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$$\frac{n!}{(n-1)!} p^{m-1} (1-p)^{n-m} = p \sum_{\ell=0}^{n-1} \frac{\ell+1}{n} \frac{(n-1)!}{(n-1-\ell)! \ell!} p^{\ell} (1-p)^{n-1-\ell}$$
$$= p \frac{n-1}{n} \sum_{\ell=0}^{n-1} \left[ \frac{\ell}{n-1} + \frac{1}{n-1} \right] \frac{(n-1)!}{(n-1-\ell)! \ell!} p^{\ell} (1-p)^{n-1-\ell} = p^2 \frac{n-1}{n} +$$

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# Labor Force Participation of Married Woman in Russia

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## **Abstract:**

Women make up a little over half the world's population, but their contribution to the labor force is far below its potential, with serious macroeconomic consequences. Despite a recent progress, labor markets across the globe remain divided along gender lines, and female LFP remains lower than the participation of their male counterparts. This paper assesses the determinants of labor force participation of married woman in Russia, using data obtained from Russian Longitudinal Monitoring Survey (RLMS). The study employs two-step Heckman selection model whose major function is to give unbiased estimators of the parameters of the wage function, which could serve to estimate parameters of a structural equation of participation. Two types of proxies (the presence of children and household income characteristics) that affect the married female's opportunity cost of working but do not generate sample selection mechanisms are used in order to overcome the identification problem in the first-stage wage equation. The estimated semi-elasticity of married female participation to wage is equal to 0.24. The findings of the study also indicate that such factors as gender, age, the presence of dependent children, educational attainment, location and the religious affiliation are the significant determinants of the LFP. The income of the other household members, and race of the respondent, on the other hand, proved to be insignificant determinants of labor supply. As a result, the empirical evidence provided by this project can be useful in future assessments of current social security and employment policies implemented in transition economies.

**JEL:** J21, J22, J31

**Keywords:** female labour supply, economic transition, Russian labour market

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# 1 INTRODUCTION

For more than half a century, labour markets across the globe have been witnessing increasing levels of female participation in employment. There are a number of factors that seem to be responsible for such historical trend, among which are male labour force shortages during and after the World War II, changes in social organizations facilitating and encouraging female employment (Mahoney, 1961), technological advances, alleviation of the household facilities, and changing social and employer attitudes towards working females (McGrattan & Rogerson, 2004).

At the same time, married females still remain one of the most vulnerable groups of employees, as their attitude towards employment lacks independence and more than often heavily depends upon such factors as income of a spouse, numbers of dependent children, and access to social security programs to name a few. The vulnerability of married females as a working class becomes more vivid in developing and transition economies, where low rates of married female labour participation are usually associated with limited access to healthcare programs and lack of appropriate childcare facilities. On the other hand, the necessity of having two earners during the turbulent transition period may act as a pressure stronger than the difficulties represented by the deterioration of childcare facilities (Bardasi & Monfardini, 2004). Since married females occupy a relatively large share of female labour force, the study of the determinants of married female labour force participation rates becomes essential.

To the best of authors knowledge the literature analysing the LFP of married females in Russia is absent up to this date. This paper provides empirical evidence on Russian female labour supply behaviour and contributes to the pool of scarce literature on female labour supply in transition economies by analysing Russian Longitudinal Monitoring Survey (RLMS)<sup>1</sup>.

Russia went through a number of political and economic transformations since the collapse of the Soviet Union in 1990-1991. A period of stagnation (1992-1998) was followed by a decade of rapid economic growth in 1998. This economic development resulted in increase in the living standards from 60-65 % of that of Western Europe in 1990 to 70-75% by the 2010 (Novokmet, Piketty, & Zucman, 2017).

However, since then there was only sluggish growth and the economy went into recession following financial crisis of 2008-2009, and the economic sanctions imposed by a number of countries (USA, EU, Canada, Japan, and some other countries) due to Russia's annexation of Crimea in March of 2014 and its reported involvement in Ukrainian conflict since then ("Highlights", 2017).

Currently the economy of Russia is trying to cope with the consequences of the sanctions and lower oil prices, as crude oil, petroleum products and natural gas compose nearly 60% of total exports (Halley, 2015). The heavy reliance of Russia on the commodity market for growth in a time of a global economic and political turmoil is clearly not a positive factor in the current economic situation of the country.

Furthermore, the situation of women in Russia is also a matter of concern. There is still no definition of discrimination against women in Russian constitution (Kosterina, 2011). The list of occupations where it is prohibited to hire a woman consists of more than 450 entries, and

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<sup>1</sup> In recent years RLMS is administered by Higher School of Economics, and the full abbreviation is thus RLMS-HSE.

there is no guarantee of equal opportunities (in terms of equal pay or advance to higher positions) for men and women even in the case of successful employment (Kosterina, 2011).

Some recent studies show that the gender pay gap in Russia can reach up to 35-40% (Novikova, 2011), women more often than men are denied a loan by banks, and face daily sexual harassment at work (Obrazkova, 2015).

