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Keywords: labour supply, elasticities, tax and benefit reforms

JEL Classification: J22, I38, H31.

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1 Introduction

In recent decades labour supply models have become popular tools for the analysis of labour market implications of tax and benefit reforms in numerous countries (Aaberge et al., 1995; van Soest, 1995; Blundell et al., 2000; Bargain and Orsini, 2006; Haan and Myck, 2007), and reliability of some models has been confirmed in reduced-form evaluations of policies initially examined using a-priori structural approach. Until recently, however, most of the structural labour supply analysis has been done on data from developed countries with established and relatively stable tax and benefit systems and labour markets. A recent paper (Bargain et al. 2012) takes a broader international approach to the analysis of labour supply in US and Europe covering a number of countries of Central and Eastern Europe (CEE) for which until now labor supply estimates have been virtually non-existent. Two key results from this paper are, first of all, the high degree of heterogeneity of labour supply elasticity estimates between countries and, secondly, very low elasticities estimated for the three CEE countries included in the analysis (Estonia, Hungary and Poland). The varying degree of labour market responsiveness to financial incentives in different countries suggests that the specificity of each labour market has to be taken into account when designing tax and benefit reforms and that one ought to be cautious with respect to the use of labour market elasticities from other countries as a guide for policies. This result raises another concern, examined earlier in the literature (e.g. Blundell and Macurdy, 1999; Evers et al., 2008; Heim, 2007) namely the question of stability of labour market elasticities within countries over time, in particular in scenarios of rapidly changing labour market incentives which are frequently experienced in developing economies.

The purpose of this paper is to look at a within country variation of labour supply parameters taking advantage of unique labour market circumstances experienced in Poland between 2005 and 2009, i.e. in the initial years after accession to the European Union and still before the economic crisis begun to be felt more strongly in the Polish economy. Additionally the analysis presented here serves to cross-validate the results presented by Bargain et al. (2012) with regard to the responsiveness to financial incentives on the Polish labour market. The paper focuses on labour supply behaviour of individuals living in couples with and without children and examines labour supply elasticities in three years: 2005, 2007 and 2009 using data from the Polish Household

Budget Surveys (PHBS).

In the initial years after the EU accession Poland experienced several years of very rapid economic growth, which was reflected among other things in significant real growth of wages. Between June 2005 and 2009 average wage went up by 30.3% while the minimum wage grew by 37.7% in real terms. These changes were accompanied by a number of reforms of the tax and benefit system. In July 2007 and January 2008 the government significantly reduced the rates of social security contributions, and in 2007 introduced a generous tax credit for families with children (see: Morawski and Myck, 2010). These reforms were followed by a major reform of the income tax system in which a three rates system (19%, 30% and 40%) was replaced by a system with two rates (18% and 32%) in which the higher rate threshold was set at the level of the old 40% rate threshold. On two occasions over this period the government also reformed the system of means-tested family support (Family Benefits) with a general effect of increasing benefit rates for low income families. However, because the maximum income requirements to qualify for these benefits were frozen over this period the policy resulted in higher values of benefits going to a smaller number of families (for details of the reforms see: Domitrz et al., 2013). As shown in Myck et al. (2013), despite increases in the value of low income support through Family Benefits, the policies, combined with significant real wage growth, had an overall strong positive effect on labour market incentives. The developments over this period get reflected in increases in employment levels among both men and women, but as the estimated labour supply effects suggest, the majority of these effects have come from real changes in wages and to a much lower degree from implemented policies. However, looking at the actual changes in employment over the analysed period, we argue that the extremely low labour market elasticities presented by Bargain et al. (2012) seem very unlikely and could not explain the observed shifts in labour market activity in Poland during that time.

The rest of the paper is structured as follows. In Section 2 we briefly explain the approach to modelling of labour supply. This is followed by description of the data we use for the estimation in Section 3, and results concerning the estimated elasticities in Section 4. In Section 5 we simulate labour supply effects of the policies introduced over this period combined with labour supply effects of changes in the real level of wages. These results are contrasted with the actual changes in employment between

2005 and 2009. Section 6 concludes the paper.

