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**Determinants of the Female Employment Rate in The European Union in
Comparison With Non-Europaen Countries
With a Special Look at The Republic Of Macedonia**

Abstract

The purpose of this study is to analyze the determinants of the female employment rate in the European Union where we have used panel analyses of 27 countries members of the European Union from 1995 till 2008. In order to make comparison among countries we have included institutional variables like: maternity leave, child care facilities, college education, female unemployment rate and part-time employment. We expect this variables to have a positive impact on the female employment rate except for the female unemployment rate. At the same time we are taking in consideration the national employment structure in Macedonia compared to the EU countries.

Key words: female employment rate, determinants, cross-national comparison, European Union

Introduction

Faced with a trend of overall employment decline and demographic changes associated with an ageing of the European labour force, the European Union found itself under pressure to undertake certain action toward increasing the overall employment rate by creation of new jobs, investing in people and technologies and, more specifically, increasing female employment.

Confronted with globalization and the challenges of a new knowledge-driven economy, the European Council held on 23-24 March 2000 in Lisbon came to an agreement for a new strategic goal for the European Union *to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion*. Achieving this goal required an **overall strategy** aimed at:

- preparing the transition to a knowledge-based economy and society by better policies for the information society and R&D, as well as by stepping up the process of structural reform for competitiveness and innovation and by completing the internal market;

- modernizing the European social model, investing in people and combating social exclusion;
- sustaining the healthy economic outlook and favorable growth prospects by applying an appropriate macro-economic policy mix.

This strategy was designed to enable the Union to regain the conditions for full employment, and to strengthen regional cohesion in the European Union. The European Council needed to set a goal for full employment in Europe in an emerging new society which is more adapted to the personal choices of women and men. If the measures set out below were to be successfully implemented against a sound macro-economic background, an *average economic growth rate of around 3%* was thought to be a realistic prospect for the coming years. Among the goals for modernizing the European Social Model by investing in people and building an active welfare system was creation of more and better jobs for Europe as well as substantial reduction of unemployment. (www.europa.eu, summary of legislations).

The European Council considered that the overall aim was to raise the *employment rate from an average of 61% in 2000 to as close as possible to 70% by 2010* and to *increase the percentage of women in employment from an average of 51% in 2000 to more than 60% by 2010*. The new goal required Member States to consider setting national targets for an increased employment rate, which it was argued by enlarging the labor force would reinforce the sustainability of social protection systems (www.europa.eu, summary of legislations)

Table 1. The progress of Total and Female employment rate from 2000 till 2008 in percentages

	Employment Rate % overall	Employment rate 55-64 years old %overall	Female Employment Rate 15-64 years old	GDP Growth percentage change on previous year
EU Benchmark	70% (2010 target, Lisbon summit)	50% (2010 target, Stockholm summit)	60% (2010, Lisbon summit)	Base line scenario of 3% per annum, Lisbon summit
1997	60.7	36.4	50.8	2.5
2000	63.4	37.5	54.1	3.9
2001	64.1	38.4	55.0	1.9
2002	64.2	39.8	55.6	1.2
2003	64.5	41.5	56.2	1.2
2004	64.8	42.3	57.0	2.3

2005	65.4	44.2	57.8	1.8
2006	66.2	45.3	58.8	2.9
2007	67.0	46.5	59.7	2.7
2008	67.3	47.4	60.4	0.6

- Source: EUROSTAT- European Commission Statistics

The goals set above were a result of mainly two major trends in the European labour market. The first major trend concerns the changes in the employment pattern and the second trend concerns demographic changes in the European population in general. In the early 1990's under two thirds of the population aged 15 to 64 years of age in the EU 12 were economically active, a ratio of 10 points lower than in the Scandinavian countries and the US. The labour participation rate varied from just 58 per cent in Italy and 59 percent in Spain to 73 percent in the UK and over 80 percent in Denmark. Overall, there has been a tendency of decline in the participation rate of the under 25 years of age reflecting the growth of full-time schooling and training as well as decline in the participation rate among the low – skilled older workers especially for males mainly in Finland, France, The Netherlands and the UK (Adnett, 1996)

