the program resulted in better prepared children for primary education and improvements in terms of equal access and opportunities

[5]We take this possibility into account by conducting a robustness test and including children who are five years old in the treatment group. In this robustness test, we additionally include children who are seven years old in the treatment group because they could potentially have been six years old when the school year started.

Figure 1: Number of six-year-old children in primary education in Romania, 1995-2021



Source: Administrative data published by the National Institute for Statistics (2023).

within the Romanian school system, independent of the origin of the children (Langa 2015). Figure 1 plots the number of six-year-old children enrolled in primary education and demonstrates that the policy was effective, with the number rising from 42,288 in 2011 to 158,936 the following year. We are confident relating this increase to the policy reform because the number of six-year-old children in the country did not increase between these years, staying at around 215,000 children, according to data published by the National Institute for Statistics (2023). Based on these data, the increase in enrollment is not related to an increase in the birth cohort between 2011 and 2012.

These numbers also reveal that the reform was unsuccessful in reaching all children of the targeted age group. However, enrollment rates for six-year-old children increased significantly, going from 19.7 percent in 2011 to 73.9 percent in 2012. Importantly, the age cutoff was imposed nationally and unaffected by household characteristics. Consequently, manipulation by parents was unlikely.

3 Theoretical Rationale

To help frame our empirical research question and findings, we briefly review the existing theoretical literature on the effect of childcare on women's labor market participation.

The study most relevant to our work is Fong and Lokshin (1999) investigating the interaction between child care and participation in the maternal labor force in Romania. These authors argue that households maximize welfare by choosing the optimal level of consumption of quality childcare, market goods, and leisure. The optimal amount of quality of childcare is a function of childcare provided by the mother, purchased on the market, and provided by other members of the household or relatives. The budget constraint is determined by exogenous nonwage household income, each household member's labor income (a function of each member's wage and hours worked), the number of children, the unit price of quality childcare, and the quantity of quality childcare provided by each household member and the market. Based on their model, Fong and Lokshin (1999) predicts that an increase in the price of childcare negatively affects the number of hours mothers work.

Our analysis connects to this work by exploring the 2012 educational reform, which was an exogenous shock that increased the availability of publicly provided childcare for children of age six. We argue that this policy led to a sudden decrease in the price of childcare because the government was providing a form of childcare during the time children participated in mandatory, preparatory classes. At the same time, it reduced the time constraints of primary caregivers. We expect an increase in labor force participation and employment of mothers of children affected by the reform. Given that preparatory classes are obligatory and universal in Romania, we can address endogeneity concerns around unobservable household characteristics that might influence the optimal combination of quality childcare purchased on the market. Doing so will make a considerable contribution to the literature to date.

Another theoretical work closely related to our paper is that of Ho and Pavoni (2020). Focusing on the optimal design of childcare subsidies in their analysis of maternal labor supply, they argue that household members optimize welfare by allocating time between

childcare and the labor market and find a positive effect of childcare subsidies on usage of formal childcare. They make an important point about optimal subsidy design entailing higher subsidies for lower-income households. The reform we investigate in this paper can be understood as a universal childcare subsidy, given that it incorporated an entire cohort of children into the formal education system.

4 Data and Empirical Strategy

To estimate the impact of introducing preparatory school years in Romania on maternal employment, we employ difference-in-difference (DiD) estimation techniques and estimate Equation 1. Specifically, we compare the employment rate of women with and without children ages six years old, before and after 2012:

$$P(E_{ist}) = f(\beta_1 Mom6_{ist} + \beta_2 Post2012_{ist} + \beta_3 Mom6_{ist} \times Post2012_{ist} + \beta_4 X_{ist} + \delta_s + \gamma_t + \epsilon_{ist}). \tag{1}$$

The variable E_{ist} is binary and denotes whether a mother with a six-year-old child is employed: i identifies a mother at the individual level, s the respective state, and t the time period. $Mom6_{ist}$ indicates whether a woman is a mother of a six-year-old child, while $Post2012_{ist}$ indicates whether a year is after the reform in 2012. $Mom6_{ist} \times Post2012_{ist}$ is the DiD effect of interest. We expect the effect of β_2 to be positive given that the preparatory school year replaces the childcare provided by mothers. X_{ist} are individual-level controls that vary at the individual, state, and year level, δ_s are state-fixed effects to control for time-invariant, state-specific characteristics, and γ_t are time-specific, state-invariant characteristics. ϵ_{ist} is an error term. We report average marginal effects from a logit specification throughout (unless otherwise stated). Standard errors are clustered at the state level.

We estimate equation 1 using data from the European Labor Force Survey (EU-LFS) from 2010 to 2019. The treatment group consists of all mothers whose youngest child is six years

old. Importantly, we restrict our treatment group to mothers whose youngest child is six years old because mothers with six-year-old children who also have younger children do not benefit from the reform given that they have to take care of these younger children. We consider two different control groups. First, we consider mothers whose youngest child is three or four years old, since this group of women might be more similar to our treatment group in terms of unobservable characteristics. We do not consider mothers with younger children because parents are more reluctant to put children below three years old into childcare (Fong and Lokshin 1999). Given that five-year-old children can also participate in preparatory classes by request of their parents under certain circumstances, we do not consider their mothers as part of the control group. To validate our results, we also consider women without children as an additional control group. However, we believe that mothers of three to four-year-old children might be a better control group, as they might be more similar to mothers of six-year-old children on unobservable characteristics and also might experience unobservable shocks in a more similar fashion. Importantly, the treatment and control groups are mutually exclusive because we restrict the treatment group to mothers whose youngest child is six years old.

Table 1 shows the summary statistics for the three groups. The women in the three groups are in their early to mid-30s and the share of migrants[6] is negligible. Although nearly nine out of ten women whose youngest child is three, four, or six years old are married, only half of women without children are married. The divorce rate is also higher for women without children. Similarly, almost all women with young children indicated that their partner lives with them in the household, while this was true for half of women without children. These numbers imply that there are some significant differences between treated and untreated women when considering women without children as the control group. In line with these patterns of results, women without children also differ in their skill distribution compared to the other two groups. A significantly lower share is low-skilled. Moreover, they live on average in smaller households, in which a higher share of members is employed as well as

[6]The EU-LFS collects information on the country of birth of each respondent. We define a migrant as a person whose country of birth is not Romania.

inactive. Table 1 also reveals that women without children are more likely to be employed, belong on average to a slightly higher labor income decile, work more hours, and are less likely to work part-time. In addition, the share of women without children seeking employment is larger when compared to women whose youngest child is six, three, or four years old. See Online Appendix A for data and sample details.

