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INCOME TAXATION AND LABOR FORCE PARTICIPATION IN TRANSITION ECONOMIES: EVIDENCE FROM BULGARIA, RUSSIAN FEDERATION AND SERBIA

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ABSTRACT

This paper provides the evidence of the impact of income taxation on the labor force participation in three transition economies, namely, Bulgaria, Russian Federation and Serbia. The evidence suggests that countries which inherited high labor force participation rates are relatively insensitive to changes in the wage rates induced by the changes in the personal income taxation. The estimations have been performed using Heckman (1979) methodology and results showed relatively small wage elasticities of labor force participation for both men and women. In contrast, the sensitivity of the labor force participation decision to changes in wages is found to be bigger for females. The insensitivity of the labor force participation to changes in personal income taxation in all countries under the study may bear serious implications for tax policy design.

Keywords: *Income taxation, Labor force participation, Labor supply, Heckman system of equations, Bulgaria, Russia, Serbia*

GEÇİŞ EKONOMİLERİNDE İŞGÜCÜNE KATILIM VE GELİR VERGİLENDİRMESİ : BULGARİSTAN, RUSYA FEDERASYONU VE SIRBİSTAN ÖRNEĞİ

ÖZ

Bu çalışma Bulgaristan, Rusya Federasyonu ve Sırbistan gibi geçiş ekonomilerinde işgücüne katılıma gelir vergilendirmesinin etkisine kanıt bulmaya yöneliktir. Bu kanıt yüksek işgücüne katılım oranlarına sahip olan ülkelerin kişisel gelir vergilendirmesindeki değişmeye nispeten duyarlı olmadığını öne sürmektedir. Ekonometrik tahminler Heckman (1979) yöntemi kullanılarak yapılmıştır ve ampirik sonuçlar hem kadın hem de erkeklerde işgücüne katılımın ücret esnekliklerinin nispeten küçük olduğunu göstermektedir. Buna karşılık, ücretlerdeki değişmeye işgücüne katılım kararının duyarlılığının kadınlarda daha büyük olduğu sonucu bulunmuştur. Çalışmada ele alınan ülkelerde vergi politikası düzenlenirken kişisel gelir vergilendirmesindeki değişmelere işgücüne katılımın duyarsızlığının ciddi etkiler ortaya çıkarabileceği söylenebilir.

Anahtar Kelimeler: *Gelir vergilendirmesi, İşgücüne katılım, Emek arzı, Bulgaristan, Rusya ve Sırbistan için Heckman eşitlikleri*

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1. INTRODUCTION

Almost twenty years have passed since the planned economies started their transition to a market economy. The transition to a market economy by all the former planned economies has been characterized by large declines in output, income and employment, growing poverty and inequality as well as great uncertainties. Drastic changes in economic and political circumstances resulted in the disruption of trade and a substantial decline in the industrial output and GDP. Though public expenditure was substantially cut, output and tax revenues declined at faster rate, resulting in severe fiscal imbalances in many of these countries, which in turn led to broad macroeconomic instability. The inherited Soviet-type tax systems, characterized by the dominance of turnover and enterprise profit taxes, could not operate efficiently under the conditions of liberalization of prices and methods of payment, the privatization of state enterprises and increasing share of the private sector in GDP. There was an urgent need to reform both statutory and the administrative aspects of the tax systems (Harylyshyn and Ebrill, 1999).

The goal of the current paper is to provide a cross-country study of the sensitivity of labor force participation rates to changes in income taxation in transition economies. The study is one of the first attempts to analyze labor supply functions of Bulgaria, Russia and Serbia. We have to note that these three economies were formerly planned economies and initial labor relations were similar. After the collapse of planned regimes, these economies adopted different transition paths and labor market and tax reforms were different. Recently, most of these countries gradually shifted to flat rate income tax regimes and effect of these tax regime changes is still hard to assess. For policymaker the effect of taxes on labor market became one of the hotly debated topics especially during the world financial crisis. Since the policymaker is mostly confronted with balanced budget and employment tradeoff. Countries with rich resources (especially, oil and gas-rich counties) can easily reduce income taxes and stimulate employment in the country whereas other countries face significant challenges in attempting to stimulate employment through tax reforms. For the second group of countries, the sensitivity of labor market to changes in income taxes plays a crucial role since it will determine whether a government is capable to afford large income tax cuts to stimulate labor market. Therefore, the results of this study may help policymakers to evaluate the consequences of the various tax reforms on labor market associated with changes in the income taxation.

The paper is organized as follows. Section two discusses literature review of the recent empirical studies of labor supply with income taxes. Section three provides the methodology of the theory and empirical specification along with estimation techniques used in this study. Section four discusses the data details. Section five provides the results of the study along with their discussion. Section six discusses and compares the results with the similar studies on transition economies and derives the appropriate policy recommendations.

2. LITERATURE REVIEW

The empirical evidence on labor supply and income taxes can be found in the results of the empirical surveys and the econometric estimates of labor supply functions. Most of the surveys on labor supply models with taxes have usually come to the conclusion that labor supply is insensitive to changes in income taxes. This section provides an overview of the key findings of some recent empirical research of labor supply with taxes. It considers both static and inter-temporal setting and focuses on the studies of labor supply with income taxes in developed and transition economies.

Hausman (1981) was among the first who has provided a thorough discussion of static labor supply model with income taxes along with estimation techniques needed to estimate labor supply responses to marginal income tax changes. Hausman (1981) model assumed linear labor supply specification with non-convex piecewise-linear budget constraint. The wage coefficient was considered to be constant

across individuals, in contrast to virtual income coefficient which was allowed to vary. Econometric estimation showed that, for males, uncompensated labor supply elasticity was close to zero and substantially smaller than income elasticity. Since the wage and income variables from the convex and non-convex budget sets were similar, Hausman's study proposed to smooth the non-convexities created by the earned income credit, social security taxes, and the standard deduction. In contrast to prim-aged males, the magnitudes of the uncompensated and income elasticities was found to be substantial larger for prime-aged females. The general results obtained by the study indicated that marginal income taxes did not discourage labor supply substantially.

Blomquist's (1983) study of Swedish labor supply with marginal income taxes was similar to Hausman's approach (1981). Blomquist estimated labor supply function of 688 Swedish males by using 1974 Swedish Level of Living Survey. Similar to Hausman's estimation, the wage coefficient was considered to be constant across individuals, in contrast to virtual income coefficient which is allowed to vary. Estimation by maximum-likelihood yielded the estimates of -0.03 for income elasticity, 0.11 for wage elasticity and 0.08 for uncompensated wage elasticity.