2 Labour supply estimation

We follow van Soest (1995) and Blundell et al. (2000) to estimate three separate static discrete choice models for each of the analysed years: 2005, 2007 and 2009. In each case we focus on couples (married and cohabiting) and estimate a quadratic utility function with the deterministic part represented by the following expression:

$$U_{ij} = \beta_{ci}C_{ij} + \beta_{cci}(C_{ij})^2 + \beta_{lmi}L_{ij}^m + \beta_{lmi}(L_{ij}^m)^2 + \beta_{lfi}L_{ij}^f + \beta_{lfi}(L_{ij}^f)^2 + \quad (1)$$

$$+ \gamma_{clf}C_{ij}L_{ij}^f + \gamma_{clm}C_{ij}L_{ij}^m + \gamma_{lmlf}L_{ij}^mL_{ij}^f, \quad (2)$$

where C_{ij} is the household level consumption, L_{ij}^m is leisure of the man, and L_{ij}^f is leisure of the woman. To estimate the model we assume that the stochastic form of the utility function has i.i.d. error terms which are distributed with extreme-value type-I distribution (EV-I):

$$V_{ij} = U_{ij} + \varepsilon_{ij}. \quad (3)$$

This allows us to represent the conditional probability of choice j by household i as:

$$P_{ij} = \frac{\exp(U_{ij})}{\sum_{k=1}^J \exp(U_{ik})} \quad (4)$$

which can be estimated using the conditional logit model and its extensions.

In the estimated specifications parameters β_{ci} , β_{lmi} and β_{lfi} are allowed to vary with characteristics (taste shifters) and we estimate the models with and without accounting for unobserved heterogeneity. In the latter case we follow Hoynes (1996) and introduce unobserved heterogeneity through a mass point on parameter β_{ci} to estimate the so-called random parameter logit model.¹

The model is closed by a budget constraint equation in which disposable incomes (equivalent in the static model to the value of consumption) are determined by wages (w_i), hours of work ($T - L_{ij}$), out of work incomes (y_i) and the tax and benefit function (ϖ):

$$C_{ij} = \varpi[w_i^m, w_i^f, (T - L_{ij}^m), (T - L_{ij}^f), X_i, y_i]. \quad (5)$$

¹The estimation is conducted using the gllamm procedure in STATA 12, see: Rabe-Hesketh et al. 2005.

2.1 Estimating labour supply elasticities

In the literature the standard approach for estimation of elasticities relies on computing labour supply reactions to small changes in gross earnings (see for example van Soest 1995, or Bargain et al. 2012). However, given the specific purpose of this paper to examine the *stability* of labour supply elasticities, and the significant number of tax and benefit reforms which took place over the analysed period, we compute elasticities with respect to net contributions to family incomes (net earnings elasticities). This approach, in which elasticities are not affected by how gross wages are translated into net incomes in the tax and benefit system, guarantees that any differences we see in the responsiveness to labour market incentives derives from the same proportional change in these incentives. To derive net income elasticities we simulate labour supply changes to increases in the disposable income C_{ij} resulting from a 1% change in contribution from employment of one or both partners in the couple. For example the change in disposable income resulting from a 1% change in the female employment net earnings contribution is equal to:

$$\Delta C_{ij} = 0.01 * \{\varpi[w_i^f = \hat{\omega}_i^f, Z_{ij}] - \{\varpi[w_i^f = 0, Z_{ij}]\}, \quad (6)$$

where w_i^f is the measure of female wage assumed to take the value of an expected wage ($\hat{\omega}_i^f$) to compute the total disposable income of the family if the woman is working or zero if not. The difference in disposable incomes under these alternative wage assumptions, assuming other factors (Z_{ij}) which include gross earnings of the man are unchanged, is the net employment contribution of the woman to the disposable income in scenario j . In a similar way we compute the contribution of the man, while the joint contribution of both partners to calculate total net income elasticities takes the following form:

$$\Delta C_{ij} = 0.01 * \{\varpi[w_i^f = \hat{\omega}_i^f, w_i^m = \hat{\omega}_i^m, Z_{ij}^*] - \varpi[w_i^f = 0, w_i^m = 0, Z_{ij}^*]\}, \quad (7)$$

with w_i^m standing for the expected male gross wage and Z_{ij}^* representing the unchanged other factors in scenario j excluding both male and female wages.

