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Gender Gaps in the Labor Market and Economic Growth

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Abstract

This paper studies the effects of policies aimed at mitigating discrimination against women in the marketplace on the gender wage gap, decisions to invest in skills, the composition of employment and unemployment, and long-run growth. The analysis uses a gender-based overlapping generations model with labor market rigidities. Gender bias in the workplace varies inversely with the presence of skilled women (as agents of change) in the labor market and has a direct impact on their bargaining power in the family. The model is calibrated for Morocco. Experiments show that although the benefits of policies aimed at mitigating gender bias in the workplace can promote growth and be significantly magnified through a stronger presence of skilled women in the labor market, a trade-off may emerge with respect to female unemployment when anti-discrimination policies are combined with policies aimed at subsidizing women's training. To internalize this trade-off, anti-discrimination policies in the marketplace may need to be complemented by measures aimed at reducing labor costs and raising productivity.

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1 Introduction

Despite improvements in education and skills, gender disparities in labor market opportunities and outcomes remain widespread in the developing world. In many countries labor force participation rates among women remain indeed well below those for men and, when women do participate, they often face a higher likelihood of being employed in precarious jobs or of being openly unemployed.

Northern Africa provides a vivid illustration of these disparities. The labor market participation rate for women in that region remains very low by international standards; at just under 23 percent currently, it is less than half the world average of about 49 percent. It is also 51 percent lower than the participation rate for men. Working women in that part of the world are more likely than men to be in vulnerable forms of employment; they are over-represented among contributing family workers, who often perform a disproportionate amount of unpaid care and household work (Charmes (2015), International Labour Organization (2016*a*), and Rubiano and Viollaz (2018)). The gender gap in formal sector jobs is also large; in 2017, the shares of men and women in wage and salaried employment were 62.8 percent for men and 54 percent for women (International Labour Organization (2017, Table E5c)). In addition, women in the labor force are twice as likely as men to be unemployed, with an average female unemployment rate of about 20 percent compared to 9.5 percent for men—a gap of 10.5 percentage points.[1] At the same time, gender disparities in employment and unemployment only partially reflects the extent of the labor market challenges that women face, in North Africa and elsewhere: these disparities also relate to remuneration, across all levels of occupation and sectors. In many countries, the gender gap in hourly wages remains large, despite the introduction of equal pay laws (International Labour Organization (2016*b*)).

The persistence of these gender gaps in labor force participation rates, hours worked, and earnings is the result of a number of factors. Social and cultural norms, as well as entrenched stereotypes, are a key source of discrimination against women in the labor market. In turn, discrimination shapes women's labor supply decisions; in effect, women

[1] See International Labour Organization (2017, Chapter 2). This gap is even larger for young females. The *MENA gender paradox* is an expression that has been used by some to describe the fact that despite having achieved higher educational levels, women in the Middle East and North Africa are also more likely to be unemployed or not economically active.

often internalize the future constraints that they may face in the labor market and may decide either to eschew higher education or not to enter the labor force, even when they do acquire advanced skills. In such conditions, increased effort to improve labor market opportunities for women is essential. For many advocates, the entrenched nature of the obstacles that women face represents *prima facie* evidence in favor of targeted and well-designed public policies to address them.

The purpose of this paper is to contribute to this debate by focusing on the role of anti-discrimination policies on gender inequality in the labor market and assess their impact on economic growth. Our analysis is quantitative in nature and based on an overlapping generations (OLG) model, where, due to the existence of labor market rigidities unemployment of both men and women emerges in equilibrium. Much of the existing literature on gender-based OLG models that account for gender discrimination in the labor market has, by and large, focused on men's and women's time allocation, that is, the *intensive* margin of labor supply. They also generally assume that wages are fully flexible and that all individuals allocate some (if not all) of their time to market employment. The focus has therefore been mainly on the interaction between changes in time allocation (induced for instance by improved access to infrastructure or technology), gender bias in the workplace (and possibly in the family) and growth.[2] Human capital accumulation is often modelled in the Lucas-Uzawa tradition (according to which knowledge can accumulate indefinitely), and individual educational choices are ignored. By contrast, in the model developed in this paper, our focus is on the decision, for both men and women, to acquire skills; that decision depends endogenously on expected relative wages. Thus, wage discrimination against women in high-skill jobs may have an adverse effect on the composition of women's labor supply. In addition, due to minimum wage legislation (for the unskilled) and the presence of a wage-setting trade union (for the skilled), unemployment of both types of labor can emerge in equilibrium. The possibility of high unemployment, by affecting the expected return to education, has an indirect adverse effect on women's incentives to acquire skills. Finally, the model assumes that skilled women in employment are *agents of change* in the labor market, and that their presence contributes to reducing gender discrimination against them.