All of the above indicates that in Russia women face an environment close or similar to one faced by women in a typical developing country, and the empirical evidence provided by this project can be useful in future assessments of current social security, and employment policies implemented in transition and developing economies.

We choose to study the period just after the financial crisis, and before the imposition of economic sanctions on Russia in 2014. This particular period was chosen to minimize any unambiguity of estimations that may result from the effect of these two economic shocks on the Russian female labour market.

The research paper proceeds as follows: the second chapter reviews the existing literature on LFP of married female. The next chapter describes the data, descriptive statistics of the sample and implemented empirical methodology. The proceeding chapter presents the results of the estimations. The last section concludes the undertaken study, and discusses possible limitations of the current paper.

## **2 THEORETICAL BACKGROUND / LITERATURE REVIEW**

Numerous studies have attempted to analyse the underlying factors determining the participation of married females in employment. Labour supply literature studying married females' behaviour in the labour markets is vast and covers a wide range of countries (mostly developed) implementing different models to measure the impact of numerous factors on female labour force participation (LFP) rates.

In general, married female's decision to be employed is found to be inversely related to such factors as husband's income, non-labour income, and household wealth. These factors generally represent negative effect which induces married females to work less and consume more leisure. For instance, early studies indicate that negative income effect arises as a result of the increases in total income incorporated by the aforementioned factors, thus leading to an increase in purchasing power of various goods, including leisure (see Eckstein & Lifshitz, 2011; Mincer, 1962).

The presence of dependent children and expectations of future life cycle events (such as a birth of a child, child's enrolment to school, or death of a spouse) also tend to influence the decision to participate negatively. This can be explained by the increased opportunity cost of working with the presence of dependent children within the household, increasing the reservation wage of the wife above the market wage (Eckstein & Lifshitz, 2011; Mincer, 1962; Cain et al. 1970; Spencer, 1973; Heckman, 1974, 1979; Shapiro & Shaw, 1983; Fosu, 1990).

In contrast, such factors as increase in a real wage, extensive experience, and education encourage married females to be employed. This pinpoints on mostly positive substitution effect, which increases the opportunity cost of leisure as a result of the increases in the level of earnings. The level of earnings, in its own turn, may be dependent on the investments into education and experience. Therefore, increases in real wages make leisure more expensive and induce females to the employment (Eckstein & Lifshitz, 2011; Mincer, 1962; Cain et al, 1970; Spencer, 1973, Heckman, 1974, 1979; Shapiro & Shaw, 1983; Fosu, 1990).

The magnitudes and signs of income and substitution effects may vary depending on the question at hand and time period considered. For instance, Shapiro and Shaw (1983) show that the responsiveness of married females' participation rates to husband's income (income effect) of white married-women aged 30-34 has declined slightly over the period of 1967-1978. On the contrary, authors observe that the elasticity with respect to the market wage (substitution effect) has in fact increased considerably over the same period. In order to explain the observed trend in LFP of married-women Brown (1985) proposes an alternative "institutional model" postulating that the wives' decision to work (in developed countries) reflects social norms rather than any substitution between home and labour market production activities.

Paying attention to the time horizon, Fosu (1990) estimates the relationship between LFP of married females and similar variables employed in previous studies. This relationship was compared to the previous estimates and the downward trend in the sensitivity of the LFP of married women to traditional economic variables proved to continue, however, the estimated impact of husband's income is found to substantially exceed those obtained by the previous studies. Hyslop (1999) goes further and analyses the intertemporal LFP behaviour of married women. The study concludes that married females' participation response is stronger to permanent rather than current non-labour income, reflecting unobserved taste characteristics of wives.

Apart from traditional variables, a number of factors have been found to explain labour supply behaviour of married females. For instance, the evidence suggests that the existence and extent of family borrowing restrictions positively affect married females LFP rates (Shack-Marquez & Wascher, 1987; O'Brien & Hawley, 1988).

Considering household characteristics, the size of the family proved to be one of the major forces influencing married females' LFP rates. Specifically, Mahoney (1961) finds that the size of the family is inversely related to participation in the younger age and positively to participation in the older age groups. Generally, this can be explained by reasons such that after marriage women often have to migrate from one place to another; more time is required for childcare and home management as well as the fact that in so called "patrilineal paradigm" (especially in Muslim families) married women have to depend upon the approval of their husband even to re-enter the labour force after marriage (see for instance, the case of Pakistan investigated by Khan & Khan, 2009).

Paying attention to the impact of public policy, married females' decision to participate is found to exhibit the largest response to income taxation in comparison to other cohorts (Blundell, 1995; Blundell et al. 1998). This is particularly an issue for females that would like to work part-time, as they face relatively higher fixed costs of working (Cogan, 1981). Furthermore, the feedback from the public benefit system such as unemployment and childcare benefits should also be considered, as the benefit income of an unemployed man will be reduced if his wife works, imposing a 'tax' on the income of the married women (Kell & Wright, 1990).