3 Data used for estimation

For the analysis we use data from the annual Polish Household Budget Survey (PHBS) for years 2005, 2007 and 2009 and simulate disposable incomes using CenEA's tax

and benefit microsimulation model SIMPL. The analysis focuses on labour market behaviour of couples in which both partners are labour supply flexible, i.e. where both partners fulfil the following criteria:

- men aged 18-59, women aged 18-54;
- not self-employed or student;
- not receiving disability or retirement pensions.

These sample selection criteria imply that for the three years we have respectively 10509, 11165 and 10625 observations in the estimation sample. Since the only information concerning the intensity of work in PHBS is whether individuals work full time or part time, we base the model on the combination of three labour supply scenarios for men and women: not employed, part time employed and full time employed, i.e. nine labour supply combinations for each couple. Given a high proportion of so-called complex households in Poland (see Haan and Myck, 2012), i.e. households made of more than one nuclear family the modelling approach here focuses on the responsiveness of the main family in the household and treats the behaviour of household members from other families as exogenous. The sample used for the analysis covers over a quarter of all households in the PHBS data. The basic sample statistics are presented in Table 1. The data confirm significant changes in the level of wages and employment between 2005 and 2009. The real wage among working men in the sample grew by around 40.1% while among women by 34.2%, and employment (full and part time jointly) went up by 6.2pp and 7.8pp respectively. During the analysed years Poland has gone through a rapid increase in the level of tertiary education, which reflected a significant expansion of external higher degrees as well as growing levels of tertiary education achievement among younger cohorts. These developments are also reflected in the PHBS data. For example in 2005 only 13.0% of men and 17.4% of women in the sample declared having completed higher education, while four years later these numbers were 16.2% and 24.2% respectively.

3.1 Modelling incomes

We use CenEA's SIMPL microsimulation model to compute disposable incomes in the nine labour market scenarios for every couple in the sample. SIMPL is a complex tax

Table 1: Sample selection and household types in BBGD data 2005, 2007, 2009

	Data year					
	2005		2007		2009	
Number of couples:						
- observations	10509		11165		10625	
- grossed up	3.64 mln		3.79 mln		3.79 mln	
Men						
age	40.503	(9.067)	40.415	(9.111)	40.454	(9.231)
higher education	0.130	(0.336)	0.144	(0.351)	0.162	(0.369)
FT work	0.821	(0.383)	0.894	(0.308)	0.897	(0.304)
PT work	0.039	(0.194)	0.026	(0.159)	0.025	(0.155)
wage (conditional)	2278.34	(1720.04)	2651.71	(1954.72)	3193.77	(2065.50)
Women						
age	38.144	(8.946)	38.082	(8.927)	38.037	(9.011)
higher education	0.174	(0.379)	0.203	(0.403)	0.242	(0.428)
FT work	0.548	(0.498)	0.614	(0.487)	0.629	(0.483)
PT work	0.054	(0.226)	0.049	(0.215)	0.051	(0.219)
wage (conditional)	1779.72	(1273.61)	1938.83	(1355.93)	2388.22	(1511.14)
Children	0.802	(0.398)	0.786	(0.410)	0.759	(0.428)
3+ children	0.140	(0.347)	0.126	(0.332)	0.114	(0.318)
Warsaw voivodship	0.130	(0.336)	0.133	(0.339)	0.134	(0.341)

Source: Author's calculations using BBGD data.

and benefit model which covers all major aspects of the Polish system and allows for computation of disposable incomes under different actual or hypothetical scenarios. Individual gross wages are calculated using a selection corrected wage equation, which is computed separately for every year of data, and separately for men and women (details available from the author on request). Since on several occasions the tax and benefit system changed in the middle of the year we condition the simulated system on the time in which the interviews were conducted in specific households. In the exercise of modelling the effect of tax and benefit reforms the reference system for comparison with actual changes is the system from the comparison year indexed by the cpi to correctly reflect real changes in incentives to work.

