FAMILY TAXATION AND THE FEMALE LABOR SUPPLY: EVIDENCE FROM THE CZECH REPUBLIC

Klára Kalíšková

CERGE EI

Charles University
Center for Economic Research and Graduate Education
Academy of Sciences of the Czech Republic
Economics Institute

WORKING PAPER SERIES (ISSN 1211-3298)
Electronic Version

496

Working Paper Series **496**
(ISSN 1211-3298)

Family Taxation and the Female Labor Supply: Evidence from the Czech Republic

Klára Kalíšková

CERGE-EI
Prague, November 2013

ISBN 978-80-7343-300-0 (Univerzita Karlova. Centrum pro ekonomický výzkum a doktorské studium)
ISBN 978-80-7344-292-7 (Akademie věd České republiky. Národohospodářský ústav)

Family Taxation and the Female Labor Supply: Evidence from the Czech Republic*

Klára Kalíšková†

CERGE–EI‡

November 6, 2013

Abstract

Married couples file joint tax returns in many European countries. Nevertheless, research quantifying the effect of joint taxation on the work incentives of secondary earners is scarce thanks to a lack of recent policy changes. This study makes use of the introduction of joint taxation in the Czech Republic in 2005 to estimate its effect on married women's labor supply. Results based on difference–in–differences and on triple differences with several alternative control groups suggest that the introduction of joint taxation lead to a decline of about 3 percentage points in the employment rate of married women with children. Participation declines are twice as large when the tax work disincentives are highest—among women with high–income husbands.

Abstrakt

V mnoha evropských zemích podávají manželé společná daňová přiznání. Výzkum zabývající se dopady společného zdanění manželů na nabídku práce žen je však omezen nedostatkem aktuálních daňových reforem. Tato studie využívá zavedení společného zdanění manželů v České republice v roce 2005 k odhadu jeho dopadu na nabídku práce vdaných žen. Výsledky založené na metodě rozdílu v rozdílech s několika alternativními kontrolními skupinami ukazují, že zavedení společného zdanění manželů vede k poklesu míry zaměstnanosti žen s dětmi o 3 procentní body. Pokles v zaměstnanosti je dvojnásobně velký u žen, které zaznamenaly největší pokles v pracovní motivaci, tedy u žen s vysokopříjmovými manželi.

JEL classification: J21, H24

Keywords: joint taxation, female labor supply, difference–in–differences

*This research is supported by the Grant Agency of the Charles University, grant no. 595812. This paper has greatly benefited from comments by Alena Bičáková, Štěpán Jurajda, and Patrick Gaule. I also thank the audience at the 25th Annual Conference of the European Association of Labour Economists, and the 26th Annual Conference of the European Society for Population Economics for helpful suggestions. This paper is based on data from Eurostat, EU Labour Force Survey 2002-2007. The responsibility for all remaining errors and conclusions drawn from the data lies entirely with the author.

†Email: klara.kaliskova@cerge-ei.cz

‡CERGE–EI, a joint workplace of Charles University and the Economics Institute of the Academy of Sciences of the Czech Republic, Politickych veznu 7, 111 21 Prague, Czech Republic.

Introduction

The choice of appropriate family tax treatment is an important part of an optimal tax design. While individual taxation systems tax each individual's income separately, systems of joint taxation either tax the sum of the family income as a whole or tax each spouse individually based on half of the total income (Stephens and Ward–Batts, 2004). Joint taxation meets the requirement for equal treatment of households with the same total income—the tax liability of a married couple is the same regardless of how income is divided between spouses (Cigno, Pestieau, and Rees, 2011). However, joint taxation equalizes the marginal tax rates of the spouses and thereby increases the marginal tax rates of secondary earners (usually women). Joint taxation can thus be expected to decrease the labor supply of married women if they are sufficiently responsive to changes in tax rates. This study is concerned with this labor supply aspect of family tax treatment.

Countries are not unified in their choice of tax unit. Even though individual taxation is in force in the majority of EU countries, a tax law often contains features that provide incentives similar to those of a joint taxation system, and tax systems based on joint taxation are not an exception either.[1] Figure 1 shows that, indeed, countries with systems of (truly) individual taxation (Sweden, Denmark, Finland, the United Kingdom, etc.) tend to have higher female employment rates (for a given level of male employment) than countries with joint taxation systems or systems with 'joint' features.

Although economic theory predicts a negative female labor supply effect of joint taxation, there is little empirical evidence as a result of the lack of recent policy changes with respect to family taxation. Two studies have estimated the impact of joint taxation on the labor supply of married women using family taxation reforms: LaLumia (2008) and Selin (2009). Although both studies provide a comprehensive

[1] Among others, Crossley and Jeon (2007) argue that 'joint' elements in the individual taxation systems (mainly tax deductions for single–earner couples) provide incentives similar to joint taxation. About one third of EU countries have individual taxation systems with these 'joint' elements, and about one third have joint taxation systems (see note below Figure 1).

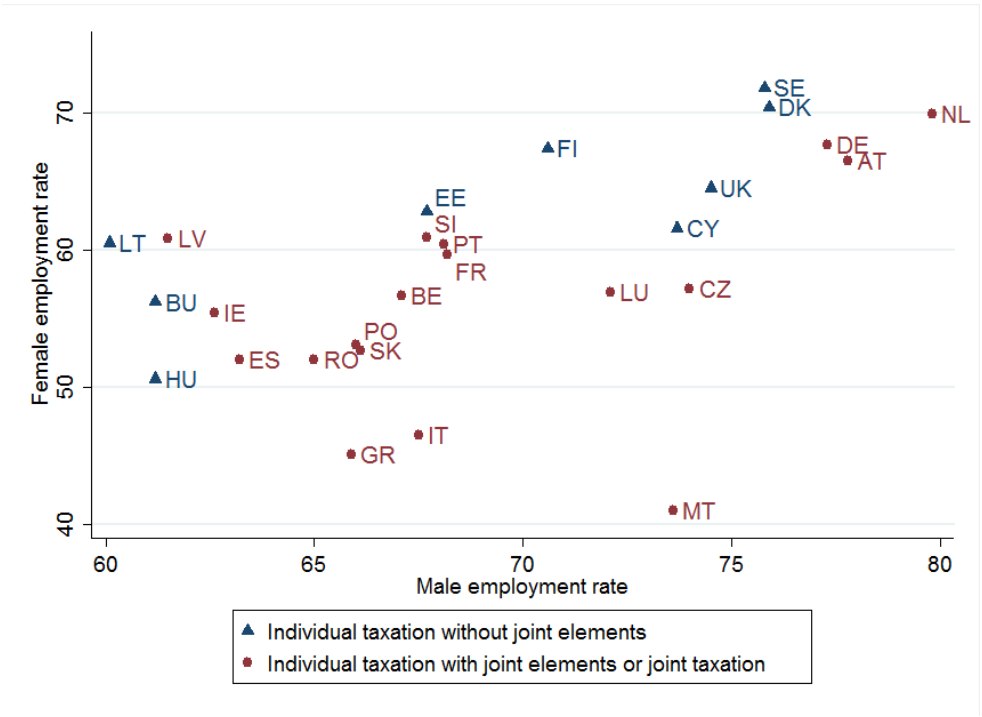

Figure 1: Female and male employment rates by taxation systems in the EU.

Note: Graph shows employment rates (15 to 64 years) in 2011. Joint elements in the individual taxation systems are tax deductions for single–earner couples. Individual taxation systems without joint elements: BU, CY, DK, EE, FI, HU, LT, SE, UK; individual taxation systems with joint elements: AT, CZ, EL, IT, LV, NL, RO, SI, SK; and joint taxation countries: BE, DE, ES, FR, IE, LU, MT, PO, PT. Source: Eurostat LFS employment statistics and EUROMOD country reports 2007–2010: `http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics` `https://www.iser.essex.ac.uk/euromod/resources-for-euromod-users/country-reports`

analysis of the changes in the tax treatment of families in the U.S. and Sweden, respectively, their results are based on tax reforms that are more than 40 years old. Among others, Blau and Kahn (2007) show that the female labor supply elasticities and behavioral responses to tax reforms have changed significantly since the 1980s pointing out to the need for more up–to–date evidence.

This paper exploits the most recent family taxation reform, the introduction of joint taxation in the Czech Republic in 2005, to estimate the female labor supply effect of joint taxation.[2] Effective from January 1, 2005, married couples raising at least one child could have taken the opportunity for joint taxation in the Czech Republic. Since the actual usage of joint taxation among eligible couples is unknown,[3]

[2]The second most recent tax reform concerning family taxation was in the UK in 1990 (the abolition of joint taxation).