MaCurdy (1983) estimated the intertemporal labor supply model with income taxes. He uses the data from the 1972-1975 Pre-enrollment and the Monthly Labor Supply Files of the Denver Income Maintenance Experiment for 121 married prime-aged males. The study used two-stage instrumental variable technique in order to estimate marginal rate of substitution functions, monotonic transformations and the income and substitution effects. The estimates of the substitution and income effects were found to be larger compared to the previous studies of the intertemporal labor supply with taxes (see Cain-Watts (1973) and Borjas-Heckman (1979)). The instrumental variable estimation technique yielded the uncompensated wage elasticity in a range of 0.31-0.7 and the income elasticity in a range of -0.28 and -0.16.

Triest (1990) analyzed the sensitivity of Hausman's estimates to changes in model specification. By using a 1983 sub sample of the PSID, the author estimated the various variants of Hausman's model. The study used maximum-likelihood approach with heterogeneous preferences to estimate linear labor supply with the linear measurement error. The estimates across model specifications indicated that the supply of labor for prime-aged married men was relatively invariant to the net wage and virtual income. However, in contrast to Hausman's (1981) results, Triest found no virtual income effect. The net wage elasticities were positive and larger than those obtained by Hausman. The results for females have shown to be more sensitive to changes in marginal income taxes. Net wage elasticities resulting from a censored estimator were found to be similar to those of Hausman.

Friedberg (1995) analyzed data from the United States March Current Population Survey. She considered the linear functional specification and employed convex budget set with the piecewise-linear budget constraint in order to study a progressive taxes and the social security earnings test. Estimations by Freidberg used Heckman sample selection technique in order to predict non-participant wages in the labor supply equation. The study found compensated wage elasticity of 1.12, an uncompensated wage elasticity of 0.36, and an income elasticity of -0.76.

Garsia and Squarez (2002) estimated four models of married female labor supply using the data from the 1994 Spanish section of the European Household Panel. The empirical analysis was based on a sample of 2586 married women who were living with their husbands and were not the household heads. They specified four alternative models, which differed with regard to the hypothesis about the optimization error and/or the likelihood contribution of non-workers. Following Hausman's approach the results obtained for the four models suggested that the effects of wages and non-labor income on the labor supply of Spanish married women depended on the specification used. The model which had both preference and optimization errors and allowed for both voluntarily and involuntarily unemployed females desiring to participate seemed to better fit the evidence for Spanish married women.

Kalb (2002) estimated labor supply models for four subgroups of the Australian population: couples with and without children, single men, single women, and sole parents. Kalb assumed linear functional form with income taxation, fixed costs and missing wages, as well as non-convex budget set. The maximum-likelihood method estimation results suggested that preference for labor supply was highest for people who were in their 30's with a high education level. Moreover, the education levels were found to be more important for females than for males and the preference for labor supply was lower for women with children, in particular when the children are young.

Ziliak and Kneisner (2004) estimated the incentive effects of personal income taxation in an intertemporal model of consumption and labor supply that relaxed the standard assumption of strong separability within periods. They used data on 1980-1999 male heads of household from the US PSID, which spans the major recent federal tax reforms in the United States from the Economic Recovery Tax Act of 1981 to the Taxpayer Relief Act of 1997. The analysis was restricted to males between 25-60 years old. The estimation was conducted following MaCurdy's (1983) two-stage instrumental variable technique. The model permitted identification of both within-period preference parameters and lifecycle preference parameters such as the inter-temporal substitution elasticity. The estimates by the two-stage estimation methods yielded the compensated net wage elasticity of 0.3, the intertemporal substitution elasticity of -0.96, and the Frisch elasticities of 0.1 and 0.5. The results pointed that consumption and hours worked are direct complements in utility, and both increase with an increase in the after-tax share and with a compensated increase in the net wage.

Tondani (2006) estimated the elasticities of the labor supply for four categories of Italian workers: married men, married women, unmarried men, and unmarried women. He used the micro data from the 2002 Survey of Households' Income and Wealth (SHIW). Tondani assumed the linear functional specification with the piecewise-linear budget constraint to estimate the wage and income elasticities of 21144 individuals 13536 of which received income benefits. The analysis was restricted to the individuals between 19 and 60 years old. The estimates of the wage and income elasticities by Tobit technique suggested that hours of work were positively related to after tax labor income and negatively related to virtual income. Female labor supply was found to be more sensitive than that of males to an increase in net wage.

As it is apparent from the discussion, most of the focus was given for the choices at the intensive margin, that is, how hours of labor change due to changes in marginal income taxes. Although there are a range of estimates for each group of population (married men, unmarried women, and married women), the empirical results from the labor supply literature suggest that the estimated elasticity for husbands is the lower than females.

In contrast to the empirical literature on developed countries, the empirical evidence of the behavior of labor supply in transition economies is relatively scarce. Moreover, most of the empirical estimation was focused on the choices at the extensive margin, which is the labor force participation decision. The explanation for the studies of labor force participation rather than optimal hours of work is found in the presence of the labor contracts and incompleteness of data on wages, non-labor income and other determinants of labor supply in the transition economies.

Bic'akova et al. (2008) estimates the wage elasticity of the labor force participation in Czech Republic. She uses Heckman selection to employment approach to estimate the standard static labor supply function with taxes. The data used originates from the Czech Household Income Survey for the year 2002 and covers 19003 individuals in 7973 households. Bic'akova et al. (2008) estimates two models of labor supply behavior. The first model excludes any tax and benefits system variables and produces uncompensated wage elasticities of 0.16 and 0.02 for females and males, respectively. The second model takes into account tax and benefit system of the Czech Republic and its estimation results in the semi-elasticities of 0.06 and 0.01 for women and men, respectively.

Staehr (2008) estimated the employment and welfare effects of flat personal income taxation in Estonia. He found that economic incentives affect the participation decisions of the individuals, but not the number of hours worked by individuals already working.

Saget (1999) uses 1992 data to estimate a labor force participation model for 720 Hungarian prime-aged females. The estimations result in labor force participation rate of 1.81, a value which is relatively high compared to other studies of labor force participation.

Chase (1995) compares labor force participation of Czech and Slovak married women (between 20 and 69 years of age) before (in 1984) and after (in 1993) the change of the political regime and the division of Czechoslovakia. Chase finds that the wage semi-elasticity of labor force participation changed from 0.54 to zero for the Czech and from 0.49 to 0.63 for the Slovak married women between the two years.