4 Results - model estimates and labour supply elasticities

In this section we present the results of the estimations from the model with unobserved heterogeneity and compare the resulting net wage elasticities for the three years of data between the model which does and does not account it. As we discussed in Section 2 the labour supply choice parameters, i.e. consumption, leisure of the man and leisure of the woman, are interacted with a number of observable characteristics in order to allow for differentiated labour supply response for different types of families. The list of interactions with observable characteristics for each of the choice parameters is given in Table 2 and has been arrived at through testing of statistical significance of the interaction coefficients. If an interaction was found to be statistically significant in any of the three years the variable was included in the estimation in each sample. The models have been estimated in two versions - with and without accounting for unobserved heterogeneity. Coefficient estimates from the latter model are presented in Table 3, while the resulting net earnings elasticities computed on the basis of both models are given in Table 4 and are presented in Figure 1.²

The estimated elasticities first of all show the important role of accounting for unobserved heterogeneity. For example there are statistically significant differences in the estimated own net earnings elasticities for men in 2005 and 2007 which are lower in the model with unobserved heterogeneity (RPL) than in the one without (CL), while the opposite holds for cross net earnings elasticity for men in 2005. For women the differences in the estimated elasticities between the two models are in most cases not statistically significant (with the exception of cross earnings elasticity for women in 2005), but the magnitude of the differences is in a number of cases substantial. For example own earnings elasticity in 2005 is 0.8 in the conditional logit model and 0.91 in the model which accounts for unobserved heterogeneity. The second important conclusion from the analysis are the substantial differences in the level of estimated elasticities in particular between 2005 and the later two years of data. In the RPL model for men for example, the own net earnings elasticity falls from 0.41 in 2005 to 0.17 and 0.26 in 2007 and 2009 respectively, while cross net earnings elasticity

²Elasticities and effects of the reforms presented in Section 5 have been calculated using the so-called frequency method with standard errors computed using parametric bootstrap with 1000 draws.

changes from -0.07 to about -0.03 in both years. Labour supply responsiveness is also reduced (in absolute terms) for women, with the own elasticity changing from as much as 0.91 in 2005 to about 0.7 in the later years, and the cross elasticity from -0.23 to -0.07. It is thus notable that estimates reflect so much variation over such a short period of time, and accounting for unobserved heterogeneity does not help in providing more stable results over time. It also needs to be noted that the elasticity estimates are substantially different from those presented for Poland in Bargain et al. (2012). In particular the reported own wage elasticities for men and women in couples in Bargain et al. (2012) are 0.03 and 0.09 - i.e. almost ten times lower, while cross wage elasticities are respectively -0.01 and 0.08, thus also substantially different. Some of the discrepancy could be explained by a different definition of elasticities (Bargain et al., 2012, report gross wage elasticities), but it would be unreasonable to expect that all of the difference can be explained in this way. While the estimated elasticities are relatively high, in particular for women, they fall within a range often reported in the literature for other countries, for example for Ireland by Callan et al. (2009) or for France by Bargain and Orsini 2006.

Table 2: Interactions - final specification

	Income	Leisure - man	Leisure - woman
Level	X	X	X
Squared	X	X	X
Interactions:			
- age of man	X	X	
- age of woman	X		X
- higher education of man	X	X	
- higher education of woman	X		X
- having a child	X	X	X
- having 3+ children	X	X	X
- having a child aged ≥ 3	X		X
- living in capital region	X		X
- living in a city	X	X	X
- leisure of man	X		X
- leisure of woman	X	X	