Important impact on the labour market, especially the supply side. In the last three decades the working- age population has grown more slowly in Europe than elsewhere, averaging around half the 1.2 percent increase found in the OECD as a whole. Increased life expectancy at birth, as well as fall of fertility rates, have contributed to a rise in the share of older age groups in the population. Life expectancy in the EU has risen by about 5 years for males and nearly 7 years for females since 1960. Over the same period the fertility rate, live birth per 100 women aged 15 to 64 years has fallen from 2.6 to 1.5, with only Ireland having rate above 2. As a result, 15 percent of the European population in the early 1990's were aged 65, with a predicted rise to nearly 20 percent by 2020. Concerning the workforce around 34 percent of the EU labour force will be aged over 45 by 2005, with the ratio exceeding 40 percent in Scandinavia (Adnett, 1996).

Based on the trends in the early 1990's Johnson and Zimmermann (1993) have concluded that the increased ageing in Europe is likely to increase labour cost, reduce labour supply and increase the vintage of human capital. The potential combination of raising the proportion of retired people, falling activity rates and persistent high employment has caused concern about the ability of European economies to finance existing state pension. For that purpose, Austria, France and Germany have made policy changes to discourage early retirement (Adnett, 2007)

While there was tendency for a decline in male participation rates in European labour markets as well as in the USA, female participation rates have been slowly increasing, for all levels of educational attainment, especially amongst those within the prime working-age aged of 25-49 years, the child-bearing and child-rearing age.

In the early 1990's women accounted over 40 percent of the labour force in most European countries. However, the rates of progress toward the European average of 40 percent has been uneven, e.g. around 48% in Sweden, 45 percent in the UK and only 35 percent in Italy. In the early 1990's the southern Member Countries, Greece, Spain and Italy had relatively low rates of female participation but at the same time have had among the highest rates of increase. The steady change in the pattern of employment, i.e. the increased female participation rate during past decades, is partly the result of a significant shift in the demand for female employment, especially after the Great Depression when low-skilled men were substituted with cheap yet educated females. The burst of predominately female employing industries and occupation had their impact as well. However, female decision to supply work is mainly determined by the household formation, fertility and house hold dissolution which as stated above have been subject to radical changes in the past few decades.

Literature review

In general there are two main approaches employed across studies of female employment across countries. The **first** approach examines the level of female employment itself, focusing on the labour force participation rate and the number of hours worked such as part-time to full-time category. The **second** approach explores the determinants of female employment. While the determinants selected for analysis vary from study to study, they may include one or more of the following three types of variables: (1) individual level (micro variables, such as number of children in household); (2) institutional level (macro) variables, such as the size of the welfare state and (3) a combination of individual and institutional level variables. Warnecke, L.T (2008). While single-country level studies use micro-level variables, macro-level variables focus on family policies as diverse social, political, institutional and cultural constraints of the average female participation rate.

Institutional determinants became important determinants of female employment after the global economic crisis in the 1970's when high levels of government intervention via social welfare system was needed because of the rampant inflation, unemployment and slow growth. Family policies include parental leave, child benefits and child care subsidies as part of the welfare system in one country. Developed countries have some form of family policy guidelines, but there has been little convergence among advanced industrial societies (Gauthier 2002, Albert and Standing 2000, Orloff 1993, 1996, Nelson 1994). EU 15 countries are countries with different welfare systems. According to Esping-Andersen's Welfare Regime Typology(1990) where European employment models are grouped into liberal, Scandinavian (or social - democratic) and continental models. The new Member States, which still seem in search of an appropriate model, are called "

transition model" models. The same typology has been used by Bosch, Rubery and Lenhendorff (2007) in their report on the recent trend influencing female participation.

Maternity and parental leave.

