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EMPLOYMENT EFFECTS OF CHILDCARE AVAILABILITY: EVIDENCE FROM EUROPEAN UNION

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ABSTRACT. There are several factors that contribute to the success of a society. Economic and demographic developments are known as important drivers, while the role of parental employment as a key component is sometimes overlooked. This paper focuses on the effects of childcare availability on female and male employment in the European Union regions. Regional differences may be significant, therefore separate panel regression models (with economic and demographic control variables) are established for regions in old and new member states, and the results are compared across different levels of male and female educational attainment. The findings suggest that there is a considerable difference between old and new members states. The availability of early childhood educational development significantly increases employment both for female and male employees with higher education levels in new members states, while this effect is not significant in old member states. For male employees with relatively low education levels, the availability of early childhood educational development does have a significant effect on employment both in old and new member states but this does not hold for female employees with lower education levels.

JEL Classification: E24, J22, I21

Keywords: employment, labour supply, early childhood education, European Union

Introduction

Social policy measures promoting work-life balance have considerable economic effects beyond addressing a personal topic. One of the recent European Union directives (Directive 2019/1158) emphasizes the role of family-related leave for men and women and the provision of accessible and affordable childcare and long-term care services as important factors possibly influencing the labour market participation of individuals. The implementation of family-support social policy measures can have effects on employment and fertility both in the short term and the long run. An effective family-support measure can relatively quickly help increase fertility or improve education of children, and after decades these effects could enhance economic performance.

When examining these relationships, previous literature has primarily focused on the link between female employment and various factors (e.g. Del Boca-Sauer, 2009; Fernández-Kranz & Rodríguez-Planas, 2021; Lee & Lee, 2014; Cebrián et al., 2019; Landivar et al., 2022), however, social policy measures may also have effect on male employment (e.g., Eckhoff Andresen & Havnes, 2019; Farré & González, 2019). The main research question of this paper is whether childcare availability (as a possible family-support measure) has employment effects. Since education may also influence employment (e.g. Malinowski & Jabłońska-Porzuczek, 2020), separate panel regression models are set up for different education levels. Female and male employment effects are also studied separately. In Europe, another possible difference may exist between the member states joining the European Union before and after 2004, therefore data of these two groups is examined separately as well.

This paper emphasizes regional heterogeneity, and panel regression is applied to study data of NUTS 2 regions between the years 2015-2020. The regression models aim to explore the relationship between employment and the availability of early childhood educational development. Similar examinations have already been performed, the paper aims to contribute to previous literature primarily by highlighting differences between different groups of European Union regions and by comparing male and female employment effects.

The paper is organised as follows. Section 1 summarizes the main findings of previous literature about the links between employment, fertility and childcare availability. Section 2 introduces data and methodology, while Section 3 outlines the main results. The key findings are also summarized among the conclusions.

1. Literature review and hypothesis development

Employment rates are among the most important indicators of economic performance. Labour market is quite heterogeneous, a high employment rate in certain parts of the society may be accompanied by low employment rates in other parts. However, there are certain similarities in many countries in terms of employment. For instance, female employment rates are often lower than those of male employees. *Figure 1* illustrates this difference.

Figure 1 shows employment rate data for 238 NUTS 2 regions in the European Union (for persons from 15 to 64 years in those regions for which all data was available between 2017 and 2021), accounting for 95,6% of the number of all regions.The difference between male and female employment is clearly observable on *Figure 1*: the median value (indicated by the lines within the boxes on the boxplot diagram is higher for male employees than for female employees in all years. The lowest employment rates in the European Union regions (indicated by the circles on the boxplot) belong to female employment in all years.

Previous literature has studied the possible reasons for this difference extensively. One of the conclusions is that the lower female employment rates may partly be attributed to family reasons. For instance, Fitzenberger et al. (2013) found strong negative employment effects that are causally due to childbirth, and based on personnel records from a company Lucifora et al. (2021) reported that the arrival of a child, partly due to the gap in internal promotions, creates a penalty in earnings for mothers. These employment and earnings effects may possibly induce lower fertility, thereby influencing also several long-term economic relationships, for example the financial balance of the pension system. The European Union has also recognised this problem, in one of the Council Decisions (2018/1215, on guidelines for the employment policies) an increased labour market participation of women has been indicated as a goal. It has also been emphasized that the reconciliation of work, family and private life should be promoted through access to affordable quality early childhood education and care services, and parents should have access to suitable family leave and flexible working arrangements.