An interesting paper was provided by Slinko (1999) who estimated the Russian labor supply function in order to explain why the individuals faced with chronic wage arrears continued to spend certain amount of their time at their state jobs. She estimates log-linear labor supply function by Tobit estimation technique. The data is provided by the 1998 Russian Longitudinal Monitoring Survey by Carolina Population center at the University of North Carolina at Chapel Hill. The survey includes 10677 interviews. The sample size of the data considered 4047 individuals of which 111 were on maternity leave. The estimated model reports positive uncompensated wage and cross-wage elasticities, negative income elasticities and indicates on the need of including Russia-specific factors, as wage arrears and unpaid leaves into the model.

Ivanova et al. (2005) use micro-level data to examine the employment effect of introduction of a flat income tax in Russian Federation in 2001. The main finding of this paper is that while revenues increased, these increases in revenues were the results of the better compliance, while the total labor supply effect was relatively limited.

As it was noted, the research on labor supply in transition economies is in its early stages. In order to further discuss the issues of labor supply in other transition economies, and investigate specifics of these economies compared to other developed and developing economies, this study further analyses the labor supply in three other transitions economies. This is the first attempt to analyze labor markets of these economies and provides comprehensive sensitivity analysis of labor supply on income tax changes. The results of the study can be used in important public policy discussions, where determination of optimal taxes and controlling employment are key issues. Especially during the anti-crisis period, where more than two-thirds of developing economies reduced their individual income taxes only because of employment issues. Thus, the results of the study will be important and crucial in economic development and tax policy design processes.

3. METHODOLOGY

The study uses the standard static neoclassical model of labor supply extensively discussed by the recent literature[1]. The empirical model employed is based on the Heckman (1979) model to estimate the wage equation on the sample of workers, taking into account the selection to employment equation. We use the Heckman model to specify the system of equations consisting from wage and selection to employment equations. This system of equations is then estimated by maximum likelihood method as a bi-variate probit model for both genders, males and females, separately.

1 See, for instance, Pencavel (1986), Blundell and McCurdy (1999), Hausman (1986), Heckman (1993)

Once the estimations of the Heckman model have been completed we use the predicted gross hourly wages to transform them into net effective monthly wages. In order to derive the corresponding wage semi-elasticities and elasticities of labor force participation we specify two models: the one that uses the gross monthly wage and the other with the net effective wage, taking into account income taxes and transfers.

3.1. Theory

In this paper we use the standard model of consumer choice to lay the theoretical framework. Not going in too many details, the traditional model of consumer choice involves the maximization of utility over the consumption, C, and labor hours, h, subject to a his/her budget constraint:

$$\begin{aligned} &\max \Rightarrow U(C,h,\delta) \\ &\text{s.t}: C = wh + I + T(wh, I, \delta) \\ &\text{with } h = H - L \\ &\text{and } 0 \le h \le H \end{aligned}$$

, where δ is the individual specific characteristics and T (●) is the tax function. In this paper we estimate the sensitivity of the labor force participation rate to changes in income taxation. We do not consider the case when the individual is at the intensive margin, that is when h > 0. Concentrating only on the participation, the solution to the maximization problem is reduced to comparison of utility from working and not working. If the former exceeds the latter the individual decides to participate in employment: $U(C^*, h^*, \delta) \ge U(0, C^0, \delta)$ In case, when the individual decides not to work, his/her optimal consumption depends on government benefits and non-labour income: $C^0 = T(0, I, \delta) + I$

On the other hand, if the individual decides participate the optimal consumption bundle depends on labour and non-labour income plus net transfers. In this case the optimal consumption bundle is given by:

$$C^* = wh^* + T(wh^*, I, \delta) + I = C^0 + (1-t)wh^*$$

and

$$t = \frac{T(0, I, \delta) - T(wh^*, I, \delta)}{wh^*}$$

where, t, represents an effective marginal tax rate of transition from not working to working. The optimal hours of labor supply are given by the following conditions:

$$\begin{aligned} h &= h^* \quad \text{iff } U(C^*, h^*) \ge U(0, C^0) \\ h &= 0 \quad \text{otherwise} \end{aligned}$$

, where, h, is a function of all the parameters of the model and fully describes the individual labor supply behavior[2].

We have decided to choose the labor force participation rather than hours of labor supply due to several reasons. In particular, most of the hours in the transition economies under the study are fixed by labor contracts. Furthermore, most of the respondents in the estimation sample come from various occupations. Because these are characterized by divergent hours and wage combinations the preference is given to the LFP rate sensitivity. The data on hours of work is often over-reported and suffer from substantial measurement error. Finally, previous study on labor supply revealed higher wage elasticity of labor supply at the extensive rather than at the intensive margin.

2 Note, that in the first scenario we identify the income effect and the substitution effect of a change in the wage rate on the hours of labor supplied by a worker. In the case, of labor force participation a wage change (unlike a change in unearned income) does not cause an additional income effect because, for an individual, the participation decision is a binary one.

3.2. Empirical Specification

Empirical specification of the study was adapted from Heckman (1976) where individual makes choice to participate or not to participate in the labor market. If individual decides to participate then binary random variable LFP_i is equal to 1, otherwise it is equal to zero. Let vector X to include all non-wage household income, household characteristics and individual preferences that affect individual's labor force participation decision. Then the individual i's effective net wage is given by:

$$ENW_i = (1\text{-}t_i)\text{x}GW_i$$

, where GW_i is gross wage and t_i is individual specific marginal tax rate of transition from non-participation to participation in employment. This tax rate that takes into account existing taxes on personal income, social contribution rates and social benefits available for non-working and working individuals. Then labor force participation decision equation can be specified as follows:

$$LFP_i = f\,(ENW_i, X_i, ...)$$

In order to estimate the effect of wage on labor force participation decision, the optimal number of hours of work, h_i, are approximated by the following equation:

$$h_i = \alpha \ln ENW_i + X_i\beta + \varepsilon_i$$

, where α and β are the vectors of parameters of the model and ε_i is an error term assumed to be independent and normally distributed across individuals, $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$. Then, the probability that an individual *i* participates in the employment can be expressed by:

$$\Pr(LFP_i = 1) = \Pr(h_i > 0) = \Pr(\alpha \ln ENW_i + X_i\beta + \varepsilon_i > 0)$$

Given our assumptions about the error term ε_i , the labor force participation decision, as described by LFP_i, can be estimated by a standard probit model:

$$\Pr[LFP_i = 1 / ENW_i, X_i] = \Phi(\alpha \ln ENW_i + X_i\beta)$$

, where $\Phi(.)$ is the standard normal cumulative distribution function. Since the model is non-linear, the impact of the right-hand side variables has to be expressed in terms of the marginal effects evaluated at different values of the independent variables.