Table 3: Coefficient estimates for the random parameter model: 2005, 2007, 2009

	2005		2007		2009	
	Coeff.	St. error	Coeff.	St. error	Coeff.	St. error
Income	0.7295	(0.0536)	0.5142	(0.0480)	0.4082	(0.0408)
Income squared	-0.0025	(0.0004)	-0.0011	(0.0003)	-0.0011	(0.0002)
Interactions with income:						
- age of man	-0.0028	(0.0007)	-0.0009	(0.0006)	0.0000	(0.0005)
- age of woman	0.0010	(0.0006)	0.0005	(0.0006)	0.0013	(0.0005)
- higher education of man	0.0135	(0.0095)	-0.0154	(0.0076)	-0.0045	(0.0056)
- higher education of woman	0.0357	(0.0086)	0.0186	(0.0083)	0.0064	(0.0067)
- having a child	0.0201	(0.0184)	-0.0007	(0.0176)	-0.0315	(0.0143)
- having 3+ children	0.0419	(0.0255)	0.0218	(0.0214)	-0.0552	(0.0166)
- living in Mazowiskie Voi.	-0.0204	(0.0065)	-0.0199	(0.0065)	-0.0203	(0.0052)
- living in a city	-0.0905	(0.0166)	-0.0564	(0.0147)	-0.0677	(0.0117)
- leisure of man	-0.0011	(0.0003)	-0.0005	(0.0002)	-0.0009	(0.0002)
- leisure of woman	-0.0008	(0.0002)	-0.0003	(0.0001)	-0.0007	(0.0001)
Leisure (man)	-0.5019	(0.0290)	-0.6190	(0.0289)	-0.5971	(0.0359)
Leisure (man) squared	0.0049	(0.0002)	0.0053	(0.0002)	0.0055	(0.0002)
Interactions with man's leisure						
- age of man	0.0012	(0.0002)	0.0017	(0.0002)	0.0017	(0.0002)
- higher education of man	0.0191	(0.0061)	0.0100	(0.0061)	0.0024	(0.0062)
- having a child	-0.0009	(0.0070)	-0.0058	(0.0071)	-0.0121	(0.0073)
- having 3+ children	0.0071	(0.0085)	0.0095	(0.0083)	-0.0298	(0.0083)
- having a child aged <3	0.0112	(0.0030)	0.0041	(0.0037)	0.0002	(0.0035)
- living in a city	-0.0238	(0.0059)	-0.0131	(0.0059)	-0.0260	(0.0061)
Leisure (woman)	-0.4750	(0.0204)	-0.5256	(0.0215)	-0.4974	(0.0252)
Leisure (woman) squared	0.0048	(0.0001)	0.0050	(0.0001)	0.0050	(0.0001)
Interactions with woman's leisure						
- age of woman	0.0004	(0.0002)	0.0004	(0.0002)	0.0007	(0.0002)
- higher education of woman	0.0070	(0.0037)	-0.0040	(0.0039)	-0.0109	(0.0039)
- having a child	-0.0036	(0.0044)	-0.0050	(0.0050)	-0.0090	(0.0052)
- having 3+ children	0.0112	(0.0048)	0.0083	(0.0049)	-0.0159	(0.0053)
- having a child aged <3	0.0267	(0.0023)	0.0374	(0.0026)	0.0360	(0.0022)
- living in Mazowieckie voj.	0.0010	(0.0023)	0.0006	(0.0026)	-0.0028	(0.0027)
- living in a city	-0.0189	(0.0035)	-0.0107	(0.0038)	-0.0222	(0.0041)
Leisure of man * Leisure of woman	-0.0005	(0.0001)	-0.0003	(0.0001)	-0.0006	(0.0002)
Log likelihood	-13242.50		-12057.00		-11389.62	
Number of couples:	10509		11165		10625	
Mass point values	0.1653	-0.1046	0.2714	-0.1039	0.2714	-0.1039
Mass point probabilities	0.3875	0.6125	0.2769	0.7231	0.2769	0.7231

Source: Author's calculations using BBGD data.

5 Results - wage growth and reforms

In this Section using the estimates from the random parameter models presented above we simulate the labour supply response to the changing financial incentives to work over the analysed period. This analysis focuses on two aspects of these changes. First we examine the effect of reforms to the tax and benefit system introduced between 2005 and 2009, and secondly we model the effect of the changing wage distribution.