Parental leave, maternity leave and child leave boost female participation by helping women to reconcile work and family life (Ruhm, 1998). Since in most countries maternity and parental leave are focused on motherhood (and fatherhood), it is important to note that only paid leave time can truly support the woman's role as mother. Long parental leave, especially not accompanied by job-guarantee may cause difficulties for women to trying to return to the labour market (Ondrich et al, 1998; Edin and Gustavsson, 2001) at the same time causing negative impact on the salary of return mothers (Ruhm, 1998 and OECD 2002,a) Spain is among the countries with the longest and most generous maternity leave policies in Europe, i.e, 16 weeks, all each paid at 100% of the woman salary up to a maximum level (Eurostat 2004). However, longer maternity leave supports the position of women as dependent wives by taking maternity leave longer then 16 weeks where participation rate begins to drop (Juamote 2003). In 1992, the European Commission passed a pregnancy directive, sating that all members countries of the EU must provide a minimum of 14-week paid maternity leave. However, while some countries provide only the minimum 14-week program (Belgium, Germany, Portugal), other countries provide substantially more generous maternity leave programs eg. United kingdom with 26 weeks, Italy 20 weeks, Denmark and Finland 18 weeks (DiCioccio and Wunnava, 2008)

Child care

The analysis of child care policies impact on female labour supply necessitates consideration of two of dimensions : availability and cost (Vuri and Del Boca, 2007). Since child care policies differ among European countries (**Esping-Andersen's Welfare Regime Typology,1990**), availability and cost tend to have different impact on female labour supply decision. (Vuri and Del Boca, 2007). For example, Wronhlich (2004) comparing West and East Germany has found significant bur very small effects of child care cost on mother's labour supply while Gustafsson and Stafford (1992) revealed significant relationship only in particular areas of Sweden; Chiuri (2000) found non significant relationship between cost and female labour decision.

However, studies done by Heckman 1974; Blau and Robins 1988; Conelly 1992; Ribar 1995; Averet et al. 1997; Vitanen 2005, have found that child care cost are very significant determinants of the demand for childcare services and employment decision ranging from -0.02, Ribar 1995 to low of - 0.82, Averet at al, 1997. (Vuri and Del Boca, 2007). A reduction in child care cost increases the

probability of mother's part time employment but has a less significant effect on the probability of working full time.(Del Boca, 1993). The burden of child care cost was mainly eased through childcare provision recommended by the European Commission, which according to Del Boca and Viuri (2007) in the Italian labour market, was above the needed level. There is a common lack of subsidies in the Southern European countries among them Spain. Warnecke, L.T (2008). This lack of subsidies for 0-3 age grouped force mother to take longer parental leave which decreases women's likelihood to return back to the market work leading lower wages and flatter lifetime earning pattern (Mincer and Polachek 1974).

Fertility rate and presence of young children at home (under 6 years old).

In many studies, presents of children is taken as strictly exogenous variable in the employment equations which rules out feedback effects. Following the strategy proposed by Carrasco (2001) we relax this assumption and allow for endogeneity. According to Michaud and Tatsiramos (2008) current employment is likely to depend on the number of children in the household which is the result of past fertility decision. Similarly the decision to have a child may depend on current employment

Gross Domestic Product per capita

GDP and employment rate have a positive correlation with another words there is a simultaneity because both have effect to each other. Most of the studies have shown that for each percentage increase in GDP per capita there will be increased in goods and services as well as creation of new vacancies leading to higher overall employment. For example, according to Polozani (2008), if there is an average increase for 10 years of 4.1% in GDP there will be 1.4 percent in employment. It is often assumed that female spouse's primary responsibility is child rearing and household management, especially at the children's younger ages. Such assumption is reinforced by the fact that in the formal labour market male earnings potential exceeds female earnings potential (even in the 21st century). Thus having relatively young children at home becomes de facto constraint for women in pursuing paid employment(Cebula and Coomb, 2007).Accordingly Female participation rate is hypothesized to be a decreasing function of presents of small children at home. According to Troske and Voicu (2009), women with higher education have fewer children and work more before the birth of the first child, but children have larger negative effects on their level of labour market involvement. The coefficient of - 1.429 for children aged between 0 and 1, indicates that children lower women's level of labour market involvement by reducing the attractiveness of work relative to non work and the attractiveness of full time and full time part year work relative to part

time. The sign may be relative to females with older than six years old children. (Cebula and Coomb, 2007). The coefficient for older children are still negative in sign but smaller in absolute value indicating that the effect declines as the age of the child. Same conclusion was found by Falzone (2000), where he number of children and having younger ages of children, husband income increase the probability that married women to work part time rather full-time. Tax incentives to split income – and thus work hours-between spouses also positively influence the choice of married women between inactivity and part-time participation (OECD, 1990).