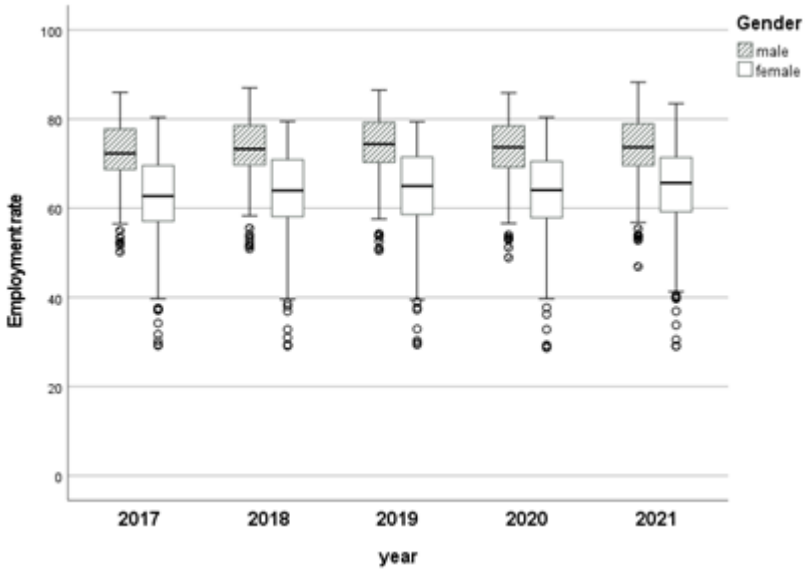

Figure 1. Employment differences
Data source: Eurostat (2022f)

Labour market decisions of parents are influenced by various factors. For instance, Schøne and Strøm (2021) found that in a certain industry a fall in labour earnings of workers has been accompanied by increased wife labour supply, although a similar change in the division of labour in home production measured by the share of parental leave was not found, and having small children did not constrain the labour market decisions of wives.

Childcare availability can also influence employment (e.g. Nollenberger & Rodríguez-Planas, 2015; Felfe et al., 2016; Müller & Wrohlich, 2020) and fertility (Fukai, 2017), although it should be noted that fertility has numerous influencing factors, such as for example income tax regulations (Azmat & González, 2010), fertility of colleagues (Pink et al., 2014), number of network members with young children (Lois & Arránz Becker, 2014), the number of brothers of the husband (Yang & Spencer, 2022), job insecurity perceptions (Glavin et al., 2020) and employment protection regulation (Prifti & Vuri, 2013). Unemployment may also influence fertility, Andersen and Özcan (2021) argue that it has a positive effect on motherhood transition and a negative effect on fatherhood transition (although the latter is not robust to the inclusion of controls). It is also interesting to note that increasing fertility does not necessarily have negative employment effects (Schmieder, 2021).

Financial support or other social policy measures, such as the availability of early childhood education, may contribute to promote work-life balance. Tax and social welfare system may affect labour supply (Gauščák & Kátay, 2019), and work-life balance policies can contribute to increase women's share of time spent in paid employment (Kohara & Maity, 2021). The effect of childcare availability on employment depends on several factors. If full-time public childcare for young children is offered, some mothers may enter employment (Nollenberger & Rodríguez-Planas, 2015). Felfe et al. (2016) indicate that although it is possible that there is no impact of the after-school care provision on parental employment, a positive impact on the full-time employment of mothers may exist. According to the results of Brewer et al. (2022) free part-time childcare marginally affected the labour force participation of mothers, but expanding from part-time to full-time free childcare led to a significant increase in labour force participation and employment of mothers. The carer role in family context may also be important in labour supply decisions. Chari and Valli (2021) found elasticity between informal care supply and kindergarten access especially for female carers: it is possible that due

to kindergarten access mainly not labour supply but care supply increases. A comparison of three country contexts revealed that there is no automatism concerning a demand-driven push towards employer-provided family-friendly practices (Joecks et al., 2021), although, as Kim and Liu (2021) found, mothers with irregular working schedule may be more likely to use multiple childcare arrangements.

