Taxes, Subsidies, and Gender Gaps in Hours and Wages*

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Abstract

Using micro data from 17 OECD countries, this paper documents a negative cross-country correlation between gender gaps in market hours and wages. We find that the cross-country differences in market hours are mostly accounted for by female market hours and the size of the sector that produces close substitutes to home production. We quantify the role played by taxes and family care subsidies on the two gender gaps in a multi-sector model with home production. Higher taxes and lower subsidies reduce the marketization of home production, leading to lower market hours. The effect is largely on women because both home production and the production of its market substitutes are female-intensive. The larger fall in female market hours reduces relative female labor supply, contributing to a higher female to male wage ratio.

JEL classification: E24, E62, J22

Keywords: Gender hour ratios, Gender wage ratios, Subsidies on family care, Taxes, Home production, Marketization

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1 Introduction

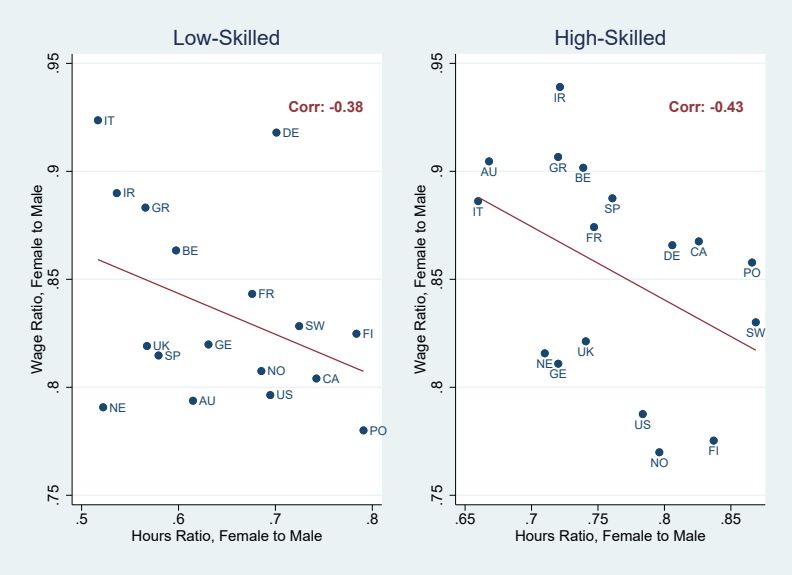
Gender gaps in average market hours per adult and in wages vary widely across OECD countries. Using household surveys from seventeen OECD countries, we show, in Figure 1, that the ratio of market hours per female relative to hours per male in the United States is higher than in most European countries, especially among non-college graduates (hereafter referred to as low-skilled). In contrast, the gender ratio in wages (female to male) is larger in European countries and the larger hour ratios are often associated with smaller wage ratios. More importantly, we find that the cross-country differences in market hours are mostly accounted for by the differences in the market hours of women and the size of the service sectors that produce close substitutes to home production.

A recent publication by the International Labor Organization (Addati, Cattaneo, Esquivel and Valarino (2018)) reveals that home production is the main self-reported barrier for women to participate in the labor market because the hours devoted to home production by women are triple that of men. Home production can be outsourced by purchasing close substitutes from the corresponding market service sectors. This process of marketization converts home production hours into market hours. In this paper, we focus on the effects of taxes and of social subsidies on family care on the marketization of home production. The main contribution is to quantify the effects of taxes and subsidies on the cross-country differences in the gender gaps of hours and wages through marketization. Intuitively, higher taxes reduce the returns to market work and therefore reduce the incentive to marketize home production. In contrast, high subsidies lower the cost of marketizing home production and therefore increase market work. The marketization channel is especially relevant for women because home production and the market sectors that produce close substitutes to home-produed goods are both female intensive.[1] Thus, policies that reduce the cost of marketizing home production can be important in increasing female market hours.

Using the income and consumption taxes constructed by McDaniel (2020) and subsidies on family care from the OECD Social Expenditure Database, we document that taxes are negatively correlated with gender hour ratios (women relative to men) and positively correlated with the corresponding wage ratios for both high-skilled (college graduates) and low-skilled (non-college graduates) labor. In contrast, subsidies on family care display the opposite correlation with such gender ratios. These correlations operate mainly by affecting the marketization of home production, which primarily affects women.

[1]The closure of many of these market sectors during the recent COVID-19 pandemic has lead to a disproportional impact on female market work around the world (see, International Labour Organization 2021).

Figure 1: Gender Gaps in Market Hours and Wages



Notes: Hours are adjusted for demographic differences across countries and include zero hours for non-employed individuals. Hourly wage ratios are obtained from a Mincerian regression that controls for age and marital status. Low-skilled individuals are those without a college degree. Our sample is restricted to individuals between the age of 20-64. Data cover selected years between 2007-2015.

Motivated by these stylized facts, we develop a multi-sector model to study the quantitative effects of taxes and social subsidies on gender gaps by skill group. The model consists of three market sectors producing goods, non-substitutable services, and substitutable services. Substitutable services and home services are good substitutes, while output from the three market sectors are gross complements in consumption. We model subsidies as a negative tax on the market consumption of substitutable services. There are four types of labor inputs: men and women with low or high skill. Labor can move freely across sectors and production in each sector uses all four types of labor inputs. A representative household allocates time to market work, home production, and leisure for each gender-skill group.

The model is calibrated to match wages and time allocations by gender-skill group in the US economy. The observed sector-specific gender intensity in labor inputs implies that the production functions of home services and substitutable market services place a higher weight on female labor input than other sectors. This implies that the extent of marketization has a larger impact on women than men. To examine the role of taxes and subsidies, we simulate the calibrated model with country-specific taxes and subsidies and predict hours and wages by gender-skill group in Europe.

The quantitative results show that cross-country differences in taxes and social subsidies

can indeed generate a negative correlation between gender ratios in hours and wages, as in the data. They also account well for the cross-country variations in the two gender ratios, as judged by the correlation coefficient and the coefficient of determination between model predictions and data. Overall, the prediction obtained from country-specific taxes and subsidies are 69% and 93% of the observed average differences in the gender hour ratios between Western and Southern Europe and the United States for the low-skilled and high-skilled, respectively. Further analysis of the separate effects of each policy shows that our results are mainly driven by the cross-country differences in taxes, and income taxes have a larger effect than consumption taxes. Subsidies play an important role in raising gender hour ratios in Nordic countries despite their higher taxes, but the quantitative effects are relatively small relative to taxes.

The marketization channel and the higher intensity of female labor in producing home services and their market substitutes are important in generating the results of the model. In particular, as taxes increase, households reduce the marketization of home production and market hours decline as a result. The reduction in market hours is especially large in the substitutable service sector because it produces close substitutes to home services. Because female labor is used more intensively in producing home and substitutable services, the reduction in marketization of home hours is larger for women than for men. Given the limited substitutability between male and female labor, the fall in the relative labor supply of women drives up the relative female wage, resulting in higher gender wage ratios in countries with higher taxes. In contrast, social subsidies increase the incentive to marketize home services, leading to the opposite effect.

The model matches well the negative correlation between gender ratios in hours and wages presented in Figure 1 but it does not generate enough variation in the gender wage ratio. The predictions obtained from country-specific taxes and subsidies are 11% and 5% of the observed average differences between European countries and the United States for the low-skilled and high-skilled individuals, respectively. To explore further the factors that may affect gender wage ratios, we calibrate the parameters of the model to match the gender wage ratios and time allocations of each country by allowing for country-specific preferences and productivity. This exercise shows that the parameters that governs the gender intensity of the labor inputs have the largest quantitative effect on the gender wage ratio. The cross-country variation in these gender-specific parameters might not only be related to the cross-country differences in the productivity of women relative to men, but can also be related to factors affecting the preferences for female labor in market production, such as social norms or discrimination against women working in the market. Indeed, we find this parameter to be highly correlated with the fraction of respondents in the World Value Survey who agree that

"When jobs are scarce, men have more right to a job than women". This is consistent with the view that country-specific gender norms are important for cross-country differences in gender wage gaps.

The negative correlation between gender gaps in hours and wages documented in this paper is related to Olivetti and Petrongolo (2008) who find a negative cross-country correlation between the gender gaps in employment and wages. Using a reduced-form analysis, they show that selection into employment explains half of the negative correlation between the gender gaps in wages and employment. In contrast, we use a structural model to study the general equilibrium effects of taxes and subsidies on the cross-country differences of gender gaps in working hours and wages. We find that the effects of taxes and subsidies through marketization of home production are important in accounting for the cross-country differences in the gaps.[2]

Olivetti and Petrongolo (2016) and Blau and Kahn (2017) provide comprehensive surveys of the literature on the two gender gaps over time and across countries. In addition to taxes and subsidies, other factors, such as discrimination, social norms, and wage structure, may also contribute to cross-country differences in gender gaps. Among the proposed factors, our model mechanism is related to Olivetti and Petrongolo (2014) who study the effects of international differences in the size of service industries on gender outcomes. In contrast, we study the effect of taxes and subsidies and in our paper one channel through which they affect gender outcomes is by affecting the size of the substitutable service sector.

Our focus on the role of social subsidies is related to the studies on child-related transfers. Cattan (2016) shows that an increase in the provision of government subsidized preschool encourages women to work, and the impacts are concentrated among low-income women. Guner, Kaygusuz and Ventura (2020) show that increasing child-care subsidies in the United States has substantial positive effects on female labor supply, especially for low-skilled women. Hannusch (2022), on the other hand, finds that child-related transfers are important for explaining the labor market participation differences due to the presence of children among married women.

There is a large literature analyzing the relation between taxes, subsidies, and cross-country differences in market hours, beginning with Prescott (2004) and Ohanian, Raffo and Rogerson (2008). Recent cross-country studies on taxes and market hours focus on the

[2]In the Online Appendix we present a detailed decomposition of the gender ratios in market hours into gender ratios in employment rates (extensive margin) and gender ratios in hours per employed worker (intensive margin). We find that the negative association between the gender ratios in market hours and wages reported in Figure 1 is mainly driven by the gender ratio in the employment rate. However, both extensive and intensive margins are important for the cross-country differences in the levels of gender ratios in market hours.

structure of the tax system taking into account the role of gender and marital status, see for instance Chakraborty, Holter and Stepanchuk (2015) and Bick and Fuchs-Schündeln (2018). These studies abstract from home production and focus on the substitution margin between work and leisure. Using harmonized cross-country time use data, Freeman and Schettkat (2005) and Burda, Hamermesh and Weil (2013) document the importance of marketization of home production in understanding market hours across countries. With a quantitative model, we further show that taxes and subsidies are important factors in determining the extent of marketization. In this sense, our work is related to Rogerson (2008), Olovsson (2009), McDaniel (2011), and Duernecker and Herrendorf (2018) in showing that home production is important in propagating the effect of cross-country differences in taxes.[3] Using a similar framework, Ngai and Pissarides (2011) and Ragan (2013) show that, in addition to differences in taxes, social subsidies on family care also play an important role in accounting for cross-country differences in aggregate market hours. However, none of these papers focuses on the effect of taxes and subsidies on the gender gaps in both market hours and wages. Our contribution to this literature is to show that the effects of taxes and subsidies through the marketization channel are also quantitatively important for these two gender gaps.

Finally, the marketization channel is also emphasized by Ngai and Petrongolo (2017) who argue that the expansion of service sectors in the process of structural transformation generates higher demand for female labor and thus reduces gender differences in market hours and wages over time in the United States. In contrast, we show that higher taxes lead to a lower supply of female labor and thus raise female wages relative to male wages, leading to a negative cross-country correlation between gender gaps in market hours and wages.

The rest of the paper is organized as follows. Section 2 presents the data and the cross-country facts that motivate the paper. Section 3 presents the model. Section 4 calibrates the model and presents the quantitative results of the model. Section 5 concludes.

2 Data and Cross-Country Facts

Our data cover almost all the EU-15 region, plus Norway, Canada, and the United States over the period 2007-2015.[4] This section briefly describes the data used in the analysis and presents a set of key stylized facts about time allocation and wages by gender and skill.