College education

Females with high or College education expect a relatively higher return with college education which makes it more likely that she will be in the labour force seeking to receive this return. Further more, the absence of significant gender discrimination, greater levels of education attainment theoretically afford females a greater range possibilities and a greater choice of superior (more “ desirable”) employment, e.g, higher paying jobs, thereby creating an incentive to enter the labour force. Studies by Gerner and Zick (1983), Rexroat (1990) and Miller and Xiao (1999) have found that higher education attainment exercises a positive impact on female labour force participation. According to Troske and Voicu (2009), education is the strongest determinant of women’s labour supply. The coefficients of 0.142 and for women with 13 -15 years of education and coefficient of 0.188 respectively, for women with 16 years of education, suggest that women with higher education are relatively more likely to work fulltime.

Female unemployment rate

To control the labour market conditions and the expectation of obtaining gainful employment in 2008 we can include female unemployment rate in 2007 in each member country of the EU 15. This measure provides the marginal female with a more precise likelihood of gaining employment to the extent that there still exist occupations that are predominantly performed by women. To the extent that unfavorable labour market conditions exist in the current period, discouraged females will drop out of the labour force in the next period. Therefore there is a negative relationship between female participation rate and the unemployment rate. (Cebula and Coomb, 2007). According to Hotchkiss (2006), who has investigated the changes in female participation rate for women aged 25 to 54 in period of 1975 to 2005, weak labour conditions (i.e higher unemployment rates) provide downward pressure upon the female employment rate.

Case of Former Yugoslav Republic of Macedonia (FYROM)

Former Yugoslav Republic of Macedonia, as a candidate member of the European Union, has faced the same situation concerning the female employment and above all female social status. Female status has become an increasing problem that started to preoccupy the official state institution that began to undertake steps to regulate this problem by establishing certain legislation.

Women had been marginalized in public, social and political life, paid less for work of equal value and find themselves victims of poverty and unemployment more often than men. The legal status of women had become an increasing problem to the point that had raised the question of equality of both sexes in all spheres of public, political and private life leading to another question of female employment.

For that purpose Republic of Macedonia has started a continuous development processes toward gender equality. However, in the practice there are still obstacles to the implementation of gender equality. In 1997, the Government of Republic of Macedonia established the Gender equality Promotions Unit, within the Ministry of Labor and Social Policy. The aim of this unit is a promotion of women in accordance with international conventions and documents ratified by Republic of Macedonia.

According to the data given in Table.2, activity rates, male and female employment rates between 1996 and 2005 were very unequal. While the male rate reached 41.2% in 2005, only 26.6% of women of working age were employed, and rates were particularly low for older women.

Table 2.
Employment Rate
%

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total employment rate	37.4	34.4	35.9	35.9	35.8	38.6	35.8	34.5	32.8	33.9
Female employment rate	27.4	24.4	26.3	27.1	27.2	30.9	28.1	27.7	25.4	26.6
Male employment rate	47.5	44.6	45.4	44.6	44.7	46.3	43.5	41.3	40.2	41.2

Analyzing the structure of employment by level of education, age and ethnicity we can come to the following conclusion. The employment rates according to level of education show that the lowest rates are found among those having primary education or less, while the highest are for people whose education was of

university level. There are significant disparities which have been increasing over time, the total for people without education went down from 13.4% in 2001 to 6.7% in 2005.

According to age, particularly for the younger and the older age groups the activity rates for workers aged 15-19 decreased from 18.4% (61.6%) in 1999 to 14.5% (50.9%) in 2005; for workers aged 65 and above from 9.0% to 4.8% between 2001 and 2005, while the activity rates for workers between 45 and 64 years of age have increased slightly over the same period.

