Marriage Stability, Taxation and Aggregate Labor Supply in the U.S. vs. Europe[1]

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Abstract

Americans work more than Europeans. Using micro data from the U.S. and 17 European countries, we study the contributions from demographic subgroups to these aggregate level differences. We document that women are typically the largest contributors to the discrepancy in work hours. We also document a negative empirical correlation between hours worked and different measures of taxation, driven by men, and a positive correlation between hours worked and divorce rates, driven by women. Motivated by these observations, we develop a life-cycle model with heterogeneous agents, marriage and divorce and use it to study the impact of two mechanisms on labor supply: (i) differences in marriage stability and (ii) differences in tax systems. We calibrate the model to U.S. data and study how labor supply in the U.S. changes as we introduce European tax systems, and as we replace the U.S. divorce and marriage rates with their European equivalents. We find that the divorce and tax mechanisms combined explain 58% of the variation in labor supply between the U.S. and the European countries in our sample.

Keywords: Aggregate Labor Supply, Taxation, Marriage, Divorce, Heterogeneous Households

JEL: E24, E62, H24, H31, J21, J22

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1 Introduction

It is a well-known empirical finding that aggregate hours worked are higher in the United States than in Europe and that there is also substantial variation among European countries; see for instance Prescott (2004) and Rogerson (2006). These differences deserve attention: Rogerson (2006) notes that they are an order of magnitude larger than the fluctuations at business cycle frequencies in post-WWII U.S. data. Are the differences in hours worked due to public policies or are they due to other fundamental differences between societies? The first contribution of this paper is an analysis of micro data to investigate which demographic groups are responsible for the discrepancy in work hours between the US and Europe. We hope that this analysis can serve as a guide for future research on the topic. The second contribution is a quantitative assessment of two driving forces for cross-country differences in labor supply, motivated by our empirical findings: (i) differences in marriage stability, which is a novel channel, and (ii) differences in taxation, which has been proposed before but deserve a more careful reexamination based on our empirical analysis.

We begin by using micro level data to document the contribution of various demographic groups to the aggregate differences in hours worked between the U.S. and 17 European countries (Western Europe, except Iceland and Lichtenstein[4]). We divide the populations into 12 demographic groups, by age, gender and marital status, and find that the largest contribution comes from prime-aged women. In most European countries[5], women work substantially less than in the United States while the difference in hours worked between European and American men is smaller. This is especially true for married women, but also holds for single women, and for women with and without children. Next, we document a negative cross-country correlation between tax levels and hours worked, and a positive correlation between divorce rates

[4]The selection of countries is due to data availability.

[5]The Nordic countries are an exception.

and hours worked across countries and across time. However, taxes are in particular correlated with male work hours, while divorce rates are in particular correlated with female work hours.

Why should divorce rates affect labor supply? The value of marriage as consumption insurance has been pointed out in the literature[6]. This paper argues that a higher probability of divorce affects labor supply by reducing the expected value of insurance provided by marriage. In response, individuals self-insure by investing in experience accumulation in the labor market. The argument also applies to individuals who have not yet married, and expect to remain single.

To quantitatively assess the impact of taxes and marriage stability on labor supply, we develop a life-cycle, overlapping-generations model with heterogeneous agents, marriage and divorce. There are three types of households: single men, single women and married couples. Divorces and marriages occur stochastically. We calibrate our model to U.S. data and study how labor supply in the U.S. changes as we introduce divorce and marriage probabilities and tax systems from other countries. We find that making marriages more stable results in a reduction of labor supply, particularly for women. This is because women are usually the second earners in a married couple. The insurance effect of marriage is therefore stronger for women, and female labor supply is more sensitive to divorce and marriage rates.

When treated with both divorce and marriage probabilities and tax systems from the European countries at the same time, the model can explain 58% of the variation in aggregate labor supply between the U.S. and the European countries. Changing only the probabilities of marriage and divorce in the U.S. to their European equivalents accounts for 19% of the cross-country differences in aggregate hours worked. When we only introduce European taxes, we can account for 43% of the variation in aggregate hours worked between the U.S. and the European countries. However,

[6]See for instance Kotlikoff and Spivak (1981) who study the gains from marriage due to risk sharing.

for female labor supply the two mechanisms are equally successful in explaining the variation in work hours: marriage stability explains 24% and taxation 23%. Taxes are very good predictors of male labor supply. For men, taxes explain 60% of the variation between the U.S. and the 17 European countries compared to 12% explained by divorce and marriage rates. In Section 7 we relate the differential impact of taxation on male and female labor supply to the fact that countries with high tax average levels also tend to have progressive taxes.

Whereas taxes have been suggested as a major contributor to cross-country differences in aggregate labor supply[7], to the best of our knowledge, the role of differences in marriage stability is a new explanation in this context. In Section 2, we find that the biggest contribution to the cross-country differences in average hours worked comes from prime-aged married women. In Section 3 we show that there is a weak correlation between female work hours and average effective tax rates, whereas the correlation for men is strong. Female work hours is on the other hand strongly correlated with divorce rates. These empirical findings motivates the choice of cross-country differences in marriage stability as an explanation for differences in work hours.

Similar to Cubeddu and Rios-Rull (2003) and Fernandez and Wong (2011), in our work marriage and divorce rates are exogenous. We believe that cultural and legal factors play an important role for cross-country differences in divorce and marriage rates. Gonzalez and Viitanen (2009) find the liberalization of divorce laws to have a significant and positive impact on divorce rates in a 54-year panel of European countries. Crouch and Beaulieu (2006) document a correlation between different types of divorce laws and divorce rates in the U.S. and European countries. They document that divorce laws are stricter in Europe. For instance, they require a longer waiting period before a divorce can be obtained. Furtado, Marcen, and Sevilla-Sanz

[7]See for instance Prescott (2004) and Rogerson (2006).

(2010) find that country of origin, which they interpret as a proxy for culture, is important for the probability of divorce among immigrants who arrived in the US at a young age. They also find evidence of neighborhood effects, i.e. an individual's probability of divorce is affected by the ethnicity of the people who reside in the same neighborhood[8]. Finally there is a literature arguing that the legalization of oral contraceptives and abortion can explain much of the decrease in marriage in the US over the past 50 years by improving the quality of single life, see Kennes and Knowles (2012), and also Goldin and Katz (2002) for decline in marriage. Contraceptive technologies became available at different times in different countries - abortion was for instance still illegal in Spain and Ireland in 2000. This may explain some of the variation in marriage and divorce rates.

Stevenson (2008) and Johnson and Skinner (1986) provide empirical support to our theory concerning the impact of exogenous changes in the probability of divorces on female labor supply. Stevenson (2008) finds that the U.S. states who adopted unilateral divorce in the 1970s experienced a spike in divorce rates as well as in female labor supply compared to states who did not. Johnson and Skinner (1986) estimate a simultaneous model of future divorce probability and current labor supply using U.S. data. They conclude that higher divorce probabilities increase labor supply, while the reverse effect, i.e., the impact of work hours on the probability of divorce, appears insignificant[9].

Taxes have been suggested as a major contributor to cross-country differences in aggregate labor supply by Prescott (2004) and Rogerson (2006). They used infinite

[8]Another example is McDermott, Fowler, and Christakis (2009) who find that social networks affect divorce decisions in the US.

[9]Furthermore, regarding the reverse effect, Sayer and Bianchi (2000) also find no impact of economic independence of women on divorce rates, but rather find evidence that quality of marriage as measured by marital commitment and satisfaction determine the likelihood of divorce. Schoen, Rogers, and Amato (2006) also investigate the direction of the relationship between marital happiness and wives full-time employment using waves of the National Survey of Families and Households. They find that changes in wives employment have no significant effect on how marital quality changes between the waves.

horizon, representative agent models to evaluate the impact of differences in average tax rates. In Section 3 we find the correlation between work hours and measures of taxation, such as the average tax rate, to be relatively weak in our sample of countries. However, summarizing the tax system in a country by just one number is perhaps not a good assumption. In Section 7 we conclude, through a more detailed modeling of the tax systems, that taxes alone can explain 43% of the variation in work hours between the US and our European countries. We use a life-cycle model with heterogeneous agents who accumulate labor market experience, reside in one and two person households, and have both a continuous choice of hours if they participate in the labor market (intensive margin) and decide whether or not to participate (extensive margin). We fit nonlinear income tax schedules, and also fit different tax schedules for married and single households. Our framework allows us to address several dimensions of tax systems that cannot be captured in a representative agent model. Tax levels, tax progressivity and redistribution all affect labor supply. Heterogeneous agents and non-linear taxes allow us to capture the differential impact of taxes on various parts of the income distribution. Another dimension is gender: our framework helps to capture the differential impact of taxes on men and women, which we find to be important in explaining the differences in labor supply across countries.

We believe that an operative extensive margin and experience accumulation are essential model elements in a study of cross-country differences in work hours. Keane (2011) surveys the empirical labor supply literature and points out that variation along the extensive margin and experience accumulation have been found to be crucial elements when modeling female labor supply. Blundell, Bozio, and Laroque (2011) develop a statistical framework to analyze the contribution of intensive and extensive margins, to the changes in hours worked in 3 countries - the U.S., the U.K. and France, over time. They find that both margins are important. In Section 2 we show that the extensive and intensive margin each accounts for about 50% of the difference in work hours between the US and our European countries.

A contemporary paper which is closely related to ours is Bick and Fuchs-Schundeln (2012). They also point out the important differences in female labor supply that exist across countries and focus on the impact of taxes on the labor supply of married females. They use a static, representative agent model with 2-person households and labor choice along the intensive margin. The authors find that the introduction of European tax systems on average reduces the labor supply of married females by region. However, at the country level there is little correlation between the hours worked in the data and the hours worked in their model after introducing European taxes[10]. This is similar to what we find in Sections 3 and 7.

Other mechanisms that may affect differences in work hours across countries have also been investigated in the literature. In a contemporary paper, Rendall (2011) adds sectoral transformation, see also Rogerson (2008), and gives women differential productivity across sectors to explain female hours. Alesina, Glaeser, and Sacerdote (2005) argue that regulations and unionization are more likely explanations than taxes. Wallenius (2012) finds social security systems to be important for the difference in work hours between the U.S. and 3 Central European countries[11]. Changes in the gender wage gap and in female returns to labor market experience have been proposed as explanations for changes in U.S. female labor supply over time[12], see for instance Olivetti (2006) and Attanasio, Low, and Sanchez-Marcos (2008)[13]. These

[10]In Table A3 in Bick and Fuchs-Schundeln (2012) the correlation between columns 2 and 6 is -0.06, indicating a weakly negative correlation between the work hours of married females in the data and those in the model, after introducing European taxes.

[11]Because a large fraction of tax revenues is redistributed back to households as a lump sum payment in our model, this allows us to partially capture higher social security payments in countries with higher taxes.

[12]Unfortunately we do not have the data to carry out the same detailed estimation of the returns to labor market experience, which we do for the US, for a large number of countries. This stops us from considering wages as an explanation.

[13]Attanasio, Low, and Sanchez-Marcos (2008) also focus on the importance of reductions in childcare costs for the increase in female labor supply in the US over time. However, in Section 2 we argue that differences in child care costs seem unlikely to explain cross-country differences in

mechanisms could also contribute to explaining cross-country differences in work hours. While we do not expect that our two mechanisms can explain all of the cross-country variation in hours, in Section 7 we find that they explain a substantial fraction (58%).

The remainder of the paper is organized as follows: In Section 2, we study the contributions of different demographic groups to aggregate differences in labor supply between the U.S. and 17 Western European countries. In Section 3, we document a correlation between aggregate labor supply and taxation across countries and a correlation between aggregate labor supply and divorce rates across time and geographic regions. Section 4 studies the impact of divorce rates on labor supply in a simple model. Section 5 develops the quantitative model. Section 6 discusses data and calibration. Section 7, studies the quantitative implications of changing the U.S. divorce and marriage probabilities to their European counterparts, and quantitative implications of introducing European tax schemes in the U.S. Section 8 concludes.

2 Labor Supply in the U.S. and Europe

In this section, we use micro data to document differences in labor supply between the U.S. and 17 European countries. To understand where to focus the research efforts on aggregate cross-country differences in work hours, we break down the aggregate differences into contributions from different demographic groups. We find that typically the discrepancy in work hours between the U.S. and the European countries are larger for women than for men. Also, American women work more than European women, irrespective of whether they are single, married, with children or without children. The difference between the two genders is especially large with respect to Southern European or Catholic countries[14]. The exception is the Nordic

work hours.

[14]We categorize Greece, Ireland, Italy, Portugal and Spain as "Southern" European or "Catholic" countries.

countries, where the difference for men is larger than the difference for women. In Section 3 below we document that the Southern European countries are characterized by stable marriages whereas the Nordic countries are characterized by less frequent and less stable marriages, and we relate this to labor supply.

We also analyze the importance of the intensive and extensive margins in accounting for the cross-country differences in labor supply, and find that they are both important. However, the extensive margin is particularly important for Spain, Italy, Greece and Ireland (coincidentally, these are the countries where the relative contribution of women to the difference with the U.S. is particularly large), while the intensive margin is particularly important in Nordic countries, Germany and the Netherlands.

Data Description

To obtain information about annual hours worked, we use two sources of micro data – the European Union Labor Force Survey database (EU LFS), which contains data from the 17 European countries in our sample, and the Current Population Survey (CPS), which contains the corresponding data from the U.S. Both of these datasets are used by the OECD to construct their macro-level labor market statistics. We use data from 2000 for all countries except Germany, for which EU LFS data is only available from 2002.

Similar to Prescott (2004), we consider individuals between 15 and 64 years of age. We construct the data on annual hours worked as the product of hours worked per week[15] and the number of weeks worked per year. We provide further details and discuss some existing issues with the data in the Appendix 9.4.

[15]Hours worked per week correspond to the hours worked in all jobs in the reference week of the interview.

Table 1: Annual Hours Worked, all Persons 15-64 Years of Age, OECD 2000

Country	Annual Hours	Difference with the U.S.	% of the U.S.
Switzerland	1322.8	37.6	97.24
UK	1226.6	133.8	90.17
Sweden	1220.5	139.9	89.72
Denmark	1208.0	152.4	88.80
Portugal	1204.8	155.5	88.57
Greece	1184.7	175.7	87.09
Finland	1182.5	177.9	86.92
Norway	1133.5	226.9	83.32
Austria	1132.3	228.1	83.24
Ireland	1117.8	242.6	82.17
Luxembourg	1042.1	318.3	76.60
Netherlands	1034.0	326.4	76.01
Italy	1002.7	357.7	73.70
Spain	993.6	366.8	73.04
France	982.0	378.4	72.18
Germany	965.9	394.5	71.00
Belgium	941.1	419.2	69.18
Mean:	1111.5	248.9	81.7
United States	1360.4	0.0	100.00

Labor Supply Across Countries

Table 1 shows that according to the OECD data in the year 2000, Europeans worked on average about 249 hours less than in the U.S., with a substantial variation within Europe. The annual hours worked in Switzerland were quite close to those in the U.S., while in Belgium they were more than 400 hours lower.

Table 2 provides details about cross-country differences in hours worked for men and women separately. On average, the difference for women is about 45 percent larger than for men. However, the average again masks a large variation within Europe. We divide the European countries in our sample in 3 subgroups: Nordic countries, Central Europe and Southern Europe[16]. In the Nordic countries, the difference from the U.S. is in fact larger for men, while in a typical Southern European country (with the only exception of Portugal), the difference for women is about two

[16]We put Ireland in the "Southern" European group, since it resembles those countries along two important dimensions: marriage stability and labor supply of women. It might be more appropriate to call this group of countries "Catholic".

Table 2: Annual Hours Worked, by Gender and Marital Status

Country	Men						Women					
	All		Married		Single		All		Married		Single	
	Hours	%(U.S.)	Hours	%(U.S.)	Hours	%(U.S.)	Hours	%(U.S.)	Hours	% (U.S.)	Hours	% (U.S.)
Nordic countries												
Denmark	1418.6	87.95	1566.5	81.1	1274.6	107.0	1031.5	91.98	1089.2	92.9	960.4	88.3
Finland	1344.1	83.33	1563.4	80.9	1160.8	97.4	1025.5	91.45	1153.7	98.5	907.2	83.4
Norway	1368.8	84.86	1582.4	81.9	1176.6	98.8	896.6	79.96	959.7	81.9	831.5	76.5
Sweden	1390.1	86.18	1610.4	83.4	1241.4	104.2	1053.9	93.99	1165.7	99.5	961.8	88.4
Mean:	*1380.4*	*85.6*	*1580.7*	*81.8*	*1213.4*	*101.9*	*1001.9*	*89.3*	*1092.1*	*93.2*	*915.2*	*84.2*
Central Europe												
Austria	1431.6	88.76	1545.6	80.0	1278.1	107.3	845.3	75.38	778.1	66.4	940.9	86.5
Belgium	1208.0	74.89	1387.8	71.8	966.1	81.1	683.5	60.96	691.5	59.0	672.1	61.8
France	1209.4	74.98	1432.0	74.1	972.7	81.6	765.0	68.22	813.0	69.4	712.2	65.5
Germany	1204.6	74.68	1343.1	69.5	1029.2	86.4	728.1	64.93	652.3	55.7	836.7	76.9
Luxembourg	1386.5	85.96	1593.6	82.5	1029.3	86.4	696.0	62.07	651.2	55.6	788.4	72.5
Netherlands	1422.4	88.19	1579.7	81.8	1186.9	99.6	648.2	57.81	560.2	47.8	792.3	72.9
Switzerland	1736.8	107.68	1892.4	98.0	1554.0	130.5	951.9	84.89	704.5	60.1	1231.0	113.2
UK	1572.1	97.47	1788.2	92.6	1312.2	110.1	906.6	80.85	893.8	76.3	922.0	84.8
Mean:	*1396.4*	*86.6*	*1570.3*	*81.3*	*1166.0*	*97.9*	*778.1*	*69.4*	*718.1*	*61.3*	*862.0*	*79.3*
Southern Europe												
Greece	1586.3	98.35	1847.7	95.7	1198.9	100.6	804.4	71.73	844.7	72.1	731.0	67.2
Ireland	1489.6	92.35	1778.2	92.1	1213.0	101.8	746.2	66.55	653.9	55.8	844.9	77.7
Italy	1363.5	84.54	1592.8	82.5	1043.8	87.6	654.6	58.37	641.2	54.7	676.5	62.2
Portugal	1461.6	90.62	1694.7	87.7	1093.1	91.8	959.8	85.60	1044.6	89.1	811.9	74.7
Spain	1346.0	83.45	1615.0	83.6	1016.1	85.3	650.4	58.00	616.5	52.6	696.9	64.1
Mean:	*1449.4*	*89.9*	*1705.7*	*88.3*	*1113.0*	*93.4*	*763.1*	*68.1*	*760.2*	*64.9*	*752.2*	*69.2*
Mean:	1408.2	87.3	1612.6	83.5	1161.6	97.5	826.3	73.7	818.5	69.8	842.2	77.4
United States:	1613.0	n.a.	1931.7	n.a.	1191.3	n.a.	1121.3	n.a.	1171.9	n.a.	1087.5	n.a.

to three times larger than the corresponding difference for men.