[3] Rendall (2018) analyzes the impact of different taxation regimes, using a multisector model with home production, on structural transformation and the rise of female and service employment in the United States.

[4] The period analyzed for a given country is centered around the year where time-use data is available. Appendix Table A1 lists the years analyzed for each country. Of the EU-15 region, only Luxembourg is excluded as there is no comparable tax data.

High-skilled workers are those with college degrees and low-skilled workers are those without such degrees.[5]

2.1 Data

2.1.1 Market Hours

Market hours are constructed using various Labor Force Surveys for European countries, the Current Population Survey for the United States, and the 2011 Population Census for Canada. The sample includes individuals between the ages of 20 and 64. The annual average hours worked per person are derived as the total annual hours divided by the number of individuals within the specified age range. Following procedures outlined by Bick, Brüggemann and Fuchs-Schündeln (2019), we construct consistent measures of annual market hours per person across countries.

It is well-known that market hours differ across demographic groups. Thus cross-country differences in demographic composition may lead to differences in aggregate market hours and in hours by gender-skill group. To isolate the effect of taxes and subsidies, we construct market hours controlling for cross-country differences in demographic composition. Specifically, we partition each country's population according to skill, gender, age, and marital status, and calculate the average working hours for each group in this partition. The cell-specific averages are then aggregated into hours per person for each gender-skill group in each country using the US population shares. Furthermore, the US population shares are adjusted so that the age and marital composition is constant across gender-skill cells. Therefore, the estimates also control for differences in marriage rates across education groups and across countries.[6]

To highlight the importance of the marketization of home production in accounting for gender gaps, we divide the market production into three sectors and estimate market hours for each of the sectors: goods, non-substitutable services, and substitutable services sectors.[7] Broadly speaking, a service industry is classified as "substitutable" if its product can be replaced by activities performed at home.[8]

[5]For a more detailed description of the data sources and construction procedures, please refer to the Appendix.

[6]Table OA.1 in the Online Appendix shows that cross-country differences in hours worked within a given demographic group explain most of the differences in aggregate market hours across countries.

[7]The substitutable service sector includes Retail trade, Hotels and restaurants, Health and social work, Personal and community services, and Domestic services hired by households. Given the available industry classification in most household surveys it is not possible to do a more detailed disaggregation. Table A2 in the Appendix contains the detailed sector classification.

[8]Ideally, we would like to include pre-school teachers in the substitutable service sector. However, in most countries such detailed breakdown of the data is not possible. In any case, pre-school teachers only represent

2.1.2 Time Allocation across Market, Home and Leisure

The data for time allocation come from the American Time Use Survey (ATUS), the Harmonised European Time Use Survey (HETUS), and the Multinational Time Use Study (MTUS). For the years we study, publicly available micro-level data from time use surveys are only available for twelve of the sample countries.[9] The construction of market and home hours follows closely Aguiar and Hurst (2007b) with the key exception that we consistently include child care in home hours. Leisure is any time not allocated to work neither in the market nor at home. These estimates are also adjusted for demographic composition differences following the procedure outlined earlier.

2.1.3 Wages

We construct the pre-tax hourly wage rates using various sources including the European Union Statistics on Income and Living Conditions (EU-SILC) for most countries, Labor Force Surveys for France and the United Kingdom, the Socioeconomic Panel (SOEP) for Germany, the 2011 population Census for Canada, and the March CPS for the United States. Gender wage ratios for low-skilled and high-skilled labor are estimated after controlling for age and marital status through a standard Mincerian regression for employed workers.

2.1.4 Taxes and Social Subsidies

We abstract from the complexity of the tax structure and use average labor income and consumption taxes as constructed by McDaniel (2020). Labor income taxes include Federal and State income taxes, as well as Social Security taxes.

Social subsidies on family care are applicable only to the substitutable service sector. We include public non-cash benefits (a.k.a. "in-kind" expenditures) on old-age, incapacity, and family care services. The main care items covered under these categories include residential care, home-help services, rehabilitation, day-care, and early childhood education. The expenditure data from the OECD Social Expenditure Database (SOCX) include direct expenses on the provision of these services, as well as subsidies for the purchase of such services in the market. Following Ngai and Pissarides (2011), the subsidy rate is computed by expressing total expenditures on these services as a fraction of the sectoral output of the

a very small share of the total employment in all countries studied. For example, the share is only 0.2% in the United States. Given that the substitutable service sector represents more than 36% of employment in the United States, the underestimation caused by excluding the pre-school teachers from the substitutable service sector is negligible.

[9]The countries are Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Norway, Spain, the United Kingdom and the United States.

substitutable service sector.

The country-specific tax and subsidy rates are reported in Table A4.[10] The tax rates and subsidy rates are much larger in Europe than in the United States. Among all countries, Nordic countries have the highest subsidy rates.

2.2 Key Stylized Facts

In this subsection we first discuss the cross-country differences of gender ratios in hours and wages. To better understand the gender ratio in hours, we also study market hours by gender and skill. We next explore the correlations between the two gender ratios by skill and our policy variables: taxes and subsidies to family care. Because of the differences in the substitutability between different types of market goods and home-produced goods, the marketization of home production has asymmetric effects across the market sectors. To explore these effects, we also investigate the cross-country differences in sectoral hours.

2.2.1 Gender Ratios

The top panel of Figure 2 plots the gender ratio in market hours (female relative to male) by country relative to the values observed in the United States. In most countries, the ratio is smaller than in the United States, especially among the low-skilled. The exceptions are Nordic countries, together with Canada and Portugal.[11]

The bottom panel of Figure 2 plots the corresponding difference in the gender wage ratio from the United States. Almost all countries have higher gender wage ratios than the United States for both skill levels. In general, countries with smaller gender hour ratios also have larger gender wage ratios. This leads to a negative cross-country correlation between the two ratios (-0.38 for the low-skilled, -0.43 for the high-skilled), as documented in Figure 1.

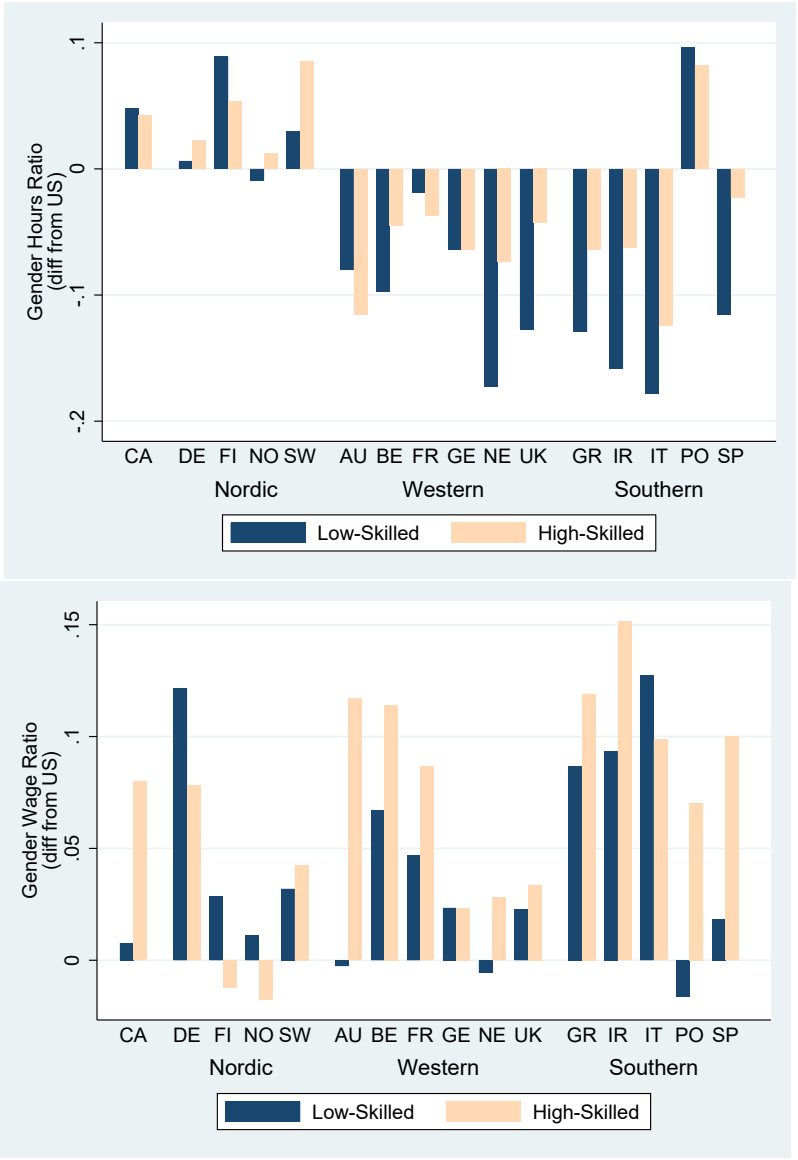
2.2.2 Market Hours

We now turn to market hours by gender, skill, and sector. Figure 3 presents the percentage difference in annual hours worked per person relative to the United States for each of the four population groups. Market hours of virtually every gender-skill group are lower in Europe than in the United States. In most Western and Southern European countries the largest

[10] Table A4 also includes the rates for the subcomponents of taxes (consumption tax and income tax) and for the subcomponents of subsidies (old-age, incapacity, and family care).

[11] In all our analyses we group Ireland together with Southern European countries based on the similarity of the labor supply of women among these countries.

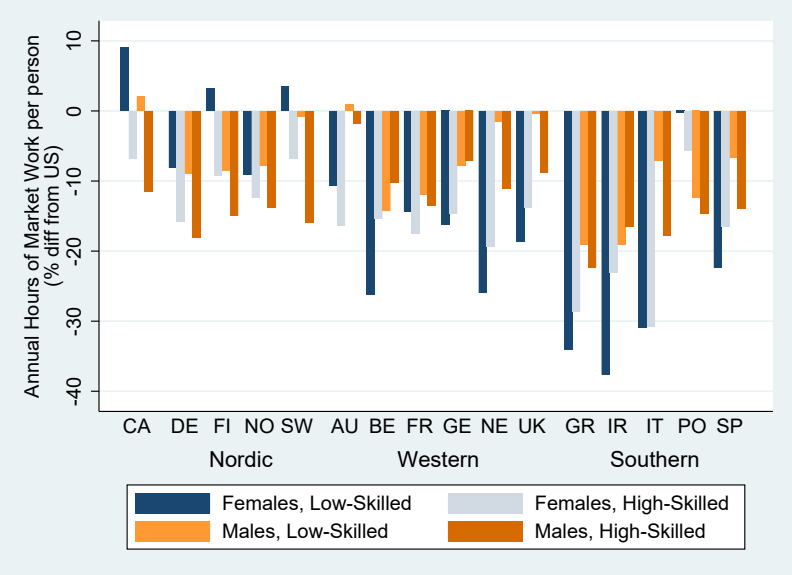
Figure 2: Gender Ratios in Market Hours and Wages Relative to the US



Notes: Gender Hour and Wage ratios are adjusted for age and marital status. Data cover selected years between 2007-2015. Low-skilled individuals are those without a college degree.

proportional differences occur for low-skilled women, and the differences are larger for women than for men with the same skill level. Columns 3-6 of Table 1 report the contribution of each demographic group to the difference in aggregate market hours with respect to the United States. In most Western and Southern European countries more than 60% of the difference in market hours is accounted for by the hours of women. In contrast, in Nordic countries, Canada, and Portugal, women account for less than half of the difference with respect to the United States, and in some countries (such as Canada, Finland and Sweden) low-skilled women work more hours than their American counterparts. These results imply that in Western and Southern European countries, most of the differences in gender hour ratios come from differences in female hours, while in Nordic countries, most of the differences arise from differences in male hours.

Figure 3: Hours Worked in the Market by Population Group Relative to the US



Notes: Hours are adjusted for demographic differences across countries. Low-skilled individuals are those without a college degree. Data cover selected years between 2007-2015.

