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Culture, Gender, and Structural Transformation:
The Case of Turkey

So Kubota

Waseda INstitute of Political EConomy
Waseda University
Tokyo, Japan

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So Kubota†

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Abstract

In this article, I propose a macroeconomic approach to measure cross-country differences in culture. This method is applied to explain the drastic decline in the Turkish female employment rate over a half-century. I construct a quantitative general equilibrium model of worker allocation by industry and gender. A cross-country simulation finds that Turkish families' social stigma due to female employment is 39% higher than that of the U.S. Its magnitude is comparable to the scale in Egypt but is significantly higher than the Greek case. I also find consistent microeconometric evidence in the European Social Survey.

Keywords: Culture, Female Labor, Structural Transformation, Turkey

Journal of Economic Literature Classification Number: O11, D10, J16

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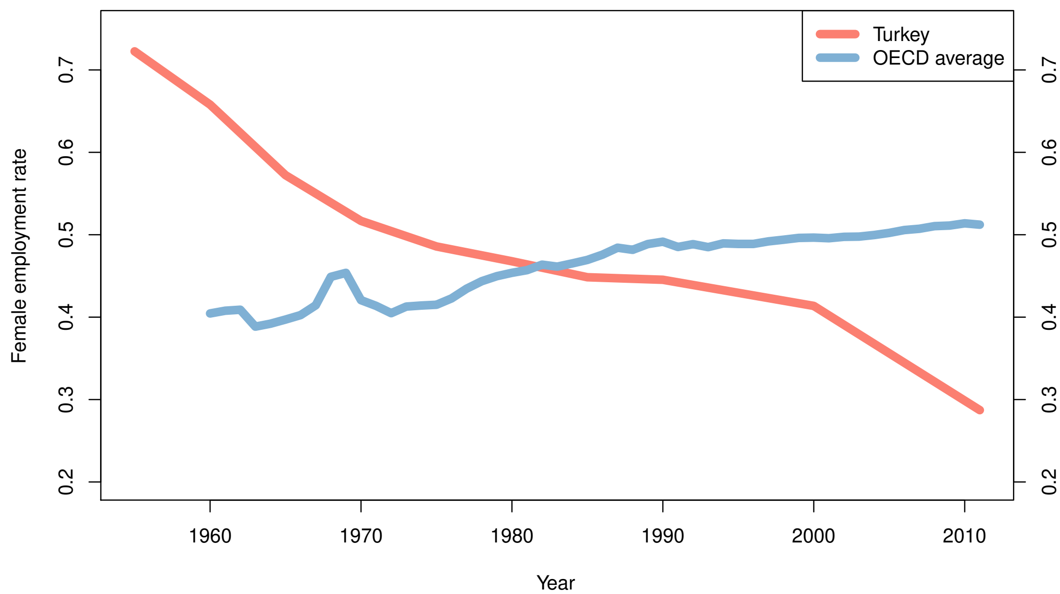
†Faculty of Political Science and Economics, Waseda University, 1-6-1 Nishiwaseda Shinjuku-ku, Tokyo 169-8050, Japan. (Phone: +81-3-5286-1208, E-mail: kubotaso@aoni.waseda.jp)

Figure 1: Female Employment Rate



Source: The Turkish rate is from Turkish Statistical Institute (2014). The OECD average is calculated from ILO (1986) until 1980 and from the ILOSTAT online database thereafter. The OECD average includes 23 countries that participated before 1973 except Turkey.

1 Introduction

The opportunity for women to participate in the workplace varies considerably across regions and social groups. The literature found that, besides observable economic and social characteristics, cultural differences are also substantial (Fernández (2011)). However, measuring culture is indeed a challenging task in economics. Alesina and Giuliano (2015) summarize three existing approaches: (i) direct measurement through subjective questions in social value surveys (Guiso et al. (2003)), (ii) the epidemiological approach of looking at second-generation immigrants to identify the culture inherited from their home countries (Fernandez and Fogli (2009)), and (iii) experimental studies evaluating culture (mainly trust) as the deviation from the predicted outcome based on non-cooperative game theory (Henrich et al. (2001)).

This research measures the cultural factor from a different perspective: a cross-country comparison based on a quantitative macroeconomic model. While microeconomic studies identify particular aspects of culture, I analyze the country-level variation, including market effects. The main topic of this paper is the willingness of families to send their female members to the labor market in Turkey compared to the United States. Two neighbors, Egypt and Greece, are also studied. It is generally considered that the traditional gender division plays a substantial role in the Middle East (ILO (2015)). To infer this kind of family norm distinctly, I focus on a unique trend in Turkey's female employment patterns.

Over more than a half-century, Turkey has experienced a dramatic decline in the female employment rate. It dropped down from 72% in 1955 to 29% in 2011, as shown[1] in Figure 1. The Turkish employment rate in 1960 was significantly higher than the OECD average. However, after this drastic decline, Turkey is now way behind other OECD countries in terms of gender equality in the labor market.

This dramatic drop in female employment can be explained by the interaction between macroeconomic and individual-level cultural factors. The former is a structural transformation from agriculture to the manufacturing and service sectors. In line with the U-shape hypothesis of Goldin (1994) and Tansel (2001), female employment tends to decline as the agricultural sector shrinks in the early stage of economic development. Subsequently, an expansion in the service sector labor demand enhances female participation. However, in Turkey, the shrinking phase of the U-shape is sharp. Also, the service sector fails to employ a sufficient number of women.

The individual-level factor is a family norm about gender roles. Turkey is generally regarded as a country with a relatively strong male breadwinner/female homemaker tradition. Conventionally, families may hesitate to let their female members work in offices or factories, sharing workplaces with male strangers. On the other hand, the traditional norm encourages women to help family businesses, mainly farming. With the structural transformation,

[1]The rapid decline between 2000 and 2011 is due to the shrinkage in agricultural sector employment observed in the census survey. This has been partially offset by the expansion in service sector employment as shown in Figure 2. The female employment rate obtained by the Household Labor Force Survey increased from 26.6% in 2000 to 28.8% in 2011. Although the sign of the change in the total employment rate is different, it also shows a drastic decline in agricultural employment and an expansion in service sector.

a large number of women lost agriculture jobs, but they are reluctant to move to the non-agriculture sector. Consequently, the total female employment rate significantly dropped down. This cultural factor may also affect the labor market equilibrium outcome. Interestingly, the mean female hourly wage is higher than the male wage in the Turkish service sector. This is possibly due to the female labor supply shortage because of the family norm.

Given these observations, I evaluate how much this cultural factor affects the unique female employment trends in Turkey. I first construct a simple general equilibrium model of male and female labor inputs for agriculture, manufacturing, service, and home productions following Ngai and Petrongolo (2017). The model's parameters are calibrated so that the simulation result successfully captures the U.S. trend over a half-century. Then, I apply the model to Turkey by keeping the same parameters and changing only estimated sectoral productivities. The model clearly fails to capture the evolution of sectoral hours by gender. In particular, the model counterfactually predicts a significant increase in the share of female time devoted to the service sector and a much too small drop in the percentage for agriculture.

On top of that, I modify the model to incorporate a new factor representing the family norm[2]. It is introduced as an additional time-invariant linear disutility term from the female market hours of work. The new model does a satisfactory job of capturing the evolution of hours by sector and gender in Turkey over a half-century. In particular, it improves the model's fit with the data not only for females but also for males by substitution in labor inputs. Only one factor is added, but it provides a consistent explanation for the abnormal patterns of the Turkish trend by gender and industry and across time. The family norm

[2]The component of culture I try to elicit is the international difference in women's willingness to participate in the labor market. According to Guiso et al. (2006) and Fernandez and Fogli (2009), among others, cultural variation is interpreted as the difference in preference or belief. Belief possibly changes over time by, for example, inter-generational information transmission (Fogli and Veldkamp (2011) and Fernández (2013)). In contrast, this paper considers a time-invariant factor interpreted as a cross-country variation in preference. The concept of culture is also related to the institution (Alesina and Giuliano (2015)). In my model, an estimated cross-country wedge is introduced as a component in the utility function. In the sensitivity analysis, I consider a variety of wedges regarded as the institution and technology; however, nothing dominates culture. Note also that the preference I considered in the model can be interpreted as both the woman's own taste and the family's requirements, particularly the father's and husband's voices. My macroeconomic model does not differentiate the two factors, but the microeconometric regression by the European Social Survey finds both factors significant.

is quantitatively substantial. I evaluate the culture term's disutility from one additional hour of female non-agriculture work per week. This is equivalent 24 minutes' leisure lost (leisure equivalence) or a 0.76% reduction in total consumption (consumption equivalence). I conduct the same exercise for Egypt and Greece and find a similarly large family norm for the former but a small one for the latter, possibly due to the religious difference.

To complement the main macroeconomic finding, I directly examine this family norm from the European Social Survey microdata covering both Turkey and Greece. The harmonized structure of the survey allows a direct cross-country comparison with the same econometric model. I run a Probit regression about married women's employment status. As a result, both women's personal religiosity and their husbands' relative bargaining power in family decision-makings decrease the likelihood of their participation in non-family jobs. However, these women tend to work more in their family business. This is consistent with the macroeconomic finding that Turkish female labor is allocated more to agriculture and less to service. Notably, this result is unobserved in Greece.

My findings are associated with the literature of culture and female labor supply, mainly studied with microeconometric methods. As already mentioned, there is an influential strategy called the epidemiological approach, which identifies the cultural inheritance of the immigrants and their descendants from their home countries (e.g., Antecol (2000); Fernandez (2007); Fernandez and Fogli (2009)). Guner and Uysal (2014) apply this approach to domestic migrants from rural to urban areas in Turkey and find the causal effects of religiosity on women's labor market participation. Göksel (2013) and Dildar (2015) construct measures of religiosity, patriarchy, and conservatism using subjective social survey questions. They find the significance of these subjective measures on female work. These microeconomic papers estimate a kind of *lower* bound for the effect of all cultural factors on economic activities by reasonable identification strategies. On the other hand, the present paper finds an *upper* bound from the macroeconomic perspective.