Table 1: Summary Statistics

	(1)		(2)		(3)	
	Mother (6-year-old)		Mother (3-to-4-year-old)		Women without kids	
	mean	sd	mean	sd	mean	sd
Age	34.62	5.75	32.26	5.88	34.78	9.20
Migrant	0.00	0.02	0.00	0.04	0.00	0.03
Married	0.87	0.33	0.86	0.34	0.49	0.50
Divorced	0.05	0.22	0.04	0.20	0.08	0.27
Partner lives in household	0.92	0.27	0.92	0.27	0.54	0.50
Low-skilled	0.28	0.45	0.28	0.45	0.16	0.37
Middle-skilled	0.53	0.50	0.48	0.50	0.59	0.49
High-skilled	0.19	0.40	0.24	0.43	0.25	0.43
Youngest child six years old	1.00	0.00	0.00	0.00	0.00	0.00
Age of the youngest child in the household, aged less than 15 years	6.00	0.00	3.50	0.50	.	.
Number of children in the household aged less than 15 years	1.64	0.77	1.73	0.90	0.00	0.00
Number of persons in the household, whatever the age	4.32	1.40	4.43	1.58	2.77	1.30
Number of employed persons in the household aged 15 years and more	1.72	0.90	1.71	0.98	1.87	1.21
Number of inactive adults in the household aged 15 years and more	0.67	0.90	0.74	0.94	0.75	1.00
Employed	0.65	0.48	0.62	0.49	0.72	0.45
Part-time work	0.06	0.23	0.05	0.22	0.04	0.20
Seeking work	0.04	0.19	0.04	0.19	0.05	0.23
Monthly take-home pay from main job (deciles)	4.99	2.93	5.08	2.95	5.11	2.85
Number of hours per week usually worked in main job	34.53	14.11	35.71	12.72	36.68	11.90
Observations	8948		15837		189951	

Notes: Skill levels follow the official definition of the EU-SILC and is the highest education attainment level according to ISCED 2011. The low-skilled have at most lower secondary education, the middle-skilled at most upper secondary education, and the high-skilled tertiary education degress. Source: EU-LSF (2010-2019).

The difference in employment shares of the three groups described in Table 1 becomes evident in Figure 2 and 3. The graph on the left shows the employment rate of mothers with six-year-old children, mothers with children between three and four years of age, and women without children. In all three cases, we restrict the sample to women between 20 and 50 years old. The black, vertical line indicates the year of the reform. The graph reveals a clear gap between women with and without children in the age group analyzed. Based on these unadjusted trends there is no evidence of significant changes after the introduction of the reform. The right figure plots the magnitude of the employment gap between women without children and women with six-year-old children. The employment gap seems to increase after

the introduction of the reform, mainly driven by an increase in the employment rate of mothers without children. This evidence might support our hypothesis that mothers of three- to four-year-old children are the better control group because women without children are subject to different unobservables.

Figure 2: Unadjusted employment trends for women with young children and women without children in Romania, 2010–2019

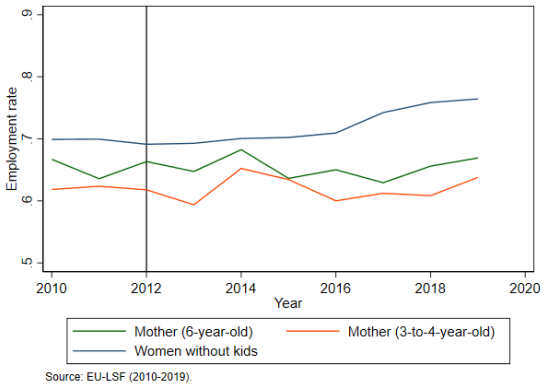
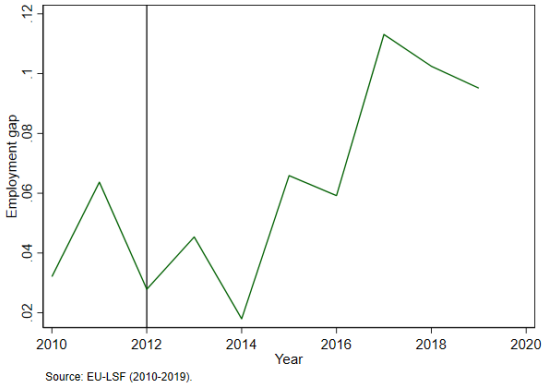


Figure 3: Unadjusted employment gaps for women with young children and women without children, 2010–2019



Notes: The left panel plots the employment rate for mothers (six-year-old) (in Green), mothers (three-or-four-year-old) (in Orange), and women without children (in Blue). The right panel plots the employment gap between women without children and mothers with six-year-old children. We restrict the sample to 20- to 50-year old. The vertical black line indicates the year Romania introduced obligatory, preparatory classes for six-year-old children. Source: EU-LFS (2010-2019).

Figure 3 also indicates that a difference-in-difference (DiD) strategy might be a better empirical setting than a regression discontinuity design (RDD) in the case of the reform under consideration. The effect builds over time, and DiD allows for lagged treatment effects and more flexible timing in the outcome. RDD is best suited when the treatment has an immediate effect. Moreover, the figure confirms the parallel trends assumption in the pre-treatment period.

To test the robustness of the results, we also implemented a triple-difference estimation strategy using variation in pre-reform participation in pre-primary classes across cohorts. While this specification aimed to capture heterogeneity in reform effects by uptake, the results were less stable than our main DiD estimates. This is likely due to limited cross-

cohort variation in participation rates, potential measurement error in the third dimension, and a loss of statistical power from the additional layer of interaction. Appendix B details the results.

5 Preparatory Years and Maternal Labor Supply

5.1 Average Treatment Effects

We estimate the average effect of preparatory classes on the employment of mothers with six-year-old children using equation (1) in Table 2. We use EU-LFS survey weights and add controls cumulatively across columns. Column 1 only includes an indicator variable for being a mother of a six-year-old child, an indicator variable for the post-reform periods, and the DD estimator (Mom(six-year-old $\times$ Post2012). Column 2 adds individual-level characteristics that vary over time to account for differences in the age and skill decomposition, migration background, marriage status, and the presence of a partner in the same household, as well as differences in the household decomposition concerning the number of employed household members. Column 3 adds state and year-fixed effects to account for annual shocks affecting all mothers and idiosyncratic state traits. Column 4 adds region-by-year unemployment rates to account for economic conditions. Columns 5 and 6 show that the results are robust to a probit and ordinary least squares (OLS) estimation, although insignificant and considerably smaller in the case of OLS. Given that OLS regressions are subject to important empirical limitations in the case of binary outcome variables (Stock and Watson 2015), we are not concerned about the insignificance in column 6.

Across each set of controls, the DD estimate is stable between 2.6 and 4.1 percentage points (or 4.3 percent and 6.6 percent from an average of 61.2 percent). Results are significant at the 1-percent level. These findings imply that the reform led to a considerable increase in the labor supply of mothers of six-year-old children and that substituting maternal childcare with childcare provided by the government is an effective way to increase maternal labor

Table 2: The effects of the 2012 reform on employment rates

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	0.0263	0.0386	0.0401	0.0403	0.0405	0.00191
	(0.0143)	(0.00788)	(0.00886)	(0.00905)	(0.0106)	(0.0182)
Mean (Dep. Var)	.612	.612	.612	.612	.612	.612
St. Dv. (Dep. Var.)	.487	.487	.487	.487	.487	.487
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	26,114	26,114	26,114	26,114	26,114	26,114

Notes: The sample consists of mothers of six-year-old children (the treatment group) and three- to four-year-old children (the control group). Standard errors are clustered and in parentheses. Source: EU-LSF (2010-2019).

supply.

