Taxation and Labor Supply of Married Couples across Countries: A Macroeconomic Analysis

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March 27, 2014

Abstract

We document contemporaneous differences in the aggregate labor supply of married couples across 18 OECD countries. Relative to their US counterparts, European married men work on average 9 to 17 percent, and married women in Western and Southern Europe 26 and 31 percent fewer hours. Married women in Scandinavia and Eastern Europe however work almost as many hours as US married women. We find that a model of joint household decision-making can largely replicate these facts if the full non-linearity of labor income taxes and the tax treatment of married couples are taken into account. Going to a system of strictly separate taxation would increase labor supply of married women by more than 100 hours annually in a third of our sample countries.

Keywords: Taxation, Two-Earner Households, Hours Worked

JEL classification: E60, H20, H31, J12, J22

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1 Introduction

The international labor supply of married men and women differs substantially. While married men in the core age group 25 to 54 work on average between 9 and 17 percent fewer hours in Europe than in the US, the picture is substantially more heterogeneous for married women. Married women in Eastern Europe and Scandinavia work only 3 and 9 percent fewer hours, respectively, than US married women, whereas married women in Western and Southern European work 26 and 31 percent fewer hours, respectively.[1] In other words, for Scandinavia and Eastern Europe, hours worked differences to the US are half the size or less for married women than for married men, while for Southern and Western Europe they are twice the size or more for women than for men. The cross-country correlation of average hours worked of married men and married women is essentially zero, while countries with low hours worked by married men are also countries with low hours worked by singles, independent of the gender (the respective cross-country correlations are 0.75 and 0.70). Explaining these large differences in the labor supply behavior of married men and married women with linear (average marginal) taxes – a prominent and successful predictor in explaining aggregate hours worked differences in the literature pioneered by Prescott (2004) – seems challenging. Even if women have a higher labor supply elasticity than men, the relative country ordering of differences to the US should be similar for both genders, possibly with larger differences for women, which is not consistent with the data.

In this paper, we build a simple model of joint household decision making that incorporates international differences in wages and taxation, and show that it is in fact largely able to replicate the above mentioned international differences in the hours worked of married men and married women. The key to this success is the explicit modeling of non-linearities in the labor income tax code together with the tax treatment of married couples, which ranges from completely joint to completely separate taxation. This tax treatment interacts with the progressivity of the tax system in affecting labor supply decisions of both spouses. Of the countries in our sample, Germany, Ireland, Norway, Poland, Portugal and the US use some variant of a system of joint taxation of married couples, and France uses a system of family splitting. All the other countries have systems based on individual taxation of spouses, which nevertheless often feature some elements of joint taxation through specific exemptions or alike, see Pearson and Binder (2011). To give a concrete example, consider the case of Germany, which features a very clear system of joint taxation. The incomes of husband and wife are summed up and divided by two, and the household tax burden is then determined as the sum of the tax burdens on these two hypothetical equal incomes. Due to the progressivity of the German tax code, this lowers the overall tax burden of the household,

[1] The country groups are made up as follows: Scandinavia – Sweden and Norway; Western Europe – Austria, Belgium, France, Germany, Ireland, Netherlands, United Kingdom; Eastern Europe – Czech Republic, Hungary, Poland; Southern Europe – Greece, Italy, Spain. Portugal and Denmark are also included in our sample but we discuss them separately as they differ along two important dimensions from the other countries in their respective region.

but increases the marginal tax rate of the secondary income earner, whose contribution to the household income is less than half and who would therefore face a lower marginal tax rate under individual taxation. By contrast, it decreases the marginal tax rate of the primary income earner. Thus, the treatment of couples in labor income taxes leads to additional non-linearities in the tax code compared to singles, which differ substantially for husband and wife.

The paper makes two contributions to the literature. First, we combine different micro data sets to present new facts about the international labor supply of different demographic subgroups in 18 OECD countries in the 2000s (excluding the recent crisis years), focusing on gender and marital status, and on the core age group 25 to 54. Secondly, we document international differences in the tax treatment of married couples and take the full non-linearity of the labor income tax code into account in our analysis. We incorporate these differences into a quantitative macro model and show that the model is largely able to replicate the hours worked differences relative to the US for European married men and for married women in Eastern Europe, Scandinavia, and Western Europe, but is somewhat less successful for Southern European married women.

Our quantitative framework is based on the model of joint labor supply of married couples developed in Kaygusuz (2010), Guner et al. (2012a), and Guner et al. (2012b), which features an extensive and an intensive margin of female labor supply. As typical for cross-country studies in macroeconomics, we calibrate the model to match the labor supply behavior in a benchmark country, namely the US. We first show that the model provides a remarkably good fit for the time series of labor supply in the US from the late 1970s on, and then predict labor supply behavior in the remaining 17 European countries of the sample, holding preferences fixed but using the country-specific economic environment. The latter comprises non-linear labor income taxes, consumption taxes, wages, specifically the gender wage gap and educational premia, and the education distribution plus the degree of assortative matching into couples. For the non-linear labor income taxes, we use OECD tax modules which capture country specific features of average and marginal income tax rates of married couples in detail, along with all types of exemptions, tax credits and benefits, etc., as well as the tax treatment of married couples.

The model correctly predicts lower, but relatively homogeneous hours worked of married men in Europe compared to the US. For married women, the model is able to replicate the small hours worked differences between the US and Eastern Europe and Scandinavia, explains two thirds of the large hours worked difference between the US and Western Europe, and 40 percent of the difference between the US and Southern Europe. Crucial for the results is the fact that the US features a system of joint taxation of married couples, while most Scandinavian, Eastern, and Southern European countries rely on separate taxation, with a mixture of both systems in Western Europe. Higher consumption and average labor income tax rates in Europe mostly lead to *lower* optimal hours relative to the US, an effect which we find for both married men and married women. However, the different tax treatment of married couples and the implied differences in the marginal tax rates of the primary (male) and secondary (female) income earner imply *higher* hours worked of married women in the majority of European countries than in the US, counteracting the effect of the average tax rate to a large degree. This effect is on average absent in Western Europe, where many countries also feature strong elements of joint taxation. Differences in the gender wage gap and educational premia across countries play a relatively minor role in explaining cross-country differences in hours worked of married men and women. Breaking our overall results further down into an extensive and an intensive margin for women, the model replicates the facts closely for Eastern Europe and reasonably for Southern Europe. Despite the model's success in predicting total hours worked per married woman, it however cannot replicate the high employment rates and low hours worked per employed woman in Scandinavia and Western Europe. Through the lens of our model, this is not surprising. The effects of taxes and wages are qualitatively the same for the extensive and intensive margins. We discuss potential explanations, which are not part of our model environment as they are hard to quantify, e.g. easier possibilities to work part-time (because of different regulation), in the results section.

The key importance of the tax treatment of married couples can be best illustrated with a concrete example. Take the case of the US, a country with **low** average tax rates and *joint* taxation, Germany, a country with **high** average tax rates and *joint* taxation, and Sweden, a country with **high** average tax rates but with *individual* taxation. In Table 2, we show that the average tax rate of a household in which the husband works the mean hours of US married men is with 20.5% substantially lower in the US than in Germany and Sweden with 31.0% and 32.8%, respectively. Yet, the marginal tax rate that a wife faces if she goes from not working to working the average hours of US married women is fairly similar in the US and Sweden, with 29.1% and 30.1%, respectively, but drastically higher in Germany with 50.3%. Married men in Germany and Sweden work roughly the same hours, and around 15% fewer hours than in the US, while married women in Sweden work only slightly fewer hours than US married women (4%), but German married women work 34% fewer hours. The model is able to replicate these observations both qualitatively and quantitatively because it features both differences in the average tax rate and in the tax structure, combining the progressivity and the tax treatment of couples. The Swedish tax structure alone, keeping government revenues constant, predicts 10 percent higher hours worked of married women in Sweden than in the US, while the German tax structure predicts 13 percent lower hours worked than in the US, allowing us to replicate the high hours in Sweden and low hours in Germany.

A series of papers (Prescott (2004), Rogerson (2006), Rogerson (2008), Rogerson (2009), Ohanian et al. (2008)) have shown that differences in average tax rates can largely explain differences in the developments of *aggregate* hours worked across European countries and the US, with the exception of Scandinavia. We differentiate explicitly between consumption and labor income taxes, and show that it is crucial to take the full non-linearity of labor income tax schedules into account. Two features that we abstract from in our model are capital income taxes and retirement incentives through social security programs. McDaniel (2011) shows in a dynamic model that labor income and consumption taxes are much more important than capital income taxes and productivity growth in explaining the different developments of total hours over time across countries. Erosa et al. (2012) and Wallenius (2013) analyze international differences in social security programs, and specifically in retirement systems and conclude that they can explain large international differences in the timing of retirement, while having almost no effect on labor supply behavior before retirement, i.e. in the age group we focus on.[2]

High hours worked in Scandinavia despite high consumption and labor income taxes there have been raised as a puzzle in the literature. Ragan (2013), and in a similar fashion Ngai and Pissarides (2011), suggest government subsidies in sectors that serve as complements to home production (e.g. child care) as the main explanation for this apparent puzzle, a point that was already raised theoretically by Rogerson (2007). They therefore explicitly model home production in addition to market work and distinguish between the taxation of sectors that are substitutes or complements to home production. By contrast, we can replicate Scandinavian hours well, and even better than Ragan (2013), by taking the non-linearity of the labor income tax code into account.[3] Moreover, we show in the data that Scandinavian labor supply is especially high exactly for married women: married women work 9 percent less than US married women in Scandinavia, while single women work 22 percent less, married men 17 percent less, and single men 8 percent less. Our approach thus offers a complementary explanation to Ragan (2013) and Ngai and Pissarides (2011) for high hours worked by Scandinavian married women.

The paper most closely related to ours is Chakraborty et al. (2012). They build a comprehensive life-cycle model with idiosyncratic income risk to investigate the cross-country variation in hours worked for married and single men and women. Besides taxes, they concentrate on exogenous marriage and divorce probabilities as driving forces of labor supply differences, but do not model international differences in divorce legislation and alimony regulations. Chakraborty et al. (2012) estimate polynomial tax functions for married couples and thus allow for some non-linearity, but base their estimates on the sum of household earnings, and thus cannot exploit the differential effects of tax progressivity vs. tax levels on husbands and wives under systems of joint vs. separate taxation. This also does not allow them to talk about differences between current systems and systems of separate taxation. Their model fit is worse than ours for men and women with the exception of married women in Portugal and Denmark. This again stresses the importance of modeling the tax system in all its details.

[2]By starting at the age 25, we also abstract from differences in education systems and youth unemployment rates.

[3]Our predictions for hours worked in the three Scandinavian countries are off by 1 percent for Sweden, 10 percent for Norway, and 12 percent for Denmark, whereas the corresponding numbers in Ragan (2013) are 39 percent, 41 percent and 50 percent in her benchmark calibration, and 24 percent, 28 percent and 41 percent in the specification with government subsidies. Note, however, that our data and predictions refer to married men and women in the core age group, while Ragan's sample comprises all men and women aged 15 to 64. We cannot directly compare our results to Ngai and Pissarides (2011), as they do not predict total hours, but only relative shares in different sectors.

Besides the literature on international labor supply differences, our paper connects to the large literature documenting the increase in labor supply of married women in the US over the last decades. Within this literature, Guner et al. (2012a) and Guner et al. (2012b) focus explicitly on the taxation of married women. In an elaborate quantitative life cycle model, they find that going from joint to individual taxation would increase the labor supply of married women in the US substantially. We conduct the same experiment for the US and our results line up closely with theirs. Crossley and Jeon (2007) study in a difference-in-differences approach a Canadian tax reform in 1988 which reduced the "jointness" of the labor income tax system, while Eissa (1995) and Eissa (1996) analyze in a similar approach the effects of significant decreases in the top marginal income tax rate in the US in the 1980s. These three studies conclude that the relevant tax reforms increased the labor supply of wives of well-earning husbands significantly. Kaygusuz (2010) evaluates the effects of the same US tax reforms on the labor supply of married women with a quantitative model.

The paper is organized as follows. The next section presents the micro data sources, explains the construction of the relevant data series, and presents our sample selection criteria. Section 3 shows some facts on the labor supply of married couples. The following section introduces the model, as well as its parametrization and calibration. Section 5 quantifies to which degree international differences in taxation and wages can explain differences in hours worked, and investigates the relative role of the various model inputs, specifically of the non-linear labor income tax schedule. Section 6 analyzes the country-specific consequences in going from the current tax system to one of strictly separate taxation of married couples. The subsequent section compares our results explicitly to a more standard calibration in the literature that takes linear taxes as a model input. Section 8 shows that our results are robust to controlling for the presence of children in the household and a series of other robustness checks, before the last section concludes.

2 Micro Data

2.1 Data Sets

We work with three different micro data sets to construct hours worked, namely the European Labor Force Survey, the Current Population Survey, and the German Microcensus. A detailed description of the data work, as well as a comparison of the resulting aggregate data to similar series from the OECD and the Conference Board, can be found in Bick et al. (2014).

2.1.1 European Labor Force Survey

The European Labor Force Survey (ELFS) is a collection of annual labor force surveys from different European countries, with the explicit goal of making them comparable across countries. Our ELFS sample comprises the Scandinavian countries Denmark, Norway, and Sweden, the Eastern European countries Czech Republic, Hungary, and Poland, the Southern European countries Greece, Italy, Portugal, and Spain, and the Western European countries Austria, Belgium, France, Ireland, Netherlands, and the UK.[4] The sample size of the ELFS varies across countries and within a country over time, but is always of considerable magnitude, with the minimum annual sample size being more than 15,000 for Denmark, a country with roughly 5.5 million inhabitants. The weeks used as reference week in the survey vary from country to country and year to year, mostly covering a period of between 1 and 12 weeks in the first half of the year up to the year 2004, and the entire year from 2005 on. Appendix A.1 describes some data modifications that we have to apply to specific years and countries of the ELFS.

2.1.2 Current Population Survey

For the US, we use the Current Population Survey (CPS), which is a monthly survey of around 60,000 households. Specifically, we work with the CPS Merged Outgoing Rotation Groups data provided by the National Bureau of Economic Research.[5] This data set includes only those interviews in which the households are asked about actual and usual hours worked, namely the fourth and eighth interview of each household. The data cover the entire year, with the reference week always including the 12th of a month, and comprise individual data for about 300,000 individuals per year.

2.1.3 German Microcensus

The German Microcensus covers a one percent random sample of the population of Germany and is an administrative survey. Participation is mandatory. We use the scientific use files, which are a 70 percent random subsample of the original sample. This leaves us with a sample size of between 400,000 and 500,000 individuals per year. Until 2004, the Microcensus was carried out in the last week without a public holiday in April or the first week without a public holiday in May, and from 2005 on continuously over the year.[6]

2.2 Calculation of Average Hours Worked per Person

For each individual, we have information on four key variables: usual hours worked in the main job during a working week, actual hours worked in the main job during a specific reference week, actual hours worked in additional jobs during the reference week, and reasons why the individual

[4] The ELFS covers even more transition countries as well as Finland and Switzerland, which we however exclude from the analysis because of data limitations along other dimensions.

[5] All information on these data files can be found on `http://www.nber.org/data/morg.html`.

[6] From 2002 on, data from the German Microcensus are used also as input into the European Labor Force Survey, but before 2002 Germany is missing from the anonymized ELFS available to researchers.

worked more or less hours than usual in the reference week.[7]

The main challenge in generating average annual hours worked per person lies in the fact that the reference weeks are not spread representatively across the entire year. This is especially a concern for vacation days and public holidays, which show systematic seasonal patterns. The reference weeks mostly exclude typical vacation periods and weeks with major holidays, which might lead to an overestimation of total hours worked. In the companion paper Bick et al. (2014), we find evidence that vacation days and public holidays are underreported even during the years in which reference weeks ought to cover the entire year. Therefore, we collect information on the number of vacation days and public holidays by country and year from external data sources. The main disadvantage from using external data sources is that we cannot account for heterogeneity in the population when it comes to vacation days.

To generate annual hours worked per person, we first construct individual weekly hours worked by adding up actual hours worked in the reference week in all jobs. To make the data comparable across countries, we cap the sum of usual or actual hours worked in all jobs at 80, which is the largest possible value for usual or actual hours worked in the main job in the ELFS. For individuals who report having worked less hours than usual in the reference week due to vacation or public holidays, we use usual hours worked instead of actual hours worked. We then multiply these weekly hours worked by 52 minus the weeks lost due to vacation days and public holidays, i.e. the number of these days divided by five, in the respective country, and then average over all individuals.[8]

2.3 Sample Selection

We include only married individuals into the sample. There are a few countries which differentiate between marriage and a civil union. In this case, the ELFS makes it explicitly clear that every respondent who is treated for tax purposes as "married" should indicate married as the civil status. This is for example the case in the Netherlands, where individuals living in a civil union are recorded as married in the ELFS. Next, we include only couples for which both partners are observed and fit our sample restrictions. Since clear identifiers for husbands and wives are missing for many years and countries, we define couples consistently as two people of opposite sex who are both married and live in the same household, and drop households in which more than two married adults live. We focus on couples in which both husband and wife are aged 25 to 54. Since we are mainly interested in the role of taxation in explaining international differences in hours worked

[7]For the CPS, we have usual hours worked in the main job and actual hours worked in all jobs in the reference week, i.e. we cannot distinguish between overtime work in the main job and actual hours worked in any additional job in the reference week.