Table 2 compares the average annual hours worked by marital status[17]. Among the four gender/marital status groups shown in the table (married men, single men, married women and single women), married women in Europe display the largest difference from their U.S. counterparts. However, this is primarily due to the behavior of married women in Central and Southern European countries, while in Nordic countries, married women work almost as many hours as those in the U.S. Single women in Europe also work substantially less compared to their U.S. counterparts, and the difference is particularly large in Southern Europe.

Table 15 in the Appendix contrasts the cross-country differences in hours worked by gender and 3 age groups: (i) "young" (16-24 years of age), (ii) "prime-aged" (25-54 years of age) and (iii) "old" (55-64 years of age). We again find that for each age group, the difference is larger for women. Among the three age groups, the largest difference from the corresponding reference group in the U.S. on average is displayed by the "old" European men and women. However, as we will argue later, because of the relative sizes of the age groups, prime-aged persons (and in particular prime-aged women) are typically the largest contributors to the aggregate difference with the U.S.

Given that we find that the difference in hours worked between the U.S. and Europe is larger for women than for men, it is natural to ask whether this is related to women reducing their labor supply as a result of having children. Figure 14 in the Appendix (based on World Bank data[18]) shows that women in Europe have lower fertility rates than in the U.S. This is especially so in Italy, Spain and Greece – the countries where women worked the least.

Table 16 in the Appendix contrasts the hours worked by all women to those of

[17] We use the legal marital status in our analysis.

[18] Available at: `http://data.worldbank.org/indicator/SP.DYN.TFRT.IN/countries?page=2&display=default`

women with small children (of age 4 or less)[19]. On average, we find that European women with small children exhibit smaller difference (in percentage terms) in their hours worked from their U.S. counterparts than all women combined. Only in 3 cases (Austria, Germany and UK) women with small children reduce their hours worked by a noticeably larger magnitude.

The two observations that: (i) fertility in the U.S. is relatively high, and (ii) women with small children in Europe do not disproportionately reduce their labor supply relative to their American counterparts, suggest that having small children is not a major reason for the difference in women's labor supply between the U.S. and Europe.

Group Contribution Decomposition

To analyze the contributions of various demographic groups to the difference between aggregate labor supply in the U.S. and the European countries in our sample, we perform the following decomposition. Suppose we divide each country's sample into n different groups. Then the difference between the aggregate average annual hours worked in the U.S., $\bar{h}^{us}$, and in country j, $\bar{h}^j$, can be written as:

$$\begin{aligned} \bar{h}^{us} - \bar{h}^j &= \sum_{i=1}^{n} \omega_i^{us} h_i^{us} - \sum_{i=1}^{n} \omega_i^j h_i^j \\ &= \underbrace{\sum_{i=1}^{n} (h_i^{us} - h_i^j)\omega_i^{us}}_{\text{“behavioral effect”}} + \underbrace{\sum_{i=1}^{n} (\omega_i^{us} - \omega_i^j) h_i^j}_{\text{“compositional effect”}} \end{aligned} \tag{1}$$

where ω_i^j is the share of observations that come from group i in country j's sample, while h_i^j is the average annual hours worked by individuals in this group[20]. The last

[19]Unfortunately, EU LFS does not provide the data on the presence of children for the Scandinavian countries and Switzerland, and the data for France starts in 2003, for Italy and Austria in 2004, and for Ireland in 2006.

[20]This is similar to the decomposition performed in Blundell, Bozio, and Laroque (2011). They analyze the changes in hours worked over time, while we look at the differences in hours worked between countries at a given point in time.

term in equation 1, which we call the "compositional" effect, reflects the differences in hours worked due to the differences in the composition of the population in the two countries. For instance, a positive compositional effect would mean that in the U.S., the demographic groups that typically work more (such as prime-aged men) have relatively larger size, and the demographic groups that typically work less (such as older women) have smaller size compared to the corresponding European country j. We are more interested in the first term which we call the "behavioral effect". It captures the differences in hours worked by various demographic groups in the two countries, assuming that the composition of the population in these two countries is the same.

We divide the data into 12 demographic groups, according to gender, marital status and age (using three age groups). As can be seen from column 7 in Table 3, the compositional effect is typically small. On average, it accounts for 6.6% of the difference between the U.S. and the European countries in our dataset. The rest of the difference is due to the behavioral effect.

Columns 2-6 in Table 3 shows the contribution of several demographic groups of interest to the behavioral effect (while Table 18 in the Appendix provides more details). To compute the weighted means for the 3 subgroups, and for all European countries in our sample, we weight them according to the size of the difference from the U.S.[21]. The table shows that in Central and especially in Southern Europe, women are the main contributors to the differences in hours worked between the U.S. and the European countries. In particular, the biggest contribution in these two groups of countries are coming from married prime-aged women. In contrast to this, in the Nordic countries, the biggest contribution comes from married prime-aged men.

[21] We use the weights $\omega_i = \frac{\Delta_{U.S.,i}}{\sum_i \Delta_{U.S.,i}}$. One feature of such a weighting scheme is that it puts lower weight on Switzerland, which appears to be a special case. The difference between the U.S. and Switzerland is very small to begin with and therefore a relatively small absolute difference for one demographic group can be a large percentage difference.

Table 3: Contribution of Several Demographic Groups to the Overall Difference in Annual Hours Worked, with respect to the U.S.

Country	Men (2)	Women (3)	Young (4)	Prime-aged (5)	Old (6)	Composition (7)	Intensive Margin (8)	Extensive Margin (9)
Nordic countries								
Denmark	62.3	37.7	-31.4	105.9	25.5	8.9	124.0	-24.0
Finland	73.6	26.4	-6.7	69.5	37.2	18.8	35.4	64.6
Norway	49.1	50.9	-2.1	94.8	7.3	-3.9	124.4	-24.4
Sweden	73.0	27.0	7.9	85.2	6.9	6.9	102.7	-2.7
Central Europe								
Austria	36.6	63.4	-24.7	82.6	42.1	17.0	57.8	42.2
Belgium	47.7	52.3	9.4	66.5	24.1	4.4	51.4	48.6
Netherlands	30.9	69.1	-3.0	80.6	22.4	-4.0	91.0	9.0
Germany	50.3	49.7	-0.7	81.1	19.6	5.4	68.2	31.8
Switzerland	-74.8	174.8	-138.6	211.4	27.3	-40.2	34.4	65.6
France	50.8	49.2	11.5	64.7	23.8	5.3	48.0	52.0
Luxembourg	36.4	63.6	10.0	61.3	28.7	8.0	40.5	59.5
UK	12.1	87.9	-30.6	98.0	32.5	9.1	75.3	24.7
Southern Europe								
Greece	0.4	99.6	5.0	67.6	27.4	22.5	-120.2	220.2
Ireland	15.0	85.0	-10.8	91.9	19.0	11.8	35.7	64.3
Italy	33.9	66.1	9.9	67.2	22.9	6.0	-5.2	105.2
Portugal	52.7	47.3	-17.7	90.5	27.2	26.3	33.8	66.2
Spain	33.6	66.4	3.8	79.0	17.2	9.8	21.2	78.8
R^2	–	–	–	–	–	–	0.138	0.423
Mean :	34.3	65.7	-12.3	88.1	24.2	6.6	63.3	36.7
Mean (weighted):	39.7	60.3	-2.3	78.8	23.5	7.6	49.6	50.4
Mean (*Nordic*):	63.0	37.0	-7.7	88.9	18.8	6.9	97.3	2.7
Mean (*Central*):	39.3	60.7	-2.1	76.0	26.1	4.8	64.1	35.9
Mean (*South*):	28.0	72.0	0.3	78.0	21.7	12.8	-5.7	105.7

Columns 2-6 shows the contribution of selected demographic groups to the "behavioral" effect. Column 7 shows the size of the "compositional" effect. Columns 8-9 shows the contribution of the intensive and extensive margins to the overall difference with the U.S. Regional means are weighted.

As we mentioned earlier, the largest difference in terms of hours worked per person is displayed by older persons. However, because of the small size of that demographic group, their contribution to the overall difference is much smaller than the contribution of the prime-aged individuals.

Intensive vs. Extensive Margin

In this subsection we investigate whether the discrepancies in work hours between the U.S. and Europe are due to Americans working longer hours (intensive margin) or whether they are due to more Americans working (extensive margin). We find that the two margins are about equally important.

The two last columns of Table 3 shows the contribution of the intensive and extensive margins to the difference in labor supply between the U.S. and country i, using the following decomposition formula:

$$\bar{h}^{U.S.} - \bar{h}^{i} = H^{U.S.}_{\text{empl}} \cdot \text{Share}^{U.S.}_{\text{empl}} - H^{i}_{\text{empl}} \cdot \text{Share}^{i}_{\text{empl}} \tag{2}$$

$$= \underbrace{\left(H^{U.S.}_{\text{empl}} - H^{i}_{\text{empl}}\right) \text{Share}^{U.S.}_{\text{empl}}}_{\text{Intensive Margin}} + \underbrace{\left(\text{Share}^{U.S.}_{\text{empl}} - \text{Share}^{i}_{\text{empl}}\right) H^{i}_{\text{empl}}}_{\text{Extensive Margin}}$$

From the OECD data, one can compute the total average hours worked in country i, H^i, as the product of the hours worked by employed persons, H^i_{empl}, and the share of the population which is employed, $\text{Share}^i_{\text{empl}}$. Table 3 reports the contributions of intensive and extensive margins as a percentage of the total difference in hours worked between the U.S. and country i, $\bar{h}^{U.S.} - \bar{h}^{i}$. As can be seen from the table, both margins appear to be important. The contribution of the extensive margin is particularly large in Southern Europe, while the intensive margin is more important in the Nordic countries, Netherlands and Germany (with Switzerland being a special case).

We also report the R^2 from a regression where we regress total hours worked on $\tilde{h}^{\text{intens}}$ (column 8) and $\tilde{h}^{\text{extens}}$ (column 9), where $\tilde{h}^{\text{intens}} = H^i_{\text{empl}}\text{Share}^{U.S.}_{\text{empl}}$ are the hypothetical hours worked in country i if we keep the employment level in that country equal to that in the U.S., while $\tilde{h}^{\text{extens}} = H^{U.S.}_{\text{empl}}\text{Share}^{i}_{\text{empl}}$ are the hypothetical hours in country i if we keep hours worked by employed persons equal to those in the U.S. The results suggest that the extensive margin explains a much larger percentage of the total variation in hours worked between the countries[22].

We also ran similar regressions for men and women separately. While for men,

[22]In both cases, the regression coefficients have the expected positive sign. However, the coefficient is not statistically significant in the intensive margin regression (with the p-value of 0.129), while it is highly statistically significant in the extensive margin regression (with the p-value of 0.003).

the R^2 from a regression with the intensive margin hours ($\tilde{h}^{\text{intens}}$) is very similar to one from a regression with the extensive margin hours ($\tilde{h}^{\text{extens}}$) (0.410 and 0.403 respectively), for women the R^2 from the regression with the extensive margin hours is substantially higher compared to the regression with the intensive margin hours (0.517 and 0.042), suggesting that the variation in the extensive margin is more important in accounting for the differences in hours worked by women.

3 Possible Determinants of Labor Supply: Taxes and Marriage Stability

In this section, we analyze the empirical relationship between hours worked in the U.S. and Europe, and the following two candidate explanations for cross-country differences in labor supply: (i) differences in taxes, and (ii) differences in marriage stability. Taxes have been suggested as a major contributor to cross country differences in labor supply in the literature (see Prescott (2004) and Rogerson (2006)). Marriage stability is a new explanation in this context, motivated by our finding in Section 2 that women are the biggest contributor to the cross-country differences in labor supply. Our hypothesis is that more stable marriages provide consumption insurance, thereby reducing the incentives to accumulate labor market experience, in particular for women who often are secondary earners. Conversely, a higher probability of divorce can increase the value of market experience for the woman who has a higher probability of ending up as a single earner.

We first briefly compare and discuss some features of the tax systems in the U.S. and Europe. We then study the correlation between labor supply and various measures of tax levels, tax progressivity, and marriage stability. We find that there is positive correlation between taxes and aggregate labor supply, and negative correlation between marriage stability and aggregate labor supply, but in both cases, the correlation is of moderate strength. In addition, when we regress average annual hours worked in each country on different measures of taxation and marriage stability separately, the regression coefficients have the expected sign, but are only marginally statistically significant (at 10% significance level), and the R^2 of the regressions are low.

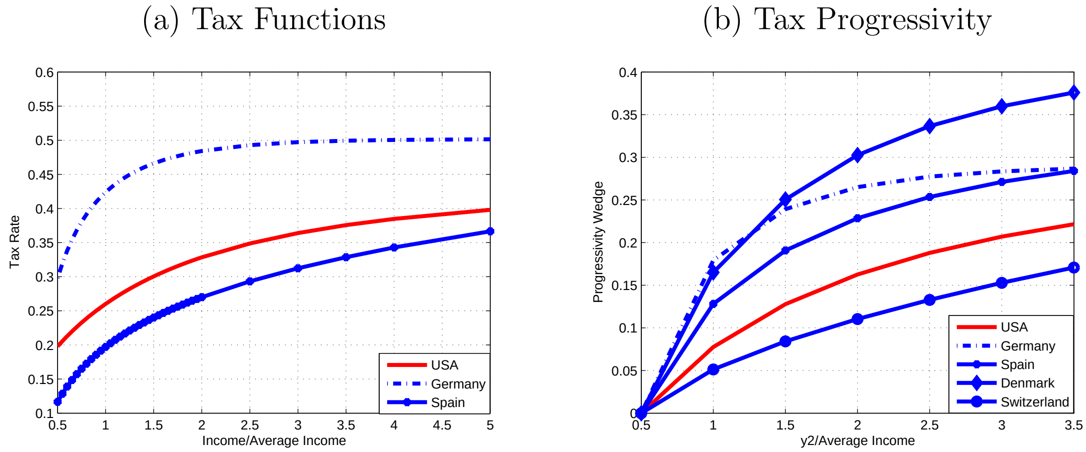
However, when we combine a measure of tax levels and divorce rates in the same regression, both regression coefficients become highly statistically significant, and the adjusted R^2 increases considerably (to 49%). We see that the importance of these two mechanisms is different for different groups of countries within Europe. Finally, we document strong correlation between female labor supply and divorce rates. These observations motivate us to more carefully study the impact of taxes and marriage stability on labor supply in a structural model.

Labor Income Taxes in the U.S. and Europe

There are many issues to consider when comparing labor income taxes across countries. (i) Firstly, both the levels and progressivity of taxes may be of interest, when studying the impact of taxation on labor supply. (ii) Secondly, tax systems differ with respect to the degree of joint taxation of married couples. In the U.S. married couples are taxed 100% jointly, i.e. the sum of the couple's earnings is taxed irrespective of each spouse's individual earnings. Some countries tax the individual income of each spouse to a larger degree. However, it seems evident from the OECD tax data that all countries have some element of joint taxation. (iii) Finally, taxes vary with the number of children in the household. In this section, we will focus on the taxes paid by single person households without children[23].

[23] Essentially, we abstract in this section from points (ii) and (iii) above. We do it here because taxes paid by an average single household without children is the measure that is most easily comparable between the countries. In Sections 5-7, we differentiate between the taxes paid by single and married households within the structural model of labor supply. However, our tax schedules for married couples are based on the sum of their earnings so we cannot capture the effects of varying degrees of separate taxation. We also do not include children in our model.

Figure 1: Country Labor Income Tax Functions (Singles)



For each country in Table 1, we fit a polynomial tax function, based on tax data from the OECD[24]: Among the countries in our dataset, labor income taxes are the lowest in Greece and Spain, moderate to low in the U.S., and highest in Belgium, Denmark and Germany. In part (a) of Figure 1 we plot fitted labor income tax schedules for single individuals in Spain, the U.S., and Germany. The figure suggests that if labor income taxes are an important driver of labor supply, they could potentially explain the difference in hours between the U.S. and Germany, but may not be the explanation for the lower hours worked in Spain.

Columns 2 and 3 of Table 17 display the top marginal tax rates and the income level where they become effective for single households in the U.S. and many Western European countries. The maximum tax rates may not always be very different, but the income level where the rates become effective can vary greatly. In Germany for instance, the top tax rate becomes effective already at 1.5 times average earnings (AE), while in the U.S. the top marginal rate first becomes effective at 9 times average earnings. Column 5 of Table 17 displays the labor income tax paid by singles with average earnings across countries.

[24]See Appendix 9.1

A person making labor supply decisions will care about his marginal tax rate in addition to his average tax level. It is possible that tax progressivity, and not only the level of taxes are important for the cross-country pattern in labor supply. Wedge based measures of tax progressivity are common in the literature. We adopt the below progressivity wedge, PW, from Guvenen, Kuruscu, and Ozkan (2009)[25]. An analogous measure is used in Caucutt, Imrohoroglu, and Kumar (2003).

$$PW(y_1, y_2) = 1 - \frac{1 - \tau(y_2)}{1 - \tau(y_1)} \tag{3}$$

This intuitive measure, where a higher value indicates a more progressive tax schedule, takes values between 0 and 1 but will naturally be sensitive to the choice of y_1 and $y2$, except with flat taxes. If there is a flat tax, then the progressivity wedge would be zero for all levels of y_1 and y_2. Part (b) of Figure 1 plots progressivity wedges for $y_1 = 0.5AE$ for the U.S., Germany, Spain, Denmark, and Switzerland. Among the 18 countries in Table 17, Denmark has the most progressive taxes and Switzerland the least progressive. The U.S. is among the countries with the least progressive taxes, while Germany are among the countries with the most progressive taxes.

Consumption Taxes

Consumption taxes also have an impact on labor supply decisions. The fourth column of Table 17 reports these flat taxes in 2001. The consumption tax varies from a low 7.6% in Switzerland, to a high 25% in Denmark and Sweden. The U.S. has the second lowest consumption tax among the countries in our dataset.

