On the Future of Female Employment in Turkey*

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Abstract

Turkey has the lowest female employment rate among OECD countries. In 2005, the employment rate among women was almost half of the second lowest rate in OECD. Mid 2000's marked a reversal for the decreasing trend in the female employment rate in Turkey. Since 2005, the employment rate of women increased by around 6 percentage points reaching to 27 percent in 2013, around 65 percent of the nearest OECD country. Continuation of the rise for over half a decade spur discussions about whether this rise is permanent. Contributing to these discussions, this paper explores the possible behavior of Turkish female employment rate in the future. Using a multi-sector exogenous growth model, we examine how female employment rates will evolve under different scenarios for sectoral productivity growth rates from 2013 onwards. The results from our quantitative analysis suggest that if sectoral productivity levels in Turkey grow at their recently observed averages, female employment rate increases by 8.7 percentage points in 20 years. Further analysis shows that, among all sectors, additional one percentage points growth in service sector productivity has the most significant impact on female employment.

*The views expressed in this working paper are those of the authors and do not necessarily represent the official views of the Central Bank of the Republic of Turkey.

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1 Introduction

Female labor force participation has been an important question of interest in the literature. It has been well documented that female labor force participation displays a U-shape as a country prospers (see Olivetti (2013) and references there in). Turkey, having the lowest level of female labor force participation among OECD countries, witnessed a seemingly U-shape pattern of female labor force participation lately. Figure 1 displays this behavior. The participation rate fell from around 32% in 1988 to 23% in 2005. Beginning from 2005 there was a reversal in this downward trend and the participation rate of women increased to 31% in 2013. Whether or not this recently observed increase in female participation rate will continue determines where Turkey falls on the U-shape.

Female labor force participation rate is closely linked to female employment to population ratio in Turkey. This relationship, illustrated in Figure 2, allows us to study employment rates of women in this paper to infer the possible future paths of their labor force participation. In doing so we examine how the employment rate dynamics of women evolve under different scenarios regarding the sectoral productivity growth rates. Answering this question is essential as having more accurate trajectories of female employment enables policy makers to have better projections of the Turkish economy. This question is also of interest to the policy makers as increasing attachment of women to labor markets has implications for the saving and consumption patterns of households as well as income inequality.

The rise in female employment rate observed during this period coincides with a sectoral shift away from agriculture to services. Figure 3 shows that nearly 45% of the employed population was in agriculture in 1988. This ratio fell to 20% at the end of the period. Meanwhile the share of employed individuals in service sector increased from 33% to 50%. This observation guides us to employ a structural transformation model to explore the future path of female employment.

Structural transformation models have been heavily used in the literature to study the transition of economies from more agricultural based forms to more industry or service oriented ones. Recently, these models have also been used to explain the increasing female employment rates observed in developed economies. Akbulut (2011), Rendall (2014) and Ngai and Petrongolo (2013) can be listed among these. Akbulut (2011) shows that the increase in female labor force participation observed after 1950s in the U.S. is linked to the expansion of the service

sector. The conjecture in that paper is that the increase in the efficiency of service sector production after the mid 1950s resulted in a shift from home production to market production. Since mostly women work at home, one important factor contributing to the rise in the employment of women was this movement from unmeasured work at home to measured work. The paper builds a model that is closely related to the model economy in Rogerson (2008) with goods and services sectors and a home production technology. It quantitatively investigates the contribution of the faster increase in the productivity of market services relative to home production to the increasing employment of women between 1950 and 2005.

Our model is closely related to Akbulut (2011) which performs well in addressing the increase in female labor force participation of women in the U.S. We depart from this model by separating agriculture from goods sector and building a three sector model with home production. In Akbulut (2011) agriculture is not modelled as a separate sector as the share of agriculture in employment in the U.S. is low. However for the case of Turkey, modelling agriculture as a distinct sector is a more realistic assumption since agriculture represents 22% of employment in 2013. Moreover female employment rate in agriculture, which is around 12% in 2013, shows that an important share of women is employed in this sector. Hence, we assume in the model that both men and women are employed in agriculture as well as in services production. Since female employment in industry is low in Turkey, and has not changed much during our sample period, we assume that only men are employed in goods sector. We also assume for simplicity that only females spend time engaging in home production.

The dynamics of female employment has also been explained using alternative theories in the literature. Most of these studies focus on the dramatic move of women into labor markets in the United States after 1950s. Caucutt et al. (2002), Olivetti (2006) and Jones et al. (2014) claim that increases in the return to labor and the closing gender wage gap were important factors contributing to the increase in the employment of women. Several papers including Bailey (2006), Goldin and Katz (2002), Attanasio et al. (2008), Greenwood et al. (2005) and Coen-Pirani et al. (2010) have linked this increase to the reduction in the time women allocate to housework and their children as well as the decline in fertility rates. Several papers including Fernández et al. (2004), Fernández (2007), Fernández (2013) and Fogli and Veldkamp (2011) study the impact of changes in the preferences and attitudes on increasing female employment.

There are various papers that explore the determinants of female labor force participation in Turkey as well. These papers focus on social and cultural factors, education, urbanization, marital status, and the economic cycle as essential factors affecting the participation of women into labor markets. Among these Dayıoğlu and Kırdar (2010) address the role of education, marital status and urbanization, Başlevent and Onaran (2003) analyze separately the impact of marital status on the labor force status of women especially during crisis times. Tansel (2002) finds empirical support of the U-shape of female labor force participation during economic development using cross-provincial data from Turkey. İlkkaracan (2012) emphasizes the role of demand side factors in reinforcing the patriarchal structure of the family and limiting the participation of women in Turkish labor markets.