Table 4: Net earnings elasticities in the conditional logit and random parameter logit models: 2005, 2007, 2009

Estimation method	Year	Own net earnings elasticity		Cross net earnings elasticity		Total net earnings elasticity	
		Elasticity	St. error	Elasticity	St. error	Elasticity	St. error
Men in couples:							
CL	2005	0.533	(0.021)	-0.042	(0.006)	0.509	(0.021)
CL	2007	0.282	(0.012)	-0.021	(0.003)	0.273	(0.012)
CL	2009	0.298	(0.015)	-0.021	(0.004)	0.287	(0.014)
RPL	2005	0.410	(0.025)	-0.071	(0.007)	0.356	(0.024)
RPL	2007	0.169	(0.020)	-0.026	(0.005)	0.152	(0.018)
RPL	2009	0.260	(0.017)	-0.033	(0.005)	0.238	(0.018)
Women in couples:							
CL	2005	0.800	(0.025)	-0.116	(0.016)	0.755	(0.029)
CL	2007	0.665	(0.024)	-0.084	(0.010)	0.627	(0.024)
CL	2009	0.682	(0.030)	-0.036	(0.012)	0.663	(0.030)
RPL	2005	0.905	(0.030)	-0.234	(0.022)	0.754	(0.026)
RPL	2007	0.687	(0.031)	-0.114	(0.016)	0.624	(0.027)
RPL	2009	0.742	(0.041)	-0.070	(0.015)	0.692	(0.036)

Source: Author's calculations using BBGD data 2005, 2007, 2009.

The first simulation relies on modelling the labour supply effect of introducing the 2005 tax and benefit system in 2009 (simulation: “Reforms 05-09”), with the parameters of the system indexed with inflation to the year of the data to correctly reflect the real effect on financial incentives. Secondly, to examine the role of real wage growth on labour supply response, we simulate the effect of wage changes between 2005 and 2009. This is done by computing expected 2005 wages on 2009 data, i.e. by calculating wages for the 2009 sample using the wage equation estimated on 2005 data and indexing them by inflation to 2009. Disposable incomes are then calculated using the 2009 tax and benefit system, which gives us alternative incomes in 2009 conditional on real wage level from 2005 (this simulation is labeled: “Wages 05-09”). The final simulation combines the effect of wages and changes in the tax and benefit system to estimate the total labour supply effect over this period (“Reforms and wages”). This last simulation is compared to the “Actual” change in employment between 2005 and 2009 through comparing the distribution of labour market scenarios in 2005 and 2009. In other words - we calculate by how much employment of men and women in couples changed between the two years by comparing the proportions of men and women in specific labour market scenarios in 2005 and 2009. The results of the three simulations and changes in the actual employment levels are presented in Table 5 and in Figure 2.

Table 5: Labour supply effects and actual employment changes among couples: 2005-2009

	Men in couples		Women in couples		Total
	Employment change	St. error	Employment change	St. error	
Reforms 05-09	64.9	(5.9)	167.2	(8.7)	232.1
Wages 05-09	135.4	(15.9)	525.5	(25.8)	660.9
Reforms and wages	221.4	(23.0)	663.3	(30.5)	884.7
Actual	242.7	-	287.9	-	530.6

Source: Author's calculations using BBGD data 2005, 2009.

As we can see in Table 5 the total simulated labour supply effect of tax and benefit reforms over the period 2005-2009 is 232 thousand individuals, including 65 thousand men and 167 thousand women. In the case of men the supply effect of growing gross wages between 2005 and 2009 is over twice as high (135 thousand), while for women it is as much as three times higher (526 thousand). Combining reforms and the real wage growth we get a total labour supply effect of 884 thousand individuals - 221 thousand men and 663 thousand women, which is a really substantial increase given the total sample of 3.8 mln couples (Table 1). The interesting comparison comes out of comparing the simulated and actual employment changes. Comparing the employment proportions in 2005 and 2009 the number of employed men in 2009 is by 242 thousand individuals higher than in 2005, and employment of women by 288 thousand higher. Thus for men the actual change almost perfectly matches the simulated increase. For women, however, the actual change is less than half of the simulated labour supply effect. This result might reflect constraints on the Polish labour market which seem much more strongly binding for women than for men. They may for example reflect childcare constraints, lack of part time work opportunities or gender specific demand constraints. The findings, thus may call for a more active policy concerning the elimination of these constraints.