Turning now to the sectoral dimension, Figure 4 displays the proportional differences in sectoral hours relative to the United States. In general, hours are lower in Europe (relative to the US) at the sectoral level. This is particularly true in the substitutable service sector where the largest differences in hours are observed. Columns 7–9 of Table 1 report the contribution of each sector to the difference in aggregate market hours from the United States. The large positive numbers observed in column 7 of that table indicate that the

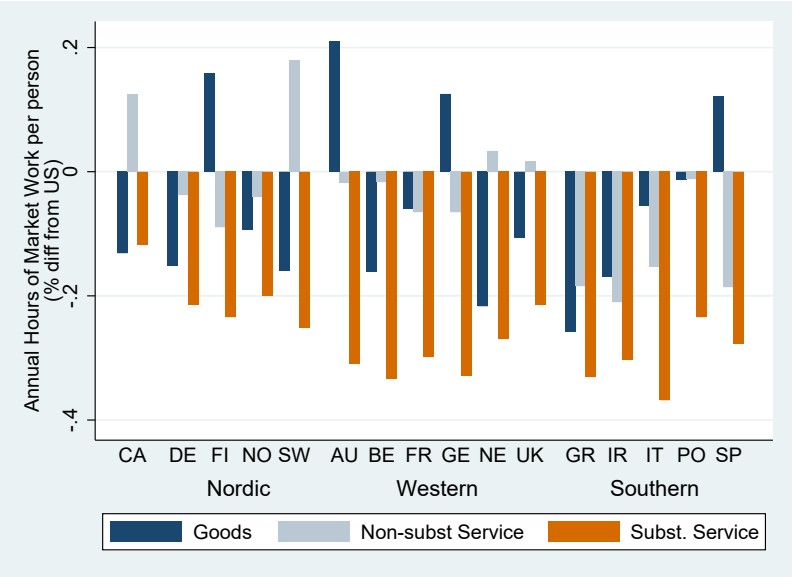
Table 1: Decomposition of Difference in Market Hours Relative to the US

			Contribution of Difference in Annual Hours Relative to US						
			Population Group				Sector		
	Weekly Hours	Fraction of US	Females Low-Skilled	Females High-Skilled	Males Low-Skilled	Males High-Skilled	Substit. Services	Non-Substit. Services	Goods
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Canada	25.5	0.98	-1.26	1.25	-0.71	1.72	2.10	-2.70	1.61
Nordic									
Denmark	22.7	0.87	0.14	0.29	0.23	0.35	0.60	0.11	0.29
Finland	23.8	0.92	-0.19	0.42	0.23	0.55	0.96	0.46	-0.41
Norway	23.1	0.89	0.12	0.36	0.16	0.37	0.65	0.15	0.20
Sweden	24.7	0.95	-0.15	0.31	0.05	0.79	1.93	-1.75	0.82
Western									
Austria	24.3	0.94	0.19	0.81	-0.19	0.19	1.87	0.06	-0.93
Belgium	21.8	0.84	0.34	0.22	0.29	0.16	0.74	0.02	0.24
France	22.2	0.86	0.15	0.36	0.21	0.28	0.71	0.19	0.10
Germany	23.1	0.89	0.29	0.33	0.20	0.18	1.08	0.23	-0.31
Netherlands	22.6	0.87	0.42	0.34	0.04	0.21	0.70	-0.09	0.39
United Kingdom	23.6	0.91	0.45	0.30	0.04	0.21	0.82	-0.09	0.27
Southern									
Greece	19.4	0.75	0.28	0.26	0.24	0.22	0.46	0.30	0.24
Ireland	19.9	0.77	0.34	0.23	0.26	0.17	0.45	0.38	0.17
Italy	20.6	0.79	0.28	0.40	0.07	0.26	0.64	0.31	0.05
Portugal	23.6	0.91	0.01	0.14	0.44	0.41	1.00	0.00	0.00
Spain	22.2	0.86	0.26	0.36	0.09	0.29	0.68	0.55	-0.23

Notes: Weekly hours are the annual market hours per person divided by 52 (including zero hours for non-employed individuals). In the US, the weekly hours are 26. All estimates hold constant the distribution of demographic characteristics to its US value and keep the age and marital distribution of the population fixed across gender and skill groups (see Appendix for details). Columns 3-6 report the contribution (share) of each labor input to the difference in aggregate hours. Columns 7-9 report the contribution of each sector to this difference. Low-skilled individuals are those without a college degree. Data cover selected years between 2007-2015 and correspond to a population with 20-64 years of age.

substitutable service sector accounts for most of the differences in aggregate market hours from the United States.

Figure 4: Hours Worked by Sector Relative to the US



Notes: Hours are adjusted for demographic differences across countries. Data cover selected years between 2007-2015.

2.2.3 Gender Ratios, Taxes, and Subsidies

In order to understand how the gender ratios relate to taxes and subsidies, we report in Table 2 the linear regressions of gender hour and wage ratios against the effective tax rate and the subsidy rate to family care. The effective tax rate, as in Prescott (2004), is given by

$$\frac{\text{consumption tax rate} + \text{labor income tax rate}}{1+\text{consumption tax rate}}.$$

The goal of the regressions is not to establish a causal relationship, but to illustrate the correlations of gender ratios with taxes and subsidies so as to motivate our quantitative analysis.

The regressions show a negative association between taxes and gender ratios in market hours and a positive association between taxes and gender wage ratios for both skill groups. The opposite is found for subsidies. In our model, taxes and subsidies affect market hours of men and women differently through two substitution margins: across market work and home

Table 2: OLS Regressions of Gender Ratios against Taxes and Subsidies

	A. Market Hours		**B. Wages**	
	Low-Skilled	High-Skilled	Low-Skilled	High-Skilled
Effective Tax Rate	-0.377	-0.463***	0.185	0.281*
	(0.149)	(0.007)	(0.236)	(0.078)
Subsidy rate	0.558**	0.565***	0.000423	-0.389**
	(0.014)	(0.004)	(0.998)	(0.025)
R^2	0.189	0.417	0.094	0.297
	C. Marketization		**D. Total Work**	
	Low-Skilled	High-Skilled	Low-Skilled	High-Skilled
Effective Tax Rate	-0.605**	-0.489**	0.173	0.00686
	(0.030)	(0.020)	(0.403)	(0.969)
Subsidy rate	1.040**	0.706**	-0.745**	-0.0527
	(0.011)	(0.013)	(0.036)	(0.827)
R^2	0.522	0.570	0.336	0.004
E. Sector Hours	Total Market	Substitutable Services	Non-Substitutable Services	Goods
Effective Tax Rate	-664.5*	-551.7***	-178.6	65.85
	(0.082)	(0.000)	(0.369)	(0.691)
Subsidy rate	522.5*	272.4***	342.0	-91.95
	(0.085)	(0.000)	(0.126)	(0.516)
R^2	0.246	0.724	0.158	0.022

Notes: Ratios in panels A-D are female to male values. Low-skilled individuals are those without a college degree. p-values are reported in the parentheses.* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$. In panels C and D only the countries with time-use surveys in the years under study are included. These countries are Austria, Belgium, Canada, Finland, France, Germany, Greece, Italy, Norway, Spain, the United Kingdom, and the United States.

work and across total work (market plus home) and leisure. We refer to the first margin as the marketization of home production. To examine the contribution of the two margins on the gender differences, we decompose the gender ratio in market hours into two components: a gender ratio in the fraction of market hours out of total work hours and a gender ratio in total work hours:

$$\frac{\text{female market hours}}{\text{male market hours}} = \left(\frac{\text{female market hours}}{\text{female total work}} / \frac{\text{male market hours}}{\text{male total work}} \right) \frac{\text{female total work}}{\text{male total work}}. \tag{1}$$

The former (the term in the parentheses in equation (1)) measures the extent of marketizaton of female hours relative to male hours. The latter (the term outside the parentheses in equation (1)) measures the extent of the substitution between total work and leisure for women relative to men.

Regressing these two components on taxes and subsides can help us understand the relative importance of the two substitution margins in affecting the gender hour ratios. Panels C and D in Table 2 report the regression results. In particular, panel C shows that the gender ratio in marketization is negatively associated with taxes and positively associated with subsidies. All the estimated coefficients are statistically significant and the coefficients are larger in absolute value for low-skilled workers than for high-skilled workers. The regressions in panel D indicate that the gender ratio in the total work hours is mostly unrelated to taxes and subsidies. These results suggest that taxes and subsidies affect gender ratios in market hours mainly through their effects on marketization.

Finally, Panel E in the table reports the corresponding regression results for sectoral hours. Market hours are negatively correlated with taxes and positively correlated with subsidies in the substitutable service sector and the estimates for the other two sectors are statistically insignificant. These results are not surprising since substitutable services and home-produced services are close substitutes, and therefore the effects of policies through the marketization channel have a larger impact on this sector.

Taking stock, this section shows that the ratio of female market hours to male market hours is larger in the United States than in most European countries, and the opposite is observed for the ratio of female to male wages. The cross-country differences in market hours, to a large extent, are accounted for by the differences in female market hours and by the hours worked in the substitutable service sector. More importantly, we find a negative association between taxes and gender ratios in market hours and a positive association between taxes and gender ratios in wages. The opposite associations are found for subsidies. These correlations are mostly driven by the effects of taxes and subsidies on the marketization of home hours.

3 The model

This section presents a model with three market sectors and a home production sector, in an environment with government taxes and subsidies. The three market sectors produce goods, non-substitutable services, and substitutable services, respectively. The production at home delivers a close substitute to the substitutable services produced in the market. Labor is supplied to each sector by a representative household and is indexed by gender and skill.

Government taxes labor income at rate τ and the consumption of market good j at a net rate t_j. t_j is the gross consumption tax rate less the subsidy rate and j takes values $1, 2, 3$, denoting the goods sector, the non-substitutable service sector, and the substitutable service sector, respectively. The subsidy is therefore modelled as a negative consumption tax and is applicable only to the consumption of the substitutable services. The net revenue from taxes less subsidies is rebated back to the household as a form of lump-sum transfer T.

3.1 Firms

Each of the three market sectors is competitive and consists of one representative firm. There are four types of labor inputs: high-skilled female, high-skilled male, low-skilled female, and low-skilled male. The labor inputs can move freely across sectors. While production in each sector utilizes all four types of inputs, the intensity of factor inputs differs. The production function in each sector takes a nested CES form capturing the finite elasticity of substitution across skills and across genders. The CES aggregator first combines labor inputs of men and women of the same skill level, and then combines the aggregated low-skilled and high-skilled labor inputs.

Let subscript i index the skill level, where i takes two values of n and e, denoting low skill and high skill, respectively. Let g index gender, where g takes two values of m and f, denoting male and female, respectively. The production function of sector j is given by:

$$Y_j = A_j L_j, \quad L_j = \left[\lambda_j L_{ej}^{\frac{\rho-1}{\rho}} + (1-\lambda_j) L_{nj}^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}}, \ j = 1, 2, 3, \tag{2}$$

where A_j is labor productivity, and ρ is the elasticity of substitution between low-skilled and high-skilled labor. L_j is an aggregator of the low-skilled composite L_{nj} and the high-skilled composite L_{ej} of female and male labor inputs. We allow $\lambda_j \in (0, 1)$ to differ across sectors. This is to capture the difference in the sectoral intensity of skilled labor. The skill composites

L_{nj} and L_{ej} combine male and female labor inputs as follows:

$$L_{ij} = \left[\xi_{ij} L_{ifj}^{\frac{\eta-1}{\eta}} + (1-\xi_{ij}) L_{imj}^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}, \; i = n, e, \; j = 1, 2, 3, \tag{3}$$

where L_{ifj} denotes the amount of female labor input and L_{imj} denotes the amount of male labor input with skill level i in sector j. η is the elasticity of substitution between female and male labor. The parameter $\xi_{ij} \in (0, 1)$ affects the intensity of female labor input in producing the composite L_{ij} and it varies by skill and sector. ξ_{ij} captures any factors that could affect the intensity of the female labor input in the production function, including social norms, discrimination against women, and women's productivity relative to men by skill and by sector.