The current paper is related to the two strands of the literature. The first one is the literature that examines the dynamics and determinants of Turkish female employment. It is also related to the literature that uses structural transformation models to understand the sectoral shift of output and employment in Turkey. Adamopoulos and Akyol (2009), İmrohoroğlu et al. (2014), Sengul and Üngör (2011) can be listed among these. However the relation between structural transformation and women's labor market experience has not been analyzed extensively for Turkey.[1] This paper both aims to contribute towards filling this gap and providing a sound framework to generate projections regarding the future behavior of female labor force participation.

To this extent, we calibrate the model to match gender and sector specific employment allocations in 1988 Turkish economy. After calibration, we produce model simulated male and female employment rates for the 1988-2013 period. These simulations show that the model captures the overall dynamics of female employment as well as its behavior at the sectoral level well. We then continue our quantitative analysis by projecting future paths for total and sectoral female employment rates. These projections show that if productivity in sectors continue to grow at their recent average rates, female employment will increase by 8.7 percentage points in 20 years and the bulk of the increase will occur in the service

[1] To our knowledge, Kubota (2014) is the only other study. Kubota (2014) evaluates in a structural transformation model the importance of a stigma effect in addressing the declining female labor force participation between 1955 and 2011 in Turkey. In addition, Üngör and Kalafatçılar (2014) conduct a decomposition exercise and show the significant contribution of female concentration in service sector to increasing Turkish female employment rate for the 2004-2012 period.

sector.

We also run simulations to investigate which sectors' productivity is more substantial for the rise of female employment. As such, we compare outcomes of scenarios where each sectoral productivity grows one percentage points higher than its benchmark value. We take average sectoral productivity growth between 1988 and 2013 as the benchmark case. Our results suggest that one percentage points higher than the average productivity growth in services generates the biggest rise in female employment rate through attracting women who are at home into the service sector. One percentage points higher than the average productivity growth increase in agriculture pushes women (as well as men) out of this sector. However, productivity growth in the service sector is not high enough to pull additional women resulting in a relatively subtle rise in female employment. A rise in industrial productivity growth mostly affects men by reallocating some of them from industry to services. As industry and service sectors are not highly substitutable we also see a mild rise in female service employment. Taken together, these simulations imply that service sector productivity is the key to the future performance of female employment rate in Turkey.

The rest of the paper is organized as follows. The following section explains the model while the one after discusses the calibration and results of the quantitative analysis. The last section concludes the paper.

2 Model

The model we use in our analysis builds on Akbulut (2011). Similar to Akbulut (2011), there is a representative household with unit measure of male and female members. Household gets utility from consumption of agriculture (A), other goods (C) and leisure (L), with the following formal representation:[2]

$$U(A,C,L) = \begin{cases} \bar{A} + \alpha_c log(C) + (1-\alpha_c) log(L), & \text{if } A \geq \bar{A} \\ A & \text{if } A < \bar{A} \end{cases} \tag{1}$$

where $\bar{A}$ is the subsistence level of consumption in agriculture. This utility form ensures that as the productivity in agriculture increases, the economy allocates less labor to agriculture and more labor to other sectors. Akbulut (2011) has two

[2] As there are no intertemporal decisions in the model, we do not use time subscript.

sectors, goods and services. We separately model agriculture as it is a significant sector in Turkey.

The consumption good is the composite of industrial goods (G) and services (S):

$$C = [\alpha_g G^\epsilon + (1 - \alpha_g) S^\epsilon]^{1/\epsilon}. \tag{2}$$

Here α_g is the share of consumption goods in the composite good and $\frac{1}{1-\epsilon}$ is the elasticity of substitution between goods and services. The degree of substitution between goods and services is an important parameter since a value different from unity is necessary to have structural change with uneven technological progress.

The aggregate consumption of services, S, is given by the constant elasticity of substitution (CES) aggregator for market and non-market services (used interchangeably with home production) as below.

$$S = [\alpha_s S_m^\eta + (1 - \alpha_s) S_n^\eta]^{1/\eta}. \tag{3}$$

Services is composed of market produced services S_m, and home produced services S_n. α_s is the share of market services and $\frac{1}{1-\eta}$ is the elasticity of substitution between market and home produced services. η is a key parameter in this model since its value being different from 0 guarantees that home and market services are not perfect substitutes. In this case different rates of productivity growth in these two sectors will create reallocation of labor from one to the other.

The aggregator for total leisure, L, consumed by the household is given by

$$L = L_m^{\alpha_l} L_f^{1-\alpha_l}, \tag{4}$$

where L_m is the leisure of males and L_f is the leisure of females. Leisure time enjoyed by males and females are

$$L_m = 1 - E_{ma} - E_{mSm} - E_{mg}, \tag{5}$$

$$L_f = 1 - E_{fa} - E_{fSm} - E_{fSn}, \tag{6}$$

respectively. We assume that both genders can be employed in agriculture and services. Similar to Akbulut (2011), only males work in goods sectors and only females do home production using a technology that is linear in labor.

$$G = \theta_g E_{mg}, \tag{7}$$

$$S_n = \theta_{Sn} E_{fSn}. \tag{8}$$

The production function in market services sector is given as:

$$S_m = \theta_{Sm}(\phi_s E_{mSm} + (1 - \phi_s) E_{fSm}). \tag{9}$$

The production function for agriculture is as follows:

$$A = \theta_a [\phi_a E_{ma}^{\mu} + (1 - \phi_a) E_{fa}^{\mu}]^{1/\mu}. \tag{10}$$

θ parameters in these equations represent time variant sector specific productivities.