The size of the effect is similar to the impact of the Earned Income Tax Credit (EITC) on maternal employment in the United States (Bastian 2020) or to that of the Universal Childcare Reforms in Germany (Geyer, Haan, and Wrohlich 2015). However, the impact is less than that found for universal full-time public childcare for three-year-olds in Spain (Nollenberger and Rodríguez-Planas 2015) or for greater availability for grandparents (Bratti, Frattini, and Scervini 2018), which could be due to preparatory classes that only take place in the morning.

The results are robust to restricting the age range of mothers (Online Appendix Table B1 and B2), abstracting from survey weights (Online Appendix Table B3), using women without children as a comparison group (Online Appendix Table B4), measuring the effect on labor force participation (Online Appendix tables B5, and B6 with age restriction), or including mothers of five- and seven-years-old children in the treatment group (Online Appendix Table B7).

We also estimate a Changes in Changes (CIC) Model, proposed by Athey and Imbens (2006), which provides a more flexible and robust method for estimating treatment effects in observational studies where traditional assumptions of the Difference-in-Differences (DID)

model may not hold. CIC does not require parallel trend assumptions and is designed for repeated cross-sections. Estimations confirm the main results.[7]

5.2 Heterogeneous and Subgroup Treatment Effects

Next, we turn to the question of heterogeneity. In Table 3 we test whether the effect of the reform differs between groups of women to shed light on some of the mechanisms that could drive the increase in the employment of mothers with six-year-old children.

Table 3: Effect of the 2012 reform on employment rates by groups

	Rural	Child	Elderly	Partner in HH	Employed in HH	Self-employed
Mom(six-year-old) × Post2012 × Group	0.0420	0.0425	-0.0165	0.0388	0.0426	0.0366
	(0.0138)	(0.0128)	(0.0195)	(0.00842)	(0.0127)	(0.0169)
Mean (Dep. Var)	.612	.612	.612	.612	.612	.612
St. Dv. (Dep. Var.)	.487	.487	.487	.487	.487	.487
Demographic controls	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region by year unemployment rate	Yes	Yes	Yes	Yes	Yes	Yes
N	26114	26114	26114	26114	23836	24601

Notes: Standard errors in parentheses and clustered. The sample consists of mothers of children between three and four or six years old. Source: EU-LSF (2010-2019).

Given the rural-urban divide that is reflected in many development indicators in Romania, we test whether mothers of six-year-old and three- to four-year-old children living in rural areas benefit differently from the program than similar mothers living in urban areas. Figure 4 demonstrates that there is a clear urban-rural gap in the case of mothers of children of these ages in Romania. In addition, Figure 5 shows that the number of creches in rural areas is significantly lower than the number of creches in urban areas. With nearly half of the population in Romania living in rural areas, these results indicate that mothers of children of preschool age face significantly more restrictions in rural than urban areas. The coefficient in Column 1 of Table 3 is positive and significant. These results indicate that women in rural areas exposed to the treatment benefited more on average, which might be related to the fact that they had less access to public childcare previous to the reform.

[7]Results are available upon request.

Figure 4: Employment rates of treated and untreated mothers in rural and urban areas, 2010–2019

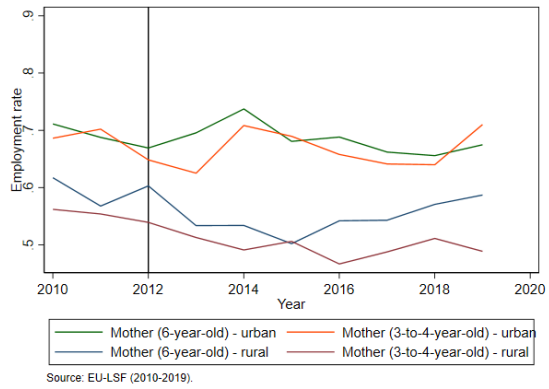
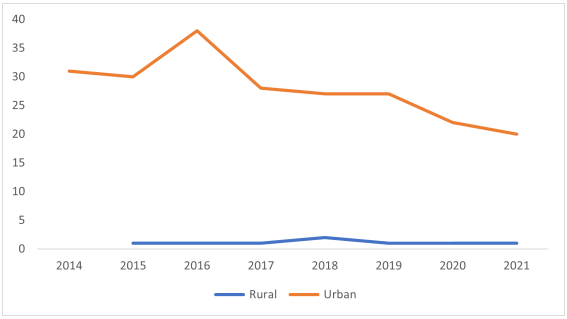


Figure 5: Number of creches (the ante-preschool level) in Romania in rural and urban areas (2014-2021)



Notes: The left panel plots the employment rate for mothers (six-year-old) in urban areas (in Green), mothers (three-or-four-year-old) in urban areas (in Orange), mothers (six-year-old) in rural areas (Blue), and mothers (three-or-four-year-old) in rural areas (in Red). The vertical black line indicates the year Romania introduced obligatory, preparatory classes for six-year-old children. The right panel plots the number of creches in Romania in urban areas (in Orange) and in rural areas (in Blue). Source: EU-LFS (2010-2019), and administrative data published by the National Institute of Statistics (2023).

Mothers with more than one child might face greater care responsibilities than mothers with only one child. Based on this rationale, we analyze whether the impact of preparatory classes differs between mothers of six-year-old children with and without additional children. As we argued above, the impact might be greater for women with greater restrictions prior to reform. The results for households with and without additional children, which are displayed in Column 2 of Table 3, differ significantly. The coefficient is positive and significant. These results seem counter-intuitive at first. Although the reform does not alleviate the greater care responsibilities associated with raising more than one child, it at least alleviates the constraints imposed by taking care of a young child. Future research could analyze the potential mechanisms at play in households with more than one child in more detail.

Next, we investigate whether the impact of the program differed between mothers living with elderly people and those living without them. There are two reasons why this differentiation is interesting. First, previous research shows that grandmothers can absorb some of the care responsibilities originally faced by mothers (Bratti, Frattini, and Scervini 2018).

Second, women might face additional care responsibilities concerning eldercare (Pezzin and Schone (1999); Johnson and Lo Sasso (2006)). In both cases, the reform might be less effective in increasing maternal labor supply, either because it does not substitute for eldercare responsibilities, or because women may have already found alternative models to substitute for their care responsibilities.

The evidence in Column 3 of Table 3 indicates that eldercare indeed seems to counteract the positive effect of the reform on maternal labor supply although the coefficient is insignificant at the 10-percent level. Mothers of six-year-old children in households with elderly experienced lower effects than did mothers of six-year-old children in households without elderly. Based on these results, we conclude that eldercare is a parallel problem policymakers should take into account when seeking to increase the labor force participation rate of women because it might impose additional time constraints on primary caretakers. If the impact is simply smaller because mothers have already substituted for childcare responsibilities by relying on grandparents, this just stresses the importance of providing care models that facilitate the incorporation of women into the labor market.