[3]Nevertheless, I estimate the take–up to be approximately 69% in 2005, 76% in 2006, and 86% in 2007 (for details, see the Institutional background section).

what I estimate here, is the intention–to–treat effect of this reform.[4]

I apply a difference–in–differences approach with several treatment and control groups to evaluate the effect of joint taxation on the married women's labor supply. First, I compare married women with children (all eligible women) with unmarried women and married women without children (all ineligible women). Next, I use the discontinuity in the eligibility rule—children are defined by a strict age threshold in the Czech tax code, which is 17 years, or 25 years in the case of full–time students. Therefore, I focus on more similar groups of women and compare married women with children aged 10–17/25 and married women with children aged 18/26–30. Furthermore, I apply a local difference–in–differences estimation around the two age thresholds—comparing married women with children aged 16–17 vs. 18–19 (not in education), and married women with children aged 24–25 (in education) vs. 26–27. Finally, I use the triple differences approach with two control groups—Slovak married women with children and married women with children over the age threshold (aged 18/26–30). This is motivated by a common history of the Czech and Slovak Republics and by the fact that female labor supply decisions in these countries have many common features even today (Bičáková, 2010).

This project sheds new light on the effect of the tax treatment of a family on the labor supply of married women with children. The estimates confirm that joint taxation decreases the labor supply of married women with children—it is associated with a decline of 2.9 percentage points in their employment rate. The response is somewhat lower for women with older children (2 percentage points). Moreover, I show that those women who experienced the highest decline in work incentives did indeed respond with the largest decrease in employment probability (by 6.4 percentage points). The local difference–in–differences and the triple differences approaches confirm the main results.

The remainder of the paper is organised as follows. The next section reviews the relevant literature, then institutional background of the Czech reform analysed

[4]For comparison of intention–to–treat to average treatment effect, see e.g. Angrist, Imbens, and Rubin (1996).

in this paper is introduced, with an ensuing discussion of the methodology and identifying assumptions of the chosen approach. Finally, the paper presents the results, and concludes.

1 Literature review

Recently, there has been an expansion in the literature that simulates the effect of a switch from joint to individual taxation on female labor supply (among others, see Steiner and Wrohlich, 2003; or Haan, 2010). However, these microsimulation studies face common problems connected to the estimation of labor supply effects. Blundell, Duncan, and Meghir (1998) argue that the "[l]abor supply effects have been notoriously difficult to estimate in a robust and generally accepted way" (p. 827). The main reason is the presence of severe simultaneity problems with wages and other income. However, Blundell et al. (1998) point out that these estimation problems can be solved if researchers correctly exploit the variation induced by tax reforms. Tax reforms provide us with an exogenous variation in the after–tax wages and enable the observation of behavioral responses to the tax reforms.

This study is highly motivated by these considerations, and I thus base my analysis on the actual policy change. To my knowledge, there are only two studies that use policy reforms in estimating the labor supply effect of joint taxation, and they are based on tax reforms that are more than 40 years old.[5] LaLumia (2008) uses the difference–in–differences strategy at the state level taking advantage of the U.S. tax reform, which introduced joint taxation in 1948. Selin (2009) studies the abolition of joint taxation in Sweden in 1971. Both studies have found a significant impact of family taxation policies on female labor supply decisions, but of different magnitudes. LaLumia (2008) found the effect only among women in highly–educated couples, and of a lower magnitude (2 p.p. decrease in the employment rate) than Selin (2009), who estimates the effect to be about a 10 p.p. increase in the em-

[5]There is a related literature focusing on the labor supply effects of more recent tax reforms that introduced flat taxation in Russia and some European countries (see e.g. Duncan and Peter, 2010).

ployment of married women. This paper contributes to this literature by providing up–to–date evidence on the impact of joint taxation on the labor supply of married women with children.

2 Institutional background

The policy change of interest in this study is the introduction of joint taxation in the Czech Republic in 2005 (joint filing was in force from January 1, 2005). Joint filing was voluntary, and this option was given to married couples raising at least one child (throughout the paper, I define children consistently with the tax law as those under 18 or 26 in the case of full–time students). In 2008, joint taxation was abolished in the Czech Republic, because flat tax was introduced. However, the effect of the abolition of joint taxation cannot be separated from the effect of the flat tax reform, because the latter was accompanied by an extremely large increase in the tax deduction for single–earner couples that significantly decreased the work incentives of married women.[6] For this reason, I concentrate solely on the impact of the introduction of joint taxation.

While joint filing was voluntary, this option was widely used. The official statistics of the Czech Ministry of Finance report that 32.3% of all tax returns in 2005, 35.7% in 2006, and 40.3% in 2007, were filed jointly, while the approximate share of the working population eligible for joint taxation was close to 47% in all relevant years.[7] Although the estimated usage of joint taxation is quite high (69% in 2005, 76% in 2006, and 86% in 2007), the data used in the estimation has no information about the actual usage of joint taxation, and the analysis below thus gives the intention–to–treat estimate.

We turn now to illustrate the magnitude of joint taxation impact on the work incentives of married women with children. Table 1 shows the impact of the in-

[6] Tax deduction for single–earner couples was increased from CZK 350 to CZK 2,070 monthly. Therefore, a husband paid CZK 1,720 less on taxes per month if his wife was not working.

[7] The share of eligible couples was calculated based on the Czech Labor Force Survey data 2005–2007. Married couples with at least one child and at least one of the spouses working were considered eligible for joint filing.

troduction of joint taxation on the net gain from a wife's work (difference between family income if the wife works and if she does not work) for each tax bracket of the wife and the husband.[8] If this change in net gain from the wife's work was positive, the work incentives for wives increased in the joint (as opposed to individual) taxation system. This is clearly the case only if the wife was a primary earner (i.e. her income belonged in a higher tax bracket than her husband's, see Table 1).

Tax bracket husband	Tax bracket wife	Change in net gain from a wife's work as a result of the introduction of joint taxation	
		in CZK per month	as % of wife's gross wage
not working	1	1,464	15.6%
	2	1,554	9.4%
	3	3,145	12.4%
	4	3,641	7.2%
	weighted average	**1,583**	**12.6%**
1	1	-257	-2.7%
	2	303	1.8%
	3	152	0.6%
	4	2,277	4.5%
	weighted average	**-115**	**-1.0%**
2	1	-384	-4.1%
	2	-461	-2.8%
	3	-48	-0.2%
	4	1,250	2.5%
	weighted average	**-382**	**-2.8%**
3	1	-1,552	-16.5%
	2	-1,302	-7.9%
	3	-2,312	-9.1%
	4	-3,726	-7.4%
	weighted average	**-1,591**	**-10.2%**
4	1	-1,162	-12.4%
	2	-5,190	-31.5%
	3	-5,176	-20.4%
	4	-3,846	-7.6%
	weighted average	**-3,873**	**-19.0%**

Table 1: Work incentive effects of the introduction of joint taxation in the Czech Republic

Note: The net gain from a wife's work is the difference between the net household income when the wife works and when she does not work. It is calculated for the average male/female wage in each tax bracket in 2004 (taken from SILC data) and for a family with two children. Calculations take into account not only the effect of income taxes, but also the effect of social benefits, and they are based on the Czech legislation as of 2004. There was a progressive income tax system with four tax brackets (the tax rates were 15% for the tax base below CZK 109,200; 20% for the tax base between CZK 109,200 and 218,400; 25% for the tax base between CZK 218,400 and 331,200; and 32% for the tax base above CZK 331,200) in 2004. The weighted average of change in the net gains for each of the husband's tax bracket is calculated as a weighted average over the wife's possible tax brackets (weighted by size of population with a given combination of the wife's and the husband's tax brackets in the SILC data).

[8] For details on the calculation, see note below Table 1.

However, 84% of Czech married women earned less than their husband.[9] Therefore, most women belonged to the 'secondary' earner category, for which the introduction of joint taxation meant a substantial decrease in work incentives (negative change in net gain from work in Table 1). Moreover, the magnitude of the disincentive effect of joint taxation increased substantially with the husband's tax bracket—while women whose husbands earned incomes belonging in the first tax bracket experienced only a very small negative impact on their work incentives (decrease in net gain from work of CZK 115 per month, which corresponds to 1% of wife's gross wage), the effect was 10 times higher if the husbands' income belonged in the third tax bracket, and 20 times higher if it belonged in the fourth tax bracket.