This paper's strategy of measuring culture is related to the estimation of *wedges* in the macroeconomic literature. For example, Hsieh et al. (2019) capture the long-run shifts in market, human capital, and preference frictions by gender and race as misallocation. A few papers also incorporate culture into quantitative macroeconomic models—Cavalcanti et al. (2007), Doepke and Zilibotti (2008), and Fernández-Villaverde et al. (2014), for example. These papers analyze the interaction between culture and economic growth in the overlapping-generations setup, while my paper focuses on cross-country differences. This paper also contributes to the growing literature of integrated models of structural transformation and female labor supply, for example, Akbulut (2010), Rendall (2017), Ngai and Petrongolo (2017), and Buera et al. (2019). My paper advances these models to cross-country study and interaction with culture. The cross-country analysis of structural transformation is based on Duarte and Restuccia (2010). My research also follows the structural transformation models without gender division in Turkey such as Adamopoulos and Akyol (2009) and Imrohoroglu et al. (2012).

2 Some Empirics of Turkish Female Labor Market

This section establishes a few empirical facts that motivate my theory. I document the time-series trend of worker allocation decomposed by industry and gender in Turkey. The rapid decline of female employment can be captured by the interaction between structural transformation from agriculture to the other sectors and the family norm, possibly discouraging female non-family employment. I will also mention the reversed gender wage gap in the service sector and other possible factors contributing to the female labor market participation.

I would like to begin by addressing workers' allocation among sectors. Turkey has experienced a dramatic shift from agriculture to the non-agriculture sector as in other countries. However, there is a notable difference in the gender division. To examine this, Figure 2 classifies Greek and Turkish men and women as non-employed and employed in service, manufacturing, and agriculture[3]. Greece and Turkey are comparable countries in terms of

[3]The share of non-employment has increased in both countries mainly by aging. Turkish and Greek historical data only provide the population size for those aged over 15 years. Therefore, the elderlies are included in non-employment. It may be also partly due to changes in the number of unemployed workers.

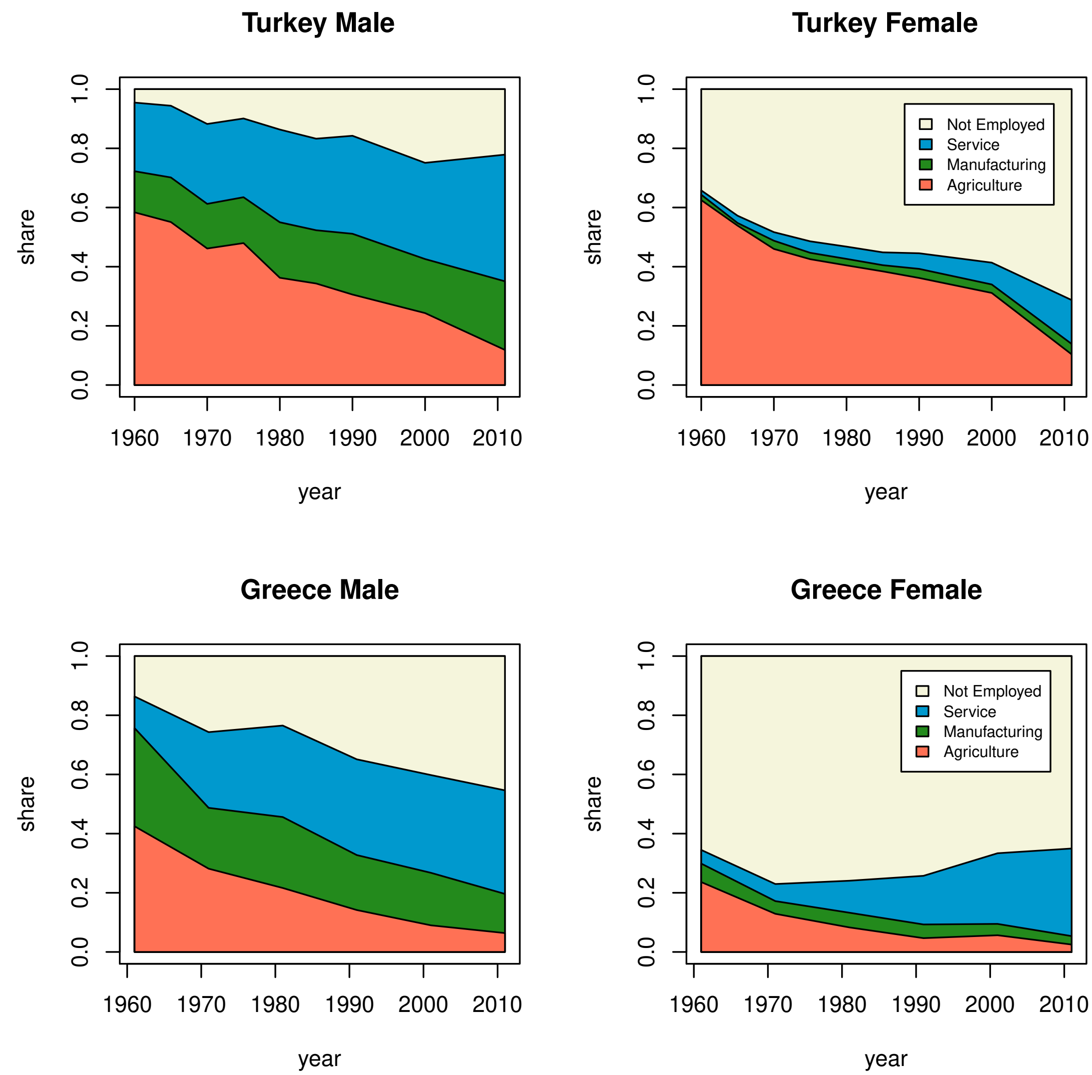
geographical location and industry structure. The share of male employment shows a similar trend in both countries. The agricultural employment ratios have rapidly declined, and the labor force has shifted mainly to the service sector. However, the sectoral share of Turkish female employment is substantially different from the Greek pattern. In the Turkish agriculture sector, about half of the workers are women[4], although this sector is male-dominant in Greece and many other countries. Given the large share of women in agriculture, the structural transformation in Turkey has reduced its female employment rate below the Greek level. Another notable difference is the advancement in the service sector. It is well-known that service sector growth is one of the main driving forces for the expansion in female employment in many countries. The share of the service sector has significantly increased in Greece, but remains small in Turkey. Note that the definition of employment is consistent between Turkey and Greece. I use census surveys that define a person as employed if he/she works for one hour or more per week to earn cash or income in kind.

The Turkish allocation of female labor input can be interpreted as a consequence of the male-breadwinner/female-homemaker family norm. It is possibly because Islamic tradition demands that women, as "good" Muslims, should avoid working outside of their home with male strangers. The literature emphasizes the possibility of a barrier to women's non-family employment not only for their own sake but also because of their husbands' and parents' requirements. They worry, in particular, about potential harassment in workplaces. Gündüz-Hoşgör and Smits (2008) find that more than a quarter of female homemakers in a sample of the Turkish Demographic and Health Survey mention family pressures as the reason for non-employment. İlkkaracan (2012) find, in a unique survey, that about 70% of homemakers desire to work. They tend to have less decision-making power in the family than employed women. Göksel (2013) also finds that urban wives who have conservative husbands work less. My microeconometric estimation in Section 5 also confirms the effects of family pressure.

Figure 2 indicates that not only are women less willing to work outside home, but Turkish families prefer female agricultural work. In Turkey, helping husbands' and families' agricul-

[4]This large share of women in agriculture is consistent with the Household Labor Force Survey conducted by Turkstat if non-market family workers are included in the employed category.

Figure 2: Employment shares in Turkey and Greece by sector and gender



See Appendix B for the source.

ture business is a type of female virtue. Women in farming also engage in some necessary parts of agricultural work (Morvaridi (1992)). These results are consistent with the statistical evidence by Göksel (2013) and Dildar (2015). In their analysis, the coefficients of religiosity (or conservatism) when regressed on female employment status are positive for cities but negative or statistically insignificant for rural areas. I interpret this result as follows: conservative women or families avoid manufacturing and service jobs in urban areas, but ethically prefer family agricultural work in rural areas. I find similar evidence in Section

Table 1: Gender wage gap

Sample	Turkey	The United States	Turkish in the U.S.
The log diff. in male-female wage	−0.085	0.204	0.233

See Appendix C for the detail.

5.

Another notable fact of the Turkish labor market is the reversed gender wage gap in the service sector. Table 1 shows the uncontrolled log difference between the male and female hourly wage in the service sector. The first sample comprises workers in Turkey, the second is a sample of workers in the U.S., and the last one consists of workers of Turkish and their descent in the U.S. The female hourly wage in the Turkish service sector is 8.5% higher than the male wage; that is, the gender wage gap is reversed. This seems to contradict the conventional wisdom of relatively large gender discrimination in Turkey. My explanation is, again, the family norm. The scarcity of female labor supply in the service sector may push up their wage relative to men[5]. In the United States, the gender wage gap in the service sector is 20.4% for all workers and 23.3% for Turkish-related workers. Hence, the male-female wage gap is significantly different between the U.S. and Turkey, but only negligibly different between two social groups inside the U.S. This seems to imply that the gender wage gap reflects the labor market equilibrium in each country rather than individual characteristics.

Finally, I would like to note other factors that may contribute to women's labor supply decision. The literature proposes several social and institutional changes as driving forces that encourage women to participate in the labor force (Greenwood et al. (2017)). Interestingly, Turkey also shares the major factors[6] that were supposed to help women participate in the labor force. From 1950 to 2010, the average female years of schooling increased from 0.63

[5]The selection bias may be also significant as emphasized by Olivetti and Petrongolo (2008). If observable characteristics, including education, are controlled for bias, the female wage is 7.8% lower than the male in Turkey. However, the wage gap is still quite smaller than the 16.0% differential in the U.S. The results are similar if the dependent variable is changed to weekly earning. See Appendix C.

[6]Average years of schooling is taken from a data set created by Barro and Lee (2013). Marriage and divorce data, and electricity statistics are obtained from Turkish Statistical Institute (2014). Total fertility rate and preprimary education enrollment rates are provided by World Bank.

to 6.33, the crude marriage rate declined from 9.51% to 7.98%, the crude divorce rate increased from 0.38% to 1.62%, and total fertility rate declined from 6.12% (1960) to 2.09%. In addition, preprimary education, including child care, has expanded from 3% in 1985 to 26% in 2010. Home appliances have also been popular: electricity consumption (excluding industry) per person increased from 19 kWh in 1955 to 1295 kWh in 2010. As a middle-income country, Turkey is not an outlier for the known social changes on women's empowerment.

3 Model

In this section, I build a general equilibrium model of sectoral allocation of labor supply by gender. The model is designed to capture hours of work data in the United States. In this sense, this baseline model will trace out the increase in female labor market participation. Later, I will incorporate a family norm term to capture the decline in female hours of work in Turkey. There are four sectors in this economy: agriculture, manufacturing, market service, and home service. Households distribute the male and female hours of work to these sectors given the sector productivities. There are three key ingredients in the model.