The key variable of interest in the above probit model is the individual's wage rate since we are interested in estimating its impact on individuals' labor force participation decisions. Consequently, a key parameter of interest is the coefficient to be estimated that corresponds to the wage variable, which is α. In the above probit model wage is used in logarithmic form for purposes of deriving coefficient α as the wage semi-elasticity of labor force participation directly from the probit model estimations. As a result, the wage elasticity of labor force participation can be estimated by dividing the semi-elasticity by the probability of labor force participation or by the labor force participation rate.

Although, the above probit model was initially specified for the effective net wage case, the estimation of the same model with the gross wages is also provided. By doing so, it is possible derive two separate estimation results and differences between these results will serve as an indicator of the welfare system's discouraging impact on labor force participation.

Based on findings of similar studies[3], which have yielded distinctly differing outcomes on impact of wage and other explanatory variables on labor force participation for women and men, the probit model is estimated separately by gender.

3 See Bicakova et.al (2008)

The above presented econometric model requires information on wages for all individuals in the estimation samples. This requirement necessitates estimation of potential wages for individuals in the estimation samples with no observed actual wages. In order to estimate such potential wages the study uses the standard Heckman (1979) model that estimates the wage equation on only the individuals in the estimation samples who have actual wages, while ignoring those who do not have observed actual wages.

After the estimation the Heckman model, the study uses the estimated wage equations to predict gross hourly wages for everybody in the estimation sample, separately for men and women. Then predicted gross hourly wages are transformed to full-time equivalent gross monthly wages, assuming that a respondent works 48 hours per week and 4 weeks per month.

The effective net wages from the estimated gross monthly wages are derived via the following equation:

$$ENW_i = GMW_i \text{ x } (1\text{-}t_i)$$

, where GMW_i denotes the estimated gross monthly wage of the individual i. t_i represents the individual-specific effective marginal tax rate of the transition from not-working to working, defined as:

$$t_i = 1 - \frac{GMW_i \times (1-\tau) + (SB_{\text{work}} - SB_{\text{non-work}})}{GMW_i}$$

, where τ is cumulative tax rate on predicted gross monthly wage, which includes personal income tax, social contributions paid out of personal earnings, SB_{work} are social benefits to be received if working, and $SB_{non\text{-}work}$ are social benefits to be received if not working.

Since social benefits are assigned depending on the composition of household such as presence of children and unemployed, and therefore target entire household well-being rather than an individual's well-being, in this study, the total social transfers at the household level are included in SB_{work} and $SB_{nonwork}$. Eligibility rules of the country's welfare system imply that an individual's decision to work will affect the social transfers received by the entire household. For instance, if an individual decides to work then the household's total income will decline by the amount of unemployment income previously received by this individual.

4. THE DATA

The data that we use in this study collected from various sources. Since the analysis is conceptually static, we use the income tax rates that were appropriate for the period of survey.[4] Moreover, we restrict our study to working ages only which include all individuals of 16 – 64 ages year old that work in the formal sector of employment. We exclude from the analysis all students, part-time workers, pensioners, self-employed and individuals who are employed by the informal sector. The estimations are performed on a gender basis, where the separate estimations are made for men and women respectively.

To estimate the sensitivity of labor force participation to changes in income taxation in Bulgaria and Serbia we use the latest available Living Standard Measurement Surveys for Bulgaria and Serbia conducted by the World Bank in 2002 for the former and 2007 latter, respectively. For Serbia we estimate the sensitivity of labor force participation rate to changes in income taxation for 4043 male respondents and 3694 female respondents. For Bulgaria the sample covers 3661 individuals of whom 1909 are men and 1752 are women.

4 For further discussion of individual income tax systems in countries' under the study please see appendix

The estimations of the labor force participation wage elasticities in Russian Federation employ the Russian Longitudinal Monitoring Survey 2002, Round 11, conducted by the Russian State Statistical Bureau Goskomstat. Given the restrictions above the estimation sample consisted from 2304 men and 2585 women, respectively.

We have chosen the three countries, namely, Bulgaria, Serbia, and Russian Federation in this study, since the data for these countries, as provided by the respective labour force surveys, is relatively complete and vast.

In this study we also use individual characteristics that in our opinion may affect the labor force participation rate besides the wage rates. These include such factors as the level of education, marital status, presence of children in the family, as well as the additional non-labor income.

The sample summary statistics for Bulgaria, the Russian Federation and Serbia are given by Tables 1, 2, and 3 below.

Table 1. The Estimation Sample Summary Statistics - Bulgaria

Variable	MEN		WOMEN	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Labor Force Participation	0.80	0.39	0.74	0.43
Avg. wrk. hrs./week	34.6	19.5	31.0	18.8
Gross hourly wage	160.9	209.3	123.6	128.2
Other Income	0.70	0.45	0.71	0.45
Age	40.7	10.6	40.5	9.6
Higher Education	0.18	0.38	0.29	0.45
Married	0.71	0.45	0.77	0.42
Children	0.39	0.48	0.47	0.49
Children < 7 Years	n/a	n/a	0.14	034
Rents apt./house	0.06	0.24	0.06	0.24
Lives in Urban area	0.73	0.44	0.75	0.43
Sample Size	1909		1752	

Table 2. The Estimation Sample Summary Statistics – Russian Federation

Variable	MEN		WOMEN	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Labour Force Participation	0.952	0.21	0.886	0.32
Average working hours p/w	47.2	13.4	41.6	12.3
Gross hourly wage	29.3	39.8	20.5	20.3
Other Income	560.2	1973.2	558.3	1977.1
Age	38.9	9.6	38.4	9.0
Higher Education	0.18	0.38	0.23	0.42
Married	0.83	0.38	0.74	0.44
Children	0.60	0.49	0.64	0.48
Children < 7 Years	0.27	0.44	0.25	0.43
Children 7-18 Years	0.42	0.49	0.49	0.50
Rents apt./house	0.07	0.25	0.06	0.24
Lives in Urban area	0.62	0.48	0.63	0.48
Sample Size	2304		2585	

As can be seen from the tables the highest mean labor force participation rate among men and women is recorded in Serbia and Russian Federation, whereas the lowest is in Bulgaria. Although the labor force participation rates have dropped since the beginning of the transition, still these countries exhibit high rates of participation among population.

The same pattern can be noticed with respect to average weekly working hours, where the highest are in Russian Federation and Serbia, whereas the lowest are for Bulgaria. This fact is in line with the recent concern over the rising unemployment and dropping participation rates in Bulgaria.