3.2 The Representative Household

The representative household consists of four types of members and L_{ig} ($i = n, e$ and $g = m, f$) is the share of household members with skill i and gender g. Each household member is endowed with one unit of time. The household utility is given by:

$$U(c_1, c_2, c_3, c_h, L_l) = \ln c + \varphi \ln L_l, \tag{4}$$

where c is the consumption composite, and L_l is the leisure composite. The household derives utility from three types of goods and services: c_1 denotes market goods, c_2 denotes non-substitutable market services, and c_s denotes a composite of substitutable services which aggregates substitutable market services (c_3) and home services (c_h) :

$$c \equiv \left[\sum_{j=1,2,s} \omega_j c_j^{\frac{\epsilon-1}{\epsilon}}\right]^{\frac{\epsilon}{\epsilon-1}}; \quad c_s = \left[\psi c_3^{\frac{\sigma-1}{\sigma}} + (1-\psi) c_h^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, \tag{5}$$

where $\sum_{j=1,2,s} \omega_j = 1$. The elasticity of substitution across different kinds of goods and services is low, with $0 \leq \varepsilon < 1$, while the elasticity of substitution between substitutable market services and home services is high, with $\sigma > 1$.

Home services are produced with a technology similar to the one used in the substitutable market services sector (see equations (2)-(3)):

$$c_h = A_h L_h, \quad L_h = \left[\lambda_h L_{eh}^{\frac{\rho-1}{\rho}} + (1-\lambda_h) L_{nh}^{\frac{\rho-1}{\rho}}\right]^{\frac{\rho}{\rho-1}}, \tag{6}$$

where

$$L_{ih} = \left[\xi_{ih} L_{ifh}^{\frac{\eta-1}{\eta}} + (1-\xi_{ih}) L_{imh}^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}, \ i = n, e, \tag{7}$$

and A_h is the labor productivity for the home sector.

Leisure L_l is a CES aggregator of male and female leisure time:

$$L_l = L_l\left(L_{nl}, L_{el}\right) = \left[\lambda_l L_{el}^{\frac{\rho_l-1}{\rho_l}} + (1-\lambda_l) L_{nl}^{\frac{\rho_l-1}{\rho_l}}\right]^{\frac{\rho_l}{\rho_l-1}}, \tag{8}$$

where

$$L_{il} = \left[\xi_{il} L_{ifl}^{\frac{\eta_l-1}{\eta_l}} + (1-\xi_{il}) L_{iml}^{\frac{\eta_l-1}{\eta_l}}\right]^{\frac{\eta_l}{\eta_l-1}}, \ i = n, e, \tag{9}$$

and the elasticity of substitution $\eta_l < 1$, indicating male and female leisure time are complements.

Let w_{if} and w_{im} denote the wages for women and men with skill i, respectively. Because labor can move freely across sectors, wages differ by gender-skill group but not by sector. Taking as given government policy parameters (τ, t_1, t_2, t_3, T), wages $\{w_{if}, w_{im}\}_{i=n,e}$, and prices (p_1, p_2, p_3), a representative household chooses market consumption (c_1, c_2, c_3), home production time $\{L_{imh}, L_{ifh}\}_{i=n,e}$, and leisure time $\{L_{iml}, L_{ifl}\}_{i=n,e}$ to maximize the utility function (4) subject to (5)-(9) and the household budget constraint:

$$\sum_{j=1,2,3} (1+t_j) p_j c_j = T + (1-\tau) \sum_{i,g} w_{ig} (L_{ig} - L_{igh} - L_{igl}). \tag{10}$$

3.3 Competitive Equilibrium

A competitive equilibrium is defined by wages $\{w_{if}, w_{im}\}_{i=n,e}$, prices and consumption $\{p_j, c_j\}_{j=1,2,3}$, and time allocations $\{L_{ifj}, L_{imj}\}_{\forall i,j}$, such that:

1. Given wages and prices, the firms maximize profits subject to production functions (2)-(3), and the representative household maximizes utility (4) subject to (5)-(10).

2. Given the optimal decisions of the firms and the household, wages and prices clear the goods market and the labor market:

$$c_j = Y_j, \qquad j = 1, 2, 3, \tag{11}$$

$$\sum_{j=1,2,3} L_{igj} = L_{ig} - L_{igh} - L_{igl}, \qquad i = n, e; \quad g = f, m. \tag{12}$$

3. Government budget constraint is satisfied:

$$T = \tau \sum_{i,g} w_{ig}(L_{ig} - L_{igh} - L_{igl}) + \sum_{j=1,2,3} t_j p_j c_j. \tag{13}$$

The derivation of the competitive equilibrium is provided in the Online Appendix.

4 Quantitative Results

In this section, we first calibrate the model to the US economy. We then quantify the effect of taxes and subsidies on gender ratios in hours and wages and decompose the total effect into the contribution by income tax, consumption tax, and subsidies on family care. Lastly, we discuss the effect of social norms on the cross-country differences in gender wage ratios.

4.1 Calibration

The model is calibrated to match time allocation and wage ratios of the US economy during 2011-2015. The full calibration procedures are documented in the Online Appendix. The basic principle is as follows. Given the tax parameters $\{\tau, t_1, t_2, t_3\}$, the parameters needed to determine time allocation and wage ratios include the relative population shares $\left\{\frac{L_{ef}}{L_{em}}, \frac{L_{nf}}{L_{nm}}, \frac{L_{ef}}{L_{nf}}\right\}$; the elasticity parameters $\{\sigma, \varepsilon, \rho, \eta, \rho_l, \eta_l\}$; the gender-specific parameters $\{\xi_{ij}\}_{\forall i,j}$; the skill-specific parameters $\{\lambda_j\}_{\forall j}$; the preference parameter on leisure φ; and the relative productivity $\left\{\hat{A}_{3h}, \hat{A}_{23}, \hat{A}_{12}\right\}$.[12]

The relative population shares $\left\{\frac{L_{ef}}{L_{em}}, \frac{L_{nf}}{L_{nm}}, \frac{L_{ef}}{L_{nf}}\right\}$ are calibrated to match the ratios between the number of workers for the relevant gender-skill groups. The six elasticity parameters $\{\sigma, \varepsilon, \rho, \eta, \rho_l, \eta_l\}$ for preferences and production functions are directly set to values derived elsewhere in the literature. The elasticity of substitution between substitutable services and home services, σ, is set to 1.9 which is the mid-point of the estimates in the literature ranging from 1.5 to 2.3.[13] The elasticity of substitution across goods and services, ϵ, is set to 0 given that Herrendorf, Rogerson and Valentinyi (2013) and Moro, Moslehi and Tanaka (2017) both find a value not significantly different from zero. The elasticity between low-skilled and high-skilled labor ρ is set to 1.42 as in Katz and Murphy (1992).

[12] $\hat{A}_{3h} \equiv \left(\frac{A_3}{A_h}\right)\left(\frac{\psi}{1-\psi}\right)^{\frac{\sigma}{\sigma-1}}$, $\hat{A}_{23} \equiv \frac{A_2}{A_3}\left(\frac{\omega_s}{\omega_2}\right)^{\frac{\varepsilon}{1-\varepsilon}} \psi^{\frac{\sigma}{1-\sigma}}$ and $\hat{A}_{12} \equiv \frac{A_1}{A_2}\left(\frac{\omega_2}{\omega_1}\right)^{\frac{\varepsilon}{1-\varepsilon}}$. Separate information on ψ and ω_j is not needed for the prediction of relative time allocations.

[13] See the survey by Aguiar, Hurst and Karabarbounis (2012) and Rogerson and Wallenius (2016). For individual papers, see for example, Rupert, Rogerson and Wright (1995), Chang and Schorfheide (2003), McGrattan, Rogerson and Wright (1997), Aguiar and Hurst (2007a), Gelber and Mitchell (2012), and Fang and Zhu (2017).

For the elasticity between female and male labor, Weinberg (2000) finds an estimate of 2.4 and Acemoglu, Autor and Lyle (2004) find estimates between 2.5 and 4. Using the equilibrium condition that sets the marginal rate of technical substitution across male and female labor equal to the gender wage ratio, Ngai and Petrongolo (2017) set the elasticity of substitution between female and male labor to match the observed response in the gender hour ratio given data on the gender wage ratio and derive an elasticity equal to 2.3. We set the benchmark value of η to 3, a value in the middle of the literature estimates. There are no readily available estimates for ρ_l and η_l. We set the benchmark value of $\rho_l = \rho = 1.42$ for the elasticity across high-skilled and low-skilled leisure time. As for the elasticity of substitution across male and female time in leisure, empirical papers have argued for complementarity of male and female leisure time (see Goux, Maurin and Petrongolo (2014), and references therein), suggesting $\eta_l < 1$. We follow Ngai and Petrongolo (2017) to set $\eta_l = 0.2$ in the benchmark. The effects of alternative values for σ, η, η_l, ρ, and ρ_l are explored in Section 4.2.3.

The remaining nineteen parameters are calibrated to match relative wages and time allocation for each of the four types of labor inputs in the five sectors (three market sectors, home sector, and leisure). There are a total of nineteen independent data targets used in calibrating the nineteen parameters. The Online Appendix explains how each of these parameters are uniquely pinned down by the data targets. In a nutshell, given the relative wages, the ratio between female and male hours of the same skill in the same sector pins down $\{\xi_{ij}\}$. Similarly, the ratio between low-skilled and high-skilled hours of the same gender in the same sector pins down $\{\lambda_j\}$. The final four parameters $\left\{\varphi, \hat{A}_{12}, \hat{A}_{23}, \hat{A}_{3h}\right\}$ are calibrated to match the three relative wages and leisure time for low-skilled women.

The construction of data targets on wage ratios and time allocation across market, home, and leisure was discussed in Section 2.1. The data targets are reported in Table 3. The calibration procedure is essentially solving nineteen unknowns from nineteen equations and thus matches the targets exactly. Table 3 also reports the sectoral shares of low-skilled, high-skilled, and total hours in the three market sectors as well as the gender-hour ratios for both skill groups. Although these statistics are not targeted, the model matches them quite well.

The calibrated parameter values are summarized in Table 4. The calibration delivers higher ξ_{ih} and ξ_{i3} than ξ_{i1} and ξ_{i2} for both skill groups ($\{\xi_{ih}, \xi_{i3}\}_{\forall i} > \{\xi_{i1}, \xi_{i2}\}_{\forall i}$). This calibration result is generated by the higher intensity of female hours in the production of home and substitutable services in the data.[14]

[14]Table A3 in the Appendix shows that the share of female employment is the largest in the Substitutable service sector, and is the smallest in Goods sector.

Table 3: Data Moments

Targets						
Time Allocation		Goods	Non-substitutable Services	Substitutable Services	Home	Leisure
Low-Skilled Females	L_{nfj}/L_{nf}	0.018	0.046	0.072	0.179	0.685
High-Skilled Females	L_{efj}/L_{ef}	0.016	0.094	0.077	0.163	0.651
Low-Skilled Males	L_{nmj}/L_{nm}	0.084	0.067	0.051	0.111	0.688
High-Skilled Males	L_{emj}/L_{em}	0.055	0.126	0.059	0.110	0.650
Relative Wages		Gender Ratio		Skill Premium		
		Low Skilled	High Skilled	Women	Men	
		0.80	0.79	1.63	1.65	
Non-Targets						
Gender Hour Ratios		Low-skilled		High-skilled		
		Model	Data	Model	Data	
		0.68	0.69	0.77	0.78	
Time Allocation		Goods	Non-substitutable Services	Substitutable Services		
Low-skilled by sector						
	Model	0.28	0.33	0.39		
	Data	0.30	0.33	0.36		
High-skilled by sector						
	Model	0.15	0.51	0.34		
	Data	0.16	0.51	0.33		
Total						
	Model	0.23	0.41	0.37		
	Data	0.24	0.42	0.35		

Table 4: Calibration

Parameters	Values	Targets
Model Free Parameters		
σ	1.9	Aguiar et al. (2012)
ϵ	0	Herrendorf et al. (2013) and Moro et al. (2017)
ρ	1.42	Katz and Murphy (1992)
η	3	Weinberg (2000) and Acemoglu et al. (2004)
η_l	0.2	Baseline based on Ngai and Petrongolo (2017)
Calibrated Parameters		
$\frac{L_{ef}}{L_{em}}, \frac{L_{nf}}{L_{nm}}, \frac{L_{ef}}{L_{nf}}$	1.18, 0.95, 0.78	Ratios of Population by skill and by gender
ξ_{nj}	0.32, 0.41, 0.47, 0.48, 0.38	Low-skilled gender hour ratios across sectors
ξ_{ej}	0.35, 0.43, 0.48, 0.49, 0.65	High-skilled gender hour ratios across sectors
λ_j	0.49,0.67, 0.58, 0.55, 0.55	The ratio of high-skilled to low-skilled female hours across sectors
$\hat{A}_{3h}$	0.78	Relative hours between substitutable services and home
$\hat{A}_{23}$	5.78	Relative hours between non-substitutable and substitutable services
$\hat{A}_{12}$	1.70	Relative hours between goods and non-substitutable services
φ	1.67	Relative hours between leisure and goods

4.2 Country-specific Taxes and Subsidies

The objective here is to examine how much of the cross-country differences in the gender gaps in market hours and wages can be generated by differences in taxes and subsidies. Using the calibrated parameters and the country-specific taxes and subsidies, we simulate the model to predict time allocation and wages by gender and skill for each country.