[8]In Bick et al. (2014), we construct hours worked for all individuals aged 15 to 64, and compare average hours worked per employed and employment rates generated from our micro data sets to the data series provided by the OECD and the Conference Board. Overall, the differences between our statistics and the macro data are small: deviations in the employment rate amount to less than 2 percentage points in most cases, and deviations in hours worked per employed to less than 5 percent. As described in Bick et al. (2014), capping the data does not have a significant impact on the overall average of hours worked.

of married couples, we focus on the core age group and avoid discussing international differences in the education systems, degrees of youth unemployment, and early retirement programs. We concentrate on the sample period 2001 to 2008. We use a sample period of more than one year and do not further analyze the time series in order to avoid that cross-country differences might be driven by uncorrelated business cycles. The choice of the exact sample period is caused by the availability of the OECD tax modules. Last, since we model heterogeneity through differences in education levels, we exclude individuals with missing information on own education or partner's education.

There are three reasons why a married individual aged 25 to 54 might be dropped from our sample, namely first because we cannot identify the partner due to more than two married adults or no other married adult living in the household, second because the partner might be younger than 25 or older than 54, and third because education information might be missing for the respondent or the partner. Table A.1 in the appendix reports the percentage of observations dropped because of these restrictions. The percentage is always larger for women than for men, because it is more likely for women that the partner is older than 54. Variation across countries arises because of variation in the number of missing education observations, variation in the age structure in marriage and age at marriage, and variation in the number of married adults living in one household.[9]

3 Hours Worked of Married Couples

Table 1 shows some statistics on hours worked per person by gender and marital status over the 18 sample countries and averaging over the years 2001 to 2008. On average, married men aged 25 to 54 work around 730 hours more than married women in the same age group. Single women work 190 hours more than married women, and single men 280 hours less than married men.[10] While married women are thus clearly the group with the lowest hours worked, they exhibit the largest cross-country standard deviation in mean hours worked per person across countries: in fact, the standard deviation of hours worked of married women is more than 70 percent higher than the ones of the other three demographic groups, while the coefficient of variation is even more than twice as large, and the variance of log hours an order of magnitude bigger. Married women contribute on average 23 percent of total hours worked, but account for 29 percent of the variance of total hours

[9] E.g. Poland, which has the largest number of observations dropped, exhibits an unusually large percentage of individuals married to someone younger than 25, as well as an unusually large number of households consisting of three or more married adults. In the data for the Scandinavian countries, it is in most years impossible to identify households. Therefore, the only reason why married individuals might be dropped is missing information on their own education, leading to the small fraction of observations dropped in Table A.1. We describe in Section 4.2.3 how we impute the matching into couples for Scandinavia using data from the EU Statistics of Income and Living Conditions (EU-SILC).

[10] The difference in hours worked between single and married women persists regardless of the presence or absence of children or preschool children, but is smaller for women with children than for women without children; for details see Bick et al. (2014).

Table 1: Cross-Country Statistics on Annual Hours Worked by Gender and Marital Status (Ages 25-54)

	Men		**Women**	
Country	Married	Single	Married	Single
Mean	1761.6	1484.5	1028.2	1217.0
Standard Deviation	104.2	108.8	179.5	96.6
Coefficient of Variation	0.059	0.073	0.175	0.079
Var(log hours)	0.003	0.005	0.033	0.006

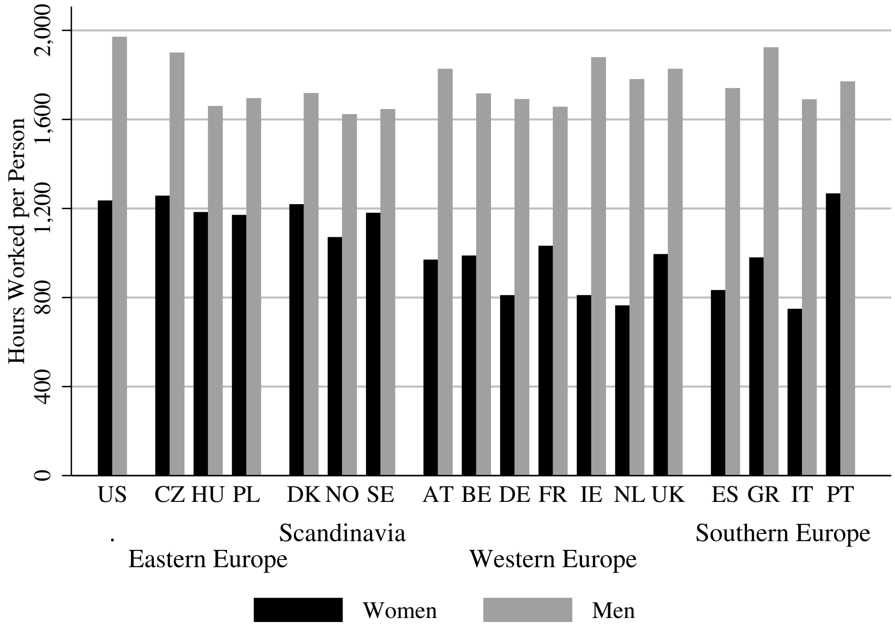
worked across countries. Moreover, the cross-country correlation of hours worked of married men with the one of single men or single women is 0.75 and 0.70, respectively, while the correlation with hours worked of married women amounts only to 0.05. Thus, there is clearly something special about married women, and investigating the sources of the different behavior of married men and married women is of great interest if one wants to understand international differences in hours worked.

Since from now on we focus on married couples, the issue of selection into marriage arises. While we do not model this selection, we report in Figure A.1 in the Appendix the fraction of women in the core age group who are married. It amounts on average to 64 percent, with a standard deviation of 0.075. The extremes are Sweden with 48 percent of women being married, and Poland with 77 percent. For the majority of countries, the fraction of married women lies between 60 and 70 percent. Any potential selection bias could go in either direction, but we find it reassuring that the cross-country correlation of the fraction of married women in our core age group with married women's hours worked is virtually zero. Similarly, the tax treatment of couples, i.e. whether a country employs a system of joint or separate taxation, is not correlated with the marriage rate. Chade and Ventura (2002) and Chade and Ventura (2005) show in a quantitative equilibrium model of the marriage market for the US that the marriage rate would barely change if the US would replace the current system of joint taxation with one of separate taxation.

Figure 1 shows average hours worked of married women (dark bars) and men (light bars) aged 25 to 54 over the period 2001 to 2008 for all eighteen countries in our sample in a bar chart (the corresponding numbers are presented in Appendix Table A.2). The countries are grouped into five regions, namely the US, Eastern Europe (Czech Republic, Hungary, Poland), Scandinavia (Denmark, Norway, Sweden), Western Europe (Austria, Belgium, Germany, France, Ireland, Netherlands, United Kingdom), and Southern Europe (Spain, Greece, Italy, Portugal). The ordering of the regions is according to the mean hours worked per person of married women, and the countries within each region are ordered alphabetically.

Hours worked of married men are highest in the US, followed closely by Greece, the Czech Republic, and Ireland. At the lower end of the sample are Norway, Sweden, Hungary, and France.

Figure 1: Average Annual Hours Worked Per Person of Married Women and Men (Ages 25-54)



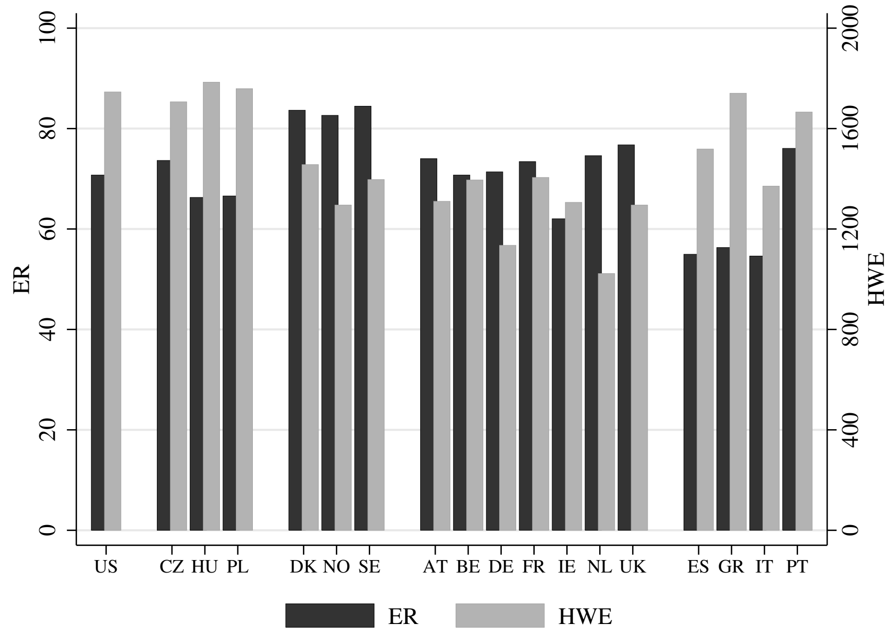
Norwegian married men work 350 hours less than, or only 82 percent of, US married men. There is no clear pattern in terms of married men's hours worked among Western, Southern, Eastern, and Northern European countries.

By contrast, for married women there is a clear regional pattern of hours worked per person, which are high in the US, Eastern Europe, and Scandinavia with 1240, 1200 and 1160 hours, respectively, and much lower in Western and Southern Europe with 910 and 960 hours. Portugal is a notable exception, which despite being a Southern European country actually features the highest hours worked of married women.[11] Western Europe is somewhat divided with Germany, Ireland and the Netherlands having relatively low hours worked, comparable to Italy and Spain, whereas France, Belgium, the UK, and Austria have higher hours worked; but still below the level of Scandinavian and Eastern European countries. The lowest hours worked arise in Italy with 750 hours, 490 hours less than, or only 61 percent of, US married women. The graph reflects the finding of Table 1 that the differences in hours worked of married women are much larger than for married men.

Figure 2 decomposes hours worked per person of married women into the extensive margin, i.e. the employment rate, and the intensive margin, i.e. hours worked per employed (the corresponding numbers can be found in Appendix Table A.3). An interesting pattern emerges here: the regions with high employment rates, Scandinavia and Western Europe, tend to have low hours worked per

[11] Without Portugal, Southern Europe features lower hours of married women than Western Europe.

Figure 2: Average Employment Rates (ER) and Hours Worked per Employed (HWE) of Married Women (Ages 25-54)



employed, while the regions with low employment rates, Eastern Europe and especially Southern Europe, exhibit high hours worked per employed married woman. While Scandinavia and Eastern Europe thus both exhibit high hours worked of married women, they show very different behavior in the decomposition into an intensive and an extensive margin. The same is true for Southern and Western Europe, which both exhibit low hours worked per married woman, but again are clearly distinguishable in the decomposition into an intensive and an extensive margin. The US looks in its decomposition similar to Eastern and Southern Europe. Figure A.2 in the appendix shows the same decomposition into both margins for married men. There is little variation in employment rates of married men, which lie always around 90 percent. The only exceptions are Hungary and Poland, where lower employment rates are driven by older married men and are probably a phenomenon of the transition from Socialism to Capitalism. As a consequence of this relative homogeneity and the high employment rates of married men, we do not model an extensive margin for married men explicitly, and report the decomposition into both margins from now on only for women.

One might be worried that part of the international differences in married women's labor supply across countries comes from differential effects of children on mothers' hours worked due to different child care availability and cost, cultural factors, etc. In Appendix Table A.4, we show country-specific differences in married womens' labor supply relative to the US first for our baseline sample (presented in the two previous figures) and then if we exclude women with children of preschool

(0-4) or school ages (5-14). Since for Scandinavia we do not have information on children in the household, we have to omit the Scandinavian countries from this analysis. As the table shows, there are indeed differential effects of children on labor supply, but they are relatively minor. Focusing on childless women decreases hours worked of married women in Eastern Europe and Southern Europe compared to the US by 2 and 5 percentage points, respectively, but increases the ones in Western Europe by 4 percentage points. This indicates that the negative "effect" of children on married women's hours worked is larger in Western Europe than in the US, but smaller in Southern and Eastern Europe. In Section 8.1, we calibrate and compare our model to these data and neither the qualitative nor quantitative results change.

Last, we assume in our analysis that differences in hours are driven by the supply side, and not by the demand side. However, international differences in unemployment rates could indicate different possibilities of individuals to find a job. To see how large this effect could potentially be, we take the extreme view that all unemployment differences are driven by the labor demand side. We therefore exclude all unemployed individuals (and partners of unemployed individuals) from the sample, and recompute our labor supply measures. The resulting measures, expressed as differences to the US, are shown in Table A.5. Relative to the US, male and female hours worked per person increase in Eastern Europe and Southern Europe, and in both cases the increase is larger for married women than for men. However, the changes are not dramatic: hours worked per married woman differences to the US increase from -3% to +3% in Eastern Europe, and from -23% to -19% in Southern Europe.[12]

4 Model

4.1 A Model of Joint Household Labor Supply

We build a static model of married couples' hours decisions to investigate in how far cross-country differences in consumption and labor income taxes, and education-gender-specific wage premia contribute to the cross-country differences in male and female labor supply presented in the previous sections in Figures 1 and 2. The model framework is based on Kaygusuz (2010) and features a maximization problem of a two person household which jointly determines male and female labor supply.[13]

There is a continuum of married households of mass one. Each household member exhibits one of three possible education levels, denoted by $x \in \{low, medium, high\}$ for women and by $z \in \{low, medium, high\}$ for men, which determine the offered wages $w_f^i(x)$ and $w_m^i(z)$, where

[12]These results are in line with unemployment rates obtained from the World Development Indicators. Some countries, especially Poland, Greece, Italy, Spain, France, and Belgium, suffer from very high youth unemployment rates during the sample period, but unemployment rate differences for the core age group are less dramatic.

[13]Guner et al. (2012a) and Guner et al. (2012b) embed the same preference structure in a life-cycle setting to evaluate different tax policies within the US.

the superscript i represents a given country. We denote the fraction of households of type x, z by $\mu^i(x, z)$ with

$$\sum_x \sum_z \mu^i(x, z) = 1. \tag{1}$$

Households draw a utility cost of joint work q from a distribution $\zeta(q|z)$ which depends on the husband's education level. This cost is only incurred if the wife participates in the labor market, and thus introduces an extensive margin choice for women. We abstract from modeling an explicit extensive margin choice for men since their participation rates in our sample are above 90 percent and display only little variation across countries. The draw q can be interpreted as a utility loss due to joint work of two household members originating from, for example, inconvenience of scheduling joint work, home production and leisure activities, or spending less family time with children, see Kaygusuz (2010). It captures residual heterogeneity across households - conditional on the husband's education level - regarding the participation choice. For each household x, z, there exists a threshold level $\bar{q}(x, z)$ from which onwards the utility costs of working are so high that the woman chooses not to work, i.e. $h_f = 0$.

The household faces two types of taxes, namely a consumption tax rate τ_c and a non-linear labor income tax τ_l, which depends on both spouses' gross incomes, as well as the number of children in the household k. The maximization problem of a type $\{x, z\}$ household in country i is given by

$$\max_{h_m, h_f} \left\{ \ln c - \alpha h_m^{1+\frac{1}{\phi}} - \alpha h_f^{1+\frac{1}{\phi}} - q\mathbf{I}_{h_f>0} \right\} \tag{2}$$

$$\text{s.t. } c = \frac{y_{hh} - \tau_l}{(1+\tau_c^i)} + T \tag{3}$$

$$y_{hh} = w_m^i(z)h_m + w_f^i(x)h_f \tag{4}$$

$$\tau_l = \tau_l^i(w_m^i(z)h_m, w_f^i(x)h_f, k^i) \tag{5}$$

where $\mathbf{I}_{h_f>0}$ takes the value one if the wife is working and zero otherwise, c represents household consumption, y_{hh} represents gross household income, and τ_l the household's income tax liability, which depends on the gross incomes of husband and wife, as well as the number of children in the household k^i through tax credits and/or child benefits. T represents a lump-sum transfer from the government which redistributes a share $\lambda^i \in [0, 1]$ of all government revenues:

$$T = \frac{\lambda^i}{1+\tau_c^i} \sum_x \sum_z \mu^i(x, z) \left[\int_{-\infty}^{\infty} \tau_l^i(w_m^i(z)h_m^*(q), w_f^i(x)h_f^*(q), k^i)\zeta(q|z)dq \right.$$
$$\left. + \tau_c^i \int_{-\infty}^{\infty} \left(w_m^i(z)h_m^*(q) + w_f^i(x)h_f^*(q)\right) \zeta(q|z)dq \right], \tag{6}$$

where * denotes the optimal hours choice given the draw of q.[14] As e.g. in Prescott (2004) and Rogerson (2008), households do not internalize that their choices affect the transfer, but their expectation about the transfer is consistent with the realization.

As usual in the literature explaining aggregate hours worked differences between Europe and the US, consumption and labor supply are assumed to be separable, and utility from consumption is logarithmic. Therefore, cross-country differences in mean wages are irrelevant, and only differences in the gender-specific education premia matter for labor supply decisions. α captures the relative weight on the disutility of work, and ϕ determines the curvature of this disutility. Both parameters are the same for men and for women.