[2] See de la Croix and Vander Donckt (2010), Hiller (2014), Agénor (2017, 2018) Agénor and Canuto (2015), and Prettner and Strulik (2017) for examples.

We conduct our numerical analysis by calibrating the model for Morocco, a country where the key gender disparities highlighted earlier (low participation rate for women, higher unemployment rate than men, and a sizable gender pay gap) are present. In addition, minimum wage legislation and a strong presence of trade unions are indeed key sources of labor market rigidities and structural unemployment. Numerical experiments show that an initial policy aimed at mitigating gender bias in the workplace can generate further benefits in terms of reductions in gender inequality, both at home and in the workplace, while at the same time improving the presence of skilled women in the labor market, reducing wage gaps and unemployment, and contributing to higher growth rates in the long run. The model therefore highlights an important source of dynamics that can be initiated by anti-discrimination laws—a two-way process between gender gaps in the labor market and growth, despite the fact that higher wages tend to mitigate the demand for women's labor. However, we also establish that when anti-discrimination policies in the marketplace are combined with subsidies to female training, a trade-off may emerge between gender equality and female unemployment; to internalize this trade-off may require complementary structural policies aimed at reducing labor costs and increasing productivity across the board.

The remainder of the paper is structured as follows. Section 2 provides a background on gender disparities in Morocco's labor market, with an emphasis on the issues that we directly address in this paper. Sections 3 and 4 present the model and its equilibrium solution. Its calibration is discussed in Section 5. Section 6 focuses on our key experiment—an anti-discriminatory policy aimed at reducing initially the gender pay gap in the marketplace—and performs some sensitivity analysis. Section 7 considers the case where this policy is accompanied by measures aimed at raising women's bargaining power in the family and with a subsidy to female education. The final section summarizes the main results and discusses some possible extensions of the analysis.

2 Background

Although a number of reforms of the legal framework have been adopted to promote gender equality in Morocco, women continue to face significant barriers. Indeed, the country's labor market is characterized by all the key gender disparities highlighted earlier, including low labor force participation and high unemployment for women, and a persistent gender wage gap. In addition there is also a low participation rate for men, and a high rate of unemployment for the youth. More than half of the working age population (53.3 percent) is out of the labor force, the vast majority being women. In 2016 the labor force participation rate was around 26.3 percent for women, compared to 71.6 percent for men. Among the young (15-29 years of age) these rates are 34.9 percent and 53.4 percent, respectively. As a result Morocco ranks in the bottom 20 percent of countries in the world with the lowest female participation in the labor force. In terms of levels of education, 3 out of 5 (63 percent) inactive women do not have any degree whereas a small share (8 percent) has a tertiary education. Moreover, the participation rate among women aged 15 and over has declined steadily since the late 1990s, by almost 3.5 percentage points between 1999 and 2016 (see Ragbi et al. (2017)). Once employed, women are also the most exposed on average to job insecurity, informal work and lower pay. Moreover, they often leave their jobs when they marry, partly as a result of social norms and partly because available jobs do not offer flexible schedules.