Childcare generally includes informal and formal components, although the pattern of childcare organisation can exhibit significant differences across countries. (Cebrián et al., 2019) Grandparents (Wang & Zhao, 2022; Lin & Wang, 2019) and non-parent adults in the family can have an important role in childcare, Compton and Pollak (2014) argue that close geographical proximity to mothers or mothers-in-law may have a positive effect on the labour supply of married women with young children. Childcare can also contribute to child development. Early education and care programs may have positive effects on cognitive development (e.g. Burger, 2010), although children with grandparental care can have different (more) external locus of control compared to children in the sole care of their parents (Ao et al., 2022). Delalibera and Ferreira (2019) found that early childhood education may increase labour productivity, while Herrington (2015) argues that public intervention in early childhood education may be related to earning inequality differences.

Designing optimal family supporting measures such as public childcare requires several considerations. For instance, multiple early childhood education funding streams can lead to misaligned policies and incoherent systems (Whitaker et al., 2022), and if public provision and financing are more prominent, the demand for public childcare may be higher (Ünver et al., 2020). Fukai (2017) conclude that a combination of better access to childcare together with other pro-family measures may be needed to support women in balancing work and family, while the policy proposals of Cebrián et al. (2019) include a combination of universal child care provision and labour market institutions and policies. When promoting employment and harmonisation of family life and work it should also be noted that employment is also influenced by several factors. Work satisfaction may differ in self-employment and paid employment (van der Zwan et al., 2018), cultural spillovers are possible, since for example foreign affiliates from countries with a more gender-equal culture may employ proportionally more women (Tang & Zhang, 2021), and the rise of the service economy may be related to the rise in the female employment (Petrongolo & Ronchi, 2020). Childcare provision is an important and widely applied family supporting social policy measure. It is often supposed to play a role in promoting female employment, although empirical evidence in previous literature is mixed, and the context of the analysis may also be of importance when drawing conclusions about the link between childcare availability and employment.

Male employment effects are also possible and may be related to the level of involvement of fathers in childcare. This involvement has several consequences, Mangiavacchi et al. (2021) for example report that a positive variation in the involvement of fathers in childcare and homeschooling activities can be accompanied by an increase in the emotional wellbeing of the children. Tamm (2019) concludes that even short periods of fathers' parental leave may have long-lasting effects on fathers' involvement in childcare and housework, however effects on labour supply do not persist over time. Eckhoff Andresen and Havnes (2019) have found differences in the impact of childcare for toddlers on the labour supply of mothers and fathers, childcare caused an increase in the labour supply of cohabiting mothers, but no impact for fathers were found. These findings support a separate examination of male and female employment effects.

Education level of parents may also influence the relationship between fertility, childcare and employment. Education level may affect how job insecurity perceptions are related to fertility, the findings of Glavin et al. (2020) suggest that an association between

perceived job insecurity and likelihood of a first birth is limited to college-educated women and those in low unemployment labour market regions. Educational heterogeneity in the population may be important in the relationship between female labour force participation and fertility: Wood and Neels (2017) have found that groups with limited labour market opportunities are more likely to have a child in response to unemployment or inactivity, and for highly educated women labour market participation is more positively related to childbearing. When exploring links between female labour supply and childcare, Landivar et al. (2022) concludes that childcare subsidy access is associated with larger maternal employment amongst those with lower levels of educational attainment, but state-funded preschool is associated with higher employment mainly among those with college education. The findings of Greenberg (2011) suggest that for the 0-2 year old group of children more highly educated mothers predict enrollment in center-based care. Based on an other dataset, Müller and Wrohlich (2020) concluded that an increase in childcare slots increased mothers' labour market participation rate, and the effect is largely driven by mothers with medium-level qualifications. Tax regulation details (for example tax credit for working mothers with young children and child deductions for households with children) may also have education-level dependent effects on fertility and employment rate of mothers with young children. (Azmat & González, 2010) These findings underline the importance of comparing employment effects for different education levels.