3 Methodology and data

3.1 Simple model of family labor supply

My empirical strategy is based on a simple model of family labor supply, which is often referred to as a unitary model (Samuelson, 1956). This model treats the household as a single decision–making–unit assuming that spouses pool their resources and maximize joint utility.[10] Moreover, following Eissa and Hoynes (2004) or LaLumia (2008), I assume that the primary earner makes his work decision independent of the secondary earner, but the secondary earner takes into account the primary earner's decision. This simple model can be summarized by a pair of labor supply equations (Eissa and Hoynes, 2004):

$$H_1 = h_1(w_1, Y, X) \text{ and } H_2 = h_2(w_2, Y + w_1 H_1, X), \tag{1}$$

where H_1 and H_2 are hours worked by primary and secondary earner at wages

[9] This is calculated using the Czech SILC (Statistics on Income and Living Conditions) data for years 2004 to 2007.

[10] An alternative approach to modeling family structure is a collective model of household labor supply (see e.g., Apps and Rees, 1999), which is based on individual decisions and assumes that they lie on the Pareto frontier. However, the collective models have been of a limited use in an empirical analysis of changes in a tax law so far (Eissa and Hoynes, 2004).

w_1 and w_2, respectively; Y is family non–labor income, and X represents family characteristics. In this analysis, I assume that married women are secondary earners, which is largely confirmed by the Czech data as around 84% of married women earn less than their husband.

3.2 Difference–in–differences and triple differences approach

I base my empirical strategy on a difference–in–differences approach,[11] focusing on the family taxation reform in the Czech Republic in 2005, which introduced joint taxation of married couples with children.

The group experiencing the policy change consists of Czech married women with children (up to the age threshold for children defined by Czech law, which is 18 or 26 in the case of full–time students). I define control groups based on the eligibility rules for joint taxation.[12] A natural starting point of the analysis is to use all ineligible women (unmarried women and married women without children) as a control group. However, focusing on all eligible and all ineligible women may be problematic, because the treatment and control groups might be too wide to be similar enough in their labor market trends. The fact that joint taxation was available only to families with children (strictly defined by the age threshold) gives a unique opportunity to study the effect of joint taxation reform using more comparable groups of women, which differ only by the age of the youngest child in a family. Therefore, I narrow the analysis and compare married women with children aged 10 to 17/25 (a subset of treated women) with a control group of married women with children aged 18/26 to 30.[13]

Next, I further narrow down the definitions of treatment and control groups and

[11] This approach has been widely used for evaluating various policy reforms; among others, see Eissa and Hoynes (2004) for labor supply effects of several expansions of the earned income tax credit in the U.S.

[12] This approach is very common in the literature on the labor supply effects of tax reforms (see e.g., Eissa and Hoynes, 2004, who compared married couples with and without children to analyse the effects of the earned income tax credit).

[13] This control group thus consists of married women with children who live in the same household, but are no longer perceived as children by the tax code, because they are older than 17 and they are not full–time students or they are full–time students but are older than 25.

focus on married women with children who are just below or just above one of the age thresholds defined by the Czech tax code. In particular, I compare married women with children aged 16 or 17 with married women with children aged 18 or 19 (who are not in education), and married women with children aged 24 or 25 (who are in education) with married women with children aged 26 or 27. Table 2 summarizes the treatment and control groups that are used in the difference–in–differences estimation.

	Treatment group	Control group
1	Married women with children (aged 0–17/25)	Unmarried women and married women without children (or with children aged over 18/26)
2	Married women with children aged 10–17/25	Married women with children aged 18/26–30
3	Married women with children aged 16–17	Married women with children aged 18–19 (not in education)
4	Married women with children aged 24–25 (in education)	Married women with children aged 26–27

Table 2: Difference–in–differences: summary of treatment and control groups.

For each of the above mentioned treatment and control groups, I estimate the following equation:

$$Y_{it} = X_{it}\theta + \beta\delta_{gt} + \gamma_t + \gamma_g + \epsilon_{it}. \tag{2}$$

The outcome of interest (Y_{it}) is the measure of labor supply at the extensive (dummy equal to one if the woman was employed) and intensive margin (number of hours worked if employed), and X_{it} represents a set of observable characteristics. I further include fixed group and fixed time effects (γ_g and γ_t, respectively). The impact of joint taxation is captured by β, which is the coefficient of the indicator variable for the treated group in 2005–2007. Moreover, I provide an analysis of the intensity of treatment, which interacts β with characteristics of the husband and the wife (husband's education and husband's and wife's tax brackets) to capture the differences in the intensity of treatment across treated women (for details, see the Institutional background section).

Furthermore, I use a triple differences approach with Slovak women serving as a second control group, which is motivated by the fact that the labor supply decisions of Czech and Slovak women follow similar patterns (see e.g., Bičáková, 2010). Slovak married women with children cannot be used directly in the difference–in–differences estimation, because Slovakia experienced a major tax reform in 2004 that affected working incentives of married women as well.[14] However, the effect of the Slovak tax reform (as well as all other country–specific policy reforms) can be filtered out in the triple differences approach. Apart from using the control group of Slovak married women with children, I use a second group—married women with children aged 18/26–30. This second control group faced the same policy changes concerning tax and social systems in a particular country as married women with children (aged under 18/26),[15] but this group was not affected by joint taxation policies. Therefore, in the triple differences estimation strategy I difference over time (the before/after difference), across states (the Czech/Slovak difference), and across groups of women (the difference between the treatment group of married women with children aged 10–17/25 and the control group of married women with children aged 18/26–30).

The triple differences estimation equation takes the following form:

$$Y_{ict} = X_{ict}\theta + \beta\delta_{gct} + \gamma_{gt} + \gamma_{ct} + \gamma_{gc} + \epsilon_{ict}, \tag{3}$$

where Y_{ict} is the outcome variable (employment dummy/hours worked) and X_{ict} is a set of observable characteristics. I also include group–year, country–year, and group–country interaction terms (γ_{gt}, γ_{ct}, and γ_{gc}, respectively) that capture the differences in trends in employment and hours worked across the two countries, across the two groups of women, and the differences in tastes for work between the

[14] In 2004, Slovakia replaced its progressive tax system (with tax rates varying from 10 to 38%) with a flat tax rate of 19%. This tax reform was accompanied by a significant increase in a tax allowance for single–earner couples (from SK 12,000 to SK 87,936 per year) decreasing the work incentives of Slovak married women substantially.

[15] The only exception are changes in policies connected to the presence of children in a family (such as a child tax credit). However, since the child tax credit can be used by one of the spouses only, changes in this tax credit do not affect the labor supply of women with working husbands as the husbands use this tax relief.

two groups of women in the two countries. The effect of joint taxation is captured by β coefficient, which is a coefficient of the indicator variable for the treatment group (married women with children aged 10–17/25) in the Czech Republic in 2005–2007.

3.3 Identification assumptions

For the difference–in–differences approach to be valid, two identification assumptions need to be satisfied. First, in the absence of any treatment (without changes in family tax policy), the trends in the labor supply of treatment and control groups would have been the same. Similarly, the triple differences approach requires that the group differences (differences in labor supply between the treatment and control groups) follow the same trend in the two countries. The second assumption requires no significant composition changes in the treatment and control groups.

To provide some evidence concerning the first identification assumption, I plot the evolution of employment–to–population ratios for the treatment and control groups in Figure 2.[16]

The first two graphs compare this labor market indicator for the first two treatment and control groups—the first treatment and control group consists of all eligible and ineligible women in the Czech Republic, and the trend in employment for the two groups is quite similar before the reform in 2005. For the second treatment and control groups, which are restricted to married women with children above/below the age threshold, the trends in employment are even more similar. The last graph in Figure 2 plots the differences in employment between the treatment and control groups in the Czech and Slovak Republics, which should follow the same trend for the triple differences approach to be valid. The differences between the two groups of women in both countries seems to be pretty stable with small fluctuations only.

Figure 3 presents some evidence for the validity of the common trend assumption for the intensive labor supply measure, the average annual number of hours worked by those employed. Average hours worked have changed a little over the period for

[16] The sample is restricted to prime–aged women (25–54 years old).