To analyze which of the two possibilities around the negative effect of elderly people is more likely to persist, we estimate the impact of the 2012 reform on employment rates of elderly people living in households with children who are five years old. The control group consists of older people in households with children three or four years of age. We identify the elderly as all people over 60 years old.[8] If the first channel is more likely to drive the negative interaction term observed in Column 3 of Table 3, then we would expect to see a positive effect on the employment rates of elderly people because they face similar time deliberations as mothers. In fact, the evidence presented in Table B8 speaks for this channel. The 2012 reform had a positive effect on employment rates of elderly people in households with six-year-old children when compared to those in households with three- to four-year-

[8]One important limitation of our analysis is retirement age. The standard retirement age for women is 61 years and 9 months and 65 years for men. A part of our sample might simply move into inactivity, or they might already be inactive. For this group, we do not observe changes in the probability of being self-employed.

old children. The effect is significant at the 1 percent level in most cases, but insignificant when estimating an OLS model. The important influence of grandparents on the impact of childcare policies is in line with recent evidence by Karademir, Laliberté, and Staubli (2023) showing the intergenerational effects of childcare policies.

In addition, we investigate whether the presence of the mother's partner in the same household influences the impact of the program.[9] given that partners could absorb some of the care responsibilities faced by mothers. Incorporation back into the labor force under the reform might then be more feasible. However, at the same time, the need for women with income-generating partners to work might be lower. The evidence in column 4 of Table 3 points to the important role of the presence of partners in the household. The coefficient is positive and significant, indicating that mothers of six-year-old children who live with their partners experience a larger effect. These results could mean that partners of women with six-year-old children assume a greater role in household care responsibilities, as well as in women's decision-making regarding labor force participation and employment.

Continuing this line of inquiry, we analyze whether the presence of additional employed household members impacts the effect of the reform on the maternal labor supply. If other members of the household are employed, there may be additional resources available for household and care responsibilities. Consequently, mothers in these households might be more able to outsource the associated tasks, which could make it easier for them to participate in the labor market. However, a counterargument is that such mothers face a lower necessity to work and generate income due to the safety net being more robust thanks to the additional income-generating individuals in the household. The coefficient in Column 5 of Table 3 is positive, showing that maternal employment in households with additional employed members indeed rises more than the employment of mothers in households without additional employed members. These findings, together with our findings on the presence of spouses in households, could mean that the employment of other household members does

[9]The EU-LFS indicates if the partner of a person is present in the same household by an indicator variable.

indeed play an important role in the decision-making of mothers about participating in the labor market.

Lastly, the impact is larger for mothers of six-year-old children who are self-employed. These results are not surprising, because entrepreneurs might be especially affected by a lack of childcare options, and drop out of leading businesses or entrepreneurial activities.

In sum, these findings indicate that women who faced more impediments to labor market opportunities prior to the reform, for example, in the form of less infrastructure in rural areas, a lower possibility of combining work with childcare responsibilities in the case of entrepreneurial activities, or a higher level of economic security due to other income-generating individuals in the household, experienced greater effects of the reform. The heterogeneity in the estimates is in line with previous evidence showing that the price elasticity of childcare depends on women's marital status (Kimmel 1998).

6 Hours Worked, Part-time Employment, and Earnings

One particularity of the 2012 reform is that compulsory preparatory classes only took place during the morning, meaning that the childcare subsidy by the public sector amounted to half and not a full day. It is therefore not surprising that we find an increase in the probability of being employed part-time as a consequence of the reform (Table 4). However, the reform resulted in a slight increase in the average number of usual hours worked per week (Table 5).

Table 6 shows that affected women experienced a significant increase in gross monthly employee cash or near-cash income. The coefficient in Column 4, the baseline specification, is equivalent to a 1.7 percent increase. The provision of public childcare could therefore also contribute to closing the gender pay gap. That said, the coefficients presented are insignificant at the common significance levels. Future research should investigate if these results

Table 4: Effect of the 2012 reform on part-time work

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) x Post2012	0.0114	0.00624	0.00377	0.00379	0.00494	0.0116
	(0.0129)	(0.00679)	(0.00493)	(0.00499)	(0.00556)	(0.00746)
Mean (Dep. Var.)	.052	.052	.052	.052	.052	.052
St. Dv. (Dep. Var.)	.223	.223	.223	.223	.223	.223
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	15920	15920	15920	15920	15920	15920

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of employed mothers of children between 3 and 4 or 6 years old.

Table 5: Effects of the 2012 reform on number of hours per week usually worked in main job

	OLS	OLS	OLS	OLS
Mom(six-year-old) x Post2012	1.099	0.625	0.772	0.771
	(0.543)	(0.578)	(0.610)	(0.615)
Mean (Dep. Var)	35.229	35.229	35.229	35.229
St. Dv. (Dep. Var.)	13.287	13.287	13.287	13.287
Demographic controls	No	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes
State fixed effects	No	No	Yes	Yes
Region by year unemployment rate	No	No	No	Yes
N	15920	15920	15920	15920

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of employed mothers of children between 3 and 4 or 6 years old.

are entirely driven by women working more, or because some of them also saw increases in their earnings.

Table 6: Effects of the 2012 reform on employee cash or near cash income

	OLS	OLS	OLS	OLS
Mom(six-year-old) × Post2012	-271.4	52.99	36.88	36.86
	(508.3)	(371.1)	(381.7)	(382.2)
Mean (Dep. Var)	2172.895	2172.895	2172.895	2172.895
St. Dv. (Dep. Var.)	3690.202	3690.202	3690.202	3690.202
Demographic controls	No	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes
State fixed effects	No	No	Yes	Yes
Region by year unemployment rate	No	No	No	Yes
N	1279	1279	1279	1279

Standard errors in parentheses

Source: EU-SILC (2010-2020). Standard errors are clustered.

The sample consists of employed mother of children between 3 and 4 or 6 years old.

7 Ruling out Contemporaneous Shocks

A causal interpretation of DiD requires that there are no other contemporaneous factors that influence the relative employment of mothers of six-year-old children. Even though it is unlikely that parallel introduced policies or other contemporaneous shocks only influenced the employment outcomes of mothers of six-year-olds, while leaving the employment of mothers of three-to-four-year-olds unaffected, we investigate this possibility in more detail.

To this end, we search for important policy reforms between 2010 and 2014. The Romanian government introduced several policy reforms that potentially could have affected employment decisions, such as a cut in public sector wages or the introduction of a flat tax rate. However, most of them were no longer in effect by 2010. In addition, we believe that none of these would have impacted the maternal employment rates of mothers with six-year-old children differently from those of mothers with three- to four-year-old children.

8 Conclusion

This paper provides new evidence on the labor market effects of age-targeted, part-day public childcare by examining a nationwide preschool reform in Romania that made one year of preparatory classes compulsory for five-year-olds. The 2012 reform in Romania provides a clean policy setting and also eliminates other potential confounding factors around the interaction between childcare and maternal employment (Fong and Lokshin (1999); Ho and Pavoni (2020)), such as costs and quality of childcare, based on its compulsory and universal design.

Using variation in cohort eligibility, we find that maternal employment increased by 4.5 percentage points among eligible households. The effects are stronger among self-employed women, mothers in rural areas, and those with more than one child, suggesting that the reform primarily benefited women who faced greater barriers prior to its implementation. Similarly, the presence of a partner or other employed household members may have imposed higher opportunity costs to working, which the reform helped alleviate. Lastly, our results indicate that the presence of grandparents may have either already substituted for childcare before the reform, or imposed additional caregiving burdens on mothers that were not addressed by the preschool reform.