In respect of ethnic minorities, by the LFS 2000 labour force survey: the participation rate of women of ethnic Albanian origin was 11.3%, compared with 51.1% for ethnic Macedonians (national report), and with 62.3% for men of ethnic Albanian origin. Other ethnic groups, such as the Roma, display a significant gender gap as well. Data from the 2002 census show major differences in ethnic groups' participation rates: the Macedonians display the highest rate, of 58%, followed by the Vlachs (54.7%), the Roma (54.2%), the Serbians (47.3%), and the Turks (44.3%). Ethnic Albanians have the lowest participation rate (37.9%), due to the extremely low level of activity among Albanian women, as already highlighted. There are, however, other factors that influence women's labour force participation rates, and these must be addressed if we are to achieve the goal of gender equality in access to paid work.

Even though the legal status of women has improved over the last thirty years, effectively equality in employment is still far from being reality. According to ETF Country plan 2009, activity and female employment rates are still very low compared to EU averages (50.4% and 32.3%, respectively, for females aged 15-64 in 2007). The gap between employment rates of men and women is high and amounted to 16.5% in 2007. Females are also more affected by unemployment than males: surveyed female unemployment amounted to 35.8% in 2007. This pattern of female employment can be attributed to the nature of most of the jobs available, but also the stereotyping in the choice of the education or job profile, the traditional role of men and women in society, lack of facilities for the care of children or elderly people, as well as gender-biased recruitment practices by employers.

Table.3 Recent data on the female employment rate

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Employment rate (15-64), female: proportion of the male population aged 15-64 that is in employment ¹⁾	29.3	30.9	30.9	34.5	32.0	31.3	28.9	30.1	30.7	32.3	32.9
Employment rate (15+), female: proportion of the male population aged 15+ that is in employment ²⁾	26.3	27.2	27.1	30.9	28.1	27.7	25.4	26.6	27.0	28.4	28.8

- Employment rate- participation of the number of employed in the working age population, aged 15 years and over
(according to the recommendations of International Labour Organization - ILO)
- Employment rate - participation of the number of employed in the working age population, aged 15 - 64 years
(according to the recommendations of Europe Statistical Bureau - EUROSTAT)
- Source: Labour Force Survey, State Statistical Office of Macedonia

With respect to the employment rate, Republic of Macedonia should be focused on qualitative and quantitative reforms of the employment structure according to the gender equality issue by providing equal access to education for both men and women, their education, emancipation and enhancement of the interests of women for the economic, social and political life and elimination of all barriers which obstacle women representations in social life.

Descriptive statistics and model specification for European Countries

In this study we empirically test the effect of selected institutional variables on a country's female employment rate by conducting a dynamic panel estimation. Dynamic panel data models estimate the effects on some observed outcome of other variables of interest, which may be exogenous or potentially endogenous, conditional on both unobserved individual heterogeneity and one or more lags of the dependent variable ¹.

Dynamic panel estimation is needed when the sample has few time periods and many cross-section units. At the same time the dependent variable depends on own past values while the independent variables may be endogenous or predetermined Roodman

(2006). Accordingly, a panel data of 25 out of 27 EU countries are going to be used in time period of 13 years starting from 1995 until 2008.

$$\begin{aligned}
 \text{Female employment rate}_{i,t} = & \alpha_i + \beta_1 \text{employment rate}_{i,t-1} + \beta_2 \text{maternity leave}_{i,t} \\
 & + \beta_3 \text{childcare facilities}_{i,t} + \beta_4 \text{fertility rate}_{i,t} + \beta_5 \text{college education}_{i,t} + \beta_6 \text{female} \\
 & \text{unemployment rate}_{i,t} + \beta_7 \text{part-time employment}_{i,t} + \mathcal{E}_{i,t}
 \end{aligned}$$

The chosen variables in the model given above have been considered in the literature as possible determinants of the female employment rate. The dependent variable is the Female Employment Rate as a percentage of the total female population over 15 years age and up to 64 years age.

The independent variables are as follows:

Maternity leave – maternity leave is defined as the number of paid weeks a women is entitled in case of normal birth. This variable is expected to have a positive effect upon the female participation rate. However, long parental leave may have negative effect because women with longer leave are less likely to return to work (Juamote,2003).