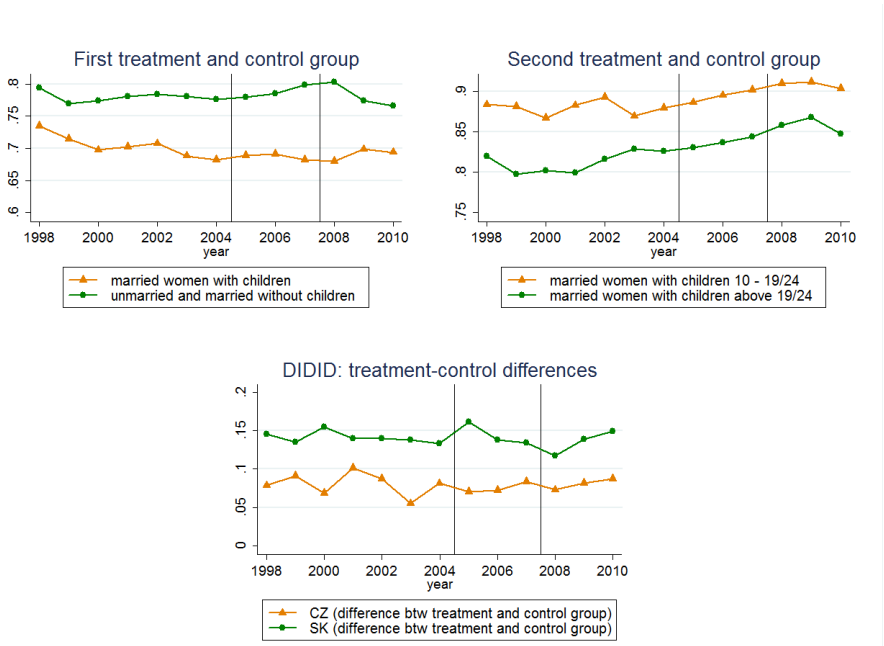

Figure 2: Common trend assumption: employment–to–population ratio.

Source: EU LFS and Czech LFS, own calculations.

all groups of women analysed, with the exception of a sudden decline in 2001, which was, however, only a consequence of a change in the definition of working hours.[17] The final graph, which illustrates differences in hours worked between treatment and control groups in the Czech Republic and Slovakia, seems to show many more fluctuations, but the fluctuations are within a very small range of 30 working hours per year.

The second identifying assumption of the difference–in–differences approach (the absence of composition changes in the treatment and control groups) could be violated if the marriage and fertility decisions of Czech couples were significantly influenced by the introduction of joint taxation. However, empirical studies usually find a very small response on these margins (see e.g., Eissa & Hoynes, 2000 or Ellwood, 2000). Moreover, this could only jeopardize the validity of the first control group, because the composition of other treatment and control groups cannot be changed with fertility and marriage decisions within the given period of time.

[17] Breaks for food and rest were excluded from the working time (as a part of the unification with the EU coding), and hours worked were thus artificially decreased.

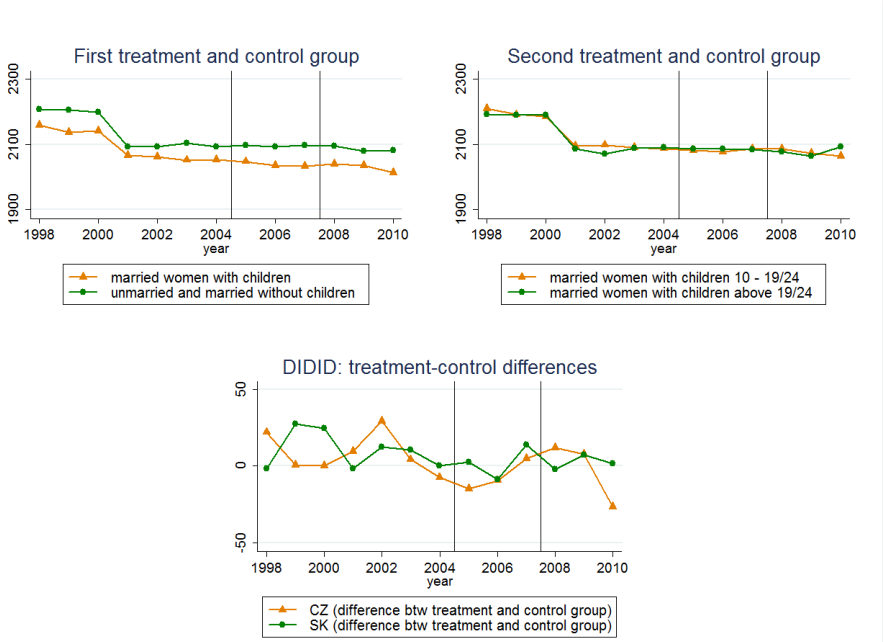

Figure 3: Common trend assumption: average annual hours per worker.

Source: EU LFS and Czech LFS, own calculations.

Figure 4 provides some evidence that the marriage decisions of Czech women were not affected by joint taxation (I focus on marital status, because it is probably easier to adjust than fertility choices). It illustrates a married–women ratio (ratio of married women to all women) for the groups of women with and without children. If there were an effect of joint taxation on marriage decisions, we would see an increase in the ratio of married women among those with children, because that would make them eligible for joint taxation. However, this is clearly not the case. On the contrary, the married–women ratio slightly increased for the group of women without children, while the trend for women with children was left unchanged.

For my estimation strategy to be valid, it is also necessary that the family taxation reform is exogenous to the outcome of interest (labor supply decisions). Among others, Besley and Case (2000) argue that policy actions are often purposeful in responding to economic conditions in a particular country, in which case it may be inappropriate to treat such actions as sources of exogenous variation. However, the change in family tax treatment in 2005 was implemented with the purpose of increasing tax relief for families with children, and it is very unlikely that the reform

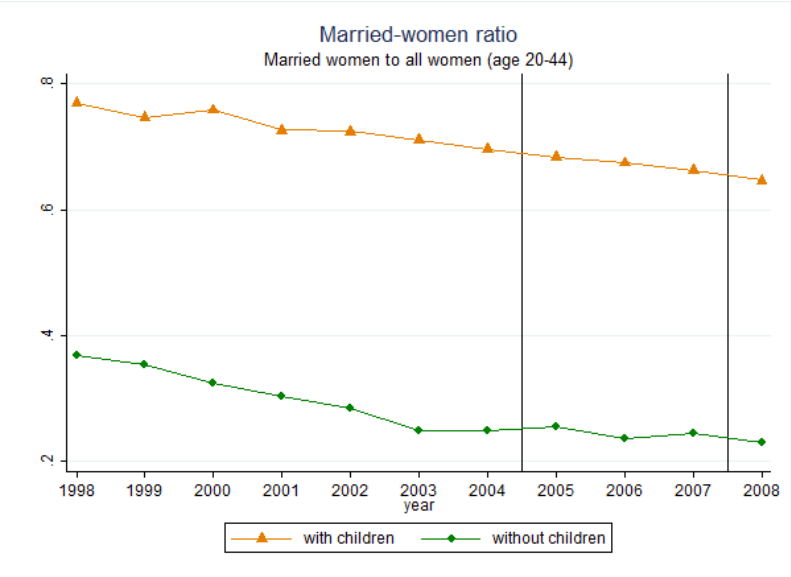

Figure 4: Marriage decisions by groups of women.

Source: EU Labor Force Survey, own calculations.

was meant to decrease the labor supply of married women with children.

3.4 Data

I use the Czech Labor Force Survey (LFS) data, which is a large quarterly sample survey covering the population in private households (a representative sample of about 60,000 Czech individuals quarterly). This dataset includes information about a household structure, detailed demographic characteristics of all household members, an indicator of economic activity during the reference week (employed/unemployed/inactive), and the number of hours worked in the reference week (if employed). I use annual LFS data for three years before the introduction of joint taxation (2002–2004) and three years with joint taxation (2005–2007).

For the difference–in–difference estimation I use the original Czech LFS, but for the triple differences approach, where data is needed for Slovak women as well, I have to use the standardized EU Labor Force Survey (EU LFS). The problem is that the information available in the EU LFS is not as detailed as in the national LFS.[18] In particular, the EU LFS includes only 5–year age bands. Therefore, an

[18]EU LFS is created based on the original LFS data that are collected by national statistical institutes; however, it is then processed and adjusted to correspond to the common coding scheme

accurate indicator for children up to the age of 18/26 cannot be created. Children can only be defined as those younger than 20, or full–time students younger than 25 years of age. Therefore, the treatment group misses some eligible women and contains some ineligible women biasing the size of joint taxation effect downwards.[19]

Moreover, the intensity of treatment analysis (see the Methodology section) requires information about the husband's and the wife's (potential) tax brackets. However, the LFS data includes no income information, so I utilize an auxiliary dataset—the Czech Statistics on Income and Living Conditions (SILC) 2005[20]—to impute the tax bracket information to the LFS data. For husbands, I can use detailed information on socio–demographic characteristics as well as their occupation, industry, and the number of working hours to assign the tax brackets. However, I need to assign potential tax brackets also to the non–working women, and I can thus use only the socio–demographic characteristics for the imputation of tax brackets to women.[21] Therefore, the tax bracket imputation for women is not as precise as for men.[22]

The sample is restricted to prime–aged women (aged 25 to 59), who are not in full–time education. Averages of the main outcome and control variables by treatment group and treatment period based on the Czech LFS data are reported in Table A.1 in the Appendix. The employment rate of Czech married women with

of the Eurostat. I use annual EU LFS data from years 2002–2007. For more information on the EU LFS, see: `http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/lfs`.