Correlation of Labor Supply with Taxes and Divorce Rates

In Figure 2, we plot the correlation between labor supply and four tax-related mea-

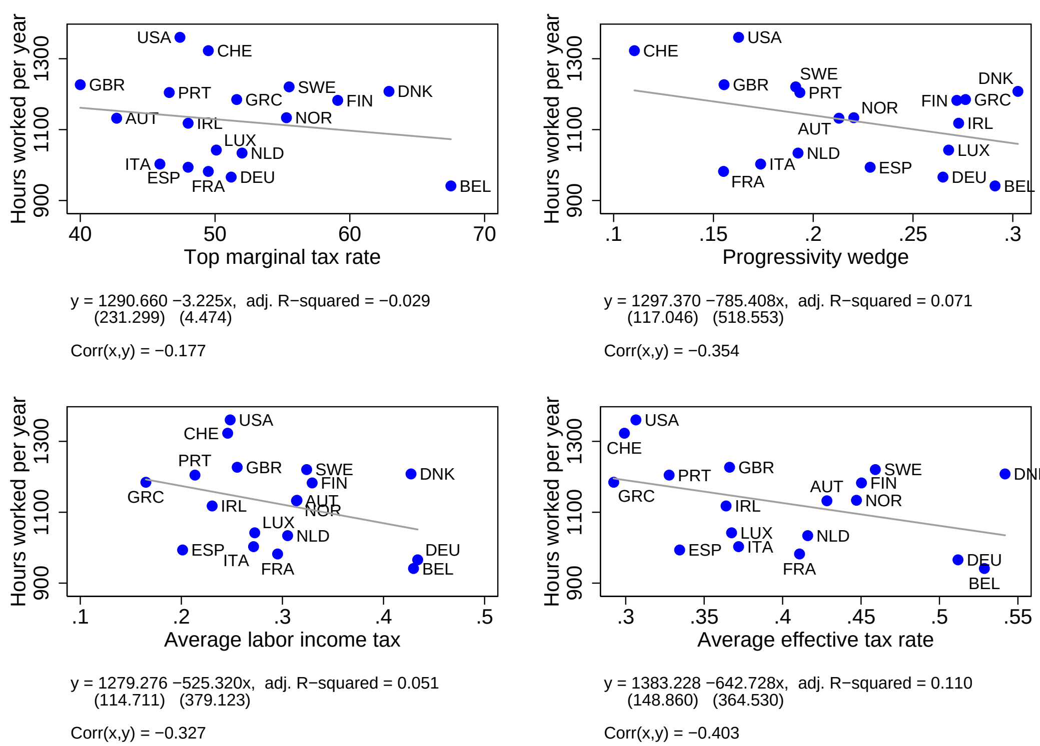
[25] Guvenen, Kuruscu, and Ozkan (2009) provide an easy way to change the tax level, while keeping progressivity constant for all levels of y_1 and y_2, which we will use for policy experiments in Section 7.

sures. They are: (i) the average labor income tax rate at average earnings, (ii) the average effective tax rate on labor income at average earnings, (iii) the top marginal tax rate, and (iv) the tax progressivity wedge at $y_1 = 0.5AE$, $y_2 = 2AE$. The effective tax rate on labor income, τ, as defined in Prescott (2004) is:

$$\tau = 1 - \frac{1 - \tau_l}{1 + \tau_c}, \tag{4}$$

which is the fraction of labor income that is taken in the form of taxes. In other words, a measure that combines labor income tax τ_l and consumption tax τ_c into a single tax rate τ.

Figure 2: Relationship Between Annual Hours and Tax Measures by Country



As can be seen from Figure 2, there is generally a negative but somewhat weak correlation between the different measures of taxes and aggregate hours worked. We find the weakest correlation, −0.18, when we use the top marginal tax rate as our measure of taxation. This is not surprising since, as we have pointed out before, there is a large dispersion in terms of the level of income at which the top marginal tax rate becomes effective. The correlation with the other two tax measures, progressivity wedge and average income tax rate, is somewhat stronger at -0.35 and -0.32 respectively. However, we find that all our Southern European/Catholic countries (Italy, Portugal, Spain, Greece and Ireland) have an average tax rate which is either very similar or even lower than the one found in the U.S., while the hours worked in these countries are notably smaller. Using the effective average tax rate, which takes into account the higher consumption taxes in the European countries, increases the correlation further to -0.40. However, we still find that the effective average tax rate is typically smaller in the Southern European countries compared to the rest of Europe. We conclude that taxes appear as a more promising mechanism in accounting for the difference in hours worked between the U.S. and Central European and Nordic countries, but less promising for the Southern European countries.

Figure 3: Average Effective Tax Rates and Hours Worked, by Gender

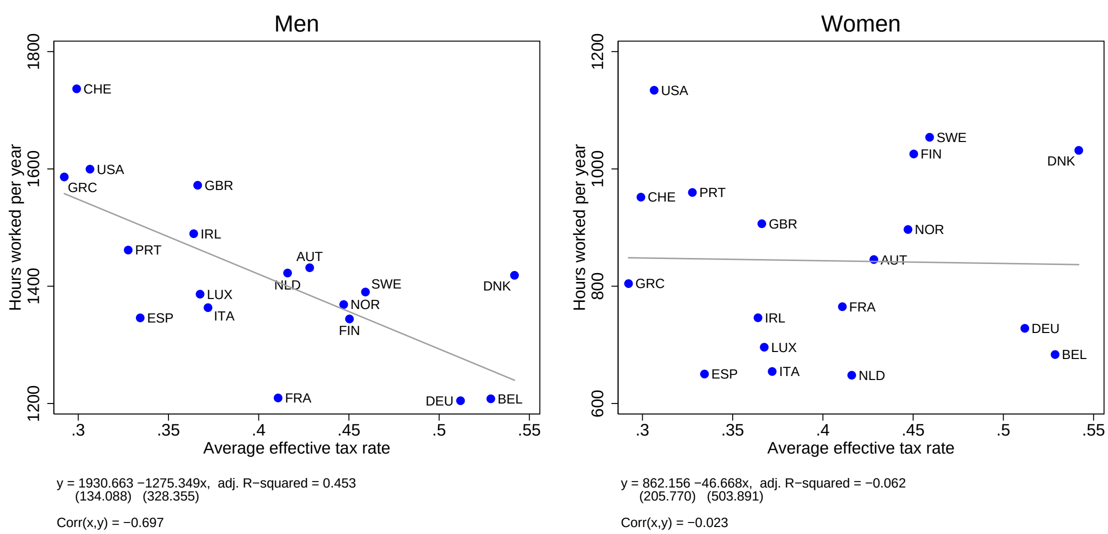
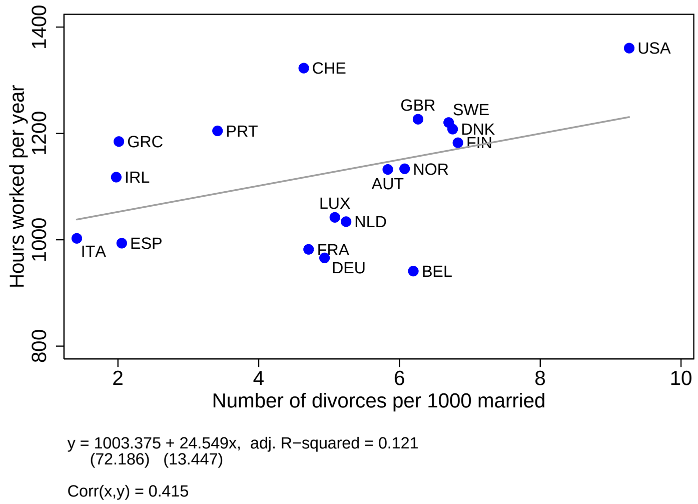


Figure 3 shows that there is a sharp difference in the relationship between the taxes and hours worked between the two genders. The negative correlation between average tax rate and aggregate hours worked is driven by the corresponding negative correlation for men. While for men the corresponding correlation and regression R^2 is significantly higher than the one in Figure 2 (for both genders combined), for women the correlation and R^2 are close to zero.

Figure 4: Relation Between Annual Hours and Divorce Rates by Country



In Figure 4, we plot the correlation between divorce rates and aggregate labor supply. The data for divorce rates in European countries is constructed using Eurostat data, while for U.S. we use the National Vital Statistics data provided by the Center for Disease Control and Prevention, and the U.S. Census data. As can be seen from Figure 4, we find a positive relationship between average annual hours worked and divorce rates, with a correlation coefficient of 0.42, which is about as high as the one we found using the effective average tax rate (our "strongest" tax measure). The figure shows that the divorce explanation appears less promising for countries such as Germany, France and Belgium. The hours worked in these countries are among the lowest in Europe, while the divorce rates are noticeably higher than in the Southern European countries.

Figure 5 shows that the positive correlation between the divorce rates and hours worked in our sample of countries are driven entirely by women. When we consider only women, this correlation increases to 0.65, while for men, it is close to 0. This is in line with our intuition, which suggests that marriage stability should affect mostly women, who are typically the secondary earners in the family. The correlation between female employment rates and divorce rates is even stronger, 0.75, as can be seen from Figure 15 in the Appendix.

Figure 5: Divorce Rates and Hours Worked for Men and Women

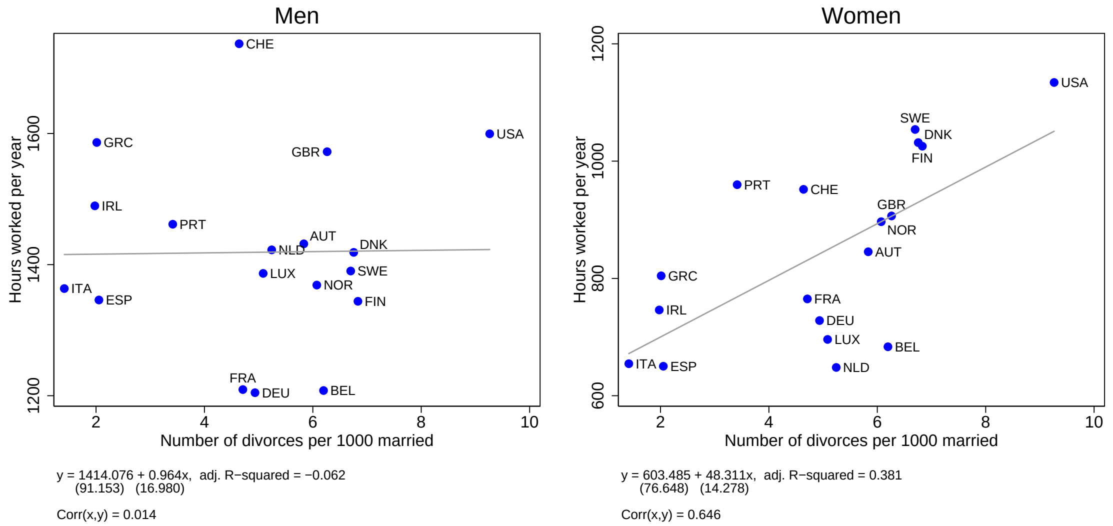


Table 4 shows a negative correlation between female work hours (for all women between 15 and 64 years of age) and the fraction of married women at different ages. The strength of the correlation increases with age. Part of this negative correlation can be explained by the compositional effect. This is because married women tend to work less than single women, and therefore countries that have more married women should have lower female work hours. However, as we pointed out in the previous section, we find that the size of the compositional effect is rather limited. In addition, we find that the strength of correlation between female work hours and fraction of married women increases with age. This may suggest that women insure themselves more against the prospect of being single later in their life.

Table 13 in Appendix shows that divorce rates appear particularly important in accounting for the cross-country variation in the employment rates (extensive margin), while taxes appear particularly important for accounting for the hours

Table 4: Correlation between Female Work Hours and Fraction of Married Women by Age

	Share of married women at age 30	Share of married women at age 40	Share of married women at age 50	Share of married women at age 60
Correlation	-0.298	-0.625	-0.746	-0.772

worked by employed persons (intensive margin).

In Table 5, we regress annual hours worked on divorce rate and each of the different tax measures. In two cases, when using the average labor income tax and average effective tax rate, the coefficients for both the divorce rate and the corresponding tax measure are statistically significant at any conventional significance level. We also find that the R^2 improves substantially (to 49%) compared to the case when we use either only the divorce rates or a measure of taxation as our regressor. From this, we conclude that using taxes and divorce rates together explains a significant share of the cross-country variation in labor supply. Both appear as important mechanisms in accounting for cross-country differences.

Table 5: Relation between Average Hours Worked and Divorce Rates and Tax Measures

	(I)	(II)	(III)	(IV)
Const	1286.077^{***}	1168.436^{***}	1233.919^{***}	1355.246^{***}
	(206.767)	(131.659)	(84.649)	(112.506)
Divorce rate	30.607^{**}	23.124^{*}	45.554^{***}	40.242^{***}
	(13.655)	(13.011)	(11.779)	(11.100)
Top marginal tax rate	-6.101	–	–	–
	(4.200)			
Progressivity wedge	–	-721.120	–	–
		(488.098)		
Average labor income tax	–	–	-1142.471^{***}	–
			(319.740)	
Average effective tax rate	–	–	–	-1071.048^{***}
				(299.175)
Adjusted R^2	0.177	0.181	0.493	0.494

Standard errors are in parentheses, $^{*} - p < 0.10$, $^{**} - p < 0.05$, $^{***} - p < 0.01$

Finally, Table 6 shows panel regression results, when regressing employment ratios on divorce rates for men and women separately, using data from 1990 to 2009 (one obtains qualitatively similar results when starting at an earlier date)[26]. The panel regression results provide further support to our finding that divorce rates appear to affect mostly the labor supply of women.

Table 6: Panel Regression: Employment Ratios and Divorce Rates

Employment rate	Women	Men
Constant	51.809***	72.681***
	(2.795)	(2.076)
Divorce rates	1.685***	0.323
	(0.398)	(0.283)

Standard errors are in parentheses $^{*} - p < 0.10$, $^{**} - p < 0.05$, $^{***} - p < 0.01$

In this section, we have documented an empirical relationship between aggregate labor supply and taxes, and aggregate labor supply and divorce rates. This motivates our study, in the next sections, of the impact of taxes, divorce and marriage probabilities on labor supply in a structural model.

4 Labor Supply and Divorce in a Simple Model

In this section, we outline the intuition for the effect of divorce rates on women's labor supply using a simplified two-period version of our model[27]. We describe our full model in the next section.

Consider a family that consists of a husband (a "man") and a wife (a "woman") who live for 2 periods. Suppose that both members of the family have 1 unit of time at their disposal in each period. For simplicity, assume here that the husband always works full-time, while the wife has to decide how much time to spend working in

[26] Since the Eurostat data on the number of divorces that we use to construct the divorce rate measure spans different time periods for different countries, we have an unbalanced panel. The U.S. data start in year 2000. Also, the data here lacks observations for some European countries, such as Spain and Greece, altogether. In our previous cross-sectional plots for 2001, we used the Eurostat Census 2001 data on the number of married people for these countries, but this data is available only for one year, 2001.

[27] The intuition concerning the effect of taxation is described very well in Rogerson (2007), Guner, Kaygusuz, and Ventura (2011) etc.

period 1 and in period 2. The husband's wage in period 1 is $w_{1,m}$, while the wife's wage in the first period is $w_{1,f}$.

Suppose that their wages in the second period increase linearly with the amount of time they spend working in period 1, with parameters k_m and k_f controlling the "returns to experience" for the husband and the wife. Thus, the husband's wage in period 2 is $w_{1,m} + k_m$ (since the husband always works full-time), while the wife's wage in period 2 is $w_{1,f} + k_f h_{1,f}$, where $h_{1,f}$ denotes the wife's choice of work hours in period 1. With probability π_d, the couple divorces before the second period starts. We assume that they cannot save or borrow in period 1.

At the start of period 1, the couple jointly maximizes their expected utility over consumption and leisure:

$$\begin{aligned} \max_{\substack{c_1, c_2, c^s_{2,m}, c^s_{2,f}, \\ h_{1,f}, h_{2,f}, h^s_{2,f}}} \quad & \alpha \log(c_1/e) + (1-\alpha)\log(1-h_{1,f}) \\ + \quad & (1-\pi_d)\left(\alpha \log(c_2/e) + (1-\alpha)\log(1-h_{2,f})\right) \\ + \quad & \pi_d \left(\alpha \log(c^s_{2,m}) + \alpha \log(c^s_{2,f}) + (1-\alpha)\log(1-h^s_{2,f})\right), \end{aligned} \tag{5}$$

subject to the budget constraints:

$$\begin{aligned} c_1 &= w_{1,m} + w_{1,f} h_{1,f} \\ c_2 &= w_{1,m} + k_m + (w_{1,f} + k_f h_{1,f}) h_{2,f} \\ c^s_{2,m} &= w_{1,m} + k_m \\ c^s_{2,f} &= (w_{1,f} + k_f h_{1,f}) h^s_{2,f}, \end{aligned} \tag{6}$$

where the first two budget constraints apply when the couple is married and pools labor income for consumption. The last two constraints apply if the couple divorces in period 2 (state s denotes being single again). $h_{2,f}$ denotes the wife's choice of work hours in period 2 in case she stays married, and $h^s_{2,f}$ is her choice of work hours if she gets divorced. e is the adult equivalence scale.

Intuitively, there are two benefits of working today: an immediate increase in consumption today and accumulation of experience that enables higher consumption tomorrow. The benefits of experience and future consumption are more valuable to a person anticipating higher likelihood of loss of spousal income. Formally, the solution is characterized by the following 3 first-order conditions:

$$\frac{1-\alpha}{1-h_{1,f}} = \frac{\alpha}{c_{1,f}^{s}} w_{1,f} + (1-\pi_d)\frac{\alpha}{c_2} k_f h_{2,f} + \pi_d \frac{\alpha}{c_{2,f}^{s}} k_f h_{2,f}^{s} \tag{7}$$

$$\frac{1-\alpha}{1-h_{2,f}} = \frac{\alpha}{c_2}(w_{1,f} + k_f h_{1,f}) \tag{8}$$

$$\frac{1-\alpha}{1-h_{2,f}^{s}} = \frac{\alpha}{c_{2,f}^{s}}(w_{1,f} + k_f h_{1,f}) \tag{9}$$

First, let us consider how a change in the probability of divorce, π_d, affects the woman's choice of labor supply in period 1, $h_{1,f}$. An increase in π_d will affect $h_{1,f}$ both directly through equation 7, and also indirectly through the effect of the change in $h_{1,f}$ on $h_{2,f}$ and $h_{2,f}^{s}$ in equations 8 and 9, which feeds back into c_2 and $c_{2,f}^{s}$ in equation 7. For simplicity, let us disregard the indirect effect, and concentrate on the direct effect in equation 7. On the right hand side of that equation, we have the marginal benefit of an increase in the wife's work in period 1, which includes both an immediate increase in consumption in period 1, and the increase in consumption in period 2 because of the accumulation of the woman's experience (and increased period 2 wages). An increase in π_d effectively decreases the weight put on the second period's marginal utility of consumption in case the couple stays married, and increases the weight on the second period's marginal utility of consumption of the divorced woman. Intuitively, because the income of the married couple also includes the income of the husband (which typically is larger than the income of the wife), we get $c_2 > c_{2,f}^{s}$. From equations 8 and 9, it also follows that $h_{2,f}^{s} > h_{2,f}$, so that $\frac{\alpha}{c_{2,f}^{s}} h_{2,f}^{s} > \frac{\alpha}{c_{2,f}} h_{2,f}$, and such re-weighting increases the marginal benefit from the woman's work in period 1.

This increases the woman's incentive to work in period 1.