Child care facilities – because of lack of data and at the same time differences in definitions of child care facilities across countries, in this analysis a proxy variable is going to be used, the participation rate of 4 year old children in pre-school education. This indicator presents the percentage of the 4 year olds who are enrolled in education-oriented pre-primary institutions which provide education-oriented care for young children. They can either be schools or non-school settings, which generally come under authorities or ministries other than those responsible for education. It is expected to have a positive sign. .

Fertility rate – the fertility rate is defined as the mean number of live children born to a women during her lifetime. Traditionally, high fertility rate has a negative impact upon female employment. However, due to institutional changes in form of subsidies, child care programs, possibility of part-time working, the sign of the effect might have changed past decades.

It is important to recognize the mutual dependence between the labour supply of married women and fertility, i.e. the endogeneity in either life cycle models or static models of female labour supply. Even though children can be exogenous to the hours of work decision for married women, according to Xie (1997) children are endogenous to the female participation decision where children under six have dramatic negative impact on female employment. Therefore a negative relationship can be expected.

College education - In order to estimate the effect of education upon female employment, a percentage of educated female tertiary education is used, irrespective of fields of education such as mathematics, science, computing, engineering, manufacturing and construction.

¹The basic characteristics of the linear dynamic panel model are displayed in the following equation: $Y_{it} = \beta Y_{i,t-1} + (\alpha_i + \varepsilon_{it})$. It is a first-order dynamic panel model, because the explanatory variables on the right-hand side include the first lag of the dependent variable ($Y_{i,t-1}$) where the group-specific random effect (α_i) control for all unobserved effects on the dependent variable that are unique to the country and

Greater levels of educational attainment theoretically afford females a greater range of employment possibilities and a greater choice of superior (more "desirable") employment, e.g. higher paying jobs, thereby creating an incentive to enter the labour force. Therefore we can expect a positive relationship between the percentage of female population with college education and female employment (Gerner and Zick, 1983, Rextorat, 1990, and Miller and Xiao, 1999)

do not vary over time i.e captures specific ignorance about country i and an error that varies all over countries and time (ε_{it}) capturing the general ignorance of the determinants of Y_{it}

Female unemployment rate – The female unemployed rate is female unemployed persons as a percentage of the female labour force based on International Labour Office definition. Unemployed persons comprise persons aged 15 to 74 who are without work and have been actively seeking work. This variable captures the labour market conditions and the expectation of obtaining gainful employment. Unfavorable market conditions, i.e. a high female unemployment rate negatively influences the female employment rate, therefore we can expect negative sign in front of the coefficient.

Table 4. Descriptive statistics

<i>Variables</i>	<i>Abbreviation</i>	<i>Standard deviation</i>	<i>Mean value</i>	<i>Min</i>	<i>Max</i>
Maternity leave	matleave	8.499553	19.40882	13	52
Child care facilities	chcare	19.63134	78.06901	29.7	100
Fertility rate	fertrate	.2396408	1.481935	1.09	2.13
College education	educ	10.59246	25.88935	2.8	54.2
Female unemployment rate	unemrate	4.745048	9.234056	2.2	30.8
Part-time employment Rate	Part-em	16.14076	23.42764	2.7	75.2
Gross Domestic Product	gdp	2.367503	2.367503	-4.582	12.233

In order to obtain more valid result we have also include time dummy variable in the model which will capture and place the effect of universal shocks (business cycle effects, demand shock etc.) from the idiosyncratic error term in to the systematic part of the model. According to Roodman (2006), contemporaneous correlation, as a result of universal time-related shocks, is causing cross-individual correlation in the error term thus offering a model that is not reliable.