Based on the results in the previous literature, some research hypotheses are formulated: (1) childcare availability influences male and female employment differently, (2) educational background has an effect on the magnitude of the link between childcare availability and employment, and (3) there are differences between old and new European Union member states in terms of the link between childcare availability and employment.

2. Data and methodology

The data in this study were downloaded from Eurostat (Eurostat, 2022a; Eurostat, 2022b; Eurostat, 2022c; Eurostat, 2022d; Eurostat, 2022e; Eurostat, 2022f). For European Union data there is a classification for regions, the Nomenclature of Territorial Units for Statistics (NUTS) that includes three hierarchical levels: the member states are divided into NUTS 1 regions, which are subdivided into NUTS 2 regions and then divided into NUTS 3 regions. The NUTS classification may ensure that comparable regions are at the same NUTS level so that population size is defined as a key indicator for comparability. (European Union, 2020) In this paper NUTS 2 regions data are studied, since regional differences are aimed to be captured by the empirical analysis.

Childcare is a complex issue, and as opposed to the informal version in family context, for public childcare the definition is associated with early childhood education. ISCED (International Standard Classification of Education) classifies education types into categories so that early childhood education is classified at ISCED level 0. On this level programmes are typically designed with a holistic approach to support the early cognitive, physical, social and emotional development of children with an intentional education component. The ISCED level 0 programmes have two categories: early childhood educational development (for children in the age range of 0 to 2 years) and preprimary education (for children from age 3 years to the start of primary education). (UIS, 2012) Greenberg (2011) emphasizes that when exploring factors affecting early childhood education participation, it is worth analyzing the 0 - 2 year old group of children and older children separately.

For the NUTS 2 regions, data is available about pupils enrolled in early childhood education. The analysis focuses on childcare for the youngest children (in the age range of 0 to

2 years), because in this age childcare support can be essential for parents to be able to continue work (if they wish to continue work). With the availability of early childhood educational development parents have the option to draw on non-family provided childcare, although choosing family-provided childcare is an individual decision that is often made after taking into account several considerations.

When exploring the link between employment and childcare availability, these concepts should be defined. Employment is measured by the employment rates (in percentages), and a childcare availability indicator is computed as the ratio between the number of pupils (children) in early childhood educational development and the total number of population in the age range of 0 to 2 years (CHD). The link between this ratio and the employment rate (EMP) is examined with an econometric model. The general form of the regression model is as follows:

$$EMP_{it} = \beta_1 \cdot CHD_{it} + \beta_2 \cdot GDPC_{it} + \beta_3 \cdot FERT_{it} + \alpha_i + \varepsilon_{it}$$

where subscript i indicates the regions, t indicates the time, β_1, β_2 and β_3 are regression coefficients, α_i corresponds to constant terms (in the fixed and random effects models the interpretation of these terms may differ), and ε_{it} is a random variable. The fertility rate (FERT) may be considered as a demographic indicator, and although not all aspects of the demographic status (including for example longevity developments) are captured by this variable, but from the point of view of possible childcare demand it may be considered as incorporating a relevant effect. For the fertility rate the unit of measure is number. Economic status may be indicated by the economic development of a region (measured by GDP per capital, GDPC). The GPD per capita is measured by euro per inhabitant. Fertility rate and GDP per capital may be considered as control variables in the model.

It could be possible to include other (for example education related) control variables in the model, especially if the employment rates were calculated for the total population. However, it is possible to include various employment rates as dependent variables in the model. In addition to a separate analysis of employment with different education levels, possible differences between male and female labour market decisions are also taken into account. The focus of this analysis is not only on female employment rates, which is a frequently studied topic in the literature, but equal attention is paid to possible effects on male employment that are sometimes partly neglected in academic discussions when examining the links between employment, fertility and childcare demand.