On individual characteristics side, ethnicity (and/or cultural differences) is also found to influence the decision of married females to participate in labour. As Reimers (1985) shows the LFP of married females of different ethnicities (foreign-born whites, US born and foreign-born His-panic, US and foreign-born Asians) differs compared to US born whites, even when comparing the married females with the same characteristics. Lee (1997) comes to the similar conclusions while studying the Korean labour market during the initial phase of 1970s industrialization. The study finds that while industrialization created a new job opportunities,

the domestic ideology formed by “Confucianism” prevailed and influenced the LFP of Korean women inversely.

Kalb (2002) indicates that married women who are in their thirties and with a higher education have a higher prevalence for participation in a labour force. Moreover, Grossbard and Amuedo-Dorantes (2005) found that an increase in the growth rate of the sex ratio (the ratio of males to females in a population) results in a decline in the labour force participation growth rate of married women.

The seminal paper by Boheim and Taylor (2005) concludes that about 40% of women prefer to work fewer hours at their current hourly wage, what indicates that working hours cannot be freely chosen by employees, (what is inconsistent with standard theory of labour supply) and are fixed by employer preferences or institutional factors.

Finally, Fosu (1999) examines the impact of cost of living on married females’ LFP in urban labour markets. The study argues that while the cost of living might serve as a pure price variable and influence the LFP of wives positively, it is also likely to reflect differences in the quality of living across localities, which may be translated into differentials in LFP.

In contrast to the developed economies, empirical evidence on married females’ labour supply behaviour in developing and transition economies is rather limited. Bhalotra and Umaña-Aponte (2010) study married females’ LFP rates in developing countries. The study finds positive income effect, reflecting discouraging effect of non-labour income on married females’ employment; although, the magnitude of income elasticity is found to be substantially lower. This result is explained by higher income volatility and limited access for such formal insurance mechanisms as unemployment benefits in developing economies.

Warunsiri and McNown (2010) investigate both intensive and extensive margins of labour supply of Thai women using synthetic cohort data constructed from the annual Thai Labour Force Survey (1985-2004). Their findings indicate that there is negative relation between wages and hours worked for Thai women suggesting the dominance of the income effect over the substitution effect. The authors also state that hours worked by married females are less responsive to wage changes compared to their unmarried counterparts, however, the probability of working is more responsive in case of wives.

Tandrayen-Ragoobur et al. (2011) analyse factors influencing the Mauritian females’ decision to enter the labour market. Using household survey data for 2006-2008, the study finds that higher educational attainment encourages women to enter the labour market. Moreover, the analysis shows that marital status has a strong negative impact on woman’s decision to enter the labour market, which is explained by the lack of facilities in terms of day care centres for children and lack of flexible working hours.

The transition countries, in general, are less sensitive to various economic variables affecting labour supply of women, and focus mainly on the extensive margin of LFP (see, Chase, 1995; Paci & Reilly, 2004; Bicakova et al. 2008; Pastore & Verashchagina, 2004, 2008). The former can be justified by the fact that during the communist regime social planners implemented social policies that aimed to provide all citizens with work (Bauerová, 1987), and thus those countries may have inherited the inertia of two workers per household, that was promoted during the regime (Paukert, 1991). The justification for the latter is the fact of the presence of labour agreements and incompleteness of the data sources, which would not allow focusing on intensive margin (optimal hours of work).

Chase (1995) studies the LFP of married females in Czech Republic and Slovakia, after the collapse of Communist regime. The study concludes that the LFP have decreased in both regions, and particularly for young wives. While the wage elasticity increased in Slovakia, it



dropped in Czech Republic, suggesting that the set of options married females face has narrowed after the fall of Communist regime.

Siliverstovs and Koulikov (2003) estimate the hours of labour of married females in Estonia. The study finds positive wage elasticity whereas non-labour income's impact on labour hours is insignificant. The findings of this study are similar to the findings of Saget (1999), who finds positive wage elasticity in Hungary. Prior and similar to Siliverstovs and Koulikov (2003), Saget (1999) finds insignificant effect of non-labour income, suggesting that Hungarian women take their labour supply decisions independently of the earnings of the other household members. The analysis also indicates that female labour supply in transition economies is high and comparable to male economic activity in western countries.

An interesting study is provided by Bardasi and Monfardini (2004), who analyse the LFP behaviour of Polish women during four years before transition (1987-1990) and three years after (1994-1996). Empirical findings suggest that worsening of the childcare facilities discouraged married females to enter the labour market. However, the pressure put by low incomes and the need of a second earner in a household persuaded married females to work. As a result, the impact of budgetary restrictions overweighed the impact of deterioration in childcare facilities resulting in increasing LFP rates among Polish wives.

Moreover, the privatization of state owned enterprise and a general weakening of employment protection legislation in a period of transition have increasing hard budget constraints for firms forcing hence the least motivated and skilled women from low wage employment into inactivity (Munich et al., 2005). This would give the wrong impression of an increase in female wages and a reduction in the unexplained gender wage gap; in fact, women average wages in Belarus were declining when considering also those who had become unemployed or inactive. (Pastore & Verashchagina, 2004).