1. Following Ngai and Petrongolo (2017), I introduce gender comparative advantages in each sector to allow the model to capture the gender bias in sectoral hours.

2. To capture the fall in agriculture sector's labor share, I introduce non-homotheticity into a Stone-Geary utility function. This is a common assumption in the literature of structural transformation, such as Kongsamut et al. (2001) and Duarte and Restuccia (2010).

3. Market service and home service are close substitutes. Because the productivity growth rate in market service exceeds that in home production, hours of work are reallocated from the latter to the former. This "marketization" effect is emphasized in Akbulut (2010), Rendall (2017), Ngai and Petrongolo (2017), and Buera et al. (2019).

Labor is reallocated at the aggregate level due to the income effect associated with the non-homothetic preferences and substitution effects driven by the sectoral differences in the growth rates of labor productivity. This aggregate sectoral reallocation results in asymmetric shifts between male and female due to the gender comparative advantages.

Household

A representative household consists of a male and a female. The household's utility function is

$$U(C_t, L_{mt}, L_{ft}) = \alpha_C \log C_t + (1 - \alpha_C) \left(\frac{1}{2} \log L_{mt} + \frac{1}{2} \log L_{ft} \right), \tag{1}$$

where C_t is the aggregated consumption of the household. L_{mt} and L_{ft} are male and female hours of leisure, respectively. Throughout the paper, time is denoted by the subscript t, and the different sectors by specific subscripts—agriculture by A, manufacturing by M, market service by SM, and home production by SH. The household chooses a static allocation of hours each period, although it intends to capture the time-series trend. The dynamics is generated by changing sectoral productivities. This assumption greatly improves the tractability. My approach follows Rogerson (2008) and Ngai and Petrongolo (2017), among others.

Each male and female is endowed with one unit of time. It is allocated to market work in agriculture H_{gAt}, manufacturing H_{gMt}, service H_{gSMt}, home production H_{gSHt}, and leisure L_{gt}, where gender $g = m, f$ denotes male and female.

$$1 = H_{gAt} + H_{gMt} + H_{gSMt} + H_{gSHt} + L_{gt} \quad \text{for } g = m, f. \tag{2}$$

The aggregate consumption C_t consists of consumption in agriculture, manufacturing, and service. I assume that the aggregation follows a Leontief function as suggested in Herrendorf et al. (2013), who estimate the elasticity of substitution using value-added components of consumption categories.

$$C_t = \min\left\{\alpha_A\left(C_{At} - \bar{C}_A\right),\quad \alpha_M C_{Mt},\quad (1-\alpha_A-\alpha_M)C_{St}\right\}, \tag{3}$$

where C_{At}, C_{Mt}, and C_{St} are agriculture, manufacturing, and service consumption, respectively, and α_A and α_M are relative weights. I assume a subsistence level of agriculture consumption $\bar{C}_A$ so that the model captures the rapid decline in agriculture hours. In the U.S., productivities in the agriculture and manufacturing sectors have grown more rapidly than service productivity. The Leontief formulation together with constant term $\bar{C}_A$ in agriculture captures labor reallocation from agriculture and manufacturing to the service sector.

Additionally, the service consumption C_{St} is composed of market service C_{SMt} and home service C_{SHt}.

$$C_{St} = [\alpha_S C_{SMt}^{\eta} + (1-\alpha_S)C_{SH}^{\eta}]^{1/\eta}, \tag{4}$$

where α_S is the weight for market service, and η is the elasticity of substitution parameter. I assume $\eta > 0$ so that market service and home production are close substitutes. In my calibration, the growth rate of service sector productivity exceeds that of home production in the U.S. This relative productivity change pushes the female home hours into market.

Technology

The production function for each sectors i is specified by the CES function F_{it} for male and female hours of work:

$$F_{it}(H_{mit}, H_{fit}) = \theta_{it}\left(\xi_i H_{mit}^{\sigma} + (1-\xi_i)H_{fit}^{\sigma}\right)^{1/\sigma}, \quad \text{for } i = A, M, SM, SH, \tag{5}$$

where θ_{it} is the time-varying sectoral productivity and ξ_i is the time-fixed gender comparative advantage. In my calibration, ξ_A and ξ_M are larger than 1/2, but ξ_{SM} and ξ_{SH} are less than 1/2. As emphasized in Rendall (2017), this can be interpreted to mean that men have comparative advantage in brawn jobs while women are relatively good at brain jobs. In the U.S. simulation, sectoral hours of work have mainly shifted from agriculture, manufacturing, and home production to the service sector. Women's comparative advantage in service increases female market participation.

Equilibrium

The resource constraints are simple:

$$C_{it} = F_{it}(H_{mit}, H_{fit}) \quad \text{for } i = A, M, SM, SH, \tag{6}$$

The competitive equilibrium in this model can be defined as the solution of a planner's problem because there is no distortion. Given the Leontief function, in the equilibrium,

$$\alpha_A \left(C_{At} - \bar{C}_A\right) = \alpha_M C_{Mt} = (1 - \alpha_A - \alpha_M) C_{St}. \tag{7}$$

Therefore, the equilibrium allocation is the solution of

$$\max_{\substack{C_{At}, C_{Mt}, C_{St}, C_{SMt}, C_{SHt}, \\ L_{mt}, L_{ft} \\ H_{mAt}, H_{mMt}, H_{mSMt}, H_{mSHt} \\ H_{fAt}, H_{fMt}, H_{fSMt}, H_{fSHt}}} \alpha_C \log\left[\alpha_A \left(C_{At} - \bar{C}_A\right)\right] + (1 - \alpha_C)\left(\frac{1}{2}\log L_{mt} + \frac{1}{2} L_{ft}\right)$$

such that (2), (4), (5), (6) and (7) hold. The first order conditions are derived in Appendix A. One can eliminates the consumption and leisure by substituting the production functions and the time constraints into the objective function. Then, the remaining eight hours of work $H_{mAt}, H_{mMt}, H_{mSMt}, H_{mSHt}, H_{fAt}, H_{fMt}, H_{fSMt}$, and H_{fSHt} are determined by the first-order conditions.

Table 2: Parameters

Parameter	Value	Source
α_C	0.337	
α_A	0.892	
α_M	0.068	
α_S	0.509	matched to hours of work in 1960
ξ_A	0.620	
ξ_M	0.556	
ξ_{SM}	0.447	
ξ_{SH}	0.383	
η	0.630	Literature
σ	0.670	
$\bar{C}_A$	0.001	Total agriculture hours in 2010

See Appendix B for the data source.

4 Quantitative results

In this section, I first calibrate the model's parameters using U.S. census data. While the model mainly targets 1960 data, it also succeeds in tracing out the evolutions of sectoral hours by gender until 2010. Next, the calibrated model is applied to Turkey. It clearly fails to capture the evolution of sectoral hours by gender in Turkey. Therefore, I modify the model to incorporate the family norm for Turkish female non-family work. The model does a reasonable job of capturing data, suggesting the quantitative importance of the family norm. Finally, I apply the same model to Egypt and Greece. In Egypt, the gender bias in employment follows a similar pattern and the family norm is estimated at a high level. As for Greece, the model captures the data with only a small modification. The result indicates that Greece may be culturally closer to the U.S. than Turkey and Egypt.

Calibration with the U.S. data

This paper mainly uses the hours of work by sector and gender in the U.S. 1960 census data for calibration. See Appendix B for the detail. The hours of work in home production is also calculated from the market work to home production ratio obtained from Aguiar and

Hurst (2007).

The model has eleven parameters. The two elasticity parameters η and σ are taken from the literature as Ngai and Petrongolo (2017). The elasticity of substitution between home and service, η, as 0.63 from Gelber and Mitchell (2011), and that between male and female labor inputs, σ, as 0.67 from Acemoglu et al. (2004). Next, I decided the subsistence level of consumption as $\bar{C_A} = 0.01$ so that the model captures the time-series of total hours of work in agriculture by the simulated methods of moments.

The remaining eight parameters are determined so that the equilibrium fits the 1960 data. The targets are eight variables of hours of work, H_{mA1960}, H_{mM1960}, $H_{mSM1960}$, $H_{mSH1960}$, H_{fA1960}, H_{fM1960}, $H_{fSM1960}$, $H_{fSH1960}$; hence, the parameters are just identified. Each sector's productivity in 1960 is normalized to 1.

To simulate the evolution of hours of work in the U.S., the sectoral labor productivity growths of agriculture, manufacturing, and service sectors are obtained from the GGDC 10-Sector Database. The home productivity θ_{SHt} is estimated so that the model's prediction gets closer to the data. Precisely, I minimize the squared sum of the distance $\sum_{g,i,t}(H_{git}^{simulation} - H_{git}^{data})^2$ for all gender g, industry sector i, and year t. This approach will be also applied in the simulations of other countries where home hours in past years are unobserved. In my estimation of the U.S., θ_{SHt} grew by 0.5% annually in the 1960s and 70s, but it has declined to 0.2% thereafter[7]. This pattern is consistent with the finding of Bridgman (2016).

The U.S. simulation results are shown in Figure 3. Although the model targets only 1960 data and the aggregate trend in agriculture, it also reasonably captures the evolution of hours of work for both genders and all sectors until 2010[8].