4.2 Model Inputs

As inputs into the model, we need country-specific information on male hourly wages by education $w_m^i(z)$, female hourly wages by education $w_f^i(x)$, non-linear labor income taxes τ_l^i, consumption tax rates τ_c^i, and the educational composition and matching into couples $\mu^i(x,z)$. Last, we calibrate the two preference parameters in the utility function, α and ϕ. When used in the model, wages and taxes are converted into 2005 US-Dollars, using PPP-adjusted exchange rates obtained from the Penn World Tables.

4.2.1 Non-Linear Labor Income Taxes and Consumption Taxes

The non-linear labor income tax systems are taken from the "OECD Taxing Wages" modules. The OECD provides annual household net income based on the respective country's and year's tax laws, taking income taxes plus employees' social security contributions as well as cash benefits into account. Tax modules are available online from the year 2001 onwards. Using these codes, we can assign an annual net household income to each combination of male and female annual earnings. We calculate the exact values for an earnings grid with 101 steps for men, ranging from 0 earnings to four times the average annual earnings in the country, and for an earnings grid with 201 steps for women, ranging from 0 earnings to three times the average annual earnings in the country.[15] We then linearly interpolate in two dimensions to assign a net annual household income to each possible annual hours choice of husband and wife. One additional input into the tax codes are the

[14] Equation (6) is derived as follows. For ease of exposition, assume there would be just one household consisting of a single member. Total government revenues R are the sum of the revenues from the labor income tax and from the consumption tax, i.e. $R = \tau_l + \tau_c^i(c - T)$. T is subtracted in this calculation since the transfer is not subject to the consumption tax. Replacing c from the budget constraint ($c = \frac{1}{1+\tau_c^i}(y_{hh} - \tau_l) + T$), yields $R = \frac{1}{1+\tau_c^i}\left[\tau_l + \tau_c^i y_{hh}\right]$. The transfer T is then the fraction λ^i from government revenues R.

[15] For women, we thus put in as many steps as the "OECD Taxing Wages" module allows. To give a specific example, for the US for the year 2005 the difference between two annual earning levels for men amounts to 2297 US-Dollars and for women to 689 US-Dollars. Note that even though in some countries the top tax bracket applies to incomes larger than four times the average annual earnings, the wage that we assign to highly educated men and women never exceeds this threshold even for high hours choices.

number of children. From the micro data, we calculate the percentage of married couples with 0, 1, 2, 3, or 4+ children conditional on the educational match, and then take the weighted average over their tax burdens for any pair of hours choices.[16]

The first three columns of Table 2 give an overview of the model inputs relating to labor income taxation. Clearly, it is impossible to summarize the complex non-linear labor income tax systems in a few numbers. We want to stress that we are exploiting the full non-linearity of the tax code in our exercise, and here just present some suggestive numbers of the tax code. Columns 1 to 3 show three possible measures that reflect two aspects of the labor income tax schedule: the first column ($\tau_l(0)$) shows the country-specific average tax rate evaluated at US mean hours worked of married men, assuming that the husband is earning the country-specific mean male wage and that the wife does not work, and thus gives one of many possible measures of an average tax rate. The second column ($\tau_l'(1/2h_f^{US})$) shows the average (marginal) tax rate paid by the household on the *additional* income earned if the woman goes from not working to working half the mean hours of US married women and earns the country-specific mean female wage, thereby capturing one possible measure of progressivity.[17] The third column then shows the same concept of an average marginal tax rate if the wife goes from not working to working the average hours of US married women. We use for both men and women the corresponding US hours to show the average/marginal tax rates faced at the mean country-specific wages for the same hours choices across all countries.

The US average tax rate as calculated in column 1 amounts to 20.5%, whereas the corresponding Danish married couple would have to pay an average tax rate of 38.9%, and the Irish couple a tax rate of only 14.9%. The average tax rates are lowest in the US and Southern Europe, followed by Eastern and Western Europe, and highest in Scandinavia. The measure of the average (marginal) tax rate of the secondary income earner shown in column 2 amounts to 29.1% in the US, peaking at 48.1% in Germany, a country with high progressivity and joint taxation of married couples. This measure is again on average lowest in Southern Europe, with similar low levels in Eastern Europe, significantly higher in Western Europe and the US, and highest in Scandinavia, driven by Denmark. Column 3 shows that the average marginal tax rate for a married woman who goes from not working to working the average hours of a US married women exceeds 50 percent in Germany and Belgium.[18]

Consumption tax rates for our sample countries are provided by McDaniel (2012), who calculates consumption tax rates from NIPA data. The advantage of these tax rates over simple value added tax rates is that they also capture excise taxes, exemptions from the value added tax, etc. They

[16] We do not have any information on children in Scandinavian countries for our sample period. For these countries, we calculate the distribution of children from the EU-SILC data. We use the 2004 value for the years 2001 to 2003.

[17] We define this average marginal tax rate as $\tau_l'(1/2h_f^{US}) = [\tau_l(w_m^i h_m^{US}, w_f^i 1/2h_f^{US}) - \tau_l(w_m^i h_m^{US}, 0)]/[w_f^i 1/2h_f^{US}]$. All tax rates in this table are calculated for couples without children. Children decrease $\tau_l(0)$ via tax credits etc., but hardly affect $\tau_l'(1/2h_f^{US})$ and $\tau_l'(h_f^{US})$.

[18] Note that the average marginal tax rates for the US do not change when the female hours are doubled as household income remains in the same tax bracket.

Table 2: Model Inputs

Country	$\tau_l(0)$	$\tau_l'(1/2h_f^{US})$	$\tau_l'(h_f^{US})$	τ_c	$\frac{w_f}{w_m}$	$\frac{w_m^{high}}{w_m^{low}}$	$\frac{w_f^{high}}{w_f^{low}}$
Czech Republic	21.1	22.0	23.7	14.8	0.76	2.0	1.8
Hungary	26.8	15.6	22.6	23.6	0.82	2.4	2.0
Poland	28.7	30.6	32.4	18.6	0.80	2.3	3.8
Mean	*25.5*	*22.8*	*26.2*	*19.0*	*0.79*	*2.3*	*2.5*
Denmark	38.9	49.4	48.7	32.0	0.80	1.4	1.3
Norway	28.1	29.8	31.6	24.3	0.78	1.4	1.1
Sweden	32.8	24.8	30.1	32.5	0.76	1.4	1.2
Mean	*33.3*	*34.7*	*36.8*	*29.6*	*0.78*	*1.4*	*1.2*
Austria	31.0	20.3	28.8	18.7	0.76	1.6	1.7
Belgium	33.5	42.0	50.0	20.7	0.85	1.4	1.6
France	23.6	33.1	33.0	23.8	0.79	1.5	1.7
Ireland	14.9	11.1	23.1	24.0	0.71	1.8	2.6
Germany	31.0	48.1	50.3	15.4	0.73	1.7	1.5
Netherlands	29.5	31.2	38.3	21.3	0.76	1.6	1.5
United Kingdom	25.9	12.1	22.5	17.1	0.74	1.8	2.1
Mean	*27.1*	*28.3*	*35.1*	*20.1*	*0.76*	*1.6*	*1.8*
Spain	17.4	21.2	20.4	15.9	0.68	1.7	2.6
Greece	24.6	16.0	16.4	14.9	0.71	1.9	2.5
Italy	28.8	25.2	31.4	22.1	0.88	1.8	1.6
Portugal	21.1	22.2	28.5	19.0	0.83	2.9	2.7
Mean	*23.0*	*21.2*	*24.2*	*18.0*	*0.77*	*2.1*	*2.3*
United States	20.5	29.1	29.1	7.4	0.77	2.1	2.2

Note: $\tau_l(0)$ is the country-specific average tax rate evaluated at the average US annual hours worked by married men, assuming the husband is earning the country-specific mean male wage and the wife does not work. $\tau_l'(1/2h_f^{US})$ is the average marginal tax rate if the woman goes from not working to working half the mean hours of US married women and earns the country-specific mean female wage, i.e. $[\tau_l(w_m^i h_m^{US}, w_f^i 1/2h_f^{US}) - \tau_l(w_m^i h_m^{US}, 0)]/[w_f^i 1/2h_f^{US}]$. $\tau_l'(h_f^{US})$ similarly represents the average marginal tax rate if the woman goes from not working to working the mean hours of US married women and earns the country-specific mean female wage. All tax rates are calculated for couples without children. τ_c are consumption tax rates as calculated by McDaniel (2012). w_f/w_m is the average gender wage gap. w_m^{high}/w_m^{low} is the male education premium (i.e. the wage of high educated men divided by the wage of low educated men). w_f^{high}/w_f^{low} is the same statistic for women. All hourly wages are given in 2005 real, PPP adjusted US Dollars.

are shown in column 4 of Table 2. Differences in consumption tax rates are large between the US and Europe, amounting to more than 10 percentage points, and consumption tax rates are highest in Scandinavia, where they can exceed 30 percent.

4.2.2 Hourly Wages

To calculate hourly wages, we have to divide earnings by hours. Unfortunately, the ELFS does not provide earnings data, and the German Microcensus only net data. Therefore, we recur to the EU Statistics of Income and Living Conditions (EU-SILC), which is a European household data set that captures income and hours but features a sample size two orders of magnitude smaller than the ELFS. We then calculate country- and year-specific mean wages for married men aged 25 to 54 in the EU-SILC and the CPS for three different education groups, namely low, medium, and high education.[19] For comparability reasons, we cap hours and earnings in the EU-SILC as in the CPS, and then construct hourly wages by dividing gross annual individual earnings by annual hours. We construct annual hours by multiplying usual weekly hours with 52 minus vacation/public holiday weeks from external data sources. Last, we drop observations with wages less than half the minimum wage (as in the Review of Economic Dynamics 2010 special issue on cross-country heterogeneity facts, see Krueger et al. (2010) for details), and the top 1 percent of observations, which are mostly driven by low hours rather than high earnings and seem to be due to measurement error. The EU-SILC starts only in 2004, and for some sample countries even later; we extrapolate wages for the missing years based on Eurostat growth rates of mean wages.

For married women, the issue of self-selection into employment arises. If high ability women of each education group are more likely to join the labor force, then observed wages overestimate the distribution of offered wages (see e.g. Olivetti and Petrongolo (2008)). We therefore apply a simple two-stage Heckman procedure to impute wages of non-working women. The exclusion restrictions are that the income of the husband as well as the presence of children do not influence directly the wage of a woman.

The last three columns of Table 2 show the corresponding mean gender wage gap in each country, as well as the education premia (defined as the ratio of wages for high and low educated people) for men and women. The gender wage gap is quite similar across regions, though with some differences across countries. The educational premia tend to be higher for both genders in Eastern and Southern Europe, as well as the US, than in Western Europe, and are lowest in Scandinavia.

[19] Low education is defined in EU-SILC, ELFS, and Microcensus as primary and lower secondary education (ISCED categories 0 to 2), medium education as upper secondary and non-tertiary post-secondary education (ISCED categories 3 and 4), and high education as any tertiary education (ISCED categories 5 and 6). In the US, low education is defined by having completed at most 11th grade of high school; medium education by having completed the 12th grade of high school, having a high school diploma, or attended some college; and high education by having at least a college degree.

4.2.3 Educational Composition and Matching into Couples

We take the percentage of husbands and wives per education group, as well as their matching into couples, directly from the data.[20] We then assign to each individual the gender-specific mean wage by education that we estimated from the EU-SILC and CPS. The demographic composition is shown in Appendix Table A.6. The first four columns show the percentage of men and women with low or high education, respectively, omitting the group of medium education, and the last column shows a simple correlation coefficient of the matching into couples between the three education groups. The degree of assortative matching is relatively homogeneous across countries, with assortative matching being naturally more prevalent in countries in which a large share of the population has the same educational level. However, there are substantial differences in the educational composition: in Southern Europe, more than half of the population exhibit low education, while in Eastern Europe and the US only around 10 percent do. Higher education rates are largest in the US with around 45 percent, followed by Scandinavia and Western Europe, and smallest in Eastern and Southern Europe with between 15 and 20 percent.

4.2.4 Redistribution of Government Revenues

The government redistributes a fraction $\lambda^i \in [0, 1]$ of all government revenues back to the households in a lump-sum fashion. In the benchmark calibration, we follow Rogerson (2008), Ohanian et al. (2008), and Ragan (2013) and assume full redistribution of government revenues and thus set $\lambda^i = 1$. In Section 8.2, we show results from two alternative specifications with either no redistribution of government revenues (i.e setting $\lambda^i = 0$), or from setting λ^i equal to 1 minus twice the share of expenditures on military from all government expenditures, similar to the specification used by Prescott (2004).

4.2.5 Calibration of Preference Parameters

As Kaygusuz (2010), we set the labor supply elasticity $\phi = 0.5$, which is consistent with the estimates surveyed in Blundell and MaCurdy (1999), Domeij and Flodén (2006), and Keane (2011). The weight on the disutility of work (α) is calibrated to match average hours worked per person by men (recall that we do not model an explicit intensive margin for them) and female hours worked per employed woman, and takes the value of $\alpha = 0.457$.

Again following Kaygusuz (2010), Guner et al. (2012a) and Guner et al. (2012b), the utility cost parameter is distributed according to a flexible gamma distribution, with the shape parameter

[20] For the Scandinavian countries we do not have any information on spousal education. We therefore base the matching into couples on data from EU-SILC applying the same sample selection criteria.

Table 3: Model Match – Some Statistics for Married Women

	Data	**Model**	**Difference***
Employment Rate			
Low education	44.9	46.8	1.9
Medium education	69.4	66.6	−2.8
High education	76.5	78.1	1.6
Mean	*70.7*	*70.3*	*-0.5*
Hours Worked per Employed			
Low education	1682.9	1524.9	−9.4
Medium education	1739.8	1649.0	−5.2
High education	1757.6	1768.2	0.6
Mean	*1746.3*	*1693.9*	*-3.0*

* Percentage point difference for employment rate, percentage difference for hours worked per employed.

k_z and scale parameter θ_z being conditional on the husband's type:

$$q \sim \zeta(q|z) \equiv q^{k_z-1} \frac{\exp(-q/\theta_z)}{\Gamma(k_z)\theta_z^{k_z}}, \tag{7}$$

where $\Gamma(\cdot)$ is the Gamma function. For each husband's education level z, we select the parameters k_z and θ_z to match as closely as possible the female labor force participation rates by their wives' three own education levels $x \in \{low, medium, high\}$.

For given preference parameters α and ϕ, and conditional on being married to a type z husband, the three different education levels x and implied wages generate three different threshold levels $\bar{q}(x,z)$ at which a woman of type x is indifferent between working and not working. Assume for simplicity that all type z husbands work the same amount of hours. Women with more education, i.e. a higher wage, will have a higher threshold q, and therefore a higher labor force participation rate for any given distribution of q. This pattern is also prevalent in the data, i.e. conditional on the husband's education, the female labor force participation rate is increasing in the woman's own education. The parameters k_z and θ_z are then selected to ensure that the mass of women below these thresholds corresponds to the empirically observed participation rates of the women's labor force participation by their own education conditional on the husband's education.

Table 3 shows how the model matches the extensive and the intensive margins for married women by education group. Note that none of these education-specific statistics are explicitly targeted by the model, but only the average hours worked across education groups and gender.[21] The model captures the gradient in the employment rate and hours worked per employed by education very well. Along the intensive margin, the model slightly underestimates hours worked per employed married woman. Similarly, not shown here, it overestimates hours worked per married man by 3 percent. In not reported results, we calibrate gender-specific disutility weights from working, which allow us to match gender-specific hours worked perfectly. This has almost no effect on the cross-country predictions. Along the intensive margin, the model also slightly overestimates the variability by education, predicting lower hours than in the data for the low education group, but higher hours for the high education group.

Note that we keep all preference parameters constant when analyzing the cross-country predictions of the model. This might be especially far-fetched for the disutility of joint work q, which could among other things capture factors that likely vary internationally, e.g. child care costs and availability, regulations regarding part-time work, etc. Thus, our exercise will tell us how much of the cross-country variation in hours worked we can explain with taxes and wages, abstracting from these other factors. This is in the spirit of other quantitative economics papers that focus on the effects of single factors without building an all-encompassing model.