Clearly, empirical evidence of labour supply behaviour of married females in developing and transition economies is scarce. Moreover, to the best of author's knowledge the empirical work examining the LFP of this cohort in Russia has not been done yet. Therefore, the following paper will attempt to fill this "gap" in the literature by examining the determinants of LFP of married females in Russia.

### **3 METHODOLOGY**

#### **3.1 Econometric Model**

Until 1970's most academic papers could not distinguish between choices at the intensive (hours of work, weeks) and extensive (the decision to participate) margins in a labour force. Thus creating a problem of missing wages, which accounts for a self-selection bias in estimating wage and labour supply functions on samples of workers (Heckman&MaCurdy, 1982; Heckman, 1993). As a result, some early studies overestimated the wage elasticity of married female as participation elasticities for women were being compared with hours of work elasticities for men (Heckman, 1993).

The empirical methodology is based on a two-step selection model adopted from Heckman (1974, 1979) in order to approximate the wages of those women who do not participate in a labour force, and tackle selection bias problem arising from non-random sampling of the data. The study focuses on the analysis at the extensive margin, as the existence of labour agreements, which prevents the workers to choose freely the hours worked, and data limitations on transition economies would not allow us to study the intensive margin of labour

supply (see, for instance, Saget 1999; Chase, 1995; Paci&Reilly, 2004; Bicakova et al.,2008; Pastore&Verashchagina, 2008).

The structural participation equation could be expressed as follows:

$$Prob[p_i = 1] = f(Z_i, lnw_i, lnh_i) \quad where \quad i = 1, \dots, N \quad (1)$$

where  $p_i$  equals  $\mathbf{1}$  if woman participates in the labour force and  $\mathbf{0}$  otherwise.  $Z_i$  is a vector of the household, demographic, and regional variables that are assumed to influence LFP of married woman;  $w_i$  is the offered market wage to the  $i$ th individual in the formal labour market;  $h_i$  is a measure of household's wealth characteristics such as total assets, non-labour personal income and total household income.

However, we cannot observe the wage variable for nonworking females, and the estimation based only on a sample of working women can lead to misleading results due to biasedness of the selected sample (Heckman, 1974). The most straight forward solution would be to estimate the wage function on a sample of workers based on their individual characteristics, and deduce the wage for non-participants with the same characteristics (education, age, work experience, and others).

Assume that the wage equation can be expressed as follows:

$$lnw_i = g(X_i) \quad i = 1, \dots, N \quad where \quad M < N \quad (2)$$

where  $X_i$  is a vector of wage determining variables some of which overlap with those contained in  $Z_i$  vector. The problem arises as wages are observed only for  $M$  of the  $N$  number of women in the sample.

The early studies were using the above-mentioned procedure and thus estimating the wage of non-participants using the wage obtained by the sample of workers with the same characteristics ( $X_i$ ). However, this approach will lead to a sample-selection bias, since we assume that this wage equation (2) also applies to the notional wage of non-participants. This hypothesis is highly unlikely, as the participants in the labour market, on average, should have non-observed characteristics that allow them to demand higher wages. Thus, this estimation procedure will consistently overestimate the notional wages of non-participants as a result of sample-selection bias (Heckman, 1974).

One solution to overcome this bias consists of simultaneous estimations of equations explaining wages and decision to supply labour. In order to accomplish this procedure we will apply the two-step selection procedure adopted from Heckman (1974, 1979).

The first step (reduced selection equation) involves the estimation of the probability of woman being employed:

$$Prob[p_i = 1] = f(Z_i, lnh_i) \quad where \quad i = 1, \dots, N \quad (3)$$

The estimates from this equation are then used to construct the Inverse Mills ratio for each of  $M$  women participating in the labour force. The Inverse Mills ratio is then inserted to the wage equation as an additional explanatory variable accounting for possible selection bias resulting from non-random selection of data (see Heckman, 1974, 1979 for more details). The estimated coefficients of the wage equation can then be used to predict the hourly wages of all

$N$  individuals in our sample. Thus, the structural participation equation can be re-expressed as follows:

$$Prob[p_i = 1] = f(Z_i, \ln \hat{w}_i, \ln h_i) \quad \text{where } i = 1, \dots, N \quad (4)$$

where  $w_i$  is the predicted wage offer for the  $i$ th individual.

This approach would allow us to eliminate the bias in wage equation fitted to the sample of workers. Thus we can estimate our model by a standard probit model expressed by the cumulative (normal) distribution function.

$$Prob[y_i = 1 | x_i] = \Phi(\mathbf{X}_i' \beta) + u_i \quad (5)$$

with a binary dependent variable  $y_i$  for LFP of married woman, which takes values of either one or zero ( $y_i = 1$  if the respondents reply that they have a job or unemployed and seeking for it; and  $y_i = 0$  for the inactive who are neither working, nor seeking for it).