Table 3. The Estimation Sample Summary Statistics - Serbia

	MEN		WOMEN	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Labor Force Participation	0.97	0.15	0.80	0.39
Avg. wrk. hrs./week	45.4	19.1	40.9	17.8
Gross hourly wage	94.1	237.8	65.7	151.1
Other Income	0.79	0.40	0.89	0.31
Age	42.5	10.6	41.3	9.5
Higher Education	0.09	0.28	0.1	0.29
Married	0.73	0.44	0.79	0.40
Children	0.32	0.46	0.36	0.48
Children < 7 Years	0.12	0.33	014	0.34
Rents apt./house	0.02	0.15	0.03	0.16
Lives in Urban area	0.51	0.49	0.56	0.49
Sample Size	4043		3694	

All three countries exhibit remarkable differences in the pay rate among men and women, where the women are seem to be more discouraged by the wage rates.

The mean age rates in the samples vary in span of 35-43 year for all for countries under the study.

Nearly 70 percent of the population is reported to have other income sources in Bulgaria, Serbia and Russian Federation. This non-labor income includes all non-labor income stemming from capital gains, self-employment as well as informal sector activities.

More than 70 percent of men and 73 percent of women are reportedly married, namely are in registered marriage or living together without civil registration in all three countries. In this analysis the term "married" is expanded to include those who have permanent partners living together without civil registration since such relationships in many ways resemble normal families.

This study utilizes information on the presence of children in the household which is sufficient information for purposes of analyzing impact of having children on labour supply decisions as child care may be provided by other members of the household as well and therefore affects their labour supply behaviour. Such approach allows including all working age individuals in the household into the estimation sample and allows increasing the size of the sample as much as possible.

The amount of people who possess the higher education diploma is extremely low in the sample ranging between 18 and 29 percent for both genders.

Finally, more than 60 percent of the sample population are recorded to reside in the urban areas of Bulgaria and Russian Federation, whereas the figures for Serbia are approximately 50 percent.

5. CROSS-COUNTRY RESULTS

Since estimation of the labour supply behaviour in this study is carried out in two stages, we present results of the Heckman model of the system of wage and selection equations, and the results for the probit model separately.

5.1. Heckman System of Equations

The results from the Heckman system of equations provide the first insights into the behaviour of the labour supply in the three transition economies and are presented in tables 5 to 7. Wages increase with the level of education in Bulgaria and Russian Federation for both genders, in contrast to Serbia where higher education does not seem to be a significant determinant of wages for both genders.

Age of an individual seems to affect positively the wage rate of men in Bulgaria, whereas it is inversely related to male wages in Serbia and Russian Federation. In contrast, wages decrease with female age in Serbia and increases in Bulgaria and Russian Federation. This conclusion differs from the found evidence on positive relation between wage rate and age.

The degree of urbanization of the residence leads to a higher wages for both genders in all three transition economies.

The selection equation shows more substantial differences between two genders. Specifically, the presence of children in the family does not seem to be a significant determinant for both genders, except for Bulgaria, where it is positive. However, when considering the presence of children under 7 years old in the family, the effect is large and negative for women in all three countries under the study. Except for Bulgaria, the effect of being married is positive for men and negative for women in the rest of the transition economies. The probability of the selection into employment increases with age for women in all three countries under the study. In contrast, the probability of selection into employment increases with age only in Serbia and decreases for the rest of the countries. Finally, the presence of the other income in the household seems to reduce the probability of selection into employment for both genders in all countries.

Table 5. Heckman Estimation Results for Bulgaria, Both Genders

Equation 1. Log of gross wage		
	Men	**Women**
Higher education	0.5188 (0.000)	0.3833 (0.000)
Age	0.0048 (0.005)	0.0089 (0.000)
Degree of Urbanization	0.2297 (0.000)	0.0906 (0.059)
Intercept	0.1620 (0.095)	-0.1614 (0.170)
Equation 2. Selection to employment		
	Men	**Women**
Married	0.1304 (0.075)	0.0472 (0.537)
Higher education	0.1819 (0.022)	0.4138 (0.000)
Children	0.0410 (0.534)	0.1723 (0.015)
Children < 7 Years	X	-0.5455 (0.000)
Other income	-0.2036 (0.002)	-0.1286 (0.066)
Age	-0.0056 (0.056)	0.0017 (0.615)
Rent	0.0335(0.787)	-0.2464 (0.051)
Degree of Urbanization	0.2162 (0.002)	0.4219 (0.000)
Intercept	0.3576 (0.012)	-0.1976 (0.263)
Log-likelihood	- 2303.659	1907.245
χ^2	186.65	111.50

Note: Numbers in parentheses are the corresponding p - values

Table 6. Heckman Estimation Results for Russian Federation, Both Genders

Equation 1. Log of gross wage		
	Men	**Women**
Higher education	0.2649 (0.003)	0.1439 (0.052)
Age	-0.0024 (0.501)	0.0083 (0.018)
Degree of Urbanization	0.5971 (0.000)	0.1716 (0.010)
Intercept	2.3905 (0.000)	2.1106 (0.000)
Equation 2. Selection to employment		
	Men	**Women**
Married	0.4119 (0.000)	-0.0581 (0.020)
Higher education	0.3051 (0.000)	0.3459 (0.000)
Children	0.0388 (0.464)	-0.0235 (0.635)
Children < 7 Years	x	-0.1868 (0.000)
Other income	-0.5822 (0.000)	-0.2881 (0.000)
Age	-0.0028 (0.374)	0.0042 (0.171)
Rent	0.3113 (0.003)	-0.1498 (0.056)
Degree of Urbanization	0.2864 (0.000)	0.2720 (0.000)
Intercept	0.4689 (0.000)	0.5396 (0.000)
Log-likelihood	-4064.8	-4475.9
χ^2	59.76	165.02

Note: Numbers in parentheses are the corresponding p - values

Table 7. Heckman Estimation Method Results for Serbia, Both Genders

Equation 1. Log of gross wage		
	Men	**Women**
Higher education	0.1205 (0.88)	-0.0829 (0.612)
Age	-0.0162 (0.000)	-0.0084 (0.106)
Degree of Urbanization	0.8249 (0.000)	0.8528 (0.000)
Intercept	4.4619 (0.000)	4.7552 (0.000)
Equation 2. Selection to employment		
	Men	**Women**
Married	0.1685 (0.000)	-0.0821 (0.012)
Higher education	0.3535 (0.000)	0.4307 (0.000)
Children	0.0585 (0.184)	0.0476 (0.086)
Children < 7 Years	-0.1059 (0.050)	-0.1067 (0.003)
Other income	-0.5822 (0.000)	-0.1792 (0.000)
Age	0.0043 (0.038)	0.0031 (0.129)
Rent	0.0381 (0.706)	0.0605 (0.397)
Degree of Urbanization	-0.2898 (0.000)	-0.1629 (0.000)
Intercept	0.6788 (0.000)	0.4915 (0.000)
Log-likelihood	-8681.93	-7183.19
χ^2	142.60	76.83