2.1 Equilibrium

All markets are competitive and there are no externalities in this problem. Therefore the competitive equilibrium problem corresponds to the social planner's problem. Moreover, the focus of this paper is about the effects of productivity differences across sectors on employment allocations. Hence we focus on the solution to the social planner's problem. Since the problem does not have any intertemporal decisions, the social planner solves the same within period problem by choosing $\{A, G, S_m, S_n, E_{mg}, E_{ma}, E_{fa}, E_{mSm}, E_{fSm}, E_{fSn}\}$ to maximize U(A, C, L) subject to technology and feasibility constraints. More formally, given the exogenous productivities θ_g, θ_a, θ_{Sm}, θ_{Sn}, equation (1) is maximized subject to the constraints in equations (4)-(10).

First, observe that since household derives utility from only the subsistence level of consumption, the economy will produce exactly that much agricultural goods. Moreover, since there is perfect substitution in market services, marginal utility of leisure is the same across genders, which also implies that the marginal product of the male end female employment in agriculture are the same. This gives us the employment allocations in equilibrium as: (see appendix for derivations).

$$E_{fa} = \frac{\bar{A}}{\theta_a}\Big[\phi_a\Big(\frac{\phi_s}{\phi_a}\frac{1-\phi_a}{1-\phi_s}\Big)^{\mu/(\mu-1)} + 1 - \phi_a\Big]^{-1/\mu}, \qquad E_{ma} = \Big(\frac{\phi_s}{\phi_a}\frac{1-\phi_a}{1-\phi_s}\Big)^{1/(\mu-1)} E_{fa}. \tag{11}$$

Notice that as the productivity in agriculture changes, so does the the labor required to produce the subsistence level. Also note that, even though the total number of employed in agriculture changes over time with the productivity, ratio of male to female labor does not change.

We have an equilibrium in which the marginal utility gain from all sectors is the same for both genders. This is because we have perfectly substitutable male and female labor in one of the sectors. Using this fact, we end up with the following relationship between employment in market services and home production

$$\frac{E_{Sm}}{E_{Sn}} = \Big(\frac{\theta_{Sn}}{\theta_{Sm}}\Big)^{\eta/(\eta-1)}\Big(\frac{1-\alpha_s}{(1-\phi_s)\alpha_s}\Big)^{1/(\eta-1)}. \tag{12}$$

Note that as long as $\eta \notin [0,1]$, the ratio of employment in services to home production is increasing in their respective productivity ratio. In other words, if the market and home service productions are high enough substitutes, then a relatively faster increase in productivity of one sector will pull the labor from the other sector. Hence, in this model, if the productivity of market services relative to home production increases, then there will be employment flow from home production to market services. As home production is done only by females, a relative gain in market productivity will pull women from homes to market work. Moreover, this pull is affected by the parameter of elasticity between market and home service goods, as well as the ratio of shares of male and female leisure.

3 Quantitative Analysis

In this section we quantify the projected impact of sectoral productivity changes on female employment rate in Turkey for the post-2013 period. To this end, we set the parameters of the model via calibrating it to 1988 Turkish data. Then we simulate the model and establish its fit to 1988-2013 Turkish data. We proceed by generating trajectories of gender and sector specific employment rates for the 2013-2033 period.[3]

[3]The data is obtained from Turkish Statistical Institute. Details regarding construction of the data series is provided in the appendix.

3.1 Calibration

We pin down parameters of the model by borrowing some of them from the literature and calibrating the remaining ones to match the 1988 Turkish data. There are two crucial parameters in the model; namely ε and η. ε determines the elasticity of substitution between goods and services which is $\frac{1}{1-\varepsilon}$. We set the value of ε to -1.28, the same value used in Akbulut (2011). η is a key parameter determining the elasticity of substitution between market and non market services. Akbulut (2011) sets the value of this parameter to 0.45. She also runs the same model for η=0.57 and 0.71.[4] We calibrate this parameter to match the overall fit of the model to total female employment rates between 1988 and 2013.

The parameter that governs the elasticity of substitution between male and female labor in agriculture, μ, mainly affects the employment allocations across genders within this sector. The value we pick for this parameter is 0.68, the value estimated by Acemoglu et al. (2004) for the aggregate US economy. ϕ_s is the parameter controlling the share of male and female labor in market services production. We set the value of this parameter to 0.5. $\bar{A}$, that measures the subsistence level of agricultural consumption is pinned down to match the total employment rate in agriculture in 1988. ϕ_a is the share parameter governing male employment in agricultural production and it is determined from the ratio of male to female employment in agricultural sector. The initial values of sectoral productivities $(\theta_{Sn}, \theta_{Sm}, \theta_a, \theta_g)$ are normalized to 1. The remaining parameters are α_c, α_g, α_s and α_l, and they are calibrated to match the fraction of employment allocated by males and females to goods, market and non-market services production.

Table 1 summarizes the parameters of the model and Table 2 presents the data moments matched in calibration. The 1988 values for fraction of male time allocated to goods sector (E_{mg}), to agriculture (E_{ma}) and service sector(E_{mSm}) in Turkey are 20.8%, 24.7% and 29.8%, respectively. Male individuals do not work at home and their mass is one, therefore the fraction of males enjoying leisure (L_m) is computed as a residual and equals to 24.6%. The target for female labor allocation to service (E_{fSm}) and agriculture (E_{fa}) sectors are 4.2% and 20.05%. The only share we cannot compute directly from the data is the share of women employed in home production. We compute this ratio as a residual following

[4]We simulated the model using 0.45 and 0.71 for η; however, these two values under and overestimate the increase in female employment rate, respectively.