Several points regarding Heckman (1974, 1979) two-step procedure need to be made. Firstly, the identification of the parameters in the wage equation is crucial to this study. The identification of the wage equation requires the variables (proxies) that affect the married female's opportunity cost of working but do not generate sample selection mechanisms (see, for instance, Saget, 1999; Siliverstovs&Koulikov, 2003; Pastore&Verashchagina, 2008). Secondly, the two-step procedure assumes that the unobserved characteristics (error terms) of the individuals in the reduced selection equation are normally distributed and correlated with error terms in the wage equation. The violation of any of these assumptions can lead to a misspecification of the model (Smutna&Scasny, 2017).

### 3.2 Identification of the Variables in the Two-Step Model

Since some of the variables are not observed for the non-working individuals of the sample (occupation, work experience etc.), they should be excluded from the augmented wage and participation equations. Thus three types of the individual characteristic variables such as age, level of educational attainment, and ethnicity were used. Moreover, a dummy variable representing Muslim married females is created, as the ideology of the husband being a main breadwinner may be stronger in these families (Khan & Khan, 2009).

As mentioned above, the first step equation (the probability of the woman being in the labour force) should include at least one additional variable that is not present in the wage equation. Such a proxy variable should influence the decision to participate and do not impact the offered wage of the individual in order to avoid the potential problems in identifying the parameters in wage equation separately.

Two types of such variables were chosen (the presence of the dependent children and the household income characteristics) to overcome the identification problem. We thus assume that presence of the children of different age categories and household income characteristics do not influence the wife's wage offer but affect her labour force participation decision (Saget, 1999; Pastore&Verashchagina, 2004; Pastore&Verashchagina, 2008). In particular, the wife's personal non-labour income, total amount of assets owned by the household (capital), and other income of the household (total income of the household minus total income of the wife) were chosen to represent household income characteristics. The latter (other income of the household) was preferred to husband's income as similarly to the case of Hungary, outlined by Saget (1999), the "overlapping generations households" are also present in Russia.

Moreover, the regional variables were also included as they may impact both wage and labour participation decision of the married female. In order to take into account the region specific characteristics we selected four regions. “Central” region includes the central part of the country including the capital, Moscow city. The northern part of the Russia is represented by “North Caucasus” and region namely “Northern” which includes all other northern parts of the country. Finally, in order to contrast the severe environment of North, the relatively warm region namely, “CentralBlackearth” with a soft environment was also selected.

### **3.3 Identification of the Variables in the Structural Equation of Participation**

The structural equation of participation contains almost all the variables that were included into the first stage reduced participation equation along with predicted log of wage obtained from the first stage of the two-step selection procedure. The variables included into the wage equation (age, educational attainment, ethnicity, urban location, and regional variables) are not included to the structural participation equation, as they are assumed to influence the participation through the wage offer, and including them can raise potential problems in identifying the parameters separately from wage.

### **3.4 Data**

The paper employs Russian Longitudinal Monitoring Survey data for the period in between the financial crisis of 2008-2009, and the imposition of economic sanctions on Russia in 2014. The primary reason for using the data for this period is that the economic shocks brought by these two events affected many sectors of the economy (see for instance, Novokmet et al., 2017) and can potentially obscure the estimation results. Thus we employ the survey that was conducted in 2011-2012 in 11 economic regions of Russia. The survey administered 7651 randomly selected households with 21993 individuals.

RLMS is administered by the Higher School of Economics, and the Carolina Population Centre at the University of Carolina. RLMS is a survey that examines the effects of Russian reforms on the health and economic welfare of households and individuals in the Russian Federation. It includes a wide set of questions on labour activity and family background characteristics.

The household and individual surveys were pooled together in order to obtain additional characteristic variables of individuals dependent on household structure and total income. In our study, we selected the sub-sample of the survey that contains 3341 married females aged 17-54 in both rural and urban areas who were either employed or unemployed during the time of the survey (See Appendix B for detailed description of the sample). In this subsample 2174 married women were actively participating in the labour force whereas remaining 1167 were unemployed.

More than a half of the respondents are located in the urban areas (66.35%). The average age is 37 years. More than a third of the surveyed married women have a higher education (almost 35%), almost a third has a technical secondary and another third have general secondary. Primary education was reported only by 0.14% of the sample, which is with consensus of generally high literacy rate of the population of the post-Soviet countries. The presence of the children aged from 1 to 3 years was reported by 27.5% of the married females. The children aged 4 to 8, and 9 to 13 years were ones with highest presence, 73% and 77.8% respectively. The children in the category of 14-17 years old were reported only by 16.7%.

As ethnicity can potentially impact the participation of the married woman and her wage offer it was also included into the estimations. In this particular case, the sample was divided to Russian and non-Russian respondents. The 14.2% of the respondents reported to consider

themselves of a non-Russian ethnicity. Muslim married females account for (6.2%) of the total sample.

## **4 RESULTS**

Unlike in other studies of women LFP in transition countries (Saget,1999; Siliverstovs&Koulikov, 2003), who found no selection bias in their datasets for Hungary and Estonia respectively, our estimations have detected the presence of sample selection bias for Russian dataset (the Inverse Mills ratio is statistically significant). Thus, estimating the LFP equation by probit without correcting for selection bias would lead to biased and inconsistent estimates.