Women are also disproportionately affected by unemployment. While the overall unemployment rate, at 9.4 percent in 2016, is high, it particularly affects women, whose unemployment rate is 14.7 percent compared to 8.8 percent for men. This gap is especially large for skilled workers: 24.9 percent for women and 14.6 percent for men, compared with 2.9 percent and 4.1 percent, respectively, among unskilled workers.[3] Similar patterns are observed in other countries in the region, including Tunisia (Mouelhi and Goaied (2017)).

According to survey results by the country's Haut-Commissariat au Plan, several factors help to explain the low labor force participation rate among women (see World Bank (2018)). Of the 10 million women not currently participating in the labor market, 52.7 percent (more than half) consider household responsibilities as the main reason for staying home—more than 22 points higher than the survey estimate reported by the International Labour Organization (2017, Table 5) for Northern Africa as a whole. Indeed, time use surveys indicate that women continue to perform the vast majority of household tasks (see Attioui et al. (2017)). This factor, however, decreases as the

[3]For workers with tertiary education only, the data are similar: the unemployment rate is 29.7 percent for women and 14.4 percent for men. he unemployment rate for the unskilled (men and women) is lower than for the skilled because they cannot remain openly unemployed for long and often seek employment in the informal economy.

level of education increases: while 60 percent of women with no education degree report household duties as the primary reason for staying home, only 31 percent of women with tertiary education make the same claim. The data indicate also that 17.9 percent do not want to work; and for 11.6 percent of inactive women, a close relative (father, husband or other) does not allow them to work.[4] Again, these numbers differ markedly from those reported by the International Labour Organization (*op. cit.*) for Northern Africa, which are 30.1 percent and 5.6 percent, respectively. In addition, 10.9 percent would like to find employment, which represents a potential of 1.1 million additional workers.[5] A formal empirical analysis by Attioui et al. (2017) has indeed documented the fact that the primary reason for inactivity among women in Morocco is related to household duties and child (as well as, in some cases, elderly) caring.

Finally, there is also evidence of persistent legal gender discrimination.[6] Women have fewer rights to economic assets (inheritance), social security benefits, and marital property. Despite the adoption of a new family code in 2004, divorced women continue to struggle to assert their alimony rights, and single mothers remain subject to discrimination.This affects women's ability and capacity to engage in the labor market, as well as (regarding their limited rights to marital property, for instance) their bargaining power in the family.

The model that we present next does not aim to explain the low participation rate for women in Morocco. Based on the above evidence, we view women's decision to participate in the labor market in the first place as essentially a dichotomous, all-or-nothing choice in the presence of social norms that compel women to devote a significant share of their daily time to household chores and child rearing, and indivisibilities in the time that women must allocate to market work—should they choose to be employed. From that perspective, the secular fall in women's participation rate reported earlier is consistent with the evidence presented by Ragbi et al. (2017, Figure 1.11), which shows

[4] This issue is not limited to Morocco. As noted in a recent issue of *The Economist* (May 4, 2018), in 104 countries around the word women are barred from certain jobs, and in 18 countries a husband can prevent his wife from working. These sex-specific restrictions do not relate to temporary and specific precautions (as in the case of pregnant and breast-feeding women when working with chemicals, for instance) but rather to *a priori* assumptions about weaknesses that women may suffer from.

[5] According to World Bank estimates, alleviating the obstacles in accessing the labor force by those 1.1 million women would bring an increase of 4.3 and 8.5 percentage points to the overall labor force participation rate (up to 51 percent compared to 46.7 percent) and to the female labor force participation rate (up to 31 percent compared to 22.4 percent). However, the implications for growth are not assessed.

[6] See World Bank (2013).

that the proportion of women permanently engaged in partial employment among all employed women in urban areas has declined substantially, from 11.9 percent in 1999 to 4.6 percent in 2013.[7] A key policy question, in that context, is thus how to promote greater flexibility in employment practices—an issue that we do not address. Our focus, instead, is on employment and unemployment gaps among active workers. We base our analysis on a framework where all adults, men and women, are willing and able to engage in market work and face only one decision prior to seeking employment—whether they should invest in advanced training or enter the labor market as unskilled workers. We study the interactions between the decision to acquire skills, firms' employment decisions, the gender pay gap, structural unemployment, and how changes in the gender composition of employment affect the degree of discrimination in the labor market—and how, in turn, changes in gender bias in the workplace affect women's bargaining power in the family and ultimately economic growth.