Akbulut (2011). Data on female sectoral employment rates provide us the information on female labor allocated to different types of market activities. The remaining female population would either work at home production or consume leisure. We assume that the ratio of leisure time enjoyed by men to that of women in the data corresponds to the fraction of male population enjoying leisure to their female counterparts in the model. Hence by finding the share of time allocated by women to leisure, we can compute the female labor allocation to home production. To achieve this we make use of a survey on time use conducted by Turkish Statistical Institute in 2006. This survey provides information about types of activity in a day and average time spent by men and women on these activities. Using these information, we compute the ratio of leisure time enjoyed by men to that of women as 0.84.[5] This ratio together with the fraction of males consuming leisure (24.6%) gives us the female share allocated for leisure as 20.6% and the home production share is calculated as a residual to be 55%.

3.2 Results

Following the parameterization of the model, we proceed by analyzing the fit of the calibrated model to 1988-2013 Turkish data. Firstly we compute average sectoral productivity growth rates observed between two subperiods, 1988-2005 and 2006-2013 for agriculture, industry and market services. The growth rate series for home service productivity is borrowed from Akbulut (2011). Then using these we generate a productivity series for each sector in Turkey starting from 1988.By feeding these series into the model, we get the implied employment to population ratio by gender and sector.

Figure 4 compares the model generated male and female employment series with their data values for the 1988-2013 period. Since we exclude women from industrial production in our model due to their historically low share in this sector, we also exclude them from the data series as well to achieve a better comparison. Female employment rate exhibits a declining behavior between 1988-2005 in the data. The beginning of the period is marked with a 24 percent rate for female employment to population ratio which goes down by 7 percentage points until 2005. After this year, the employment rate of women follows an upward sloping

[5] Our definition of leisure time includes time spent on education, voluntary work and meetings, social life and entertainment, sports, hobbies and games, television, and traveling.

trend and reaches nearly 23 percent in 2013. The model performs well in matching the overall behavior of female employment rates during this period. The simulated series closely mimics the data by capturing nearly 86 percent of the observed drop in women's employment rate from 1988 to 2005. The model also captures the reversal of the downward trend after 2005. After this date we observe a rise in the employment rate of women until it reaches 21.6 percent in 2013 in the model. For male employment we observe that the model generated employment ratio first displays a slight decline until mid 2000's, then starts increasing. The data counterpart of this series also exhibits a similar pattern with the magnitude of the decline being higher in the first half of the sample period.

Figure 5 shows the model's fit to sector and gender specific employment rates. Female employment rate in agriculture falls from around 20 percent in 1988 to nearly 9 percent in 2007 in Turkey. After 2007 we observe an upward trend in the employment ratio of women in this sector. The simulated series exhibits a similar behavior where the same ratio drops to nearly 12 percent in 2006 and moderately picks up from that year on. Unlike the agricultural sector, the employment rate of women in service sector displayed a rise from around 4 percent to 12 percent between 1988 and 2013 in Turkey. Our simulated series exhibits the observed increase of female employment rate in service sector albeit at a lower rate. The employment rate of women in service sector reaches 9.7 percent in our model economy capturing around 66 percent of the observed rise during this period.

Overall the results presented in Figure 4 shows that the model generated female employment ratio displays a very similar pattern to the data. The downward sloping behavior until 2006 and the following pick up of the series is well explained by the model. Figure 5 also establishes the model's success in replicating the overall behavior of female employment rates at the sectoral level.

Having established the success of the model in generating the overall employment dynamics for Turkey, we proceed with projecting female employment rate for the post-2013 period. To do so we need to pin down plausible paths for the sectoral productivity rates as they determine the path of the employment rates in the model. For this, we make use of the historical productivity growth rate data. As a baseline, we assume that productivity in all three sectors will grow at their observed averages between 1988 and 2013 and simulate aggregate and sectoral employment to population ratios. This implies growth rates of 2.33, 1.13 and 2.07 percent for agriculture, services and industry, respectively. We also run

our model assuming that after 2013 sectoral productivities grow at their average rates observed between 1988-2005 and 2006-2013, separately. For the first case the sectoral productivity growth rates used in our simulation are 3.20, 0.95 and 2.55 percent and for the second case they are -1.00, 1.26 and 0.69 percent in the same order. Table 3 presents the average growth rates of sectoral productivities during each period.

Projected changes in male and female employment to population ratios for the post-2013 period are presented in Table 4. Figure 6 illustrates female and male employment to population ratios for all three cases and Figure 7 displays sector and gender specific employment rates. The fastest increase in female employment rate occurs under the scenario where all sectors grow at their 2006-2013 average rates. In this case female employment rate rises by 8.7 percentage points. One important reason for observing the higher rise in women's employment rate in this scenario is that agricultural productivity grows at a negative rate. Accompanying the decline in the agricultural productivity growth, there is an increase in service sector productivity. As a result we observe a very slight increase in agricultural female employment and a nearly 8.55 percent rise in the employment rate of women in the service sector.

If sectoral productivity growth rates revert back to their 1988-2005 averages after 2013, female employment rate displays a slight decline. This outcome arises mainly because during that period agricultural productivity grows significantly while service sector productivity does not grow at a fast enough rate to absorb the female workers who are discharged from agriculture. In the economy where all three sectors grow at their 1988-2013 historical average rates, we observe a 2.3 percentage points rise in the employment rate among women. The reason for having a more moderate increase in female employment rate is again the high agricultural productivity growth and the comparably lower service productivity growth.