[19]Moreover, up until 2005, the yearly series of the EU LFS were based only on the data collected in the second quarter of the year (data for other quarters have very limited information, for example, they do not include information on marital status and the relationship between individuals within a household). Therefore, the sample for triple differences estimation is restricted to data collected in the second quarter only (to make it comparable across years).

[20]SILC is being collected annually by the Czech Statistical Office as a part of the EU SILC project. I use SILC 2005, which provides income information about the year 2004 for a representative sample of more than 17,000 Czech individuals.

[21]In particular, I first assign tax brackets to individuals in SILC based on their reported incomes. Then I run a regression of the tax bracket on individual characteristics such as age, education, marital status, and region (including also occupation, industry, and the number of working hours per week for men; for women I include a selection term adjusting for the selection to work based on Heckman's two step approach with dummies for the presence of children serving as exclusion restrictions). Finally, based on the estimated coefficients from this regression, I assign tax brackets to prime–aged women and their working husbands in the LFS data.

[22]More than 88% of women in the dataset were assigned to the second tax bracket, while in the SILC data only 40% of women fall in the second tax bracket, and not a single woman was assigned to the fourth tax bracket.

children is 71.5% in the period before joint taxation (2002–2004), and increases slightly to 71.9% in the period after (2005–2007). If we focus on married women with older children, the employment rate is obviously much higher (around 88%). Unmarried and childless women had a somewhat lower employment rate, and experienced a significant increase in employment probability: from 67.7% in the period before joint taxation to 70.1% in the period after. There is very little variation in the hours worked by employed women across groups; basically all groups of women worked an average number of hours per week close to 40. This is not surprising given the low availability of jobs with working hours other than full–time in the Czech Republic (see e.g. Tang and Cousins, 2005).

Most of the characteristics of women in the sample within each group are also pretty stable over time, the main exception being education—the level of education of women in the sample increased over time. Also, the percentage of women with non–working partners decreased slightly over time. Table A.1 also confirms that while married women with children and unmarried or childless women are quite different in some of their observable characteristics (such as level of education, number of household members, economic activity of the partner/husband), women with children aged just below and just above the age threshold are much more similar in the observable (and hopefully also in the unobservable) characteristics.

4 Results

4.1 Difference–in–differences approach

In this section, I present the estimated effect of joint taxation at the extensive and intensive margins of the labor supply of married women with children. In all specifications, the sample is restricted to prime–aged women (aged 25 to 59) who are not in full–time education. Dependent variables are the dummy variable for being employed and the number of hours usually worked per week (for those being employed). Each regression includes a full set of year dummies to control

for the time trend in the labor supply, and a dummy variable for the treatment group. Control variables include age, education dummies, number of children of a certain age (aged 0–2, 3–5, 6–9, 10–14, 15–17), a dummy variable for cohabiting and married women, dummies for the education of a partner, a dummy variable for the partner being inactive, number of household members, dummy variables for the non–Czech nationality (either EU nationality or non–EU nationality), and regional dummies.

Table 3 reports the difference–in–differences coefficients for all four treatment and control groups. Columns 1 and 2 in the upper part of Table 3 report difference–in–differences coefficients (the interaction of the treatment group dummy with joint taxation years) for the first treatment and control groups (all eligible and ineligible women). The effect on employment decisions of married women with children is negative and significant at the 1% confidence level. The coefficient of -0.029 in column 2 indicates that married women with children experienced a 2.9 percentage point decline in the probability of being employed in the period of joint taxation (2005–2007), relative to unmarried women and married women without children and relative to the period before joint taxation. The effect on hours worked is negative and significant at 1%, but the effect is rather small in magnitude (the estimates suggest a decrease in hours worked per week by 0.4 hours). This is not surprising given the low availability of jobs with flexible working hours in the Czech Republic (see e.g. Tang and Cousins, 2005).

The estimated effect of joint taxation for the second treatment and control groups (married women with children aged 10–17/25 vs. 18/26–30) are reported in Columns 3 and 4 in the upper part of Table 3. The effect of joint taxation on the labor supply for this group of women is smaller than for the first treatment group, which confirms that women with older children are less responsive to tax changes, but still highly significant. The estimates suggest a 2 percentage point decline in employment probability and a decline in hours worked by 0.3 hours per week.

The lower part of Table 3 reports results of the local difference–in–differences

	(1)	(2)	(3)	(4)
	1. treatment and control: Married women with children vs. unmarried and childless		**2. treatment and control:** Married women with children aged 10–17/25 vs. 18/26–30	
Employment decision				
DID coef.	-0.020**	-0.029***	-0.011**	-0.020***
	(0.007)	(0.007)	(0.004)	(0.004)
R^2	0.001	0.271	0.027	0.160
Observations	376517	376517	118869	118869
Hours worked				
DID coef.	-0.305***	-0.368***	-0.234**	-0.305***
	(0.078)	(0.083)	(0.086)	(0.087)
R^2	0.003	0.027	0.000	0.014
Observations	262912	262912	99628	99628

	3. treatment and control: Married women with children aged 16–17 vs. 18–19		**4. treatment and control:** Married women with children aged 24–25 vs. 26–27	
Employment decision				
DID coef.	-0.017	-0.028**	-0.052**	-0.035*
	(0.010)	(0.012)	(0.021)	(0.019)
R^2	0.009	0.115	0.026	0.244
Observations	16267	16267	8772	8772
Hours worked				
DID coef.	-0.518	-0.551	1.511***	1.359***
	(0.394)	(0.376)	(0.390)	(0.425)
R^2	0.000	0.016	0.007	0.045
Observations	14124	14124	6714	6714
controls	no	yes	no	yes
year and group dummies	yes	yes	yes	yes

Table 3: Difference–in–differences estimation results.

Note: Standard errors (in parentheses) are clustered at group–year level (* p<0.10, ** p<0.05, *** p<0.01). Source: Czech LFS, own calculations.

regressions around the two age thresholds. The effect of joint taxation on employment probability is negative and significant at 5% for the age 18 threshold and at 10% for the age 26 threshold in the specifications with controls. Estimated effects at both thresholds are close to a 3 percentage points decrease in the employment probability of married women with children below the age threshold (as compared to married women with children above the age threshold). The effect on hours worked is insignificant for married women with children below 18, and positive and significant for women with children below 26.

The control variables have the expected signs in all regressions (see Table A.2

in the Appendix): labor supply is increasing in age (but not linearly) and also in education (the excluded category is primary education); the presence of children of all ages decreases employment and hours worked; labor supply decreases in the number of household members; higher education of the partner leads to the higher employment probability of women, while inactivity of the partner decreases the employment probability of a women, and non–Czech citizens are less likely to be employed, but work more hours.

4.2 Difference–in–differences by the intensity of treatment

In the Institutional background section, the effect of joint taxation on the female labor supply incentives was found to vary greatly by the wife's and her husband's tax bracket. In this section, I investigate differences in the employment responses of women who experienced a different intensity of treatment (different change in work incentives as a result of the introduction of joint taxation). What matters most for the intensity of treatment is the difference between the tax bracket in which the woman's husband's income belongs and the tax bracket in which woman's own (actual or potential) income belongs. Unfortunately, the LFS data used in the analysis does not include any information about incomes. I use two approaches to tackle this problem.

First, I approximate the level of work income of the husband by his education. Table 4 illustrates how the difference–in–differences coefficients differ by the education of a woman's husband. The estimated coefficients confirm that the effect on employment and hours worked is larger and more significant among women with more educated husbands, which is consistent with theoretical predictions. The employment effect for married women with children and for married women with older children (aged 10–17/25), who have a tertiary–educated husband, is a 5.5 percentage points decline in employment probability (see Columns 1 and 3 in Table 4). The effect on hours worked is also somewhat higher for more educated husbands,

but still economically insignificant (see Columns 2 and 4).[23]

	(1)	(2)	(3)	(4)
	1. treatment and control: Married women with children vs. unmarried and childless		**2. treatment and control:** Married women with children aged 10–17/25 vs. 18/26–30	
	empl.	hours	empl.	hours
DID coeff. interacted with:				
husband primary education	-0.010	0.887	-0.045**	0.421
	(0.012)	(0.606)	(0.019)	(0.312)
husband secondary education	-0.024***	-0.348***	-0.011**	-0.323***
	(0.007)	(0.085)	(0.005)	(0.100)
husband tertiary education	-0.055***	-0.653***	-0.055***	-0.323*
	(0.009)	(0.160)	(0.012)	(0.158)
controls	yes	yes	yes	yes
year and group dummies	yes	yes	yes	yes
R^2	0.272	0.027	0.161	0.014
Observations	376517	262912	118869	99628

Table 4: Difference–in–differences estimation results by education of husband.