Given the utility function that we have assumed in this section, one can in fact show that an increase in divorce probability leads to an increase in the woman's labor supply:

Proposition 4.1.

$$\frac{\partial h_{1,f}}{\partial \pi_d} > 0, \quad \frac{\partial h_{2,f}}{\partial \pi_d} > 0, \quad \frac{\partial h^s_{2,f}}{\partial \pi_d} = 0 \tag{10}$$

Proof: See Appendix 9.3

It is clear from equation 7 that for the change in divorce probability to have an impact on the woman's labor supply, we need $k_f > 0$ (returns to experience must be positive). This impact is larger if the gender wage gap ($\frac{w_m}{w_f}$) is bigger. Equation 7 also suggests that the stronger the effect of the change in divorce probability, the bigger is the returns to experience. Even though this is true for fixed c_2 and $c^s_{2,f}$, and for a variety of reasonable choices of parameters in this simple two-period model, this could be at least partially offset by the income effect of the increase in k_f, which could be larger for the single woman.

To see why the increased probability of divorce can also increase labor supply of single women, imagine that there are 3 periods. All women are single in period 0, but they are certain to get married in period 1, where periods 1 and 2 are the same as above. The wages women receive in period 2 increase with experience accumulated in both periods 0 and 1. Thus, if the woman in period 0 anticipates to get married in period 1, and divorced in period 2, she will also increase her labor supply in anticipation of being single later even though she is not married yet.

5 Quantitative Model

The stationary economy is populated by three types of households: single males, single females, and married couples. Individuals start their work life at age 20. They live for at least 65 years and at most 95 years, but enter retirement at age 65. A model period is 1 year, so there are a total of 45 model periods of active work life. In addition to demographics, households are heterogeneous with respect to asset holdings, years of labor market experience, and idiosyncratic productivity shocks (market luck). Single households face an age-dependent probability of becoming married, while married couples face an age-dependent probability of divorce. One is more likely to be married to someone with a similar level of education. We assume that marriage will always happen to a partner of the same age, and that married couples die together. Households decide whether or not to participate in the labor market, how many hours to work conditional on participation, how much to consume, and how much to save. If they participate in the labor market, they accumulate one year of labor market experience.

Labor Income

Individuals choose work hours, $n \in [0, 1]$. The wage per time unit, w, of an individual depends on his level of education, $j \in \{\text{hs}, \text{c}\}$ (where "hs" stands for high school and "c" stands for college), gender, $g \in \{\text{m}, \text{f}\}$, years of labor market experience, x, and idiosyncratic productivity shock, u:

$$w(j, g, x, u) = e^{\gamma_{0jg} + \gamma_{1jg}x + \gamma_{2jg}x^2 + \gamma_{3jg}x^3 + u} \tag{11}$$

$$u' = \rho_{jg}u + \epsilon, \quad \epsilon \sim N(0, \sigma_{jg}^2) \tag{12}$$

Given this wage function, the beginning wage level as well as the returns to experience and idiosyncratic shock process are allowed to differ by level of education and gender. The productivity shock is assumed to follow the AR(1)-process in 12.

Preferences

The momentary utility function of single individuals, U^S, depends on work hours,

$n \in [0,1]$, consumption, c, and gender, g:

$$U^S(g,c,n) = \log(c) - \chi_g \frac{n^{1+\eta_g}}{1+\eta_g} - F_g \mathbb{1}_{[n>0]} \tag{13}$$

F_g is a fixed, gender specific, disutility from working positive hours. The indicator function, $\mathbb{1}_{[n>0]}$, is equal to 0 when $n = 0$ and equal to 1 when $n > 0$. χ_g here captures the taste for work while $1/\eta_g$ is the Frisch elasticity of labor supply conditional on employment. Married couples have a joint utility function, U^M, with shared consumption, measured in adult equivalents:

$$U^M(c, n_m, n_f) = \log(c/e) - \chi_m \frac{n_m^{1+\eta_m}}{1+\eta_m} - \chi_f \frac{n_f^{1+\eta_f}}{1+\eta_f} - F_m \mathbb{1}_{[n_m>0]} - F_f \mathbb{1}_{[n_f>0]} \tag{14}$$

Household's Problem

Let k be the level of asset holdings, r is the risk-free interest rate, and β the time discount factor. τ_c represents a constant consumption tax, while τ_S is a nonlinear labor income tax. In almost all OECD countries, at least some part of the tax schedule is dependent on whether a person is single or married. There is, however, significant cross country variation. Written recursively, a single household's problem can be formalized as follows:

$$\begin{aligned} V^S(g,j,k,x,u,t) &= \max_{c,n,k'} U^S(g,c,n) + \beta\Big((1-\bar{\omega}(t))E_{u'}\left[V^S(g,j,k',x',u',t+1)\right] \\ &\quad + \bar{\omega}(t)E_{j_p,k'_p,x'_p,u',u'_p}\left[V^M(j,j_p,k'+k'_p,x',x'_p,u',u'_p,t+1)\right]\Big) \\ \text{s.t.:} \quad c(1+\tau_c)+k' &= k(1+r) + nw(j,g,x,u)(1-\tau_S(w(j,g,x,u)n)) \\ &\quad + G + (1-\mathbb{1}_{[n>0]})T \\ x' &= x + \mathbb{1}_{[n>0]}, \quad n \in [0,1], \quad k' \geq 0, \quad c > 0, \end{aligned} \tag{15}$$

where G is a lump sum transfer from the government. Since there is no public good in the model, G can also be viewed as the value of government provided public goods. T is an individual's income if he chooses not to participate in the labor market. The sources of such income could be unemployment benefits, social aid, transfers from relatives and charities and so on. In the model we assume that T is financed over the government budget. $\bar{\omega}(t)$ is a time-dependent probability of becoming married in the next period. The subscript, p, stands for partner. In the case that an individual becomes married in the next period, the expectation of next period's utility must be taken with respect to the distribution over potential partners' education, experience, asset holdings, and idiosyncratic productivity shock, $Q^{jgt}(j_p, x'_p, k'_p, u_p)$. An individual is more likely to find a partner of his own education group, and the distribution of partners naturally varies by gender and age. The distribution over x'_p and k'_p is derived from the individuals' optimal decisions in the model.

Married couples maximize their joint utility and face a time-dependent probability, $\pi(t)$, of becoming divorced. When couples divorce, they split their assets evenly. Their problem can be written as:

$$V^M(j_m, j_f, k, x_m, x_f, u_m, u_f, t) =$$

$$\begin{aligned}
\max_{c,k',n_m,n_f} U^M(c, n_m, n_f) \quad &+ \quad \beta(1-\pi(t))E_{u'_m,u'_f}\left[V^M(j_m, j_f, k', x'_m, x'_f, u'_m, u'_f, t+1)\right] \\
&+ \quad \beta\pi(t)E_{u'_m}\left[V^S(m, k'/2, x'_m, u'_m, t+1)\right] \\
&+ \quad \beta\pi(t)E_{u'_f}\left[V^S(f, k'/2, x'_f, u'_f, t+1)\right] \\
\text{s.t:} \quad c(1+\tau_c) + k' \quad &= \quad k(1+r) + (n_m w_m + n_f w_f)(1 - \tau_M(n_m w_m + n_f w_f)) \\
&\quad +2G + (2 - (\mathbb{1}_{[n_m>0]} + \mathbb{1}_{[n_f>0]}))T \\
x'_m = x_m + \mathbb{1}_{[n_m>0]}, \quad x'_f \quad &= \quad x_f + \mathbb{1}_{[n_f>0]}, \quad n_f, n_m \in [0,1], \quad k' \geq 0, \quad c > 0 \qquad (16)
\end{aligned}$$

Retired households make no labor supply decisions but receive an amount of social security, Ψ_g, depending on their gender. We assume that retired households do not marry or get divorced, and that husband and wife die at the same time. Their problem, if single, is simply:

$$\begin{aligned} V^S(g,k,t) &= \max_{c>0,k'\geq 0} U^S(g,c) + \Omega(t)\beta V^S(g,k',t+1) \\ \text{s.t.:} \quad c(1+\tau_c) &= k(1+r) + \Psi_g + G \end{aligned} \tag{17}$$

where $\Omega(t)$ is the probability of survival until the next period. Married retirees solve:

$$\begin{aligned} V^M(k,t) &= \max_{c>0,k'\geq 0} U^M(c) + \Omega(t)\beta V^M(g,k',t+1), \\ \text{s.t.:} \quad c(1+\tau_c) &= k(1+r) + \Psi_m + \Psi_f + 2G \end{aligned} \tag{18}$$

Government

The government taxes consumption and labor income and runs a balanced budget. We assume that a fraction $(1-\vartheta)$ of the government revenues are spent on interest payments and pure public consumption goods, which enter separable in the utility function. The government finances the social security payments, Ψ_g, the transfers to unemployed people T and redistributes the remainder G evenly to all households. Let $\Upsilon^S(g,j,k,x,u,t)$ be the measure of single households and $\Upsilon^M(j_m,j_f,k,x_m,x_f,u_m,u_f,t)$ be the measure of married households. The government budget can thus be written:

$$\begin{aligned} \int G d\Upsilon^S + \int 2G d\Upsilon^M = \quad & \vartheta \int \big(nw\tau_S(wn) + c\tau_c\big) d\Upsilon^S \\ & + \ \vartheta \int \big((n_m w_m + n_f w_f)\tau_M(n_m w_m + n_f w_f) + c\tau_c\big) d\Upsilon^M \\ & - \int \big(T\mathbb{1}_{[t\leq 44, n=0]} + \Psi_g \mathbb{1}_{[t>44]}\big) d{\Upsilon_g}^S \\ & - \int \big(T(\mathbb{1}_{[t\leq 64, n_m=0]} + \mathbb{1}_{[t\leq 64, n_f=0]})\big) d\Upsilon^M \\ & - \int \big((\Psi_m + \Psi_f)\mathbb{1}_{[t>44]}\big) d\Upsilon^M \end{aligned} \tag{19}$$

Equation 19 says that the sum of lump sum payments to households is equal to the fraction of tax revenues that is not spent on interest payments and pure public consumption goods minus expenses on social security and transfers to non-working households.

6 Calibration

This section describes the calibration of the model parameters. We calibrate our model to match the appropriate moments from the U.S. data. We try to use data from 2000 or the year closest to 2000 that we can obtain. The reason for this is that for the year 2000, we have data that can be used to construct divorce and marriage probabilities for all the countries in Western Europe. We also have tax data for all the countries starting in 2001. Many parameters can be calibrated to direct empirical counterparts without solving the model. They are listed in Table 7. The 9 parameters in Table 8 below are, however, calibrated using an exactly identified simulated method of moments approach. We use the data from the European countries in our sample only to obtain the estimates of tax polynomials and age-specific marriage and divorce probabilities, which we use in Section 7 in our counterfactual experiments.

Preferences

The momentary utility functions for single and married are given in equations 13 and 14, with consumption measured in adult equivalents, $\frac{c}{e}$. We use the OECD adult equivalence scale and set $e = 1.7$ for married couples, and $e = 1.0$ for singles. The discount factor, β, the fixed costs of working, F_m and F_f, as well as χ_m and χ_f are among the estimated parameters. The corresponding data moments are the mean asset holdings of individuals in households with head aged $20 - 64$, taken from the PSID (99-05), male and female employment rates from the CPS (2000) and work hours, taken from OECD 2000.

There is considerable debate in the economic literature about the intertemporal elasticity of labor supply, see Keane (2011) for a thorough survey. However, there seems to be a consensus that the elasticity of labor supply for women is larger than that for men. In our model, the intertemporal elasticity will be related to both the fixed costs of working, F_m and F_f, and the parameters η_m and η_f. We chose to fix the latter two and calibrate the first two within the model. This ensures that the model matches both the intensive and extensive margin of labor supply for men and women. Another reason is that η parameters have direct empirical counterparts in the intensive margin intertemporal elasticity of labor supply. Kimmel and Kniesner (1998) separately estimate the intensive margin elasticities, corresponding to $\frac{1}{\eta_m}$ and $\frac{1}{\eta_f}$ in the model by controlling for selection and includes a fixed cost of participation. They obtain 0.39 for men and 0.66 for women. We choose to be slightly more conservative and set $\frac{1}{\eta_m} = 0.3$, $\frac{1}{\eta_f} = 0.6$. In Appendix 9.7, we present the results from a calibration where we set the elasticity of labor supply of both genders equal to each other, $\frac{1}{\eta_m} = \frac{1}{\eta_f} = 0.4$. We find that this has little effect on our results.

Risk Free Interest Rate

Given the partial equilibrium nature of the model, we take the risk free rate as fixed and calibrate it using the data. We set the risk free rate equal to the average of 3-month t-bill rates minus inflation over the period from 1947-2008 based on data from the Federal Reserve Bank of St. Louis[28].

Wages

We estimate the experience profile of wages and the processes for the idiosyncratic shocks exogenously, using the PSID from 1968-1997. After 1997, it is not possible to get years of actual labor market experience from the PSID. Appendix 9.5 describes the estimation procedure in more detail. We use a maximum likelihood approach to control for selection into the labor market, as described in Heckman (1976) and Heck-

[28]Series TB3MS and GDPDEF.

man (1979). We estimate different returns to experience for each gender/education group. We then obtain the residuals from these estimations and use the panel data structure of the PSID to estimate the parameters for productivity shock process ρ_{jg} and σ_{jg} by OLS. Our results for the shock processes are in line with Chang and Kim (2006) who use a similar approach on PSID data. To get levels of earnings that are in line with the asset holdings, we include a parameter controlling the average earnings of each gender/education group in the simulated moments estimation. The corresponding data moments are the average wage of each group in the PSID 99-05.

Taxes

The labor income tax schedule is a polynomial function of an individual's earnings relative to the average earnings (AE) (See equation 24 in the Appendix). As described in more detail in the Appendix, we fit this polynomial to labor income tax data from the OECD tax database (2001). This data is constructed by the OECD based on tax laws from different countries. It is well suited for cross country comparisons, see also Guvenen, Kuruscu, and Ozkan (2009).

We fit a different tax schedule for married and single individuals. Coming up with an accurate estimate of consumption taxes in the U.S. is complicated by the fact that there are local county-level taxes in addition to state taxes. Vertex Inc. (a consulting company) estimated that the average consumption tax in the U.S. was 8.4% in 2002. We use that number. For simplicity, we abstract from capital taxes. We do this because different types of capital is taxed differently, and this also differs across countries. Households for instance have about half of their wealth in their homes, which may or may not be taxed. In the U.S., interest income is taxed as labor income, while dividends and capital gains are subject to capital gains tax. The return on capital is, however, set very conservatively in our calibration. It is set equal to the returns on risk free bonds, which was 1.1% over the past 60 years.

Table 7: Parameters Calibrated Outside of the Model

Parameter	Value	Description	Target
r	0.011	Risk free interest rate (annual)	3-mnth T-bill minus inflation (1947-2008)
e	1.0 or 1.7	$U^M(c, n_m, n_f) = \log(\frac{c}{e}) - \chi_m \frac{n_m^{1+\eta_m}}{1+\eta_m}$	OECD equivalence scale.
$1/\eta_m, 1/\eta_f$	0.3, 0.6	$-\chi_f \frac{n_f^{1+\eta_f}}{1+\eta_f} - F_m I\{n_m\} - F_f I\{n_f\}$	Kimmel & Kniesner (1998)
$\gamma_{1hsm}, \gamma_{2hsm}, \gamma_{3hsm}$	0.0533, -146(-4), 142(-6)	$w_{hsm} = e^{(\gamma_{0hsm}+\gamma_{1hsm}x+\gamma_{2hsm}x^2+\gamma_{3hsm}x^3)}$	PSID (1968-1997)
$\gamma_{1cm}, \gamma_{2cm}, \gamma_{3cm}$	0.0721, -209(-4), 214(-6)	$w_{cm} = e^{(\gamma_{0cm}+\gamma_{1cm}x+\gamma_{2cm}x^2+\gamma_{3cm}x^3)}$	
$\gamma_{1hsf}, \gamma_{2hsf}, \gamma_{3hsf}$	0.0556, -165(-4), 161(-6)	$w_{hsf} = e^{(\gamma_{0hsf}+\gamma_{1hsf}x+\gamma_{2hsf}x^2+\gamma_{3hsf}x^3)}$	
$\gamma_{1cf}, \gamma_{2cf}, \gamma_{3cf}$	0.0714, -204(-4), 185(-6)	$w_{cf} = e^{(\gamma_{0cf}+\gamma_{1cf}x+\gamma_{2cf}x^2+\gamma_{3cf}x^3)}$	
$\sigma_{hsm}, \sigma_{cm}, \sigma_{hsf}, \sigma_{cf}$	0.326, 0.337, 0.333, 0.347	$u' = \rho_{jg}u + \epsilon$	
$\rho_{hsm}, \rho_{cm}, \rho_{hsf}, \rho_{cf}$	0.761, 0.735, 0.717, 0.743	$\epsilon \sim N(0, \sigma_{jg}^2)$	
τ_{s0}, τ_{s1}	1.727, -6.450	$\tau(y) = \tau_{s0} + \tau_{s1}(y/AE)^{0.2}$	OECD tax data (01)
τ_{s2}, τ_{s3}	8.995, -5.000	$+\tau_{s2}(y/AE)^{0.4} + \tau_{s3}(y/AE)^{0.6}$	
τ_{s4}	0.988	$+\tau_{s4}(y/AE)^{0.8}$	
τ_{m0}, τ_{m1}	2.162, -7.302	$\tau(y) = \tau_{m0} + \tau_{m1}(y/AE)^{0.2}$	OECD tax data (01)
τ_{m2}, τ_{m3}	9.222, -4.736	$+\tau_{m2}(y/AE)^{0.4} + \tau_{m3}(y/AE)^{0.6}$	
τ_{m4}	0.872	$+\tau_{m4}(y/AE)^{0.8}$	
τ_c	0.084	Consumption tax	Vertex Inc. (2002)
T	$8400	Income if not working	CEX 2000-2001
Ψ_m, Ψ_f	$12600, $9680	Social security	S.S. Admin. (2000)
ϑ	0.74	Government budget, eqn. 19	Government budget (2000)
$\bar{\omega}(t)$	Varies	Prob. of marriage	CPS (1999-2001)
$\pi(t)$	Varies	Prob of divorce	CPS (1999-2001)
$\Gamma(t)$	Varies	Death probabilities	NCHS (1991-2001)
Fraction w. some college	0.533		CPS (1999-2001)
Prob. intra ed. marriage	0.737		CPS (1999-2001)
k_0	8260	Savings at age 20	NLSY97
M_0	0.126	Share of married 20 year-olds	CPS (1999-2001)

Table 8: Parameters Calibrated Endogenously

Parameter	Value	Description	Moment	Moment Value
γ_{0hsm}	-0.653	$w_{hsm} = e^{(\gamma_{0hsm}+\gamma_{1hsm}x+\gamma_{2hsm}x^2+\gamma_{3hsm}x^3)}$	Mean male hs-wages	1.006
γ_{0cm}	-0.394	$w_{cm} = e^{(\gamma_{0cm}+\gamma_{1cm}x+\gamma_{2cm}x^2+\gamma_{3cm}x^3)}$	Mean male c-wages	1.493
γ_{0hsf}	-0.998	$w_{hsf} = e^{(\gamma_{0hsf}+\gamma_{1hsf}x+\gamma_{2hsf}x^2+\gamma_{3hsf}x^3)}$	Mean female hs-wages	0.705
γ_{0cf}	-0.740	$w_{cf} = e^{(\gamma_{0cf}+\gamma_{1cf}x+\gamma_{2cf}x^2+\gamma_{3cf}x^3)}$	Mean female c-wages	1.043
β	1.002	Discount factor	Mean assets	1.200
F_m	0.333	$U^M(c, n_m, n_f) = \log(\frac{c}{e}) - \chi_m \frac{n_m^{1+\eta_m}}{1+\eta_m}$	Male employment rate	0.840
F_f	0.022	$-\chi_f \frac{n_f^{1+\eta_f}}{1+\eta_f} - F_m I\{n_m\} - F_f I\{n_f\}$	Female employment rate	0.706
χ_m	46.70		Male hours	0.328
χ_f	13.20		Female hours	0.224

Death Probabilities and Social Security

We obtain the probability that a retiree will survive to the next period from the National Center for Health Statistics (1991-2001). We assume that all retirees receive the same constant Social Security benefit, which only depends on gender. We obtain the average benefit for males and females from the Annual Statistical Supplement to the Social Security Bulletin (2000).