### **4.1 Reduced Participation Equation**

On the first stage, the likelihood of being in the labour force is computed using different individual and household characteristics of the respondents (See appendix C for a detailed table). The effect of education is statistically significant for technical secondary and higher education. In accordance with the results, having higher and secondary technical education substantially increases the probability of married females to participate in the labour force.

Children in general have similar effects to those obtained in other studies (see the structural equation of participation). The presence of children aged 1 to 3 years influences the LFP rate of wife negatively. The impact of children of age categories of 4-8 years old, and 14-17 years old proved to be insignificant. The effect of children between 9-13 years old has a positive effect and is significant at 90-percent.

The effect of being of nationality other than Russian, and the size of the family are insignificant determinants of LFP. The religion (in this particular case, the dummy variable for the Muslim wives) on the other hand, has a significant and relatively strong negative impact on LFP of married female.

The variables representing household income characteristics, in general, are statistically insignificant. The effect of other income of the household (income of the husband and other members of the family) is highly insignificant, and in line with the findings by Saget (1999) who concludes that Hungarian women take their decision to supply labour independently from the income of their husbands or other members of the family. The impact of the capital is (total assets in the households) also insignificant. The only statistically significant income variable was non-labour personal income of the wife. This result shows that Russian wives rely, in general, on their own income rather than income of other family members.

The age profile proved to be statistically significant. The coefficient of age has a positive sign and shows that the woman is more probable to work as her age increases. However, this effect is only up to some point, after which the age starts to influence the probability negatively, as suggested by its concave form. This result is in line with findings by Saget (1999), and Paci and Reilly (2004).

Finally, living in the urban area increases the LFP rates of married females. Looking at the regional breakdown, the results also suggest that married females residing in northern region of the country tend to participate in the labour force more actively. This may be explained by higher level of earnings in this particular region (see wage equation).

### **4.2 Wage Equation**

As the results reflect, the wages, in general, are not dependent on age profile of married female. In contrast, having higher education positively affects the wages being earned. That is,

as the level of educational attainment increases, the wages of married females may expect to increase accordingly. Hence, married females with higher educational attainment, on average, receive 40-percent higher wages compared to those with lower educational attainment. This result is similar to other studies in transition economies (see, Paternostro & Sahn, 1998; Saget, 1999; Siliverstov & Koulikov, 2003).

Looking at ethnicity and regional location variables, we see that being non-Russian does not determine the size of the wages offered to the married females. On the other hand, married females located in urban areas, on average, earn 28-percent higher salaries compared to those in rural areas, supporting the findings made in similar studies on transition economies (Paternostro & Sahn, 1998; Siliverstovs & Koulikov, 2003; Paci & Reilly, 2004). Furthermore, those wives settled in “northern” and “central” areas of Russia on average earn 46-percent and 35-percent higher wages, respectively, as compared to married females in other regions. The effect of central region is in line with other studies (Siliverstovs & Koulikov, 2003) where the dummy variable for individuals living in the capital is estimated to have a positive impact on wages. The positive impact of “northern” region can be attributed to the unpleasant environment in this particular location of Russia. The impact is highly significant, indicating that workers should be compensated for the harsh weather conditions in these regions.

As the proposed explanation of the positive impact of the “northern” region comes from a conventional knowledge this hypothesis should be checked for validity. To check the validity of the hypothesis, one more region with relatively better environmental conditions is included to the wage equation. Then, if proposed hypothesis is correct, the region with relatively better conditions should influence the wages negatively. Indeed, estimations show that those married females settled in “centralblackearth” tend to receive on average 27-percent lower wages compared to individuals in other regions supporting the argument above.

#### **4.3 Estimation of Structural Equation of Participation**

The consistent wage estimator obtained from the reduced participation and wage equations allowed us to derive the predicted wages for both working and non-working individuals in our dataset. We then estimate the marginal effects from the probit model using the predicted wage along with other control variables. Marginal effects of binary variables are calculated as a discrete change in the predicted probability, induced by the value of the variable changing from 0 to 1. In order to explore the fit of the model, two standard measures of probit model were used, namely pseudo R-squared and chi-square statistics of the Wald-test (see Appendix C).

The value of the pseudo R-squared is equal to 0.1674, the chi-square statistics of Wald-test of all coefficients (except intercept) is highly significant indicating a rather good fit of our model. The computed semi-elasticity of wage is equal to 0.24 at the 1-percent significance level. That implies that for every 1-percent increase in offered wage, the probability of LFP of married women will grow by 0.24-percent in Russian Federation. The computed semi-elasticity is substantially smaller compared to those obtained in other similar studies on transition economies. For instance, Saget (1999) estimated the wage elasticity of Hungarian females to be 1.81, while Siliverstovs and Koulikov (2003) estimated the wage elasticity of married females for Estonian dataset to be 0.53.