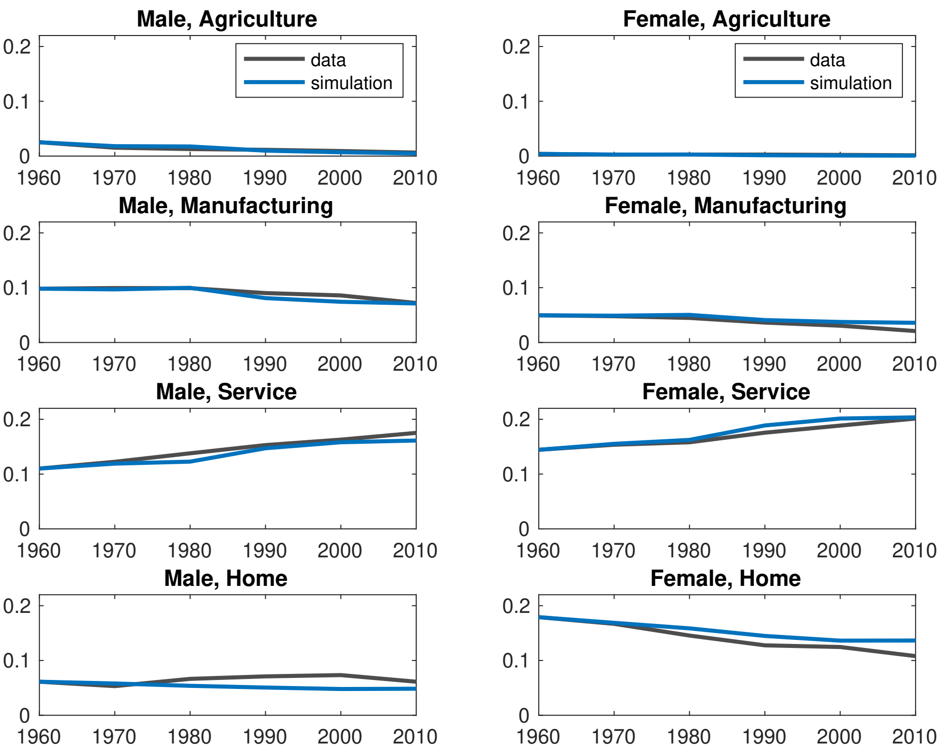
Application to Turkey

I first apply the calibrated model to Turkey, and next, to Egypt and Greece. I follow

[7]The home productivity growth rate varies in the literature. It is -0.2% per year in Rogerson (2008), 0.2% in Akbulut (2010), and 0.45% in Ngai and Petrongolo (2017)

[8]The present model focuses only on hours of work and its transition to allow the analysis to keep the gender comparative advantage parameter in production, ξ_i, fixed. Ngai and Petrongolo (2017) show that changes in ξ_i are crucial to capture the long-run evolution in the gender wage gap. My model predicts an increase in the gender wage gap from 73% in 1960 to 74% in 2010.

Figure 3: Simulation result of the United States

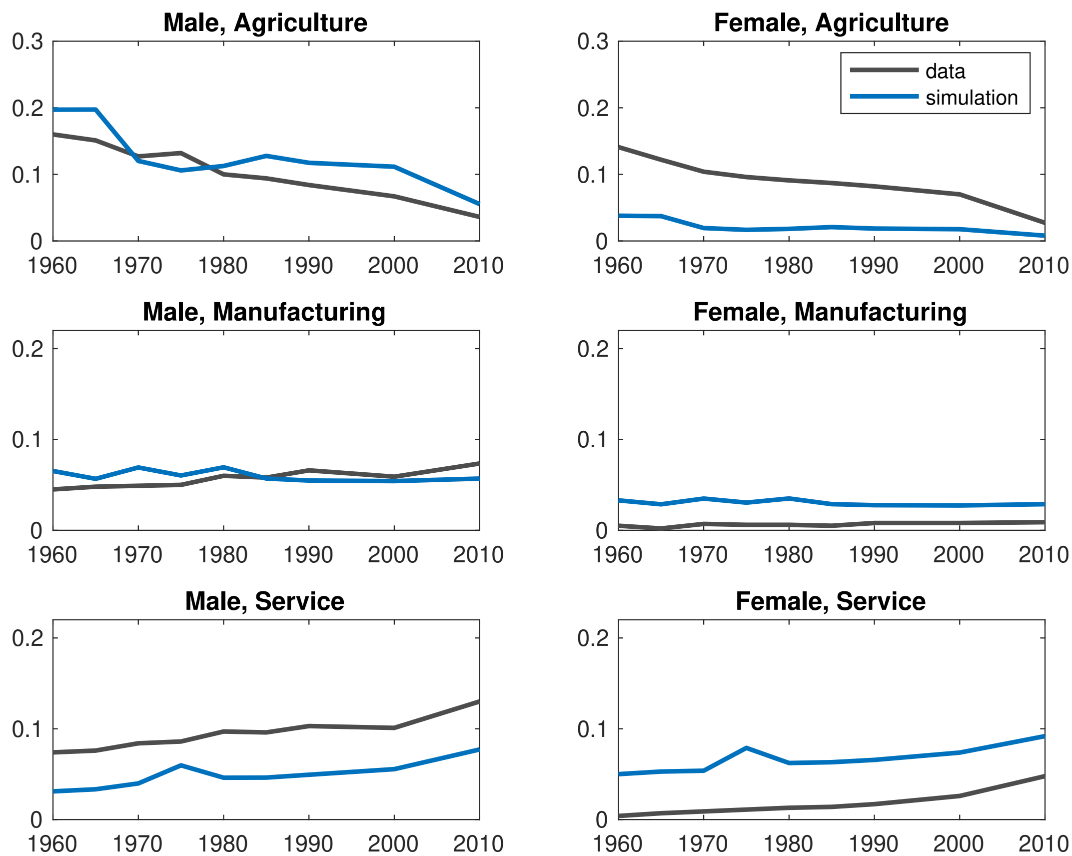


See Appendix B for the data source.

Duarte and Restuccia (2010) to determine the sectoral productivities. This method overcomes the lack of PPP-adjusted sectoral value added across countries. I first set the baseline year for each country picking up the year in which its PPP-converted total market productivity, obtained from the Conference Board Total Economy Database, is close to that of the U.S. as of 1960. I set four labor productivities, $\theta_{A,t}$, $\theta_{M,t}$, $\theta_{SM,t}$, and $\theta_{SH,t}$ so that the model matches the four targets in the baseline year: (1) total hours of work in agriculture, (2) total hours of work in manufacturing, (3) total hours of work in service, and (4) the aggregate productivity relative to the U.S. level as of 1960. Then, the evolution of labor productivities in the market sectors is obtained from the GGDC 10-Sector Database. The unobserved home productivity is estimated as that of the U.S.

As expected, the model clearly fails to capture the Turkish data as shown in Figure

Figure 4: The baseline model's simulation result of Turkey



See Appendix B for data source,

4. The female hours of work in agriculture are significantly underestimated, while those in manufacturing and service are over-predicted. The male result is asymmetric: the simulated hours of work are too high for agriculture and too low for services. This simulation results predict an *increase* in the female labor market participation rates in Turkey over the period. The increase in service hours offsets the decline in agriculture as in other countries. This implies that, given the U.S. preference and technology, Turkey would not experience the unique transition in female labor supply. It also suggests the existence of a unique factor that affects the gender bias in Turkey.

To capture the Turkish data, the model is modified to include a family norm. Following

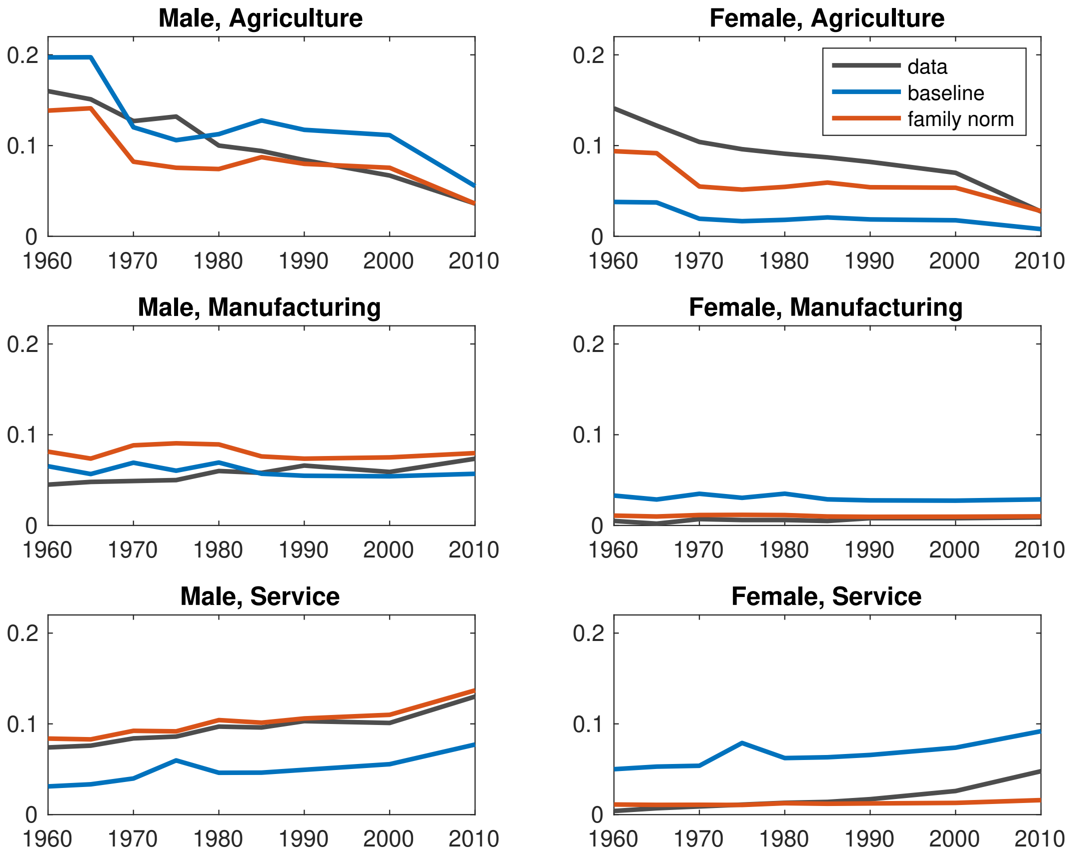
Guiso et al. (2006) and Fernández (2011), I interpret the cultural difference as a cross-country variation in preference, which is reflected in the following modified the utility function:

$$
\begin{aligned}
&U(C_t, L_{mt}, L_{ft}, H_{fAt}, H_{fMt}, H_{fSHt}, H_{fSMt},) \\
&= \alpha_C \log C_t + (1-\alpha_C)\left(\frac{1}{2}\log L_{mt} + \frac{1}{2}\log L_{ft}\right) + d\big[(H_{fAt} + H_{fSHt}) - (H_{fMt} + H_{fSMt})\big].
\end{aligned}
\tag{8}
$$

I add the family norm term $d\big[(H_{fAt}+H_{fSHt})-(H_{fMt}+H_{fSMt})\big]$. The coefficient d represents the degree of relative reluctance of female manufacturing and service works compared to family jobs in agriculture and home service. Given $d > 0$, the reallocation of hours from family to non-family work results in a decline in family utility. This specification implies that the reallocation of hours among sectors is neutral given that female leisure, L_{ft}, remains unchanged. Given the time constraint in Equation 2, a reallocation of hours of work among the four sectors keeps the same utility. If each term has a different coefficient, this family norm term makes unnecessary substitution between consumption and leisure. This case is also considered in the sensitivity analysis in the next subsection.