Note: Standard errors (in parentheses) are clustered at group–year level (* p<0.10, ** p<0.05, *** p<0.01). Source: Czech LFS, own calculations.

Second, I use an auxiliary dataset (SILC) to impute the husband's and the wife's tax brackets into the LFS data.[24] I report results on the interactions of the reform effect with dummy variables for the non–working husband and for the tax brackets of working husbands in Table 5. If the husband is not working, joint taxation increases the incentives of women to work (these women are potentially primary earners). The effect of joint taxation on the employment probability of women with non–working husbands indeed implies an increase in the employment probability of married women with children by 3.8 percentage points.

For women with working husbands, the effect of joint taxation on employment probability is negative, and the magnitude of the effect increases with the tax bracket in which the husband's income belongs.[25] Married women with children

[23]Due to small sample sizes in the third and fourth treatment and control groups, I report how the reform effect differs by the intensity of treatment only for the first and second treatment and control groups.

[24]See the Data section for details on tax brackets imputation.

[25]This holds with the exception of women with husbands' earnings in the first tax bracket, for

	(1)	(2)	(3)	(4)
	1. treatment and control: Married women with children vs. unmarried and childless		**2. treatment and control:** Married women with children aged 10–17/25 vs. 18/26–30	
	empl.	hours	empl.	hours
DID coeff. interacted with:				
husband not working	0.038***	0.732	-0.002	0.157
	(0.010)	(0.423)	(0.017)	(0.378)
husband 1. tax bracket	-0.038***	-0.288*	-0.081***	-0.601*
	(0.010)	(0.137)	(0.017)	(0.333)
husband 2. tax bracket	-0.027***	-0.524***	-0.014***	-0.614***
	(0.007)	(0.083)	(0.004)	(0.100)
husband 3. tax bracket	-0.045***	-0.287*	-0.027***	0.098
	(0.007)	(0.131)	(0.007)	(0.129)
husband 4. tax bracket	-0.064***	0.969**	-0.049**	1.914***
	(0.011)	(0.366)	(0.019)	(0.303)
controls	yes	yes	yes	yes
year and group dummies	yes	yes	yes	yes
[1em] R^2	0.272	0.027	0.161	0.016
Observations	376517	262912	118869	99628

Table 5: Difference–in–differences estimation results by tax bracket of husband.

Note: Standard errors (in parentheses) are clustered at group–year level (* p<0.10, ** p<0.05, *** p<0.01). Source: Czech LFS and SILC data, own calculations.

whose husbands earn income belonging in the second tax bracket decreased their employment probability by 2.7 p.p., those with the husband's income in the third tax bracket by 4.5 p.p., and those with the husband's income in the fourth tax bracket by 6.4 p.p. This is consistent with work incentive effects of joint taxation illustrated in the Institutional background section. The intensive margin responses do not show such a clear pattern. They are positive for non–working husbands, and in most cases negative for working husbands, but do not show a larger effect for the larger tax bracket of the husband.[26]

Table A.3 in the Appendix reports the difference–in–differences coefficients interacted with the woman's and her husband's tax brackets. However, the results

which the effect is quite large. However, this is a very small and specific group of women.

[26]This is caused by a very small variation in the number of working hours among employed women, because the availability of part–time jobs in the Czech Republic is very low.

should be interpreted with caution because the tax bracket imputation for women was much less precise than for men, and for some combinations of the husband's and wife's tax bracket there were too few observations to create a reliable measure of the reform effect (denoted as N/A in the Table A.3). Nevertheless, the results generally confirm the findings in Table 5—the employment effect is negative for women with a working husband while the magnitude in general increases in the husband's tax bracket.[27]

4.3 Triple differences approach

This section reports the estimates of the triple differences approach, which compares the treatment group of Czech married women with children aged 10–17/25, and two control groups—Slovak married women with children aged 10–17/25 and women with children over the age threshold (aged 18/26–30). The triple differences approach is somewhat less restricted than the difference–in–differences approach as it allows for different labor supply trends in the two countries, across the two groups of women, and also for differences in tastes for work between the two groups of women in the two countries.

The triple differences analysis is conducted using the EU LFS data, which have the shortcoming of reporting age in 5–year bands. Therefore, the treatment group consists of Czech married women with children aged 10 to 19/24—it includes some ineligible women (with children aged 18 and 19 who are not students) and it omits some eligible women (with children aged 25 who are students) biasing the estimated effect downwards.

The estimation results are reported in Table 6. All regressions include a full set of year and regional dummies, interactions between the country and year dummies, country and treatment dummies, and treatment and year dummies. The controls

[27]Some results in Table A.3 do not correspond to the theoretical prediction. For example, the effect for women who were assigned to the second tax bracket with the husband being assigned to the first tax bracket should be either zero or positive (depending on the exact difference between the wife's and the husband's income), but it is negative. These discrepancies are probably caused by the imprecise imputation of tax brackets to women that clearly does not correspond to reality. For details, see the Data section.

	(1)	(2)	(3)	(4)
	Employment decision		Hours worked	
DIDID coef.	-0.010*	-0.016**	-0.009	-0.002
	(0.005)	(0.006)	(0.124)	(0.125)
controls	no	yes	no	yes
year, group, and country dummies	yes	yes	yes	yes
interactions of year, group, and country dummies	yes	yes	yes	yes
R^2	0.035	0.128	0.004	0.010
Observations	43193	43193	35914	35914

Table 6: Triple differences estimation results.

Note: Standard errors (in parentheses) are clustered at country–group–year level (* p<0.10, ** p<0.05, *** p<0.01).
Source: EU LFS, own calculations.

included are the same as in the difference–in–differences regressions. The effect of joint taxation on the employment of Czech married women with children (aged 10–19/24) remains significantly negative at 5% if we include controls to the regression, and thus confirms the findings of the previous section. The coefficient of -0.016 in column 2 suggest a 1.6 percentage point decline in the employment probability of Czech married women with children aged 10–19/24 during the period of joint taxation (compared to Slovak married women with children and Czech married women with children aged 20/25–30 and compared to the period before joint taxation). The magnitude of the effect is only slightly smaller compared to the difference–in–difference analysis, where the effect on this group of women was 2 percentage points. The effect on hours worked is negative, but insignificant using the triple differences approach, so the presence of a significant effect at the intensive margin of labor supply is not confirmed.

Control variables have the expected signs (the same as in the difference–in–differences estimation, see Table A.4 in Appendix). Moreover, Table A.5 in the Appendix reports results of the triple differences approach by husband's education. The effect is again highest and most significant for women with tertiary–educated husbands, which is consistent with the results of the difference–in–differences approach and with the theoretical predictions.

Conclusion

Joint taxation of married couples provides negative working incentives for secondary earners (usually women). Despite extensive literature on female labor supply, the magnitude of this effect remains unclear as the empirical literature is limited by a lack of recent policy changes with respect to family taxation.

This paper utilizes the most recent family taxation reform, the introduction of joint taxation in the Czech Republic in 2005, to investigate the labor supply effects of joint taxation of married couples. In the period 2005–2007 (inclusive) married couples raising at least one child could have used the opportunity of joint taxation in the Czech Republic. I used a difference–in–difference estimation strategy with four treatment and control groups and a triple differences approach to estimate the magnitude of the joint taxation effect on the labor supply of Czech married women with children. Since the information on the take–up of joint taxation is not available in the data, the estimated effect should be interpreted as intention–to–treat.

The results suggest that joint taxation indeed affects the labor supply of married women with children. Using the difference–in–differences approach, the results suggest a 2.9 percentage point decline in the employment probability of Czech married women with children compared to unmarried and childless women and compared to the period before joint taxation in the Czech Republic. The effect is a somewhat smaller (2 percentage points decline) among married women with older children (aged 10–17/25). The response at the intensive margin is statistically significant, but rather negligible (the results suggest a decline in the number of hours worked per week by 0.4 hours for married women with children), which is not surprising given the low availability of jobs with other than standard full–time working hours in the Czech Republic. Moreover, I use the age thresholds that define children in the Czech law and I apply a local difference–in–differences analysis comparing women with children just below and just above the age threshold. The results of this estimation also confirm a negative and significant effect of joint taxation on married women's labor supply at the extensive margin, of a magnitude close to 3 percentage

points. Furthermore, the estimation results of the triple differences approach (with Slovak women serving as the second control group) also confirm the findings of the difference–in–differences estimation for the employment decisions (but not for the intensive margin decisions).