Note: Numbers in parentheses are the corresponding p - values

5.2. Probit Results

The marginal effects from the estimated probit model of the labor force participation for three countries are represented in Tables A3 to A8 in the appendix. The effects presented in these tables are estimated at the means of the variables. These marginal effects of binary variables are estimated as a discrete change in the predicted probability induced by the value of the variable changing from 0 to 1. The tables compare the results for men and women respectively and compare the specification with the gross wage and with the effective net wage. We start from the discussion of the semi-wage elasticities of the labor force participation for both genders represented by the corresponding marginal effects and then discuss how various factors other than wages affect the labor force participation decision.

Semi-wage elasticities of labor force participation probability in three transition economies

The wage semi-elasticities of probability of supplying labor are given in the first rows of tables A3 to table A8. For men the highest gross wage semi-elasticity is found in Russian Federation, being nearly 0.06. For Bulgaria the changes in the gross wage seem not to affect the labor force participation of men. This implies that for a 1 percent increase in the wage rate the labor force participation in Russian Federation increases by about 0.06 percent. For women, the largest gross wage semi-elasticity is found in Serbia, where a one percent increase in the wage rate increases the probability of supplying labor by nearly 0.491 percent. Again, the gross wage semi-elasticity in Bulgaria is found not to affect the decisions of females to supply labor. However, note the remarkable differences between the sensitivity of labor force participation to changes in the gross wage between males and females in Russian Federation and Serbia. While changes in the gross wage have no significant effect on male labor force participation rates, its effect is highly significant for females.

Focusing on the second specification with effective net wage for men, we find that Bulgaria possess highest sensitivity of labor force participation to changes in the effective wage. Similar pattern can be seen when analyzing the responses of labor force participation among women. The highest net effective wage semi-elasticity is found in Russian Federation being nearly 0.3. This implies that a one percent increase in the net effective wage rate induces the increase in the probability of labor force participation among women by 0.3 percent.

Hence we explain this result that the gross wage elasticities are greater than effective net wage elasticities mainly because the effective net wage is distributed among individuals more unevenly. That is, the marginal effective tax rate that we use to construct the effective net wage takes into account the actual income taxes as well as the social contributions and the implicit taxation resulting from the reduction in social transfers associated with wage increases.

The sensitivity of labor force participation probability to changes in other determinants

The marital status is found to affect positively the probability of labor force participation of men in all transition economies. This implies that by being married men are more inclined to participate in the employment. In contrast, by being married the probability of female labor force participation falls in all three countries under the study. This result is in line with the results documented in the standard literature.

The effect of the other income that captures other sources of non-social income in the household is in line with the standard literature, both negative and significant for all countries under the study.

The presence of children in the household is found not to affect significantly the male and female labor force participation decisions in all three countries. However, the presence of children under 7 years old is found to significantly reduce the probability of labor force participation decision of females in all countries under the study. This result is not surprising, since most of the women usually take some time to take care after children prior to their school-age.

We find that the degree of urbanization of residence is significant only in Serbia, although according to the estimates, it is negative. This is rather a surprising result that may stem from the incompleteness of data or wrong empirical specification.

Finally, whether a person lives in a rented apartment or housing is found to increase the probability of male labor force participation only in Russian Federation.

6. WAGE ELASTICITIES AND TAX POLICY IMPLICATIONS

In tables 9 and 10 we present wage elasticities for three transition economies, namely, Bulgaria, Serbia and Russian Federation. The wage elasticities of the labor force participation rate in Bulgaria, Serbia and Russian Federation have been estimated by dividing wage semi-elasticities with the predicted probability of labour force participation at means of the variables.

Table 9. A Comparison of the Wage Elasticities – Men (Three Transition Economies)

Country	Gross wage	Effective net wage
Bulgaria[1]	0.289	0.1356
Serbia	0.039	0.021
Russian Federation	0.0605	0.0490

Notes: 1) Wage elasticity for Bulgaria is found to be insignificant at all three levels of significance.

Table 10. A Comparison of the Wage Elasticities – Women (Three Transition Economies)

Country	Gross wage	Effective net wage
Bulgaria[1]	0.1179	0.0398
Serbia	0.57	0.11
Russian Federation	0.4663	0.3236

Notes: 1) Wage elasticity for Bulgaria is found to be insignificant at all three levels of significance.

From the tables above we note that the labor force participation decision is more sensitive to changes in wage rates induced by the changes in the personal income taxation for women as compared for men for both specifications. Under gross wage specification the sensitivity of labor force participation decision for men is highest for the Russian Federation. In contrast, female wage elasticity under gross wage specification is found to be the most sensitive in Serbia. The difference between the two estimated wage elasticities (one for the gross wage and the other for the net effective wage) can be interpreted as an indicator of the impact of the welfare system on individuals' labour supply decisions. The estimation results suggest that the countries' existing welfare systems have discouraging effect on labour force participation for both men and women.

These welfare system disincentives are greater for women than for men. The difference in magnitude of welfare system disincentives is associated with availability of child benefits on top of unemployment benefits for non-working women, while non-working men are entitled only for unemployment benefits in most of the transition economies.

As discussed above, the labour force participation rates across the post-Communist countries were high due to the law on full employment. Although the transition brought with itself declining rates of employment and falling rates of labour force participation, the labour force participation rates among the transition economies remain high.

The results of the wage elasticities of the labour force participation in three transition economies found in this study confirm the recent findings of the mature markets on the inverse relationship between labour force participation rates and wage sensitivity of labour supply (Alesina and Ichino, 2007; Blau and Kahn, 2007). Hence, the findings of this study suggest that the labour supply responses to the wage changes are expected to be low in most of the transition economies which inherited high levels of labour force participation rates (Similar results were found for Czech Republic by Bicakova, 2008, and for Estonia by Staehr, 2008).

In general, after the initial implementation of market-oriented tax system elements, further changes and reforms of tax systems in many transition economies, however, resulted in more complex and less transparent tax systems with numerous exemptions and deductions (Shome and Escolano, 1993).