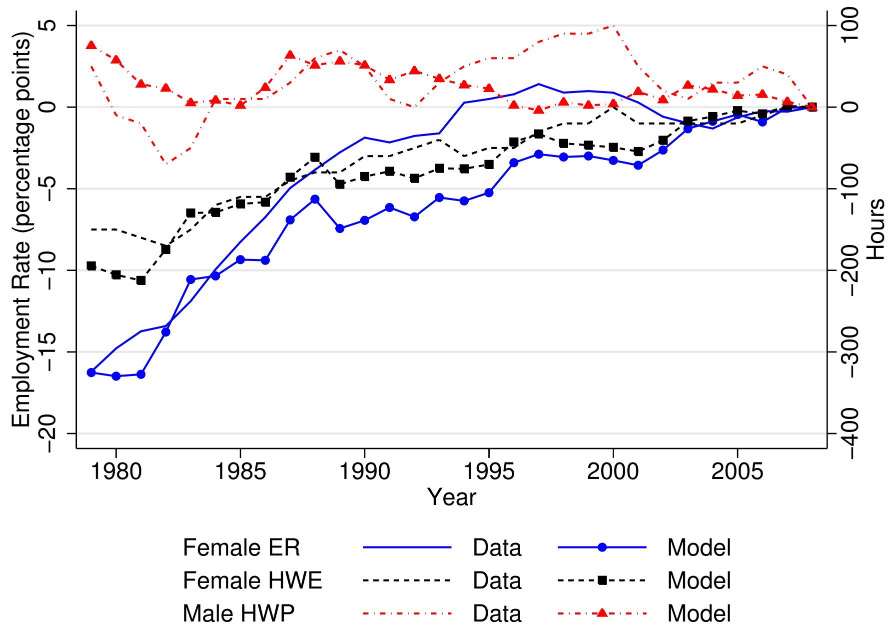
4.3 Time-Series Performance of the Model

While the goal of the paper is to use the model to evaluate in how far differences in taxes and wages can explain cross-country differences in hours worked of married women and men, we can evaluate the predictive power of the model also by analyzing its performance in replicating the US time series of labor supply of married couples. To do that, we generate the US-specific model inputs back to the year 1979 and plug them into the model, keeping the preference parameter values fixed.[22] As later on in the cross-country comparisons, we take the actual matching of men and women of the three education groups into couples from the data and replicate it in the model. Figure 3 shows employment rate differences (in percentage points, left y-axis) and hours differences (in levels, right y-axis) for each year relative to the year 2008 in the data and the model. The model correctly predicts hardly any change in hours worked of married men over the period of three decades. While hours worked per married man where 50 hours higher in 1979 than in 2008, the model predicts a difference of 75 hours. For married women, the model captures both the increase in the employment rate and in hours worked per employed very well. The employment rate increases in both model and data by 15 percentage points from 1979 to 2008, with some deviations in the 1990s, when the model predicts an increase in the late 90s rather than in the early 90s. Especially the increase in

[21] Table A.7 in the appendix records the fit of female employment rates by education of the husband and education of the wife. The average female employment rates by education of the husband, which are explicit targets, are matched almost perfectly.

[22] For the labor income taxes in the US, we can use the "NBER TaxSim" module, which in contrast to the "OECD Taxing Wages" modules goes back to the 70s. As in the OECD modules, the state tax is taken from Michigan, which is close to the average across the US states, and the city tax is taken from Detroit.

Figure 3: Time-Series Predictions for the US



the 1980s, when several tax reforms favored married women (see also Kaygusuz (2010)), is captured correctly by the model. The difference in hours worked per employed is overstated by around 50 hours around 1980, but the increase over the remaining years is replicated almost perfectly.

To understand which input factor is responsible for the success of the model in replicating the rise in female employment rates and hours worked per employed in the US, we also let only the labor income taxes, only wages, or only the educational composition plus matching into couples vary over time, while holding everything else constant.[23] Labor income taxes and wages both separately can account for around one third of the rise in the female employment rate, and one half of the rise in female hours worked per employed. For the employment rate, the remaining third of the increase is explained by changes in the educational composition and matching into couples. Thus, changes in the tax code over time are as important as changes in the gender and educational wage gaps in explaining the rise in both the intensive and extensive margins of female labor supply in the US from the late 1970s to the late 2000s. Non-linearities between the different factors are relatively weak.

[23] Consumption taxes are almost constant over the time period in question anyway.

5 Results

Keeping the preference parameters fixed across countries, we use country-specific taxes, wages, and the demographic composition (i.e. the educational distribution by gender and the degree of assortative matching) in order to obtain predicted hours worked of married couples across countries. We first present the cross-sectional predictions of hours worked per person of married men and women, before we decompose hours worked of married women further into an extensive and an intensive margin. Using the US as the benchmark country, we always compare deviations from US hours in model and data. In a decomposition analysis, we evaluate the relative importance of wages and taxes in explaining the cross-country variations of married individuals' hours worked. We further analyze the effects of labor income taxes by decomposing them into differences in tax levels and differences in marginal tax rate schedules. We discuss Denmark and Portugal separately in the last subsection: Denmark is an important outlier within Scandinavia in terms of the taxes, while Portugal is an outlier within Southern Europe in terms of the data.

5.1 Hours Worked per Person in Model and Data

Table 4 shows in the first column the percent difference in married men's hours worked per person between the respective country and the US in the data, and in the second column the model predicted percent difference. Similarly, the third and fourth columns show percent differences to the US in data and model for married women.

Differences in taxation, wages, and the demographic composition explain the cross-country variation in married men's hours worked very well. On average, the model somewhat underpredicts the differences to the US. While married men in Eastern Europe and Scandinavia work 11 and 17 percent less, respectively, than married men in the US in the data, the model predicts on average a difference of minus 6 and minus 11 percent, respectively. For Western Europe, the fit is best with a model predicted difference of 8 percent, compared to 10 percent in the data. For Southern Europe, the model explain half of the difference to the US. However, this is almost entirely driven by the bad fit for Spain, which exhibits 12 percent lower male hours worked than the US, while the model predicts 2 percent higher hours than in the US. Focusing on individual countries, for 9 countries the differences between prediction and data amount to 3 percentage points or less. Overall, the correlation between male hours worked per person in data and model amounts to 0.44.

We now turn to hours worked of married women in the last two columns of Table 4. Eastern European married women work on average 3 percent less than US ones in the data, which the model replicates very closely with a prediction of minus 5 percent. For Scandinavia, the model generates a similarly good fit with a difference to the US of minus 9 percent in the data, compared to minus 6 percent in the model. Thus, the model is able to replicate the small differences to the US in married women's hours worked for both Eastern Europe and Scandinavia.

Table 4: Male and Female Hours Worked per Person – Percent Differences Relative to the US

	Men		Women	
Country	**Data**	**Model**	**Data**	**Model**
Czech Republic	−0.04	−0.01	0.02	−0.01
Hungary	−0.16	−0.11	−0.04	−0.01
Poland	−0.14	−0.04	−0.05	−0.13
Mean	*-0.11*	*-0.06*	*-0.03*	*-0.05*
Norway	−0.18	−0.10	−0.13	−0.05
Sweden	−0.16	−0.13	−0.04	−0.08
Mean	*-0.17*	*-0.11*	*-0.09*	*-0.06*
Austria	−0.07	−0.09	−0.22	−0.06
Belgium	−0.13	−0.14	−0.20	−0.29
France	−0.16	−0.02	−0.16	−0.13
Germany	−0.14	−0.08	−0.34	−0.29
Ireland	−0.05	−0.05	−0.34	−0.19
Netherlands	−0.10	−0.10	−0.38	−0.14
United Kingdom	−0.07	−0.04	−0.19	−0.11
Mean	*-0.10*	*-0.08*	*-0.26*	*-0.17*
Greece	−0.02	−0.04	−0.21	−0.07
Italy	−0.14	−0.11	−0.39	−0.10
Spain	−0.12	0.02	−0.33	−0.19
Mean	*-0.09*	*-0.04*	*-0.31*	*-0.12*

For Western Europe the model explains two thirds of the observed large difference in married women's hours worked of minus 26 percent in the data. The fit is very good for France and Germany, with a deviation between model and data of only 3 and 5 percentage points, respectively. This excellent fit is quite remarkable, given that married women work 16 percent (200 hours) and 34 percent (425 hours) less, respectively, in these two countries than in the US. Only for the Netherlands and Austria, where married women work 38 percent and 22 percent, respectively, less than in the US, can the model explain less than half of the difference. For Belgium, the model overshoots in predicting the difference.

For Southern Europe, the model explains on average 40 percent of the difference in hours worked relative to the US, predicting 12 percent lower hours than in the US, while in the data Southern

European married women work 31 percent less than their US counterparts. Relative to the other regions, additional factors outside the model, e.g. cultural effects, must play a more important role in Southern Europe (see e.g. Alesina and Giuliano (2010) for evidence on strong family ties in Southern Europe lowering female labor market participation rates).

Summarizing, the model replicates very successfully the small difference in married women's hours worked between Eastern Europe and Scandinavia and the US, and explains on average two thirds and 40 percent of the large differences in hours worked per married woman between the US and Western and Southern Europe. The correlation between married women's hours worked per person in model and data amounts to 0.56 and is thus higher than for men. Also, the model is able to replicate the low correlation of male and female hours worked per person in the data: while the correlation is slightly negative with -.12 in the data, it is slightly positive with .06 in the model.[24]

5.2 Extensive and Intensive Margins of Married Women's Hours Worked

For married women, we further compare the performance of the model in explaining extensive and intensive margin differences relative to the US. Table 5 shows the corresponding results. The first two columns show employment rate differences relative to the US (in percentage points) in the data and the model, respectively, the next two columns show hours worked per employed differences (in percent).

The model generates a close fit on both margins for Eastern Europe. For Southern Europe, the model reproduces half of the employment rate difference, but underestimates the difference in the intensive margin with 1 percent relative to 12 percent in the data.

However, the decomposition into the extensive and intensive margin does not work well for Scandinavia and Western Europe. Scandinavia and Western Europe exhibit higher employment rates of married women than the US, namely 13 percentage points and 1 percentage point higher ones, respectively. By contrast, the model predicts lower employment rates by 2 and 7 percentage points, respectively. Regarding hours worked per employed, the opposite picture arises, with large negative differences in the data, namely 23 percent for Scandinavia and 27 percent for Western Europe, but smaller predicted negative differences by the model, namely 3 and 8 percent, respectively. For Scandinavia and Western Europe, the model thus has difficulties explaining the decomposition of hours worked per married woman into an intensive and an extensive margin. It does however an overall decent job in establishing the relative ordering of countries in hours worked per employed and employment rate differences relative to the US: the correlations between model and data amount to 0.44 and 0.33, respectively. Similarly, the model captures the cross-country correlations between male and female labor supply. It not only replicates the almost zero correlation between male and female hours worked per person fairly well (as already reported in the previous subsection), but also the negative correlation between male hours worked per person and female employment rates

[24]The correlation in the data is -.12 if Denmark and Portugal are excluded, and .05 if they are included.

Table 5: Female Employment Rate (ER) and Female Hours Worked per Employed (HWE) Differences Relative to the US

	ER		**HWE**	
Country	**Data**	**Model**	**Data**	**Model**
Czech Republic	0.03	−0.02	−0.02	0.01
Hungary	−0.04	0.03	0.02	−0.06
Poland	−0.04	−0.07	0.01	−0.04
Mean	*-0.02*	*-0.02*	*0.00*	*-0.03*
Norway	0.12	−0.01	−0.26	−0.03
Sweden	0.14	−0.03	−0.20	−0.04
Mean	*0.13*	*-0.02*	*-0.23*	*-0.03*
Austria	0.03	0.00	−0.25	−0.07
Belgium	0.00	−0.12	−0.20	−0.14
France	0.03	−0.08	−0.20	−0.02
Germany	0.01	−0.14	−0.35	−0.12
Ireland	−0.09	−0.08	−0.25	−0.08
Netherlands	0.04	−0.07	−0.41	−0.04
United Kingdom	0.06	−0.04	−0.26	−0.06
Mean	*0.01*	*-0.07*	*-0.27*	*-0.08*
Greece	−0.14	−0.05	0.00	0.00
Italy	−0.16	−0.06	−0.22	−0.01
Spain	−0.16	−0.13	−0.13	−0.01
Mean	*-0.15*	*-0.08*	*-0.12*	*-0.01*

Note: For the employment rate we show percentage point differences, and for hours worked per employed percent differences.

(-.30 in the data and -.20 in the model), and at least qualitatively generates the positive correlation between male hours worked per person and female hours worked per employed (.13 in the data vs. .51 in the model).

Through the lens of the model, it is not surprising that we have difficulties explaining the vastly different decomposition into intensive and extensive margins in Scandinavia and Western Europe on the one hand, and Eastern and Southern Europe and the US on the other hand shown in Figure 2. Since the effects of taxes and wages should affect both margins in the same direction (which we will confirm in the next subsection when looking at the different model inputs separately), the predictions relative to the US are qualitatively similar across both margins. As a consequence, the model features a positive correlation of .37 between married women's employment rates and hours worked per employed, while in the data the correlation is -.37. One reason for the negative correlation in the data not captured by our model might be that the marginal woman entering the labor market exhibits low labor productivity, and therefore optimally chooses to work few hours. The heterogeneity in productivity in our model is quite limited, being restricted to three education levels. Thus, the heterogeneity of fixed costs of joint work plays a much larger role in determining the marginal woman entering employment than her own labor productivity. She will thus work just as many hours as her counterparts already in the labor market.

As a key open question remains what makes Scandinavia and Western Europe different from the US, Eastern and Southern Europe, and could help explaining the patterns observed in the data. One explanation could be different returns to experience or depreciation of human capital, which in Western Europe and Scandinavia would have to be driven rather by the extensive margin, and in the US by the intensive margin (in relative terms). Secondly, the availability of part-time jobs could differ across countries. In Bick et al. (2014), we present some evidence suggesting that there indeed exists a scarcity of part-time jobs relative to their demand in the US, Eastern and Southern Europe, compared to Western Europe and Scandinavia. A reduced form way to model both these features in our static framework would be to make wages depend on hours worked, either in a discrete or continuous way. If relative to the US wages offered at lower hours worked are higher in Western Europe and Scandinavia (i.e. the part-time penalty is lower in Western Europe and Scandinavia than in the US), more women are above the threshold level to participate $\bar{q}$ in these two regions. Moreover, these women would optimally choose to work lower hours than the average working US woman, for whom due to the part-time penalty working is only beneficial if she chooses to work long hours. Alternatively, the scarcity of part-time jobs could be captured by a different distribution of the disutility of working q leading to higher employment rates in Western Europe and Scandinavia, which would however have hardly any impact on the intensive margin. Finally, one could follow the argument put forward in Ragan (2013) and Ngai and Pissarides (2011), namely to model government subsidies in Western Europe and Scandinavia in sectors that serve as complements to home production (e.g. child care). In contrast to their modeling approach, it would however be key that the subsidies are paid conditional on working, rather than (linearly) increasing in hours worked. All these explanations are hard to quantify and therefore not incorporated into the model, but may indicate avenues for future research.

5.3 Decomposition Analysis

To understand the relative importance of wages and taxes in explaining the cross-country differences, we simulate the model setting only one feature of the economic environment country-specific and leaving all others as in the US. For each exercise we adjust the transfers such that the government always maintains a balanced budget. Results from this decomposition analysis are shown in

Table 6. We present the results here only for the country groups; detailed country results are shown in Appendix tables A.8 to A.11. Columns "Data" and "Model" in Table 6 replicate the results from Tables 4 and 5, in which we use the full country-specific economic environment described in Equations (1) to (6). The next three columns set only one single element in Equations (1) to (6) specific to country i, namely non-linear labor income taxes (τ_l), consumption taxes (τ_c), or wages (w), while keeping all others at the US level.

The first column (τ_l) shows the results if the tax system is set country-specific, while gross household income y_{hh} in Equation (4) remains at the US level, i.e.

$$y_{hh} = w_m^{US}(z)h_m + w_f^{US}(x)h_f. \tag{8}$$

Progressive tax systems are in some way defined relative to the income level in a country. For example, the US mean wage ($\bar{w}^{US}$) is around four times higher than the mean wage in Hungary (which has the lowest wage). Simply applying the Hungarian tax system one to one to the US would imply that the average household would end up in a range of the tax code featuring a much higher tax rate than the average Hungarian household. We account for this in the following way. First, we calculate for any combination of male and female hours choices the country-specific tax rate using the US gender-specific education premia and the country-specific mean wage ($\bar{w}^i$) . Second, we apply the resulting average tax rate to the corresponding US household income to obtain the household's income tax liability τ_l, and set Equation (5) equal to:

$$\tau_l = y_{hh} \frac{\tau_l^i \left(\frac{w_m^{US}(z)}{\bar{w}^{US}} \bar{w}^i h_m, \frac{w_f^{US}(x)}{\bar{w}^{US}} \bar{w}^i h_f \right)}{\frac{w_m^{US}(z)}{\bar{w}^{US}} \bar{w}^i h_m + \frac{w_f^{US}(x)}{\bar{w}^{US}} \bar{w}^i h_f} \tag{9}$$

in the household optimization problem.

We proceed in a similar fashion when we analyze the effects of country-specific gender-education premia. Household income in Equation (4) in this case is replaced by

$$y_{hh} = \frac{w_m^i(z)}{\bar{w}^i} \bar{w}^{US} h_m + \frac{w_f^i(x)}{\bar{w}^i} \bar{w}^{US} h_f, \tag{10}$$

and the household's income tax liability in Equation (5) by

$$\tau_l = \tau_l^{US} \left(\frac{w_m^i(z)}{\bar{w}^i} \bar{w}^{US} h_m, \frac{w_f^i(x)}{\bar{w}^i} \bar{w}^{US} h_f \right). \tag{11}$$

Thus, the mean wage remains unchanged, but only the gender-education premia are set country-specific.

The last column shows the predicted differences to the US if labor income taxes, consumption taxes, and wages are jointly set country-specific; what then still remains at the US level is the heterogeneity in education and the matching by male and female education levels into couples. The table exhibits four panels, each comprising the four European regions. The two upper panels show differences to the US in male and female hours worked per person, respectively, while the two lower panels decompose female hours worked per person into the extensive and the intensive margin.