Regression models are often applied in the literature when examining topics related to the links between childcare availability and employment. For instance, for time series data cointegration could be one of the options, similar to the research framework of Lee and Lee (2014). Cross sectional or panel data in the analysis may be analyzed with other methods, for example Abendroth et al. (2012) applies hierarchical linear model, and a differences-in-differences approach may also be related to the research methodology (e.g. Müller & Wrohlich, 2020; Felfe et al., 2016; Nollenberger & Rodríguez-Planas, 2015). For examining similar questions, depending on the level of measurement of the dependent variable, for example logistic regression models (e.g. Landivar et al., 2022; Joecks et al., 2021; Kim & Liu, 2021; Greenberg, 2011) or tobit model (e.g. Cebrián et al., 2019) have also been applied in previous literature. Panel regression application with fixed effects also can be found in the literature (e.g. Kohara & Maity, 2021). It is worth noting, that several previous studies examined labour supply related data of individuals (for example belonging to mothers or fathers), and it is also frequent that the effect of certain changes (for example in tax regulation) are analysed, and the research framework is adjusted to these conditions. The (regional) panel data in the paper may be analyzed with regression (with fixed effects or random effects approach).

The distinction across low-level, medium-level and high-level education and the difference between male and female labour market participation may be relevant, therefore in the current paper the employment rates are calculated separately for male and female employees and for different educational attainment levels (less than primary, primary and lower secondary education, upper secondary and post-secondary non-tertiary education, and tertiary education). The age range (from 25 to 54 years) for the employees is selected for the analysis so that it is similar to that spent possibly with child care activities. According to these considerations, when examining the link between childcare availability and employment, six regression models are established.

The model results are computed based on European Union regional data (for those countries that were member states at the beginning of 2022). For some regions data is not available, and to avoid possibly biased results as a consequence of missing data imputation techniques, only regions with nonmissing data are included in the analysis. The years between 2015 and 2020 are selected for the econometric examinations, since labour market developments are influenced by several factors that emerged during the latest years, such as the increasing digitalisation that may also transform labour markets. In addition to this, the inclusion of longer time series in the analysis could also have resulted in an increasing ratio of missing data. Between 2015 and 2020 63 regions have data in all years, 20 regions belong to new member states (joining the EU after the beginning of 2004), and 43 regions belong to other countries. The population of the regions in the analysis accounts for approximately 24 % of the total population of those regions that belong to member states (at the beginning of 2022). Since data in 2020 is also examined, it could also be a question how the pandemic situation may have influenced the results. The employment and GDP data could have been influenced by it, but its effect on the other variables may be more limited, therefore data in the year 2020 is also included in the analysis.

3. Empirical results

Descriptive statistics (mean values) of the dependent, explanatory and control variables are presented in *Table 1*. As seen in *Table 1* there are certain differences between regions in old and new member states. In addition to the GDP per capita, the childcare indicator also exhibits observable differences (both are higher in the old member states), while other variables have relatively similar values in these groups of regions.

Table 1 also indicates the evolution of these indicators over time. The childcare availability indicator only slightly increased in the new member states, and a modest increase could be observed in the old member states so that the difference between the groups increased over time. It is interesting to note that the fertility rate was higher in old member states in 2015, but in 2020, with increasing mean values in the new member states and after 2016 decreasing mean values in old member states, it was larger in the new member states (although both mean values are relatively low). Differences in male and female employment rates can be found for each education levels, and it can also be observed that employment rates are larger for higher education levels. The pandemic situation may have had an effect on the employment rates in 2020, but the reduction was relatively modest, especially for higher education levels. The question arises, whether these differences can be considered as significant. *Table 2* summarizes the results of Mann-Whitney tests for the comparison of old and new member states.

Table 1. Descriptive statistics (mean values)

year	member state	Emp. male, ISCED 0-2	Emp. female, ISCED 0-2	Emp. male, ISCED 3-4	Emp. female, ISCED 3-4	Emp. male, ISCED 5-8	Emp. female, ISCED 5-8	GDP per capita	fertility rate	childcare indicator
2015	old	68,19	51,24	82,97	72,89	88,36	81,91	33 258	1,55	0,33
	new	69,80	51,78	85,87	72,76	92,80	85,03	11 120	1,52	0,09
2016	old	70,23	52,52	84,51	73,40	88,50	82,72	34 074	1,57	0,33
	new	69,68	50,94	86,97	73,68	93,26	85,85	11 665	1,56	0,09
2017	old	70,48	52,48	85,05	74,42	89,76	83,33	35 163	1,53	0,34
	new	73,05	52,75	89,20	75,72	93,78	86,76	12 690	1,62	0,10
2018	old	72,20	53,70	85,85	75,16	90,48	83,96	35 814	1,49	0,35
	new	74,22	52,96	89,93	76,31	94,11	87,10	13 635	1,62	0,11
2019	old	72,84	53,77	86,48	75,85	90,40	84,59	36 544	1,45	0,37
	new	75,42	53,71	90,64	76,68	94,97	87,79	14 610	1,63	0,11
2020	old	69,85	51,08	83,93	73,40	89,10	83,52	34 884	1,41	0,38
	new	73,97	50,21	89,72	74,66	94,78	87,11	13 915	1,65	0,11