In the mid-90s many transition economies initiated tax policies focusing on simplification of the overall tax system, improvement of structural aspects of taxation and minimization of tax-induced distortions. However, many governments had difficulties in sustaining good tax policies and frequent changes to tax legislations resulted in worsening of overall business environment. Nearly all of the transition countries concentrated more on tax policies while giving less attention to the amendments in tax administration. Tax administration reforms were mainly associated with the enactment of necessary legislation, establishment of organizational structures, development of systems and procedures; however, little has been done in the issues concerning the tax collection and enforcement (Stepanyan, 2003).

Still, the experiences of the transition economies show a heavy reliance on the indirect taxes as compared to the direct ones. Indirect taxes, such as import and export duties and excise taxes comprise the major source of fiscal revenue for the most transition economies. It is not surprising that in transition economies personal income taxes yield much less revenue as opposed to the more developed countries. Probably, one of the major explanations can be found, again, in the weaknesses of the tax administrations and tax enforcements of most of the post-Communist countries.

Furthermore, when incomes are low and the unemployment rates are high, the changes in income taxes do not drastically change the individual's choice to supply labor since labor supply is nearly inelastic. In addition, due to low education levels and consequently low productivity of human capital its price is low in the official sector. This induces most of the people to turn to the underground economy. As a result, the income tax changes rather affect more people to search better opportunities in the underground economy[5] and as a consequence increase the level of tax evasion.

It seems that the future income tax policy design should be aiming to increase the level of tax compliance in transition economies first, as the habit of tax evasion is still high. By stimulating labor supply and labor participation by decreasing marginal tax rates may seem useful in developed countries, where the income tax avoidance is much lower; however the effects on transition economies may still be low. Moreover, our findings suggest that income tax policy measures aimed at enhancing labor supply should also primarily target women (rather than men) as the changes in taxes and benefits resulting from the changes of the effective net wage have a higher impact on this group.

7. CONCLUSION

This paper has attempted to derive the wage elasticities of labor force participation in three transition economies, namely, Bulgaria, Russian Federation and Serbia. The empirical analysis entailed two steps using the Heckman estimation method, namely a construction of effective net wage which takes into account tax and benefit systems and then estimation of the wage elasticity of labor force participation in three countries.

5 An interesting discussion of this issue can be found in Lemieux et.al. (1994)

The econometric analysis was based on the various micro-data sources for each country separately. Estimation results show that on average the probability of labour force participation in most of the transition economies, except for Bulgaria, are positively related to the gross wage. When the gross wage is replaced by the effective net wage, the magnitudes of probability of labour force participation fall although retain positive relationship with wages. We attribute the difference between the wage semi-elasticities using gross wage and effective net wage to country's welfare system's disincentives effects on the labour supply decision. As the results shown the welfare system disincentive effects were greater for women than for men in all transition economies.

The comparison of the results with the similar studies shows that the responses among the population to changes in income taxation in most of the transition economies are expected to be small. One of the possible explanations is found in the high labour force participation rates inherited from the previous system. We therefore expect a limited response of labor supply to wages as a result of personal income taxes in other post-transition countries, which have retained high labor force participation rates since the Communist period.

The results of this study provide some suggestions that can be considered in the future income tax policy design in transition economies, specifically: (1) the future income tax policies in transition economies should focus on the measures aiming to enhance the tax compliance as the level of tax evasion is belived to be a key buffer against a successful income tax reforms; (2) the responses of labor supply and labor force participation rates to income tax policy changes are relativelty low; (3) Women are more sensitive to changes in income tax policy measures aimed to enhancing labour supply.

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APPENDIX

CURRENT PERSONAL INCOME TAX SYSTEMS IN BULGARIA, THE RUSSIAN FEDERATION AND SERBIA

This section briefly overviews the major peculiarities of the personal income tax systems in the countries under the study.

Bulgaria introduced flat income tax system in 2009 at 10% which replaced the previous progressive tax system with four income brackets. The progressive tax system in Bulgaria consisted from three tax brackets from 20% to 24% above the basic exemptions.

Table A1. Personal Income Tax System in Bulgaria

Before Reform (2008)		After Reform (2009)	
Taxable Income (BGL)	Marginal Rate	Taxable Income (BGL)	Marginal Rate
Below 2,160	0	All labor incomes	10%
2,161 to 3,000	20%		
3,001 to 7,200	22%		
Above 7,201	24%		

Before 2001 the Russian Federation did not bring substantial changes to its progressive income tax system. The progressive income tax system comprised from three tax brackets with corresponding income brackets of 12%, 20%, and 30%, respectively. In 2001 the Russian Federation substituted its progressive income tax system with the flat tax rate of 13%. The flat personal income tax regime was introduced in 2001 as part of a major tax reform and it replaced progressive personal income tax scheme with rates ranging from 12 percent to 30 percent.

Table A2. Personal Income Tax in Russian Federation

Before Reform (2000)		After Reform (2001)	
Taxable Income (RBL)	Marginal Rate	Taxable Income (RBL)	Marginal Rate
Below 3,168	0	Below 4,800	0
3,168 to 50,000	12%	Above 4,800	13%
50,000 to 150,000	20%		
Above 150,000	30%		

Finally, the Serbian income tax system is comprised of the flat tax rate of 12% on labor incomes and 20% on all other types of income, which include self-employment, rental, royalties, and capital and property gains.

The analysis of the personal income taxes in all three transition economies reflect very similar trend with respect to tax reform. In particular, most of the transition economies under the study started with the progressive income tax systems with income brackets ranging from three to four. However, during the transition period most of the countries attempted to reduce the burden from income taxation by reducing the marginal tax rates. Most of these countries adopted the flat income tax rates recently to replace the progressive income tax structure. Among the first ones to adopt the flat income tax systems were Estonia and the Russian Federation. Czech Republic and Bulgaria amended their income tax systems recently.