Finally, I take advantage of heterogeneity in the intensity of treatment caused by the joint taxation reform. The change in work incentives of married women with children varied a lot according to the difference between their husband's and their own (potential) wages. I show that those women who experienced the highest change in work incentives (women with high–income husbands) indeed responded with the largest decrease in employment probability, namely by 6.4 percentage points. Moreover, the Czech Republic is a country with high labor force participation rates and relatively small labor supply elasticities compared to other EU countries (Bičáková, Slačálek, and Slavík, 2011), the estimated effects thus likely provide a lower bound for the effect of joint taxation than what could be expected in other EU countries.

References

Angrist, J., Imbens, G., & Rubin, D. (1996). Identification of causal effects using instrumental variables. *Journal of the American Statistical Association*, 91(434), 444–455.

Apps, P., & Rees, R. (1999). Individual versus joint taxation in models with household production. *Journal of Political Economy*, 107(2), 393–403.

Bičáková, A. (2010). Gender unemployment gaps: Evidence from the new EU member states. *CERGE–EI Working Paper Series*, 410. `http://www.cerge-ei.cz/pdf/wp/Wp410.pdf` (accessed October 2011).

Bičáková, A., Slačálek, J., & Slavík, M. (2011). Labor Supply after Transition: Evidence from the Czech Republic. *Czech Journal of Economics and Finance*, 61(4), 327–347.

Besley, T., & Case, A. (2000). Unnatural experiments? Estimating the incidence of endogenous policies. *The Economic Journal*, 110(467), 672–694.

Blau, F. D., & Kahn, L. M. (2007). Changes in the Labor Supply Behavior of Married Women: 1980–2000. Journal of Labor Economics, 25(3), 393–438.

Blundell, R., Duncan, A., & Meghir, C. (1998). Estimating labor supply responses using tax reforms. *Econometrica*, 66(4), 827–861.

Cigno, A., Pestieau, P., & Rees, R. (2011). Introduction to the symposium on taxation and the family. *CESifo Economic Studies*, 57(2), 203–215.

Crossley, T., & Jeon, S.–H. (2007). Joint taxation and the labour supply of married women: Evidence from the Canadian tax reform of 1988. *Fiscal Studies*, 28(3), 343–365.

Duncan, D., & Peter, K. S. (2010). Does labor supply respond to a flat tax? Evidence from the Russian tax reform. *Economics of Transition*, 18(2), 365–404.

Eissa, N., & Hoynes, H. W. (2000). *Good News for Low Income Parents: Tax–Transfer Schemes and Marriage*. Mimeo, University of California, Berkeley.

Eissa, N., & Hoynes, H. W. (2004). Taxes and the labor market participation of married couples: The earned income tax credit. *Journal of Public Economics*, 88(9–10), 1931–1958.

Ellwood, D. T. (2000). The impact of the earned income tax credit and social policy reforms on work, marriage, and living arrangements. *National Tax Journal*, 53(4), 1063–1105.

Haan, P. (2010). A Multi–state model of state dependence in labor supply: Intertemporal labor supply effects of a shift from joint to individual taxation. *Labour Economics*, 17(2), 323–335.

LaLumia, S. (2008). The effects of joint taxation of married couples on labor supply and non–wage income. *Journal of Public Economics*, 92, 1698–1719.

Samuelson, P. A. (1956). Social indifference curves. *The Quarterly Journal of Economics*, 70(1), 1–22.

Selin, H. (2009). The rise in female employment and the role of tax incentives—An empirical analysis of the Swedish individual tax reform of 1971. *CESifo Working Paper Series*, 2629.

Steiner, V., & Wrohlich, K. (2003). Household taxation, income splitting and labor supply incentives—A microsimulation study for Germany. *CESifo Economic Studies*, 50(3), 541–568.

Stephens, M., & Ward–Batts, J. (2004). The impact of separate taxation on the intra–household allocation of assets: Evidence from the UK. *Journal of Public Economics*, 88(9–10), 1989–2007.

Tang, N., & Cousins, C. (2005). Working Time, Gender and Family: An East–West European Comparison.*Gender, Work and Organization*, 12(6), 527–550.

Appendix

	1. treatment and control: Married women with children vs. unmarried and childless				**2. treatment and control:** Married women with children aged 10–17/25 vs. 18/26–30			
	Control		Treatment		Control		Treatment	
	Before	After	Before	After	Before	After	Before	After
Employment rate	0.677	0.701	0.715	0.719	0.746	0.767	0.876	0.887
Hours worked per week	40.027	40.091	39.48	39.24	39.93	40.021	40.097	39.954
Age	45.894	45.726	37.718	38.275	49.168	49.646	42.442	42.775
Primary–educated	0.193	0.165	0.082	0.067	0.212	0.192	0.098	0.076
Secondary–educated	0.723	0.741	0.798	0.796	0.742	0.759	0.785	0.797
Tertiary–educated	0.083	0.093	0.12	0.137	0.045	0.049	0.117	0.127
Married	0.509	0.487	1	1	1	1	1	1
Cohabiting	0.091	0.114	0	0	0	0	0	0
Number of HH members	2.69	2.616	3.937	3.924	3.66	3.601	3.896	3.883
Number of children aged 0–2	0.02	0.025	0.159	0.171	0	0	0	0
Number of children aged 3–5	0.025	0.026	0.191	0.196	0	0	0	0
Number of children aged 6–9	0.044	0.043	0.295	0.279	0	0	0	0
Number of children aged 10–14	0.075	0.076	0.472	0.422	0	0	0.562	0.495
Number of children aged 15–17	0.051	0.053	0.293	0.301	0	0	0.462	0.459
Partner primary–educated	0.452	0.445	0.044	0.036	0.077	0.067	0.043	0.034
Partner secondary–educated	0.488	0.492	0.794	0.795	0.846	0.848	0.792	0.795
Partner tertiary–educated	0.06	0.063	0.161	0.169	0.077	0.084	0.164	0.171
Partner not working	0.15	0.142	0.065	0.055	0.187	0.168	0.079	0.065
Number of observations	113391	116191	74555	72380	21683	18344	39985	38857

	3. treatment and control: Married women with children aged 16–17 vs. 18–19				**4. treatment and control:** Married women with children aged 24–25 vs. 26–27			
	Control		Treatment		Control		Treatment	
	Before	After	Before	After	Before	After	Before	After
Employment rate	0.79	0.805	0.884	0.882	0.71	0.766	0.877	0.881
Hours worked per week	39.834	40.355	40.122	40.126	39.94	39.77	39.708	41.047
Age	45.702	45.529	43.966	43.55	52.253	52.014	51.011	50.44
Primary–educated	0.255	0.238	0.134	0.095	0.221	0.172	0.053	0.037
Secondary–educated	0.721	0.744	0.775	0.788	0.717	0.763	0.746	0.787
Tertiary–educated	0.024	0.018	0.091	0.116	0.062	0.066	0.201	0.176
Number of HH members	3.739	3.764	3.89	3.852	3.512	3.437	3.506	3.534
Partner primary–educated	0.117	0.09	0.047	0.042	0.057	0.053	0.028	0.009
Partner secondary–educated	0.83	0.883	0.814	0.804	0.838	0.827	0.683	0.691
Partner tertiary–educated	0.052	0.028	0.139	0.154	0.104	0.12	0.289	0.3
Partner not working	0.153	0.152	0.082	0.073	0.229	0.172	0.095	0.1
Number of observations	1397	1115	6829	6926	3585	3399	751	1037

Table A.1: Summary statistics of the sample by treatment group and period.

Note: The table reports means of the outcome and control variables used in the regressions. The treatment period is defined as before (2002–2004), and after (2005–2007) the introduction of joint taxation.
Source: Czech LFS data.