I choose $d = 0.43$ to minimize the squared sum distance between the simulated result and the data. The family norm term allows the model to explain the sharp decline in female labor supply in Turkey as shown in Figure 5. The culture factor helps to explain the level of sectoral hours and also its evolution. First, the modification of preference increases the level of female agriculture hours. Then, it enhances the decline in female agriculture hours by the income effect from the non-homothetic preference. Second, it also discourages women from entering the service sector. It decreases both the level and the growth of hours of work in the service sector. Third, the modification also affects the male labor supply so that the allocation of male hours substitutes for the change in female labor. Male hours rise in manufacturing and service and fall in agriculture. Although the specification of the family norm term is simple, the modification significantly improves the model's prediction in all dimensions. This paper interprets the result as an indirect evidence of the social barrier for

Figure 5: Simulation result of Turkey with the family norm term



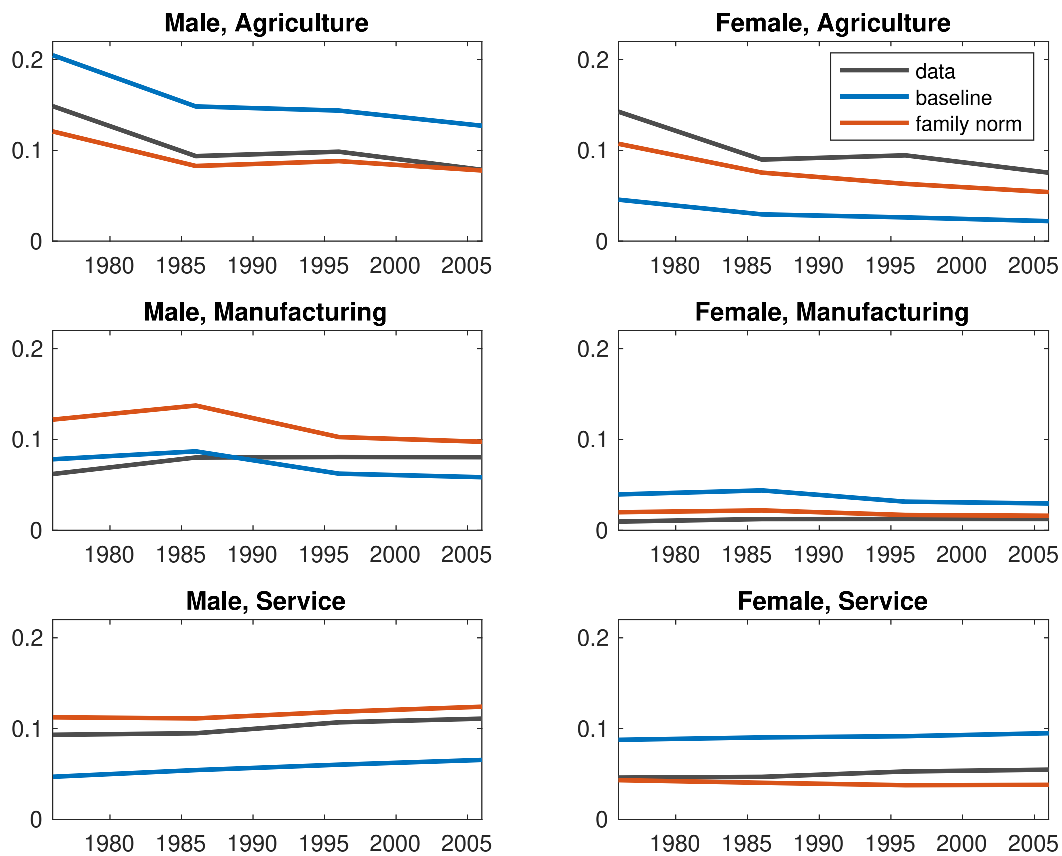
See Appendix B for the data source,

Turkish women.

I evaluate the magnitude of the cultural factor as leisure and consumption equivalence. I estimate the decrease in the family norm's utility from an additional hour of work by women per week in the manufacturing or service sector. This is evaluated as the decline in leisure or consumption that derives the same degree of disutility. Since this involves calculation of a marginal change, the model needs a kind of reference point. I simulate this one-hour change from the calibration target, namely, the hours allocated in the United States in 1960.

The quantitative magnitude of this culture term is significant. The marginal increase in the disutility through the family norm term is equivalent to a reduction of 23.5 minutes leisure

Figure 6: Simulation results of Egypt



See Appendix B for data source.

per week. This implies that the wage needs to be 39% higher than the level without the social norm term to compensate for the additional disutility. In terms of consumption equivalence, the magnitude of the social barrier for one hour of female market work corresponds to 0.76% of aggregate family consumption.

Application to Egypt and Greece

I also conduct a similar exercise in Egypt. Again, I apply the same model calibrated to match the U.S. data, and then add the family norm term d so as to minimize the squared sum distance between model's prediction and data. The Egyptian census data are problematic.

The survey questionnaire asks about the employment status without any clear definition of the job timing (usually the last week of the survey) and hours (one hour or more per week in general). As a result, the census disregards almost all female agricultural workers. To make the data comparable, I fist use the 2006 Egypt Labor Market Panel Survey conducted by the Economic Research Forum and calculate the ratio of male and female aggregate hours of work in agriculture. Then, on the assumption that the ratio as of 2006 is constant over time, I impute the female agricultural hours multiplying this ratio by the male agricultural hours reported in the 1976, 1986, 1996, and 2006 census data.

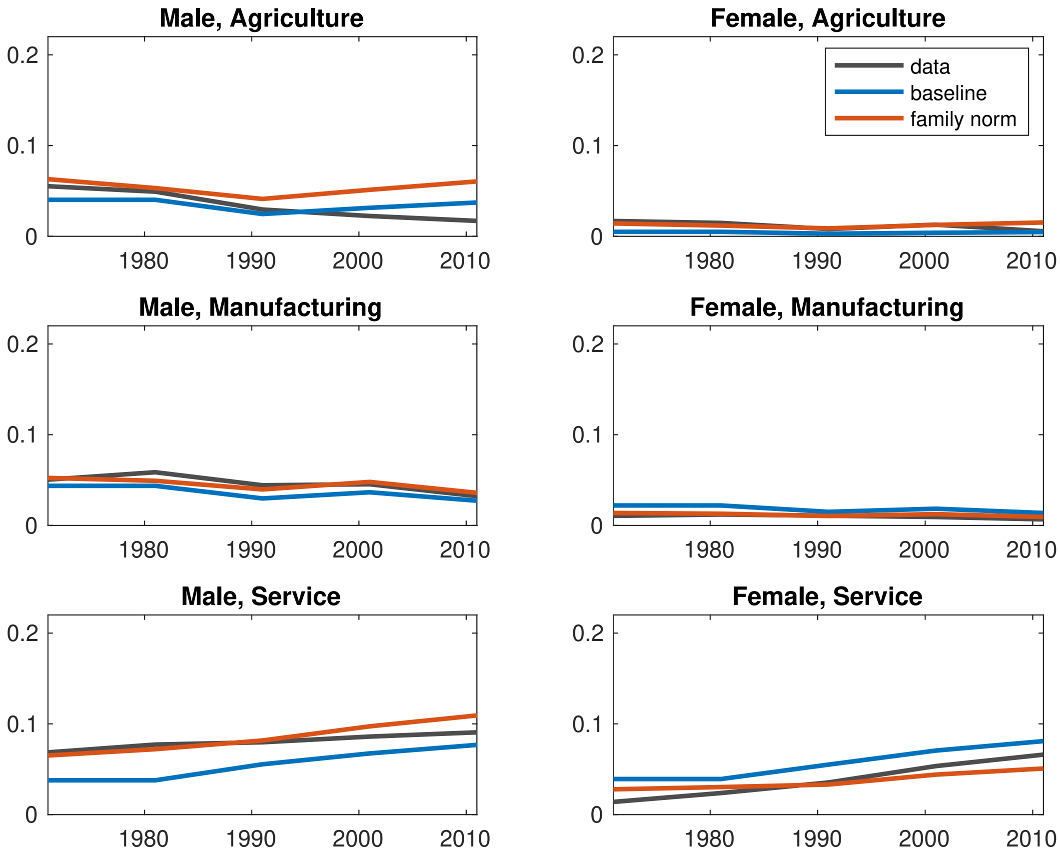
The outcomes for Egypt in Figure 6 is very close to Turkey. The family norm term improves the model's fit in all dimensions of sector and gender and over time except male manufacturing. A large substitution is observed between male and female labor inputs in the agriculture and service sectors, which is consistent with the data. Overall, the simulation results indicate that the family norm term for Egypt may be similar to the Turkish one. The estimated value of the family norm coefficient is $d = 0.28$. This implies that the leisure equivalence of additional costs of one hour female market work per week is 15.3 minutes, and the consumption equivalence is 0.5% of the aggregate level.

The results for Greece are displayed in Figure 7. Even without the family norm term, the model captures the overall hours by sector and gender and their evolution. While the model predicts more gender-neutral allocation in the service sector than the data suggest, the simulation shows significant expansion in female service hours over time. An introduction of the family norm term indeed improves the model's fit mainly in the service sector. However, the measured Greek coefficient is significantly smaller: $d = 0.14$. It is equivalent to 7.9 minutes in terms of leisure and 0.26% in terms of total consumption. The Greek family norm regarding women's employment is closer to that of the U.S. than either Turkey's or Egypt's.