Analysis above shows that productivity growth in both agriculture and service sectors are important in determining the path of female employment. However, it is salient about how sensitive female employment is to each sector. Hence, we explore which sector's productivity has a bigger impact on the growth rate of female employment rate from 2013 on. To this extent, we examine four different cases. In our baseline scenario we assume that sectoral productivities grow at their 1988-2013 average rates after 2013. We compare the model output under

this scenario to three different cases where the productivity growth of each sector is increased separately by 1 percentage points. In Table 5 and figures 8, 9, we present the results of this simulation.

Among all the sectors, service seems to have the most significant impact on female employment. The simulation results show that if productivity in agriculture or industry grows at 1 percentage points above its 1988-2013 average rate, female employment rate follows a very similar behavior to the benchmark case. In both these cases and the main scenario the female employment rate stays nearly constant for almost 4-5 years and displays a very moderate increase afterwards. This is mainly because the agricultural female employment rate falls and the service sector cannot generate enough demand for female workers to increase the overall female employment rate.

This picture changes when we assume that service sector productivity grows at a 1 percentage points higher rate than the observed historical average. In this case female employment rate starts following an upward trend beginning from 2013. In 20 years period, the share of females employed in the economy rises by 10.48 percentage points. In this case service sector is productive enough to utilize women who are discharged from agricultural sector. This exercise reveals that female employment is most sensitive to the improvements in service sector productivity. Furthermore, we observe that productivity enhancements in agriculture and industry tend to reduce overall female employment, unless supported by increase in service productivity.

4 Concluding Remarks

Turkey stands out as a special case having the lowest female labor force participation rate among all other OECD countries. Both the employment and participation rate of women displayed a decline until 2005 in the country. However the declining trend in the female employment rate in Turkey displayed a reversal beginning from 2005 and rose by 6.3 percentage points until 2013. Continuation of the rise for over half a decade spur discussions about whether this rise is permanent. We contribute to this discussion by exploring the future path of female employment rates in Turkey starting from 2013 using a multi-sector exogenous growth model. We first calibrate our model to match 1988 Turkish data. Having established the performance of the model to explain female Turkish employment

for the 1988-2013 period, we make projections for female employment rates under plausible assumptions of sectoral productivities for the post 2013 period.

The results from our quantitative analysis suggest that if all the sectors grow at their average rates observed between 1988 and 2013, female employment rate will increase slightly by 2.3 percentage points in the next 20 years. Assuming that productivity in all sectors keeps growing at 2006-2013 average rates, ratio of women employed in the economy will go up by 8.7 percentage points. The underlying reason for observing a higher increase with more recent growth rates is that during this period, agricultural productivity displayed a slower growth performance compared to the previous period. The implication of this under our multi-sector model is that less women are discharged from agriculture hence female employment rate rises at a faster rate.

In a set of simulations we examine how female employment rate will evolve after 2013 if the average productivity growth rate of each sector is one percentage points higher than its 1988-2013 historical average. Based on the results of this experiment we conclude that an improvement in the productivity growth of the service sector generates the biggest increase in female employment rate. On the other hand, a higher than the average productivity growth rate in agriculture and industry, generates moderate increases in the employment rate of women for the post-2013 period. These results highlight the significance of a productive service sector to pull women in to the employment pool.

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Figure 1: Participation Rates (%), Turkey, 1988-2013