We use three statistics to evaluate the model predictions against the data. The first statistic is the average difference from the United States in the model across the studied countries. The second statistic is the correlation coefficient between the model prediction and the data. The last statistic is the coefficient of determination, as used in Chakraborty et al. (2015), which measures the variation in the data captured by the model. The coefficient of determination is defined as:

$$R^2 = 1 - SSE/SST, \tag{14}$$

where $SSE = \sum_c (x_{c,model} - x_{c,data})^2$ and $SST = \sum_c (x_{c,data} - x_{US})^2$. $x_{c,model}$ is the value predicted by the model for country c, $x_{c,data}$ is the data value of variable x in that country, and x_{US} is the value of variable x in the data for the United States.[15] Table 5 reports the three statistics for the gender wage and hour ratios. Panel A contains the summary statistics for Western and Southern Europe and Panel B contains the same statistics for all countries. Results for individual countries are reported in Appendix Table A5.

Columns three and five of Table 5 report the model-predicted average European differences from the United States in the female to male hour ratios, for low-skilled and high-skilled labor, respectively. Consistent with the data, the model predicts lower gender hour ratios for both skill groups in Western and Southern European countries relative to the United States. For these countries, the average prediction obtained by varying taxes and subsidies is 69% (-6.59/-9.49) and 93% (-4.81/-5.17) of the observed average differences in gender hour ratios from the United States, for the low-skilled and high-skilled, respectively. The correlation coefficients between the model predictions and the data are 0.15 and 0.48 for the low-skilled and high-skilled, respectively. Furthermore, the model generates 50% and 58% of the variation in the gender hour ratio from the United States for the low skilled and high-skilled, as measured by the coefficient of determination. When all countries are included, the correlation coefficients between model and data are roughly the same as for the Western and Southern European countries, while the coefficient of determination declines to 0.31 for the low-skilled and to 0.19 for the high-skilled. This implies that the model performs slightly worse for Nordic countries.

The last four columns of Table 5 present the data and model predictions on the gender

[15] Please see the Online Appendix for more details about the coefficient of determination.

wage ratios. Consistent with the data, the model generates higher gender wage ratios in European countries and Canada than in the United States. Together with the results on gender hour ratios, the model generates a negative cross-country correlation between the gender ratios in hours and wages as documented in Figure 1. From panel B of Table 5, the correlation coefficient between the model predicted gender wage ratio and the data is 0.24 for the low-skilled and 0.37 for the high-skilled. As measured by the coefficient of determination, the model generates 10% of the cross-country variation in the gender wage ratio for the low-skilled, and 7% for the high-skilled. The correlation coefficient and the coefficient of determination do not change much by excluding Nordic countries for either skill group. Quantitatively, the model generates an average difference of 0.45 in the gender wage ratio from the United States for the low-skilled and 0.34 for the high-skilled. Hence, taxes and subsidies can generate 11% (0.45/4.14) and 5% (0.34/6.96) of the observed average differences in gender wage ratios from the United States for the low-skilled and high-skilled, respectively. Excluding Nordic countries does not change the estimates by much.

Table 5: Model Prediction on Gender Ratios

	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
	Data	Model	Data	Model	Data	Model	Data	Model
Panel A: Western and Southern Europe								
Average Difference	-9.49	-6.59	-5.17	-4.81	4.19	0.52	8.56	0.38
Correlation		0.15		0.48		0.28		0.39
Coeff. of Determ.		0.50		0.58		0.11		0.07
Panel B: All Countries								
Average Difference	-5.50	-5.88	-2.22	-4.29	4.14	0.45	6.96	0.34
Correlation		0.27		0.47		0.24		0.37
Coeff. of Determ.		0.31		0.19		0.10		0.07

Notes: "Average Difference" is the average European differences from the United States, (Europe-US)*100), in the female to male hour and wage ratios, both in the model and in the data. "Coeff. of Determ" reports the coefficient of determination as defined in equation (14). Low-skilled individuals are those without a college degree. Data cover selected years in 2007-2015.

4.2.1 The Role of Marketization

As previously mentioned, an important channel for taxes and subsidies to shape the gender gaps in wages and hours is through the process of marketization of home production. Marketization shifts hours of work from the home sector to market sectors, especially to the

substitutable service sector because of the good substitutability between home services and substitutable services. Higher taxes or lower subsidies, weaken the marketization process as they increase the relative costs of outsourcing home produced services. This leads to lower market hours, especially among women because both the home sector and the substitutable service sector use female labor more intensively (as the calibrated $\{\xi_{ih}, \xi_{i3}\}_{\forall i} > \{\xi_{i1}, \xi_{i2}\}_{\forall i}$). Given the limited substitutability between male and female labor, less marketization of female market hours decreases the labor supply of women relative to men and drives up the gender wage ratio. This explains why higher taxes or lower subsidies induce a lower gender hour ratio and a higher gender wage ratio.

There are two key implications of the marketization mechanism for countries with higher taxes. First, they would have a smaller substitutable service sector. Second, women would spend a higher fraction of their working hours in home production relative to men. To validate such mechanism, Table 6 compares the model implied shares of hours across the three market sectors and the gender ratio in the fraction of market hours out of total work hours (market hours plus home hours) with the data.

Panel A of Table 6 compares the predicted sectoral shares of market hours with the data. Consistent with the data, the model predicts a smaller substitutable service sector in Europe and Canada compared to the United States. The predicted average differences from the United States for sectoral shares are the same as those in the data. The correlation coefficient and the coefficient of determination for the sectoral shares are all positive and especially large for the substitutable service sector. For this sector, the correlation coefficient is 0.81 and the coefficient of determination is 0.91, implying that the model also generates most of the cross-country variation in the sectoral share of hours in the substitutable service sector.

Panel B of Table 6 compares the predicted gender ratio in the share of market hours out of total work hours with the data. The model predicts lower values for this gender ratio in Europe and Canada relative to the United States, and the predicted average differences are close to the data for both skill groups. The correlation coefficient and the coefficient of determination of this gender ratio for both skill groups are larger than 0.5. These results, together with those reported in Panel A, are consistent with less marketization of home services, especially for women, in Europe and Canada, because of their higher taxes.

4.2.2 Decomposition: Income Taxes, Consumption Taxes, and Subsidies

In this subsection we decompose the total effects of taxes and subsidies on the cross-country differences in gender ratios on hours and wages into the contribution of three policies: income taxes, consumption taxes, and subsidies on family care. In each decomposition, we simulate

Table 6: Marketization: Model *vs* Data

Panel A: Shares of Market Hours by Sector				
	Correlation	Coeff. Of Determ	Ave. Data Diff	Ave. Model Diff
Goods	0.32	0.26	0.02	0.02
Non-substitutable	0.24	0.57	0.04	0.04
Substitutable	0.81	0.91	-0.06	-0.06
Panel B: Gender Ratio in the Fraction of Market Hours out of Total Work Hours				
	Correlation	Coeff. Of Determ	Ave. Data Diff	Ave. Model Diff
Low-skilled	0.56	0.54	-0.07	-0.06
High-skilled	0.63	0.59	-0.06	-0.05

Notes: "Ave. Data Diff" and "Ave. Model Diff" are the average differences in gender ratios from the United States ((Europe-US)*100) in the data and model, respectively. Low-skilled individuals are those without a college degree. Data cover years 2007-2015 for twelve countries with time use data.

the model with only one country-specific policy and keep the other two policy parameters at the US values for each studied country. Table 7 reports, in each decomposition, the model-generated average differences from the United States for the two gender ratios, the correlation coefficient between the model prediction and the data, and the coefficient of determination. The decomposition results for individual countries are included in Appendix Tables A6 to A8.

Panels A and B of Table 7 show that higher income and consumption taxes in Europe generate lower gender hour ratios and higher gender wage ratios for both skill groups, as the reported average differences from the United States are negative for hours and positive for wages. The decomposition shows that the income tax generates larger average differences from the United States for both gender ratios. This is because the income tax rate is generally higher than the consumption tax rate in all countries except for Sweden (see Appendix Table A4). While the correlation coefficient and the coefficient of determination are comparable in the decomposition with income taxes and consumption taxes for Western and Southern Europe, they are much smaller when all countries are considered.These results imply that income taxes are more important than consumption taxes in generating the cross-country variations in the gender ratios of hours and wages.

Panel C of Table 7 shows that higher subsidies in Europe generate higher gender hour ratios and lower gender wage ratios relative to the US and the effects are larger for the low-skilled than for the high-skilled. However, the effects of subsidies alone are much smaller than the ones of either income or consumption taxes. Table A8 in the appendix reveals that the main effect of subsidies are on gender hour ratios in Nordic countries since they have higher subsidy rates as reported in Table A4. Qualitatively, high subsidies in Nordic countries

operate in the opposite direction to their high taxes, and generate higher gender hour ratios of women relative to men. Although subsidies do help in raising gender hour ratios in Nordic countries, and therefore improve the model predictions, the quantitative effects are relatively small compared to taxes and thus are unable to produce the high gender hour ratios observed in these countries.

Our measure of social subsidies is likely to be a lower bound of the subsidies to family care, as it only includes non-cash benefits from the OECD SOCX database. Nordic countries have other family-friendly policies that are not included here, such as larger tax credits and exemptions for domestic services.[16] If these policies were quantified, they would lead to an even higher subsidy rate for Nordic countries, and would improve the model's performance in predicting female market hours in Nordic countries.

To summarize, the decomposition reveals that taxes, especially income tax, are more important than subsidies in generating the cross-country differences in the gender ratios, while subsidies help explaining the high gender hour ratio in Nordic countries.

4.2.3 Sensitivity Analysis

This subsection discusses the robustness of the benchmark results to alternative values of $\{\sigma, \eta, \eta_l, \rho_l, \rho\}$. The results from the sensitivity analyses, including similar summary statistics as in Table 5 for the benchmark results, are reported in Appendix Tables A9 and A10.

As discussed in Section 4.1, the literature finds an estimate for σ between 1.5 and 2.3 and an estimate for η between 2.3 and 4. We use the lower and upper bounds as alternative values. The literature also argues for complementarity for male and female leisure time and thus we explore alternative values of 0.1 and 0.9 for η_l. There is no good estimates for ρ_l and we explore two alternative values of 0.5 and 2. In the benchmark simulation, we have assumed that the elasticity of substitution between high-skilled and low-skilled labor, ρ, is constant across sectors. One may expect that the two skill types are more substitutable in the home sector but less substitutable in the non-substitutable sector, since the non-substitutable sector is the most skill-intensive sector. As robustness checks, we perform two alternative experiments. The first one sets $\rho = 2$ in the home sector and the second one sets $\rho = 0.9$ in the non-substitutable sector. Finally, in the benchmark case, we have also assumed that the elasticity of substitution between female and male labor, η, is constant across skill groups and across sectors. One may expect that male and female labor are more substitutable in service sectors than in the goods sector. As a robustness check, we set η to 4 in the two market service sectors while holding it at the benchmark value elsewhere. We

[16] Carbonnier and Morel, eds (2015) discuss the potential consequences on the labor market of alternative policies, including tax credits and exemptions on the purchases of care services in the private market.