Among the different features of the country-specific environments, labor income taxes play the largest role in explaining low hours worked relative to the US for men, whereas for women consumption taxes are the main factor driving European female hours worked down (see two upper panels). While labor income taxes uniformly predict lower hours worked of married men in Europe than in the US by 3 to 7 percent, they in fact predict lower hours worked for married women than in the US only for Western Europe, but *higher* ones for Eastern Europe, Scandinavia, and Southern Europe. Only for Western Europe is the effect of labor income taxes of roughly the same size as the effect of consumption taxes.[25] One can already see here that for Eastern Europe, Scandinavia, and Southern Europe, labor income taxes partly counterweigh the effect of consumption taxes, which explains the success of the model in replicating married women's hours worked in Eastern Europe and Scandinavia, and its difficulties in replicating married women's hours worked in Southern Europe. We will analyze the reason for this counterweighing effect in the next Subsection 5.4, which investigates the labor income taxes in more detail.

Not surprisingly, the disincentive effects of consumption taxes on hours worked of both married men and women are largest for Scandinavia, where consumption taxes are highest. Consumption taxes alone would predict that Scandinavian married women should work 12 percent less than US married women. For all other European regions, the effects of consumption taxes alone on married women's labor supply are also sizeable, predicting around 7 percent lower hours worked than in the US. For married men, the disincentive effects of European consumption taxes are smaller, with 2 to 5 percent. This is due to the higher implied female elasticity of labor supply, which arises because women face lower wages and are affected both along the extensive and intensive margin.[26] As expected, the regional ordering of the consumption tax effect is the same for men and women (for both, the effects are largest for Scandinavia and smallest for Southern Europe), while this is not at all true for labor income taxes.

The effect of the country-specific gender and educational wage premia on hours worked in Europe is relatively small. It is largest for Scandinavian married women: wages alone in fact predict 3 percent higher hours worked than in the US, in contrast to lower hours worked in the data. For Southern Europe, in turn, wages alone predict 3 percent lower hours worked than in the

[25] Note that the previous literature on taxation and hours worked, e.g. Prescott (2004), Ohanian et al. (2008), and McDaniel (2011), do not distinguish the effects of labor and consumption taxes in a decomposition exercise.

[26] Note that, even if we would model an extensive margin for men, due to their already very high participation rates we would expect only minimal effects along this margin.

Table 6: Decomposing the Effects of Different Model Inputs on Labor Supply Relative to the US

	Country Group	Data	Model	τ_l	τ_c	w	$\tau_l + \tau_c + w$
HWP$_m$	Eastern Europe	−0.11	−0.06	−0.04	−0.03	−0.03	−0.07
	Scandinavia	−0.17	−0.11	−0.07	−0.05	0.01	−0.12
	Western Europe	−0.10	−0.08	−0.06	−0.03	−0.01	−0.09
	Southern Europe	−0.09	−0.04	−0.03	−0.02	−0.01	−0.06
HWP$_f$	Eastern Europe	−0.03	−0.05	0.03	−0.07	0.00	−0.06
	Scandinavia	−0.09	−0.06	0.01	−0.12	0.03	−0.06
	Western Europe	−0.26	−0.17	−0.06	−0.08	0.02	−0.11
	Southern Europe	−0.31	−0.12	0.07	−0.06	−0.03	−0.01
ER$_f$	Eastern Europe	−0.02	−0.02	0.02	−0.03	0.00	−0.01
	Scandinavia	0.13	−0.02	0.02	−0.05	0.02	−0.02
	Western Europe	0.01	−0.07	−0.01	−0.03	0.01	−0.03
	Southern Europe	−0.15	−0.08	0.04	−0.03	−0.01	0.01
HWE$_f$	Eastern Europe	0.00	−0.03	0.00	−0.03	0.00	−0.04
	Scandinavia	−0.23	−0.03	−0.02	−0.05	0.01	−0.04
	Western Europe	−0.27	−0.08	−0.06	−0.03	0.01	−0.07
	Southern Europe	−0.12	−0.01	0.01	−0.03	−0.02	−0.02

Note: For the decomposition in columns 4 to 6, exactly one model input is set country-specific, and the rest are left unchanged at their US values. For the decomposition in column 7, three model inputs are set country-specific, and only the educational composition and matching are left unchanged at their US values. The country-specific results are shown in Tables A.8 to A.11 in the Appendix.

US. Southern Europe is the only region where the wage effect goes in the same direction as the data, namely predicting lower hours worked in Europe than in the US. As Table 2 shows, in fact the gender wage gap is somewhat smaller on average in Scandinavia and Eastern Europe than in the US, and very similar in Southern and Western Europe.

Column 5 shows the joint effect of taxation and wages, setting labor income and consumption taxes as well as wages country-specific. The joint effect is quite similar to the sum of the three individual effects, pointing to small interaction effects. Compared to the full model predictions, the educational composition and the matching into couples are still at the US level here. Comparing the results with the full model predictions, one can see that for Western and Southern European women the demographic composition is a further factor in explaining lower hours worked in Europe than in the US. This is especially true for Southern Europe, where the percentage of low-educated women is much larger than in the US.

The two lower panels of Table 6 further decompose hours worked per person of married women into the extensive and the intensive margin. In Section 5.2, we saw that the model predictions are qualitatively similar across the extensive and the intensive margin. Here, one can see that this is also true for the individual features of the country-specific economic environment. For the consumption tax and wages, the results are quantitatively almost the same across both margins. For labor income taxes, the ordering across country groups is also preserved: Western European labor income taxes generate the lowest employment rate and lowest hours worked per employed woman, and Southern European labor income taxes the highest employment rate and highest hours worked per employed woman.

Summarizing, the decomposition analysis shows that labor income taxes are of great importance in explaining the lower hours worked of married men in Europe than in the US, while consumption taxes are the main driver of low hours worked of married women in Europe. The effect of wage differences on hours worked differences is relatively small for both men and women.

5.4 Investigating Labor Income Taxes in More Detail

One can conceptually distinguish two components of the labor income tax code which differ internationally: first, the average tax rate, i.e. the level of the tax schedule, and second, the actual marginal tax schedule along with the tax treatment of married couples, which together define how the marginal tax rate for each spouse changes with the own and the spousal income. In the previous subsection, we saw that labor income taxes uniformly predict lower hours worked in Europe than in the US for married men, but for married women only in Western Europe. In this subsection, we derive more insights into why this is the case by further decomposing the actual non-linear labor income tax schedule into the average tax rate and the tax structure, i.e. the non-linearity of the tax system along with the tax treatment of married couples. To distinguish between the average tax rate and the tax structure, we conduct the following experiment: to capture the effect of the tax

Table 7: The Effect of the Tax Structure and Tax Level on Labor Supply Relative to the US

	Country Group	Data	τ_l	Tax Structure	Tax Level
$\mathbf{HWP}_m$	Eastern Europe	−0.11	−0.04	−0.05	0.01
	Scandinavia	−0.17	−0.07	−0.04	−0.03
	Western Europe	−0.10	−0.06	−0.04	−0.02
	Southern Europe	−0.09	−0.03	−0.03	0.00
$\mathbf{HWP}_f$	Eastern Europe	−0.03	0.03	0.02	0.01
	Scandinavia	−0.09	0.01	0.08	−0.07
	Western Europe	−0.26	−0.06	−0.02	−0.04
	Southern Europe	−0.31	0.07	0.07	0.00
$\mathbf{ER}_f$	Eastern Europe	−0.02	0.02	0.01	0.01
	Scandinavia	0.13	0.02	0.05	−0.03
	Western Europe	0.01	−0.01	0.01	−0.02
	Southern Europe	−0.15	0.04	0.04	0.00
$\mathbf{HWE}_f$	Eastern Europe	0.00	0.00	0.00	0.01
	Scandinavia	−0.23	−0.02	0.00	−0.03
	Western Europe	−0.27	−0.06	−0.03	−0.02
	Southern Europe	−0.12	0.01	0.01	0.00

Note: Columns 4 and 5 add up to Column 3. Column 3 corresponds to column 4 in Table 6. The country-specific results are shown in Tables A.13 to A.16 in the Appendix.

structure alone, we calculate the taxes implied by the country-specific tax code as in Equation (9), but then levy an additional linear tax or subsidy such that government revenues are left unchanged at the US level.[27] Put differently, one may think of this experiment as a reform which implements a different tax structure but is required to be revenue neutral. The effect of the country-specific average tax rate, or the level, is then indirectly inferred by the difference in hours worked between setting the entire labor income tax schedule country specific, or shifting it up or down to match the US government revenues.[28]

Table 7 shows the resulting decomposition of the labor income tax effect into the tax structure and the average tax rate (the full country results are shown in Appendix Tables A.13 to A.16). As in the previous table, the upper panel shows results for hours worked per person of married men.

[27] The household's income tax liability (Equation 5) hence becomes $\tau_l = \tau_l^i(w_m^i(z)h_m, w_f^i(x)h_f, k^i) + \theta^i y_{hh}$, with $\theta^i > 0$ being an additional linear tax and $\theta^i < 0$ being a subsidy.

[28] As an alternative to adding a linear tax in order to shift the average tax rate, we follow Guvenen et al. (2014), who require that for any gross income level z the following condition has to be satisfied: $\frac{1-\tilde{\tau}_l'(z)}{1-\tau_l'(z)} = (1-\kappa)\forall z$, where τ_l' is the marginal tax rate of the original tax schedule, $\tilde{\tau}_l'$ is the marginal tax rate of the schedule allowing for a different average tax rate, and κ is a constant. Results using this approach are quantitatively similar and are shown in the Appendix in Table A.12.

For this group, the tax structure uniformly predicts lower hours worked in Europe than in the US, while the average tax rate has a smaller effect, and even a positive one in Eastern Europe. This indicates the higher progressivity of taxes in Europe. The mechanism is reinforced since the degree of joint taxation is more pronounced in the US than in most other countries. Therefore American married men actually face a lower marginal tax rate. On top of that is an additional disincentive effect through the higher tax levels in Scandinavia and Western Europe.

For married women, the results are very different, with the tax structure on average predicting *higher* hours worked in Europe than in the US, rather than lower hours worked. Focusing first on the tax level, we see that, as for consumption taxes, the relative ordering of the regional effects is the same for men and women, with larger effects for women due to the higher implied female elasticity. The tax level predicts 7 and 4 percent lower hours worked by married women in Scandinavia and Western Europe, respectively, with almost no effect for Southern and Eastern Europe. This ordering is in line with the measure of the average tax rate shown in Table 2, which was highest in Scandinavia, followed by Western Europe, then Eastern and Southern Europe. Thus, the disincentive effects of average labor income tax rates and of consumption taxes are quite easy to deduce from the data, and always larger for women than for men.

By contrast, the tax structure itself predicts uniformly *higher* hours worked of married women in Europe than in the US, with the exception of Western Europe. For Western Europe, the tax structure alone would predict 2 percent lower hours worked per married woman than in the US, for Eastern Europe 2 percent higher hours, and for Southern Europe and Scandinavia 7 and 8 percent higher hours. In fact, as Table A.14 in the appendix shows, there are only four countries for which the tax structure alone would predict lower hours worked of married women in Europe than in the US, namely Germany, Ireland, and Belgium, all located in Western Europe, plus the Czech Republic. In Scandinavia the two large effects of the average tax rate and the tax structure nearly offset each other. In Eastern Europe, both effects are positive and add up, while for Western Europe both are negative and add up. For Southern Europe, all effects come from the tax structure and would predict higher hours worked than in the US.

The reason behind this positive effect of the tax structure on married women's hours worked in Europe compared to the US lies in the joint taxation of married couples in the US. Joint taxation makes the marginal tax rate of the each spouse depend on the other spouse's income. E.g. in Germany, which has a relatively pure system of joint taxation, half of the couple's joint income is assigned to each partner when determining his or her taxes. As a result, if a woman starts working, she faces a relatively high marginal tax rate, which is increasing in her husband's income. Table 2 presented as an exemplary measure the average marginal tax rate if a woman starts working the same hours as the average US woman. This rate exceeds 50% in Germany, but is only close to 30% in the US, reflecting the higher progessivity of the general labor income tax schedule in Germany even though both countries feature joint taxation. This in fact explains the larger disincentive effect of the tax schedule on married women's hours worked in Germany than in the US predicted by the model. In contrast, most of the other European countries feature systems closer to separate taxation than the US system. Therefore, the tax structure predicts higher hours worked of married women for the majority of European countries. Section 6 shows explicitly the degree of jointness of taxation in each country by comparing predicted labor supply under the current income taxation system and a system of strictly separate taxation.

Thus, the decomposition of the labor income tax into the tax schedule and the average tax rate makes it clear that the average tax rate alone is not a good approximation of the incentive effects of income taxes on married women's labor supply, as will be discussed further in Section 7. Especially to generate the comparatively high hours worked of married women in Eastern Europe and Scandinavia, incorporating the tax structure is crucial. For Southern Europe, by contrast, the tax structure would predict higher hours worked than in the US, and thus makes it more difficult to predict hours worked differences in the data. Therefore, additional effects outside the model which reduce hours worked in Southern Europe must be large. Comparing the extensive and the intensive margin, the tax structure itself matters more on the extensive margin, and predicts between 1 and 5 percentage points higher employment rates in Europe than in the US.

5.5 Two Outliers: Denmark and Portugal

As discussed in the introduction, there are two outliers that we shortly discuss separately in this section, namely Denmark within Scandinavia and Portugal within Southern Europe. Danish married women work essentially the same number of hours as US married women, but the model predicts a difference of minus 26 percent (see Table 8). The failure of the model to replicate the labor supply behavior of Danish married women comes from the joint effect of consumption and labor income taxes. In contrast to the other Scandinavian countries, the labor income tax also predicts substantially lower hours in Denmark than in the US: Denmark features the highest average tax rate in Scandinavia and combines this with a tax system that features strong elements of joint taxation, which is not the case in the other Scandinavian countries. While the tax structure still predicts higher hours worked in Denmark than in the US, the effect is relatively weak compared to the other Scandinavian countries. Coupled with the much stronger negative effect of the high average tax rate, this leads to a predicted difference of minus 17 percent based on the income taxes alone.

Portugal, on the other hand, is a clear outlier when it comes to Southern Europe from the data side. While Greek, Spanish, and Italian married women work between 20 and 40 percent fewer hours than US married women, Portuguese married women work even slightly more hours than US ones. While the Portuguese labor income tax system alone correctly predicts higher hours worked in Portugal than in the US, consumption taxes, wages, and the demographic composition all predict lower hours worked, such that in the end the model predicts 18 percent lower hours

Table 8: Decomposing Hours Worked Differences Relative to the US for Denmark and Portugal

	Country	Data	Model	τ_c	τ_l	w	Tax Structure	Tax Level
$\mathbf{HWP}_m$	Denmark	−0.13	−0.16	−0.05	−0.12	0.00	−0.03	−0.08
	Portugal	−0.10	−0.03	−0.03	−0.01	−0.02	−0.02	0.01
$\mathbf{HWP}_f$	Denmark	−0.01	−0.26	−0.14	−0.17	0.06	0.02	−0.19
	Portugal	0.03	−0.18	−0.07	0.04	−0.11	0.02	0.02

worked of married women in Portugal than in the US. Note, however, that the tax structure effect goes into the correct direction for both countries, closing the gap between model and data.

6 Joint vs. Separate Taxation

In this section, we get further insights into the degree of individual vs. joint taxation in the sample countries, and the potential disincentive effects of the current systems of (joint) taxation on married women's labor supply. In order to do so, we compare two singles living together in one household with a married couple living in one household. We analyze the case of no children to avoid further complications, e.g. as who of the two spouses would receive a potential child tax credit or benefit. Both households share the same utility function, but have different budget constraints, since the members of the first household are taxed as singles, while the members of the second household are taxed as in the actual tax code, thus capturing any elements of joint taxation. For the household with two singles, the budget constraint becomes

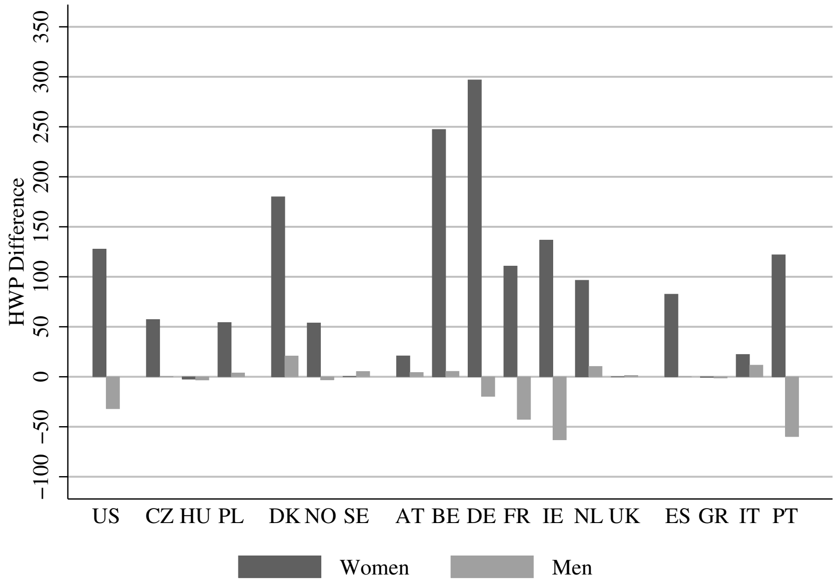
$$c = \frac{1}{(1+\tau_c)} \left[(1-\theta)w_m(z)h_m - \tau_l(w_m(z)h_m) + (1-\theta)w_f(x)h_f - \tau_l(w_f(x)h_f)\right] + T. \tag{12}$$

We add a proportional tax/subsidy rate θ as in Section 5.4 when going from the current system to a system of strictly separate taxation, such that tax revenues are kept constant in both cases. In countries with joint taxation, going from the current system to one of separate taxation lowers the marginal tax rates of married women, but increases the ones of married men.