Marriage and Divorce Probabilities

To compute the age-specific probabilities for marriage and divorce for the U.S., we use the data from the CPS March supplement from 1999-2001. For most European countries, we use the data from Eurostat on-line database[29]. For some European countries, we supplement it with the data from the IPUMS International.

We assume a stationary environment, where the probabilities of getting married and divorced don't change over time (we allow them to depend on the age of the person, but not on his/her cohort). We also assume that the probability of getting married is the same for those who get married for the first time, and those who were previously divorced. This allows us to compute the probabilities using the following approach. Let M_t and D_t be the share of the married and divorced persons respectively at age t[30]. Then the probability of getting married at age t, $\bar{\omega}(t)$, and

[29] Available at `http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database`.

[30] Figure 16 in the Appendix shows the fraction of married and divorced women by age in the

the probability of getting divorced at age t, $\pi(t)$, is pinned down by:

$$M_{t+1} = (1 - M_t)\bar{\omega}(t) + M_t(1 - \pi(t)) \quad (20)$$

$$D_{t+1} = D_t(1 - \bar{\omega}(t)) + M_t\pi(t) \quad (21)$$

We smooth the resulting age-profiles for $\bar{\omega}(t)$ and $\pi(t)$ by fitting a polynomial. Figure 6 shows the resulting probability profiles for the U.S., Germany and Italy[31].

Figure 6: Age-dependent Probabilities of Marriage and Divorce

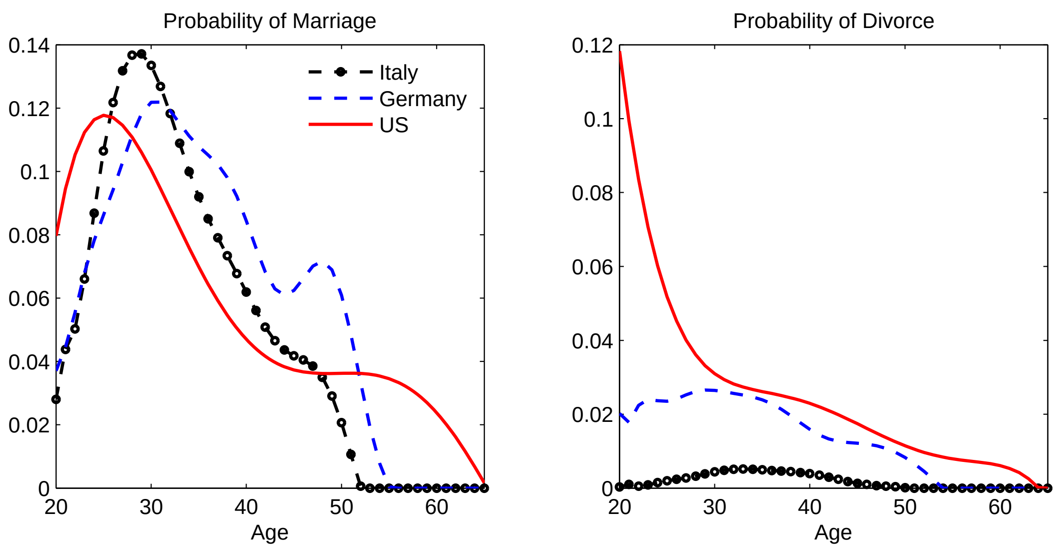


Figure 6 shows that the probability of getting divorced is noticeably higher in the U.S. than Italy, and somewhat higher than in Germany. At the same time, the probability of getting married reaches its peak in the U.S. somewhat earlier compared to the two European countries[32].

U.S., Italy and Germany.

[31]Countries like Spain, Ireland, Greece and Portugal have marriage and divorce probabilities similar to Italy, and countries like Netherlands and Belgium are similar in this respect to Germany.

[32]The computed probabilities use the data for women. We get a qualitatively similar picture when using the data for both men and women (with the exception that men in all countries tend to get married somewhat later than women).

Transfers to Unemployed, Fixed Cost of Working and Lump Sum Redistribution

People who do not work have other source of income such as unemployment benefits, social aid, gifts from relatives and charities, black market work etc. They do also have more time for home production (not included in the model). Pinning down the money equivalent value of not working is a difficult task. The number we land on will also clearly affect the size of the fixed cost of working, which we calibrate endogenously to hit the employment rates for men and women, see Table 8. As an approximation for income when not working, we take the average value of non-housing consumption of households with income less than \$5000 per year from the 2000-2001 Consumer Expenditure Survey. To determine ϑ, the fraction of the government's income, which can be spent on households in the model, we follow Prescott (2004) and assume that government expenditure on pure public consumption goods is equal to 2 times expenditure on national defense. If we also deduct interest payments, we are left with 74% of the year 2000 government budget.

Estimation Method

9 model parameters are calibrated using an exactly identified simulated method of moments approach. We minimize the squared percentage deviation of simulated model statistics from the 9 data moments in column 3 of Table 8. Let $\Theta = \{\gamma_{0hsm}, \gamma_{0cm}, \gamma_{0hsf}, \gamma_{0cf},\ \beta, F_m, F_f, \chi_m, \chi_f\}$ and let $V(\Theta) = (V_1(\Theta), \ldots, V_9(\Theta))'$ denote the vector where $V_i(\Theta) = (\bar{m}_i - \hat{m}_i(\Theta))/\bar{m}_i$ is the percentage difference between empirical moments and simulated moments. Then:

$$\hat{V} = \min_{\Theta} V(\Theta)'V(\Theta) \tag{22}$$

Table 8 summarizes the estimated parameter values and the data moments. We match all the moments exactly so that $V(\Theta)'V(\Theta) = 0$.

7 The Impact of Marriage Stability and Taxation on Labor Supply

In Section 3, we documented a negative correlation between work hours and taxation measures, and a positive correlation between work hours and divorce rates across countries and across time. Motivated by these observations, in this section we study the quantitative impact of cross-country differences in tax schemes, divorce and marriage rates on labor supply. We use the model we developed in Section 5 and calibrated to U.S. data in Section 6. Then, we replace the U.S. tax system and the marriage and divorce probabilities in the model with the ones that we compute from each of the European countries in our sample.

We consider 3 different counterfactual experiments: **(i)** We replace both the U.S. marriage and divorce probabilities, and the tax system in the model with the ones we compute for each European country in our sample; **(ii)** We replace only the marriage and divorce probabilities, and leave the tax system unchanged, at the U.S. level; **(iii)** We replace only the tax system, and leave the marriage and divorce probabilities unchanged, at their U.S. values.

During these experiments, we keep taxes, old age social security, and income when not working proportional to the average earnings in the economy[33]. In this way, if the society becomes richer or poorer because of a counterfactual experiment, taxes and social security payments will adjust accordingly.

The Effect of Marriage Stability and Taxation

Figure 7 shows the results when simultaneously replacing both the U.S. marriage and divorce probabilities and the tax system in the model with those obtained for each European country. On the x-axis, we put the difference in hours worked between

[33] In the case of taxes, we have specified them as polynomials in y/AE, where y is individual labor income, and AE is the average earnings in the economy.

the U.S. and the European countries produced by our model, and on the y axis, we put the difference that we find in the data. Ideally, if the model were able to match the hours worked in the European countries exactly, using just the two mechanisms that we study in this paper, all the observations would fall on the diagonal line (the black line). If the observation for a particular European country falls to the left of the diagonal line in the picture, it means that the two mechanisms that we study do not lead to enough reduction of hours worked in that country compared to the U.S. to match the data perfectly (agents "work too much" in the model compared to the data), and vice versa if the observation falls to the right of the diagonal. Hours worked in the U.S. fall on the diagonal line by construction, since our model is calibrated to match the U.S. in terms of annual hours worked. The sum of the squares of the horizontal distances from each country's observation to the diagonal line is equal to the mean squared error.

Figure 7: The Combined Effect of Marriage Stability and Taxes

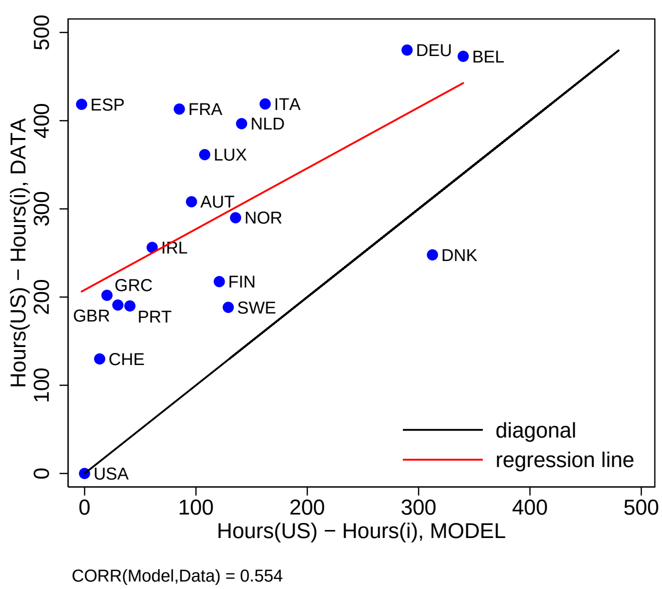


Figure 7 shows that we obtain a positive correlation between the hours worked generated by the model and hours worked that we find in the data, equal to 0.554. We explain 58% of the variation between the U.S. and the European countries in the data as measured by the coefficient of determination[34]:

$$R^2 = 1 - \frac{\text{SS}_{err}}{\text{SS}_{tot}} \tag{23}$$

where $\text{SS}_{err} = \sum_{i=1}^{n} (h_{i,model} - h_{i,data})^2$, $\text{SS}_{tot} = \sum_{i=1}^{n} (h_{i,data} - h_{us})^2$, $h_{i,model}$ is the hours worked in country i generetad by the model, $h_{i,data}$ is the hours worked in country i in the data, and h_{us} is the hours worked in the U.S. (both in the model and in the data)[35]. This means that the two mechanisms that we study work in the right direction. However, since all our European countries but Denmark fall to the left of the diagonal, this means that the two mechanisms that we study generally do not reduce the hours worked in the model enough to match the data perfectly.

Column 3 of Table 9 lists the results for each country in the model, as percent of hours worked in the U.S., next to the observed value in the data in column 2. As can be seen from the Table we are relatively more successful in explaining hours worked in the Nordic countries and Central Europe than in Southern Europe.

Figure 8 illustrates the impact of one mechanism at a time – we either change the U.S. marriage and divorce probabilities in the model to those found in the European countries while keeping the tax system unchanged (set to the U.S. level), or change the U.S. tax system while keeping the marriage and divorce probabilities unchanged. In both cases, we get positive correlations between the hours worked generated in the model and those that we find in the data – higher taxes and higher marriage stability reduce hours worked in the model. The correlations with the data in both separate experiments are of about equal strength, and smaller than those from the combined experiment, suggesting that both mechanisms play an important role in

[34]Table 14 in the Appendix evaluates the model's performance as measured by other commonly used goodness-of-fit measures.

[35]In the literature our R^2 is also referred to as the "forecast skill" measure. It evaluates by how much the model in question improves the forecast compared to some reference model. In our case, the hours worked in the U.S. are used as the "reference model".

accounting for the difference in hours worked between the U.S. and Europe (which is similar to what we found in Section 3). As measured by R^2, divorce and marriage probabilities explain 19% of the variation in labor supply between the U.S. and the European countries, whereas taxes explain 43%.

As can be seen from columns 4 and 5 in Table 9, taxes generally work in the wrong direction for the Southern European countries, which have low taxes, and hours increase relative to the United States. However, Southern European countries have very low divorce rates, which work in the right direction for these countries. In the Nordic countries divorce and marriage probabilities work in the wrong direction. These countries have very low marriage rates, and also high divorce rates. Taxes, however, do a good job of predicting labor supply in the Nordic countries. In Central Europe both the divorce and tax mechanisms reduce hours relative to the U.S.

Table 14 in the Appendix provides the details for several other commonly used measures of goodness of fit/forecast evaluation for our 3 counterfactual experiments. All the goodness of fit measures in Table 14 point in the same direction – Experiment 1 where both mechanisms are present provide the best fit to the data (smallest MSE/largest R^2). Experiment 3 (with only the tax mechanism operative) provides a better fit to the data than Experiment 2 (with only the marriage stability mechanism operative). We conclude that both mechanisms contribute to our model's ability to account for the cross-country differences in hours worked, with taxes playing a somewhat larger role.

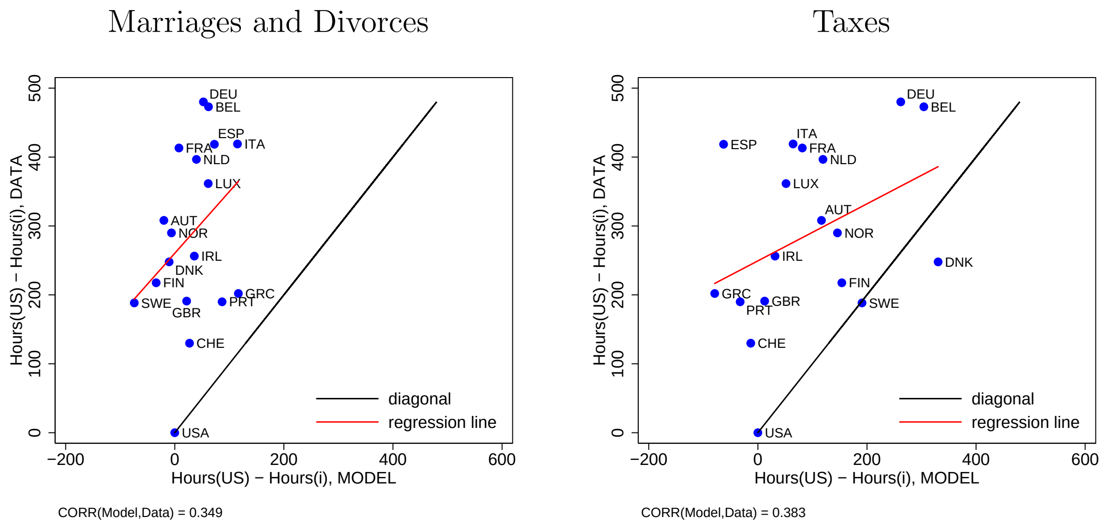
The Effect on Men and Women Separately

Motivated by our finding in Section 3 that the correlation between work hours and taxes is much stronger for men and that the correlation between work hours and divorce rates is much stronger for women, in this section we examine the impact of the two mechanisms that we study in this paper on the two genders separately. Figures 9 and 10 and columns 6-13 of Table 9 present the results. The two figures

Table 9: Hours Worked in the Model and in the Data, in Percent of the U.S. hours

	All				Men				Women			
	Data (2)	Tax. & Div. (3)	Divorces (4)	Taxes (5)	Data (6)	Tax. & Div. (7)	Divorces (8)	Taxes (9)	Data (10)	Tax. & Div. (11)	Divorces (12)	Taxes (13)
Nordic countries:												
Denmark	83.5	79.1	100.7	77.9	82.3	71.5	100.2	70.3	86.9	90.3	101.4	89.1
Finnland	85.5	91.9	102.3	89.7	81.3	90.7	100.7	89.9	90.6	93.7	104.5	89.4
Norway	80.6	90.9	100.4	90.3	81.7	90.8	99.7	90.2	77.7	91.0	101.4	90.3
Sweden	87.4	91.4	105.0	87.3	83.7	89.8	102.5	87.5	91.9	93.8	108.6	86.9
Mean:	84.2	88.3	102.1	86.3	82.2	85.7	100.8	84.5	86.8	92.2	104.0	88.9
Central Europe:												
Austria	79.4	93.6	101.3	92.2	84.6	94.4	100.8	93.2	71.8	92.5	102.2	90.7
Belgium	68.4	77.3	95.9	79.7	73.9	78.7	97.8	80.2	60.5	75.2	93.0	78.9
Netherlands	73.5	90.6	97.4	92.0	85.4	90.7	98.3	91.7	55.5	90.4	95.9	92.5
Germany	67.9	80.7	96.5	82.5	71.3	82.2	98.0	83.5	62.1	78.4	94.3	81.1
Switzerland	91.3	99.1	98.2	100.9	101.3	98.0	98.7	99.3	79.4	100.7	97.4	103.2
France	72.4	94.3	99.5	94.6	75.0	94.8	99.1	95.3	68.8	93.6	100.0	93.5
Luxembourg	75.9	92.8	95.9	96.6	85.1	95.0	97.9	96.6	61.4	89.6	93.0	96.4
UK	87.3	98.0	98.6	99.2	94.5	97.5	98.9	98.4	77.9	98.8	98.1	100.2
Mean:	77.0	90.8	97.9	92.2	83.9	91.4	98.7	92.3	67.2	89.9	96.7	92.1
Southern Europe:												
Greece	86.5	98.7	92.2	105.3	97.3	98.7	95.5	103.0	71.6	98.6	87.3	108.6
Ireland	82.9	95.9	97.6	97.9	93.0	95.8	98.1	97.7	67.2	96.2	96.9	98.1
Italy	72.0	89.2	92.3	95.7	82.3	91.3	95.4	95.4	57.3	86.0	87.8	96.2
Portugal	87.3	97.3	94.2	102.2	88.9	99.7	96.8	101.6	84.9	95.1	90.4	103.1
Spain	72.0	100.2	95.1	104.2	82.0	99.8	96.9	102.7	57.4	100.7	92.6	106.4
Mean:	80.2	96.2	94.3	101.1	88.7	97.1	96.5	100.1	67.7	95.3	91.0	102.5
U.S.A	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
R^2:	n.a.	0.577	0.189	0.430	n.a.	0.669	0.117	0.596	n.a.	0.427	0.241	0.232
Corr(data,model):	n.a.	0.554	0.349	0.383	n.a.	0.620	-0.070	0.601	n.a.	0.435	0.608	0.062

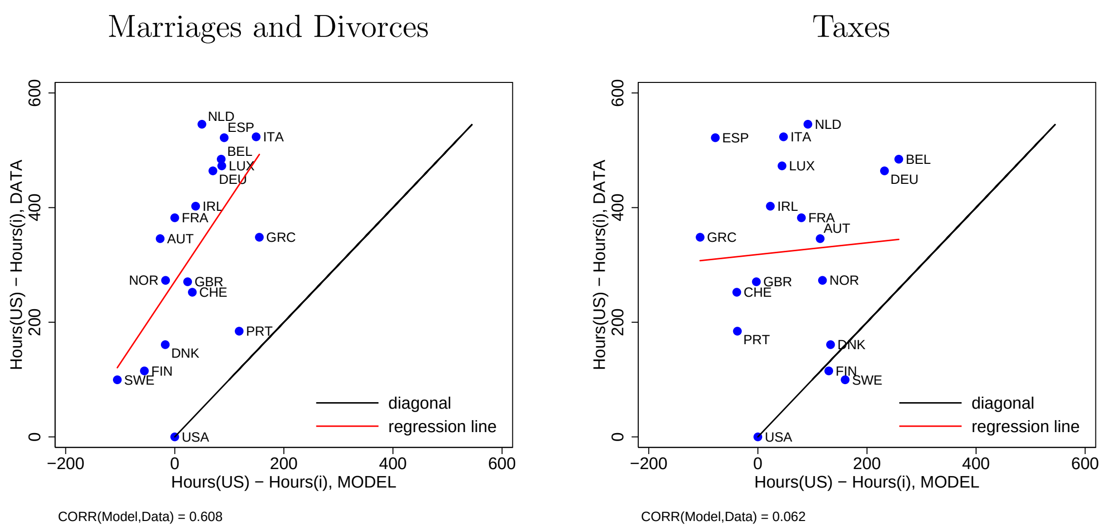
Figure 8: Separate Effects of Marriage Stability and Taxes



show that there is a very pronounced difference in how these two mechanisms affect men and women in our model. Figure 9 shows that female labor supply is mostly correlated with the marriage stability mechanism. Female hours worked fall in countries with more stable marriages. At the same time, in the model where we only change the tax system, leaving the marriage and divorce probabilities at their U.S. levels, the correlation between the actual hours worked by women in the data and those generated by our model is close to 0. Taxes do, however, on average reduce hours worked for women. As measured by R^2, divorce and marriage probabilities explain 24% of the variation in female labor supply between the U.S. and the European countries, while taxes explain 23%.