Table 7: Decomposition: Income Tax, Consumption Tax and Subsidy

	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
	Data	Model	Data	Model	Data	Model	Data	Model
Panel A: Income Tax								
Western and Southern Europe								
Average Difference	-9.49	-4.93	-5.17	-3.56	4.19	0.36	8.56	0.26
Correlation		0.15		0.48		0.18		0.25
Coeff. of Determ.		0.43		0.53		0.08		0.05
All Countries								
Average Difference	-5.50	-4.42	-2.22	-3.19	4.14	0.32	6.96	0.23
Correlation		0.24		0.48		0.23		0.16
Coeff. of Determ.		0.29		0.26		0.08		0.05
Panel B: Consumption Tax								
	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
	Data	Model	Data	Model	Data	Model	Data	Model
Western and Southern Europe								
Average Difference	-9.49	-2.61	-5.17	-1.84	4.19	0.15	8.56	0.10
Correlation		0.19		0.38		0.26		0.41
Coeff. of Determ.		0.28		0.31		0.03		0.02
All Countries								
Average Difference	-5.50	-3.17	-2.22	-2.25	4.14	0.19	6.96	0.13
Correlation		-0.24		-0.34		0.20		-0.03
Coeff. of Determ.		0.12		-0.06		0.04		0.02
Panel C: Subsidy								
	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
	Data	Model	Data	Model	Data	Model	Data	Model
Western and Southern Europe								
Average Difference	-9.49	0.88	-5.17	0.60	4.19	-0.04	8.56	-0.02
Correlation		-0.24		-0.28		0.24		0.24
Coeff. of Determ.		-0.13		-0.14		-0.01		0.00
All Countries								
Average Difference	-5.50	1.96	-2.22	1.34	4.14	-0.07	6.96	-0.04
Correlation		0.34		0.45		-0.11		0.46
Coeff. of Determ.		-0.14		-0.02		-0.02		0.00

Notes: "Average Difference" is the average European differences from the United States, (Europe-US)*100), in the female to male hour and wage ratios, both in the model and in the data. "Coeff. of Determ" reports the coefficient of determination as defined in equation (14). Low-skilled individuals are those without a college degree. Data cover selected years in 2007-2015.

show in Appendix Tables A9 and A10 that the quantitative results with these alternative parameter values are similar to the benchmark results reported in Table 5.

4.3 Discussion on the Gender Wage Ratio

The quantitative analysis has shown that taxes and subsidies can generate 11% of the average cross-country difference in the gender wage ratio from the United States for the low-skilled and 5% for the high-skilled. To explore other factors that may also contribute to the cross-country difference in the gender wage ratio, we calibrate the model to each country and target the same set of moments. This alternative calibration matches time allocations, and more importantly, wage ratios to the data values of each country. Moreover, this alternative calibration takes into account cross-country differences not only in taxes and subsidies (τ, t_j), but also in gender-skill intensities (ξ_{ij}, λ_j), productivity (A_j), and preference for leisure (φ).[17] Since this calibration requires time use data, we perform this analysis only for the twelve countries with available time use data.

This calibration exercise implies a set of country-specific parameters (τ^c, t_j^c, ξ_{ij}^c, λ_j^c, A_j^c, φ^c) for matching the time allocation and the gender wage ratio in each country c. We perform the following counterfactual exercise to examine the role of each of these country-specific parameters on the gender wage ratio. Starting from the calibrated values for the United States, we change the parameters to the country-specific parameter values, one by one. We then measure the effect of that parameter by the fraction of the average differences in the gender ratios from the US in the model to the data. In other words, the counterfactual exercise for (τ^c, t_j^c) is the same as that reported in Section 4.2. The results of the counterfactuals are reported in Table 8 for the twelve countries with time use data.

Table 8 shows that while taxes and subsidies (τ, t_j) are the most important factor for the cross-country difference in the gender hour ratio, ξ_{ij}^c is the factor that has the largest quantitative effect on the gender wage ratio. ξ_{ij}^c determines the relative intensity of the two gender inputs in the production of sector j. It captures not only the productivity differences between men and women, but also factors that could affect preferences for female labor, such as social norms or discrimination against women working in the market. The literature (e.g. Heathcote, Storesletten and Violante (2010) and Ngai and Petrongolo (2017)) sometimes refers to changes in ξ_{ij}^c as a gender-specific demand shift. One way to understand this is to

[17] As discussed in Section 2.1, we control for cross-country differences in demographics by applying the US population shares to all studied countries. Thus, the shares of workers by gender and skill (L_{ig}) are the same across countries in our constructed data.

Table 8: Contribution of Country-Specific Parameters to Gender Ratios

	Gender Hour Ratio, Ave. % Explained		Gender Wage Ratio, Ave. % Explained	
	Low Skilled	High Skilled	Low Skilled	High Skilled
τ, t_j	99	120	12	5
ξ_{ij}	21	30	122	104
λ_j	-2	-16	-3	5
A_j	-30	-41	-26	-10
φ	0	0	0	0

Notes: Each row represents a counterfactual experiment of setting the parameter in that row to its country-specific value. The reported numbers are the ratio of the average model predictions on the difference in the gender ratio from the US relative to the average difference in the data. Low-skilled individuals are those without a college degree. Data cover selected years between 2007-2015, for the twelve countries with time use data.

think of the parameter for country c as:

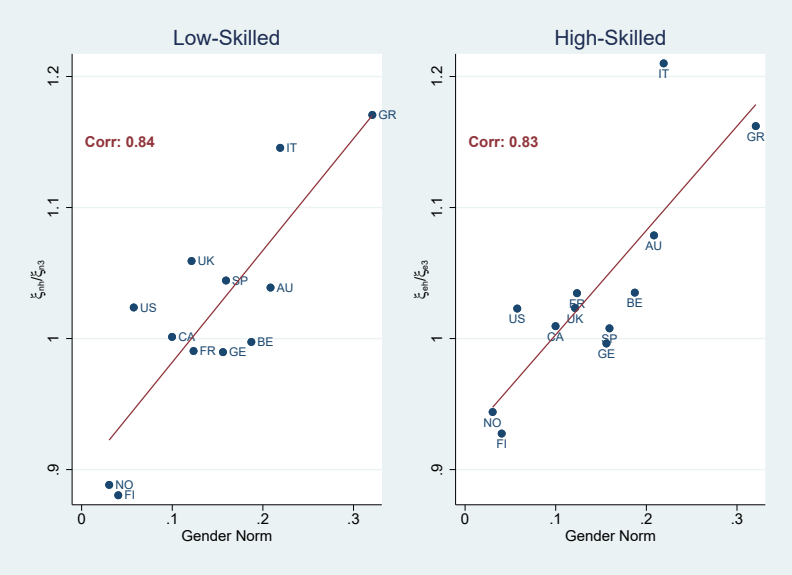
$$\xi_{ij}^c = \frac{\chi_{ij}^c}{\theta^c}, \quad j = 1, 2, 3, \quad i = n, e, \tag{15}$$

$$\xi_{ij}^c = \chi_{ij}^c, \quad j = h, \ell, \quad i = n, e. \tag{16}$$

χ_{ij}^c is a technology parameter capturing the productivity differences between women and men in sectors j for skill type i. θ^c is a country-specific parameter that only affects market production. θ^c captures factors (such as social norms or discrimination) that lower women's perceived marginal product of labor relative to men in the market sectors, and thus generate a wedge that lowers the gender wage ratio relative to the marginal rate of technical substitution in country c.

Using this interpretation, suppose the technology parameters are such that the relative productivity of women between home and market substitutable services is the same across all countries, i.e., $\chi_{ih}^c/\chi_{i3}^c = \kappa_i$, then the ratio of ξ_{ih}^c/ξ_{i3}^c is equal to $\kappa_i\theta^c$. A natural question is whether this country-specific wedge θ^c bears any relationship with cross-country variations in social norms towards women working in the market. One commonly used measure of gender norms in the literature is the fraction of respondents in the integrated European and World Values Survey (EVS 2021, Haerpfer et al. 2021) who agree or strongly agree that "When jobs are scarce, men have more right to a job than women". Figure 5 plots ξ_{ih}^c/ξ_{i3}^c against this measure of gender norm. As the figure shows, ξ_{ih}^c/ξ_{i3}^c, and hence the country-specific wedge, is highly correlated with this gender norm measure, with a correlation coefficient above 0.8 for both skill groups. Thus, the findings of Table 8 are consistent with the view that gender norms play an quantitatively important role in understanding the cross-country differences in the gender wage ratio.

Figure 5: ξ_{ih}/ξ_{i3} and Gender Norms



Notes: Gender norm is measured by the fraction of respondents in the integrated European and World Values Survey who agree or strongly agree that *"When jobs are scarce, men have more right to a job than women"*. Data cover selected years between 2007-2015 and for the twelve countries with time use data. Low-skilled individuals are those without a college degree.

5 Conclusion

Using micro data from 17 OECD countries, this paper documents a negative cross-country correlation between gender ratios (female relative to male) in market hours and wages. The gender hour ratios are usually higher in the United States than in Europe while the opposite occurs for the wage ratios. We find that the cross-country differences in market hours are mostly accounted for by female market hours and the size of the sector that produces close substitutes to home production.

Using a multi-sector model with gender and skill differences, we show that cross-country differences in income taxs, consumption taxes, and subsidies on family care can account for a substantial fraction of the cross-country differences in the gender ratios in market hours and wages and can also account for the negative correlation between the two ratios. The marketization of female home hours is important for driving these results. Higher taxes in Europe reduce the marketization of home production and therefore reduce market hours. Higher subsidies lower the cost of marketization and improve the model prediction on market hours in Nordic countries. These effects are larger for women because both home production

and its corresponding market substitutes are female intensive.

Our study has implications that go beyond the European context and that concern more generally the types of policies that can be used to promote the participation of women in the market. For instance, the International Labour Organization (2016) documents that the gender gap in employment is much larger in many developing countries, and as in the case of Europe, women do most of the housework. That report also suggests that higher government spending on family policies, such as social care services, policies on family leave and family-friendly work schedules, are associated with higher female employment-to-population ratios. This is consistent with our finding that the key to increase female market hours is to establish policies that reduce the cost of marketizing home production.

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A Appendix

As previously mentioned, our data covers selected years in the period 2007-2015. The years selected, shown in Table A1, are centered around the years where time-use information is available. For countries without time-use data, and for the United States, where we have yearly time-use data, we average data for the period 2011-2015.

Table A1: Selected Data Periods

Country		Selected Years	Time-Use data
Canada	CA	2009-2011	2010
Nordic			
Denmark	DE	2011-2015	
Finland	FI	2008-2010	2009
Norway	NO	2009-2011	2010
Sweden	SW	2011-2015	
Western			
Austria	AU	2007-2009	2008
Belgium	BE	2012-2014	2013
France	FR	2008-2010	2009
Germany	GE	2011-2013	2012
Netherlands	NE	2011-2015	
United Kingdom	UK	2013-2015	2014
Southern			
Greece	GR	2012-2014	2013
Ireland	IR	2011-2015	
Italy	IT	2007-2009	2008
Portugal	PO	2011-2015	
Spain	SP	2007-2009	2008
United States	US	2011-2015	2011-15

A.1 Hours of Work in the Market

To analyze the hours of work in the market we use the Labor Force Surveys in European countries (Eurostat 2021a, Insee 2021, ONS 2021), the CPS for the United States (Flood, King, Ruggles, Warren and Westberry 2021), and the 2011 Population Census for Canada (Minnesota Population Center 2020). Our sample is restricted to individuals between the ages of 20-64. We classify individuals as high-skilled if they completed college.[18]

All these surveys contain information on weekly hours worked. In order to construct a consistent measure of annual hours of work per person, we follow the procedures outlined by Bick et al. (2019), including the use of their estimated weeks of effective work over a calendar

[18]Olivetti and Petrongolo (2014) find that high-school dropouts and high-school graduates are equivalent labor inputs based on their average wages.

year. In the case of Finland we scale up the weekly hours using the average weeks worked in other Nordic countries, while for Canada we scale up weekly hours by the number of weeks worked the previous year, since the aforementioned paper does not include these countries in their sample.

To control for demographic differences across countries, we partition each country's population according to skill, gender, age (nine 5-year groups), and marital status. As a result, there are 72 population groups for each year/country pair. For each one of the population groups we calculate average hours and we aggregate them at the gender-skill level using as weights the U.S. population shares. Prior to the aggregation, we adjust the U.S. population shares to ensure that the distribution of age and marital status is constant across gender-skill groups. This is done as follows.

Denote by g a member of the 72-group partition. For any given g, there is a corresponding gender-skill group GS_k such that $g \in GS_k$, and a corresponding age-marital status group AM_l such that $g \in AM_l$. Let $f(g)$, $f(GS_k)$ and $f(AM_l)$ be the fraction of the population in these groups respectively. Then $f(g)$ can be rewritten as:

$$f(g) = f(GS_k)f(AM_l|GS_k), \tag{A.1}$$

where $f(AM_l|GS_k)$ is the fraction of group GS_k with age-marital status AM_l. This fraction $f(AM_l|GS_k)$ varies depending on the gender-skill group. To hold constant the distribution of age and marital status across different gender-skill groups, we replace $f(AM_l|GS_k)$ by $f(AM_l)$. This gives the weights to aggregate the 72 groups:

$$\tilde{f}(g) = f(GS_k)f(AM_l). \tag{A.2}$$

The weight $\tilde{f}(g)$ is constructed from the U.S. population and is then applied to all countries to estimate average hours that control for differences in the demographic composition of the population.

A.1.1 Sectoral Hours

The detailed sectoral classification is presented in Table A2. Given the available industry classification in most household surveys, a more detailed disaggregation is not possible.[19] Sectoral hours are estimated by multiplying the average market hours per person with the share of hours in a given sector. To be consistent with the previous estimates, we also hold

[19]EU-LFS do not separate wholesale trade with retail trade. We impute the hours going to "Retail Trade" by using detailed information on the shares of population groups employed in Retail in France and Germany.

the demographics constant across countries in constructing the sectoral hour shares. Table A3 shows the percentage of female employment by sector.

Table A2: Sector Classification

Sector	**ISIC (v. 3)**	**ISIC (v. 4)**
Goods		
Agriculture, Hunting, Forestry and Fishing	A, B	A
Mining and Quarrying	C	B
Manufacturing	D	C
Electricity, Gas, and Water	E	D, E
Construction	F	F
Non-Substitutable Services		
Wholesale Trade and Sale of Motor vehicles	50, 51	45, 46
Transport and Communications	I	H, J
Financial Intermediation	J	K
Real Estate and Business Activities	K	L, M, N
Public Administration, Defense, Compulsory Soc. Sec.	L	O
Education	M	P
Substitutable Services		
Retail Trade	52	47
Hotels and Restaurants	H	I
Health and Social Work	N	Q
Other Personal and Community Services	O	R, S
Private Households as Employers	P	T

A.2 Time Use Data

The data for time allocation come from the American Time Use Survey (Flood, Sayer, Backman and Hofferth 2022), the Harmonised European Time Use Survey (Eurostat 2020) and the Multinational Time Use Study (Fisher and Gershuny 2016, Gershuny, Vega-Rapun and Lamote 2020, Fisher, Gershuny, Flood, Backman and Hofferth 2019).

The time use classification used in this paper follows closely the one of Aguiar and Hurst (2007b) with a few minor adjustments. First, our market hours correspond to the total market work in Aguiar and Hurst (2007b). Second, our hours of work at home is the sum of time in non-market work, including child care, gardening, and caring for pets.

A.3 Taxes and Subsidies

The labor income and consumption taxes (τ, t_j) are from McDaniel (2020). Labor income taxes include Federal and State income taxes, as well as Social Security taxes. We use the average rates for the aforementioned selected years.

Table A3: Percentage of Female Employment by Sector

	Goods	Non-Substitutable Services	Substitutable Services
Canada	22.5	47.9	64.4
Nordic			
Denmark	19.2	41.7	70.9
Finland	20.1	44.6	77.8
Norway	16.5	41.2	75.0
Sweden	18.5	46.7	70.7
Western			
Austria	24.7	45.0	69.7
Belgium	17.7	46.1	67.1
France	23.1	47.4	69.1
Germany	23.7	46.0	70.6
Netherlands	18.1	39.9	71.8
United Kingdom	20.6	46.0	65.1
Southern			
Greece	28.7	40.9	53.9
Ireland	17.4	43.7	66.1
Italy	22.2	42.4	60.8
Portugal	28.8	45.3	69.9
Spain	18.8	42.9	67.3
United States	21.4	47.1	62.2

Notes: Data cover selected years between 2007-2015 and correspond to a population with 20-64 years of age.

The expenditures on "in-kind" social subsidies, S, are obtained from the OECD Social Expenditure Database (SOCX). The SOCX includes Old-Age, Incapacity, and Family benefits. The "in-kind" expenditures S are the non-cash public benefits in these three categories, and include expenditures on residential care, home-help services, rehabilitation, and early childhood education and care (e.g. day-care and pre-school services) (see Adema, Fron and Ladaique (2011) for a description of the SOCX database).

The subsidy rate s is given by:

$$s = \frac{S}{SO_{SS}},$$

where SO_{SS} is the sectoral output in the substitutable service sector. SO_{SS} is constructed using the WIOD input-output matrices (see Timmer, Dietzenbacher, Los, Stehrer and de Vries (2015)). As in Prescott (2004), the effective tax rate is:

$$\tau_e = \frac{t_j + \tau}{1 + t_j}.$$

The net consumption tax in the substitutable service sector is $t_3 = t_1 - s$. The resulting tax and subsidy rates are reported in Table A4. In this table we also show the detailed components that make up the social subsidy.

A.4 Wages

We construct hourly wage rates using the Labor Force Surveys for France and the UK (Insee 2021, ONS 2021), the Socioeconomic Panel (SOEP) for Germany (Socio-Economic Panel (SOEP) 2021, Wagner, Frick and Schupp 2007), the 2011 population Census for Canada, and the March CPS for the United States. For the rest of Europe, we use the European Union Statistics on Income and Living Conditions (EU-SILC) (Eurostat 2021b).[20] In all cases, wages are estimated using the earnings of employees only.

Most surveys provide a measure of current monthly earnings, which is converted to hourly wages by dividing by the product of 4.33 and the weekly hours of work. However, monthly earnings are not available for the US and some countries in SILC, in which case hourly wages are constructed using earnings from the previous year.[21] For the US, we divide the previous year earnings by the product of usual weekly hours and weeks worked in that year. For the SILC countries, we divide the previous year earnings by the product of the number of months worked in that year and the current number of weekly hours $\times$ 4.33, because the number of weekly hours worked in the previous year are not available.

[20]The EU-LFS does not contain detailed earnings information.

[21]In SILC these countries include Belgium, Denmark, Finland, The Netherlands, Norway, and Sweden.

Table A4: Taxes and Subsidies

	Taxes		Subsidies on Care			
	Income	Consumption	Old-Age	Incapacity	Family	Total
Canada	0.21	0.17			0.011	0.01
Nordic						
Denmark	0.34	0.30	0.069	0.091	0.092	0.25
Finland	0.36	0.20	0.044	0.041	0.060	0.14
Norway	0.32	0.22	0.094	0.026	0.082	0.20
Sweden	0.25	0.49	0.087	0.081	0.083	0.25
Average Nordic	*0.31*	*0.33*	*0.074*	*0.066*	*0.081*	*0.22*
Western						
Austria	0.40	0.22	0.018	0.015	0.019	0.05
Belgium	0.42	0.16	0.013	0.021	0.042	0.08
France	0.39	0.22	0.017	0.003	0.053	0.07
Germany	0.38	0.17	0.001	0.034	0.044	0.08
Netherlands	0.36	0.20	0.039	0.017	0.029	0.08
United Kingdom	0.25	0.17	0.013	0.013	0.044	0.07
Average Western	*0.37*	*0.19*	*0.019*	*0.017*	*0.037*	*0.07*
Southern						
Greece	0.34	0.18	0.000	0.001	0.013	0.01
Ireland	0.24	0.19	0.009	0.003	0.023	0.03
Italy	0.37	0.21	0.003	0.004	0.026	0.03
Portugal	0.29	0.19	0.003	0.001	0.017	0.02
Spain	0.30	0.12	0.018	0.007	0.025	0.05
Average Southern	*0.30*	*0.18*	*0.007*	*0.003*	*0.021*	*0.03*
United States	0.20	0.07	0.001		0.020	0.02

Notes: Labor income and consumption taxes are obtained from McDaniel (2020). Subsidies are constructed following Ngai and Pissarides (2011), and are expressed as fraction of the sectoral output in the substitutable service sector.

Gender wage ratios are estimated controlling for age and marital status through a standard Mincerian regression. More specifically, we regress log-wages on a second-order age polynomial, a marital status dummy, and interacted dichotomous indicators for college and gender.[22] The predicted gender wage ratios are obtained by taking the exponential of the corresponding skill-gender interaction parameters.

A.5 Additional Model Results

Table A5, an extended version of Table 5, reports the model results for each country in the benchmark simulation. Tables A6 - A8, extended versions of Table 7, report the model results for each country in the decomposition with income tax, consumption tax, and subsidy, respectively. Tables A9 and A10 report results for the sensitivity analysis of alternative parameter values.

[22]Each regression is estimated separately by year and country. In all cases, the regressions are estimated using the surveys' sampling weights.

Table A5: Gender Ratios: Differences from the United States, (Europe-US)*100

	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
Country	Data	Model	Data	Model	Data	Model	Data	Model
Canada	4.78	-2.46	4.22	-1.77	0.77	0.18	8.00	0.13
Denmark	0.64	-4.62	2.22	-3.41	12.16	0.32	7.82	0.26
Finland	8.83	-5.75	5.29	-4.21	2.84	0.43	-1.23	0.33
Norway	-0.91	-3.02	1.22	-2.23	1.11	0.20	-1.77	0.17
Sweden	2.99	-5.72	8.50	-4.20	3.19	0.42	4.25	0.33
Austria	-7.97	-9.27	-11.57	-6.78	-0.26	0.75	11.70	0.56
Belgium	-9.71	-8.62	-4.48	-6.30	6.70	0.68	11.41	0.51
France	-1.85	-8.78	-3.67	-6.42	4.69	0.70	8.66	0.53
Germany	-6.36	-7.20	-6.36	-5.26	2.34	0.56	2.33	0.42
Netherlands	-17.22	-7.10	-7.38	-5.18	-0.57	0.55	2.81	0.41
United Kingdom	-12.71	-2.75	-4.29	-2.00	2.27	0.20	3.37	0.15
Greece	-12.86	-7.23	-6.41	-5.25	8.68	0.57	11.91	0.42
Ireland	-15.89	-3.62	-6.25	-2.62	9.35	0.27	15.15	0.19
Italy	-17.78	-8.65	-12.40	-6.31	12.72	0.69	9.86	0.51
Portugal	9.63	-5.65	8.23	-4.10	-1.63	0.43	7.02	0.32
Spain	-11.67	-3.64	-2.34	-2.64	1.83	0.27	9.99	0.20
United States	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Western and Southern Europe								
Average Difference	-9.49	-6.59	-5.17	-4.81	4.19	0.52	8.56	0.38
Correlation		0.15		0.48		0.28		0.39
Coeff. of Determ.		0.50		0.58		0.11		0.07
All Countries								
Average Difference	-5.50	-5.88	-2.22	-4.29	4.14	0.45	6.96	0.34
Correlation		0.27		0.47		0.24		0.37
Coeff. of Determ.		0.31		0.19		0.10		0.07

Notes: This table reports differences from U.S. values. Low-skilled individuals are those without a college degree. Data cover years 2007-2015.

Table A6: Decomposition with Income Tax Only: Differences from the United States, (Europe-US)*100

	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
Country	Data	Model	Data	Model	Data	Model	Data	Model
Canada	4.78	-0.03	4.22	-0.02	0.77	0.00	8.00	0.00
Denmark	0.64	-4.85	2.22	-3.50	12.16	0.35	7.82	0.25
Finland	8.83	-5.74	5.29	-4.14	2.84	0.42	-1.23	0.30
Norway	-0.91	-4.03	1.22	-2.90	1.11	0.29	-1.77	0.20
Sweden	2.99	-1.75	8.50	-1.26	3.19	0.12	4.25	0.08
Austria	-7.97	-7.10	-11.57	-5.13	-0.26	0.53	11.70	0.39
Belgium	-9.71	-8.03	-4.48	-5.82	6.70	0.61	11.41	0.45
France	-1.85	-6.82	-3.67	-4.93	4.69	0.51	8.66	0.37
Germany	-6.36	-6.49	-6.36	-4.69	2.34	0.48	2.33	0.35
Netherlands	-17.22	-5.80	-7.38	-4.18	-0.57	0.42	2.81	0.31
United Kingdom	-12.71	-1.58	-4.29	-1.13	2.27	0.11	3.37	0.08
Greece	-12.86	-4.76	-6.41	-3.43	8.68	0.34	11.91	0.25
Ireland	-15.89	-1.22	-6.25	-0.87	9.35	0.08	15.15	0.06
Italy	-17.78	-6.19	-12.40	-4.47	12.72	0.46	9.86	0.33
Portugal	9.63	-3.01	8.23	-2.16	-1.63	0.21	7.02	0.15
Spain	-11.67	-3.25	-2.34	-2.33	1.83	0.23	9.99	0.16
United States	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Western and Southern Europe								
Average Difference	-9.49	-4.93	-5.17	-3.56	4.19	0.36	8.56	0.26
Correlation		0.15		0.48		0.18		0.25
Coeff. of Determ.		0.43		0.53		0.08		0.05
All Countries								
Average Difference	-5.50	-4.42	-2.22	-3.19	4.14	0.32	6.96	0.23
Correlation		0.24		0.48		0.23		0.16
Coeff. of Determ.		0.29		0.26		0.08		0.05

Notes: This table reports differences from U.S. values. Low-skilled individuals are those without a college degree. Data cover years 2007-2015.

Table A7: Decomposition with Consumption Tax Only: Differences from the United States, (Europe-US)*100

	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
Country	Data	Model	Data	Model	Data	Model	Data	Model
Canada	4.78	-2.20	4.22	-1.55	0.77	0.12	8.00	0.08
Denmark	0.64	-5.03	2.22	-3.57	12.16	0.30	7.82	0.21
Finland	8.83	-3.01	5.29	-2.13	2.84	0.17	-1.23	0.12
Norway	-0.91	-3.30	1.22	-2.34	1.11	0.19	-1.77	0.13
Sweden	2.99	-8.52	8.50	-6.09	3.19	0.56	4.25	0.39
Austria	-7.97	-3.28	-11.57	-2.32	-0.26	0.19	11.70	0.13
Belgium	-9.71	-2.12	-4.48	-1.50	6.70	0.12	11.41	0.08
France	-1.85	-3.45	-3.67	-2.44	4.69	0.20	8.66	0.14
Germany	-6.36	-2.25	-6.36	-1.59	2.34	0.13	2.33	0.09
Netherlands	-17.22	-2.95	-7.38	-2.08	-0.57	0.17	2.81	0.12
United Kingdom	-12.71	-2.33	-4.29	-1.64	2.27	0.13	3.37	0.09
Greece	-12.86	-2.55	-6.41	-1.80	8.68	0.14	11.91	0.10
Ireland	-15.89	-2.75	-6.25	-1.95	9.35	0.16	15.15	0.11
Italy	-17.78	-3.07	-12.40	-2.18	12.72	0.18	9.86	0.12
Portugal	9.63	-2.78	8.23	-1.96	-1.63	0.16	7.02	0.11
Spain	-11.67	-1.15	-2.34	-0.81	1.83	0.06	9.99	0.04
United States	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
West and South Europe								
Average Difference	-9.49	-2.61	-5.17	-1.84	4.19	0.15	8.56	0.10
Correlation		0.19		0.38		0.26		0.41
Coeff. of Determ.		0.28		0.31		0.03		0.02
All Countries								
Average Difference	-5.50	-3.17	-2.22	-2.25	4.14	0.19	6.96	0.13
Correlation		-0.24		-0.34		0.20		-0.03
Coeff. of Determ.		0.12		-0.06		0.04		0.02

Notes: This table reports differences from U.S. values. Low-skilled individuals are those without a college degree. Data cover years 2007-2015.

Table A8: Decomposition with Subsidy Only: Differences from the United States, (Europe-US)*100

	Gender Hour Ratio				Gender Wage Ratio			
	Low Skilled		High Skilled		Low Skilled		High Skilled	
Country	Data	Model	Data	Model	Data	Model	Data	Model
Canada	4.78	-0.28	4.22	-0.19	0.77	0.01	8.00	0.01
Denmark	0.64	6.67	2.22	4.55	12.16	-0.20	7.82	-0.10
Finland	8.83	3.46	5.29	2.37	2.84	-0.13	-1.23	-0.07
Norway	-0.91	5.14	1.22	3.51	1.11	-0.17	-1.77	-0.09
Sweden	2.99	6.65	8.50	4.54	3.19	-0.20	4.25	-0.10
Austria	-7.97	0.86	-11.57	0.59	-0.26	-0.04	11.70	-0.02
Belgium	-9.71	1.50	-4.48	1.03	6.70	-0.06	11.41	-0.04
France	-1.85	1.40	-3.67	0.96	4.69	-0.06	8.66	-0.03
Germany	-6.36	1.59	-6.36	1.09	2.34	-0.07	2.33	-0.04
Netherlands	-17.22	1.74	-7.38	1.19	-0.57	-0.07	2.81	-0.04
United Kingdom	-12.71	1.31	-4.29	0.90	2.27	-0.05	3.37	-0.03
Greece	-12.86	-0.19	-6.41	-0.13	8.68	0.01	11.91	0.01
Ireland	-15.89	0.37	-6.25	0.25	9.35	-0.02	15.15	-0.01
Italy	-17.78	0.31	-12.40	0.21	12.72	-0.01	9.86	-0.01
Portugal	9.63	-0.01	8.23	-0.01	-1.63	0.00	7.02	0.00
Spain	-11.67	0.80	-2.34	0.55	1.83	-0.03	9.99	-0.02
United States	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
West and South Europe								
Average Difference	-9.49	0.88	-5.17	0.60	4.19	-0.04	8.56	-0.02
Correlation		-0.24		-0.28		0.24		0.24
Coeff. of Determ.		-0.13		-0.14		-0.01		0.00
All Countries								
Average Difference	-5.50	1.96	-2.22	1.34	4.14	-0.07	6.96	-0.04
Correlation		0.34		0.45		-0.11		0.46
Coeff. of Determ.		-0.14		-0.02		-0.02		0.00

Notes: This table reports differences from U.S. values. Low-skilled individuals are those without a college degree. Data cover years 2007-2015.

Table A9: Robustness: Model Predictions on Gender Ratios for Western and Southern Europe

	Gender Hour Ratio						Gender Wage Ratio					
	Low Skilled			High Skilled			Low Skilled			High Skilled		
	Diff.	Corr.	Determ.	Diff.	Corr.	Determ.	Diff.	Corr.	Determ.	Diff.	Corr.	Determ.
Benchmark	-6.59	0.15	0.50	-4.81	0.48	0.58	0.52	0.28	0.11	0.38	0.39	0.07
$\sigma = 1.5$	-5.24	0.15	0.45	-3.84	0.48	0.54	0.41	0.28	0.09	0.31	0.39	0.06
$\sigma = 2.3$	-7.90	0.15	0.52	-5.74	0.47	0.58	0.61	0.28	0.13	0.45	0.40	0.08
$\eta = 2.3$	-6.54	0.15	0.50	-4.77	0.48	0.58	0.64	0.28	0.14	0.48	0.39	0.09
$\eta = 4$	-6.64	0.15	0.50	-4.84	0.48	0.58	0.40	0.27	0.09	0.30	0.39	0.06
$\eta_l = 0.1$	-6.68	0.15	0.50	-4.88	0.48	0.58	0.56	0.28	0.12	0.41	0.39	0.08
$\eta_l = 0.9$	-6.22	0.15	0.49	-4.49	0.48	0.57	0.33	0.29	0.08	0.26	0.39	0.05
$\rho_l = 0.5$	-6.60	0.15	0.50	-4.82	0.48	0.58	0.51	0.28	0.11	0.38	0.39	0.07
$\rho_l = 2$	-6.59	0.15	0.50	-4.80	0.48	0.58	0.52	0.29	0.12	0.38	0.39	0.07
$\rho_h = 2$	-6.54	0.15	0.50	-4.83	0.48	0.58	0.46	0.28	0.10	0.37	0.40	0.07
$\rho_2 = 0.9$	-6.97	0.15	0.50	-5.24	0.48	0.58	0.52	0.28	0.11	0.39	0.40	0.07
$\eta_2 = \eta_3 = 4$	-6.75	0.15	0.50	-4.91	0.48	0.58	0.48	0.27	0.11	0.34	0.39	0.06

Notes: Low-skilled individuals are those without a college degree. "Diff." refers to the average model prediction on the differences from the United States ((Europe-US)*100). "Corr." refers to the correlation between model and data and "Determ." refers to the coefficient of determination.

Table A10: Robustness: Model Predictions on Gender Ratios for All Countries

	Gender Hour Ratio						Gender Wage Ratio					
	Low Skilled			High Skilled			Low Skilled			High Skilled		
	Diff.	Corr.	Determ.	Diff.	Corr.	Determ.	Diff.	Corr.	Determ.	Diff.	Corr.	Determ.
Benchmark	-5.88	0.27	0.31	-4.29	0.47	0.19	0.45	0.24	0.10	0.34	0.37	0.07
$\sigma = 1.5$	-4.67	0.27	0.31	-3.43	0.47	0.23	0.36	0.25	0.08	0.28	0.38	0.06
$\sigma = 2.3$	-7.06	0.27	0.29	-5.13	0.46	0.11	0.54	0.25	0.12	0.40	0.38	0.08
$\eta = 2.3$	-5.84	0.27	0.31	-4.26	0.47	0.19	0.56	0.25	0.13	0.43	0.38	0.09
$\eta = 4$	-5.92	0.27	0.31	-4.33	0.47	0.18	0.35	0.24	0.08	0.26	0.38	0.05
$\eta_l = 0.1$	-5.96	0.27	0.31	-4.36	0.47	0.18	0.49	0.25	0.11	0.36	0.38	0.07
$\eta_l = 0.9$	-5.55	0.27	0.32	-4.01	0.47	0.20	0.29	0.26	0.07	0.23	0.38	0.05
$\rho_l = 0.5$	-5.89	0.27	0.31	-4.30	0.47	0.19	0.45	0.25	0.10	0.34	0.37	0.07
$\rho_l = 2$	-5.88	0.27	0.31	-4.29	0.47	0.19	0.45	0.25	0.11	0.34	0.37	0.07
$\rho_h = 2$	-5.83	0.27	0.31	-4.31	0.47	0.18	0.40	0.24	0.09	0.32	0.39	0.07
$\rho_2 = 0.9$	-6.22	0.27	0.31	-4.67	0.47	0.16	0.45	0.25	0.10	0.34	0.38	0.07
$\eta_2 = \eta_3 = 4$	-6.01	0.27	0.31	-4.38	0.47	0.18	0.42	0.24	0.10	0.30	0.37	0.06

Notes: Low-skilled individuals are those without a college degree. "Diff." refers to the average model prediction on the differences from the United States ((Europe-US)*100). "Corr." refers to the correlation between model and data and "Determ." refers to the coefficient of determination.