Given that the 2012 reform in Romania only introduced preparatory school classes during morning hours, it is not surprising that the probability of working part-time increased as a result of the reform among affected mothers. Nevertheless, the average hours usually worked during a week increased slightly. Moreover, we demonstrate an increase in average monthly earnings among affected women of 10.7 percent. The results indicate that even modest expansions in early childhood education—limited in both daily duration and target age group—can yield meaningful labor supply responses in middle-income settings.

Our findings contribute to a growing literature on the interaction between family policies and female labor supply in contexts where constraints on childcare access and flexible employment are particularly binding. They also underscore the potential for relatively low-cost,

compulsory preschool policies to support women's labor market attachment, particularly among groups underrepresented in formal employment.

Future research could explore the long-run effects of such reforms on employment trajectories, earnings, and child outcomes, as well as the potential complementarities between partial-day childcare and other family-oriented policies such as parental leave or child allowances.

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Online Appendix

A Data Appendix

A.1 European Labor Force Survey

The European Labor Force Survey (EU-LFS) is a quarterly survey that has been conducted in the European Union from 1983 to the present. It is a household survey that targets the population ages 15 and above. The data only cover private households and abstract from individuals living in public institutions. Eurostat coordinates the data elevation and national statistical institutes are responsible for designing the sample, preparing the questionnaires, conducting the interviews, and forwarding the results to Eurostat.

Information gathered in the survey spans a diverse set of topics, such as employ- ment and labor, education, health, housing and land use planning, social stratification, and family life, as well as demography and migration. Data gathered as part of the EU-LFS are representative of the NUTS-2 level. Several variables are only available at aggregate levels, such as citizenship (aggregated to up to 16 groups), economic sectors (available at NACE 1-digit codes), and income (only provided in deciles). A full list of variables included in the survey and their respective codification is available in Eurostat (2018).

We make use data from the years 2010 to 2019, which yields a total sample of 2,313,986 observations. To derive the level of skills, we rely on the generated variable on educational levels published by Eurostat (denoted as hatlev1d). We also rely on variables previously constructed by Eurostat on the number of children younger than 15 years per household, the number of household members, the number of employed household members, and the number of inactive household members.

To identify mothers in our sample, we take advantage of the fact that the survey gathers information on the mother's ID for each person. The value is zero if the mother does not live in the same household and equal to the sequential number of the household member who is

the mother otherwise. We create a binary variable that is equal to one if the mother ID for children is equal to the sequential number of a household member. We verify this approach by analyzing mothers' gender and the number of children.

One important data limitation for the paper at hand is that age is only reported in groups in the case of Romania. Consequently, we cannot identify mothers of six-year-old children specifically; we can only identify mothers of children belonging to the age group of five to nine. Luckily, there is also information on the exact age of the youngest child in the household, at least at the yearly level. We use this information to identify our target group rather than relying on all children in the households and argue that the reform might be ineffective in households with six-year-old children and younger children. If publicly provided childcare substitutes for mothers' childcare of six-year-old children, but the mother still has to take care of younger children in the household, the impact on her available working hours might be minimal.

Similarly, we construct our main control group by relying on the information on the age of the youngest child. To identify the control group, we construct a binary variable that is equal to one for mothers whose youngest child is three or four years old.

We face additional data limitations when constructing our alternative control group, women without children. The EU-LFS does not collect data on the number of children outside the household. It only asks about the number of children (younger than 25 or 15 years old) in each household. Although the survey includes a question on whether the child lives in the same household or not, this variable assumes the same value for those without children and children living outside the household. Due to this data limitation, we takes that a woman has no children if there are no children younger than 25 years old in the household. This is an important caveat of this paper.

A.2 European Statistics on Income and Living Conditions

For our triple difference in difference regression, we use the European statistics on income and living conditions survey (EU-SILC). The survey is a yearly survey that collects data on income, poverty, social exclusion, and living conditions for each country in the European Union.

We take advantage of the fact that the survey contains information on children's school assistance. More specifically, the survey asks about the number of hours of education in a preschool during a usual week. Table A1 shows the cross-tabulation of an indicator variable generated from this variable that is equal to one for all cases that report a positive number of hours and zero otherwise, with all children in a household being below 16 years old. The table shows that there are 1,064 children in our main target group of interest, the six-year-olds. Of these, 258 attend a preschool for at least one hour during a usual week. Figure A1 demonstrates that most children who attend preschool do so for at least 20 hours. These results hold when restricting the sample to six-year-old children (see Figure A1).

Notes: The Table shows the cross-tabulation of an indicator variable generated from a variable measuring the hours of preschool attendance. The variable is equal to one for all cases that report a positive number of hours and zero otherwise with all children in a household being below 16 years old. Source: EU-SILC (2010-2020).

We next explore similar information on children who attend compulsory schooling. Table A2 shows that there is additional valuable information on six-year-old children that is gathered as part of this variable. Of the 1,064 children, 620 attend compulsory schooling. Similar to our results on preschool attendance, most children attend compulsory schools for 20 or more hours (see Figure A2).

We then combine these variables into one indicator variable that measures the attendance rates of children. Table A3 shows the resulting estimator by age. Of 1,064 six-year-old

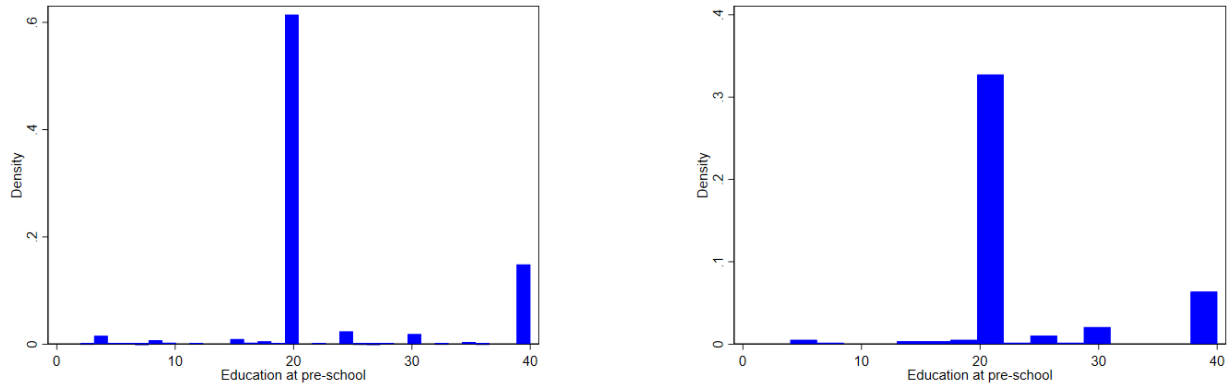
Table A1: Data on preschool assistance

	0	1	Total
0	376	5	381
1	471	30	501
2	533	139	672
3	402	424	826
4	267	655	922
5	217	783	1000
6	806	258	1064
7	1161	8	1169
8	1292	3	1295
9	1404	1	1405
10	1504	3	1507
11	1523	1	1524
12	1563	0	1563
13	1581	0	1581
14	1595	0	1595
15	1638	0	1638
Total	16333	2310	18643
N	18643		

Table A2: Data on compulsory school assistance

	0	1	Total
0	380	1	381
1	501	0	501
2	672	0	672
3	826	0	826
4	919	3	922
5	991	9	1000
6	444	620	1064
7	95	1074	1169
8	88	1207	1295
9	112	1293	1405
10	132	1375	1507
11	231	1293	1524
12	518	1045	1563
13	1580	1	1581
14	1595	0	1595
15	1638	0	1638
Total	10722	7921	18643
N	18643		

Figure A1: Histogram of hours at preschool in a usual week



Notes: The left graph shows the number of non-zero hours children attend at a preschool during a usual week. The right graph shows the same estimates restricting the sample to six-year-old children. Source: EU-SILC (2010-2020).

children, 878 attend preschool or compulsory schooling. Applying survey weights results in an average attendance rate of 80.7 percent for the period under consideration.