Data source: *Eurostat and own calculations*

As seen in *Table 2* the employment rates for male employees with tertiary education level differ significantly, according to data in *Table 1* in new member states the employment rate is higher, but other employment rates are generally not significantly different in the old and new member states. The difference between the fertility rates is not significant in the first few years in the analysis, but later a significant difference can be found: as seen in *Table 1*, the fertility rate is higher in new member states. According to the Mann-Whitney test results, the GDP per capita and the childcare availability indicators differ significantly in these groups of regions. These results provide interesting insights into regional differences, but it should be emphasized that the size of the sample is an important factor during the interpretation of the results: the sample includes all regions without missing data, and accounts for approximately 24 % of European Union total population at the beginning of 2022.

Table 2. Mann-Whitney test statistics

year	Emp. male, ISCED 0-2	Emp. female, ISCED 0-2	Emp. male, ISCED 3-4	Emp. female, ISCED 3-4	Emp. male, ISCED 5-8	Emp. female, ISCED 5-8	GDP per capita	fertility rate	childcare indicator
2015	384,0	423,0	337,5	387,5	181,5**	355,5	40,5**	397,0	79,0**
	(0,497)	(0,918)	(0,172)	(0,530)	(0,000)	(0,271)	(0,000)	(0,626)	(0,000)
2016	400,0	4110	324,0	398,5	158,5**	327,0	42,0**	419,5	78,0**
	(0,658)	(0,779)	(0,118)	(0,642)	(0,000)	(0,128)	(0,000)	(0,877)	(0,000)
2017	321,5	417,5	248,0**	429,5	146,5**	334,0	45,0**	338,0	80,0**
	(0,109)	(0,854)	(0,007)	(0,994)	(0,000)	(0,156)	(0,000)	(0,174)	(0,000)
2018	326,5	420,5	234,5**	428,5	130,0**	323,5	50,0**	300,0	76,0**
	(0,126)	(0,888)	(0,004)	(0,982)	(0,000)	(0,116)	(0,000)	(0,055)	(0,000)
2019	349,5	417,5	180,0**	416,5	94,0**	298,5	51,5**	261,0*	76,0**
	(0,235)	(0,854)	(0,000)	(0,842)	(0,000)	(0,052)	(0,000)	(0,013)	(0,000)
2020	310,0	430,0	179,5**	418,5	95,0**	306,5	61,5**	217,0**	75,0**
	(0,076)	(1,000)	(0,000)	(0,865)	(0,000)	(0,068)	(0,000)	(0,002)	(0,000)

Notes: The asterisks * and ** denote statistical significance at the 5% level and 1% level, respectively. The value in the parentheses indicates p-value.
Data source: *Eurostat and own calculations*

As *Table 1* and *Table 2* indicate, there are certain differences between regions in old and new member states, and employment rates also vary across education levels and for male and female employees, therefore, it may be adequate to establish separate regression models for different employment rates as dependent variables.

The main explanatory variable is the childcare availability indicator in the regression model. Correlations between this explanatory variable and the control variables (fertility rate and GDP per capita) may influence the results as a consequence of multicollinearity. This

problem however is limited in these regression models, because in the years 2015-2020 the determinants of the correlation matrices of these three variables (correlation matrices can be calculated for the years separately) are between the values 0,571 and 0,714 for old member states, and between 0,301 and 0,431 for new member states. Since the determinant of the correlation matrix is theoretically between zero and one (with one indicating the case with no multicollinearity), the smallest determinant value (0,301) may be associated with one of the possible multicollinearity problems, in this case the correlation values are -0,661, 0,591 and -0,136, respectively.