Sensitivity Analysis

Although Turkey's family norm term significantly improves the model's fit, there may be a

Figure 7: Simulation results of Greece



See Appendix B for data source.

more plausible modification. For example, a change in the comparative advantage parameter in the service sector ξ_{SM} may give a better performance. To examine this possibility, I change other parameters one by one and evaluate the model's fit. Similar to the determination of the family norm coefficient d, I choose each parameter's modified value in turn so as to minimize the squared sum of distances between the model's prediction and the data by year, industry, and gender. I change the gender comparative advantage ξ_i for sector $i = A, M, SM, SH$, and the elasticity of substitution between male and female labor inputs σ_i for each sector, as well as the elasticity of substitution between market and home service, η. Table 3 presents each parameter's fitted value and the distance. As a result, no parameter gives a better fit

Table 3: Changes in other parameters

Parameter	symbol	original value	modified value	sqr dist.
No modification	–	–	–	0.098
Family norm, original	d	0	0.43	0.025
Gender com. adv. in agrictulture	ξ_A	0.62	0.46	0.049
Gender com. adv. in manufacturing	ξ_M	0.56	0.59	0.096
Gender com. adv. in market service	ξ_{SM}	0.45	0.65	0.054
Gender com. adv. in home service	ξ_{SH}	0.38	0.66	0.054
Gender elast. of sub. in all sectors	σ	0.67	-1.24	0.054
Gender elast. of sub. in agriculture	σ_A	0.67	-6.83	0.048
Gender elast. of sub. in manufact.	σ_M	0.67	0.80	0.097
Gender elast. of sub. in service	σ_{SM}	0.67	-1.17	0.089
Gender elast. of sub. in home	σ_{SH}	0.67	1.74	0.091
Elast. of sub. btw. market & home	η	0.63	0.86	0.094
Family norm, separated	$(d_{M,SM},\ d_{A,SH})$	$(0,0)$	$(0.16, 0.54)$	0.022

than the original case. Some cases give a relatively better value around 0.05 by reallocation of male and female hours in one specific sector. However, the original case shows a smaller distance because of the reallocation in all sectors.

Another interesting extension is to separately change the family norm coefficient d by sector. I decide the additional utility terms as $-d_{M,SM}(H_{fMt} + H_{fSMt}) + d_{A,SH}(H_{fSt} + H_{fSHt})$, where $d_{M,SM}$ is the coefficients for non-family manufacturing and market service hours and $d_{A,SH}$ for family agriculture and home service hours. The best fitting parameters are $(d_{M,SM}, d_{A,SH}) = (0.16, 0.54)$. Because of two free parameters, this case provides a better match than the original one. However, the squared sum of distances only decreased from 0.25 to 0.22 because the original case already obtaines a good enough simulation result. Note again that, besides the substitution of hours among sectors, this also possibly distorts the substitution between consumption and leisure.

5 Microeconomic estimation of the family norm

This section finds that the cultural factor suggested by the macroeconomic model is supported by micro-level evidence. The main variable here is the direct measure of a family-/individual-level factors in the subjective questionnaire about culture. The macroeconomic model implies that the family norm discourages women's willingness to engage in non-family occupations, but encourages assistance in family business. Hence, the availability of family jobs may turn the influence of cultural factors on female employment in the opposite direction. In my regression analysis, this effect will be captured by an interaction term of the cultural factors and family job availability. I also separate the cultural factor into women's personal value and families' decision-making power. Besides, the Turkey and Greek results are compared consistently on the basis of an international harmonized survey.

I use the sample of married women in the European Social Survey in 2004 and 2008. It is a harmonized survey covering both Turkey and Greece. Turkey is included since it has had a customs union agreement with the European Union since 1995 and is a potential future member.

The following Probit model is evaluated:

$$\begin{aligned} Y_i^* = \beta_0 \; + \; \beta_1 \times RLG_i \; + \; \beta_2 \times BGP_i \; + \; \beta_3 \times FJ_i \\ + \beta_4 \times RLG_i \times FJ_i + \beta_5 \times BGP_i \times FJ_i + X_i + \varepsilon_i. \end{aligned} \tag{9}$$

The employment status of women Y_i is a dummy variable where

$$Y_i = \begin{cases} 1 & \text{if } Y_i^* > 0, \\ 0 & \text{if } Y_i^* \leq 0. \end{cases} \tag{10}$$

$Y_i = 1$ implies employment status, either family or non-family occupations. The nature of job each woman holds is not available in the data. RLG_i is the subjective answer for woman i's religiosity, scaled from 0 to 10. BGP_i is each women's bargaining power in the

Table 4: Labor market participation and individual/family values in Turkey

	Dependent variable:								
	Employment dummy								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Religiousity	−0.028	−0.027	−0.045*				−0.021	−0.022	−0.039
	(0.023)	(0.023)	(0.025)				(0.024)	(0.024)	(0.026)
Bargaining				0.015	0.017	0.031**	0.014	0.016	0.030**
				(0.012)	(0.013)	(0.015)	(0.012)	(0.013)	(0.015)
Family Job		−0.041	−0.952*		0.037	0.297*		0.052	−0.613
		(0.128)	(0.516)		(0.141)	(0.173)		(0.142)	(0.565)
RLG × FJ			0.119*						0.121*
			(0.065)						(0.071)
BGP × FJ						−0.124**			−0.127**
						(0.051)			(0.052)
Observations	848	838	838	767	758	758	762	753	753
Note:									*p<0.1; **p<0.05; ***p<0.01

household, also scaled from 0 to 10. I use answers about the degree to which a wife is allowed to influence her husband's decisions on job-related activities[9]. FJ_i represents family job availability, which is 1 if the main source of income for the family is self-employment or family business, otherwise 0. It is assumed that female earning is always the secondary source of total family income even if the wife actually works. X_i includes other observable characteristics: household size, child status, urban status, wife's and husband's educational attainment, and region.

The cross-terms $\beta_4 \times RLG_i \times FJ_i$ and $\beta_5 \times BGP_i \times FJ_i$ are the main variables of interest because they potentially capture the switching sign of the correlation between culture and female work. The woman's choice $Y_i \in \{0, 1\}$ is interpreted as homemaker/market work choice if $FJ_i = 0$, but as homemaker/family job if $FJ_i = 1$. Therefore, FJ_i changes the occupational choice itself for women[10].

[9]The original question is about the husband's influence on the decision. I inverted the scale to obtain the wife's relative power. The questionnaire is somewhat ambiguous: "I am going to read out a list of things about your partner's working life. Using this card, please say how much the management at his/her work allows him/her to influence the policy decisions about the activities of the organization?"

[10]Note that, if family job is available, market work can be neglected. According to the Turkish household labor force survey, 87% of workers in this category engage in family jobs.

The results for Turkey are summarized in Table 4. Regressions (1), (2), and (3) show the results of individual religiosity and its interaction with family job availability. The coefficients are negative but insignificant in (1) and (2), where the cross-term is unavailable. This is because the regression potentially includes opposite effects for family and non-family jobs. In regression (3), all target explanatory variables are significant. More religious wives are less likely to work if a family job is unavailable, but they tend to help family jobs. Women's personal religiosity seems to matter, which is consistent with my own finding in the macroeconomic model.

Regressions (4), (5), and (6) indicate similar result by the female bargaining power in family decisions. A woman in more patriarchal family is less likely to go to the market. However, the propensity to engage in family work increases to the extent possible. The family norm variable has a similar consequence as the results of individual religiosity. However, the interpretation is different: the results of (4), (5), and (6) may be regarded as the family's preference, instead. In regressions (7), (8), and (9), both terms are included. Similarly, the consequence of a woman's personal religiosity and bargaining power on female employment is ambiguous without the cross-terms. If these are included, the cross-terms and the bargaining power are statistically significant. Religiosity and family job availability show consistent signs.

Table 5 shows the results of the same regression analysis in Greece. Interestingly, the coefficients are insignificant in all cases. Religiosity and family power seem to be irrelevant to labor market participation in both market and family jobs. The finding is consistent with the macroeconomic model's implication about the small family norm coefficient d in Greece.

The results confirm the popular belief that the male breadwinner/female homemaker family norm in Turkey significantly affects women's decisions. It may be due to the woman's personal preference as well as the family's voice. This plausibly explains why the Turkish agriculture sector employs so many female workers while the service hires few.

Table 5: Labor market participation and individual/family values in Greece

	Dependent variable:								
	Employment dummy								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Religiousity	−0.015	−0.016	−0.038				−0.018	−0.019	−0.041
	(0.031)	(0.031)	(0.037)				(0.032)	(0.032)	(0.038)
Bargaining				−0.001	−0.003	−0.005	−0.002	−0.005	−0.006
				(0.015)	(0.017)	(0.019)	(0.015)	(0.017)	(0.019)
Family Job		−0.034	−0.534		−0.023	−0.038		−0.030	−0.583
		(0.137)	(0.487)		(0.156)	(0.182)		(0.157)	(0.532)
RLG × FJ			0.069						0.073
			(0.065)						(0.068)
BGP × FJ						0.007			0.013
						(0.045)			(0.046)
Observations	969	966	966	940	936	936	935	932	932
Note:									*p<0.1; **p<0.05; ***p<0.01

6 Conclusions

Cultural factors are often pointed out as the source of cross-country differences in economic activities. Although the literature has found enough microeconometric evidence, it has not attempted to capture the quantitative measurement of nation-wide effects. This paper estimates the family norm's effects on the unique historical path of Turkish female employment in international comparison. The calibrated general equilibrium model of structural transformation of labor inputs by sector and gender elicits the family norm as a type of wedge between the simulation result and data. The family norm's effects, evaluated as the additional disutility from one hour of non-family work in a week, is quantitatively equivalent to a 0.76% reduction in family consumption or 24 minutes of less leisure. The results are supported by microeconometric regression analysis by the European Social Survey.

In the macroeconomic analysis, culture is simply introduced as a Turkish family's preference for family jobs to non-family ones. However, the results of the European Social Survey are possibly due to women's own social preference or their families' influence. The observed economic outcomes are similar in both cases, but the normative interpretations are complicated. Besides, gender discrimination from the employer side and the labor market may also be a factor. To conduct a detailed study that addresses policy issues, one may need a rich model with a variety of cultural factors. I believe such a model can be quantitatively studied if it is combined with the rich microdata on Turkey.