Figure A3 plots the number of hours attended in a usual week for all children with positive values as well as those who are six years old and attend at least one hour of preschool or compulsory school.

Given that we are ultimately interested in maternal labor force participation and not attendance rates, we next aggregate this variable at the household level. Figure A4 plots the share of households with six-year-old children who attend (pre)school over the period 2010-2020. The graph reveals that there was a clear increase after the introduction of the reform in 2012. While there was a slight drop in 2013, the share remains higher throughout the post-program period.

Table A5 shows that only 5 percent of all households in the sample had children who were six years old during the period 2010-2020. A slightly larger share has children between three- and four years old. Attendance rates were similar if measured at the household or individual level, and were higher for six- than three-to-four-year-old children, as expected.

Table A3: Data on preschool and compulsory school assistance

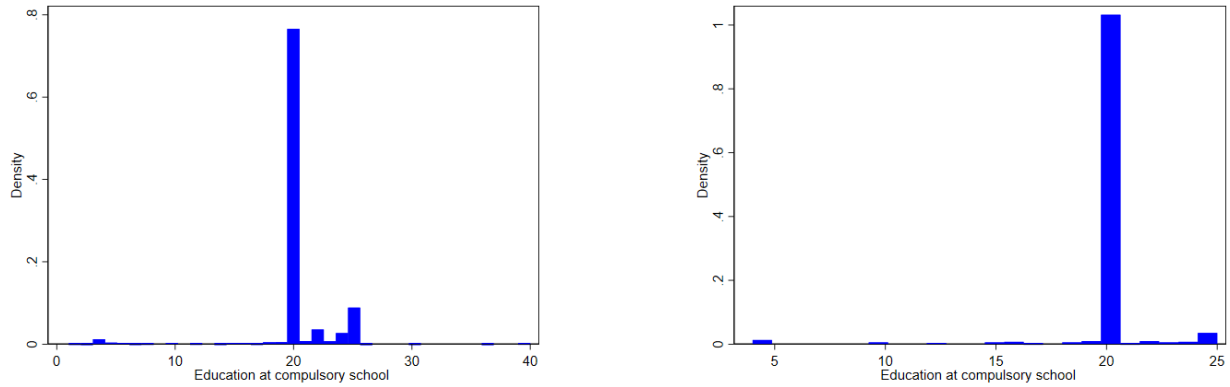
	0	1	Total
0	375	6	381
1	471	30	501
2	533	139	672
3	402	424	826
4	264	658	922
5	208	792	1000
6	186	878	1064
7	87	1082	1169
8	85	1210	1295
9	111	1294	1405
10	129	1378	1507
11	230	1294	1524
12	518	1045	1563
13	1580	1	1581
14	1595	0	1595
15	1638	0	1638
Total	8412	10231	18643
N	18643		

Table A4: Summary statistics of households by children and attendance rates

	Mean	St. Dev.
HH with six-year-old child	0.05	0.22
Six-year-old attends (pre)school	0.81	0.39
HH with six-year-old attending (pre)school	0.80	0.40
HH with three- to four-year-old child	0.08	0.27
Three- to four-year-old attends (pre)school	0.62	0.49
HH with three-to four-year-old attending (pre)school	0.61	0.49
Observations	192115	

Notes: The table describes the share of households with six-year-old (three- to four-year-old children) and their average attendance rates in (pre)school for 2010-2020. It also shows the attendance rate of these children. Data is at the individual level and weighted accordingly using survey weights. Source: EU-SILC (2010-2020).

Figure A2: Histogram of hours at compulsory schooling in a usual week



Notes: The left graph shows the number of non-zero hours children attend school on a compulsory during a usual week. The right graph shows the same estimates with the sample restricted to six-year-old children. Source: EU-SILC (2010-2020).

Table A5: Share of mothers in population

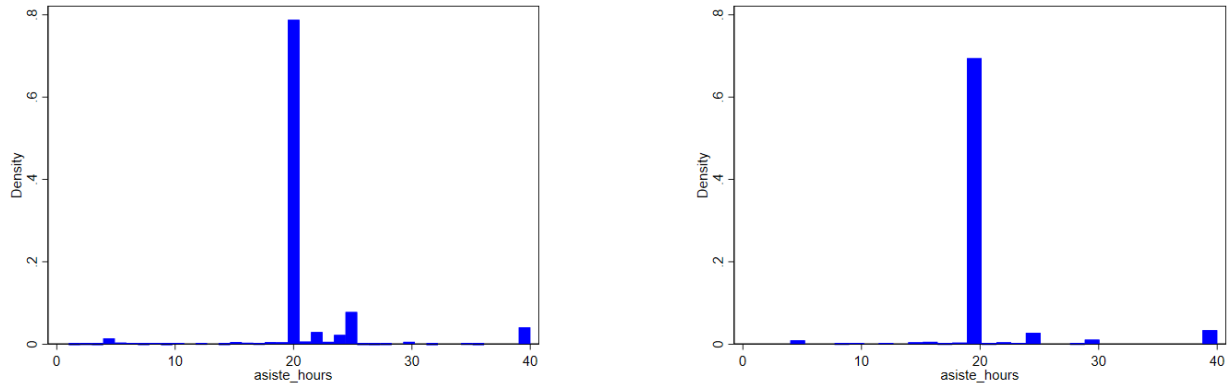
	Mean	St. Dev.
mother	0.1802	0.3843
Mother with six-year-old	0.0098	0.0983
Mother with three- or four-year-old	0.0163	0.1265
Observations	192115	

Notes: The table reports the share of mothers - overall, with six-year-old, and with three- to four-year-old children - in the EU-SILC for the period 2010-2020. Data are at the individual level and weighted accordingly using survey weights. Source: EU-SILC (2010-2020).

We next identify mothers in these households. For this purpose, we take advantage of a variable that identifies the mother's ID of each child in the same household. By matching the person's ID to the mother's ID we can determine whether a woman in a given household is a mother of a child in the same household. One limitation of the survey is that we cannot identify mothers if their children live in another household because information is restricted to the same household. Table A5 reveals that only a small share of individuals can be identified as mothers. An even lower share of individuals are mothers of six-year-old children, or children who are three- or four years old.

Table A6 presents the average characteristics of mothers of six-year-old children, the

Figure A3: Histogram of hours at preschool or compulsory schooling in a usual week



Notes: The left graph shows the number of non-zero hours children attend at a preschool or compulsory school during a usual week. The right graph shows the same estimates restricting the sample to six-year-old children. Source: EU-SILC (2010-2020).

treatment group, and three- to four-year-old children, the control group. The table reveals that they are relatively similar to each other. There are some slight differences in the mean disposable household income. Mothers of six-year-old children live in households with slightly lower household incomes. The educational distribution also differs slightly between both groups.