6 Conclusions

The recent developments in the Polish economy and more specifically on the Polish labour market have resulted in significant changes in the level of employment among men and women. The rate of employment grew in particular in the first years after Poland's entry into the European Union in 2004. Between 2005 and 2009 Poland experienced very rapid growth of real wages which was combined with substantial

reforms of the tax and benefit system, including reductions in the rates of social security contributions and income tax as well as introduction of a substantial child related income tax credit. Although at the same time the government increased the level of means tested benefits, the overall effect of policy changes implied improvements in work incentives (Myck et al., 2013). Using a static labour supply modelling approach of van Soest (1995) and following such studies as Blundell et al. (2000), Haan and Myck (2007) and Bargain et al. (2012) we estimate the labour supply effect on couples of the entire 2005-2009 policy package to amount to approximately 230 thousand individuals. This effect is substantially dominated by the labour supply consequences of the growing real wages which increase the labour supply of men in couples by about 135 thousand and of women by about 525 thousand. In the case of men the total simulated labour supply effect resulting from changes the tax and benefit system and wage growth is very close to the actual change in employment. For women the actual changes are about half the size of the simulated labour supply effects. The latter result may suggest significant constraints faced by women on the labour market.

The developments on the Polish labour market present an interesting case for examining the stability of estimated parameters of structural labour supply models in a rapidly changing environment. We find for example that while the estimated labour supply elasticities in 2007 and 2009 are very close, those computed on the data from the first year of the analysed period (2005) are in many instances significantly different. Extending the models to account for unobserved heterogeneity in preferences, while generates slightly different values of the responsiveness on the labour market is insufficient to guarantee stability of estimated elasticities. The estimated labour supply elasticities are much higher compared to those presented for Poland and other Central and Eastern European countries in Bargain et al. (2012). It seems very unlikely that the latter elasticities, which are in some case ten times lower compared to ours, would be capable of reflecting the actual changes in employment in Poland between 2005 and 2009.

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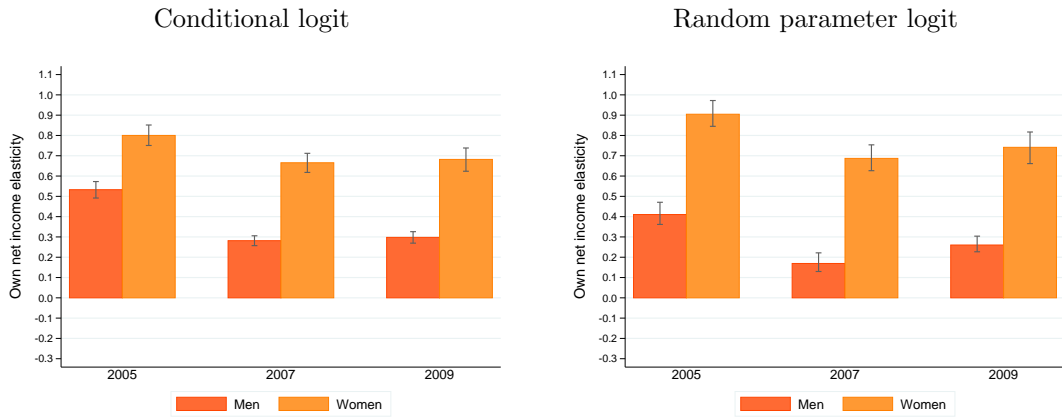
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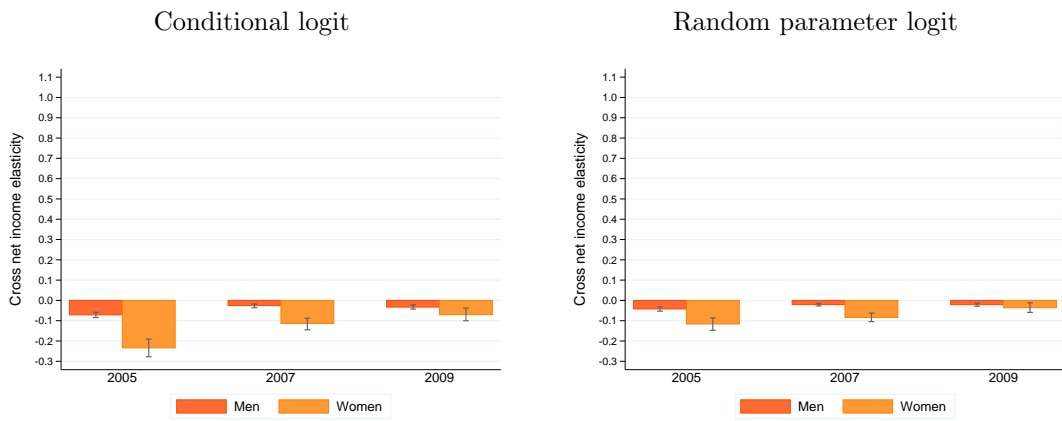
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Figure 1: Estimated total participation elasticities for couples