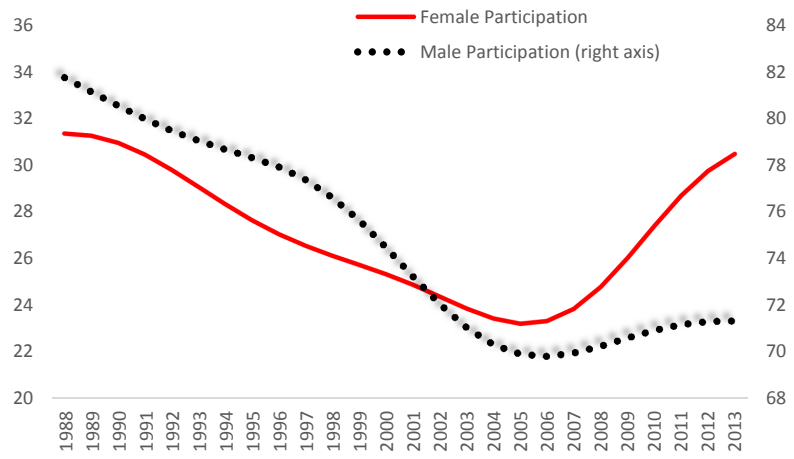

Figure 2: Female Participation and Employment Rates (%), Turkey, 1988-2013

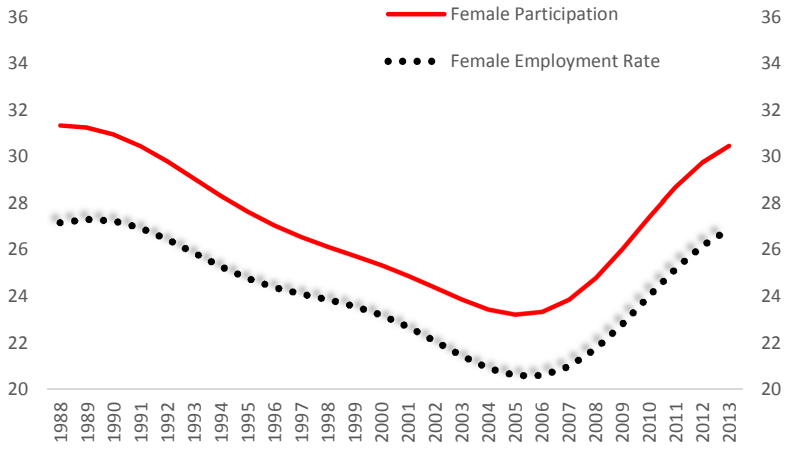

Figure 3: Sectoral Employment Shares (%), Turkey, 1988-2013

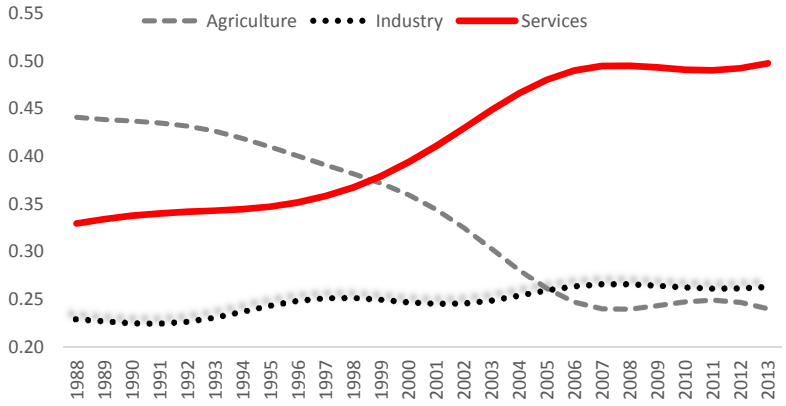

Figure 4: Model Fit in Male and Female Employment Ratios

Figure 5: Model Fit in Sector-Gender Employment Ratios

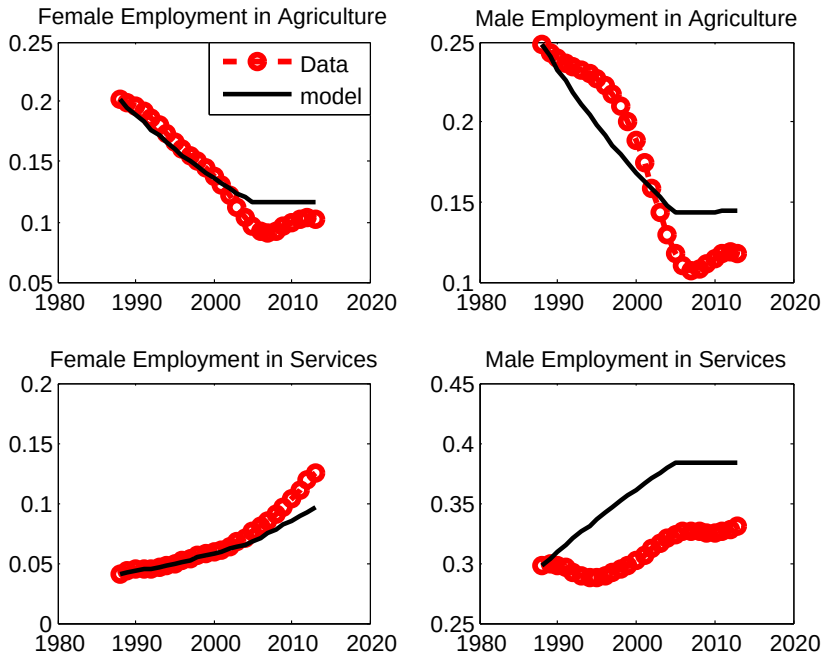

Figure 6: Male and Female Employment Ratio Simulations; 1988-2033

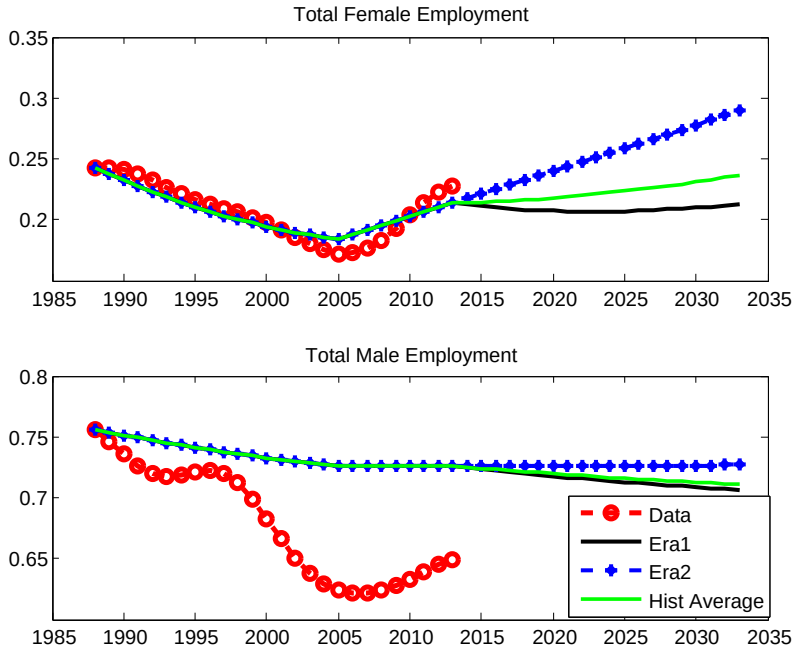

Figure 7: Sectoral Male and Female Employment Simulations; 1988-2033

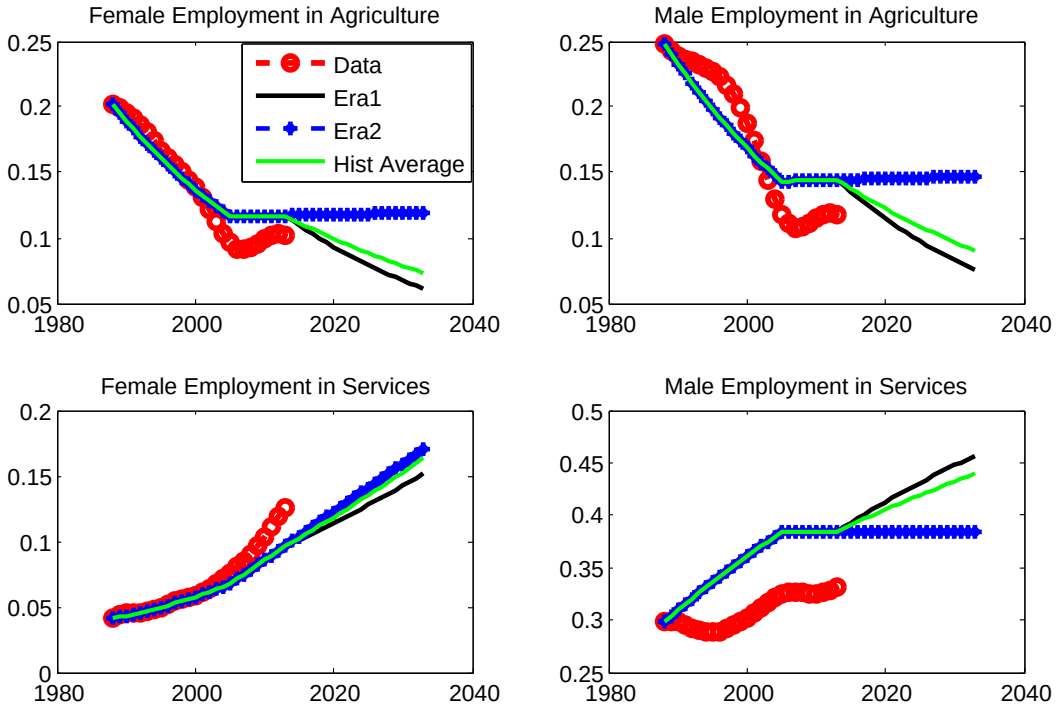

Figure 8: Male and Female Employment Ratio Simulations; 1988-2033

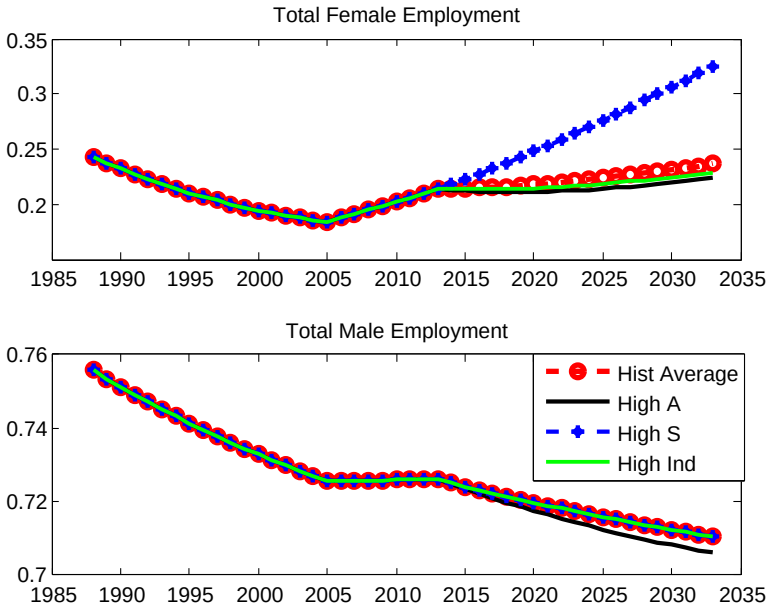

Figure 9: Sectoral Male and Female Employment Simulations; 1988-2033

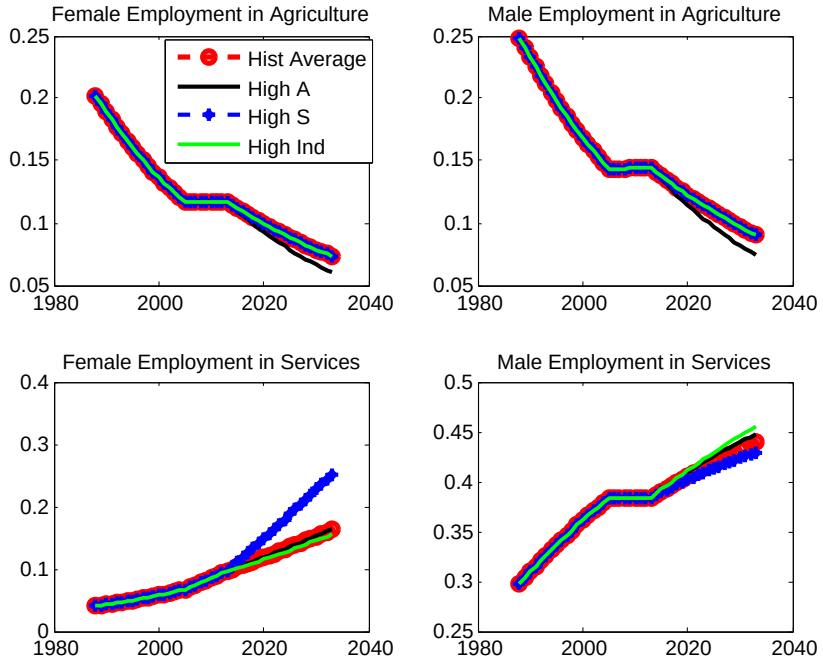

Table 1: Model Parameters

Parameter	Value	Source
η	0.59	Calibration
ε	-1.28	Rogerson (2008)
μ	0.68	Acemoglu et al. (2004)
α_c	0.71	Calibration
α_g	0.08	Calibration
α_l	0.54	Calibration
α_s	0.45	Calibration
$\bar{A}$	0.45	Calibration
ϕ_a	0.51	Calibration
ϕ_s	0.50	Calibration

Table 2: Moments used in calibration (%)

	Male	Female
Employment rate in agriculture	24.7	20.1
Employment rate in market service	29.8	4.2
Employment rate in goods	20.8	-
Share of time for home production	-	55.0

Table 3: Average sectoral productivity growth rates (%)

	1988-2005	2006-2013	1988-2013
Agriculture	3.20	-1.00	2.33
Service	0.95	1.26	1.13
Industry	2.55	0.69	2.07

Table 4: Projection Results: Change in employment ratios 2013-2033 (% points)

	Total		Services		Agriculture		Goods	Home
	Male	Female	Male	Female	Male	Female	Male	Female
Scenario 1	-1.54	2.33	5.42	6.72	-5.40	-4.38	-1.56	-3.63
Scenario 2	-1.95	-0.60	7.17	4.94	-6.83	-5.54	-2.28	-1.03
Scenario 3	0.06	8.71	-0.09	8.55	0.20	0.16	-0.04	-8.66

Note: Scenario 1 uses 1988-2013 growth rates, Scenario 2 uses 1988-2005 growth rates while Scenario 3 uses 2006-2013 growth rates.