	(1)	(2)	(3)	(4)
	1. treatment and control: Married women with children vs. unmarried and childless		**2. treatment and control:** Married women with children aged 10–17/25 vs. 18/26–30	
	empl	hours	empl	hours
DID coef.	-0.029***	-0.368***	-0.020***	-0.305***
	(0.007)	(0.083)	(0.004)	(0.087)
treatment	0.016*	-0.020	0.022**	0.218**
	(0.008)	(0.098)	(0.007)	(0.096)
age	0.098***	0.326***	0.128***	0.301***
	(0.005)	(0.041)	(0.014)	(0.077)
age squared	-0.001***	-0.004***	-0.002***	-0.004***
	(0.000)	(0.001)	(0.000)	(0.001)
secondary education	0.178***	0.846***	0.140***	0.854***
	(0.005)	(0.081)	(0.007)	(0.134)
tertiary education	0.290***	1.709***	0.212***	2.075***
	(0.012)	(0.094)	(0.007)	(0.196)
child 0–2	-0.544***	-3.680***	.	.
	(0.009)	(0.528)	.	.
child 3–5	-0.234***	-2.045***	.	.
	(0.005)	(0.122)	.	.
child 6–9	-0.078***	-1.079***	.	.
	(0.004)	(0.089)	.	.
child 10–14	-0.042***	-0.574***	-0.014***	-0.544***
	(0.003)	(0.042)	(0.004)	(0.053)
child 15–17	-0.027***	-0.217***	-0.016***	-0.271***
	(0.002)	(0.069)	(0.003)	(0.066)
number of HH members	-0.011***	-0.009	-0.030***	-0.068
	(0.003)	(0.045)	(0.002)	(0.047)
married	0.012	-0.064	.	.
	(0.008)	(0.138)	.	.
cohabiting	-0.012*	0.135	.	.
	(0.006)	(0.254)	.	.
secondary education of partner	0.050***	0.011	0.085***	-0.304
	(0.003)	(0.153)	(0.007)	(0.221)
tertiary education of partner	0.059***	0.045	0.106***	-0.198
	(0.005)	(0.201)	(0.009)	(0.200)
inactive partner	-0.135***	-0.006	-0.115***	0.011
	(0.005)	(0.144)	(0.007)	(0.167)
EU nationality	-0.021	0.489*	-0.137***	0.703
	(0.023)	(0.267)	(0.042)	(0.550)
non–EU nationality	-0.078***	2.206***	-0.195***	-0.303
	(0.017)	(0.530)	(0.038)	(0.761)
R^2	0.271	0.027	0.160	0.014
Observations	376517	262912	118869	99628

Table A.2: Difference–in–differences estimation results, full specification.

Note: Standard errors (in parentheses) are clustered at group–year level (* p<0.10, ** p<0.05, *** p<0.01). All regressions include regional and year dummies.
Source: Czech LFS, own calculations.

	(1)	(2)	(3)	(4)
	1. treatment and control: Married women with children vs. unmarried and childless		**2. treatment and control:** Married women with children aged 10–17/25 vs. 18/26–30	
	empl	hours	empl	hours
DID coef. for couple's tax brackets:				
woman 1. tax bracket, husband not working	0.016 (0.026)	1.515 (1.366)	-0.098** (0.033)	-0.805* (0.444)
woman 1. tax bracket, husband 1. tax bracket	-0.041*** (0.013)	1.819* (0.996)	-0.183*** (0.041)	1.962 (1.716)
woman 1. tax bracket, husband 2. tax bracket	0.034*** (0.010)	-0.159 (0.110)	-0.011 (0.010)	-0.273 (0.172)
woman 1. tax bracket, husband 3. tax bracket	-0.053* (0.026)	-0.735 (1.198)	N/A N/A	N/A N/A
woman 1. tax bracket, husband 4. tax bracket	N/A N/A	N/A N/A	N/A N/A	N/A N/A
woman 2. tax bracket, husband not working	0.047*** (0.008)	0.687** (0.284)	0.020 (0.011)	0.384 (0.333)
woman 2. tax bracket, husband 1. tax bracket	-0.037*** (0.012)	-0.554* (0.257)	-0.053*** (0.014)	-0.995*** (0.153)
woman 2. tax bracket, husband 2. tax bracket	-0.030*** (0.006)	-0.547*** (0.084)	-0.013*** (0.004)	-0.643*** (0.101)
woman 2. tax bracket, husband 3. tax bracket	-0.041*** (0.007)	-0.133 (0.129)	-0.027*** (0.007)	0.199 (0.146)
woman 2. tax bracket, husband 4. tax bracket	-0.040*** (0.009)	0.622 (0.384)	-0.042* (0.021)	1.572*** (0.416)
woman 3. tax bracket, husband not working	N/A N/A	N/A N/A	N/A N/A	N/A N/A
woman 3. tax bracket, husband 1. tax bracket	N/A N/A	N/A N/A	N/A N/A	N/A N/A
woman 3. tax bracket, husband 2. tax bracket	-0.046 (0.032)	0.303 (0.358)	-0.036 (0.028)	0.854** (0.309)
woman 3. tax bracket, husband 3. tax bracket	-0.088*** (0.013)	-2.133*** (0.274)	-0.025* (0.012)	-0.995*** (0.156)
woman 3. tax bracket, husband 4. tax bracket	-0.131*** (0.020)	1.818*** (0.357)	-0.067*** (0.019)	2.580*** (0.434)
R^2	0.272	0.028	0.161	0.017
Observations	376517	262912	118869	99628

Table A.3: Difference–in–differences estimation results by couple's tax bracket.

Note: Standard errors (in parentheses) are clustered at group–year level (* p<0.10, ** p<0.05, *** p<0.01). All regressions include controls and year and group dummies.
Source: Czech LFS and SILC data, own calculations.

	(1)	(2)	(3)	(4)
	Employment decision		Hours worked	
DIDID coef.	-0.010*	-0.016**	-0.009	-0.002
	(0.005)	(0.006)	(0.125)	(0.125)
treatment group	0.140***	0.044***	0.389**	0.659***
	(0.006)	(0.008)	(0.139)	(0.143)
CZ	0.146***	0.079***	-0.738***	-0.692***
	(0.006)	(0.007)	(0.137)	(0.150)
age		0.075***		0.182***
		(0.005)		(0.058)
age squared		-0.001***		-0.002***
		(0.000)		(0.001)
secondary education		0.168***		0.794***
		(0.012)		(0.112)
tertiary education		0.247***		1.531***
		(0.015)		(0.177)
child 10–14		0.001		-0.504***
		(0.004)		(0.048)
child 15–19		-0.002		-0.270***
		(0.003)		(0.045)
number of HH members		-0.029***		-0.008
		(0.002)		(0.042)
secondary education of partner		0.097***		-0.135
		(0.008)		(0.171)
tertiary education of partner		0.107***		0.099
		(0.010)		(0.145)
inactive partner		-0.134***		0.072
		(0.009)		(0.133)
EU nationality		-0.130***		0.205
		(0.035)		(0.221)
non-EU nationality		-0.198***		-1.363
		(0.059)		(1.036)
year dummies	yes	yes	yes	yes
interactions of year, group, and country dummies	yes	yes	yes	yes
R^2	0.035	0.128	0.004	0.010
Observations	43193	43193	35914	35914

Table A.4: Triple differences estimation results, full specification.

Note: Standard errors (in parentheses) are clustered at country–group–year level (* p<0.10, ** p<0.05, *** p<0.01).
Source: EU LFS, own calculations.

	(1) Employment decision	(2) Hours worked
DIDID coef. for:		
husband primary education	-0.032**	0.600**
	(0.015)	(0.264)
husband secondary education	-0.009	-0.064
	(0.006)	(0.131)
husband tertiary education	-0.043***	0.108
	(0.010)	(0.184)
controls	yes	yes
year, group, country dummies	yes	yes
interactions of year, group, and country dummies	yes	yes
R^2	0.128	0.010
Observations	43193	35914

Table A.5: Triple differences estimation results by partner's education.

Note: Standard errors (in parentheses) are clustered at country–group–year level (* p<0.10, ** p<0.05, *** p<0.01).
Source: EU LFS, own calculations.

Working Paper Series
ISSN 1211-3298
Registration No. (Ministry of Culture): E 19443

Individual researchers, as well as the on-line and printed versions of the CERGE-EI Working Papers (including their dissemination) were supported from institutional support RVO 67985998 from Economics Institute of the ASCR, v. v. i.

Specific research support and/or other grants the researchers/publications benefited from are acknowledged at the beginning of the Paper.

Published by
Charles University in Prague, Center for Economic Research and Graduate Education (CERGE)
and
Economics Institute of the ASCR, v. v. i. (EI)
CERGE-EI, Politických vězňů 7, 111 21 Prague 1, tel.: +420 224 005 153, Czech Republic.
Printed by CERGE-EI, Prague
Subscription: CERGE-EI homepage: http://www.cerge-ei.cz

Phone: + 420 224 005 153
Email: office@cerge-ei.cz
Web: http://www.cerge-ei.cz

Editor: Marek Kapička

The paper is available online at http://www.cerge-ei.cz/publications/working_papers/.

ISBN 978-80-7343-300-0 (Univerzita Karlova. Centrum pro ekonomický výzkum
a doktorské studium)
ISBN 978-80-7344-292-7 (Akademie věd České republiky. Národohospodářský ústav)

CERGE-EI
P.O.BOX 882
Politických vězňů 7
111 21 Praha 1
Czech Republic
http://www.cerge-ei.cz