Table 3. Regression result for regions in old member states

	Emp. male, ISCED 0-2	Emp. female, ISCED 0-2	Emp. male, ISCED 3-4	Emp. female, ISCED 3-4	Emp. male, ISCED 5-8	Emp. female, ISCED 5-8
childcare availability indicator	24,18* (0,0113)	15,12 (0,1301)	9,37 (0,1066)	0,45 (0,9262)	-0,78 (0,8736)	-0,86 (0,8879)
GDP per capita	0,0005** (0,0005)	0,0006** (0,0003)	0,0007** (0,0000)	0,0006** (0,0000)	0,0005** (0,0000)	0,0004** (0,0000)
fertility rate	2,77 (0,4157)	5,97 (0,0963)	2,50 (0,2293)	-2,72 (0,1388)	-3,19 (0,0697)	-9,56** (0,0000)
Hausman test	12,58 (0,0056)	17,18 (0,0007)	35,59 (0,0000)	2,25 (0,5212)	23,55 (0,0000)	14,94 (0,0019)
model	FE	FE	FE	RE	FE	FE

Notes: The asterisks * and ** denote statistical significance at the 5% level and 1% level, respectively. The value in the parentheses indicates p-value. Results are reported with two or four decimal places. FE = fixed effect, RE = random effect
Data source: *Eurostat and own calculations*

The relationship between employment and childcare availability is examined with balanced panel data that covers a recent period including 2020, thereby partly accounting also for possible pandemic effects. After performing some preliminary analyses, the presence of autocorrelation and heteroskedasticity suggest that instead of pooled OLS other estimation options are preferable. Regarding autocorrelation, in the pooled OLS models all Durbin-Watson values are lower than 1, and when examining heteroskedasticity, the p-values of the White test are almost in all cases smaller than 0,05 (only in one of the models is the p-value of the White test higher than 0,05, but the Durbin-Watson value in this model is smaller than 0,29). As a result, the Hausman test is applied to select the adequate panel regression model estimation method. With few exceptions the fixed effects model is selected for the analysis also to account for unobserved time-invariant heterogeneity, in other cases random effects model is applied to estimate the model parameters. The regression result (estimated parameter values and the related p-values) for the regions in old and new member states are presented separately. *Table 3* summarizes the results for regions in the old member states in the analysis, while *Table 4* indicates results for regions in the new member states.

As seen in *Table 3*, the childcare availability indicator has no significant effect on employment in most cases, only for male employees with relatively low education level can a significant effect be found: a higher level of childcare availability has an increasing effect on male employment. There are various possible reasons for this result. For instance, it could be a

direction for future research how possible family support (by non-parent adults who can provide informal childcare) and education level are related. An other reason for this result may be associated with education-related income. Petrongolo and Ronchi (2020) argue that the rise of the service economy may be related to the rise in female employment, the availability of employment options in the service economy could also contribute to explain the difference between the male and female employment effect for a relatively low education level.

Regarding the control variables, in the 43 regions in old member states the economic status (measured by GDP per capita) has a significant (positive) effect on employment. Fertility has only for female employees with high education level a significant (negative) effect on employment. It is worth noting that this significance is only related to female employees, the effect of fertility on male employment for high education level can not be considered as significant at the 5% level (only at the 10 % level).

As seen in *Table 2* the childcare availability indicators differ significantly in regions of old and new member states. An other question is, whether the relationship between childcare availability and employment differs in these groups of regions. *Table 4* summarizes the regression results that contribute to answer this question.