Figure 4 shows the effect of going from the current system to one of strictly separate taxation of married couples on hours worked per person of married women (dark bars) and married men (light bars). For six of the 18 countries, female labor supply increases by less than 50 hours. For Sweden, Hungary, Greece, and the UK, effects are virtually zero, indicating that these countries exhibit strict systems of individual taxation.[29] For a further 5 countries, female hours worked

[29] The caveat applies that this is at least true for the nine couple types that we consider, but might not be entirely

Figure 4: Hours Worked Per Person (HWP) under the Current System and a System of Strictly Separate Filing

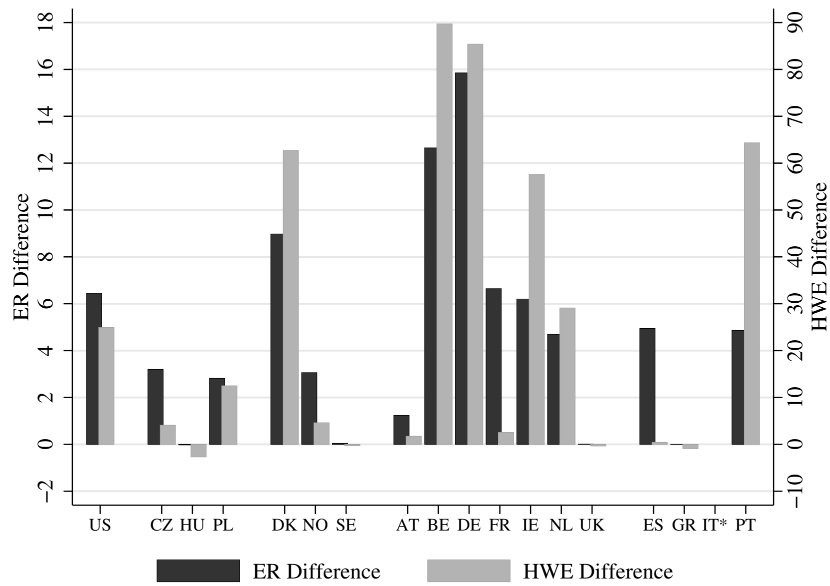


Note: This figure shows the predicted changes in hours worked per person when going from the current country-specific system of filing to a system of strictly separate taxation of married couples, keeping government revenues constant.

increase by 50 to 100 hours. The remaining 7 countries show significant effects on female labor supply: in France, Portugal, the US, and Ireland, female hours worked would increase by 100 to 150 hours, in Denmark by 180 hours, in Belgium by 250 hours, and in Germany by even 300 hours. These are very large effects, as 300 hours correspond to almost two months of full-time work, and would increase hours worked of married German women by 31 percent. Going from the current system to one of separate taxation in these countries raises the marginal tax rate for married men. As a consequence, male hours worked decrease. The effect is however much smaller in absolute terms than the effect for women, amounting to a reduction of at most 60 hours, due to the lower implied labor supply elasticity and the higher wages. Therefore, the net effects remain large in the countries with large increases in female hours worked. Our results are in line with the description of tax systems shown in Pearson and Binder (2011) based on OECD data. Of the countries in our sample, France, Germany, Ireland, Norway, Poland, Portugal, and the US exhibit a system of joint taxation of married couples, while Greece, Hungary, Sweden and UK have a strict system of separate taxation. Indeed, for the latter four countries we find virtually no effects of the proposed tax reform. The remaining countries have intermediate systems, which nevertheless create relatively large disincentive effects for women in Belgium and Denmark.

true if we would allow for more heterogeneity.

Figure 5: Female Employment Rate (ER) and Female Hours Worked Per Employed (HWE) under the Current System and a System of Strictly Separate Filing



Note: This figure shows the predicted percentage point changes in the female employment rate and changes in female hours worked per employed when going from the current country-specific system of filing to a system of strictly separate taxation of married couples, keeping government revenues constant. Italy is omitted (see footnote 30 for an explanation).

Figure 5 decomposes the effect of going to separate taxation on married women's labor supply into the extensive and the intensive margin.[30] The effects of going to a system of separate filing work along both margins, but the extensive margin effects are mainly responsible in quantitative terms for the increase in female hours worked. For the US, the model predicts an increase in the employment rate of married women by 6.4 percentage points, and an increase in hours worked per employed by 25 hours. For Germany, the country with the largest overall increase, the employment rate is predicted to rise by almost 16 percent, and hours worked per employed by 85 hours. Note that our results are roughly similar to and only slightly smaller than the results of going to a system of separate taxation in the US in Guner et al. (2012a), who set up a rich general equilibrium life-cycle model that features marriage and fertility, a social security system, and labor income risk, and calibrate it in detail to the US economy. While Guner et al. (2012a) find that the employment rate of married women would increase by 10.4 percent, we find an increase of 9.2 percent, and their predicted increase in hours worked per employed married woman of 0.3 percent compares to ours

[30]We omit Italy in this picture, as for Italy we get a negative effect on hours worked per employed of 40 hours. This effect is not robust, as it does not appear in the results with country-specific calibration in Figure A.4 in the appendix, and thus likely results from the fact that female hours worked are exactly at a non-monotonicity point in the tax code.

of 0.14 percent.[31] It is quite reassuring that our static model gets similar results for the US than their richer one, and the comparison confirms that our results of the labor market effects from going to separate taxation of married couples are not unrealistically large. Figures A.3 and A.4 in the appendix show analogous results to Figures 4 and 5 if we calibrate each country separately to match hours worked and female employment rates there, i.e. without keeping preferences at the baseline calibration. This might be interesting, as we do not get a good hours fit for all countries in our baseline calibration. Overall, results are very robust. The most notable changes come from Belgium, where the increase in hours worked per married woman becomes larger than 350 hours when going to separate taxation, compared to 250 hours in the US calibration, and from Portugal, where the increase declines from 120 hours in the US calibration to 70 hours in the country-specific calibration.

7 Actual vs. Linear Taxes

The major novelty of our study is that we use actual non-linear tax systems rather than average marginal tax rates as model inputs in order to predict hours worked. To understand how important this is, we compare our results to results from a model where simple linear taxes are used as inputs. Specifically, we compare our results from the ones that we obtain if we use the linear tax rates calculated by McDaniel (2011) and Ragan (2013) as model inputs.[32] When we use these linear tax rates, we recalibrate the model in order to still match the moments for the US.

As Table 9 shows in the first three columns, predicted hours worked of married men are very similar whether we use the full schedule of non-linear or simple linear labor income taxes. Married men make up the majority of the workforce, and thus average labor income tax rates capture their actual income tax rates very well.

For women, however, results are very different whether we use the actual non-linear tax code or simple linear taxes. The model with linear taxes always predicts larger hours worked differences between Europe and the US than the model with actual taxes. This is not surprising, since our decomposition in Table 7 showed significant disincentive effects of average tax rates in Europe also for married women. The countervailing effects of the tax structure are missing entirely when we use simple linear tax rates. As a consequence of the larger predicted differences, the model with linear taxes performs much worse than the benchmark model in replicating female hours worked in Eastern Europe and Scandinavia, where it predicts differences of 16 and 28 percent, respectively, compared to the US. For Western Europe, on the first view it appears that the model with linear taxes performs better than the model with non-linear taxes. However, this comes from the fact that

[31] Note that Figure 5 shows percentage point increases, but Guner et al. (2012a) report percent increases.

[32] McDaniel (2011) and Ragan (2013) multiply average labor income tax rates (but not social security contribution rates) by a factor of 1.6 in order to convert them into average marginal tax rates. Ohanian et al. (2008) do not multiply by 1.6, while Prescott (2004) multiplies the sum of labor income and social security contribution rates by 1.6.

Table 9: Hours Worked Per Person Differences Relative to the US with Actual and Linear Taxes

	Men			**Women**		
		Taxes			**Taxes**	
Country	**Data**	**Actual**	**Linear**	**Data**	**Actual**	**Linear**
Czech Republic	−0.04	−0.01	−0.06	0.02	−0.01	−0.16
Hungary	−0.16	−0.11	−0.10	−0.04	−0.01	−0.16
Poland	−0.14	−0.04	−0.05	−0.05	−0.13	−0.16
Mean	*-0.11*	*-0.06*	*-0.07*	*-0.03*	*-0.05*	*-0.16*
Norway	−0.18	−0.10	−0.08	−0.13	−0.05	−0.19
Sweden	−0.16	−0.13	−0.16	−0.04	−0.08	−0.37
Mean	*-0.17*	*-0.11*	*-0.12*	*-0.09*	*-0.06*	*-0.28*
Austria	−0.07	−0.09	−0.11	−0.22	−0.06	−0.29
Belgium	−0.13	−0.14	−0.14	−0.20	−0.29	−0.30
France	−0.16	−0.02	−0.11	−0.16	−0.13	−0.30
Germany	−0.14	−0.08	−0.09	−0.34	−0.29	−0.26
Ireland	−0.05	−0.05	−0.03	−0.34	−0.19	−0.22
Netherlands	−0.10	−0.10	−0.08	−0.38	−0.14	−0.24
United Kingdom	−0.07	−0.04	−0.05	−0.19	−0.11	−0.25
Mean	*-0.10*	*-0.08*	*-0.09*	*-0.26*	*-0.17*	*-0.27*
Greece	−0.02	−0.04	−0.02	−0.21	−0.07	−0.29
Italy	−0.14	−0.11	−0.12	−0.39	−0.10	−0.25
Spain	−0.12	0.02	−0.02	−0.33	−0.19	−0.35
Mean	*-0.09*	*-0.04*	*-0.05*	*-0.31*	*-0.12*	*-0.29*

the former sometimes over- and sometimes underpredicts differences to the US, while our benchmark model always underpredicts with the exception of Belgium. Judged by the mean absolute deviation between model and data, both models perform equally well for Western Europe, but our benchmark model performs better in explaining variation within Western Europe, creating a correlation of .27 between model and data within Western Europe, compared to a correlation of -.74 when using linear tax rates. Only for Southern Europe does the model with linear tax rates perform better than the benchmark model: as the countervailing effect of separate taxation is missing in the former, it creates larger female hours worked differences to the US than the benchmark model. Overall, the model with linear tax rates does a worse job in explaining cross-country differences: the correlation in female hours worked per person between data and model amounts to only .32 when linear taxes are applied, as compared to 0.56 in the benchmark case. The model with linear taxes also performs worse for Denmark and Portugal. It predicts 37 and 23 percent lower hours worked in Denmark and Portugal, respectively, than in the US, while our benchmark model predicts 26 and 18 percent lower hours worked of married women.

We also compare the US time-series prediction of the model with linear taxes to the benchmark model (results available from the authors upon request). Contrary to the data, the model with linear taxes predicts male hours worked to be 140 hours higher in 1979 than in 2008, whereas the actual male hours in 1979 were only 50 hours higher. Similarly, the fit for the female employment rate is also worse than in the benchmark model: in the data, the employment rate is 15 percentage points higher in the late 2000s than in the 70s, which is perfectly replicated by the benchmark model, while the model with linear taxes would predict an increase of only 11 percentage points. The fit of female hours worked per employed is similar to the benchmark model.

8 Alternative Specifications

In this section, we conduct a number of robustness checks. As in the previous section, in all of them we recalibrate the model to match the targeted moments.

8.1 The Effect of Children

In Section 3, we already discussed that differential effects of children on married women's labor supply are not a major driving force of the differences that we see in the data. Table 10 repeats in columns 2 and 3 the benchmark results, and compares them in columns 4 and 5 to data and model for women without children in preschool or school age. In the model, we then also assume that no children are present in the household when calculating taxes.

As a comparison of the data in columns 2 and 4 shows, the differences in hours worked relative to the US do not change much when we focus on childless women, but labor supply increases in Western Europe relative to the US. The model predicts minimally smaller differences to the US for married women when we simulate only households without children. Overall, the model fit thus remains similar, and even slightly improves for Western and Eastern Europe. We also investigated differences in the data if rather than excluding women and men with children we regress hours worked on dummies for the presence of children in the household and predict hours setting the dummies equal to zero, and results are very similar.

8.2 Further Robustness Checks

We perform two further robustness checks. First, we change the curvature parameter ϕ on the disutility of working only for women to 1 and 1.5, thereby increasing the female labor supply

Table 10: Labor Supply Relative to the US – Benchmark vs. Childless Women

	Country Group	Benchmark Data	Benchmark Model	Without Children Data	Without Children Model
$\mathbf{HWP}_{m}$	Eastern Europe	−0.11	−0.06	−0.14	−0.04
	Scandinavia	−0.17	−0.11	–	–
	Western Europe	−0.10	−0.08	−0.10	−0.07
	Southern Europe	−0.09	−0.04	−0.09	−0.04
$\mathbf{HWP}_{f}$	Eastern Europe	−0.03	−0.05	−0.05	−0.04
	Scandinavia	−0.09	−0.06	–	–
	Western Europe	−0.26	−0.17	−0.22	−0.17
	Southern Europe	−0.31	−0.12	−0.32	−0.11
$\mathbf{ER}_{f}$	Eastern Europe	−0.02	−0.02	0.00	−0.02
	Scandinavia	0.13	−0.02	–	–
	Western Europe	0.01	−0.07	0.00	−0.08
	Southern Europe	−0.15	−0.08	−0.17	−0.08
$\mathbf{HWE}_{f}$	Eastern Europe	0.00	−0.03	−0.04	−0.03
	Scandinavia	−0.23	−0.03	–	–
	Western Europe	−0.27	−0.08	−0.22	−0.07
	Southern Europe	−0.12	−0.01	−0.13	0.00

elasticity. We leave the value for men at 0.5. Table A.17 in the appendix shows the results. Changing the female elasticity has almost no effect on male labor supply. For married women, increasing the elasticity increases the effects of any cross-country differences, and therefore increases the difference between hours worked in the US and Europe. This leads to a worsening of the fit for Scandinavia and Eastern Europe, but an improved fit for Western Europe. The effect of the elasticity on female hours worked is quite small and comes almost exclusively through the intensive margin, but is absent there for Southern Europe.

Secondly, we vary the redistribution scheme of government revenues. In the benchmark analysis, we assume full redistribution, while here we consider two alternative redistribution schemes: first, the alternative extreme of no redistribution, i.e. $\lambda^i = 0$, or secondly, a specification similar to the one used by Prescott (2004), namely setting λ^i equal to 1 minus twice the share of expenditures on military from all government expenditures. Redistribution matters in the analysis, as the redistribution of tax revenues in a lump-sum fashion to households provides important income effects that lower the incentives to work.

As Table A.18 in the appendix shows, compared to the benchmark scenario a scenario with no redistribution of government revenues leads to significantly higher predicted hours worked in

Europe. This lowers the model-predicted US-European difference and even turns it positive for married women in Eastern Europe and Scandinavia. In the benchmark scenario, the income effect from redistribution is on average larger in Europe than in the US due to higher taxes and therefore higher government revenues in Europe. This leads to larger disincentive effects on labor supply from redistribution in Europe than in the US, which are absent in the case of no redistribution.

Going from the benchmark redistribution to the country-specific redistribution scheme used by Prescott (2004) decreases hours worked for men and women in Europe relative to the US more than in the benchmark. Due to the higher military expenses in the US than in Europe, a lower share of government revenues is redistributed in the US, which makes the income effect of high taxes via transfers even larger in Europe. Comparing the benchmark to the Prescott redistribution scenario, the fit is always slightly worse in the benchmark scenario for married men, as well for married women in Southern and Western Europe, but is slightly better for married women in Scandinavia and Eastern Europe.

9 Conclusion

Relying on three micro data sets, we document average hours worked of married couples for a sample of eighteen European countries and the US over the time period 2001 to 2008. We find that hours worked vary significantly across countries, and the largest variations can be found for married women. Whereas European married men work relatively homogeneously between 9 and 17 percent fewer hours than US married men, the picture for married women is much more heterogeneous, with Eastern European and Scandinavian married women working only 3 and 9 percent fewer hours than US married women, but Western and Southern European women working 26 and 31 percent fewer hours.

We investigate in how far international differences in consumption taxes, labor income tax systems, gender wage gaps and educational premia, and the educational composition and matching into couples can quantitatively account for the international differences in hours worked by married couples. We do this in the context of a static model of joint labor supply, holding preferences constant across countries. The model only slightly underpredicts the observed international hours differences for married men. Moreover, it does a good job in explaining international differences in hours worked by married women. Specifically, the model is able to replicate the low hours worked per married woman differences between the US and Eastern Europe and Scandinavia, as well as the large differences between the US and Western Europe. Only for Southern Europe can the model only explain 40 percent of the observed difference.

A decomposition analysis shows that consumption taxes offer significant disincentives to work in all European countries and for both sexes. The effect of non-linear labor income taxes is however much more complicated: for married men, labor income taxes always predict lower hours worked in Europe than in the US, which is however not true for married women. While the on average higher tax rates in Europe also provide a disincentive effect for married women, the tax structure is often more favorable for European women than for US ones, since the US features a system of joint taxation of married couples. We find that going from the current tax system to a system of strictly separate taxation of married couples would increase hours worked of married women by around 300 hours in Germany, and by between 100 and 250 hours in Belgium, Denmark, Ireland, the US, France, and Portugal.