PROBIT ESTIMATIONS REUSLTS

Table A3. Marginal Effects – Men (Bulgaria)

	Gross wage		**Effective net wage**	
Variable	**Marginal Effect**	**P > z**	**Marginal Effect**	**P > z**
Log Wage	0.2470	0.122	0.1157**	0.021
Married	0.0818***	0.000	0.0776***	0.000
Higher education	0.1657**	0.014	0.1689***	0.001
Children	-0.0125	0.504	-0.0118	0.529
Other income	-0.0599***	0.001	-0.0596***	0.001
Rent	-0.0259	0.469	-0.0252	0.480
Log-Likelihood	-843.70		842.21	
Pseudo – R^2	0.097		0.099	
Observations	1909			

Notes: *, **, ***, - *Statistical significance at 10, 5, and 1 percent, respectively.*

Table A4. Marginal Effects – Women (Bulgaria)

	Gross wage		Effective net wage	
Variable	**Marginal effect**	**P > z**	**Marginal effect**	**P > z**
Log Wage	0.0931	0.443	0.0315	0.660
Married	0.0387	0.149	0.0418	0.119
Higher education	0.1713***	0.000	0.1835***	0.000
Children	0.0513**	0.027	0.0506**	0.029
Children < 7 Years	-0.0982***	0.005	-0.0996***	0.004
Other income	-0.2253*	0.000	-0.2257*	0.000
Rent	-0.0706	0.112	-0.0724	0.104
Log-likelihood	-846.39		-846.59	
Pseudo R2	0.15		0.15	
Observations	1752			

Notes: *, **, ***, - *Statistical significance at 10, 5, and 1 percent, respectively.*

Table A5. Marginal Effects – Men (Russian Federation)

	Gross wage		Effective net wage	
Variable	**Marginal Effect**	**P > z**	**Marginal Effect**	**P > z**
Log Wage	0.0581***	0.000	0.0471***	0.000
Married	0.0205*	0.076	0.0205*	0.076
Higher education	-0.0122	0.366	-0.0116	0.384
Children	0.0101	0.259	0.0101	0.260
Other income	-0.0407***	0.000	-0.0407***	0.000
Rent	0.0306**	0.042	0.0306**	0.042
Log-Likelihood	-418.45		-418.37	
Pseudo – R^2	0.053		0.053	
Observations	2304			

Notes: *, **, ***, - *Statistical significance at 10, 5, and 1 percent, respectively.*

Table A6. Marginal Effects – Women (Russian Federation)

	Gross wage		Effective net wage	
Variable	**Marginal effect**	**P > z**	**Marginal effect**	**P > z**
Log Wage	0.4192***	0.000	0.2909***	0.000
Married	-0.0545***	0.000	-0.0547***	0.000
Higher education	-0.0236	0.253	-0.0222	0.275
Children	-0.0217	0.139	-0.0219	0.134
Children < 7 Years	-0.0497***	0.002	-0.0496***	0.002
Other income	-0.0429***	0.004	-0.0429***	0.004
Rent	0.0355	0.117	0.0357	0.114
Log-likelihood	-864.89		-864.55	
Pseudo R2	0.058		0.058	
Observations	2585			

Notes: *, **, ***, - *Statistical significance at 10, 5, and 1 percent, respectively.*

Table A7. Marginal Effects – Men (Serbia)

	Gross wage		Effective net wage	
Variable	**Marginal effect**	**P > z**	**Marginal effect**	**P > z**
Log Wage	0.0392***	0.001	0.0206***	0.000
Married	0.0111**	0.033	0.0099**	0.040
Higher education	0.0046	0.555	0.0032	0.681
Children	0.0031	0.492	0.0019	0.660
Other income	-0.0239***	0.000	-0.0228***	0.000
Urban	-0.0292*	0.060	-0.4444*	0.000
Rent	-0.0047	0.742	-0.0059	0.684
Log-likelihood	-423.30		-418.74	
Pseudo R^2	0.052		0.062	
Observations	4043			

Notes: *, **, ***, - *Statistical significance at 10, 5, and 1 percent, respectively.*

Table A8. Marginal Effects – Women (Serbia)

	Gross wage		Effective net wage	
Variable	**Marginal effect**	**P > z**	**Marginal effect**	**P > z**
Log Wage	0.4874***	0.000	0.1148***	0.000
Married	-0.1241***	0.000	-0.1296***	0.000
Higher education	0.1678***	0.000	0.1632***	0.000
Children	0.0208	0.162	0.0213	0.155
Children < 7 Years	-0.1069***	0.000	-0.0993***	0.000
Other income	-0.0831***	0.000	-0.0812***	0.000
Urban	-0.2967***	0.000	-0.1303*	0.002
Rent	-0.0042	0.911	0.0049	0.899
Log-likelihood	-1622.58		-1628.32	
Pseudo R^2	0.103		0.100	
Observations	3694			

Notes: *, **, ***, - *Statistical significance at 10, 5, and 1 percent, respectively*

LIST OF VARIABLES USED IN THE STUDY

LgGHW - Logarithm of gross hourly wage (*monthly wage income/average weekly work hours *4*);

Age - Respondent's age as of year 2002;

OthInc1 - Total household income excluding respondent's wage income;

OthInc2 - Total household income excluding respondent's wage income and social benefits received by the household (*standard definition of the "other income*");

HiEDUC – Dummy variable taking values of 1 if respondent has institute/university diploma and 0 if respondent does not have institute/university diploma;

Urban - Dummy variable taking values of 1 if respondent lives in city and 0 if respond does live in rural area;

Married – Dummy variable taking value of 1 if respondent is married and 0 if respondent is single;

Kids – Dummy variable taking value of 1 if respondent has kids aged 0-18 and 0 if respondent does not have children;

Kids7 – Dummy variable taking value of 1 if respondent has kids aged 0-7 and zero otherwise;

Rent - Dummy variable taking value 1 if respondent lives in rented apartment/house and 0 otherwise;

EMP = 1 if respondent currently works (for women EMP=1 if she in maternity leave as well)

LFP = 1 if respondent currently works, does not work but looking for job.

A DETAILED DESCRIPTION OF ESTIMATION PROCEDURE

Estimations

Estimations are performed separately for men and women (*standard procedure*). Students, pensioners (retired and not working), self-employed (farmers and individual entrepreneurs) and fully disabled are excluded (*standard procedure*).

Estimation procedure (2 stages)

Stage 1: Gross hourly wages are estimated for everyone in the sample, including those who are not working, using Heckman model on above listed variables. Then, gross monthly wages are computed by multiplying estimated gross hourly wages by 48 hours (weekly working hours) and 4 (number of weeks in a month). Then, individual specific effective marginal tax rate of transition from not-working to working is estimated for everyone in the sample:

$$t = \frac{\text{1-[Gross monthly wage x (1-Personal income tax rate)-Unemployme nt Benefits-Child Benefits]}}{\text{Gross monthly wage}}$$

Child benefit is considered only for women. Then Effective Net Wage is computed as:

$$\text{Effective net wage} = (1-t) \times \text{Gross monthly wage}$$

Stage 2: Probit estimations are performed on both Gross monthly and Effective Net ages as well as on selected variables. Dependent variable is Labour Force Participation.