Table 4. Regression results for regions in new member states

	Emp. male, ISCED 0-2	Emp. female, ISCED 0-2	Emp. male, ISCED 3-4	Emp. female, ISCED 3-4	Emp. male, ISCED 5-8	Emp. female, ISCED 5-8
childcare availability indicator	59,55* (0,0370)	10,60 (0,5766)	50,08** (0,0002)	48,94** (0,0008)	34,44** (0,0020)	33,33* (0,0326)
GDP per capita	0,0009* (0,0112)	0,0000 (0,9245)	0,0004* (0,0139)	0,0005** (0,0039)	0,0002 (0,1058)	0,0002 (0,4271)
fertility rate	5,78 (0,4242)	6,04 (0,2897)	14,14** (0,0000)	4,59 (0,2097)	4,10 (0,1437)	8,63* (0,0307)
Hausman test	14,36 (0,0024)	4,67 (0,1974)	26,82 (0,0000)	10,62 (0,0140)	23,50 (0,0000)	8,59 (0,0353)
model	FE	RE	FE	FE	FE	FE

Notes: The asterisks * and ** denote statistical significance at the 5% level and 1% level, respectively. The value in the parentheses indicates p-value. Results are reported with two or four decimal places. FE = fixed effect, RE = random effect
Data source: *Eurostat and own calculations*

Regarding the effect of childcare availability on employment there are several differences. As opposed to the regions in old member states, childcare availability can be considered to have a significant positive effect both on male and female employment for relatively high level of education (upper secondary and post-secondary non-tertiary education, and tertiary education) in new member state regions. This result may be related to the lower level of the childcare availability in these regions. Similar to old member state regions, for a lower level of educational attainment (less than primary, primary and lower secondary education) there is a difference between the significant (positive) male and (insignificant) female employment effect.

The economic status (measured by GDP per capita) has only in some cases a significant effect on employment. This result differs from that in the previous regression models for old

member state regions. For instance, it is worth noting that for tertiary education level GDP per capita does not have an increasing effect on employment. An other interesting difference is that fertility and employment of female employees with tertiary education are positively related in new member state regions, while this effect is negative in old member state regions.

Conclusions

Employment is a key factor when evaluating the success of an economy. There is a widespread phenomenon that currently prevails in many countries: female employment is often lower than that of male employees, and family roles are frequently considered as an important reason for this difference. However, male employment may also be affected by family roles, such as childcare activities. Family supporting social policy measures may have various economically advantageous effect, and since these measures may contribute to increase fertility, promote educational development of children and to enhance work-life balance of parents, some questions about the optimal form of family supporting measures arise. When assessing efficiency of childcare provision, it could be a relevant question, how it influences employment. This paper aims to contribute to previous literature with the analysis of this question.

To explore the effects of childcare availability on employment, a special attention is paid to factors that may be relevant in influencing this link. In an econometric analysis separate regression models are established for male and female employees with different level of educational attainment, and the effects of economic status (measured by GDP per capita) and demographic status (indicated by fertility rate) are also controlled for. The findings aim to provide additional insights about the childcare availability-employment link primarily with the comparison of these details across the regions in old and new European Union member states.

The analysis is based on panel data of European Union regions between the years 2015-2020, the population of the regions in the analysis accounts for approximately 24 % of the total population of those regions that belong to countries that are member states at the beginning of 2022. There are several differences that are highlighted by the econometric examinations. The research hypotheses about the difference of childcare availability effect on male and female employment, the effect of educational background on the link between childcare availability and employment, and the differences between old and new European Union member states in terms of the link between childcare availability and employment were supported by the empirical findings.

As opposed to regions in old member states, for higher level of education the childcare availability was found to have a significant (increasing) effect both on male and female employment in new member state regions. Previous literature (e.g. Brewer et al., 2022; Cebrián et al., 2019; Müller & Wrohlich, 2020) provided mixed results about the female employment effects (depending also on the dataset attributes and the research questions). Male employment effects received less attention in previous studies, and only limited links between labour supply and childcare availability have been found (e.g. Eckhoff Andresen & Havnes, 2019). Therefore, this finding sheds light on an important feature of the link between childcare availability and employment. For lower education level (less than primary, primary and lower secondary education) the regression results are similar in old and new member states: a higher level of childcare availability has a significant increasing effect on male employment, but does not influence female employment significantly. This finding may be partly associated with a changing role of service economy, but raises also some questions that may be topic of future research. In addition to the effects of educational attainment level, regional differences and similarities are also highlighted by the results.

When interpreting the results, some research limitations should be taken into account. Due to data availability problems the econometric analysis did not include data for all European Union regions. In addition to this, since the selection of a childcare option combination is a complex question, further qualitative research may highlight other aspects of this question, thereby contributing to the development of related econometric models.

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