The model that we use in this paper is a very simple one. It does e.g. not incorporate a home production sector in competition with the service sector of the economy, a subsistence level of consumption, a life cycle component, or income risk. The success of the model is thus quite remarkable. While the model results leave some scope for other factors explaining hours worked of married women, they come quite close to replicating the data. Taxes and wages thus have large explanatory power for international differences in hours worked of married women. It is however crucial to model non-linear labor income tax systems in order to replicate the behavior of married women. The origins of the different decomposition into the extensive and the intensive margin for married women in Scandinavia and Western Europe remain as an open question for future research.

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A Appendix

A.1 Data Issues

For data reasons detailed in Bick et al. (2014), we exclude the years 2001 for the UK and 2005 for Spain from the analysis. Furthermore, we exclude the year 2001 for Italy and the year 2008 for Ireland because the OECD TaxBen Module does not produce the corresponding tax rates. We exclude households in the ELFS of which at least one member lives in an institution, since the CPS does not cover individuals living in institutions. This leads to the deletion of a negligent number of observations. A detailed description of all issues involving setting up the data sets can be found in Bick et al. (2014).

A.2 Figures

Figure A.1: Fraction of Married Women (Ages 25-54)

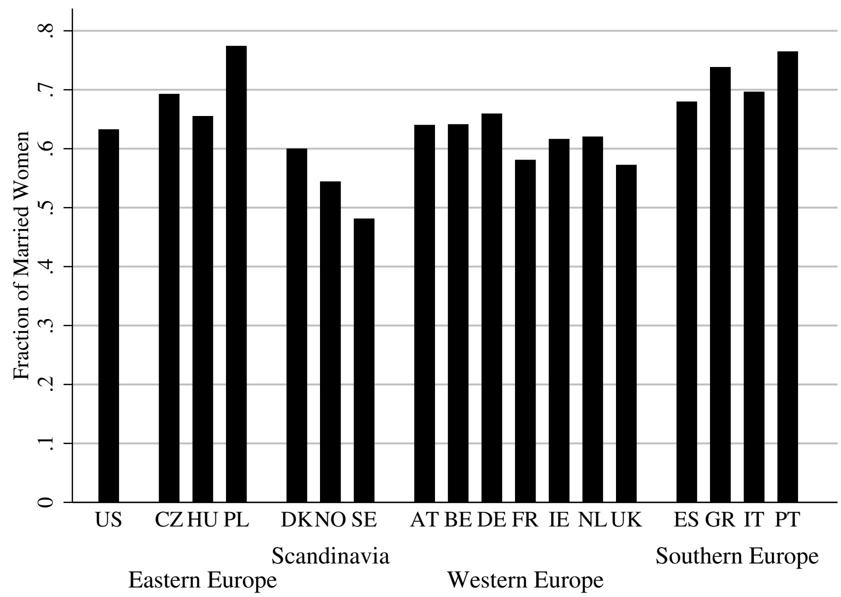


Figure A.2: Employment Rates (ER) and Hours Worked per Employed (HWE) of Married Men (Ages 25-54)

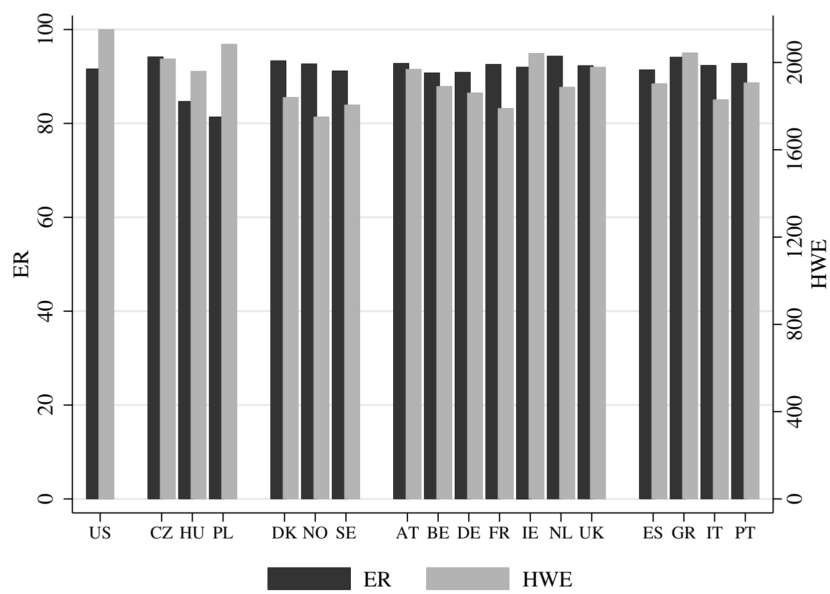


Figure A.3: Joint vs. Separate Filing – Hours Worked per Person (HWP) – Country Calibration

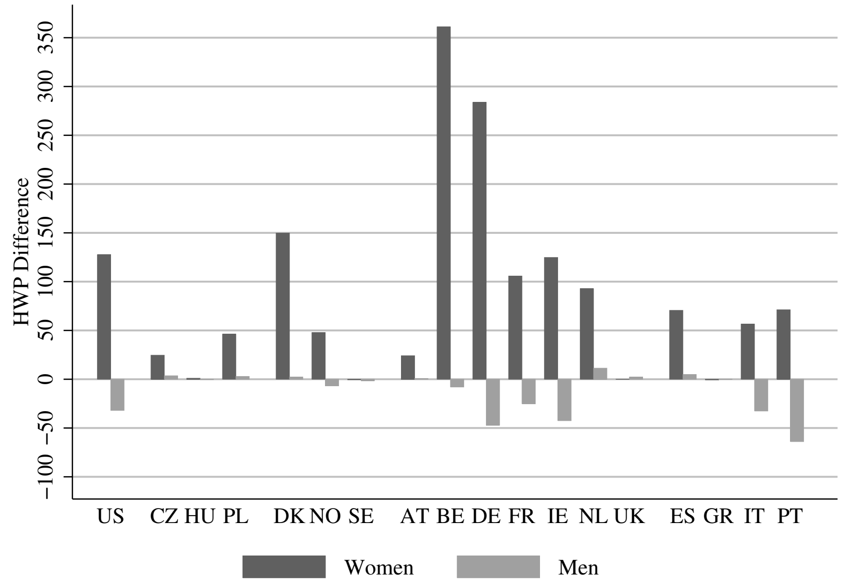
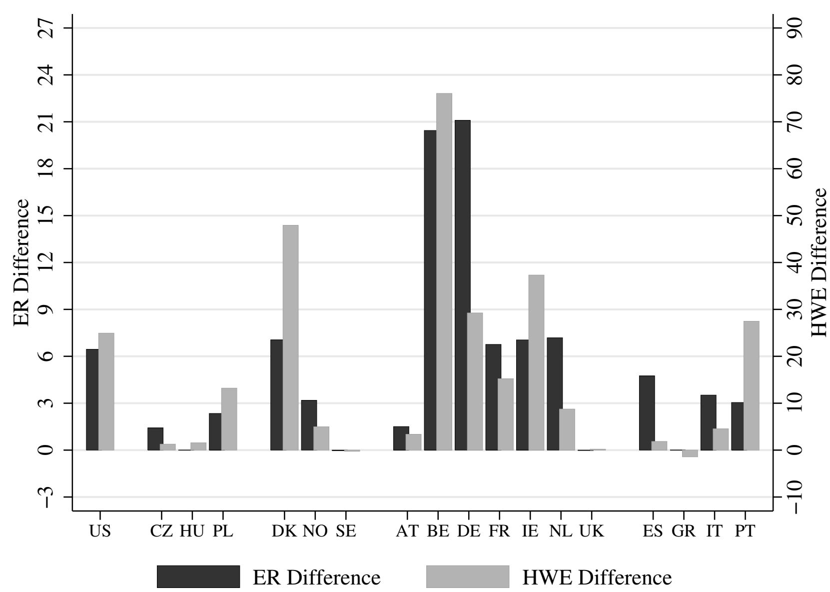


Figure A.4: Joint vs. Separate Filing – Female Employment Rate (ER) and Female Hours Worked Per Employed (HWE) – Country Calibration



A.3 Tables

Table A.1: Share of Observations Dropped from the Sample

Country	Men	Women
Czech Repbulic	0.056	0.125
Hungary	0.066	0.133
Poland	0.135	0.193
Mean	*0.086*	*0.151*
Denmark	0.007	0.006
Norway	0.012	0.017
Sweden	0.005	0.005
Mean	*0.008*	*0.010*
Austria	0.067	0.135
Belgium	0.073	0.146
France	0.044	0.095
Germany	0.079	0.147
Ireland	0.067	0.114
Netherlands	0.038	0.096
United Kingdom	0.086	0.135
Mean	*0.065*	*0.124*
Greece	0.052	0.183
Italy	0.047	0.146
Portugal	0.080	0.154
Spain	0.047	0.121
Mean	*0.057*	*0.151*
United States	0.069	0.102

Table A.2: Hours Worked per Person by Gender and Marital Status

	Men		**Women**	
Country	Married	Single	Married	Single
Czech Repbulic	1899.6	1633.8	1256.7	1310.6
Hungary	1659.5	1460.6	1182.9	1298.0
Poland	1694.7	1301.7	1170.2	1210.0
Mean	*1751.3*	*1465.4*	*1203.3*	*1272.9*
Denmark	1717.7	1452.0	1218.3	1108.9
Norway	1622.9	1409.2	1070.7	1074.7
Sweden	1645.6	1475.5	1179.7	1153.4
Mean	*1662.1*	*1445.6*	*1156.2*	*1112.3*
Austria	1826.4	1626.8	969.4	1296.2
Belgium	1716.1	1459.6	987.7	1180.6
France	1656.0	1398.2	1031.6	1113.3
Germany	1690.8	1400.5	809.8	1260.3
Ireland	1878.7	1619.5	809.8	1275.2
Netherlands	1780.3	1613.8	763.7	1216.6
United Kingdom	1826.6	1544.7	994.3	1170.2
Mean	*1767.9*	*1523.3*	*909.5*	*1216.1*
Greece	1923.2	1628.0	979.3	1264.1
Italy	1689.7	1354.9	748.4	1041.7
Portugal	1770.3	1358.2	1266.9	1297.9
Spain	1740.0	1419.0	832.7	1212.8
Mean	*1780.8*	*1440.0*	*956.8*	*1204.1*
United States	1970.4	1565.3	1235.0	1422.0
Mean	*1761.6*	*1484.5*	*1028.2*	*1217.0*
Standard Deviation	*104.2*	*108.8*	*179.5*	*96.6*
Coefficient of Variation	*0.059*	*0.073*	*0.175*	*0.079*
Var(log hours)	*0.003*	*0.005*	*0.033*	*0.006*

Table A.3: Employment Rate (ER) and Hours Worked per Employed (HWE) of Married Women

Country	**ER$_f$**	**HWE$_f$**
Czech Repbulic	73.6	1706.4
Hungary	66.3	1784.7
Poland	66.6	1758.7
Mean	*68.8*	*1749.9*
Denmark	83.6	1456.5
Norway	82.6	1295.5
Sweden	84.4	1396.9
Mean	*83.6*	*1383.0*
Austria	74.0	1310.2
Belgium	70.7	1395.3
France	73.4	1405.2
Germany	71.4	1134.9
Ireland	62.0	1306.0
Netherlands	74.6	1022.4
United Kingdom	76.8	1295.4
Mean	*71.8*	*1267.1*
Greece	56.3	1740.6
Italy	54.6	1370.8
Portugal	76.0	1665.9
Spain	55.0	1518.5
Mean	*60.5*	*1573.9*
United States	70.7	1745.8
Mean	*70.7*	*1461.6*
Standard Deviation	*9.2*	*227.3*
Coefficient of Variation	*0.130*	*0.155*

Table A.4: Labor Supply of Married Women Relative to the US – All Women (Raw) and Women Without Children

	$\mathbf{HWP}_f$		$\mathbf{ER}_f$		$\mathbf{HWE}_f$	
Country	Raw	w/o Kids	Raw	w/o Kids	Raw	w/o Kids
Czech Repbulic	0.02	0.05	0.03	0.10	−0.02	−0.06
Hungary	−0.04	−0.04	−0.04	−0.01	0.02	−0.03
Poland	−0.05	−0.16	−0.04	−0.10	0.01	−0.04
Mean	*-0.03*	*-0.05*	*-0.02*	*0.00*	*0.00*	*-0.04*
Austria	−0.22	−0.16	0.03	0.02	−0.25	−0.17
Belgium	−0.20	−0.33	0.00	−0.10	−0.20	−0.23
France	−0.16	−0.22	0.03	0.00	−0.20	−0.22
Germany	−0.34	−0.22	0.01	0.02	−0.35	−0.24
Ireland	−0.34	−0.19	−0.09	−0.03	−0.25	−0.16
Netherlands	−0.38	−0.34	0.04	−0.01	−0.41	−0.33
United Kingdom	−0.19	−0.09	0.06	0.07	−0.26	−0.17
Mean	*-0.26*	*-0.22*	*0.01*	*0.00*	*-0.27*	*-0.22*
Greece	−0.21	−0.28	−0.14	−0.19	0.00	−0.05
Italy	−0.39	−0.36	−0.16	−0.15	−0.22	−0.21
Portugal	0.03	−0.13	0.05	−0.02	−0.05	−0.10
Spain	−0.33	−0.33	−0.16	−0.17	−0.13	−0.14
Mean	*-0.23*	*-0.28*	*-0.10*	*-0.13*	*-0.10*	*-0.13*

Table A.5: Labor Supply of Married Men and Women Relative to the US – All (Raw) and Excluding Unemployed Individuals

	HWP$_m$		**HWP$_f$**		**ER$_f$**	
Country	Raw	w/o UE	Raw	w/o UE	Raw	w/o UE
Czech Repbulic	−0.04	−0.03	0.02	0.06	0.03	0.06
Hungary	−0.16	−0.15	−0.04	−0.02	−0.04	−0.03
Poland	−0.14	−0.08	−0.05	0.04	−0.04	0.03
Mean	*-0.11*	*-0.09*	*-0.03*	*0.03*	*-0.02*	*0.02*
Denmark	−0.13	−0.13	−0.01	−0.01	0.13	0.14
Norway	−0.18	−0.19	−0.13	−0.14	0.12	0.12
Sweden	−0.16	−0.16	−0.04	−0.03	0.14	0.15
Mean	*-0.16*	*-0.16*	*-0.06*	*-0.06*	*0.13*	*0.13*
Austria	−0.07	−0.07	−0.22	−0.21	0.03	0.04
Belgium	−0.13	−0.12	−0.20	−0.18	0.00	0.02
France	−0.16	−0.15	−0.16	−0.13	0.03	0.06
Germany	−0.14	−0.11	−0.34	−0.32	0.01	0.04
Ireland	−0.05	−0.05	−0.34	−0.34	−0.09	−0.09
Netherlands	−0.10	−0.11	−0.38	−0.38	0.04	0.04
United Kingdom	−0.07	−0.08	−0.19	−0.19	0.06	0.06
Mean	*-0.10*	*-0.10*	*-0.26*	*-0.25*	*0.01*	*0.03*
Greece	−0.02	−0.03	−0.21	−0.16	−0.14	−0.12
Italy	−0.14	−0.14	−0.39	−0.37	−0.16	−0.15
Portugal	−0.10	−0.09	0.03	0.06	0.05	0.08
Spain	−0.12	−0.10	−0.33	−0.28	−0.16	−0.13
Mean	*-0.10*	*-0.09*	*-0.23*	*-0.19*	*-0.10*	*-0.08*

Table A.6: Demographic Composition

Country	**Low Education** Men	Women	**High Education** Men	Women	Assortative Matching
Czech Repbulic	4.6	9.2	15.6	12.1	0.46
Hungary	14.1	20.8	16.5	18.9	0.55
Poland	9.8	10.8	14.9	18.9	0.52
Mean	*9.5*	*13.6*	*15.7*	*16.7*	*0.51*
Denmark	15.9	19.3	31.7	35.6	0.39
Norway	12.7	13.9	35.2	38.3	0.40
Sweden	16.8	13.9	27.9	37.1	0.38
Mean	*15.1*	*15.7*	*31.6*	*37.0*	*0.39*
Austria	12.7	23.8	21.1	14.7	0.39
Belgium	32.0	28.7	31.4	34.7	0.55
France	28.1	29.7	24.8	28.0	0.48
Germany	10.5	16.4	31.6	20.5	0.50
Ireland	35.6	27.7	28.7	29.7	0.52
Netherlands	25.5	28.9	30.7	24.5	0.44
United Kingdom	22.1	29.4	33.0	33.0	0.40
Mean	*23.8*	*26.4*	*28.8*	*26.4*	*0.47*
Greece	38.4	34.4	23.3	21.4	0.63
Italy	50.7	45.8	10.7	12.1	0.54
Portugal	78.1	72.6	9.6	13.8	0.62
Spain	52.0	50.8	27.0	27.8	0.53
Mean	*54.8*	*50.9*	*17.6*	*18.8*	*0.58*
United States	9.3	7.8	43.3	45.7	0.54

Note: The last column shows the correlation coefficient of a simple correlation between the education level of husbands and wives. Data for Scandinavia in the last column come from EU-SILC.