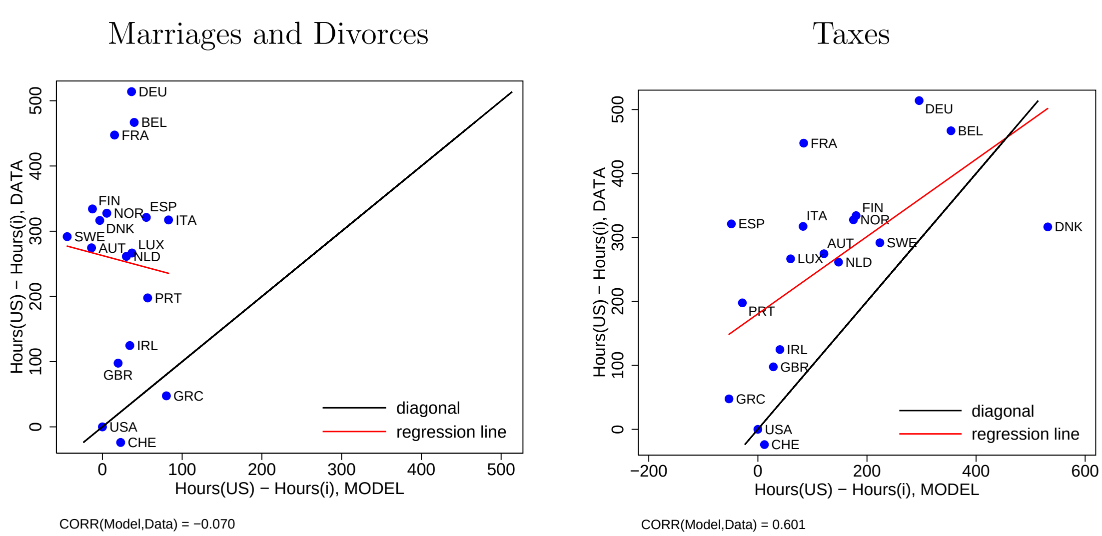
The results for men are directly opposite to those for women. In our model, men appear to react mostly to the changes in the tax system. When we change the marriage and divorce probabilities and leave the taxes at their U.S. levels, the correlation between the actual hours worked by men in the data and those generated by our model is very small and negative. This is in line with our findings in Section 2 that there is no correlation between male labor supply and divorce rates in the

Figure 9: Separate Effects of Marriage Stability and Taxes on Women



data. The R^2 for men is 12% when we introduce European marriage and divorce probabilities and 60% when we introduce European tax systems into the model. With both mechanisms combined we can explain 67% of the variation from the U.S. for men and 43% for women. We conclude that taxes are a very powerful explanation for male labor supply, while divorce and marriage rates help significantly in explaining female labor supply.

Figure 10: Separate Effects of Marriage Stability and Taxes on Men



The Impact of Tax Progressivity on Male and Female Labor Supply

Why do the higher European taxes affect men much more than women in our model? It is related to the structure of the tax systems. The European countries with high average labor income taxes are also more likely to have higher tax progressivity (the correlation between the average effective labor income tax rate and the tax progressivity measure that we used in Section 3 is for instance 0.389 is our sample), meaning that the higher tax rates in these countries will disproportionately affect high earning households. It is even possible that because of the tax progressivity, low earners face lower tax rates in Europe compared to the U.S. Because of the gender wage gap, men are more likely to be among the high earners, and single men will thus be more affected by the higher labor income taxes than single women. Since we tax married households jointly in our model, it is somewhat less straightforward to see why married women would increase their labor supply relative to their spouses when taxes become more progressive. That effect comes from the extensive margin. Many poorer married households increase their labor supply and they do so by going from 1 to 2 earners, i.e. they let the female spouse work.

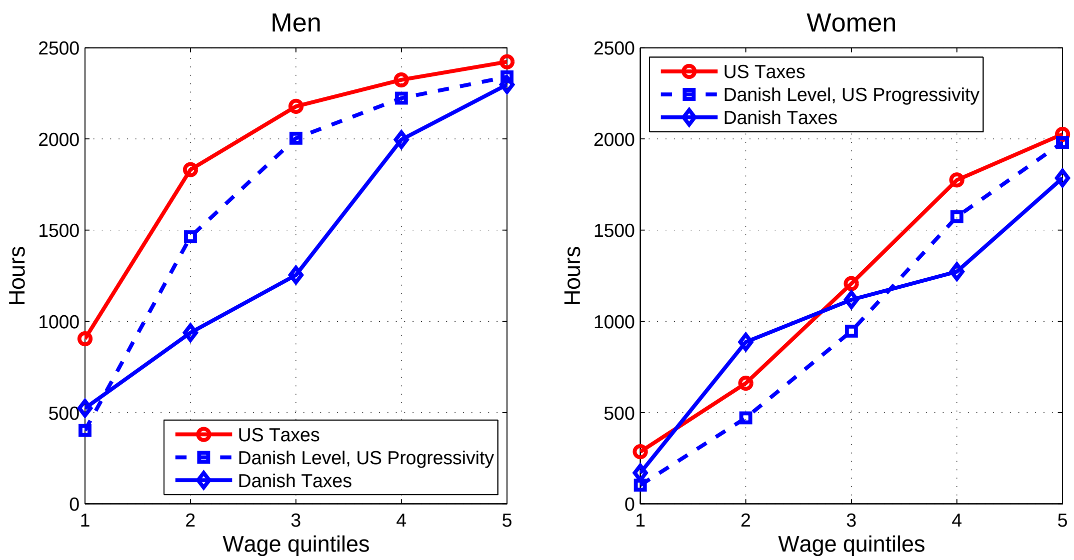
To study the impact of tax progressivity versus tax level, we conduct the following experiment. We start with our benchmark model, which we calibrated using the U.S. labor income taxes. Then we first change the labor income taxes so that the average labor income tax rate would be equal to that in Denmark, but tax progressivity would remain the same as in the U.S.[36]. Next, we also change the tax progressivity so that it is the same as in Denmark. We choose Denmark because it is both among the countries with the highest tax levels and among the countries with the most progressive taxes in our sample.

Figure 11 shows what happens to hours worked for men and women at different wage-quintiles as we change the tax system[37]. The results confirm our intuition.

[36]See Appendix 9.6 for the details.

[37]The figure shows the results for 40-year old persons who are in the middle of their life cycle in

Figure 11: Changing Tax Level vs. Changing Tax Progressivity



As we change the U.S. taxes to the Danish tax level, keeping tax progressivity unchanged, the work hours schedule shifts downward – individuals at all wage-quintiles reduce their labor supply. As we also change the tax progressivity so that it is the same as in Denmark, the work hours schedule also changes its shape – because of the higher tax progressivity, the lowest earners actually increase their work hours, while higher earners reduce their work hours further. For single households this effect is more pronounced for women because they earn less than men. For married low income households, wives increase their labor supply relative to their husbands because many of these households change from 1 to 2 earners. Table 20 in the Appendix shows how the labor force participation rate of wives in low earning households increases as taxes become more progressive.

Intensive vs. Extensive Margin

In Section 2 we documented that the intensive and extensive margin are about equally important in accounting for differences in labor supply between the U.S. and Europe but that the importance of the two margins varies greatly with region. Table 19 in

our model. The results for the agents of other ages are similar.

the Appendix displays our model's performance in accounting for the intensive and extensive margin of labor supply across countries. A striking result of the table is the obtained R^2. Divorce and marriage probabilities explain 35% of the variation in employment rates between the U.S. and our European countries and have close to 0 explanatory power with respect to the intensive margin. For taxes its the other way around. Taxes explain 41% of the variation in intensive margin hours between the U.S. and the European countries but have negative explanatory power with respect to employment rates. This is similar to what we find in the data (see Table 13 in Appendix).

Discussion

The correlation between female labor supply in the data and in our model when we introduce European divorce and marriage rates is quite strong, 0.61. However as measured by R^2 we only explain 24% of the variation in female labor supply between the U.S. and our European countries. The effect of marriage and divorce rates pull in the right direction but the size of the effects is not that large.

A concern may be whether divorces are costly enough in the model. More costly divorces are likely to increase the impact of marriage and divorce probabilities on labor supply. For instance, we do not have children in the model. Children usually follow their mother in case of divorce, making divorce more costly for women (See Fernandez and Wong (2011) for a model that incorporates this effect). Cubeddu and Rios-Rull (2003) assume that 20% of a couple's assets are lost when there is a divorce. This may be a reasonable assumption. Divorces carry large administrative costs, potential losses related to liquidation of home equity, reduced labor market mobility if there are children in the marriage etc. We leave alternative specifications of the cost of divorce for future research but believe that the real cost of divorce is larger than in the current model.

8 Conclusion

In this paper we show that prime aged women are the largest contributor to differences in aggregate labor supply between the U.S. and Western Europe. We document a negative cross-country correlation between tax levels and labor supply and a positive correlation between divorce rates and labor supply across time and place. However, the first correlation is driven by a strong correlation between male labor supply and taxes whereas the latter correlation is driven by a strong correlation between female labor supply and divorce rates.

To quantify the impact of differences in tax schemes and divorce/marriage rates on labor supply, we develop a life-cycle, overlapping-generations model with heterogeneous agents, marriage, and divorce. We calibrate our model to U.S. data and study how labor supply in the U.S. changes as we introduce European tax systems, and as we replace the U.S. divorce and marriage rates with their European equivalents. Combining these two mechanisms can account for 58% of the variation in hours worked between the U.S. and the European countries. Taxes are a good predictor of male labor supply, while the two mechanisms are equally important in explaining female labor supply across countries.

References

Alesina, Alberto, Edward Glaeser, and Bruce Sacerdote, 2005, Work and Leisure in the US and Europe: Why so Different?, *NBER Macroeconomic Annual* pp. 1–64.

Attanasio, Orazio, Hamish Low, and Virginia Sanchez-Marcos, 2008, Explaining Changes in Female Labor Supply in a Life-Cycle Model, *American Economic Review* 98, 1517–52.

Bick, Alexander, and Nicola Fuchs-Schundeln, 2012, Taxation and Labor Supply of Married Women: A Cross-Country Analysis, Working paper Goethe University Frankfurt.

Blundell, Richard, Antoine Bozio, and Guy Laroque, 2011, Extensive and Intensive Margins of Labour Supply: Working Hours in the US, UK and France, *IFS Working Paper*.

Caucutt, Elizabeth M., Selahattin Imrohoroglu, and Krishna B. Kumar, 2003, Growth and Welfare Analysis of Tax Progressivity in a Heterogeneous-Agent Model, *Review of Economic Dynamics* pp. 546–577.

Chang, Yongsung, and Sun-Bin Kim, 2006, From Individual to Aggregate Labor Supply: A Quantitative Analysis Based on a Heterogeneous-Agent Macroeconomy, *International Economic Review* 47, 1–27.

Crouch, John, and Richard Beaulieu, 2006, No-Fault Divorce Laws and Divorce Rates in the United States and Europe: Variations and Correlations, in *Loveless, A.S. and Holman, T.B. (Eds.), The Family in the New Millennium: Protecting the Natural and Fundamental Group Unit of Society.* (Praeger Publishing, Westport, CT).

Cubeddu, Luis, and Jose Victor Rios-Rull, 2003, Families as Shocks, *Journal of the European Economic Association* pp. 671–682.

Fernandez, Raquel, and Joyce Cheng Wong, 2011, The Disappearing Gender Gap: The Impact of Divorce, Wages, and Preferences on Eduction Choices and Women's Work, *Working Paper*.

Furtado, Delia, Miriam Marcen, and Almudena Sevilla-Sanz, 2010, Does Culture Affect Divorce Decisions? Evidence From European Immigrants in the US, Working Paper 495 University of Oxford.

Goldin, Claudia, and Laurence Katz, 2002, The power of the pill: Oral contraceptives and womens career and marriage decisions., *Journal of Political Economy* 110(4), 730–770.

Gonzalez, Libertad, and Tarja K. Viitanen, 2009, The Effect of Divorce Laws on Divorce Rates in Europe, *European Economic Review* pp. 127–138.

Guner, Nezih, Remzi Kaygusuz, and Gustavo Ventura, 2011, Taxation and Household Labor Supply, *Review of Economic Studies, forthcoming.*

Guvenen, Fatih, Burhanettin Kuruscu, and Serdar Ozkan, 2009, Taxation of Human Capital and Wage Inequality: A Cross-Country Analysis, Working Paper 15526 National Bureau of Economic Research.

Heckman, James, 1976, The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models, *The Annals of Economic and Social Measurement* 5, 475–492.

Heckman, James, 1979, Sample Selection Bias as a Specification Error, *Econometrica* 47, 153–162.

Johnson, William, and Jonathan Skinner, 1986, Labor Supply and Marital Separation, *The American Economic Review* 76, 455–469.

Keane, Michael P., 2011, Labor Supply and Taxes: A Survey, *Journal of Economic Literature* 49, 961–1045.

Kennes, John, and John Knowles, 2012, Can Improved Contraception Account for the Decline of Marriage?, Working paper University of Aarhus and University of Southampton.

Kimmel, Jean, and Thomas J. Kniesner, 1998, New Evidence on Labor Supply: Employment vs. Hours Elasticities by sex and Marital Status, *Journal of Monetary Economics* 42, 289–301.

Kotlikoff, Laurence J., and Avia Spivak, 1981, The Family as an Incomplete Annuities Market, *Journal of Political Economy* pp. 372–391.

McDermott, Rose, James H. Fowler, and Nicholas A. Christakis, 2009, Breaking Up is Hard to Do, Unless Everyone Else is Doing it Too: Social Network Effects on Divorce in a Longitudinal Sample Followed for 32 Years, Working paper Brown University.

Olivetti, Claudia, 2006, Changes in Women's Hours of Market Work: The Role of Returns to Experience, *Review of Economic Dynamics* 9, 557–587.

Prescott, Edward C., 2004, Why do Americans Work so Much More Than Europeans, *Federal Reserve Bank of Minneapolis Quarterly Review* 28, 2–13.

Rendall, Michelle, 2011, The Service Sector and Female Market Work: Europe vs US, Working paper University of Zurich.

Rogerson, Richard, 2006, Understanding Differences in Hours Worked, *Review of Economic Dynamics* pp. 365–409.

Rogerson, Richard, 2007, Taxation and Market Work: is Scandinavia an Outlier?, *Economic Theory* 32, 59–85.

Rogerson, Richard, 2008, Structural Transformation and the Deterioration of European Labor Market Outcomes, *Journal of Political Economy* pp. 235–259.

Sayer, Liana C., and Suzanne M. Bianchi, 2000, Women's Economic Independence and the Probability of Divorce: A Review and Reexamination, *Journal of Family Issues* 21(7), 906–943.

Schoen, Robert, Stacy J. Rogers, and Paul R. Amato, 2006, Wives' Employment and Spouses' Marital Happiness: Assessing the Direction of Influence Using Longitudinal Couple Data, *Journal of Family Issues* 27, 506–528.

Stevenson, Betsey, 2008, Divorce Law and Women's Labor Supply, *Journal of Empirical Legal Studies* 5, 853–873.

Tauchen, George, 1986, Finite State Markov-chain Approximations to Univariate and Vector Autoregressions, *Economic Letters* 20, 177–181.

Wallenius, Johanna, 2012, Social Security and Cross-Country Differences in Hours: A General Equilibrium Analysis, *Working Paper, Stockholm School of Economics.*

9 Appendix

9.1 Fitting Tax Functions Based on Data from the OECD

For every country in Table 1, we fit the below polynomial where an individual's average tax rate is a function of his earnings relative to the average earnings in the economy:

$$\tau(y) = \tau_0 + \tau_1 \left(\frac{y}{AE}\right)^{0.2} + \tau_2 \left(\frac{y}{AE}\right)^{0.4} + \tau_3 \left(\frac{y}{AE}\right)^{0.6} + \tau_4 \left(\frac{y}{AE}\right)^{0.8} \tag{24}$$

The advantage of this specific functional form is that it generally gives us a very good fit with the data, R^2. We use labor income tax data from the OECD Tax-Benefit Calculator[38] and the OECD Tax Database[39]. This data is constructed by the OECD based on tax laws from different countries. The OECD Tax-Benefit Calculator gives the gross- and net-, after taxes and benefits, labor income, by family type in 2001. For single individuals we can get these data for every percentile of average labor income for a range between 50% and 200% of average labor income. For married couples, one spouse's earnings have to be fixed at either 0%, 67%, 100% or 167% of average labor income, while the other spouse's earnings can take any whole percent value between 50% and 200% of average labor income. We fit different polynomials for married and single. We use the data for single and married individuals without children. For married individuals, we let the couples be as symmetric as possible. [40]. The OECD Tax Database provides the top marginal tax rate in each country and the starting point for this tax rate for single individuals. To get the tax at earnings above 200% of average labor income, we use this information. For many countries the top marginal tax rate kicks in before 200% of average labor income but in the U.S., for instance, the top marginal tax rate starts at 9 times average earnings. We then assume that the marginal tax rate increases linearly between 2 times average earnings and the point where the top marginal tax rate becomes effective. We assume that the top marginal tax rate for married couples starts at twice the level for singles.