In the (Arellano-Bover/Blundel-Bond regression), a system-GMM approach, apart from the dependent variable three other variables were used as endogenous: **childcare, fertility rate and GDP per capita**. The error component regression model controls for unobservable characteristics including the tradition, employer preferences i.e stereotype ,work-live balance policies and so on. According to the literature, there is high possibility for the tradition to be correlated with the some of the independent variables in the employment rate, e.g. in highly traditional counties, where the bread –wiener model is dominant the less possibility for supporting the female partner in the family to enter the working market, the higher the female unemployment rate, higher fertility rate. However, in such cases the random effect estimators are bias and inconsistent which require a GMM estimation.³

According to Green(2002) and Verbeek (2000), the main advantages of GMM is that it does not require distributional assumption of normality and it allows for heteroscedasticity which can be over come by the means of “robust estimator”. However, GMM does require **NO** autocorrelation in the error term. If for any reason $\varepsilon_{i,t-1}$ is correlated with $\varepsilon_{i,t-2}$, $\varepsilon_{i,t-3}$, etc., then the lagged error terms are not

independent of the instruments, which by definition can not be valid. Therefore, before interpretation of the system GMM estimation, two tests for instrumental validity have been used (1) test for first- and –second order serial correlation among the residuals ($m1+m2$ statistics)¹ and (2) the Sargan test of over-identifying restrictions.

Table 5. Interpretation of diagnostic tests for Arrelano and Bover System GMM

MODEL	Number of instruments	m2 statistics: Ho→ no 2 nd order serial correlation m1statistics: Ho→ no 1 st order serial correlation	Sargan test= Hansen J Statistics: Ho: correlations are sufficiently close to 0; valid instruments
All variables treated as endogenous	Max-183	t-stat 5%/10% c.v 2.3167 0.0205 0.1061 0.2687	M1: Ho rejected M2: Ho not rejected Ho not rejected- prob > chi2 =0.1928
All variables as endogenous with 2nd lag in level and 1st lag differences	Min-86	1.9278 0.0539 1.6056 0.1084	M1 Ho rejected M2: Ho not rejected Ho not rejected- Prob > chi2 =1.000
All variables endogenous with 3th lag in level and 2nd lag differences (1instrument more)	111	2.271 0.0231 1.1937 0.2326	M1:Ho rejected M2: Honot rejected Ho not rejected- Prob > chi2 =0.0563
All variables endogenous with 4 th lag in level and 3 lag differences (2 instruments more)	135	2.2837 0.0224 1.1487 0.2507	M1:Ho rejected M2: Ho not rejected Ho not rejected- Prob > chi2 =0.2050

³ GMM is a general method of estimating population parameters from a data sample where OLS and instrumental estimations are special cases. GMM is assuming population conditions expressed in terms of expectations, i.e, $E(\varepsilon_t, x_t) = 0$ which is a

restriction on the covariance between the error term and the independent variable known as conditions. GMM allows use of set of instruments per variable with in the data which give a great possibility for resolving endogeneity problems within the model. (see **GMM estimation of Dynamic panel model**)

⁴ Arrelano and Bond (1991) GMM estimation require $E[\Delta \varepsilon_{it}, \Delta \varepsilon_{i,t-2}] = 0$ i.e, no second-order serial correlation in the error term of the first differenced equation, where **m2** statistics test the maintained hypothesis (H_0) in the equation above. The **m1** statistics has a subsidiary role by providing information on the robustness of m2 statistics. The m2 statistics is unreliable i.e, it may fail to reject- if the error term in levels follow a random walk. Thus, if there is first – order serial correlation in the first differenced error term where $0 < \rho < 1$, the random walk in the first –order errors is excluded. Therefore, the m1+m2 statistics require first -order serial correlation and **NO** second -order serial correlation.

According to the first way of testing instrumental validity, i.e test for first- and – second order of serial correlation among the residuals, in all cases the t-statistics for m2 was high where we accept the null for **No** 2nd-order autocorrelation in the differenced error terms. At the same time we do reject the null of m1 statistics for 1st –order autocorrelation in the differenced error terms.

Concerning Sargan/Hansen test, as second test for instrument validity, to low and two high p-values can be indicative of weak instruments Roodman (2007). Also there is the problem of “ too many” instruments where the Sargan test grows weaker the more instruments were test and unable to reject the null of instrument validity. In this study, p values obtained in most of the cases were above the apparently very high rule of thumb a threshold of $p=0.25$. According to the statistics presented in the table only the forth case of estimation provided p value near to the rule of thumb suggested by Rodman, $p = 0.2050$. Even we do accept the null of valid instruments we still had to deal with the problem of two many instruments.