Table 5: Role of Sectors in Female Employment: Change in employment ratios 2013-2033 (% points)

	Total		Services		Agriculture		Goods	Home
	Male	Female	Male	Female	Male	Female	Male	Female
Benchmark	-1.54	2.33	5.42	6.72	-5.40	-4.38	-1.56	-3.63
High θ_a	-2.01	1.11	6.29	6.82	-7.03	-5.7	-1.26	-2.79
High θ_s	-1.54	10.48	4.41	14.86	-5.41	-4.38	-0.54	-11.77
High θ_g	-1.54	1.57	7.07	5.95	-5.41	-4.38	-3.21	-2.86

θ_a: Agricultural productivity; θ_s: Service productivity; θ_g: Industry productivity. High θ_a: Scenario under which we use the average productivity growth rates between 1988-2013 for industry and services, and one percentage points higher productivity growth than the 1988-2013 average for agriculture. Productivity growth rates in High θ_s and High θ_g cases are computed in the same fashion.

A Appendix

Data

All the data used in this paper is retrieved from Turkish Statistical Institute (TurkStat).[6] Sectoral GDP data is constructed using GDP by production approach data under the National Accounts Database of TurkStat. There are three main sectors in the model, namely agriculture, industry and services. GDP by production approach data presents output produced for different categories of economic activity. We group Agriculture, Hunting and Forestry and Fishing under Agriculture; Wholesale and Retail Trade, Hotels and Restaurants, Transportation, Storage and Communication, Financial Intermediation, Real Estate, Renting and Business Activities, Public Administration, and Defense, Compulsory Social Security, Education Health and Social Work, Other Community Social, Private Household with employed persons under Service category; Mining and Quarrying, Manufacturing, Electricity, Gas and Water supply, Construction under Industry Category.