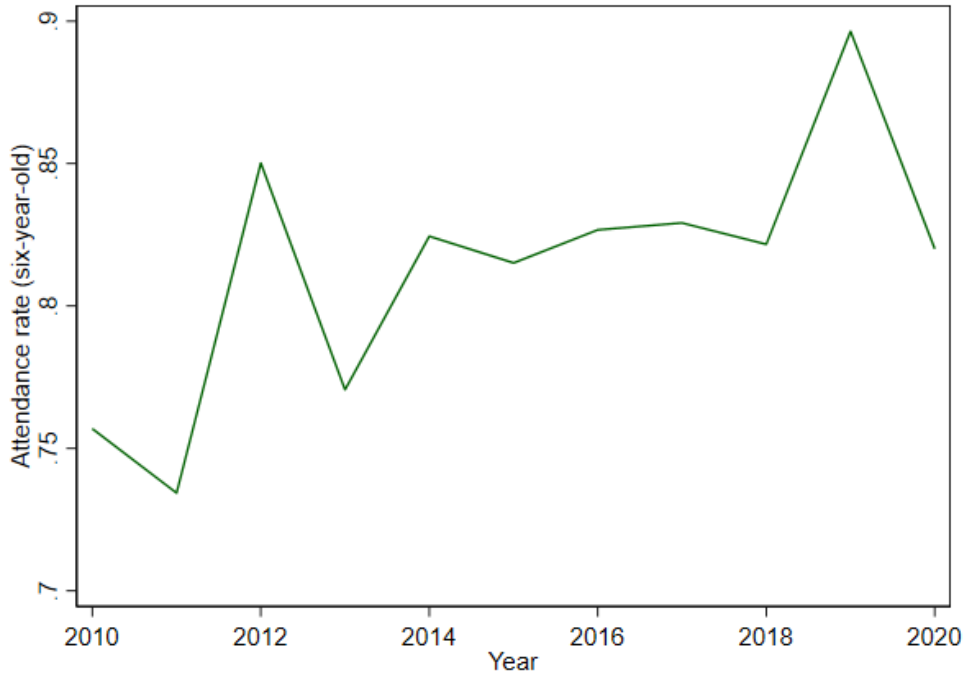
Table A6: Summary statistics of mothers

	(1) Mothers (six-year-olds)		(2) Mothers (three- to four-year-olds)	
	mean	sd	mean	sd
Age	40.38	12.78	40.09	13.40
Migrant	0.00	0.00	0.00	0.03
Married	0.80	0.40	0.79	0.41
Divorced	0.02	0.15	0.03	0.16
Partner in HH	0.08	0.27	0.08	0.27
No schooling	0.02	0.12	0.01	0.11
Primary educ.	0.08	0.28	0.09	0.29
Secondary educ.	0.57	0.49	0.53	0.50
Tertiary educ.	0.19	0.39	0.23	0.42
PhD	0.00	0.00	0.00	0.00
HH with child (<15)	2.19	1.30	2.04	1.16
HH members	4.88	1.83	4.77	1.68
No. of working HH members	1.70	0.86	1.71	0.89
Part-time work	0.00	0.05	0.00	0.06
Total disposable household income	6341.47	4991.31	6610.13	5213.89
Post-reform	0.81	0.39	0.80	0.40
Observations	1015		1655	

Source: EU-SILC (2010-2020).

Notes: The table shows average characteristics of mothers of six-year-old children, the treatment group, and three- to four-year-old children (the control group). Source: EU-SILC (2010-2020).

Figure A4: Share of households with six-year-old children who attend (pre)school



B Robustness Checks

B.1 Difference-in-difference Estimation

Table B1: Effect of the 2012 reform on employment rates

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	0.0334	0.00785	0.0101	0.0101	0.0136	0.0000787
	(0.0158)	(0.00964)	(0.0102)	(0.0103)	(0.0130)	(0.0202)
Mean (Dep. Var)	.632	.632	.632	.632	.632	.632
St. Dv. (Dep. Var.)	.482	.482	.482	.482	.482	.482
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	24,785	24,785	24,785	24,785	24,785	24,785

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of mothers between 20 and 49 years old with children between three and four or six years old.

Table B2: Effect of the 2012 reform on employment rates

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	0.0303	0.00284	0.00526	0.00542	0.00692	-0.000989
	(0.0148)	(0.00891)	(0.00939)	(0.00950)	(0.0115)	(0.0199)
Mean (Dep. Var)	.632	.632	.632	.632	.632	.632
St. Dv. (Dep. Var.)	.482	.482	.482	.482	.482	.482
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	24,785	24,785	24,785	24,785	24,785	24,785

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of mothers between 20 and 49 years old with children between three and four or six years old.

Table B3: Effect of the 2012 reform on employment rates when abstracting from survey weights

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	0.0262	0.0335	0.0340	0.0340	0.0335	-0.0159
	(0.0138)	(0.00773)	(0.00835)	(0.00839)	(0.00988)	(0.0174)
Mean (Dep. Var)	.61	.61	.61	.61	.61	.61
St. Dv. (Dep. Var.)	.488	.488	.488	.488	.488	.488
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	26114	26114	26114	26114	26114	26114

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of mothers of children between 3 and 4 or 6 years old.

Table B4: Effect of the 2012 reform on employment rates

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	-0.0662	0.0153	0.0153	0.0154	0.0173	-0.0338
	(0.0136)	(0.00730)	(0.00576)	(0.00575)	(0.00628)	(0.00970)
Mean (Dep. Var)	.710	.710	.710	.710	.710	.710
St. Dv. (Dep. Var.)	.454	.454	.454	.454	.454	.454
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	198899	198899	198899	198899	198899	198899

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of 20-49-year-old mothers of six-year-old children and women without children.

Table B5: Effect of the 2012 reform on labor force participation rate - no age restriction

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	0.0269	0.0409	0.0422	0.0417	0.0418	0.00823
	(0.0176)	(0.00423)	(0.00559)	(0.00574)	(0.00721)	(0.00920)
Mean (Dep. Var)	.65	.65	.65	.65	.65	.65
St. Dv. (Dep. Var.)	.476	.476	.476	.476	.476	.476
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	26114	26114	26114	26114	26114	26114

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of mothers of children between 3 and 4 or 6 years old.

Table B6: Effect of the 2012 reform on labor force participation rates

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	0.0343	0.0117	0.0132	0.0126	0.0152	0.00664
	(0.0177)	(0.00599)	(0.00718)	(0.00721)	(0.00966)	(0.00979)
Mean (Dep. Var)	.670	.670	.670	.670	.670	.670
St. Dv. (Dep. Var.)	.470	.470	.470	.470	.470	.470
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	24785	24785	24785	24785	24785	24785

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of 20-49-year-old mothers of children between 3 and 4 or 6 years old.