[38]Available at: `www.oecd.org/document/18/0,3343,en_2649_34637_39717906_1_1_1_1,00.html`.

[39]Available at: `www.oecd.org/document/60/0,3343,en_2649_34533_1942460_1_1_1_1,00&&en-USS_01DBC.html`.

[40]One feature of the tax system that we are not able to capture with this approach is varying degrees of joint versus separate taxation of married couples. Guner, Kaygusuz, and Ventura (2011) points out that separate taxation of married couples leads to a lower marginal tax rate on the secondary earner in a couple, and therefore encourages female labor supply.

Furthermore we assume that there is 0% tax at 0 earnings and for earnings below 50% of average earnings we linearly interpolate the tax between $\tau(0.5 * AE)$ and $\tau(0)$.

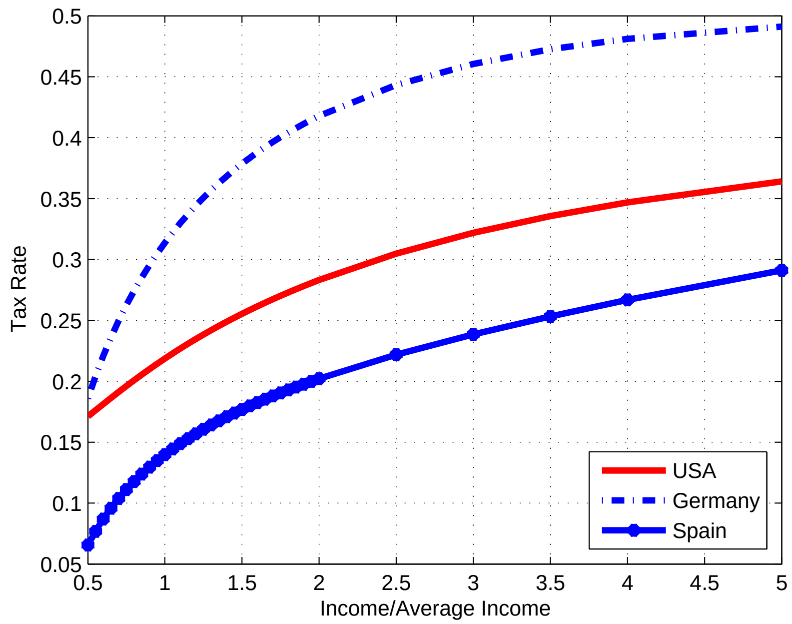
Table 10: Country Tax Functions for Married Couples

Country	τ_0	τ_1	τ_2	τ_3	τ_4	R^2
Austria	5.591343	-19.17492	24.16844	-12.8056	2.451535	0.9945
Belgium	-6.1645	18.35908	-19.74126	9.674913	-1.783321	0.9982
Denmark	-28.1151	82.6305	-89.35836	42.80431	-7.638321	0.9905
Finland	-5.062344	13.81237	-13.90515	6.559641	-1.186956	0.9998
France	-0.4677592	2.062677	-2.743411	1.820481	-0.4305004	0.9989
Germany	-0.5409343	-0.9886915	4.474231	-3.421762	0.7909097	0.9962
Greece	-15.38484	48.03587	-55.50611	28.30343	-5.32562	0.9941
Ireland	1.612143	-6.871639	9.391285	-4.898055	0.8901651	0.9940
Italy	-4.143618	11.07723	-10.77931	4.893096	-0.8552848	0.9996
Luxembourg	-0.0840795	-2.859591	6.036954	-3.722134	0.7483014	0.9990
Netherlands	-10.87501	32.46464	-35.65958	17.52148	-3.214915	0.9928
Norway	-5.335858	14.96881	-15.43612	7.362051	-1.335945	0.9981
Portugal	3.907341	-12.23614	13.88106	-6.514196	1.101643	0.9995
Spain	-2.811092	8.034616	-8.401096	4.023208	-0.7058137	0.9959
Sweden	-3.314906	9.808722	-10.54196	5.343565	-1.032559	0.9927
Switzerland	-16.09581	48.2164	-53.35435	26.20165	-4.78368	0.9950
UK	-4.01828	11.29697	-11.56235	5.448592	-0.9772443	0.9990
U.S.A	2.16239	-7.301506	9.221961	-4.736035	0.8718943	0.9949

Table 11: Country Tax Functions for Singles

Country	τ_0	τ_1	τ_2	τ_3	τ_4	R^2
Austria	-5.626168	16.19854	-16.39948	7.397988	-1.250442	0.9937
Belgium	-4.587984	13.62661	-14.19084	6.823648	-1.24974	0.9959
Denmark	0.1422833	-2.357568	5.737164	-3.968169	0.8855884	0.9940
Finland	-1.387284	2.706099	-0.9767094	-0.0860593	0.0717587	0.9987
France	0.7157418	-2.514716	3.64648	-1.88936	0.3320441	0.9980
Germany	-6.582745	19.08046	-19.22463	8.580912	-1.430125	0.9964
Greece	-5.55185	14.76655	-14.7313	6.887032	-1.237959	0.9909
Ireland	-1.75284	2.625375	0.1463597	-1.13193	0.3456357	0.9983
Italy	-1.555522	2.965259	-0.9916236	-0.3076185	0.1599916	0.9992
Luxembourg	0.0866169	-2.91607	6.525497	-4.37144	0.9543883	0.9977
Netherlands	1.126893	-4.322011	6.331867	-3.487033	0 .6651015	0.9899
Norway	2.335783	-8.6315	11.83152	-6.471281	1.25354	0.9988
Portugal	2.604929	-9.655736	12.78917	-6.821912	1.293703	0.9994
Spain	-2.640157	7.853874	-8.641411	4.527437	-0.9025463	0.9979
Sweden	5.645098	-18.75109	23.36599	-12.24517	2.322895	0.9968
Switzerland	-1.4185	5.181097	-6.488006	3.771889	-0.8035895	0.9985
UK	-0.3775787	0.2900424	1.07663	-0.9579886	0.2236049	0.9953
U.S.A	1.727408	-6.44973	8.994808	-4.999817	0.9875019	0.9969

Figure 12: Country Tax Functions (Married)



9.2 Computational Details

Computation of Optimal Policies

We put boundaries on the capital space and pick a 16 point grid in $K = [0, k^{max}]$. Capital is the only continuous state variable, which is also a choice variable. Following the method outlined by Tauchen (1986), we approximate the processes for the idiosyncratic productivity shocks, u, as finite state Markov processes. We use 5 equally spaced states for u in $U = [-\sqrt{\frac{\sigma^2}{1-\rho^2}}, \sqrt{\frac{\sigma^2}{1-\rho^2}}]$. Let $J = \{hs, c\}$ be the state space for whether an individual is high school or college educated, $X = \{0, ..., 44\}$ be the state space for the number of years of labor market experience, and $T = \{20, ..., 95\}$ be the state space for age. The state space for working age married individuals is then: $J \times J \times K \times X \times X \times U \times U \times T$. Letting $G = \{m, f\}$ be the state space for gender, the state space for working age single individuals is: $G \times J \times K \times X \times U \times T$. For retired individuals, it is: $G \times T \times K$ for singles and $T \times K$ for married. We compute the household's optimal policies for each state by iterating backwards. We start from age 95, the last possible period of life. In that period, the next period's value function is 0, and the optimal policy is to consume as much as possible. Knowing the value function at age 95, we can compute optimal policies and value functions for age 94, and so on. The labor market participation decisions are discrete, and so we compare the different options. For each choice of labor market participation, we must solve for the optimal level of capital in the next period as well as optimal work hours in the cases where the individual(s) are participating in the labor market. We find the optimal choice of capital by "golden search". To interpolate next period's value function outside of the grid, we use cubic splines. In the cases when the individuals are working, each choice of capital in the next period imply an optimal number of work hours. We solve for optimal work hours using the routine called LCONF from the IMSL Fortran library. It is based on M. Powell's method for solving linearly constrained optimization problems; see IMSL documentation for details. To speed up the computation when the number of experience levels grow large, we solve the household's problem for every 4 levels of experience and linearly interpolate the value- and policy functions at the remaining experience levels. We follow this approach for households aged 33-64. For households aged 20-32 we solve the problem for all experience levels.

Simulation

We simulate an overlapping generations economy with 100,000 men and 100,000 women in each identical generation. Knowing today's state, the policy functions, and next period's marital status, we can find the next period's state. To determine next period's marital status, we draw a random number, $\nu \in (0,1)$, for every single individual and every married couple in each time period. We use the age dependent probabilities for divorce and marriage to determine whether a single individual is going to marry or a couple is going to split. We only let the random number drawn by the single men determine if they are going to get married. Then to find them a partner, we sort single men and women by their random number and find a partner for each man that is going to change status. We also make sure that the right number of men marry women with the same level of education.

Partial Equilibrium

When we calibrate the model we must have equilibrium in the marriage market, in the sense that single individuals must have rational expectations about their potential partners in the next period. This expectation must be taken with respect to education, experience, asset holdings, and idiosyncratic productivity shock, $Q^{jgt}(j_p, x_p', k_p', u_p)$.. Given his own education, an individual knows the likelihood of marrying someone with high school and college education in the next period. We keep track of the distribution of single individuals in each education group with respect to capital and experience for each value of the productivity shock at every age. We start out with an educated guess for the distribution and then solve the model iteratively until we reach a fixed point. In addition to the distribution of partners, we must also solve for a fixed point in the government lump sum distribution of excess tax revenues.

When we perform the policy experiments we also solve for a fixed point in terms of the average earnings in the economy because the tax functions, the social security payments, and the value of not working are kept as functions of average earnings.

9.3 Proof of Proposition 4.1

Given the choice of the utility function, one can solve for $h_{2,f}$ and $h^s_{2,f}$ in terms of $h_{1,f}$ from equations 8 and 9, and after plugging these solutions into 7, obtain that the dependence of $h_{1,f}$ on π_d is implicitly defined by:

$$\begin{aligned} & G(h_{1,f},\pi_d) \\ = \; & \frac{\alpha w_{1,f}}{w_{1,m}+w_{1,f}h_{1,f}} - \frac{1-\alpha}{1-h_{1,f}} + \pi_d\left(\frac{\alpha k_f}{w_{1,f}+k_f h_{1,f}}\right) \\ & +(1-\pi_d)\left(\frac{k_f}{w_{1,f}+k_f h_{1,f}+w_{1,m}+k_m}\left(\alpha+(\alpha-1)\left(\frac{w_{1,m}+k_m}{w_{1,f}+k_f h_{1,f}}\right)\right)\right) \\ = \; & 0 \end{aligned} \tag{25}$$

Using the implicit function theorem, one can show that:

$$\begin{aligned} \text{sign}\left(\frac{\partial h_{1,f}}{\partial \pi_d}\right) & = \text{sign}\left(\frac{\partial G}{\partial \pi_d}\right) \\ & = \text{sign}\left(\frac{\alpha}{w_{1,f}+k_f h_{1,f}} - \frac{1}{w_{1,f}+k_f h_{1,f}+w_{1,m}+k_m}\left(\alpha+(\alpha-1)\left(\frac{w_{1,m}+k_m}{w_{1,f}+k_f h_{1,f}}\right)\right)\right) \end{aligned} \tag{26}$$

Since $\frac{w_{1,f}+k_f h_{1,f}+w_{1,m}+k_m}{w_{1,f}+k_f h_{1,f}} > 1 > 1 + \frac{\alpha-1}{\alpha}\left(\frac{w_{1,m}+k_m}{w_{1,f}+k_f h_{1,f}}\right)$, we get $\frac{\partial h_{1,f}}{\partial \pi_d} > 0$.

An increase in woman's labor supply in period 1 leads to accumulation of experience, and thus higher wages in period 2. On one hand, this gives both the married and the single woman an incentive to increase labor supply in period 2 through the substitution effect. However, there is also potentially an offsetting income effect. Intuitively, the income effect will be stronger for the divorced woman who does not have access to her spouse's income (and thus, its is more likely that the married woman will increase her labor supply in period 2). Given the utility function we have assumed in this section, we get $h^s_{2,f} = \alpha$ and $h_{2,f} = \frac{\alpha(w_{1,f}+k_f h_{1,f}+w_{1,m}+k_m)-(w_{1,m}+k_m)}{w_{1,f}+k_f h_{1,f}}$, so that $\frac{\partial h^s_{2,f}}{\partial \pi_d} = 0$ and $\frac{\partial h_{2,f}}{\partial \pi_d} = \frac{\partial h_{2,f}}{\partial h_{1,f}}\frac{\partial h_{1,f}}{\partial \pi_d} = \frac{k_f(w_{1,m}+k_m)(1-\alpha)}{(w_{1,f}+k_f h_{1,f})^2}\frac{\partial h_{1,f}}{\partial \pi_d} > 0$ ■

9.4 LFS vs OECD data

Unlike the CPS, the EU LFS does not provide information on the number of weeks worked per year. However, it reports the labor force status during the reference week, which we use to reconstruct information about weeks worked as follows: we set the number of weeks worked to 52 for people who reported having a job, and to

0 otherwise[41].

Table 12: Annual Hours Worked in OECD vs LFS/CPS micro data

Country	LFS/CPS data	OECD data	LFS/CPS − OECD	$\frac{\Delta_{U.S.}(\text{LFS/CPS})}{\Delta_{U.S.}\text{OECD}}$
Austria	1280.5	1132.3	148.2	48.91
Belgium	1073.7	941.1	132.5	75.94
Denmark	1337.7	1208.0	129.6	35.69
Finland	1313.1	1182.5	130.6	44.37
France	1165.7	982.0	183.7	59.81
Germany	1213.8	965.9	247.9	45.19
Greece	1257.1	1184.7	72.3	76.84
Ireland	1265.5	1117.8	147.6	52.18
Italy	1036.4	1002.7	33.7	99.41
Luxembourg	1165.4	1042.1	123.2	71.22
Netherlands	1162.9	1034.0	128.9	70.21
Norway	1359.7	1133.5	226.3	14.24
Portugal	1338.5	1204.8	133.7	34.42
Spain	1119.0	993.6	125.4	74.45
Sweden	1336.6	1220.5	116.1	39.61
UK	1340.9	1226.6	114.2	38.27
Mean:	1235.4	1098.3	137.1	55.05
United States	1392.1	1360.4	31.7	n.a.

It is worth mentioning that the differences in the annual hours worked between the U.S. and Europe that we find in the micro level data are smaller than the ones reported by the OECD[42]. There is some evidence that most of the discrepancy between the micro-level estimates and the macro-level statistics reported by the OECD comes from the cross-country differences in the duration of vacations and public holidays. According to the OECD's online documenation[43], they use external sources to adjust for hours not worked due to public holidays and annual leave. To maintain consistency with the majority of studies of the differences in hours worked between the U.S. and Europe, which have used the OECD aggregate-level data, we uniformly adjust the hours worked for all observations in our micro data sets so that the country-level average corresponds to the one reported by the OECD. One downside of doing this is that we cannot capture the differences in days off between different demographic groups within a given country. However, if anything, we expect that this should provide us with a conservative estimate of the differences in the contributions of various demographic groups to the cross-country differences in hours worked[44].

[41] We also set the number of weeks worked to 0 for people on maternity or paternity leave, and we set it to 48 for people who had a job but did not work during the reference week due to labor dispute, and to 40 where it was due to school education and training, illness or temporary disability.

[42] Table 12 provides the details.

[43] See: `http://www.oecd.org/dataoecd/56/28/48658644.pdf`

[44] Using a multiplicative factor adjustment, we essentially assume that workers that report longer

9.5 *Estimation of Returns to Experience and Shock Processes From the PSID*

We take the log of equation 11 and estimate a log(wage) equation using data from the non-poverty sample of the PSID 1968-1997. We inflation adjust the nominal wages using the GDP deflator series from the Bureau of Economic Analysis with 2005 as the base year. Equation 12 is estimated using the residuals from 11. To control for selection bias we use Heckman's selection model and estimate it by a maximum likelihood approach. For people that are working and for which we observe wages, the likelihood density function (or population equation) depends on a 3rd order polynomial in years of labor market experience, x, as well as dummies for the year of observation, D:

$$\phi_i\big(log(w_{jgi})\big) = \phi_i(constant_{jg} + D_i'\zeta_{jg} + \gamma_{1jg}x_i + \gamma_{2jg}x_i^2 + \gamma_{3jg}x_i^3 + u_i) \qquad (27)$$

Labor market experience is the only observable determinant of wages in the model apart from gender and education. The probability of participation (or selection equation) depends on various demographic characteristics, Z:

$$\Phi(participation) = \Phi(Z_i'\xi_{jg} + \upsilon_i) \qquad (28)$$

The variables included in Z are marital status, age, the number of children, years of schooling, time dummies, and an interaction term between years of schooling and age. We obtain the residuals u_i and use them to estimate equation 12 by OLS. The coefficients γ_{1jg}, γ_{2jg}, γ_{3jg}, ρ_{jg}, and σ_{jg} can be found in Table 7.

9.6 *Introducing a Tax System with U.S. Level and Danish Progressivity*

Here we follow Guvenen, Kuruscu, and Ozkan (2009). We want to introduce a new tax function, $\tilde{\tau}(y)$, which has the same average tax rate as in Denmark but where progressivity, as defined in 3, is the same as in the U.S. tax system, $\tau_{U.S.}(y)$. We must have:

$$1 - \frac{1-\tilde{\tau}(y_2)}{1-\tilde{\tau}(y_1)} = 1 - \frac{1-\tau_{U.S.}(y_2)}{1-\tau_{U.S.}(y_1)} \Rightarrow \frac{1-\tilde{\tau}(y_2)}{1-\tau_{U.S.}(y_2)} = \frac{1-\tilde{\tau}(y_1)}{1-\tau_{U.S.}(y_1)} \qquad (29)$$

hours of work in our data had proportionally longer vacations/days off compared to those who reported less hours of work. We also attempted to make the adjustment where all observations are adjusted by the same number of days off, which made practically no difference to the result.

for all levels of y_1 and y_2. Letting the fraction $\frac{1-\tilde{\tau}(y)}{1-\tau_{U.S.}(y)}$ be equal to a constant, Λ, for all levels of y, we can obtain a new tax system with the desired properties as follows:

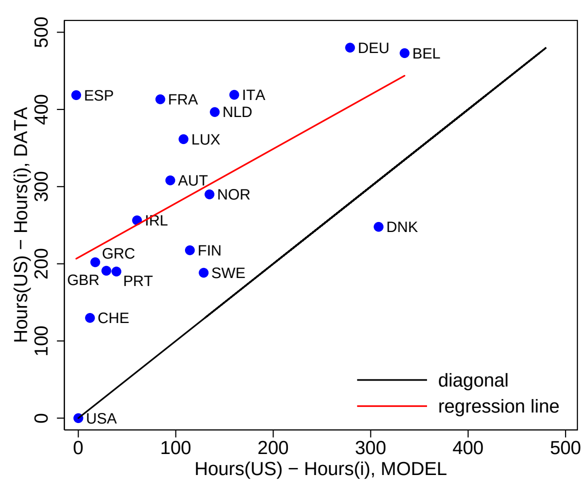
$$1 - \tilde{\tau}(y) = \Lambda\big(1 - \tau_{U.S.}(y)\big) \Rightarrow \tilde{\tau}(y) = 1 - \Lambda + \Lambda\tau_{U.S.}(y) \tag{30}$$

We must solve for Λ in the context of the model to obtain the same average tax level as in Denmark.