3 The Model

Consider an economy where a market good is produced and individuals, males and females, live for two periods: adulthood (period t) and retirement (period $t+1$). The good can be either consumed in the period it is produced or stored to yield capital at the beginning of the next period. Population is constant at $\bar{N}$ and is equally distributed across genders.

Each individual is either male or female, and is endowed with one unit of time in each period of life. In old age time is devoted entirely to non productive activities. At the beginning of adulthood, individuals decide whether or not to invest in advanced training; if they do, they become skilled workers, otherwise, they are unskilled. Acquiring skills requires both time and pecuniary costs. After they have undergone training (if they choose to do so) they meet randomly with someone of the opposite sex to form a family. Once married, individuals do not divorce; couples retire together and die together.[8] All income is pooled and there is full consumption insurance in each household. Rigidities

[7] As documented by Attaoui et al. (2017), women's labor force participation in Morocco depends on a number of other structural factors, which include demographic characteristics.

[8] By excluding the possibility of divorce, and its possible impact on women's bargaining power, we abstract from a possibly important determinant of labor force participation and the decision to acquire skills. However, doing so would complicate significantly the analysis.

prevail in the labor market and unemployment emerges in equilibrium.

3.1 Skills Acquisition

Individuals have identical preferences but are born with different abilities, indexed by a^j, where $j = f, m$ refers to female and male, respectively. Ability is instantly observable and follows a continuous distribution with density function $f(a^j)$ and cumulative function $F(a^j)$, with support $(0, 1)$ in both cases. For tractability, a^j is assumed to be uniformly distributed on its support.

The decision to acquire skills depends on relative wages and the cost of training. Specifically, an adult with ability a^j can enter the labor force at the beginning of period t as unskilled and earn the wage w_t^U, which is independent of the worker's ability and (as discussed later) identical for both genders. Alternatively, individual j may choose to first spend a fraction $\varepsilon \in (0, 1)$ of his/her time endowment at the beginning of adulthood in training, incur a cost $tc_t^j > 0$, and then enter the labor force for the remainder of the period as skilled, earning the wage $w_t^{j,S}$. During training, workers earn no income. All individuals can be either employed or unemployed. If unemployed, individuals earn an unemployment benefit, x_t^h, $h = U, S$, which is the same for males and females and is not taxable.

Let $\varepsilon_t^{j,h}$ denote time allocated to market activity by adult j. The time constraint of each individual is thus

$$\varepsilon_t^{j,U} = 1, \tag{1}$$

if unskilled, and

$$\varepsilon_t^{j,S} + \varepsilon = 1, \tag{2}$$

if skilled. From now on, the time subscript is omitted for simplicity.

An individual j finds it optimal to train if and only if his/her expected earnings as a skilled worker, adjusted for the time and pecuniary costs of training, exceed the expected earnings of an unskilled worker:

$$\begin{aligned}(1-\tau)(1-\varepsilon)q^{j,S}w_t^{j,S} + (1-q^{j,S})(1-\varepsilon)x_t^S \\ -tc_t^j \geq q^{j,U}w_t^U + (1-q^{j,U})x_t^U,\end{aligned} \tag{3}$$

where $\tau \in (0, 1)$ is the tax rate, $q^{j,S}(1-\tau)(1-\varepsilon)w_t^{j,S}$ is the expected after-tax wage if skilled and employed (for period $1-\varepsilon$, as implied by (2)), with $q^{j,S} \in (0, 1)$ denoting the subjective employment probability, and $(1-q^{j,S})(1-\varepsilon)x_t^S$ expected income if skilled and unemployed. Similar definitions apply to $q^{j,U}w_t^U$ and $(1-q^{j,U})x_t^U$, with the difference that now all time is allocated to market work (as implied by (1)).[9] For simplicity, only employed skilled workers are taxed.