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Appendix A. The planner's problem

By substituting equations, one can erase $C_{At}, C_{Mt}, C_{St}, C_{SMt}, C_{SHt}$, L_{mt}, L_{ft}. The planner's problem is:

$$\begin{aligned}\max_{\substack{H_{mAt},H_{mMt},H_{mSMt},H_{mSHt},\\ H_{fAt},H_{fMt},H_{fSMt},H_{fSHt}}} & \alpha_C \log\left[\alpha_A\left(\theta_{At}\left(\xi_A H_{mAt}^{\sigma}+(1-\xi_A)H_{fAt}^{\sigma}\right)^{1/\sigma}-\bar{C}_A\right)\right] \\ & +(1-\alpha_C)\left[\frac{1}{2}\log(1-H_{mAt}-H_{mMt}-H_{mSMt}-H_{mSHt})\right. \\ & \left.+\frac{1}{2}\log(1-H_{fAt}-H_{fMt}-H_{fSMt}-H_{fSHt})\right],\end{aligned}$$

s.t.

$$\alpha_A\left(\theta_{At}\left(\xi_A H_{mAt}^{\sigma}+(1-\xi_A)H_{fAt}^{\sigma}\right)^{1/\sigma}-\bar{C}_A\right)=\alpha_M\theta_{Mt}\left(\xi_M H_{mMt}^{\sigma}+(1-\xi_M)H_{fMt}^{\sigma}\right)^{1/\sigma},$$

$$\begin{aligned}&\alpha_A\left(\theta_{At}\left(\xi_A H_{mAt}^{\sigma}+(1-\xi_A)H_{fAt}^{\sigma}\right)^{1/\sigma}-\bar{C}_A\right) \\ &\quad=(1-\alpha_A-\alpha_M)\left[\alpha_S\theta_{SMt}^{\eta}\left(\xi_{SM}H_{mSMt}^{\sigma}+(1-\xi_{SM})H_{fSMt}^{\sigma}\right)^{\eta/\sigma}\right. \\ &\qquad\left.+(1-\alpha_S)\theta_{SHt}^{\eta}\left(\xi_{SH}H_{mSHt}^{\sigma}+(1-\xi_{SH})H_{fSHt}^{\sigma}\right)^{\eta/\sigma}\right]^{1/\eta}.\end{aligned}$$

Then, the model's solution is derived by the folliwng first order conditions.

$$
\begin{aligned}
&\left(\frac{\alpha_C}{D} - \lambda_1 - \lambda_2\right) \alpha_A \theta_{At} \left(\xi_A H_{mAt}^{\sigma} + (1-\xi_A) H_{fAt}^{\sigma}\right)^{(1/\sigma)-1} \xi_A H_{mAt}^{\sigma-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{mAt} - H_{mMt} - H_{mSMt} - H_{mSHt}}, \\
&\left(\frac{\alpha_C}{D} - \lambda_1 - \lambda_2\right) \alpha_A \theta_{At} \left(\xi_A H_{mAt}^{\sigma} + (1-\xi_A) H_{fAt}^{\sigma}\right)^{(1/\sigma)-1} (1-\xi_A) H_{fAt}^{\sigma-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{fAt} - H_{fMt} - H_{fSMt} - H_{fSHt}}, \\
&\lambda_1 \alpha_M \theta_{Mt} \left(\xi_M H_{mMt}^{\sigma} + (1-\xi_M) H_{fMt}^{\sigma}\right)^{(1/\sigma)-1} \xi_M H_{mMt}^{\sigma-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{mAt} - H_{mMt} - H_{mSMt} - H_{mSHt}}, \\
&\lambda_1 \alpha_M \theta_{Mt} \left(\xi_M H_{mMt}^{\sigma} + (1-\xi_M) H_{fMt}^{\sigma}\right)^{(1/\sigma)-1} (1-\xi_M) H_{fMt}^{\sigma-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{fAt} - H_{fMt} - H_{fSMt} - H_{fSHt}}, \\
&\lambda_2 (1-\alpha_A-\alpha_M) \alpha_S \theta_{SMt}^{\eta} \left(\xi_{SM} H_{mSMt}^{\sigma} + (1-\xi_{SM}) H_{fSMt}^{\sigma}\right)^{(\eta/\sigma)-1} \xi_{SM} H_{mSMt}^{\sigma-1} G^{1/\eta-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{mAt} - H_{mMt} - H_{mHt}}, \\
&\lambda_2 (1-\alpha_A-\alpha_M) \alpha_S \theta_{SMt}^{\eta} \left(\xi_{SM} H_{mSMt}^{\sigma} + (1-\xi_{SM}) H_{fSMt}^{\sigma}\right)^{(\eta/\sigma)-1} (1-\xi_{SM}) H_{fSMt}^{\sigma-1} G^{1/\eta-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{fAt} - H_{fMt} - H_{fHt}}, \\
&\lambda_2 (1-\alpha_A-\alpha_M)(1-\alpha_S) \theta_{SHt}^{\eta} \left(\xi_{SH} H_{mSHt}^{\sigma} + (1-\xi_{SH}) H_{fHt}^{\sigma}\right)^{(\eta/\sigma)-1} \xi_{SH} H_{mSHt}^{\sigma-1} G^{1/\eta-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{mAt} - H_{mMt} - H_{mHt}}, \\
&\lambda_2 (1-\alpha_A-\alpha_M)(1-\alpha_S) \theta_{SHt}^{\eta} \left(\xi_{SH} H_{mSHt}^{\sigma} + (1-\xi_{SH}) H_{fSHt}^{\sigma}\right)^{(\eta/\sigma)-1} (1-\xi_{SH}) H_{fSHt}^{\sigma-1} G^{1/\eta-1} \\
&\qquad = \left(\frac{1}{2}\right) \frac{(1-\alpha_C)}{1 - H_{fAt} - H_{fMt} - H_{fHt}},
\end{aligned}
$$

where

$$
\begin{aligned}
D &= \alpha_A \left(\theta_{At} \left(\xi_A H_{mAt}^{\sigma} + (1-\xi_A) H_{fAt}^{\sigma} \right)^{1/\sigma} - \bar{C}_A \right), \\
G &= \alpha_S \theta_{SMt}^{\eta} \left(\xi_{SM} H_{mSMt}^{\sigma} + (1-\xi_{SM}) H_{fSMt}^{\sigma} \right)^{\eta/\sigma} \\
&\quad + (1-\alpha_S) \theta_{SHt}^{\eta} \left(\xi_{SH} H_{mSHt}^{\sigma} + (1-\xi_{SH}) H_{fSHt}^{\sigma} \right)^{\eta/\sigma}.
\end{aligned}
$$

Appendix B. Data

The main data sources are the IPUMS international census microdata, the GGDC 10-Sector Database maintained by the Groningen Growth and Development Centre, the Total Economy Database published by the Conference Board Inc., and each country's historical census tables. For all countries, I assume that the total population consists of people aged 15 years or more except students. I do not eliminate old or retired people because historical employment data by age, gender, and sector are unavailable in old census tables.

The United States

Hours of work by gender and sector are calculated from census microdata from IPUMS USA. Hours for home production are calculated from the home to market hours ratio obtained from Aguiar and Hurst (2007). The ratios for 1970 and 1980 are calculated by linear interpolation from 1965, 1975, and 1985 data. For 1990 and 2000, I use 1993 and 2003 data. I normalize each sector's productivity in 1950 as 1 and determine the subsequent productivity growth from the GGDC 10-Sector Database.

Turkey

Hours of work data are unavailable even at the aggregate level in Turkey except for recent data. I do not use the Total Economy Database for Turkish average hours of work because it assumes Greece hours as Turkish data. Alternatively, I first calculate hours of work per employee by sector and gender from Household Labour Force Statistics microdata 2008-2012. On the assumption that the individual hours are constant over time, the past hours of work data are calculated from individual hours of work multiplied by the employment share by sector and gender from *Statistical Indicators 1923-2013*, published by the Turkish Statistical Institute. The book also provides value added by sector for productivity estimation. The aggregate productivity for cross-country comparison with the United States is from the Total Economy Database published by the Conference Board Inc.

Greece

Hours of work by gender and sector in 1961 are obtained from the *Results of the population and housing census of 19 March 1961*. From 1971 to 2001, these are calculated from IPUMS international census microdata. The aggregate productivity for cross-country comparison is from the Total Economy Database, and the domestic sectoral productivities are from Papaelias et al. (2014).

Egypt

I first estimate hours of work by gender in manufacturing and service. The hours of work per employee by gender in the two sectors are obtained from the Egypt Labor Market Panel Survey of 2006. Employment shares by sector and gender are derived from census data provided by the 1976 Statistical Yearbook of the Arab Republic of Egypt and IPUMS-international microdata for 1986, 1996, and 2006. Under the assumption that the individual hours as of 2006 are constant over time, past aggregate hours of work in manufacturing and service are calculated as individual hours multiplied by employment shares. Female employment in agriculture is not available in the census data. I obtain the male hours in agriculture as above. Then, I calculate the ratio between male and female aggregate hours of work in agriculture again from the Egypt Labor Market Panel Survey of 2006. Finally, aggregate female hours of work in agriculture before 2006 are imputed from the male hours in the agriculture multiplied by the ratio. Aggregate productivity and sectoral productivities are sourced from the Total Economy Database and GGDC 10-Sector Database, respectively.

Appendix C. Tables for the regression results

Table 6: Gender hourly wage gap among all workers

	Dependent variable:					
	Log hourly wage					
	(1)	(2)	(3)	(4)	(5)	(6)
Sample	TR	TR	US	US	TR in US	TR in US
female	0.085***	−0.078***	−0.204***	−0.160***	−0.233***	−0.151***
	(0.003)	(0.002)	(0.001)	(0.001)	(0.036)	(0.032)
age		0.089***		0.075***		0.056***
		(0.001)		(0.0002)		(0.008)
agesq		−0.001***		−0.001***		−0.0004***
		(0.00001)		(0.00000)		(0.0001)
married		0.119***		0.143***		0.107***
		(0.003)		(0.001)		(0.036)
Highschool		0.392***		0.359***		0.443***
		(0.002)		(0.001)		(0.067)
college		1.001***		0.864***		1.038***
		(0.002)		(0.001)		(0.065)
urban		0.069***		−0.076***		0.066*
		(0.003)		(0.001)		(0.035)
child age less than 5		−0.017***		0.069***		0.083*
		(0.002)		(0.001)		(0.046)
parttime		0.324***		−0.558***		−0.639***
		(0.005)		(0.001)		(0.044)
year, 2008	−0.092***	−0.076***				
	(0.004)	(0.003)				
year, 2009	−0.052***	−0.012***				
	(0.004)	(0.003)				
year, 2010	−0.049***	−0.023***				
	(0.004)	(0.003)				
year, 2011	−0.041***	−0.022***				
	(0.004)	(0.003)				
Constant	2.981***	0.593***	6.707***	4.460***	6.860***	4.587***
	(0.003)	(0.011)	(0.001)	(0.004)	(0.023)	(0.178)
Observations	269,384	269,384	4,963,550	4,963,550	3,302	3,302
R^2	0.005	0.502	0.012	0.276	0.013	0.254
Adjusted R^2	0.005	0.502	0.012	0.276	0.012	0.252
Residual Std. Error	8.674	6.134	4.207	3.602	4.759	4.143

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7: Gernder weekly earning gap among full-time workers