Data on labor force, population and employed individuals by branch of economic activity for males and females are retrieved from Labor Force Statistics Database. Our population, labor force and employed pool consists of individuals aged 15 and above. There is a break in the labor force survey data that is due to a change in the method of the Census survey in 2007. Prior to this date, Census survey was conducted every five years and the labor force survey used weights based on population projections from this survey to aggregate the results. From

[6] Visit *http://www.turkstat.gov.tr/* for more information.

that year on individuals have been tracked with their national identity number and the residency address they need to report to the population registry offices. Hence TurkStat was able to use the actual population data. This change resulted in a level shift in the labor force survey data. To adjust the data for this break, we make use of the fact that growth rates are not affected by this change in methodology. Hence we compute the growth rate for male and female statistics of interest for the whole period. The only problematic year is 2004 where we assume that the growth rates are the average of the growth rates observed in 2003 and 2005. Having computed these growth rates, we calculated the whole series backwards starting from their 2013 values.

There is another change in sectoral employment and GDP data stemming from a reclassification of detailed sectors. TurkStat gives employment numbers using Nace Rev.1 classification until 2009 and in Nace Rev.2 starting from 2004. Subsectors were reclassified in a more disaggregated way in the new system. For years between 2004 and 2009, where there is data with both classifications, we compare Nace Rev.1 and Nace Rev.2 values for sectoral employment data and observe that the change in the classification method does not appear to create a break. Therefore in computing sectoral employment data we use Nace Rev. 1 values until 2009 and Nace. Rev. 2 values after 2009. For sectoral GDP data, we use Nace Rev. 1 data at 1998 prices for the whole period.