The training cost is proportional at the rate $\lambda \in (0,1)$ to the expected skilled wage when employed and varies inversely with the individual's ability, which determines how well he or she can learn:

$$tc_t^j = (\lambda - \mu^j)(1-\tau)(1-\varepsilon)q^{j,S}w_t^{j,S}/(a^j)^\chi, \tag{4}$$

with $\chi \in (0,1)$ and $0 \leq \mu^j < \lambda$ is the share of the training cost incurred by individual j covered by government subsidies. The assumption on the productivity parameter χ ensures that the effect of ability on training costs is subject to diminishing returns.

As shown in the Appendix (available upon request), the threshold level of ability $a_t^{j,C}$ such that all individuals (males or females) with ability higher than $a_t^{j,C}$ choose to undergo training is given by

$$a_t^{j,C} = (\lambda - \mu^j)^{1/\chi}\left\{1 - \frac{q^{j,U}w_t^U + (1-q^{j,U})x_t^U - (1-q^{j,S})(1-\varepsilon)x_t^S}{(1-\tau)(1-\varepsilon)q^{j,S}w_t^{j,S}}\right\}^{-1/\chi}. \tag{5}$$

The productivity of unskilled workers is constant regardless of ability or gender (as noted earlier) and is normalized to unity. Given (5), the raw supply of unskilled labor j, $Z_t^{j,U}$, is equal to the number of individuals of gender j in the population—which is equal to $\bar{N}/2$, given that men and women are in equal numbers—who choose not to undergo training:

$$Z_t^{j,U} = \frac{\bar{N}}{2}\int_0^{a_t^{j,C}} f(a)da = \frac{a_t^{j,C}\bar{N}}{2}. \tag{6}$$

The *raw* supply of skilled workers with ability $a^j \in (a_t^{j,C}, 1)$ is $0.5\bar{N}\int_{a_t^{j,C}}^1 f(a^j)da^j = (1-a_t^{j,C})0.5\bar{N}$. However, the average productivity of these workers, by the properties of the uniform distribution, is equal to $0.5(a_t^{j,C}+1)$. Thus, by implication of the law of large numbers, the *effective* supply of skilled labor j, $Z_t^{j,S}$, can be defined as

$$Z_t^{j,S} = \frac{(1-a_t^{j,C})(a_t^{j,C}+1)}{4}\bar{N} = \frac{1-(a_t^{j,C})^2}{4}\bar{N}. \tag{7}$$

[9]Equation (3) is assumed to hold as a strict inequality for individual j with the highest ability, that is, $a^j = 1$, otherwise nobody of gender type j would choose to become skilled. In principle, the decision to acquire skills should depend on expected utility under alternative occupations, as in Agénor and Alpaslan (2018) for instance. However, in the present setting, the resulting condition cannot be solved explicitly for the threshold level of ability.

3.2 Family Preferences

Each parent's utility function depends on gender (male or female, indexed by $j = f, m$), the level of education (unskilled or skilled, indexed by $h = U, S$), and labor market status (employed or unemployed, indexed by $\upsilon = E, L$), because all three characteristics, as shown next, determine income. Thus, there are in principle eight possible types of families.

A parent j with status h, υ has own utility function given by

$$V_t^{j,h}(\upsilon) = \eta_C^{j,h} \ln c_t^{j,h}(\upsilon) + \frac{1 - \eta_C^{j,h}}{1+\rho} \ln c_{t+1}^{j,h}(\upsilon), \tag{8}$$

where $c_t^{j,h}(\upsilon)$ ($c_{t+1}^{j,h}(\upsilon)$) is consumption in adulthood (old age), and ρ the common discount rate. In addition, spouses differ with respect to the weights that they attach to today's consumption, as measured by $\eta_C^{j,h} \in (0, 1)$. Specifically, the restriction $\eta_C^{f,h} < \eta_C^{m,h}$ is imposed. Thus, women are less (more) concerned than men about current (future) consumption, which induces them to save more (less) today. This assumption has been well documented in the literature (see World Bank (2011)).