Other marginal effects are almost similar to those obtained in reduced participation equation at the first stage. Other household income as well as capital (total assets) have statistically insignificant impact on wife’s decision to work, similarly to Saget (1999) and Siliverstovs and Koulikov (2003), indicating that in transition economies married females take their decision to participate independently from the income of their husbands or other members of the

family. Non-labour personal income, on the other hand, is highly significant, although, the marginal effect is very small (0.007), indicating that, generally, a 1-percent increase of non-labour personal income will decrease the probability of LFP by 0.007-percent.

The study finds that the size of the family does not affect the probability to participate in labour. However, the children under the school age (1-3 years) have a significant negative influence on the probability of wife's LFP. The presence of the children of this age category in the household decreases the probability to participate in a labour force by 41-percent. The effect of children aged 4-8 years is insignificant, whereas starting from 9 years children increase the probability of married woman to participate in the labour force by 5.8-percent.

The effect of children of younger age (1-3 years) is in accord with those obtained by Saget (1999), Siliverstovs, and Koulikov (2003), where the authors conclude that the presence of children of younger age categories affects the probability of wife being in the labour force negatively. The effect of children in the older age category (13 and older), on the other hand, contradicts to those obtained by Siliverstovs and Koulikov (2003), and in line with those obtained by Saget (1999). The former study concludes that in Estonia children of both younger and teen age categories impact the LFP of married female negatively, whereas the latter study reports the positive effect of children of the teen age on labour supply decision. This can be explained by the availability of additional free time as the child gets older, and the financial constraints related to raising the children in the older age categories which also induces the woman to enter the labour force.

The effect of religion is statistically significant, and indicates that Muslim wives are less probable to participate in the labour force by 28-percent in Russia. We can attribute this to the ideology of man being the main bread-winner and the woman being a homemaker in those families (Khan&Khan, 2009).

## **5 DISCUSSION AND CONCLUSION**

The study arrives at a number of interesting conclusions. First of all, the semi-elasticity of wage of the married females in Russia is lower (0.24) compared to those reported in other similar studies on transition economies (see Saget, 1999 and Siliverstovs&Koulikov, 2003). This implies that a 1-percent increase in the wage rate leads to 0.24-percent increase in married female's participation rate.

The elasticity of the age proved to be concave, indicating that the labour supply of married female in Russia increases with her age, however, this effect is only to some point after which the age is a decreasing function of labour supply. These findings are in accord with the results obtained in transition and classical labour supply studies.

We also found that the non-labour income (income of the spouse and other members of the household) is insignificant determinant of labour supply of the married woman. These findings are in line with those obtained by Saget (1999) and Siliverstovs and Koulikov (2003), and in contrast with the results obtained in other classical literature on female labour supply, where the negative impact of non-labour income is reported (Rosett, 1957; Mincer, 1962; Cain et.al, 1970; Spencer, 1973, Heckman, 1974; Heckman, 1979).

The presence of dependent children (below school age) has a discouraging effect on labour supply of married woman, while the presence of children of school age motivates females to work. These findings are in line with those of Saget (1999), but partially contradict to Siliverstovs and Koulikov (2003) who find that the presence of children in both younger and older age categories have a negative impact on married females' decision to participate in labour.

The study also finds that Muslim females 28-percent less inclined to participate in labour market as compared to other religions in the study. This may be explained by the ideology of a man being a main breadwinner, and the wife being mostly a homemaker in this type of households (Khan&Khan, 2009).

The location of the individual is found to be an important determinant of the wage offer and the probability to participate in the labour force. Married females in urban areas are more likely to participate in labour and receive wages 28-percent higher as compared to rural areas. Moreover, married females residing in the central part of the Russia (including Moscow) are found to earn wages that exceed wages in rural areas by 35-percent. This can be attributed to the fact that in urban areas, and especially in the capital city, the cost of living is generally higher and the central areas are often the primary subject to economic reforms, which bring better and higher-paid jobs for the inhabitants (Siliverstovs&Koulikov, 2003). The effect of the “Northern” region on both offered wage and decision to participate is also rather conventional. The harsh environment of the north requires some additional monetary compensation for workers, which in turn increases the supply of labour in this region.

Finally, the profile of education seems to impact both the probability to participate in the labour force as well as the wage offer of married females. The findings are in line with conventional findings of other studies. Married females with higher education are more likely to be employed and in general tend to receive 40-percent higher wages, compared to those with lower educational attainment.

To conclude, we would like to outline limitations of this study, and propose some potential directions for future research. In particular, the current study did not take into account possible empirical specification problems as endogeneity, as this is out of scope of the current study, and may serve as an avenue for the future research. Moreover, the future studies can implement a dynamic analysis of the LFP of this cohort as well as to study more factors that could potentially impact the labour supply decision of the married females in Russian Federation.



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## Appendix A: Definitions of the variables

**Age:** Age of the respondent in years.

**Education:** Educational background of the respondent; classified into primary, general secondary, technical secondary and higher.

**Children:** The presence of children in the household classified to four categories by age, namely: children (1-3 years), children (4-8 years), children (9-13 years), children (14-17 years).