9.7 Sensitivity Analysis With Respect to η_m *and* η_f

To test the sensitivity of our results with respect to the choice of the two parameters that control the intensive margin elasticity of labor supply for men and women, we set them both equal to 0.4. This appears to have little effect on our overall results. In the experiment where we simultaneously replace the U.S. tax code and marriage and divorce probabilities with their European counterparts, we get that the R^2 between the hours predicted by our model and those found in the data falls very slightly to 0.5708 for both genders (compared to 0.577 before). This is driven by the smaller R^2 for women (0.387 compared to 0.427 in the main text), while the R^2 for men slightly improves (0.693 vs 0.669). Figure 13 provides more details for each country separately. It is directly comparable to Figure 7 in the main text.

Figure 13: Sensitivity Analysis: Changing η_m and η_f



CORR(Model,Data) = 0.555

9.8 Figures and Tables

Figure 14: Fertility Rates, by Country (World Bank data)

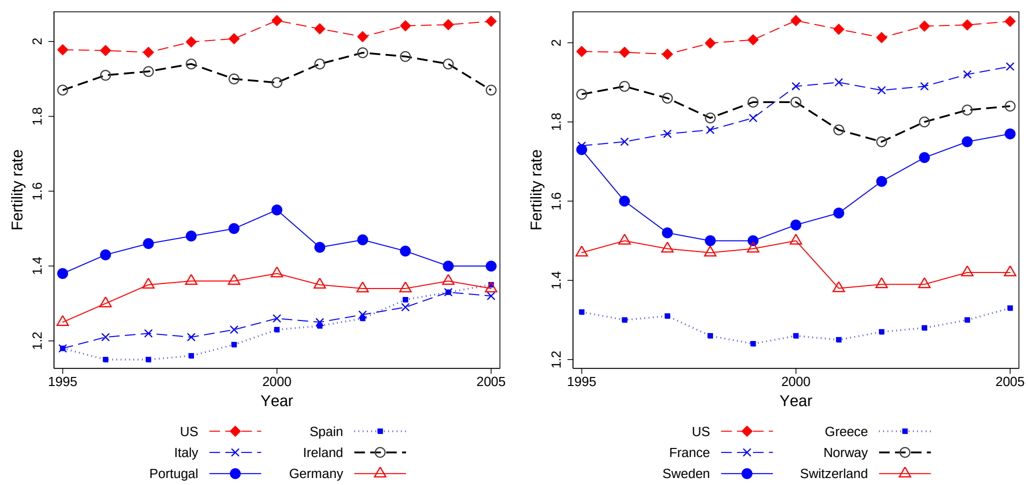


Figure 15: Divorce Rates and Employment Rates for Men and Women

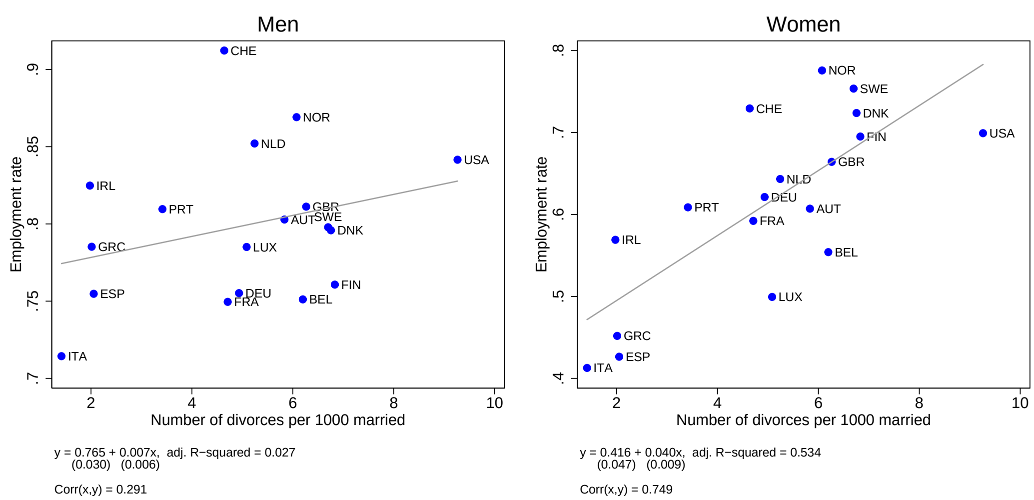


Figure 16: Share of Married and Divorced Women at Different Ages

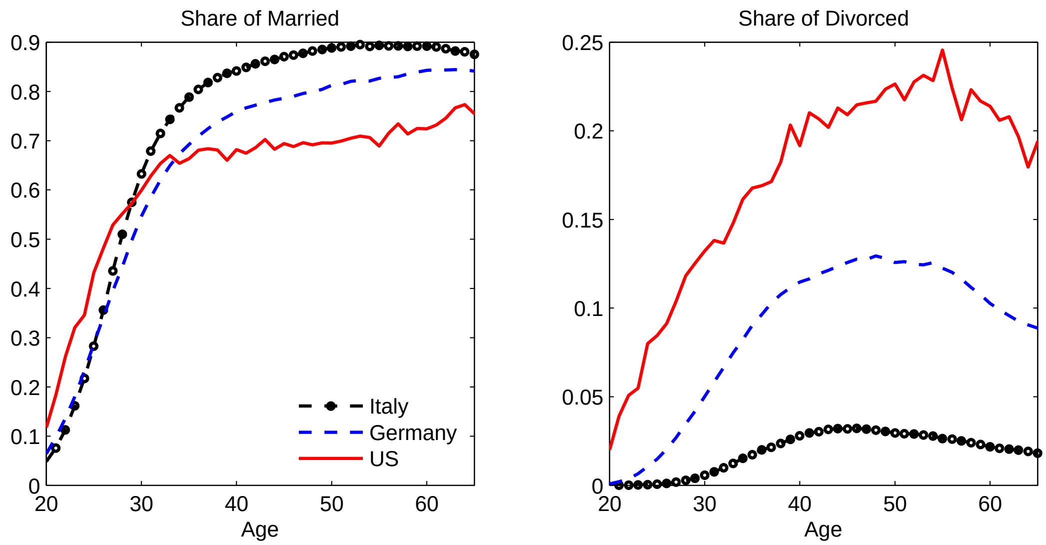


Table 13: Regressing Employment Rates and Hours Worked of Employed on Divorce Rates and Effective Tax Rates

Dep.Variable:	Empl.Rate	Empl.Rate	Hours (employed)	Hours (employed)
Div.Rate	0.024***	–	−29.879	–
	(0.006)		(18.137)	
Eff.Tax Rate	–	0.155	–	−1464.12***
		(0.246)		(398.228)
R^2	0.463	0.026	0.145	0.474

Standard errors are in parentheses; *- $p < 0.10$, **- $p < 0.05$, ***- $p < 0.01$

Table 14: Summary of Goodness-of-fit Measures

	Tax & Div.	Divorces	Tax
R^2	0.577	0.189	0.430
Mean Squared Error (MSE)	41856.381	80318.818	56450.113
Mean Absolute Error (MAE)	179.414	257.146	204.199
Symmetric Mean Absolute Percentage Error (SMAPE)	0.070	0.098	0.079
Mean Absolute Percentage Error (MAPE)	0.155	0.224	0.177

Table 15: Annual Hours Worked, by Gender and Age Group

Country	Men						Women					
	15-24 years		25-64 years		55-64 years		15-24 years		25-64 years		55-64 years	
	Hours	%(US)	Hours	%(US)	Hours	%(US)	Hours	%(US)	Hours	%(US)	Hours	%(US)
Denmark	972.2	136.1	1609.1	82.4	1053.7	77.8	699.6	121.8	1180.4	88.6	646.2	72.2
Finland	774.2	108.4	1661.4	85.1	764.5	56.4	564.3	98.2	1272.0	95.5	627.0	70.1
Norway	776.6	108.7	1556.2	79.7	1229.2	90.7	536.8	93.5	1026.0	77.0	741.4	82.9
Sweden	637.8	89.3	1647.4	84.4	1181.5	87.2	504.4	87.8	1235.9	92.8	900.8	100.7
Austria	973.8	136.3	1760.5	90.2	759.1	56.0	744.6	129.6	1038.5	78.0	276.0	30.8
Belgium	498.9	69.8	1564.8	80.2	580.4	42.8	357.0	62.2	909.9	68.3	185.3	20.7
France	486.8	68.1	1582.2	81.1	578.9	42.7	330.9	57.6	992.0	74.5	352.8	39.4
Germany	691.8	96.9	1466.5	75.1	779.7	57.6	599.9	104.4	883.3	66.3	347.0	38.8
Luxembourg	545.8	76.4	1801.5	92.3	686.0	50.6	379.0	66.0	882.3	66.2	244.7	27.3
Netherlands	756.3	105.9	1706.2	87.4	862.1	63.6	588.6	102.5	741.9	55.7	242.5	27.1
Switzerland	1009.7	141.4	1925.7	98.7	1479.3	109.2	926.7	161.4	1055.9	79.3	598.5	66.9
UK	900.6	126.1	1863.5	95.5	1158.2	85.5	702.5	122.3	1061.4	79.7	497.5	55.6
Greece	707.9	99.1	1968.2	100.8	1251.3	92.4	437.3	76.2	1019.7	76.6	491.9	55.0
Ireland	869.5	121.7	1804.1	92.4	1278.3	94.4	607.0	105.7	884.0	66.4	356.8	39.9
Italy	562.3	78.7	1742.6	89.3	814.1	60.1	362.3	63.1	846.0	63.5	265.7	29.7
Portugal	882.2	123.5	1772.0	90.8	1198.3	88.5	566.3	98.6	1215.2	91.2	620.2	69.3
Spain	680.8	95.3	1664.4	85.3	1063.1	78.5	415.7	72.4	818.5	61.4	326.6	36.5
Mean:	748.7	104.8	1711.5	87.7	983.4	72.6	548.4	95.5	1003.7	75.4	454.2	50.8
United States	714.3	n.a.	1951.9	n.a.	1354.8	n.a.	574.3	n.a.	1332.0	n.a.	894.8	n.a.

Table 16: Annual Hours Worked by Women With Small Children (age 4 and less)

Country	All Women		Women with Children		Share of women with small children, %
	Hours	% of US	Hours	% of US	
Austria	845.0	75.4	546.4	62.1	13.4
Belgium	683.5	61.0	783.4	89.0	11.1
France	797.8	71.1	726.8	82.6	15.0
Germany	711.5	63.4	454.0	51.6	1.9
Greece	804.4	71.7	853.7	97.0	9.7
Ireland	784.3	69.9	639.2	72.6	15.1
Italy	706.2	63.0	701.0	79.6	10.9
Luxembourg	696.0	62.1	674.6	76.6	17.8
Netherlands	648.2	57.8	505.3	57.4	17.0
Portugal	959.8	85.6	1094.9	124.4	9.8
Spain	650.4	58.0	659.3	74.9	10.0
UK	906.6	80.8	580.9	66.0	15.5
Mean:	766.1	68.3	685.0	77.8	12.2
United States	1121.3	–	880.3	–	15.3

Table 17: Tax-Related Measures by Country (OECD Tax Database, 2001)

Country	Max marginal rate	Earnings level where the max marginal rate becomes effective	Consumption tax	Average labor income tax rate paid by the average worker
Austria	42.7%	2.2*AE	20.0%	31.4%
Belgium	67.5%	1.2*AE	21.0%	43.0%
Denmark	62.9%	1.0*AE	25.0%	42.7%
Finland	59.1%	2.1*AE	22.0%	32.9%
France	49.5%	1.8*AE	19.6%	29.5%
Germany	51.2%	1.5*AE	16.0%	43.4%
Greece	51.6%	3.8*AE	18.0%	16.5%
Ireland	48.0%	1.1*AE	21.0%	23.0%
Italy	45.9%	3.7*AE	20.0%	27.1%
Luxembourg	50.1%	1.1*AE	15.0%	27.3%
Netherlands	52.0%	1.4*AE	19.0%	30.5%
Norway	55.3%	2.4*AE	24.0%	31.4%
Portugal	46.6%	4.9*AE	17.0%	21.3%
Spain	48.0%	4.2*AE	16.0%	20.1%
Sweden	55.5%	1.5*AE	25.0%	32.4%
Switzerland	49.5%	3.9*AE	7.6%	24.6%
UK	40.0%	1.3*AE	17.5%	25.5%
USA	47.4%	9.0*AE	8.4%	24.8%

U.S. consumption tax is from Vertex Inc. (2002)

Table 18: Contribution of Demographic Groups to the Difference in Annual Hours Worked With the US

Country	Young				Prime-Aged				Old			
	Men		Women		Men		Women		Men		Women	
	Married	Single	Married	Single	Married	Single	Married	Single	Married	Single	Married	Single
Nordic												
Norway	1.6	-5.6	1.9	-0.0	38.6	11.7	21.9	22.7	1.8	0.9	1.4	3.1
Finland	0.8	-8.4	2.6	-1.7	42.6	14.1	-9.2	22.1	19.0	5.6	6.1	6.6
Denmark	2.8	-23.1	-1.6	-9.5	50.9	18.4	6.8	29.8	10.8	2.5	5.8	6.4
Sweden	2.9	-0.1	2.6	2.5	51.5	11.4	-3.8	26.2	6.3	0.9	-2.7	2.4
Central												
Austria	0.8	-16.6	1.1	-9.9	29.3	3.4	37.5	12.4	17.0	2.8	13.6	8.6
Belgium	1.0	3.4	0.0	4.9	23.5	7.5	22.6	12.8	10.0	2.1	7.6	4.4
Netherlands	0.8	-3.1	0.3	-1.1	20.5	3.2	41.0	15.9	7.6	1.8	8.0	4.9
Germany	1.0	-1.1	1.1	-1.6	29.5	11.2	28.7	11.7	8.1	1.6	6.2	3.7
Switzerland	-0.8	-65.6	-7.9	-64.3	30.2	-23.5	208.6	-3.9	-6.5	-8.5	30.2	12.1
France	1.2	4.2	0.7	5.5	23.6	8.3	19.0	13.8	11.4	2.2	6.3	3.9
Luxembourg	-0.1	4.0	0.4	5.7	17.6	0.8	37.6	5.4	12.5	1.7	9.7	4.8
UK	0.6	-19.8	0.3	-11.8	20.2	0.8	43.9	33.1	8.0	2.2	12.5	9.8
South												
Spain	0.4	-1.0	0.8	3.5	19.2	9.0	36.5	14.3	4.9	1.0	7.4	4.0
Greece	-1.2	-3.5	1.9	7.8	2.2	-3.8	48.2	21.0	5.3	1.3	10.5	10.2
Ireland	1.9	-10.5	0.5	-2.8	19.6	1.9	54.3	16.0	1.6	0.5	10.8	6.1
Italy	1.2	2.4	1.4	4.8	13.2	6.8	32.3	14.9	8.6	1.6	7.8	4.9
Portugal	-0.8	-16.5	-2.7	2.4	40.6	18.5	11.0	20.4	8.4	2.6	8.5	7.7
Mean (weighted):	0.9	-4.2	0.7	0.3	25.5	7.1	30.2	16.0	8.7	1.8	7.8	5.3
Mean (*Nordic*):	1.9	-9.0	1.4	-2.0	44.9	13.7	5.5	24.8	9.1	2.5	2.7	4.6
Mean (*Central*):	0.8	-2.7	0.4	-0.6	23.8	5.4	33.8	13.1	10.2	1.8	8.8	5.2
Mean (*South*):	0.6	-4.0	0.7	3.1	17.9	6.5	37.2	16.4	5.8	1.3	8.7	5.9

Table 19: The Impact of Marriage Stability and Taxation on the Intensive and Extensive Margin

Country	Extensive Margin				Intensive Margin			
	Data	T. & Div.	Divorce	Tax	Data	T. & Div.	Divorce	Tax
Nordic countries								
Denmark	97.9	90.7	100.2	89.5	85.2	88.9	100.6	88.8
Finland	94.2	96.8	101.4	94.9	90.8	95.2	101.0	94.5
Norway	106.5	94.9	99.9	94.8	75.7	95.8	100.6	95.3
Sweden	100.4	94.7	103.5	91.3	87.1	96.7	101.7	95.6
Mean	99.7	94.3	101.2	92.6	84.7	94.2	101.0	93.5
Central Europe								
Austria	91.0	96.0	100.8	95.0	87.3	97.4	100.6	96.9
Belgium	84.3	83.5	96.5	86.1	81.1	92.4	99.1	92.5
Netherlands	96.7	94.2	97.6	95.6	76.0	96.2	99.7	96.3
Germany	89.0	85.9	96.8	87.8	76.3	93.8	99.4	93.9
Switzerland	105.5	99.8	98.3	101.3	86.6	99.5	99.8	99.7
France	86.5	95.8	99.3	96.3	83.7	98.4	100.2	98.1
Luxembourg	83.1	96.0	96.5	99.8	91.3	96.4	99.1	96.8
UK	95.1	99.4	98.6	100.7	91.7	98.7	99.9	98.6
Mean	91.4	93.8	98.0	95.3	84.3	96.6	99.7	96.6
Southern Europe								
Greece	79.4	101.6	93.6	106.8	109.0	97.2	98.1	98.9
Ireland	90.1	98.9	97.7	101.2	92.0	97.1	99.9	96.8
Italy	72.5	92.6	93.5	98.9	99.3	96.0	98.3	96.8
Portugal	91.4	99.2	95.3	103.3	95.5	97.9	98.5	99.0
Spain	76.1	101.2	95.8	104.7	94.7	99.0	99.1	99.7
Mean	81.9	98.7	95.2	103.0	98.1	97.4	98.8	98.2
Mean	90.6	95.4	97.9	96.9	88.4	96.3	99.7	96.4
R^2	n.a.	0.251	0.354	-0.094	n.a.	0.392	-0.015	0.414

The table displays hours worked as % of U.S. hours

Table 20: Labor Force Participation Rate for Married Females

Wage Quintile ($w_{husband} + w_{wife}$)	US Tax	Danish Tax Level, US Progressivity	Danish Tax
1	0.329	0.297	0.512
2	0.435	0.344	0.655
3	0.529	0.354	0.560
4	0.610	0.533	0.486
5	0.746	0.589	0.507