Table B7: Effect of the 2012 reform on employment rates when abstracting from survey weights

	Logit	Logit	Logit	Logit	Probit	OLS
Mom(six-year-old) × Post2012	0.0262	0.0450	0.0456	0.0459	0.0470	0.000818
	(0.0140)	(0.00531)	(0.00623)	(0.00629)	(0.00762)	(0.0140)
Mean (Dep. Var)	.61	.61	.61	.61	.61	.61
St. Dv. (Dep. Var.)	.488	.488	.488	.488	.488	.488
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	26114	26114	26114	26114	26114	26114

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

The sample consists of mothers of children between 3 and 4 or 6 years old.

B.2 Mechanisms

Table B8: Effect of the 2012 reform on employment rates of grand-parents

	Logit	Logit	Logit	Logit	Probit	OLS
Elderly in HH with six-year-old × Post2012	0.0204	0.0126	0.0139	0.0143	0.0120	0.00762
	(0.00670)	(0.00000)	(0.00462)	(0.00497)	(0.00506)	(0.0261)
Mean (Dep. Var)	.123	.123	.123	.123	.123	.123
St. Dv. (Dep. Var.)	.328	.328	.328	.328	.328	.328
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	5340	2082	5339	5339	5339	5340

Standard errors in parentheses

Source: EU-LSF (2010-2019). Standard errors are clustered.

B.3 Triple Difference Estimation

B.4 DDD Effects

An omitted variable that affects the employment of mothers of six-year-old children differently than the employment of mothers of three- to four-year-old children could bias our estimates from difference-in-difference regressions. Adding a third difference might generate more reliable results (Angrist and Pischke 2009).

We add a third difference by differentiating between mothers of children who participated in preparatory classes and pre-primary care and mothers whose children did not. This approach allows us to control for any factors that could impact mothers of six-year-old children differently than those of younger children. At the same time, it allows us to control for unobservable factors that could drive the employment of mothers who send their children to public childcare and early childhood education facilities and those who do not tend to take advantage of these services. One important shortcoming of our triple difference estimation is the fact that preparatory classes are compulsory, while all forms of early childhood education and childcare that target children younger than six years old are voluntary.

To identify the two groups described above, we use data from the European Union Statistics on Income and Living Conditions (EU-SILC) from 2010 to 2020. In contrast to the EU-LFS, the EU-SILC, which collects data on living conditions and income in the European Union, contains information on children's participation in (pre)primary education facilities. Appendix A presents detailed information on the data and the underlying variables. We estimate Equation 2 as follows:

$$\begin{aligned} P(E_{ist}) =& f(\beta_1 Assist_{ist} + \beta_2 Post2012_{ist} + \beta_3 Mom6_{ist} + \\ & \beta_4 Assist_{ist} \times Post2012_{ist} \times Mom6_{ist} + \beta_5 X_{ist} + \delta_s + \gamma_t + \epsilon_{ist}). \end{aligned} \tag{2}$$

We also control for additional interaction terms.[10] Table B9 presents the results. The estimate of β_4 is not stable in all model specifications. Estimates vary in magnitude and size. This pattern of results might be driven by the small sample size. We also observe that the estimates are insignificant in all model specifications. The results are similar when abstracting from the additional interaction terms (see the Online Appendix Table B10). Estimates are more stable when restricting the sample to 20-to-49-year-old mothers: those estimates presented in Online Appendix Tables B11 and B12 remain positive across most model specifications, though they are insignificant at the common significance levels. The difference between the results presented in Tables 2 and B9 could be due to diverging concepts of work between the surveys, with the EU-SILC captures an annual and more stable concept of work than the EU-LFS.

We conclude that the estimates are less robust when employing a triple difference estimation. These results may be driven by the small sample size or by unobservable confounding factors that affected mothers exposed to the reform and who comply with it differently than mothers who were not exposed or who did not comply. While we rule out the existence of potential confounding shocks or policies later in this paper, we cannot rule out potentially significant differences in unobservable characteristics between the different groups of

[10] We control for $Assist_{ist} \times Post2012_{ist}$, $Post2012_{ist} \times Mom6_{ist}$, and $Assist_{ist} \times Mom6_{ist}$.

Table B9: Effect of the 2012 reform on employment rates - triple difference estimation with additional interaction terms

	Logit	Logit	Logit	Logit	Probit	OLS
DiDiD effect	-0.0394	-0.00163	-0.00110	-0.000124	-0.00474	-0.0907
	(0.0413)	(0.0161)	(0.0166)	(0.0157)	(0.0182)	(0.0451)
Mean (Dep. Var)	.5262	.5262	.5262	.5262	.5262	.5262
St. Dv. (Dep. Var.)	.4994	.4994	.4994	.4994	.4994	.4994
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	2509	2502	2502	2502	2502	2509

Standard errors are in parentheses and clustered. The sample consists of mothers of children between three and four or six years old. Source: EU-SILC (2010-2020).

mothers.

Table B10: The effect of the 2012 reform on employed rates - triple difference estimation without additional interaction terms

	Logit	Logit	Logit	Logit	Probit	OLS
Triple difference effect	-0.0461	0.00325	0.00683	0.00735	0.00337	-0.0350
	(0.0485)	(0.0139)	(0.0133)	(0.0121)	(0.0131)	(0.0561)
Mean (Dep. Var)	.5262	.5262	.5262	.5262	.5262	.5262
St. Dv. (Dep. Var.)	.4994	.4994	.4994	.4994	.4994	.4994
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	2509	2502	2502	2502	2502	2509

Standard errors in parentheses

Source: EU-SILC (2010-2020). Standard errors are clustered.

The sample consists of mothers of children between 3 and 4 or 6 years old.

Table B11: Effect of the 2012 reform on employment rates - triple difference estimation with age restriction

	Logit	Logit	Logit	Logit	Probit	OLS
Triple difference effect	-0.0461	0.00325	0.00683	0.00735	0.00337	-0.0350
	(0.0485)	(0.0139)	(0.0133)	(0.0121)	(0.0131)	(0.0561)
Mean (Dep. Var)	.625	.625	.625	.625	.625	.625
St. Dv. (Dep. Var.)	.484	.484	.484	.484	.484	.484
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	1839	1832	1832	1832	1832	1839

Standard errors in parentheses

Source: EU-SILC (2010-2020). Standard errors are clustered.

The sample consists of 20-to-49-year-old mothers of children between 3 and 4 or 6 years old.

Table B12: Effect of the 2012 reform on employment rates - triple difference estimation with age restriction and interaction term

	Logit	Logit	Logit	Logit	Probit	OLS
Triple difference effect	-0.0461	0.00325	0.00683	0.00735	0.00337	0.0511
	(0.0485)	(0.0139)	(0.0133)	(0.0121)	(0.0131)	(0.102)
Mean (Dep. Var)	.625	.625	.625	.625	.625	.625
St. Dv. (Dep. Var.)	.484	.484	.484	.484	.484	.484
Demographic controls	No	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	Yes	Yes	Yes	Yes
State fixed effects	No	No	Yes	Yes	Yes	Yes
Region by year unemployment rate	No	No	No	Yes	Yes	Yes
N	1839	1832	1832	1832	1832	1839

Standard errors in parentheses

Source: EU-SILC (2010-2020). Standard errors are clustered.

The sample consists of 20-to-49-year-old mothers of children between 3 and 4 or 6 years old.