For tractability, we assume that marriage only occurs within each education group and labor market status, that is, skilled with skilled, employed with employed, and so on. Thus, there are only four types of families: unskilled employed (U, E), unskilled unemployed (U, L), skilled employed (S, E), and skilled unemployed (S, L).[10] In addition, in line with the collective household approach, we assume that parents pool all their resources.

For the first two family types, U, E and U, L, the budget constraint for period t is thus given by

$$c_t^{f,U}(\upsilon) + c_t^{m,U}(\upsilon) + s_t^U(\upsilon) = \begin{cases} 2w_t^U & \upsilon = E \\ 2x_t^U & \upsilon = L \end{cases}, \tag{9}$$

whereas for types S, E and S, L:

$$c_t^{f,S}(\upsilon) + c_t^{m,S}(\upsilon) + s_t^S(\upsilon) = \begin{cases} (1-\tau)(1-\varepsilon)[(w_t^{f,S} + w_t^{m,S}) - tc_t^f - tc_t^m] & \upsilon = E \\ (1-\varepsilon)2x_t^S - tc_t^f - tc_t^m & \upsilon = L \end{cases}, \tag{10}$$

where $s_t^h(\upsilon)$ is savings of family h with employment status υ, and $1 + r_{t+1}$ the gross rate of return between periods t and $t+1$. The budget constraint for period $t+1$ takes the same form for all types h, υ, that is,

[10] A more general treatment of potential pairing between individuals would of course be more realistic but would make the notation and derivations a lot more cumbersome, without adding much insight.

$$c_{t+1}^{f,h}(\upsilon) + c_{t+1}^{m,h}(\upsilon) = (1 + r_{t+1}) s_t^h(\upsilon). \tag{11}$$

Combining (9), (10) and (11), the consolidated budget constraint for family type h is thus

$$c_t^U(\upsilon) + \frac{c_{t+1}^U(\upsilon)}{1 + r_{t+1}} = \begin{cases} 2w_t^U & \upsilon = E \\ 2x_t^U & \upsilon = L \end{cases}, \tag{12}$$

$$c_t^S(\upsilon) + \frac{c_{t+1}^S(\upsilon)}{1 + r_{t+1}} = \begin{cases} (1-\tau)[(1-\varepsilon)(w_t^{f,S} + w_t^{m,S}) - tc_t^f - tc_t^m] & \upsilon = E \\ (1-\varepsilon)2x_t^S - tc_t^f - tc_t^m & \upsilon = L \end{cases}, \tag{13}$$

where

$$c_{t+n}^h(\upsilon) = c_{t+n}^{f,h}(\upsilon) + c_{t+n}^{m,h}(\upsilon), \tag{14}$$

denotes total consumption of family h, υ for $t + n$, with $n = 0, 1$.

Family type h, υ's utility takes the form

$$V_t^h(\upsilon) = \varkappa_t^h V_t^{f,h}(\upsilon) + (1 - \varkappa_t^h) V_t^{m,h}(\upsilon), \tag{15}$$

where $\varkappa_t^h \in (0, 1)$ measures the wife's bargaining power in the family's decision process. Each family maximizes (15) subject to (1) or (2), (8), (12) or (13), with respect to $c_t^{j,h}(\upsilon)$ and $c_{t+1}^{j,h}(\upsilon)$, taking b_t, $\varkappa_t^h$, $w_t^{j,h}$, x_t^h, and r_{t+1} as given.[11]

3.3 Market Production

Firms engaged in market production are identical and their number is normalized to unity. Each firm $i \in (0, 1)$ produces a single market good, using male and female labor, both skilled and unskilled, and physical capital, K_t^i.