**Family size:** The number of family members in the household.

**Capital:** The total amount of assets owned by the household in rubbles.

**Other household income:** The total household income minus the total income of the respondent in rubles.

**Net wage:** The gross wage minus all explicit and implicit taxes in rubles

**Non-labor personal income:** The total personal income of the respondent minus her wage in rubles.

**Urban:** A dummy variable taking value of 1 if the respondent lives in an urban settlement and 0 otherwise.

**North Caucasus:** A dummy variable taking value of 1 if the respondent is located in “North Caucasus” and 0 otherwise.

**Central:** A dummy variable taking value of 1 if the respondent is located in “Central” region of the Russia and 0 otherwise.

**Northern:** A dummy variable taking value of 1 if the respondent is located in “Northern” region of the Russia and 0 otherwise.

**Central Black Earth:** A dummy variable taking value of 1 if the respondent is located in “Central Black Earth” region of the Russia and 0 otherwise.

**Non-Russian:** A dummy variable taking value of 1 if the respondent reckons himself to of a nationality other than Russian and 0 otherwise.

**Muslim:** A dummy variable taking value of 1 if the respondent is Muslim and 0 otherwise.

## Appendix B: Descriptive Statistics

*Tab. 1 – Descriptive Statistics of dummy variables. Source: author’s estimations*

<b>Variable</b>	<b>Percent%</b>	<b>Observations</b>
Employed	66.92	3341
Higher Education	34.09	3341
Secondary Tech.	28.43	3341
Secondary	29.42	3341
Primary	0.14	3341
Urban	66.35	3341
Children 1-3	27.56	3341
Children 4-8	73.06	3341
Children 9-13	77.82	3341
Children 14-17	16.73	3341
Non-Russian	14.24	3341
Muslim	6.22	3341
Central	20.62	3341
North-Caucasus	14.33	3341
Northern	4.84	3341
Central Blackearth	5.95	3341

*Tab. 2 – Descriptive Statistics of continuous Variables. Source: author’s estimations*

<b>Variable</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>Min</b>	<b>Max</b>
Age	37.40	9.52	17	54
Age^2	1488.93	727.66	289	2916
Other income	30606.74	44785.91	0	1750000
Nonlabor personal inc.	2217.91	6195.36	0	100000
Capital	12577.61	59591.90	0	1200000
Family size	3.81	1.42	1	13

## Appendix C: Results

Tab. 3 – Two-step Heckman selection. Source: author's estimations

Variable	Coefficient	Std. Err.
<b>Equation 1: logarithm of Net Wage</b>		
Age	0.017	0.014
AgeSq	0.000	0.230
Higher Education	0.398***	0.000
Technical Secondary	0.060	0.293
Primary	-0.606	0.308
Non-Russian	0.037	0.387
North Caucasus	0.058	0.163
Northern	0.463***	0.060
Central Black Earth	-0.270***	0.056
Central	0.355***	0.033
Urban	0.287***	0.030
Intercept	8.581***	0.281
<b>Equation 2: selection to employment</b>		
Age	0.103***	0.026
AgeSq	-0.001***	0.000
Higher Education	0.589***	0.100
Technical Secondary	0.351***	0.099
Primary	-0.329	0.737
Children 1-3 yrs	-1.073***	0.068
Children 4-8 yrs	-0.052	0.065
Children 9-13 yrs	0.113*	0.070
Children 14-18 yrs	0.039	0.077
Ln Other Income	0.010	0.418
Ln Capital	0.002	0.187
Ln Nonlaborpersonal inc.	-0.022***	0.000
Family Size	-0.003	0.023
Non-Russian	-0.119	0.090
Muslim	-0.613***	0.128
North Caucasus	-0.112	0.155
Northern	0.247**	0.127
Central	-0.006	0.066
Central Black Earth	-0.038	0.115
Intercept	-1.589***	0.473
Lambda	-0.1326133**	0.054
Rho	-0.5839775	
Sigma	0.6195080	
Wald chi2(12)	535.56	0.00



Tab. 4 – Structural Equation of Participation. Source: author's estimations

<b>Variable</b>	<b>Marg. Effect</b>	<b>Std. Error*</b>
<b>LnNet Wage</b>	0.240***	0.085
<b>Ln Other Income</b>	0.000	0.000
<b>Ln Capital</b>	0.000	0.111
<b>LnNonlaborpersonalInc.</b>	-0.007***	0.000
<b>Family size</b>	-0.010	0.022
<b>Children 3 yrs</b>	-0.416***	0.055
<b>Children 4-8 yrs</b>	-0.026	0.064
<b>Children 9-13 yrs</b>	0.058***	0.063
<b>Children 14-19 yrs</b>	0.033	0.073
<b>Muslim</b>	-0.288***	0.104
<b>N of observations</b>	3341	
<b>Log likelihood</b>	-1765.6165	
<b>LR chi2(10)</b>	709.84	
<b>Pseudo R2</b>	0.1674	

Note: \*, \*\*, \*\*\* are significance levels: 10%, 5%, 1% respectively.

\*Standard errors are bootstrapped, 500 replications

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