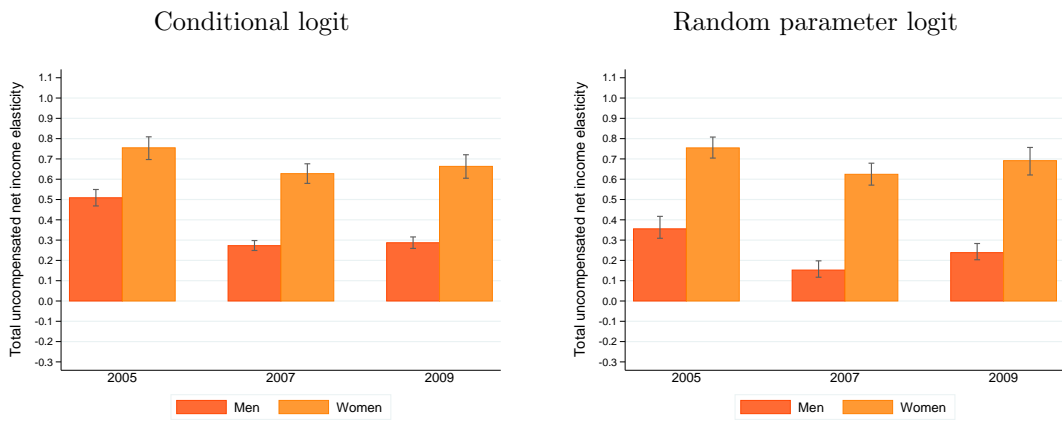
Own net earnings elasticity



Cross net earnings elasticity

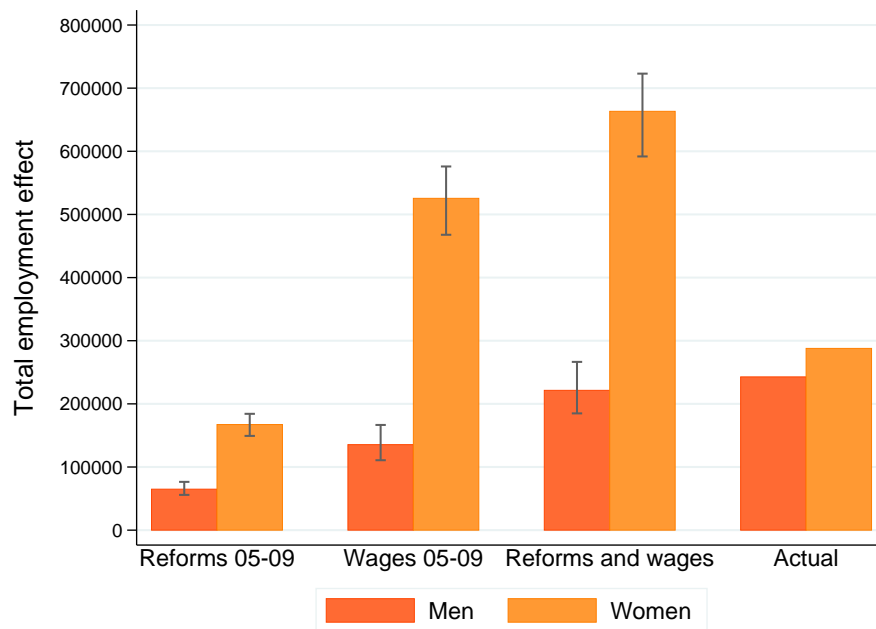


Total net earnings elasticity



Source: Author's estimates on PHBS data using SIMPL microsimulation model.

Figure 2: Labor supply effect of 2005-2009 reforms and wage changes



Source: Author's estimates on PHBS data using SIMPL microsimulation model.