The production function of firm i takes the Cobb-Douglas form

$$Y_t^i = A_t (N_t^{U,i})^{\beta^U} (N_t^{S,i})^{\beta^S} (K_t^i)^{1-\beta^U-\beta^S}, \tag{16}$$

where A_t is an aggregate productivity index, and $N_t^{U,i}$ and $N_t^{S,i}$ are unskilled and skilled composite labor inputs, respectively, also taking a Cobb-Douglas form:

$$N_t^{h,i} = (\varepsilon^{f,h} N_{i,t}^{f,h})^{\delta} (\varepsilon^{m,h} N_{i,t}^{m,h})^{1-\delta}, \qquad h = U, S \tag{17}$$

[11] In this setting, where the possibility of divorce is excluded, Nash bargaining is efficient. See Doepke and Tertilt (2016) for a discussion of the solution of cooperative and noncooperative household bargaining models.

where $\varepsilon^{f,U} = \varepsilon^{m,U} = 1$ (as implied by (1)), $\beta^U, \beta^S, \delta \in (0,1)$. Thus, inputs are imperfect substitutes and production exhibits constant returns to scale.

Assuming full depreciation, firm i's profits are defined as

$$\Pi_{i,t}^Y = Y_t^i - (1+\varsigma_t)\sum\nolimits_j (w_t^{j,U} N_{i,t}^{j,U} + w_t^{j,S}\varepsilon^{j,S} N_{i,t}^{j,S}) - (1+r_t)K_t^i,$$

where $\varsigma_t \in (0,1)$ is the firm's contribution rate to the unemployment insurance scheme, based on its total wage bill.

There is no discrimination between men and women in the unskilled labor market, so $w_t^{j,U} = w_t^U$. But although the production technology itself is gender neutral, women experience wage discrimination in the skilled labor market. Specifically, as a result of gender bias, skilled women earn only a fraction $b_t \in (0,1)$ of their marginal product. In addition, discrimination is a pure loss to society. Thus, profit maximization with respect to production inputs gives, under symmetry,

$$w_t^U = (\frac{1}{1+\varsigma_t})\frac{\delta\beta^U Y_t}{N_t^{f,U}} = (\frac{1}{1+\varsigma_t})\frac{(1-\delta)\beta^U Y_t}{N_t^{m,U}}, \tag{18}$$

$$\varepsilon_t^{f,S} w_t^{f,S} = (\frac{b_t}{1+\varsigma_t})(\frac{\delta\beta^S Y_t}{N_t^{f,S}}), \qquad \varepsilon_t^{m,S} w_t^{m,S} = (\frac{1}{1+\varsigma_t})\frac{(1-\delta)\beta^S Y_t}{N_t^{m,S}}, \tag{19}$$

$$1 + r_t = (1-\beta^U-\beta^S)\frac{Y_t}{K_t}. \tag{20}$$

From (19), and given that from (2) $\varepsilon_t^{j,S} = 1-\varepsilon$,

$$\frac{w_t^{f,S} N_t^{f,S}}{w_t^{m,S} N_t^{m,S}} = \frac{\delta b_t}{1-\delta}. \tag{21}$$

Setting $n_t^{j,S} = N_t^{j,S}/0.5\bar{N}$, this equation implies that the gender wage gap is given by

$$\frac{w_t^{m,S}}{w_t^{f,S}} = \frac{1-\delta}{\delta b_t}(\frac{n_t^{f,S}}{n_t^{m,S}}), \tag{22}$$

which implies that, for a given skilled wage ratio (determined by utility-maximizing trade unions, as discussed next), the higher the degree of discrimination in the workplace is (that is, the lower b_t is), the lower the female-male employment ratio.

We assume a generalized Arrow-Romer externality, which is such that

$$A_t = A\frac{K_t^{\beta^U+\beta^S}}{(N_t^U)^{\beta^U}(N_t^S)^{\beta^S}}, \tag{23}$$

where $A > 0$ and, N_t^h, aggregate employment of type h, is obtained from (17) under symmetry.

Given that firms are identical, and that their number is normalized to 1, $K_t = K_t^i \; \forall i$ and aggregate output is, from (16) and (23),

$$Y_t = \int_0^1 Y_t^i di = AK_t. \tag{24}$$

3.4 Wages and the Labor Market

Wage formation differs for skilled and unskilled workers. