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Collective Intrahousehold Labor Supply in Europe: Distribution Factors and Policy Implications

Ignacio Belloc^{1,2} · Jorge Velilla^{1,2}

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Abstract

This paper analyzes how variables that shape intrahousehold bargaining relate to spouses' labor supply. We estimate a collective model using data from the EU-SILC over 2004–2019 for 17 countries. Results provide evidence of the relevance of the following distribution factors: sex ratio, non-labor income, age difference, education difference, and fertility rates. The sex ratio seems to be a distribution factor in Czech Republic, Denmark, Hungary, Ireland, Italy, Poland, Spain, and Switzerland. In addition, the wife's share of non-labor income is a distribution factor in Belgium, Czech Republic, Estonia, Ireland, Italy, Luxembourg, Poland, Portugal, Spain, and the UK. In Austria, Belgium, Czech Republic, Denmark, Estonia, France, Ireland, Italy, Luxembourg, Switzerland, and the UK the spouses' age gap displays opposite signs on spouses' labor supply, whereas in Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, Portugal, and the UK the spouses' education level differences display intrahousehold bargaining signs. Finally, the fertility rate is a distribution factor in Austria, Czech Republic, Denmark, Estonia, France, Ireland, Latvia, Portugal, Switzerland, and the UK. These results indicate that spousal- and country-specific characteristics are assessed differently across Europe and may help planners to implement household policies on cash transfers, schooling, and fertility.

Keywords Household labor supply · Collective model · Distribution factors · EU-SILC

JEL Classification D13 · J22 · H31

Introduction

This paper analyzes how variables that shape intrahousehold bargaining relate to spouses' labor supply, and derives policy implications to modify the distribution of resources within households. To do so, we estimate the collective model of household labor supply (Chiappori et al., 2002) with a focus on how a set of potential distribution factors (i.e., variables that exogenously shape intrahousehold bargaining power) associate with household labor supply. On the basis of how such distribution factors relate to spouses' labor supply, we

derive how they correlate to intrahousehold allocation. To do so, we use harmonized and homogenized data for 17 European countries over the period 2004–2019, taken from the European Union Statistics on Income and Living Conditions (EU-SILC).

Historically, household economic behaviors have been analyzed from a “unitary” perspective, where families are considered single decision units with preferences represented by a single utility function, regardless of household composition and potential differences between household members' preferences, thus being considered as “black boxes”. Most of these conventional studies make use of inequality and poverty measures at the household or population level, assuming that all individuals enjoy an equal share of all household resources and are equally well off (Day, 2022; Kaplanoglou, 2022). In recent decades, this approach has come under criticism because it prevents any analysis of intrahousehold behaviors, is based on assumptions with little theoretical justification, and generates biased estimates of inequality within the household (Browning et al., 2014;

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Chiappori & Meghir, 2015; Dunbar et al., 2013). However, throughout the 1980s, several authors proposed models recognizing that families were made up of spouses with different preferences. These models included cooperative game theories (Apps, 1981, 1982; Apps & Jones, 1986; Ashworth & Ulph, 1981; Lundberg & Pollak, 1994; Manser & Brown, 1980; McElroy & Horney, 1981; Ulph, 1988), non-cooperative games (Bergström, 1997; Chen & Woolley, 2001; Konrad & Lommerud, 1995, 2000; Lundberg et al., 1997; Udry, 1996), individual and market models (Grossbard-Shechtman, 1984, 1993; Grossbard-Shechtman & Neideffer, 1997), and collective models based on social welfare programs (Chiappori, 1988, 1992).

Specifically, the collective model (Chiappori, 1988, 1992) was the first general framework to analyze unobserved intra-household issues through observed behaviors, such as consumption or labor supply.¹ The model assumes that spouses, the decision-making units in the household, cooperate to reach Pareto-efficient outcomes, where no decision could make one spouse better off without making the other worse off. The collective model is then a theoretical tool that allows us to recover unobserved behaviors on intrahousehold allocations, so long as observed behaviors do not reject a series of testable restrictions. One of the most common testable implications is the impact of distribution factors, i.e., variables that affect the distribution of power within the household, but not preferences, nor the budget constraint (Browning & Chiappori, 1998).

In this context, Chiappori et al. (2002) develop a simple collective model of household labor supply with distribution factors in which, invoking the second welfare theorem, the allocation of resources within the household is characterized by a theoretically derived sharing rule of income. The authors also propose a specific parametrization of spouses' labor supply and provide an empirical test of the model for the US, using sex ratios and changes in divorce laws as potential distribution factors. Since then, several authors have empirically studied household behaviors in a collective setting, either through labor supply (Altindag et al., 2017; Chau et al., 2007; Cherchye et al., 2012; Giovanis & Ozdamar, 2019; Nguyen et al., 2018; Oreffice, 2007, 2011, 2014; Rapoport et al., 2011; Vermeulen, 2006) or consumption (Attanasio & Lechene, 2014; Bargain & Donni, 2012; Bargain et al., 2014; Calvi, 2020; Dunbar et al., 2013; Lewbel & Pendakur, 2008).

Sex ratios have been repeatedly tested as distribution factors, and early works by Grossbard-Shechtman (1993),

Grossbard-Shechtman and Neideffer (1997) and Angrist (2002) had already concluded that higher sex ratios are associated with lower female labor force participation. Other authors, such as Browning et al., (1994, 2014) and Cherchye et al. (2012) have proposed that the share of the household non-labor income coming from one partner is a potential distribution factor. Other potential distribution factors include wives' share of household income (Lewbel & Pendakur, 2008), spouses' human capital gap (Chau et al., 2007; Crespo, 2009), divorce legislation (Gray, 1998; Voena, 2015), spouses' age gap (Cherchye et al., 2012; Gobbi et al., 2018; Oreffice, 2011, 2014; Vermeulen, 2005; Vermeulen et al., 2006), child benefits (Lyssioutou, 2017; Vermeulen et al., 2006), joint custody legislation (Altindag et al., 2017; Nguyen et al., 2018; Nunley & Seals Jr, 2011), abortion legalization (Oreffice, 2007), inheritances (Belloc et al., 2023; Blau & Goodstein, 2016), spouses' labor earnings ratio (Bargain & Donni, 2012; Gobbi et al., 2018), spouses' body mass index (Chiappori et al., 2012), and spouses' disability status (Giovanis & Ozdamar, 2019).

Within this framework the objective of this paper is to estimate a collective model of household labor supply by country, following Chiappori et al. (2002). Thus, we can study how a set of potential distribution factors relates to intrahousehold resource allocation by analyzing how such factors relate to household labor supply in a multi-country scenario. In doing so, we use harmonized and homogenized data from the EU-SILC for seventeen European countries, for the period 2004–2019, and focus on distribution factors related to individual and country characteristics. Drawing from the prior literature, we consider five prominent distribution factors: sex ratio, wives' share of non-labor income, spouse age and education gaps, and fertility rates. Our results show that the sex ratio seems to be a distribution factor in Czech Republic, Denmark, Hungary, Ireland, Italy, Poland, Spain, and Switzerland. In addition, the wife's share of non-labor income is found to be a distribution factor in Belgium, Czech Republic, Estonia, Ireland, Italy, Luxembourg, Poland, Portugal, Spain, and the UK. In Austria, Belgium, Czech Republic, Denmark, Estonia, France, Ireland, Italy, Luxembourg, Switzerland, and the UK the spouses' age gap displays opposite signs on spouses' labor supply, whereas in Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, Portugal, and the UK the spouses' education level differences display consistent results with the collective model. Finally, the fertility rate is an appropriate distribution factor in Austria, Czech Republic, Denmark, Estonia, France, Ireland, Latvia, Portugal, Switzerland, and the UK. All these results may be used by planners to evaluate the intrahousehold effects of social policies on cash transfers, schooling, and fertility, regarding time and resources allocation in different regions of Europe.

¹ See Donni and Chiappori (2011), Browning et al. (2014), Chiappori and Mazzocco (2017), Donni and Molina (2018), Chiappori and Molina (2020), and Chiappori et al. (2022) for surveys of the literature on collective models, from theoretical and empirical perspectives.

The main contribution of this paper is then twofold. First, we contribute to the literature studying household behaviors by providing an empirical analysis for seventeen different European countries, using homogeneous and harmonized data. We then study the validity of the collective model by testing if the distribution factors considered allow us to reject, or not, the testable restrictions that characterize the collective model. While several authors have estimated and tested the collective model on single countries, to the best of our knowledge this is the first empirical cross-country analysis of household collective behaviors in Europe.² Second, we simultaneously study several potential distribution factors, focusing on which variables relate to household labor supply as predicted by the collective model, and we then derive policy implications for different countries. That is to say, we provide a cross-country study of potential distribution factors that shape roles within European households and could be used in different settings, such as policies aiming to reduce time allocation disparities within household. Thus, cash transfers that affect individual non-labor income, policies aiming to increase minorities' human capital, legislation concerning fertility, or birth promotion policies, may modify allocation of resources and labor supply decisions within the household in certain countries, and our results may help in understanding which policies could be suitable in these countries.

Theoretical Framework

We use the theoretical framework proposed by Chiappori et al. (2002) and assume that each household consists of a male and a female (whether married or unmarried, with or without children), subscripted by $i = 1, 2$, respectively. Spouses have distinct preferences and egoistic utility functions, $U^i = U^i(1 - h^i, C^i, z)$, where h^i denotes spouse i 's labor supply (with $0 \leq h^i \leq 1$), C^i is the private consumption of a Hicksian good whose price is normalized to one, and z is a vector of preference factors and taste demographics.

The main assumption of the collective model is that spouses cooperate to reach Pareto-efficient outcomes (Chiappori, 1988, 1992). In this context, the allocation of resources within the household is determined by the intra-household bargaining power of spouses, represented by the Pareto weight, $\mu = \mu(w_1, w_2, y, z, s) \in [0, 1]$, which depends on spouses' wages (w_i), household unearned income (y), taste demographics (z), and on distribution factor variables

² See Browning et al. (1994), Fernández-Val (2003), Vermeulen (2005, 2006), Blundell et al. (2007), Donni and Moreau (2007), Cherchye and Vermeulen (2008), Crespo (2009), Michaud and Vermeulen (2011), Rapoport et al. (2011), Cherchye et al., (2012, 2015), Donni & Matteazi (2012, 2018), Radchenko (2016), Lyssiou (2017), Velilla (2020), and Molina et al. (2023).

Table 1 Composition of the sample, by country

Country	N. Obs	Percentage
Austria	16,854	4.330
Belgium	19,304	4.960
Czech Rep	24,894	6.400
Denmark	38,622	9.930
Estonia	21,682	5.570
France	40,625	10.440
Hungary	17,705	4.550
Ireland	11,630	2.990
Italy	30,339	7.800
Latvia	12,484	3.210
Lithuania	15,904	4.090
Luxembourg	17,055	4.380
Poland	31,259	8.030
Portugal	17,754	4.560
Spain	28,452	7.310
Switzerland	20,120	5.170
UK	24,357	6.260
Pooled	389,040	100.000

The sample (EU-SILC data 2004–2019) has been restricted to working couples (married or unmarried)

(s) which affect the Pareto weight, but not preferences or the budget constraints (Browning & Chiappori, 1998). Note that μ is, by definition, unobservable.

Then, the household program is as follows:

$$\max_{\{h^1, h^2, C^1, C^2\}} \mu U^1 + (1 - \mu)U^2 \quad (1)$$

$$\text{s.t. : } w_1 h^1 + w_2 h^2 + y = C^1 + C^2$$

The solution of the model is a series of Marshallian labor supply equations:

$$h^1 = h^1(w_1, w_2, y, z, \mu(w_1, w_2, y, z, s)) = h^1(w_1, w_2, y, z, s) \quad (2)$$

$$h^2 = h^2(w_1, w_2, y, z, 1 - \mu(w_1, w_2, y, z, s)) = h^2(w_1, w_2, y, z, s) \quad (3)$$

It is important to note that, in this context, distribution factors represent an exogenous source of variation of the Pareto weight. Consequently, these variables influence household labor supply only through their effect on the Pareto weight. The underlying intuition is that, whenever a distribution factor is favorable to one spouse, increasing their bargaining position (and decreasing that of the partner), their demand for leisure increases, thus decreasing their labor supply (with the opposite impact on the partner).

According to the Second Fundamental Welfare Theorem, Problem (1) is equivalent to a decentralized two-stage

Table 2 Descriptive statistics

Variables	Pooled	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
<i>Wife's characteristics</i>																		
Work hours	33.591 (10.705)	30.688 (10.982)	32.565 (9.492)	39.595 (5.739)	29.804 (12.211)	38.390 (7.135)	34.731 (9.463)	38.991 (5.649)	30.691 (10.454)	33.424 (8.056)	38.909 (6.744)	38.409 (6.155)	33.605 (11.523)	38.619 (7.168)	38.901 (7.542)	35.450 (9.204)	29.358 (13.067)	33.118 (12.020)
Wage	13.251 (11.267)	16.027 (12.900)	18.823 (8.409)	4.319 (2.507)	15.096 (8.788)	4.763 (4.210)	13.734 (10.687)	3.435 (2.437)	21.711 (20.401)	13.132 (7.264)	4.231 (3.470)	3.567 (3.252)	24.635 (16.119)	4.314 (3.179)	7.081 (7.167)	10.739 (7.631)	28.010 (19.898)	16.053 (15.277)
<i>Husband's characteristics</i>																		
Work hours	41.875 (8.213)	41.918 (7.786)	40.515 (8.353)	42.829 (6.606)	42.236 (7.386)	41.074 (6.705)	41.207 (9.463)	40.893 (5.739)	39.413 (9.012)	40.162 (6.395)	41.068 (6.468)	40.072 (5.395)	43.017 (7.688)	42.279 (6.931)	42.612 (8.130)	41.398 (7.149)	43.355 (8.731)	43.420 (9.841)
Wage	16.879 (16.685)	21.945 (14.946)	21.849 (10.938)	5.989 (3.350)	20.608 (11.384)	6.678 (5.181)	16.652 (16.275)	4.302 (3.808)	26.057 (29.881)	16.544 (10.142)	5.365 (5.445)	4.492 (3.708)	28.754 (18.748)	5.219 (5.777)	8.822 (8.009)	13.064 (9.339)	33.849 (22.177)	20.428 (27.395)
<i>Household characteristics</i>																		
Household non-labor income	2,297.900 (7.898.232)	3,396.268 (9,944.561)	1,624.958 (5,725.110)	1,167.792 (2,967.864)	1,449.628 (5,710.582)	1,274.633 (3,120.995)	3,542.105 (10,922.050)	989.865 (3,591.599)	3,179.162 (8,718.949)	2,779.479 (6,955.900)	1,540.069 (3,604.547)	1,167.725 (4,021.376)	4,002.902 (11,743.600)	802.975 (2,638.760)	1,464.331 (6,474.404)	2,320.028 (6,438.583)	3,784.846 (13,565.400)	2,801.683 (9,171.259)
<i>Distribution factors</i>																		
Sex ratio	0.993 (0.036)	1.002 (0.023)	1.014 (0.014)	1.025 (0.044)	1.014 (0.016)	0.954 (0.096)	0.969 (0.016)	0.968 (0.067)	0.990 (0.031)	0.979 (0.023)	0.925 (0.091)	0.916 (0.077)	1.034 (0.036)	0.999 (0.043)	0.933 (0.029)	1.020 (0.035)	1.012 (0.016)	0.983 (0.012)
Women's share of labor income	0.087 (0.274)	0.116 (0.310)	0.129 (0.327)	0.169 (0.359)	0.066 (0.243)	0.264 (0.415)	0.119 (0.318)	0.037 (0.182)	0.187 (0.380)	0.153 (0.346)	0.260 (0.420)	0.225 (0.397)	0.034 (0.180)	0.034 (0.178)	0.060 (0.234)	0.138 (0.333)	0.011 (0.102)	0.006 (0.077)
Age difference, male-female	2.179 (4.161)	2.537 (4.355)	2.044 (3.985)	2.498 (4.002)	2.404 (4.514)	1.933 (4.283)	1.926 (4.041)	2.662 (4.193)	1.827 (3.756)	2.620 (3.878)	1.877 (4.462)	1.825 (3.465)	2.221 (4.361)	2.115 (3.327)	2.085 (3.862)	2.018 (4.442)	2.430 (4.593)	1.932 (4.435)
Education level difference	4.618 (1.727)	5.116 (1.661)	4.280 (1.740)	4.897 (1.311)	4.892 (1.626)	4.115 (1.655)	4.468 (1.799)	4.703 (1.544)	4.305 (1.684)	4.733 (1.756)	4.092 (1.596)	4.216 (1.431)	4.788 (1.765)	4.332 (1.362)	4.763 (1.854)	4.442 (1.988)	5.017 (1.749)	4.479 (1.763)
Fertility rate	0.158 (0.214)	0.101 (0.160)	0.184 (0.235)	0.111 (0.177)	0.150 (0.229)	0.129 (0.180)	0.206 (0.251)	0.094 (0.147)	0.234 (0.257)	0.110 (0.157)	0.122 (0.171)	0.111 (0.174)	0.177 (0.203)	0.125 (0.161)	0.129 (0.160)	0.146 (0.174)	0.159 (0.208)	0.177 (0.215)

The EU-SILC data (2004–2019) has been restricted to working couples (married or unmarried). Standard errors in parentheses. Summary statistics are sample weighted and all the differences between men and women are statistically significant at the 5% level

process (Chiappori, 1992). In such a decentralized process, the husband and wife first decide a sharing rule for non-labor income, $\phi_1 = \phi(\mu)$, $\phi_2 = y - \phi(\mu)$, which is a bijection of the Pareto weight. Second, conditional on the sharing rule, each spouse i maximizes their utility and chooses individual consumption and labor supply, subject to an individual budget constraint that accounts for the sharing rule:

$$\max_{\{h^i, C^i\}} U^i(1 - h^i, C^i) \quad (4)$$

$$s.t. : w_i h^i + \phi_i = C^i$$

The solution of this decentralized process is a new series of labor supply equations, which can be written as:

$$h^1 = H^1(w_1, z, \phi_1(w_1, w_2, y, z, s)) \quad (5)$$

$$h^2 = H^2(w_2, z, \phi_2(w_1, w_2, y, z, s)) \quad (6)$$

The derivatives of each labor supply with respect to the third term are expected to be negative, reflecting a pure income effect. That is, distribution factors that improve the husband's bargaining power decrease his labor supply and increase his wife's labor supply, and vice versa, and then the theory disciplines the impact of distribution factors on spouses' labor supply. In this context, Chiappori et al. (2002) show that the collective framework imposes a series of testable restrictions on labor supply equations that should be satisfied for household behaviors being compatible with the collective model. These restrictions suggest that the relative marginal effects of distribution factors on spouses' labor supply are equal, but of opposite sign (Chiappori et al., 2002).

Data

We use cross-sectional data from the European Union Statistics on Income and Living Conditions (EU-SILC), for the period 2004–2019, and covering the following countries: Austria, Belgium, Czech Republic, Denmark, Estonia, France, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Poland, Portugal, Spain, Switzerland, and the UK. The EU-SILC data is a harmonized survey that provides comparable and multidimensional microdata for the entire European Union following a common framework, which eliminates measurement differences from different datasets, periods, or methods of gathering information, and is part of the European Statistical System. It is an annual survey conducted every year by Eurostat since 2004, when it succeeded the European Community Household Panel, and combines data at the household and individual level for all

working-age individuals of the interviewed households, covering a range of variables on income, labor characteristics, poverty, social exclusion, and other living conditions (Clemenceau & Museux, 2007; European Commission, 2017).³

The sample is restricted to those households formed by a “wife” and a “husband” (whether married or unmarried), between 21 and 65 years old (Chiappori et al., 2002; Grossbard, 2014; Mazzocco, 2007; Theloudis et al., 2023), in order to eliminate as many full-time students and retired individuals as possible and to reduce cohort effects. We assume that there are only two decision-makers (the spouses), regardless of whether they have children or not, as in Chiappori et al. (2002). Then, the main units of analysis are households formed by a wife and a husband as adult working age respondents, as well as by children. We also retain only households in which both the husband and the wife work, reporting positive wages and positive hours of work (Chiappori et al., 2002; Molina et al., 2023; Orefice, 2011, 2014; Theloudis et al., 2023). Restrictions leave a total sample of 389,040 observations, corresponding to 389,040 households, in which there is information for the husband and the wife simultaneously. Table 1 shows sample sizes, by country.⁴

The main variables are spouses' hours of work, spouses' wages, and household non-labor income. Hours of work of males and females are defined as total hours of (paid) work per week. Hourly wages are defined as the ratio of earnings over work hours, defined in euros per hour. The EU-SILC includes information on the annual (total) disposable income of households, defined as the sum for all household members' personal income components, net of taxes, and we use this variable to compute the household non-labor income by dropping labor earnings from the total household income.⁵ Table 2 shows descriptive statistics of work hours, wages, and household non-labor income, pooled and at the country level. The average work hours for both the husband and the wife are 41.875 and 33.591 h per week, respectively, while the average wages are €16.879 per hour, and €13.251 per hour, respectively (an average gender gap of €3.628 per hour). By country, the average wife's hourly wage ranges from €3.435 in Hungary to €28.010 in Switzerland, whereas the average husband's wage ranges from €4.302 in Hungary

³ EU-SILC was launched in 2003 in Austria, Belgium, Denmark, Greece, Ireland, Luxembourg, and Norway, in order to evaluate data collection process.

⁴ We have eliminated those observations that can be considered outliers at the 5% level, using the blocked adaptive computationally efficient outlier nominators algorithm (Billor et al., 2000).

⁵ To avoid the effect of inflation, all monetary amounts are expressed in real terms using the deflator provided by the World Bank's World Development Indicators database for each country and the base period is taken to be 2015.

to €33,849 in Switzerland. The household non-labor income is, on average, €2,279,900 per year for the pooled sample.

The EU-SILC data allows us to define the following control variables: (1) the age of respondents, measured in years; (2) the marital status of individuals (a dummy variable taking value 1 for couples who are legally married, 0 otherwise); and (3) the maximum level of education achieved by respondents, measured using the International Standard Classification of Education (ISCED). From the information of the ISCED, we define three educational dummy variables: “Primary education”, which takes value 1 for those individuals with lower secondary education or less, 0 otherwise, “Secondary education”, which takes value 1 for those individuals who have achieved an upper secondary education or post-secondary non tertiary education, 0 otherwise, and “University education”, which takes value 1 for individuals with first stage of tertiary education or higher, 0 otherwise. The reference category for education corresponds to primary education. Further control variables are: (4) the self-employment status of respondents (a dummy variable taking value 1 if respondents are self-employed, 0 otherwise); (5) the part-time status of the respondents (a dummy variable taking value 1 if the respondents are part-time workers, 0 otherwise); (6) the family size; and (7) the number of children present in the household. Vector \mathbf{z} includes these preference variables. Summary statistics for males and females are shown in Table 6, in the Appendix.

Distribution Factors

Distribution factors are variables that affect household members’ bargaining position, but not individual preferences, nor the joint budget constraint. These variables thus affect household observed behaviors, such as consumption or labor supply, only through their impact on intrahousehold allocations. This way, one can study how distribution factors affect intrahousehold allocations by analyzing their impact on labor supply or consumption. However, the theory gives no guidance as to what constitutes a distribution factor, except that it should represent an exogenous source of variation of intrahousehold bargaining power (Browning & Lechene, 2001; Browning et al., 2006). Despite that, several authors have estimated household collective models for different countries, and several distribution factors have been proposed. We now explain the distribution factors considered according to existing research, along with the underlying bargaining mechanisms in household decisions.

First, we consider the sex ratio, defined as the relative number of males per female, by country of residence, year, and husband’s age, taken from Eurostat. The sex ratio then represents the scarcity of women in the marriage market (Chiappori et al., 2002), and it should relate positively to the bargaining power of the wife (and thus negatively to her

labor supply), with the opposite impact for the husband. The intuition is that a higher sex ratio represents a lower supply of females in the marriage market, in a given age bracket, so the ability to find a match in the case of divorce is reduced for males but increased for females, making the current marriage relatively more attractive to husbands than to wives (Angrist, 2002; Campaña et al., 2018; Chiappori et al., 2002; Giménez-Nadal et al., 2021; Grossbard-Shechtman, 1993; Grossbard-Shechtman & Neideffer, 1997; Molina et al., 2023; Rapoport et al., 2011).

Second, we consider the share of the household non-labor income generated by the wife. A larger share means that the wife has greater power in the intrahousehold decision process, since the household depends more on her unearned income (Bourguignon et al., 1993; Browning et al., 1994, 2014; Cherchye et al., 2012; Lewbel & Pendakur, 2008; Molina et al., 2023; Oreffice, 2011, 2014; Vermeulen, 2005). Specifically, we assume that when spouses contribute more to household resources, they accrue greater power, materialized in an increase of their Pareto weight.⁶ Consequently, the wife’s share of household non-labor income should relate negatively with her labor supply, with the opposite for the partner’s labor supply. This way, policies such as cash transfers that affect household non-labor income should not ignore who benefits from the transfer, e.g., the husband, the wife, or the household as a unit, as such cash transfer should lead to an increase in household non-labor income, and may impact intrahousehold allocations and therefore affect inequality within households, leading to undesired effects disciplined by bargaining processes (Attanasio & Lechene, 2014; Chiappori & Meghir, 2015). The share of non-labor income of the wife has already been studied as a distribution factor, dating back to Browning et al. (1994). Lyssiotou (2017) and Molina et al. (2023) also found that this was a suitable distribution factor, while Chau et al. (2007) and Oreffice (2011, 2014) found that spouses’ labor and non-labor income gap are also potential distribution factors.

Third, we include the difference in age between the husband and the wife (Browning et al., 1994, 2006, 2014; Cherchye et al., 2012; Gobbi et al., 2018; Oreffice, 2011,

⁶ Spouses’ non-labor income is composed of the following components: gross regular pensions from individual private plans, unemployment benefits, old-age benefits, survivor benefits, sickness benefits, disability benefits and education-related allowances. However, household non-labor income also accounts for other capital income components at the household level, in addition to pensions from individual private plans, such as income from property rents, housing allowances, children allowances or interests and dividends from capital. The percentage of household non-labor income coming from spouses’ cash transfers is, on average, 16.5 percent (ranging from 1.4 percent in the UK, to 42.4 percent in Estonia). By gender, the percentage of household non-labor income coming from wives’ cash transfers is 8.4 percent in the pooled sample, so women’s share of non-labor income mainly refers to cash transfers paid to the women.

2014; Radchenko, 2016; Vermeulen, 2005; Vermeulen et al., 2006), assuming that when a given spouse is relatively younger, he/she is more attractive in the marriage market, and thus can attract a larger share of household resources. To take one example, for a given husband, a younger wife has more bargaining power in intrahousehold decisions than an older wife and supplies less labor, all other things being equal.

Similarly, we consider spouses’ differences in the level of education as a potential distribution factor (Chau et al., 2007; Crespo, 2009). Given that we do not have information on the years of schooling from the EU-SILC data, we use the definition provided by Crespo (2009) and define an index that takes higher (lower) values if the husband has a higher (lower) education level, relative to that of his wife. The intuition is as follows: if the education level of a spouse increases (relative to the partner’s education), he/she increases his/her bargaining position, attracting a greater share of resources from the household on the one hand, and increasing his/her demand for leisure on the other hand, thus supplying less labor.

Finally, we include the fertility rate as a potential distribution factor. Fertility rates, at the country, year, and 5-year age group level, are taken from Eurostat, and defined as “the mean number of children that would be born alive to a woman during her lifetime if she were to survive and pass through her childbearing years conforming to the fertility rates by age of a given year”. Although the relationship between fertility and female labor supply has been widely studied in recent years (Angrist & Evans, 1998; Bloom et al., 2009; Bronars & Grogger, 1994; Carliner et al., 1980; Cristia, 2008; Del Boca et al., 2005; Del Rey et al., 2021; Hupkau & Leturcq, 2016), to the best of our knowledge there is no study, so far, investigating the relationship between fertility rates and labor supply in a collective framework, using this variable as a potential distribution factor. Nevertheless, in societies in which fertility rates are higher, depending on social norms and values regarding marriage and childcare (e.g., childcare provision, rights protections, maternity legislation), it could be that either mothers or fathers become more empowered and supply less labor.⁷

Table 2 shows summary statistics for the distribution factors at the pooled and country level. We observe an average sex ratio of 0.993, an average share of the wife in non-labor income of 0.087, husbands are on average 2.179 years older than their wives, the spousal difference in education is 4.618, following Crespo (2009), and the fertility rate is 0.158 for the pooled sample. When we look to the country averages, we

observe that the sex ratio ranges from a minimum of 0.916 in Lithuania to a maximum of 1.034 in Luxembourg. The share of wives’ non-labor income ranges from 0.006 in the UK to 0.264 in Estonia. Consequently, husbands’ non-labor income and capital interests or cash transfers received at the household level provide the major proportion of household unearned income, in all the countries of our sample, and especially in the United Kingdom. The average age difference is, in all cases, positive, indicating that husbands in our sample are on average older than their wives, especially in Hungary where husbands are on average 2.662 years older. Furthermore, the education level difference between spouses in our sample ranges from 4.092 in Latvia to 5.116 in Austria, indicating that both spouses have similar levels of schooling, both high school or University education, according to Crespo (2009). Finally, the average fertility rate ranges from 0.094 in Hungary to 0.234 in Ireland.

Empirical Analysis and Results

Strategy

In order to estimate the collective model, we follow existing empirical analyses (Bourguignon et al., 2009; Chau et al., 2007; Chiappori et al., 2002; Donni & Moreau, 2007; Giovanis & Ozdamar, 2019; Lyssiotou, 2017; Molina et al., 2023; Radchenko, 2016; Rapoport et al., 2011), and impose a semilog parametrization of spouses’ labor supply equations:

$$h^f = f_0 + f_1 \log w_m + f_2 \log w_f + f_3 y + f_4 \log w_m \log w_f + f_5 s_1 + \dots + f_9 s_5 + f'z \tag{7}$$

$$h^m = m_0 + m_1 \log w_m + m_2 \log w_f + m_3 y + m_4 \log w_m \log w_f + m_5 s_1 + \dots + m_9 s_5 + m'z \tag{8}$$

Following Chiappori et al. (2002), if $\frac{m_3}{f_3} \neq \frac{m_5}{f_5}$, it is possible to find a set of partial derivatives of the sharing rule, and one can recover the following expression of the sharing rule, which is valid if and only if $\frac{m_4}{f_4} = \frac{m_5}{f_5} = \dots = \frac{m_9}{f_9}$:

$$\Phi = \frac{1}{\Delta} (m_1 f_4 \log w_1 + f_2 m_4 \log w_2 + f_3 m_4 y + f_4 m_4 \log w_1 \log w_2 + m_4 f_5 s_1 + \dots + m_4 f_9 s_5) + k(z) \tag{9}$$

where $\Delta = f_3 m_4 - f_4 m_3 \neq 0$; $k(z)$ is a not-identifiable integration constant. Following Chiappori et al. (2002), we estimate Eqs. (7) and (8) simultaneously, using the Generalized Method of Moments (GMM). We conduct our analysis by

⁷ Other distribution factors that have been proposed are the laws governing divorce (Chiappori et al., 2002; Voena, 2015) and child custody (Altindag et al., 2017; Nguyen et al., 2018; Nunley & Seals Jr, 2011). However, we could find no significant variation in these laws for the analyzed period and countries.

Table 3 GMM estimates, females

Variables	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
Log women's wage	-1.697*** (0.263)	-2.727*** (0.783)	-0.703* (0.375)	0.880** (0.409)	-0.463*** (0.160)	-2.771*** (0.355)	-0.177 (0.121)	-0.622 (0.484)	-1.840*** (0.316)	-0.968*** (0.150)	-0.955*** (0.114)	-3.099*** (0.597)	-2.132*** (0.133)	-3.122*** (0.306)	-1.367*** (0.236)	-5.092*** (0.590)	-3.298*** (0.517)
Log men's wage	-1.850*** (0.245)	-1.277* (0.745)	-0.918*** (0.293)	-3.564*** (0.370)	-0.002 (0.117)	-0.605* (0.328)	-0.140 (0.108)	-0.502 (0.439)	-0.526* (0.308)	-0.217* (0.113)	0.256*** (0.087)	-3.066*** (0.592)	0.074 (0.114)	-0.890*** (0.274)	-0.483** (0.207)	-4.003*** (0.543)	-4.036*** (0.471)
Household non-labor income	-0.049*** (0.010)	-0.041*** (0.013)	-0.078*** (0.012)	-0.092*** (0.010)	-0.046*** (0.014)	-0.015*** (0.005)	-0.051*** (0.017)	-0.071*** (0.010)	-0.002 (0.005)	-0.017 (0.014)	-0.007 (0.012)	-0.041*** (0.008)	-0.066*** (0.017)	-0.036** (0.014)	0.004 (0.007)	-0.036*** (0.006)	-0.107*** (0.009)
Log cross wage	0.444*** (0.082)	0.217 (0.245)	0.358* (0.201)	0.438*** (0.136)	-0.074 (0.082)	0.227* (0.124)	0.049 (0.077)	-0.063 (0.143)	0.241** (0.118)	0.247*** (0.077)	-0.054 (0.072)	0.362** (0.168)	0.057 (0.080)	0.530*** (0.128)	0.212** (0.092)	1.129*** (0.165)	1.170*** (0.162)
Sex ratio	6.255* (3.470)	14.630*** (5.312)	-1.491 (1.844)	-16.896*** (3.789)	6.159*** (1.420)	6.623* (3.840)	-0.599 (2.103)	-3.254 (3.408)	-17.345*** (6.707)	0.389 (2.524)	-2.486 (1.960)	-0.120 (2.518)	1.238 (3.234)	-2.904 (4.178)	3.317 (2.247)	-4.521 (4.928)	21.888*** (7.933)
Women's share of non-labor income	-0.136 (0.209)	-2.397*** (0.191)	-0.772*** (0.086)	1.253*** (0.196)	-0.198*** (0.090)	-2.643*** (0.149)	-0.332* (0.197)	-1.016*** (0.198)	-1.050*** (0.110)	-0.189* (0.108)	-0.009 (0.097)	-1.373*** (0.341)	-2.933*** (0.239)	-1.136*** (0.212)	-0.930*** (0.133)	0.211 (0.590)	-4.756*** (1.028)
Age dif-ference, male-female	0.104*** (0.020)	0.002 (0.020)	0.020 (0.014)	0.003 (0.013)	0.059*** (0.019)	0.037** (0.015)	-0.001 (0.022)	0.075*** (0.023)	-0.095*** (0.025)	-0.010 (0.032)	-0.038* (0.023)	0.048** (0.020)	0.005 (0.024)	-0.030* (0.017)	0.003 (0.015)	0.066*** (0.018)	0.043** (0.018)
Education level dif-ference	0.064 (0.3840***)	0.048 (0.590)	0.041 (0.402)	0.045 (0.410)	0.037 (0.490)	0.036 (0.392)	0.042 (0.620)	0.065 (0.556)	0.030 (0.512)	0.049 (0.624)	0.047 (0.497)	0.065 (0.670)	0.044 (0.644)	0.045 (0.520)	0.031 (0.464)	0.060 (0.589)	0.053 (0.562)
Fertility rate	3.840*** (0.745)	0.994* (2.5498***)	1.481*** (4.175***)	1.520*** (57.653***)	0.565 (2.393)	0.712* (4.413)	-0.819 (3.169)	1.491*** (3.788)	0.146 (7.711)	-1.562** (3.802)	-0.614 (3.003)	1.274* (3.389)	-0.672 (4.253)	-0.828 (4.453)	0.352 (2.764)	2.361*** (5.911)	1.508*** (8.341)
Constant	31.063*** (4.119)	25.498*** (6.213)	40.175*** (2.556)	57.653*** (4.457)	32.627*** (2.393)	24.717*** (4.413)	42.334*** (3.169)	36.084*** (3.788)	62.781*** (7.711)	42.363*** (3.802)	46.214*** (3.003)	44.248*** (3.389)	42.707*** (4.253)	48.242*** (4.453)	37.458*** (2.764)	63.795*** (5.911)	18.955** (8.341)
Preference factors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	16,854	19,304	24,894	38,622	21,682	40,625	17,705	11,630	30,339	12,484	15,904	17,055	31,259	17,754	28,452	20,120	24,357

Standard errors in parentheses. The EU-SILC data (2004–2019) has been restricted to working couples (married or unmarried). The dependent variables are spouses' weekly work hours. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4 GMM estimates, males

Variables	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
Log women's wage	-0.265 (0.385)	0.807 (0.724)	-1.517*** (0.397)	-0.840** (0.388)	0.275 (0.172)	-1.243*** (0.385)	0.528*** (0.144)	1.048* (0.576)	-0.341 (0.271)	-0.156 (0.166)	0.391*** (0.110)	-1.066** (0.498)	-0.115 (0.145)	-1.732*** (0.382)	-0.024 (0.171)	-1.664*** (0.459)	-2.257*** (0.501)
Log men's wage	-1.045*** (0.338)	-1.840*** (0.682)	-2.896*** (0.318)	-0.955*** (0.346)	-0.642*** (0.138)	-2.178*** (0.358)	-0.728*** (0.113)	-0.714 (0.521)	-1.200*** (0.261)	-0.919*** (0.135)	-0.302*** (0.100)	-3.072*** (0.481)	-1.862*** (0.128)	-3.534*** (0.337)	-1.091*** (0.156)	-3.409*** (0.435)	-3.340*** (0.447)
Household non-labor income	-0.010 (0.010)	-0.075*** (0.012)	-0.063*** (0.018)	-0.047*** (0.010)	-0.023 (0.017)	0.013* (0.007)	-0.059*** (0.020)	-0.046*** (0.012)	-0.002 (0.005)	-0.011 (0.015)	-0.010 (0.017)	-0.012 (0.008)	-0.068*** (0.020)	-0.031*** (0.014)	-0.007 (0.008)	-0.042*** (0.006)	-0.082*** (0.010)
Log cross wage	0.084 (0.122)	-0.291 (0.229)	0.973*** (0.212)	0.200 (0.126)	-0.124 (0.091)	0.375*** (0.135)	-0.215*** (0.086)	-0.331* (0.172)	0.079 (0.102)	0.116 (0.089)	-0.251*** (0.075)	0.214 (0.138)	-0.006 (0.086)	0.657*** (0.165)	-0.075 (0.067)	0.509*** (0.130)	0.655*** (0.155)
Sex ratio	5.796* (3.129)	15.627*** (5.289)	12.691*** (2.425)	0.261 (2.992)	3.107* (1.669)	13.954*** (4.083)	6.477** (2.647)	7.718** (3.037)	3.374 (6.268)	4.317 (2.700)	-3.799** (1.832)	-2.294 (2.110)	8.123** (3.266)	7.028 (5.052)	15.467*** (2.093)	15.870*** (4.052)	-14.890* (7.843)
Women's share of non-labor income	-0.096 (0.169)	0.228 (0.173)	0.136 (0.113)	-0.408*** (0.139)	0.242** (0.101)	-0.253* (0.131)	0.288 (0.215)	-0.273 (0.174)	-0.025 (0.099)	0.132 (0.122)	0.114 (0.090)	-0.379 (0.280)	0.048 (0.211)	0.282 (0.274)	0.093 (0.116)	0.828* (0.471)	0.027 (0.840)
Age dif-ference, male-female	0.014 (0.014)	-0.041*** (0.014)	-0.033*** (0.011)	-0.037*** (0.008)	0.005 (0.011)	-0.052*** (0.011)	0.011 (0.010)	-0.043** (0.019)	0.006 (0.009)	0.021* (0.011)	-0.014 (0.010)	-0.048*** (0.013)	0.003 (0.012)	-0.041*** (0.016)	0.021* (0.011)	0.014 (0.013)	-0.046*** (0.014)
Education level difference	-0.182*** (0.035)	-0.274*** (0.032)	-0.150*** (0.032)	-0.012 (0.022)	-0.006 (0.026)	-0.264*** (0.025)	-0.106*** (0.028)	-0.162*** (0.045)	0.011 (0.020)	-0.026 (0.036)	0.029 (0.029)	-0.239*** (0.032)	0.025 (0.028)	-0.251*** (0.037)	0.035* (0.020)	-0.020 (0.033)	-0.064* (0.036)
Fertility rate	-3.454*** (0.666)	-0.525 (0.566)	-0.798 (0.560)	-1.580*** (0.314)	-1.586*** (0.557)	-2.287*** (0.409)	-0.056 (0.782)	-0.433 (0.522)	-0.895* (0.499)	-0.692 (0.721)	-0.228 (0.481)	-0.847 (0.534)	0.116 (0.693)	-1.938*** (0.662)	0.390 (0.427)	-1.996*** (0.492)	-4.613*** (0.543)
Constant	41.431*** (3.863)	28.227*** (6.085)	32.159*** (3.459)	44.949*** (3.703)	40.149*** (2.696)	31.156*** (4.573)	33.580*** (4.048)	35.430*** (3.503)	43.173*** (7.218)	38.420*** (4.041)	48.003*** (2.639)	58.289*** (2.805)	38.877*** (4.367)	45.143*** (5.386)	26.282*** (2.549)	36.767*** (4.885)	74.618*** (8.200)
Preference factors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	16,854	19,304	24,894	38,622	21,682	40,625	17,705	11,630	30,339	12,484	15,904	17,055	31,259	17,754	28,452	20,120	24,357

Standard errors in parentheses. The EU-SILC data (2004–2019) has been restricted to working couples (married or unmarried). The dependent variables are spouses' weekly work hours. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

country to assess differences in the validity of distribution factors, so we do not need to control for any fixed effect at the country level in Eqs. (7) and (8). Against other estimators, such as Ordinary Least Squares (OLS) and Seemingly Unrelated Regressions (SUR), the GMM estimator has several advantages.⁸ On the one hand, it is more flexible and allows us to address the constraints in the labor supply equations imposed by the collective model. On the other hand, it takes into account the heteroskedasticity of unknown form across households and accounts for a possible correlation between the spouses' error terms (Davidson & MacKinnon, 1993). We first estimate these equations and, after imposing the collective rationality hypothesis, we recover the sharing rule derivatives of Eq. (9), only for the valid distribution factors for each country.⁹

Results

Labor supply equations. Tables 3 and 4 show the estimates of Eqs. (7) and (8), respectively, and separately for each country. Taste demographics include age, education (taking primary education as reference category), the number of children, family size, whether spouses are married, being a self-employed worker, and being a part-time worker. We also include year fixed effects. Additional coefficients are available upon request.

We find that own wages are negatively related to work hours for both males and females, with the associated coefficients being statistically significant at standard levels. Besides, household non-labor income is negatively associated with the labor supply of husbands and wives. Specifically, female wages are negatively related to female labor supply in Austria, Belgium, Czech Republic (statistically significant at the 90% level), Estonia, France, Italy, Latvia, Lithuania, Luxembourg, Poland, Portugal, Spain, Switzerland, and the UK. Estimated coefficients range from -5.092 (Switzerland) to 0.880 (Denmark). On the other hand, male wages are negatively related to male labor supply in Austria, Belgium, Czech Republic, Denmark, Estonia, France, Hungary, Italy, Latvia, Lithuania, Luxembourg, Poland, Portugal, Spain, Switzerland, and the UK, with coefficients between -3.534 in Portugal, and -0.302 in Lithuania. Husband (wife) wages are negatively related to the partner's labor supply in Austria, Belgium (statistically significant at the 90% level), Czech Republic, Denmark, France (statistically significant at the 90%), Italy (statistically significant at the 90% level), Latvia (statistically significant at the 90%

level), Luxembourg, Portugal, Spain, Switzerland, and the UK (Czech Republic, Denmark, France, Luxembourg, Portugal, Switzerland, and the UK). These coefficients range from -4.036 to 0.528 . Finally, the cross log-wage term is positively (negatively) correlated with both spouses' hours of work in Austria, Czech Republic, Denmark, France, Italy, Latvia, Luxembourg, Portugal, Switzerland, and the UK (Ireland, and Lithuania).

For non-labor income, we find negative and statistically significant coefficients in Austria, Belgium, Czech Republic, Denmark, Estonia, France, Hungary, Ireland, Luxembourg, Poland, Portugal, Switzerland, and the UK for females, while negative statistically significant coefficients are obtained in Belgium, Czech Republic, Denmark, Hungary, Ireland, Poland, Portugal, Switzerland, and the UK for males. These latter correlations fluctuate between -0.107 and -0.015 .

Concerning the variables of interest, the five potential distribution factors, we find that some distribution factors are consistent with the collective model and bargaining interpretation explained above for most countries, so these variables influence intrahousehold decisions through their impact on labor supply, whereas others are valid only for certain countries. We find the expected coefficient for the sex ratio (i.e., a negative and statistically significant coefficient in wives' labor supply, and/or a positive and statistically significant coefficient in those of husbands) in Czech Republic, Denmark, Hungary, Ireland, Italy, Poland, Spain, and Switzerland. We obtain unexpected signs for Lithuania and the UK, suggesting that the sex ratio is not a suitable distribution factor in these countries. Specifically, we find that an increase in the sex ratio reduces the husbands' labor supply, while it is associated with higher wives' labor supply in the UK. On the other hand, in Lithuania we find that a higher sex ratio is negatively associated with husbands' labor supply. The underlying intuition behind using the sex ratio as a distribution factor is that it captures the marriage market situation in the event of divorce and the scarcer gender should have more bargaining power in household decisions. For instance, if the number of women is lower than the number of men in a given country, then women are scarce and it will be more difficult for a man to find a partner (i.e., a good match) in the case of divorce, and vice versa. So, women are empowered when the sex ratio is higher and decrease their labor supply, whereas men are more inclined to their existing marriage and increase their labor supply.

The wives' share of non-labor income is negatively related to their weekly work hours, suggesting that this variable is a suitable distribution factor, as higher values of this variable are associated with an increase in the wives' intrahousehold bargaining power, shown in a decrease in their weekly working hours and an increase in their husbands' hours of work. More specifically, we obtain the expected signs for Belgium, Czech Republic, Estonia (for

⁸ Results using OLS and SUR are similar and available upon request.

⁹ A limitation is that we consider wages and non-labor income to be exogenous, since we could not find a proper instrumentation that worked well for all the countries considered.

both spouses), Hungary, Ireland, Italy, Latvia, Luxembourg, Poland, Portugal, Spain, Switzerland, and the UK, while the Denmark estimates are contrary to the expected signs (negative for female labor supply, positive for male labor supply). Thus, the more household resources the wife manages, the less (more) the wife (husband) supplies labor, in line with the bargaining interpretation.

The age differential between husbands and wives suggests that larger differences are negatively related to husbands' labor supply in Belgium, Czech Republic, Denmark, France, Ireland, Luxembourg, Portugal, and the UK, so older husbands have greater bargaining power within the household and decrease their labor supply consequently. Moreover, wives in Austria, Estonia, France, Ireland, Luxembourg, Switzerland, and the UK work more when they are relatively younger. All these results suggest that the older spouse has greater bargaining power within the household in these countries, as he/she decreases his/her labor supply and increases his/her demand for leisure in these countries, with the opposite being found for the younger spouse. This is contrary to our previous assumption, since we assumed that the younger spouse attracts a greater share of household resources, given that he/she is relatively more attractive in the marriage market, compared to the older partner who is more inclined to the existing marriage. Nevertheless, the results suggest that older and more experienced spouses have greater power within the family, in line with prior studies in the US and Netherlands that suggest that the life experience, knowledge and maturity of the older spouse are valued by the younger spouse (Cherchye et al., 2012; Oreffice, 2011, 2014).¹⁰ On the other hand, estimates for Italy suggest that wives work less when they are younger than their spouses.

The education level difference is also associated with a statistically significant increase in the wives' labor supply, whereas the opposite is found for husbands, consistent with Crespo (2009). Hence, the estimates for the education level difference also fit with the distribution factor assumption, since higher values of this variable are associated with a higher relative education level of the husbands and a higher bargaining power of husbands. The underlying intuition is that highly educated individuals, in relative terms, have more control over household resources, so their bargaining power increases and their labor supply decreases, and vice

versa for their less well-educated counterparts. This result is found for Belgium, Czech Republic, France, Ireland, Luxembourg, Portugal, and the UK. On the other hand, the estimates suggest that husbands in Austria and Hungary work less when their education level is higher than that of their wives, while in Denmark wives work more when their education level is lower in relative terms. We find unexpected signs for the education level difference in female labor supply for Switzerland, as the estimates suggest that wives work less when their education level, in relative terms, is lower, so this variable is not a distribution factor in Switzerland. This last result can be related to a standard specialization hypothesis, where less educated spouses work less because of a lower attachment to the labor market (i.e., a lower salary and opportunity cost of time) and a greater specialization in household production.

Our findings suggest that the fertility rate is positively related to women's labor supply, while the results display a negative and statistically significant coefficient for the male labor supply in Austria, Denmark, France, Switzerland, and the UK. In addition, wives in Czech Republic and Ireland work more when the fertility rates are higher, and we find a negative and statistically significant coefficient in the male labor supply equation for the fertility rate in Estonia, Italy and Portugal. This suggests that in those countries where fertility rates are higher, females (males) devote more (less) time to market work activities compared to males (females), thus fitting the distribution factor theory. Our results also suggest that wives in Latvia work less when the fertility rate is higher, contrary to prior estimates.

All in all, we find the expected coefficients for the sex ratio in Czech Republic, Denmark, Hungary, Ireland, Italy, Poland, Spain, and Switzerland, for the women's share of non-labor income in Belgium, Czech Republic, Estonia, Ireland, Italy, Luxembourg, Poland, Portugal, Spain, and the UK, for the age gap in Austria, Belgium, Czech Republic, Denmark, Estonia, France, Ireland, Italy, Luxembourg, Switzerland, and the UK, for the education gap in Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, Portugal, and the UK, and for the fertility rate in Austria, Czech Republic, Denmark, Estonia, France, Ireland, Latvia, Portugal, Switzerland, and the UK.

Furthermore, if we take into account whether there are any similar patterns by group of countries with specific characteristics, we find that culture and geographical context are important in justifying the main estimates of the distribution factors. For instance, the age and education level differences seem to be suitable distribution factors in Continental countries (Austria, Belgium, France, Luxembourg, and Switzerland) and Anglo-Saxon countries (Ireland and the UK). In Ireland and the UK, the sex ratio, the wives' share of unearned income and the fertility rate are also suitable distribution factors. The results for wife's share of non-labor

¹⁰ There is the possibility for an alternative explanation of the change in household labor supply due to age differences: older spouses may be less productive and work less. These estimates could be related to a traditional specialization hypothesis due to spouses' comparative advantages. Within this framework, it is possible that older spouses have a comparative advantage in household tasks and contribute less to market work as they may be less productive (Yamamura & Tsutsui, 2021). Note that this hypothesis is not contradictory to our empirical results, and we cannot discriminate between both alternatives in this case.

Table 5 Sharing rule derivatives

Variables	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxem- bourg	Poland	Portugal	Spain	Switzerland	UK
Log women's wage	148.705 ($p=0.551$)	6.313 ($p=0.461$)	9.980 ($p=0.143$)	-41.641 ($p=0.149$)	-5.855 ($p=0.479$)	21.769 ($p=0.266$)	2.739 ($p=0.426$)	-6.609 ($p=0.480$)	-603.359 ($p=0.398$)	-54.689 ($p=0.409$)	-15.680 ($p=0.486$)	89.238 ($p=0.328$)	-0.727 ($p=0.918$)	43.566** ($p=0.036$)	4.588 ($p=0.871$)	-61.863*** ($p=0.004$)	-82.590*** ($p=0.002$)
Log men's wage	262.103 ($p=0.441$)	10.172 ($p=0.299$)	17.701** ($p=0.012$)	-100.293 ($p=0.159$)	0.077 ($p=0.986$)	25.153 ($p=0.188$)	2.164 ($p=0.226$)	8.102 ($p=0.329$)	-249.446 ($p=0.571$)	-35.508 ($p=0.347$)	-47.763* ($p=0.055$)	218.473 ($p=0.265$)	-0.210 ($p=0.931$)	44.936** ($p=0.026$)	29.793 ($p=0.124$)	-66.250*** ($p=0.002$)	-87.951*** ($p=0.001$)
Household non-labor income	6.929 ($p=0.551$)	0.330 ($p=0.299$)	1.512*** ($p=0.012$)	-2.579 ($p=0.159$)	1.673 ($p=0.986$)	0.626** ($p=0.188$)	0.794* ($p=0.226$)	1.152* ($p=0.329$)	-0.908 ($p=0.571$)	-2.830 ($p=0.347$)	1.386 ($p=0.055$)	2.929 ($p=0.265$)	0.189 ($p=0.931$)	1.818** ($p=0.026$)	-0.222 ($p=0.124$)	-0.598*** ($p=0.002$)	-2.332*** ($p=0.001$)
Log cross wage	-62.947 ($p=0.429$)	-1.728 ($p=0.199$)	-6.905 ($p<0.001$)	12.323 ($p=0.143$)	2.730 ($p=0.232$)	-9.436 ($p=0.024$)	-0.754 ($p=0.056$)	1.012 ($p=0.077$)	114.161 ($p=0.742$)	40.444 ($p=0.375$)	10.045 ($p=0.525$)	-25.801 ($p=0.226$)	-0.163 ($p=0.927$)	-26.769** ($p=0.030$)	-13.068 ($p=0.636$)	18.678*** ($p<0.001$)	25.499** ($p=0.002$)
Sex ratio	-62.947 ($p=0.450$)	-1.728 ($p=0.475$)	-6.905 ($p=0.112$)	12.323 ($p=0.221$)	2.730 ($p=0.493$)	-9.436 ($p=0.193$)	9.276 ($p=0.524$)	52.513 ($p=0.672$)	-8231.375 ($p=0.554$)	464.107 ($p=0.282$)	464.107 ($p=0.495$)	97.876 ($p=0.352$)	-3.537 ($p=0.924$)	57.342*** ($p=0.011$)	57.360 ($p=0.124$)	18.678*** ($p=0.003$)	477.001** ($p=0.002$)
Women's share of non-labor income	19.094 ($p=0.450$)	19.094 ($p=0.475$)	14.877*** ($p=0.112$)	35.258 ($p=0.160$)	7.260 ($p=0.160$)	7.260 ($p=0.193$)	16.405* ($p=0.777$)	16.405* ($p=0.400$)	-498.397 ($p=0.465$)	97.876 ($p=0.282$)	97.876 ($p=0.495$)	97.876 ($p=0.352$)	8.379 ($p=0.929$)	57.342*** ($p=0.011$)	57.360 ($p=0.124$)	18.678*** ($p=0.003$)	477.001** ($p=0.002$)
Age difference, male-female	-14.719 ($p=0.159$)	-0.0135 ($p=0.932$)	-0.390 ($p<0.001$)	0.072 ($p=0.147$)	-2.159 ($p=0.268$)	-1.530** ($p=0.049$)	-1.206 ($p=0.079$)	-1.206 ($p=0.079$)	-45.137 ($p=0.450$)	-45.137 ($p=0.450$)	-45.137 ($p=0.450$)	-3.407 ($p=0.233$)	-0.927 ($p=0.927$)	-0.927 ($p=0.001$)	1.099*** ($p=0.174$)	1.099*** ($p=0.001$)	0.927** ($p=0.001$)
Education level difference	0.935 ($p=0.427$)	-2.837 ($p=0.932$)	-3.003*** ($p=0.167$)	8.238 ($p=0.848$)	8.238 ($p=0.234$)	-11.670*** ($p=0.049$)	0.8626 ($p=0.049$)	-4.876* ($p=0.102$)	-4.876* ($p=0.458$)	-4.876* ($p=0.102$)	-4.876* ($p=0.458$)	-36.811 ($p=0.280$)	-13.103*** ($p=0.001$)	-13.103*** ($p=0.001$)	-13.103*** ($p=0.001$)	-2.952** ($p=0.007$)	2.733** ($p=0.038$)
Fertility rate	-544.178 ($p=0.918$)	-544.178 ($p=0.162$)	-28.553*** ($p=0.002$)	42.775 ($p=0.148$)	-20.733 ($p=0.148$)	-29.620 ($p=0.003$)	0.8626 ($p=0.232$)	-24.070 ($p=0.093$)	-24.070 ($p=0.093$)	-255.722 ($p=0.242$)	-255.722 ($p=0.242$)	17.055 ($p=0.223$)	41.784 ($p=0.001$)	41.784 ($p<0.001$)	28.452 ($p=0.016$)	39.079*** ($p=0.004$)	32.869** ($p=0.041$)
Number of observations	16,854	19,304	24,894	38,622	21,682	40,625	17,705	11,630	30,339	12,484	15,904	17,055	31,259	17,754	28,452	20,120	24,357

P-values in parentheses. The EU-SILC data (2004–2019) has been restricted to working couples (married or unmarried). * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

income are also consistent for the Mediterranean countries (Italy, Portugal, and Spain). In Eastern Europe (Czech Republic, Estonia, Hungary, Latvia, Lithuania, and Poland) we find more heterogeneity, as the results suggest that the sex ratio, the wives' non-labor income share, spouses' age and education gaps, and the fertility rate are valid distribution factors for Czech Republic, and the wives' share of non-labor income, spouses' age gap and fertility rate are valid for Estonia. For the rest of the countries, we find that the sex ratio and the spouses' education gap are appropriate distribution factors in Hungary, as are the fertility rate in Latvia, the sex ratio in Lithuania, and the sex ratio and the wives' share of unearned income in Poland. For Denmark, we find that all distribution factors are appropriate, except for the women's share of unearned income.

Sharing rule. Table 5 displays the associated partial derivatives, along with their p -values, of the sharing rule, with respect to its arguments: wages, non-labor income, and distribution factors, as defined in Eq. (9).¹¹

The estimated parameters show that the sex ratio is positively correlated with the income share of the wife in the UK. For the woman's share of non-labor income, we find a positive statistically significant coefficient in Czech Republic and Portugal, which indicates that an increase in the woman's share of non-labor income is correlated with an increase in the household non-labor resources attracted by the wife. The coefficient for the differences in ages between spouses indicates that younger wives have lower household resources in France, while they have a greater participation in household resources in Switzerland and the UK. Lower-educated females are also characterized by a lower participation in household non-labor income in Czech Republic, France, Ireland, Portugal and Switzerland. Finally, in Czech Republic it appears that higher fertility rates are negatively associated with the fraction of household resources of the wife, while these correlations are positive in Switzerland and the UK.

Other variables that are correlated with the sharing rule for non-labor income are spouses' hourly wages and household non-labor income. However, we find different relationships on a country-by-country basis (Himmelweit et al., 2013). For the women's hourly wage, we obtain a positive statistically significant correlation with women's share of unearned income in Portugal, while the relationship is negative in Switzerland and the UK. Similarly for the men's hourly wage rate, we obtain a positive statistically significant relationship in Czech Republic and Portugal, while the relationship is negative in Switzerland and the UK. The household non-labor income is positively related

to the sharing rule of women in Czech Republic, France and Portugal, while the relationship is negative in Switzerland and the UK.¹²

Conclusions and Policy Implications

This paper analyzes how variables that shape intrahousehold bargaining power (i.e., distribution factors) relate to spouses' labor supply. To do so, we estimate the baseline collective model of household labor supply with distribution factors (Chiappori et al., 2002), with a focus on how sex ratios, wives' share of non-labor income, spouses' education and age differences, and fertility rates, a series of distribution factors, associate with household labor supply. We use data for 17 European countries from the EU-SILC over the period 2004–2019 and our work is the first cross-country analysis of the relationship between several distribution factors and household labor supply. The fact that the EU-SILC collects comparable microdata allows a comparative analysis across Europe. We estimate the same labor supply equations for each country, to identify potential cross-country differences in how households deal with distribution factors. Estimates suggest that the distribution factors considered are indeed appropriate, but we report large heterogeneity across countries. This suggests that individual- and country-level variables are assessed differently in marriage markets across Europe.

The sex ratio is a relevant distribution factor in Czech Republic, Denmark, Hungary, Ireland, Italy, Poland, Spain, and Switzerland. In addition, the wife's share of non-labor income is a distribution factor in Belgium, Czech Republic, Estonia, Ireland, Italy, Luxembourg, Poland, Portugal, Spain, and the UK. In Austria, Belgium, Czech Republic, Denmark, Estonia, France, Ireland, Italy, Luxembourg, Switzerland, and the UK the spouses' age gap displays opposite signs on spouses' labor supply that fit the intrahousehold bargaining interpretation, whereas in Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, Portugal, and the UK the spouses' education level differences display signs consistent with the collective model. Finally, the fertility rate is an appropriate distribution factor in Austria, Czech Republic, Denmark, Estonia, France, Ireland, Latvia, Portugal, Switzerland, and the UK. Besides that, we also find some similarities by group of countries according to their geographical distribution.

¹¹ To obtain the sharing rule from estimates, we must impose specific constraints on the labor supply equations. In Tables 7 and 8 we report the restricted estimates of Eqs. (7) and (8) after imposing the collective rationality hypothesis.

¹² Our results can be subjected to potential selection bias, as our sample is restricted to working couples. This is a common issue of the collective model, which is explicitly based on a sample of working couples who devote positive amounts of time to work. See Appendix B for a discussion on potential selection biases and alternative estimates including non-working couples.

Table 6 Descriptive statistics, demographics

Variables	Pooled	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
<i>Wife's characteristics</i>																		
Age	41.635 (9.485)	42.387 (8.778)	40.491 (9.294)	42.623 (9.158)	42.602 (9.665)	42.606 (10.223)	40.332 (9.562)	42.797 (9.142)	41.421 (9.328)	42.982 (8.419)	42.500 (9.978)	42.830 (9.678)	39.875 (8.609)	40.408 (8.856)	41.467 (8.674)	41.681 (8.633)	42.009 (9.964)	41.302 (10.282)
Primary education	0.122 (0.328)	0.140 (0.347)	0.107 (0.309)	0.050 (0.217)	0.053 (0.224)	0.049 (0.215)	0.134 (0.341)	0.112 (0.315)	0.105 (0.307)	0.244 (0.430)	0.047 (0.211)	0.023 (0.150)	0.291 (0.454)	0.028 (0.166)	0.463 (0.499)	0.241 (0.428)	0.116 (0.321)	0.106 (0.308)
Secondary education	0.471 (0.499)	0.617 (0.486)	0.330 (0.470)	0.746 (0.435)	0.585 (0.493)	0.426 (0.494)	0.427 (0.495)	0.584 (0.493)	0.307 (0.461)	0.493 (0.500)	0.482 (0.500)	0.476 (0.499)	0.347 (0.476)	0.541 (0.498)	0.244 (0.429)	0.234 (0.423)	0.516 (0.500)	0.415 (0.493)
University education	0.407 (0.491)	0.243 (0.429)	0.563 (0.496)	0.205 (0.403)	0.362 (0.481)	0.526 (0.499)	0.439 (0.496)	0.304 (0.460)	0.587 (0.492)	0.263 (0.440)	0.472 (0.499)	0.501 (0.500)	0.363 (0.481)	0.430 (0.495)	0.294 (0.455)	0.525 (0.499)	0.368 (0.482)	0.478 (0.500)
Part-time	0.263 (0.440)	0.413 (0.492)	0.349 (0.477)	0.037 (0.188)	0.439 (0.496)	0.074 (0.262)	0.210 (0.407)	0.037 (0.189)	0.239 (0.427)	0.263 (0.440)	0.057 (0.231)	0.036 (0.186)	0.314 (0.464)	0.053 (0.223)	0.046 (0.209)	0.169 (0.375)	0.485 (0.500)	0.257 (0.437)
Self-employed	0.018 (0.132)	0.023 (0.150)	0.012 (0.110)	0.006 (0.075)	0.006 (0.075)	0.037 (0.189)	0.027 (0.162)	0.022 (0.148)	0.002 (0.048)	0.026 (0.161)	0.050 (0.217)	0.020 (0.140)	0.020 (0.141)	0.016 (0.127)	0.009 (0.093)	0.038 (0.191)	0.036 (0.187)	0.010 (0.097)
<i>Husband's characteristics</i>																		
Age	43.814 (8.623)	44.923 (8.881)	42.535 (9.343)	45.121 (9.481)	45.006 (9.771)	44.539 (10.113)	42.258 (9.546)	45.459 (9.324)	43.248 (9.631)	45.602 (8.605)	44.377 (9.976)	44.655 (9.648)	42.096 (8.696)	42.523 (9.173)	43.551 (8.999)	43.699 (8.787)	44.439 (10.170)	43.234 (10.370)
Primary education	0.145 (0.352)	0.076 (0.266)	0.146 (0.353)	0.026 (0.159)	0.041 (0.199)	0.078 (0.268)	0.162 (0.369)	0.087 (0.282)	0.186 (0.389)	0.321 (0.467)	0.095 (0.293)	0.044 (0.205)	0.306 (0.461)	0.038 (0.191)	0.579 (0.494)	0.311 (0.463)	0.084 (0.277)	0.140 (0.347)
Secondary education	0.480 (0.500)	0.633 (0.482)	0.393 (0.489)	0.767 (0.423)	0.507 (0.500)	0.580 (0.494)	0.490 (0.500)	0.687 (0.464)	0.262 (0.440)	0.473 (0.499)	0.633 (0.482)	0.593 (0.491)	0.395 (0.489)	0.657 (0.475)	0.239 (0.427)	0.252 (0.434)	0.443 (0.497)	0.430 (0.495)
University education	0.375 (0.484)	0.291 (0.454)	0.461 (0.498)	0.207 (0.405)	0.452 (0.498)	0.342 (0.475)	0.347 (0.476)	0.226 (0.418)	0.552 (0.497)	0.206 (0.404)	0.272 (0.445)	0.363 (0.481)	0.299 (0.458)	0.305 (0.460)	0.182 (0.386)	0.436 (0.496)	0.473 (0.499)	0.430 (0.495)
Part-time	0.034 (0.180)	0.035 (0.184)	0.071 (0.256)	0.007 (0.082)	0.048 (0.214)	0.022 (0.147)	0.025 (0.155)	0.013 (0.112)	0.058 (0.234)	0.032 (0.175)	0.023 (0.150)	0.018 (0.134)	0.024 (0.154)	0.016 (0.126)	0.006 (0.076)	0.025 (0.157)	0.064 (0.245)	0.036 (0.187)
Self-employed	0.035 (0.185)	0.032 (0.177)	0.019 (0.136)	0.012 (0.111)	0.009 (0.096)	0.099 (0.299)	0.066 (0.249)	0.035 (0.183)	0.006 (0.079)	0.041 (0.197)	0.087 (0.282)	0.050 (0.217)	0.027 (0.162)	0.034 (0.181)	0.018 (0.134)	0.069 (0.253)	0.060 (0.237)	0.021 (0.142)
<i>Household characteristics</i>																		
Married	0.787 (0.410)	0.810 (0.392)	0.705 (0.456)	0.832 (0.374)	0.816 (0.387)	0.696 (0.460)	0.645 (0.479)	0.826 (0.379)	0.844 (0.362)	0.878 (0.327)	0.802 (0.398)	0.978 (0.148)	0.819 (0.385)	0.935 (0.246)	0.855 (0.352)	0.831 (0.375)	0.746 (0.435)	0.762 (0.426)
Family size	2.440 (0.740)	2.550 (0.798)	2.448 (0.802)	2.644 (0.831)	2.388 (0.679)	2.544 (0.779)	2.365 (0.677)	2.693 (0.870)	2.496 (0.846)	2.501 (0.766)	2.638 (0.831)	2.614 (0.789)	2.408 (0.739)	2.617 (0.873)	2.499 (0.747)	2.457 (0.768)	2.369 (0.727)	2.385 (0.703)
Number of children	0.428 (0.730)	0.531 (0.784)	0.432 (0.786)	0.636 (0.826)	0.383 (0.675)	0.534 (0.772)	0.354 (0.662)	0.679 (0.867)	0.475 (0.837)	0.489 (0.759)	0.608 (0.811)	0.604 (0.781)	0.396 (0.730)	0.603 (0.864)	0.482 (0.732)	0.433 (0.751)	0.361 (0.722)	0.374 (0.695)

The EU-SILC data (2004–2019) has been restricted to working couples (married or unmarried). Standard errors in parentheses. Summary statistics are sample weighted and all differences between men and women are statistically significant at the 5% level

The results suggest that these variables are appropriate distribution factors in general terms, despite differences across countries, and they open doors to further research on intrahousehold allocation. Thus, we find that certain distribution factors may operate as predicted by the theory in a given country, but the results are not fully generalizable to the continent as a whole, possibly due to work and cultural preferences, as well as to legal characteristics.

The analysis has certain limitations. First, the data is cross-sectional, and so does not allow us to determine causal relationships. Relatedly, the results may suffer from reverse causality and unobserved heterogeneity. Second, some distribution factors present a small variability, which may affect the results. For example, the sex ratio is quite stable. Nevertheless, Chiappori et al. (2002) get similar variability for the US using the Panel Study of Income Dynamics. Finally, our results are based on a sample of traditional (heterosexual) households from a developed context, so the results are not generalizable to other geographical and household contexts.

Despite these limitations, our results may be of special interest for planners and policy makers to identify and design policies that pursue increasing relative bargaining power within households, on the one hand, and to better understand household labor supply decisions in Europe, on the other. The distribution of resources within the household (which is unobserved), and how such distribution changes in terms of distribution factors (which can be identified empirically through observed labor supply behaviors) is crucial to understanding spouses' well-being, and in designing social policies. We use the collective model, the dominant theoretical framework in household economics, which only assumes that household decisions are Pareto-efficient, whereas no specific assumption is made about the way household members achieve this efficient outcome. In this way, we find that certain policies that incentivize gender education through compulsory schooling laws, specific cash transfers targeted to household spouses, or policies promoting birth rates, may be effective measures to change intrahousehold decisions regarding household labor supply, but not in all countries.

Our results suggest that policies targeting specific household members, through both taxes and cash transfers, or promoting education and fertility rates relate to intrahousehold distribution, although we cannot find a common profile for all the countries considered, which suggest heterogeneity in how households deal with those characteristics. In this way, our results can be used to better understand the potential effectiveness of social policies that affect these factors on a country-by-country basis, since the collective model is a useful tool to understand couples' decisions, and measures aimed at changing household time allocation have different effects in different countries.

For instance, several authors have claimed that many cash transfers target payments to women rather than men

nowadays (Armand et al., 2020; Attanasio & Lechene, 2014; Bargain, 2024), and our results may help to evaluate their potential intrahousehold effects across countries in Europe. Specifically, our results suggest that these measures may empower women within the household and discourage them from work in Belgium, Czech Republic, Estonia, France, Ireland, Italy, Luxembourg, Poland, Portugal, Spain, and the UK. Consequently, national policymakers should consider the identity of the cash transfer's recipient within the household and its consequent implications on household time allocation. Despite the population in Europe being well-educated overall, our results also suggest that certain reforms on compulsory schooling levels or other changes in education policies may change intrahousehold time allocation in Austria, Belgium, Czech Republic, Denmark, France, Hungary, Ireland, Luxembourg, Portugal, and the UK, so planners must consider these potential intrahousehold implications. Finally, one of the most pressing demographic problems of European societies is their ageing process and lower fertility rates, which are having significant consequences for the sustainability of current welfare state regimes. Related to this, our results suggest that current birth rate promotion policies implemented in many European countries to cope with all these challenges, through either regular or fixed subsidies, may change intrahousehold decisions regarding labor supply in Austria, Czech Republic, Denmark, Estonia, France, Ireland, Latvia, Portugal, Switzerland, and the UK.

Ultimately, we do not observe intrahousehold bargaining power and inequality, as such measures are rarely available in surveys. However, in recent years certain studies have constructed indices of women's bargaining power (Bertocchi et al., 2014; Mazzotta et al., 2019; Molina et al., 2023; Ngenzebuke et al., 2018), or have estimated inequality within households (Chavas et al., 2018; Lise & Seitz, 2011; Vijaya et al., 2014) in different parts of the world. Some of these analyses suggest that women are discriminated against within households (Lise & Seitz, 2011; Molina et al., 2023; Vijaya et al., 2014). In this sense, our results may be especially useful in showing different distribution factors in Europe that could be used to modify intrahousehold decisions regarding the allocation of resources and time, in order to target females more effectively and improve their positions within the household on a country basis.

Future research should analyze household minorities (i.e., same-sex couples), where some distribution factors related to policies might show more heterogeneous trends. On the other hand, future analysis should also extend the collective model to a dynamic context, to analyze the dynamics of household decisions, such as household formation and dissolution, or the dynamics of intrahousehold bargaining (Lise & Yamada, 2019; Mazzocco, 2007; Theloudis et al., 2023; Voena, 2015). Intertemporal analyses of household behaviors are challenging, due to the specific data constraints of

Table 7 GMM restricted estimates, females

Variables	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxem- bourg	Poland	Portugal	Spain	Switzer- land	UK
Log wom- en's wage	-1.697*** (0.263)	-2.727*** (0.783)	-0.703* (0.375)	0.880** (0.409)	-0.463*** (0.160)	-2.771*** (0.355)	-0.177 (0.121)	-0.622 (0.484)	-1.840*** (0.316)	-0.968*** (0.150)	-0.955*** (0.114)	-3.099*** (0.597)	-2.132*** (0.133)	-3.122*** (0.306)	-1.367*** (0.236)	-5.092*** (0.590)	-3.298*** (0.517)
Log men's wage	-1.850*** (0.245)	-1.277* (0.745)	-0.918*** (0.293)	-3.564*** (0.370)	-0.002 (0.117)	-0.605* (0.328)	-0.140 (0.108)	-0.502 (0.439)	-0.526* (0.308)	-0.217* (0.113)	0.256*** (0.087)	-3.066*** (0.592)	0.074 (0.114)	-0.890*** (0.274)	-0.483** (0.207)	-4.003*** (0.543)	-4.036*** (0.471)
House- hold non- labor income	-0.049*** (0.010)	-0.041*** (0.013)	-0.078*** (0.012)	-0.092*** (0.010)	-0.046*** (0.014)	-0.015*** (0.005)	-0.051*** (0.017)	-0.071*** (0.010)	-0.002 (0.005)	-0.017 (0.014)	-0.007 (0.012)	-0.041*** (0.008)	-0.066*** (0.017)	-0.036** (0.014)	0.004 (0.007)	-0.036*** (0.006)	-0.107*** (0.009)
Log cross wage	0.444*** (0.082)	0.217 (0.245)	0.358* (0.201)	0.438*** (0.136)	-0.074 (0.082)	0.227* (0.124)	0.049 (0.077)	-0.063 (0.143)	0.241** (0.118)	0.247*** (0.077)	-0.054 (0.072)	0.362** (0.168)	0.057 (0.080)	0.530*** (0.128)	0.212** (0.092)	1.129*** (0.165)	1.170*** (0.162)
Sex ratio	6.255* (3.470)	14.630*** (5.312)	-1.491 (1.844)	-16.896*** (3.789)	6.159*** (1.420)	6.623* (3.840)	-0.599 (2.103)	-3.254 (3.408)	-17.345*** (6.707)	0.389 (2.524)	-2.486 (1.960)	-0.120 (2.518)	1.238 (3.234)	-2.904 (4.178)	3.317 (2.247)	-4.521 (4.928)	21.888*** (7.933)
Women's share of non- labor income	-0.136 (0.209)	-2.397*** (0.191)	-0.772*** (0.086)	1.253*** (0.196)	-0.198** (0.090)	-2.643*** (0.149)	-0.332* (0.197)	-1.016*** (0.198)	-1.050*** (0.110)	-0.189* (0.108)	-0.009 (0.097)	-1.373*** (0.341)	-2.933*** (0.239)	-1.136*** (0.212)	-0.930*** (0.133)	0.211 (0.590)	-4.756*** (1.028)
Age differ- ence, male- female	0.104*** (0.020)	0.002 (0.020)	0.020 (0.014)	0.003 (0.013)	0.059*** (0.019)	0.037** (0.015)	-0.001 (0.022)	0.075*** (0.023)	-0.095*** (0.025)	-0.010 (0.032)	-0.038* (0.023)	0.048** (0.020)	0.005 (0.024)	-0.030* (0.017)	0.003 (0.015)	0.066*** (0.018)	0.043** (0.018)
Educa- tion level differ- ence	-0.007 (0.064)	0.356*** (0.048)	0.156*** (0.041)	0.293*** (0.045)	0.027 (0.037)	0.281*** (0.036)	-0.056 (0.042)	0.302*** (0.065)	-0.002 (0.030)	0.046 (0.049)	0.060 (0.047)	0.517*** (0.065)	0.083* (0.044)	0.260*** (0.045)	0.075** (0.031)	-0.178*** (0.060)	0.125** (0.053)
Fertility rate	3.840*** (0.745)	0.994* (0.590)	1.481*** (0.402)	1.520*** (0.410)	0.565 (0.490)	0.712* (0.392)	-0.819 (0.620)	1.491*** (0.556)	0.146 (0.512)	-1.562** (0.624)	-0.614 (0.497)	1.274* (0.670)	-0.672 (0.644)	-0.828 (0.520)	0.352 (0.464)	2.361*** (0.589)	1.508*** (0.562)
Constant	31.063*** (4.119)	25.498*** (6.213)	40.175*** (2.556)	57.653*** (4.457)	32.627*** (2.393)	24.717*** (4.413)	42.334*** (3.169)	36.084*** (3.788)	62.781*** (7.711)	42.363*** (3.802)	46.214*** (3.003)	44.248*** (3.389)	42.707*** (4.253)	48.242*** (4.453)	37.458*** (2.764)	63.795*** (5.911)	18.955** (8.341)
Prefer- ence factors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year F.E	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Table 7 (continued)

Variables	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
Number of observations	16,854	19,304	24,894	38,622	21,682	40,625	17,705	11,630	30,339	12,484	15,904	17,055	31,259	17,754	28,452	20,120	24,357

Standard errors in parentheses. The EU-SILC data (2004–2019) has been restricted to working couples (married or unmarried). The dependent variables are spouses' weekly work hours. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

the collective setting, and there remains much to be learned beyond the US (Chiappori & Mazzocco, 2017; Chiappori & Meghir, 2015; Chiappori et al., 2022).

Appendix A

See Tables 6, 7, and 8

Appendix B

Our main results are based on a sample of working couples who devote positive amounts of time to work, given our focus on the intensive margin of labor supply as is the case of most empirical papers based on the collective model. However, this may lead to sample selection issues and to potential selection bias. This represents a common issue of the collective model.

Alternatively, we include couples where one spouse does not work and predict their wages using a standard Mincer-style equation, where individual wages depend on their individual and household characteristic, but not on their spouse's characteristics. Tables 9 and 10 show the results of estimating Eqs. (7) and (8) using GMM for that alternative sample.

When we pay attention to the distribution factors, we obtain some different results. For the sex ratio, we obtain a coefficient that fits the underlying bargaining interpretation (i.e., a positive (negative) and statistically significant coefficient on males' (females') labor supply) in Belgium, France, Ireland, Latvia, Luxembourg and Portugal. The wives' share of non-labor income is negatively related to their weekly work hours and positively to that of the partner in most of the countries, which is a result in line with the bargaining hypothesis. We obtain the expected signs for the wives' share of household non-labor income in Austria, Belgium, Czech Republic, Denmark, Estonia, France, Hungary, Ireland, Latvia, Luxembourg, Poland, Portugal, Spain, Switzerland, and the UK. For the age gap between spouses, estimates mostly indicate a negative correlation with males' hours of work, and a positive relationship with females' hours of work, which suggests that older (younger) spouses devote lower (higher) amounts of time to work. These correlations are found in Austria, Belgium, Czech Republic, Denmark, Estonia, France, Hungary, Ireland, Italy, Lithuania, Luxembourg, Poland, Spain, Switzerland, and the UK. For the education level differences between spouses, we obtain results that are similar to Crespo (2009) (i.e., a positive and statistically significant relationship with females' hours of work and a negative and statistically significant correlation with males' hours of work). Those relationships are identified in Austria, Belgium, Czech Republic, Denmark, Estonia, France,

Table 8 GMM Restricted estimates, males

Variables	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
Log women's wage	-0.236 (0.378)	0.884 (0.556)	-1.670*** (0.394)	-0.619* (0.320)	0.245 (0.168)	-1.008** (0.401)	0.767** (0.372)	2.202 (2.438)	-0.387 (0.319)	-0.156 (0.167)	0.390*** (0.110)	-0.546 (0.383)	-0.068 (0.616)	-1.171*** (0.354)	-0.031 (0.196)	-1.690*** (0.465)	-2.080*** (0.487)
Log men's wage	-1.050*** (0.345)	-2.076*** (0.471)	-2.869*** (0.329)	-0.871*** (0.329)	-0.656*** (0.134)	-2.202*** (0.354)	-0.714*** (0.116)	-0.281 (1.129)	-1.188*** (0.252)	-0.919*** (0.134)	-0.301*** (0.100)	-2.861*** (0.435)	-1.849*** (0.210)	-3.553*** (0.340)	-1.062*** (0.145)	-3.391*** (0.436)	-3.249*** (0.446)
Household non-labor income	-0.009 (0.010)	-0.094*** (0.031)	-0.086*** (0.020)	-0.053*** (0.010)	-0.028 (0.017)	0.017** (0.007)	-0.058*** (0.021)	-0.051*** (0.015)	-0.001 (0.005)	-0.011 (0.015)	-0.010 (0.017)	-0.012 (0.007)	-0.076 (0.069)	-0.022 (0.014)	-0.008 (0.008)	-0.044*** (0.006)	-0.084*** (0.011)
Log cross wage	0.100 (0.124)	-0.242 (0.171)	1.156*** (0.209)	0.183 (0.124)	-0.114 (0.089)	0.437*** (0.132)	-0.211** (0.084)	-0.337* (0.182)	0.073 (0.097)	0.116 (0.089)	-0.250*** (0.074)	0.158 (0.126)	-0.015 (0.166)	0.719*** (0.172)	-0.088 (0.064)	0.510*** (0.130)	0.642*** (0.155)
Sex ratio	13.967*** (3.546)	16.230*** (5.301)	-4.810 (0.466)	-7.064 (0.151)	6.301*** (2.142)	33.118*** (6.097)	2.597 (0.799)	-17.495 (0.691)	-5.280 (0.375)	4.234 (2.582)	-11.545 (0.502)	-2.060 (2.133)	-0.332 (0.932)	5.234 (5.312)	-1.374 (0.388)	-2.044 (0.372)	12.014*** (0.018)
Women's share of non-labor income	-0.099 (0.169)	2.674 (0.428)	-2.489* (0.073)	0.524 (0.139)	-0.304 (0.090)	-0.398*** (0.139)	0.260 (0.218)	-5.465 (0.402)	-0.320 (0.352)	0.133 (0.122)	0.118 (0.091)	-0.599 (0.203)	0.788 (0.931)	-1.541*** (0.003)	0.385 (0.321)	0.831* (0.478)	-2.610*** (0.001)
Age dif-ference, male-female	0.023 (0.407)	-0.002 (0.932)	0.065 (0.272)	0.001 (0.848)	0.090 (0.434)	0.071* (0.094)	0.012 (0.010)	0.402 (1.624)	-0.029 (0.362)	0.021* (0.111)	-0.013 (0.010)	0.021 (0.249)	0.005 (0.034)	-0.022 (0.016)	0.021* (0.011)	0.030*** (0.007)	0.023** (0.035)
Education level difference	-0.001 (0.863)	-0.397 (0.432)	0.503 (4.778)	0.122 (0.635)	-0.010 (0.029)	0.540** (1.372)	0.241 (0.764)	1.624 (8.019)	0.011 (0.020)	-0.026 (0.037)	0.029 (0.029)	0.225 (0.189)	0.028 (0.056)	0.352*** (0.002)	0.027 (0.020)	-0.081** (0.016)	0.069** (0.035)
Fertility rate	0.863 (0.407)	-0.632 (0.676)	4.778 (0.102)	0.635 (0.160)	0.867 (0.506)	1.372 (0.152)	-0.764 (2.293)	8.019 (45.549***)	-1.281*** (0.487)	-0.730 (0.216)	0.063 (0.494)	-0.664 (0.549)	-1.397 (1.751)	-1.123 (0.145)	-0.325 (0.419)	1.067*** (0.004)	0.828** (0.020)
Constant	28.838*** (3.782)	27.527*** (5.997)	48.850*** (7.929)	49.683*** (5.484)	34.442*** (3.503)	5.812 (7.593)	37.952** (15.688)	45.549*** (20.515)	53.006*** (7.436)	38.559*** (3.855)	44.325*** (2.500)	55.533*** (2.595)	50.054*** (5.483)	44.711*** (5.715)	45.976*** (1.655)	53.075*** (3.333)	41.744*** (4.988)
Preference factors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	16,854	19,304	24,894	38,622	21,682	40,625	17,705	11,630	30,339	12,484	15,904	17,055	31,259	17,754	28,452	20,120	24,357

Standard errors in parentheses. The EU-SILC data (2004–2019) has been restricted to working couples (married or unmarried). The dependent variables are spouses' weekly work hours. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9 GMM estimates including non-working spouses, females

VARIABLES	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
Log women's wage	-1.337 (1.588)	12.009*** (2.663)	5.375*** (1.107)	-1.882 (2.427)	4.739*** (0.733)	30.910*** (2.143)	16.352*** (1.641)	9.903*** (1.673)	-2.558*** (0.979)	4.444*** (0.848)	2.334*** (0.575)	8.448*** (1.714)	5.684*** (0.603)	2.702*** (0.714)	-2.625*** (0.840)	0.508 (2.322)	16.208*** (1.823)
Log men's wage	-5.442*** (1.438)	-4.861* (2.945)	-5.535*** (0.973)	-21.517*** (2.360)	-0.449 (0.600)	27.201*** (2.258)	-9.028*** (0.995)	-2.387 (1.714)	-5.560*** (0.990)	-2.324*** (0.682)	-2.054*** (0.640)	2.923* (1.700)	-7.196*** (0.706)	-2.710** (1.099)	-8.474*** (0.892)	3.162 (2.241)	3.221** (1.607)
Household non-labor income	-0.055*** (0.007)	-0.051*** (0.011)	-0.467*** (0.026)	-0.019*** (0.004)	-0.583*** (0.117)	-0.010 (0.009)	-0.413*** (0.047)	-0.027*** (0.005)	0.020*** (0.004)	-0.445*** (0.042)	-0.158*** (0.024)	-0.021*** (0.006)	-0.219*** (0.019)	0.009 (0.013)	-0.005 (0.007)	-0.006 (0.004)	-0.031*** (0.015)
Log cross wage	0.366 (0.527)	-0.498 (1.038)	-3.930*** (0.719)	3.586*** (0.872)	-0.307 (0.426)	-12.017*** (0.860)	-0.342 (0.726)	-1.669*** (0.593)	-1.536*** (0.390)	0.860* (0.447)	0.266 (0.449)	-2.216*** (0.570)	-0.951** (0.407)	-0.768* (0.408)	0.326 (0.388)	-2.655*** (0.721)	-3.070*** (0.605)
Sex ratio	35.809*** (5.058)	10.158 (7.576)	73.842*** (4.839)	14.747*** (5.686)	13.532*** (3.726)	-7.656 (5.743)	27.547*** (5.950)	-7.902 (4.854)	-19.767* (11.661)	8.466 (6.444)	23.418*** (4.810)	-12.951*** (3.493)	52.583*** (5.234)	-22.044*** (7.694)	19.730*** (4.379)	37.204*** (6.019)	92.671*** (11.046)
Women's share of non-labor income	-7.585*** (0.289)	-11.402*** (0.233)	-12.226*** (0.214)	-9.998*** (0.231)	-4.718*** (0.232)	-11.040*** (0.198)	-11.418*** (0.555)	-5.338*** (0.251)	-0.155 (0.188)	-3.288*** (0.291)	3.594*** (0.245)	-12.585*** (0.397)	-19.779*** (0.235)	-14.667*** (0.366)	-7.513*** (0.205)	-3.155*** (0.819)	-12.509*** (0.781)
Age dif. female	0.381*** (0.031)	0.022 (0.030)	0.354*** (0.040)	0.216*** (0.020)	0.101** (0.048)	0.091*** (0.024)	0.437*** (0.065)	0.179*** (0.029)	0.027 (0.042)	0.029 (0.080)	0.272*** (0.058)	0.157*** (0.033)	0.365*** (0.045)	0.050 (0.036)	0.193*** (0.029)	0.240*** (0.025)	0.113*** (0.024)
Education level difference	0.639*** (0.100)	0.888*** (0.094)	2.430*** (0.123)	1.436*** (0.134)	0.048 (0.118)	0.408*** (0.090)	2.554*** (0.159)	1.392*** (0.139)	1.935*** (0.073)	-0.222 (0.176)	0.849*** (0.161)	-0.271 (0.219)	2.765*** (0.162)	1.297*** (0.281)	1.528*** (0.097)	-0.268** (0.115)	0.701*** (0.108)
Fertility rate	-3.074** (1.196)	0.175 (0.904)	-13.669*** (1.193)	-2.178*** (0.655)	-14.560*** (1.346)	-0.781 (0.580)	-12.869*** (1.804)	0.951 (0.776)	-3.134*** (0.875)	-15.900*** (1.759)	-13.415*** (1.447)	5.998*** (1.049)	-5.847*** (1.368)	-4.894*** (1.105)	-0.400 (0.791)	5.946*** (0.871)	-3.779*** (0.811)
Constant	-19.065*** (7.344)	1.979 (10.980)	-64.885*** (7.029)	36.542*** (8.761)	9.795* (5.888)	-53.133*** (8.286)	-30.195*** (8.964)	10.545 (7.118)	43.459*** (13.518)	17.071* (9.692)	-8.688 (7.167)	24.774*** (6.644)	-57.352*** (7.205)	59.233*** (8.381)	5.765 (5.490)	-4.775 (9.515)	-101.689*** (12.650)
Preference factors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year F.E	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	31,821	31,709	44,042	65,753	34,747	65,084	34,486	24,955	72,941	21,671	25,873	29,950	65,791	33,133	61,122	38,253	39,452

Standard errors in parentheses. The dependent variables are spouses' weekly work hours. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10 GMM estimates including non-working spouses, males

Variables	Austria	Belgium	Czech Rep	Denmark	Estonia	France	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Poland	Portugal	Spain	Switzerland	UK
Log non- women's wage	-15.759*** (1.673)	-13.173*** (3.637)	-3.546*** (0.993)	-12.991*** (2.656)	-2.190*** (0.821)	5.777** (2.402)	-19.298*** (1.279)	-1.508 (1.334)	-10.482*** (1.694)	-3.656*** (0.927)	-3.623*** (0.513)	1.060 (1.596)	-4.322*** (0.529)	3.521*** (0.774)	-6.575*** (0.876)	-10.499*** (2.615)	-3.579 (2.190)
Log men's wage	-11.130*** (1.495)	-6.790** (3.263)	-0.647 (0.681)	5.040** (2.082)	2.259*** (0.625)	-2.538 (2.158)	-4.548*** (1.050)	2.497* (1.423)	-2.534 (1.652)	0.923 (0.773)	0.352 (0.655)	4.278*** (1.403)	-0.660 (0.608)	-3.551*** (1.020)	4.355*** (0.812)	-3.667* (2.022)	3.717** (1.683)
Household non- labor income	-0.198*** (0.013)	-0.183*** (0.035)	-0.389*** (0.023)	-0.123*** (0.018)	-0.266*** (0.036)	-0.026 (0.020)	-0.534*** (0.064)	-0.060*** (0.010)	-0.207*** (0.009)	-0.135*** (0.034)	-0.178*** (0.028)	-0.105*** (0.016)	-0.771*** (0.048)	-0.205*** (0.025)	-0.277*** (0.015)	-0.112*** (0.009)	-0.048* (0.026)
Log cross wage	4.079*** (0.543)	1.107 (1.230)	-0.094 (0.580)	2.529*** (0.863)	0.676 (0.489)	-4.109*** (0.899)	5.735*** (0.694)	-0.296 (0.484)	2.134*** (0.675)	0.849 (0.557)	1.026** (0.411)	-1.251*** (0.503)	1.519*** (0.367)	-0.866** (0.434)	0.524 (0.372)	1.958*** (0.749)	-0.234 (0.675)
Sex ratio	76.745*** (4.661)	117.124*** (7.965)	85.106*** (4.001)	74.912*** (5.015)	31.309*** (3.342)	69.461*** (6.127)	68.303*** (5.025)	12.865*** (4.224)	-4.083 (9.923)	38.371*** (6.074)	21.681*** (4.174)	22.898*** (3.174)	56.164*** (4.772)	7.890 (7.938)	25.453*** (3.917)	74.037*** (6.725)	37.276*** (10.394)
Women's share of non- labor income	3.239*** (0.231)	3.395*** (0.210)	3.564*** (0.129)	2.814*** (0.161)	2.601*** (0.181)	3.015*** (0.162)	5.212*** (0.385)	2.319*** (0.198)	0.176 (0.144)	2.226*** (0.248)	-1.711*** (0.255)	3.948*** (0.294)	8.487*** (0.187)	5.722*** (0.261)	3.532*** (0.164)	0.640 (0.855)	2.623*** (0.696)
Age dif- ference, male- female	-0.136*** (0.021)	-0.291*** (0.024)	-0.158*** (0.015)	-0.109*** (0.014)	0.016 (0.019)	-0.224*** (0.022)	-0.213*** (0.021)	-0.176*** (0.028)	-0.125*** (0.016)	0.019 (0.024)	-0.111*** (0.026)	-0.225*** (0.027)	-0.037* (0.020)	0.028 (0.030)	-0.194*** (0.020)	-0.007 (0.021)	-0.082*** (0.018)
Education level dif- ference	-0.662*** (0.065)	-1.176*** (0.085)	-0.693*** (0.058)	-0.480*** (0.065)	-0.257*** (0.090)	-0.871*** (0.089)	-1.765*** (0.135)	-0.377*** (0.116)	-0.150*** (0.051)	-0.495*** (0.124)	-0.412*** (0.098)	-0.528*** (0.110)	0.105 (0.094)	0.431*** (0.153)	-0.431*** (0.064)	-0.197*** (0.074)	-0.407*** (0.090)
Fertility rate	-11.313*** (1.010)	-5.257*** (0.859)	2.710*** (0.716)	-6.197*** (0.591)	-2.653*** (0.959)	-15.657*** (0.594)	1.885 (1.298)	-5.461*** (0.701)	-14.359*** (0.761)	-3.943*** (1.434)	-3.512*** (1.166)	-16.415*** (0.868)	0.106 (1.073)	-14.981*** (1.105)	-5.836*** (0.737)	-3.010*** (0.869)	-11.703*** (0.768)
Constant	12.115* (7.027)	-3.1136*** (12.239)	-53.635*** (5.398)	-17.787** (7.811)	1.609 (4.846)	-2.161 (8.641)	-22.183*** (7.095)	36.235*** (6.094)	82.071*** (11.888)	-2.105 (8.821)	21.818*** (6.169)	38.682*** (5.625)	-13.471** (6.271)	50.970*** (8.541)	20.541*** (4.866)	-14.578 (9.940)	25.140** (12.272)
Preference factors	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Number of observ- ations	31,821	31,709	44,042	65,753	34,747	65,084	34,486	24,955	72,941	21,671	25,873	29,950	65,791	33,133	61,122	38,253	39,452

Standard errors in parentheses. The dependent variables are spouses' weekly work hours. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Poland, Spain, and the UK. Finally, for the fertility rate we obtain household bargaining signs in Belgium, Czech Republic, France, Hungary, Ireland, Luxembourg, Poland, Portugal, Spain, and Switzerland.

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Available of Data and Material Available upon request.

Code availability Available upon request.

Declarations

Conflict of interests The authors declare that they have no conflict of interest.

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