	Dependent variable:					
	log(realincome)					
	(1)	(2)	(3)	(4)	(5)	(6)
female	−0.040***	−0.146***	−0.215***	−0.231***	−0.195***	−0.201***
	(0.003)	(0.002)	(0.001)	(0.001)	(0.037)	(0.033)
age		0.079***		0.087***		0.062***
		(0.001)		(0.0002)		(0.010)
agesq		−0.001***		−0.001***		−0.001***
		(0.00001)		(0.00000)		(0.0001)
married		0.095***		0.147***		0.093**
		(0.003)		(0.001)		(0.037)
edu_high		0.301***		0.427***		0.276***
		(0.002)		(0.002)		(0.075)
college		0.761***		0.972***		0.923***
		(0.002)		(0.002)		(0.073)
urban		0.101***		−0.080***		0.037
		(0.002)		(0.001)		(0.037)
ch5		−0.014***		0.052***		0.012
		(0.002)		(0.001)		(0.047)
parttime						
year, 2008	−0.075***	−0.065***				
	(0.004)	(0.003)				
year, 2009	−0.038***	−0.007***				
	(0.004)	(0.003)				
year, 2010	−0.036***	−0.016***				
	(0.004)	(0.003)				
year, 2011	−0.029***	−0.015***				
	(0.004)	(0.003)				
Constant	6.970***	4.926***	10.657***	7.994***	10.792***	8.487***
	(0.003)	(0.010)	(0.001)	(0.004)	(0.022)	(0.206)
Observations	245,937	245,937	3,452,518	3,452,518	2,497	2,497
R^2	0.003	0.454	0.017	0.261	0.011	0.212
Adjusted R^2	0.003	0.454	0.017	0.261	0.011	0.209
Residual Std. Error	7.034	5.204	3.790	3.287	4.206	3.761
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 8: Labor market participation and individual/family culture in Turkey

	Dependent variable:								
	Employment								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Religiousity	−0.028	−0.027	−0.045*				−0.021	−0.022	−0.039
	(0.023)	(0.023)	(0.025)				(0.024)	(0.024)	(0.026)
Family_Business		−0.041	−0.952*		0.037	0.297*		0.052	−0.613
		(0.128)	(0.516)		(0.141)	(0.173)		(0.142)	(0.565)
Bargaining_Power				0.015	0.017	0.031**	0.014	0.016	0.030**
				(0.012)	(0.013)	(0.015)	(0.012)	(0.013)	(0.015)
Religiousity × Family_Business			0.119*						0.121*
			(0.065)						(0.071)
Bargaining_Power × Family_Business						−0.124**			−0.127**
						(0.051)			(0.052)
Kids_less_than_5	−0.142*	−0.143*	−0.144*	−0.140	−0.140	−0.144*	−0.142*	−0.143*	−0.150*
	(0.083)	(0.083)	(0.083)	(0.085)	(0.086)	(0.087)	(0.086)	(0.086)	(0.087)
Kids_5_to_12	0.051	0.045	0.042	0.039	0.038	0.037	0.037	0.037	0.035
	(0.075)	(0.076)	(0.076)	(0.077)	(0.077)	(0.077)	(0.078)	(0.078)	(0.079)
Age	0.187***	0.185***	0.184***	0.208***	0.203***	0.220***	0.206***	0.201***	0.216***
	(0.050)	(0.050)	(0.050)	(0.053)	(0.053)	(0.055)	(0.053)	(0.053)	(0.055)
Age_Squared	−0.003***	−0.003***	−0.003***	−0.003***	−0.003***	−0.003***	−0.003***	−0.003***	−0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Urban	0.014	0.008	−0.002	−0.026	−0.024	−0.007	−0.033	−0.030	−0.021
	(0.111)	(0.112)	(0.112)	(0.112)	(0.113)	(0.114)	(0.113)	(0.114)	(0.116)
Household_Size	0.056	0.058	0.052	0.064	0.064	0.064	0.068	0.068	0.063
	(0.041)	(0.041)	(0.041)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)	(0.042)
Lower_Secondary_Completed	0.269	0.265	0.257	0.190	0.184	0.172	0.178	0.171	0.150
	(0.169)	(0.169)	(0.170)	(0.177)	(0.177)	(0.180)	(0.178)	(0.179)	(0.182)
Upper_Secondary_Completed	0.846***	0.843***	0.837***	0.855***	0.853***	0.849***	0.840***	0.836***	0.829***
	(0.154)	(0.154)	(0.154)	(0.154)	(0.154)	(0.154)	(0.158)	(0.158)	(0.159)
Post_Secondary_Completed	2.743***	2.732***	2.716***	2.755***	2.746***	2.757***	2.799***	2.789***	2.780***
	(0.239)	(0.239)	(0.240)	(0.243)	(0.244)	(0.244)	(0.253)	(0.253)	(0.254)
Lower_Secondary_Completed_Husband	−0.020	−0.032	−0.028	−0.036	−0.039	−0.052	−0.016	−0.019	−0.029
	(0.142)	(0.143)	(0.144)	(0.146)	(0.146)	(0.147)	(0.147)	(0.147)	(0.149)
Upper_Secondary_Completed_Husband	−0.448***	−0.450***	−0.440***	−0.425***	−0.420***	−0.429***	−0.421***	−0.415***	−0.419***
	(0.149)	(0.150)	(0.150)	(0.152)	(0.153)	(0.153)	(0.153)	(0.154)	(0.155)
Post_Secondary_Completed_Husband	−0.625***	−0.625***	−0.631***	−0.636***	−0.625***	−0.645***	−0.704***	−0.691***	−0.715***
	(0.208)	(0.209)	(0.210)	(0.212)	(0.213)	(0.213)	(0.220)	(0.221)	(0.222)
Constant	76.841	74.779	76.199	69.303	65.075	60.472	75.462	70.612	65.994
	(50.103)	(50.566)	(50.805)	(51.217)	(51.758)	(52.121)	(51.467)	(52.026)	(52.635)
Observations	848	838	838	767	758	758	762	753	753
Log Likelihood	−419.109	−418.077	−415.862	−404.080	−403.172	−399.643	−400.679	−399.733	−394.340
Akaike Inf. Crit.	890.219	890.154	887.724	860.161	860.344	855.286	855.359	855.467	848.679

Note: *p<0.1; **p<0.05; ***p<0.01

Table 9: Labor market participation and individual/family culture in Greece

	Dependent variable:								
	Employment								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Religiousity	−0.015	−0.016	−0.038				−0.018	−0.019	−0.041
	(0.031)	(0.031)	(0.037)				(0.032)	(0.032)	(0.038)
Family_Business		−0.034	−0.534		−0.023	−0.038		−0.030	−0.583
		(0.137)	(0.487)		(0.156)	(0.182)		(0.157)	(0.532)
Bargaining_Power				−0.001	−0.003	−0.005	−0.002	−0.005	−0.006
				(0.015)	(0.017)	(0.019)	(0.015)	(0.017)	(0.019)
Religiousity × Family_Business			0.069						0.073
			(0.065)						(0.068)
Bargaining_Power × Family_Business						0.007			0.013
						(0.045)			(0.046)
Kids_less_than_5	−0.138	−0.134	−0.133	−0.127	−0.123	−0.122	−0.132	−0.129	−0.129
	(0.120)	(0.120)	(0.120)	(0.123)	(0.123)	(0.123)	(0.123)	(0.123)	(0.124)
Kids_5_to_12	−0.154	−0.151	−0.158	−0.172	−0.169	−0.168	−0.172	−0.169	−0.174
	(0.111)	(0.112)	(0.112)	(0.114)	(0.114)	(0.114)	(0.114)	(0.114)	(0.115)
Age	0.124**	0.123**	0.124**	0.137***	0.136***	0.136***	0.133***	0.132***	0.134***
	(0.049)	(0.049)	(0.049)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)
Age_Squared	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Urban	−0.115	−0.123	−0.118	−0.112	−0.116	−0.115	−0.112	−0.117	−0.113
	(0.152)	(0.154)	(0.154)	(0.156)	(0.157)	(0.157)	(0.156)	(0.157)	(0.158)
Household_Size	−0.036	−0.038	−0.035	−0.027	−0.030	−0.030	−0.030	−0.032	−0.029
	(0.062)	(0.062)	(0.062)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)	(0.064)
Lower_Secondary_Completed	−0.062	−0.074	−0.059	−0.124	−0.139	−0.140	−0.114	−0.127	−0.111
	(0.212)	(0.212)	(0.213)	(0.217)	(0.217)	(0.218)	(0.218)	(0.218)	(0.219)
Upper_Secondary_Completed	−0.028	−0.042	−0.025	−0.063	−0.080	−0.079	−0.066	−0.081	−0.064
	(0.206)	(0.207)	(0.208)	(0.211)	(0.212)	(0.212)	(0.211)	(0.212)	(0.213)
Post_Secondary_Completed	0.490*	0.475*	0.489*	0.483*	0.455*	0.454*	0.472*	0.455*	0.468*
	(0.255)	(0.255)	(0.256)	(0.261)	(0.263)	(0.263)	(0.263)	(0.263)	(0.264)
Lower_Secondary_Completed_Husband	−0.003	−0.004	−0.008	0.013	0.012	0.012	0.003	0.002	−0.005
	(0.199)	(0.200)	(0.200)	(0.202)	(0.203)	(0.203)	(0.203)	(0.204)	(0.204)
Upper_Secondary_Completed_Husband	0.038	0.025	0.025	0.107	0.096	0.095	0.089	0.079	0.079
	(0.193)	(0.195)	(0.195)	(0.197)	(0.199)	(0.199)	(0.198)	(0.199)	(0.200)
Post_Secondary_Completed_Husband	0.181	0.172	0.155	0.232	0.231	0.229	0.224	0.216	0.198
	(0.237)	(0.238)	(0.239)	(0.242)	(0.244)	(0.244)	(0.243)	(0.245)	(0.246)
Constant	−179.407***	−178.805***	−179.534***	−171.350***	−173.177***	−171.953***	−168.152***	−167.924**	−167.419**
	(63.692)	(63.918)	(63.952)	(64.327)	(64.623)	(65.145)	(65.214)	(65.424)	(65.888)
Observations	969	966	966	940	936	936	935	932	932
Log Likelihood	−228.096	−226.362	−225.260	−218.483	−216.372	−216.439	−217.819	−216.040	−215.138
Akaike Inf. Crit.	504.191	502.723	502.521	484.967	482.745	484.879	485.639	484.081	486.276

Note: *p<0.1; **p<0.05; ***p<0.01