Table A.7: Targeted Female Employment Rates

	Data	Model	Data-Model
Low educated husband			
Low educated woman	42.4	44.3	−1.9
Medium educated woman	63.3	60.3	2.9
High educated woman	76.1	77.6	−1.5
Mean	*60.6*	*60.7*	*-0.1*
Medium educated husband			
Low educated woman	48.4	50.1	−1.8
Medium educated woman	71.2	68.6	2.6
High educated woman	83.2	85.7	−2.5
Mean	*67.6*	*68.1*	*-0.5*
High educated husband			
Low educated woman	49.6	51.7	−2.2
Medium educated woman	66.2	62.9	3.3
High educated woman	73.7	74.9	−1.2
Mean	*63.2*	*63.2*	*0.0*

Table A.8: Decomposition of Male Hours Worked per Person Relative to the US

Country	**Data**	**Model**	τ_l	τ_c	**w**	$\tau_l + \tau_c + w$
Czech Republic	−0.04	−0.01	0.00	−0.02	−0.01	−0.02
Hungary	−0.16	−0.11	−0.11	−0.04	−0.04	−0.13
Poland	−0.14	−0.04	−0.01	−0.03	−0.03	−0.06
Mean	*-0.11*	*-0.06*	*-0.04*	*-0.03*	*-0.03*	*-0.07*
Norway	−0.18	−0.10	−0.06	−0.04	0.01	−0.10
Sweden	−0.16	−0.13	−0.08	−0.06	0.01	−0.13
Mean	*-0.17*	*-0.11*	*-0.07*	*-0.05*	*0.01*	*-0.12*
Austria	−0.07	−0.09	−0.09	−0.03	−0.01	−0.11
Belgium	−0.13	−0.14	−0.13	−0.03	−0.02	−0.15
France	−0.16	−0.02	0.00	−0.04	−0.01	−0.04
Germany	−0.14	−0.08	−0.07	−0.02	0.01	−0.08
Ireland	−0.05	−0.05	−0.03	−0.04	−0.01	−0.07
Netherlands	−0.10	−0.10	−0.08	−0.03	0.00	−0.11
United Kingdom	−0.07	−0.04	−0.03	−0.02	0.01	−0.04
Mean	*-0.10*	*-0.08*	*-0.06*	*-0.03*	*-0.01*	*-0.09*
Greece	−0.02	−0.04	−0.02	−0.02	0.00	−0.05
Italy	−0.14	−0.11	−0.08	−0.03	−0.03	−0.12
Spain	−0.12	0.02	0.00	−0.02	0.01	−0.01
Mean	*-0.09*	*-0.04*	*-0.03*	*-0.02*	*-0.01*	*-0.06*

Table A.9: Decomposition of Female Hours Worked per Person Relative to the US

Country	**Data**	**Model**	τ_l	τ_c	**w**	$\tau_l + \tau_c + w$
Czech Republic	0.02	−0.02	0.00	−0.05	0.01	−0.02
Hungary	−0.04	−0.01	0.10	−0.09	0.01	−0.06
Poland	−0.05	−0.13	−0.02	−0.07	−0.03	−0.10
Mean	*-0.03*	*-0.05*	*0.03*	*-0.07*	*0.00*	*-0.06*
Norway	−0.13	−0.05	0.00	−0.10	0.04	−0.04
Sweden	−0.04	−0.08	0.02	−0.15	0.03	−0.08
Mean	*-0.09*	*-0.06*	*0.01*	*-0.12*	*0.03*	*-0.06*
Austria	−0.22	−0.06	0.01	−0.07	0.04	−0.02
Belgium	−0.20	−0.29	−0.23	−0.08	0.09	−0.22
France	−0.16	−0.13	0.00	−0.10	0.04	−0.06
Germany	−0.34	−0.29	−0.24	−0.05	0.01	−0.27
Ireland	−0.34	−0.19	0.02	−0.10	−0.04	−0.12
Netherlands	−0.38	−0.14	−0.06	−0.09	0.03	−0.08
United Kingdom	−0.19	−0.11	0.05	−0.06	−0.01	−0.02
Mean	*-0.26*	*-0.17*	*-0.06*	*-0.08*	*0.02*	*-0.11*
Greece	−0.21	−0.07	0.12	−0.05	−0.08	0.02
Italy	−0.39	−0.10	−0.02	−0.09	0.06	−0.03
Spain	−0.33	−0.19	0.11	−0.05	−0.08	−0.01
Mean	*-0.31*	*-0.12*	*0.07*	*-0.06*	*-0.03*	*-0.01*

Table A.10: Decomposition of Female Employment Rate Relative to the US

Country	**Data**	**Model**	τ_l	τ_c	**w**	$\tau_l + \tau_c + w$
Czech Republic	0.03	−0.02	0.00	−0.02	0.00	−0.01
Hungary	−0.04	0.03	0.07	−0.04	0.01	0.02
Poland	−0.04	−0.07	−0.01	−0.03	−0.01	−0.05
Mean	*-0.02*	*-0.02*	*0.02*	*-0.03*	*0.00*	*-0.01*
Norway	0.12	−0.01	0.02	−0.04	0.02	−0.01
Sweden	0.14	−0.03	0.03	−0.06	0.02	−0.02
Mean	*0.13*	*-0.02*	*0.02*	*-0.05*	*0.02*	*-0.02*
Austria	0.03	0.00	0.04	−0.03	0.02	0.02
Belgium	0.00	−0.12	−0.07	−0.03	0.04	−0.08
France	0.03	−0.08	0.00	−0.04	0.02	−0.03
Germany	0.01	−0.14	−0.10	−0.02	0.01	−0.12
Ireland	−0.09	−0.08	0.04	−0.04	−0.02	−0.02
Netherlands	0.04	−0.07	0.00	−0.04	0.02	−0.03
United Kingdom	0.06	−0.04	0.04	−0.03	0.00	0.01
Mean	*0.01*	*-0.07*	*-0.01*	*-0.03*	*0.01*	*-0.03*
Greece	−0.14	−0.05	0.07	−0.02	−0.04	0.02
Italy	−0.16	−0.06	0.01	−0.04	0.03	0.00
Spain	−0.16	−0.13	0.05	−0.02	−0.04	−0.01
Mean	*-0.15*	*-0.08*	*0.04*	*-0.03*	*-0.01*	*0.01*

Table A.11: Decomposition of Female Hours Worked per Employed Relative to the US

Country	**Data**	**Model**	τ_l	τ_c	**w**	$\tau_l + \tau_c + w$
Czech Republic	−0.02	0.01	0.01	−0.02	0.00	0.00
Hungary	0.02	−0.06	0.00	−0.04	0.00	−0.09
Poland	0.01	−0.04	0.00	−0.03	−0.01	−0.03
Mean	*0.00*	*-0.03*	*0.00*	*-0.03*	*0.00*	*-0.04*
Norway	−0.26	−0.03	−0.02	−0.04	0.01	−0.03
Sweden	−0.20	−0.04	−0.02	−0.06	0.01	−0.05
Mean	*-0.23*	*-0.03*	*-0.02*	*-0.05*	*0.01*	*-0.04*
Austria	−0.25	−0.07	−0.05	−0.03	0.01	−0.05
Belgium	−0.20	−0.14	−0.14	−0.03	0.03	−0.12
France	−0.20	−0.02	0.00	−0.04	0.01	−0.02
Germany	−0.35	−0.12	−0.11	−0.02	0.00	−0.13
Ireland	−0.25	−0.08	−0.04	−0.04	−0.01	−0.09
Netherlands	−0.41	−0.04	−0.05	−0.04	0.01	−0.04
United Kingdom	−0.26	−0.06	0.00	−0.02	−0.01	−0.04
Mean	*-0.27*	*-0.08*	*-0.06*	*-0.03*	*0.01*	*-0.07*
Greece	0.00	0.00	0.02	−0.02	−0.03	−0.01
Italy	−0.22	−0.01	−0.03	−0.04	0.02	−0.03
Spain	−0.13	−0.01	0.04	−0.02	−0.03	−0.01
Mean	*-0.12*	*-0.01*	*0.01*	*-0.03*	*-0.02*	*-0.02*

Table A.12: Decomposition Relative to the US – Tax Structure and Tax Level with κ

	Country Group	**Data**	τ_l	**Tax Structure**	**Tax Level**
$\mathbf{HWP}_m$	Eastern Europe	−0.11	−0.04	−0.04	0.00
	Scandinavia	−0.17	−0.07	−0.05	−0.02
	Western Europe	−0.10	−0.06	−0.05	−0.01
	Southern Europe	−0.09	−0.03	−0.03	0.00
$\mathbf{HWP}_f$	Eastern Europe	−0.03	0.03	0.02	0.00
	Scandinavia	−0.09	0.01	0.08	−0.06
	Western Europe	−0.26	−0.06	−0.04	−0.03
	Southern Europe	−0.31	0.07	0.07	0.00
$\mathbf{ER}_f$	Eastern Europe	−0.02	0.02	0.02	0.00
	Scandinavia	0.13	0.02	0.05	−0.03
	Western Europe	0.01	−0.01	0.00	−0.01
	Southern Europe	−0.15	0.04	0.04	0.00
$\mathbf{HWE}_f$	Eastern Europe	0.00	0.00	0.00	0.00
	Scandinavia	−0.23	−0.02	0.00	−0.02
	Western Europe	−0.27	−0.06	−0.04	−0.01
	Southern Europe	−0.12	0.01	0.01	0.00

Table A.13: Decomposition of Male Hours Worked per Person Relative to the US – Tax Structure and Level

Country	**Data**	τ_l	**Tax Structure**	**Tax Level**
Czech Republic	−0.04	0.00	−0.02	0.02
Hungary	−0.16	−0.11	−0.16	0.05
Poland	−0.14	−0.01	0.03	−0.04
Mean	*-0.11*	*-0.04*	*-0.05*	*0.01*
Norway	−0.18	−0.06	−0.04	−0.03
Sweden	−0.16	−0.08	−0.04	−0.03
Mean	*-0.17*	*-0.07*	*-0.04*	*-0.03*
Austria	−0.07	−0.09	−0.07	−0.02
Belgium	−0.13	−0.13	−0.07	−0.05
France	−0.16	0.00	0.01	−0.01
Germany	−0.14	−0.07	−0.02	−0.05
Ireland	−0.05	−0.03	−0.08	0.05
Netherlands	−0.10	−0.08	−0.04	−0.05
United Kingdom	−0.07	−0.03	−0.03	0.00
Mean	*-0.10*	*-0.06*	*-0.04*	*-0.02*
Greece	−0.02	−0.02	−0.02	0.00
Italy	−0.14	−0.08	−0.06	−0.02
Spain	−0.12	0.00	−0.01	0.02
Mean	*-0.09*	*-0.03*	*-0.03*	*0.00*

Table A.14: Decomposition of Female Hours Worked per Person Relative to the US – Tax Structure and Level

Country	**Data**	τ_l	**Tax Structure**	**Tax Level**
Czech Republic	0.02	0.00	−0.05	0.05
Hungary	−0.04	0.10	0.01	0.09
Poland	−0.05	−0.02	0.08	−0.10
Mean	*-0.03*	*0.03*	*0.02*	*0.01*
Norway	−0.13	0.00	0.06	−0.06
Sweden	−0.04	0.02	0.10	−0.08
Mean	*-0.09*	*0.01*	*0.08*	*-0.07*
Austria	−0.22	0.01	0.03	−0.02
Belgium	−0.20	−0.23	−0.10	−0.13
France	−0.16	0.00	0.02	−0.02
Germany	−0.34	−0.24	−0.13	−0.11
Ireland	−0.34	0.02	−0.09	0.10
Netherlands	−0.38	−0.06	0.05	−0.11
United Kingdom	−0.19	0.05	0.06	−0.01
Mean	*-0.26*	*-0.06*	*-0.02*	*-0.04*
Greece	−0.21	0.12	0.12	0.00
Italy	−0.39	−0.02	0.03	−0.05
Spain	−0.33	0.11	0.07	0.04
Mean	*-0.31*	*0.07*	*0.07*	*0.00*

Table A.15: Decomposition of Female Employment Rate Relative to the US – Tax Structure and Level

Country	**Data**	τ_l	**Tax Structure**	**Tax Level**
Czech Republic	0.03	0.00	−0.03	0.02
Hungary	−0.04	0.07	0.04	0.04
Poland	−0.04	−0.01	0.03	−0.04
Mean	*-0.02*	*0.02*	*0.01*	*0.01*
Norway	0.12	0.02	0.04	−0.03
Sweden	0.14	0.03	0.06	−0.03
Mean	*0.13*	*0.02*	*0.05*	*-0.03*
Austria	0.03	0.04	0.05	−0.01
Belgium	0.00	−0.07	−0.03	−0.04
France	0.03	0.00	0.01	−0.01
Germany	0.01	−0.10	−0.05	−0.05
Ireland	−0.09	0.04	0.00	0.04
Netherlands	0.04	0.00	0.04	−0.04
United Kingdom	0.06	0.04	0.04	0.00
Mean	*0.01*	*-0.01*	*0.01*	*-0.02*
Greece	−0.14	0.07	0.07	0.00
Italy	−0.16	0.01	0.03	−0.02
Spain	−0.16	0.05	0.03	0.02
Mean	*-0.15*	*0.04*	*0.04*	*0.00*

Table A.16: Decomposition of Female Hours Worked per Employed Relative to the US – Tax Structure and Level

Country	**Data**	τ_l	**Tax Structure**	**Tax Level**
Czech Republic	−0.02	0.01	−0.01	0.02
Hungary	0.02	0.00	−0.04	0.04
Poland	0.01	0.00	0.04	−0.04
Mean	*0.00*	*0.00*	*0.00*	*0.01*
Norway	−0.26	−0.02	0.00	−0.02
Sweden	−0.20	−0.02	0.01	−0.03
Mean	*-0.23*	*-0.02*	*0.00*	*-0.03*
Austria	−0.25	−0.05	−0.04	−0.01
Belgium	−0.20	−0.14	−0.06	−0.08
France	−0.20	0.00	0.01	−0.01
Germany	−0.35	−0.11	−0.06	−0.05
Ireland	−0.25	−0.04	−0.09	0.05
Netherlands	−0.41	−0.05	0.00	−0.05
United Kingdom	−0.26	0.00	0.00	0.00
Mean	*-0.27*	*-0.06*	*-0.03*	*-0.02*
Greece	0.00	0.02	0.02	0.00
Italy	−0.22	−0.03	−0.01	−0.02
Spain	−0.13	0.04	0.02	0.02
Mean	*-0.12*	*0.01*	*0.01*	*0.00*

Table A.17: Labor Supply Relative to the US – Different Female Elasticities

	Country Group	**Data**	**Benchmark**	$\phi_f = 1.0$	$\phi_f = 1.5$
$\mathbf{HWP}_{\boldsymbol{m}}$	Eastern Europe	−0.11	−0.06	−0.05	−0.05
	Scandinavia	−0.17	−0.11	−0.12	−0.12
	Western Europe	−0.10	−0.08	−0.07	−0.07
	Southern Europe	−0.09	−0.04	−0.05	−0.05
$\mathbf{HWP}_{\boldsymbol{f}}$	Eastern Europe	−0.03	−0.05	−0.06	−0.06
	Scandinavia	−0.09	−0.06	−0.06	−0.07
	Western Europe	−0.26	−0.17	−0.20	−0.23
	Southern Europe	−0.31	−0.12	−0.11	−0.11
$\mathbf{ER}_{\boldsymbol{f}}$	Eastern Europe	−0.02	−0.02	−0.01	−0.01
	Scandinavia	0.13	−0.02	−0.01	−0.01
	Western Europe	0.01	−0.07	−0.06	−0.06
	Southern Europe	−0.15	−0.08	−0.08	−0.08
$\mathbf{HWE}_{\boldsymbol{f}}$	Eastern Europe	0.00	−0.03	−0.04	−0.05
	Scandinavia	−0.23	−0.03	−0.05	−0.06
	Western Europe	−0.27	−0.08	−0.12	−0.16
	Southern Europe	−0.12	−0.01	0.00	−0.01

Table A.18: Labor Supply Relative to the US – No and Prescott Redistribution

	Country Group	Data	Benchmark	No Redistribution	Prescott
$\mathbf{HWP}_m$	Eastern Europe	−0.11	−0.06	−0.02	−0.07
	Scandinavia	−0.17	−0.11	−0.06	−0.12
	Western Europe	−0.10	−0.08	−0.03	−0.09
	Southern Europe	−0.09	−0.04	−0.01	−0.06
$\mathbf{HWP}_f$	Eastern Europe	−0.03	−0.05	0.03	−0.09
	Scandinavia	−0.09	−0.06	0.13	−0.09
	Western Europe	−0.26	−0.17	−0.08	−0.20
	Southern Europe	−0.31	−0.12	−0.07	−0.15
$\mathbf{ER}_f$	Eastern Europe	−0.02	−0.02	0.02	−0.03
	Scandinavia	0.13	−0.02	0.07	−0.03
	Western Europe	0.01	−0.07	−0.03	−0.09
	Southern Europe	−0.15	−0.08	−0.06	−0.09
$\mathbf{HWE}_f$	Eastern Europe	0.00	−0.03	0.01	−0.04
	Scandinavia	−0.23	−0.03	0.04	−0.04
	Western Europe	−0.27	−0.08	−0.03	−0.09
	Southern Europe	−0.12	−0.01	0.02	−0.02