There is no clear guidance from the literature on how many instruments are “too many” (Roodman, 2009), although `>xtabond2<` does give a warning when the number of instruments is larger then the number of cross-sectional units. One of the ways to limit the instrument count is by collapsing them, i.e creating instruments for each variable only. At the same time there has been a growing evidence that that panel data is likely to exhibit cross- sectional dependence which may arise due to spatial dependencies, economic distances, common shocks” thereby causing errors to be “ correlated across the entire cross section” (Sarafidis, et al., 2006). The evidence of 2nd no order serial correlation might implies possibility of no heterogeneous error cross sectional dependence.

Table 6. The Difference – in Hansan test(= C-statistics)

C-statistics	Chi2	p value	Ho: instrument validity
Hansen test of over identified restriction	Chi2=4.52	Prob>chi2=1.000	Not rejected
Difference in Hansen test of exogeneity of instruments	Chi2=5.17	Prob>chi2=0.819	Not rejected
Comparison of both tests	Chi2=0.65	Prob>chi=1.000	Not rejected

- The p values given above were compared to the conservative threshold suggested by Roodman which is $p=0.25$

According to the statistics presented in table the system GMM instruments for levels are valid, in which case we can accept the " steady-state" assumption required for system estimation and there is no undue problem with cross-sectional dependence. Based on the diagnostic test, where we did not have 1st order correlation and have 2nd order correlation, at the same time valid instruments (Sargan/Hansen) we can say that this is a sensible mode. At the conventional 5% critical value all of the coefficients were statistically individually significant, apart from the coefficient of the lagged dependent variable. All of the signs in front of the coefficients are as expected i.e, there is high level of persistency between lagged dependent variable and dependent variable in level as well as a negative relationship between female employment rate and increase in female unemployment, long maternity leave and high fertility rate .

Table 7. Interpretation of the model

SYSTEM MODEL		
Regressors	Coefficient with Robust SE	Economic interpretation
Employment rate (Lagged)	0.96*	On average, the female employment rate in current period 96% depends form the employment rat in period from the last period t-1, ceteris paribus.(high level of persistency)
Child care facilities	0.07	On average, 1% increase in 4 year olds in pre-school education in current period, will

		increase the employment rate by 7%, ceteris paribus
Fertility rate	-0.59	On average, increased average of birth in current period, will decrease the employment rate by 59%, ceteris paribus
Maternity leave	-.0013	On, average, 1week increase in maternity leave in the current period will decrease employment rate by 1,3%, ceteris paribus
Education	0.10	On average, 1% increase in the female tertiary graduates will increase employment rate by 10%,ceteris paribus.
Female unemployment rate	-0.04	On average, 1% increase in the female unemployment rate will decrease the employment rate by 4%, ceteris paribus
Part-time employment	0.05	On average, 1% increase in the female part-time employment will increase female employment rate by 5%, ceteris paribus
GDP	0.23	On average 1% growth in GDP will lead to 23% increase in the female employment rate
Constant term	3.71	The constant term has no theoretical meaning

- The coefficients with asterisk is statistically insignificant.

Conclusion

In this paper we have investigated the question of what determines the female employment rate in the European Union where a sample of 25 countries was used in period of 13 years starting from 1995. We have employed a system GMM model where the preferred model consist 4th lag in levels and 3th lag in differences. The main findings can be summarized as follows.

Current employment rate is highly influenced i.e determined by the previous year employment rate. According to this study the employment rate 96% depends from the rate $t-1$ which suggest a high level of persistency. Apart from the previous employment rate fertility rate and Gross Domestic Product growth and tertiary education also have great influence upon the employment rate. In this sample high birth rate have substantial impact on the employment rate causing almost 60% drop in the employment rate. Even though child care facilities and maternity leave had smaller impact upon the employment rate, in many countries e.g UK where there has been increase capacity in childcare facilities the employment rate had increase substantially while the length of maternity leave could have negative impact like in this case but rather small.

Compared to European countries education is also one of the most important determinants of the employment rate in FYROM. According to level of education show that the lowest rates are found among those having primary education or less, while the highest are for people whose education was of university level. Apart from the education also the tradition has very large impact upon the employment rate.

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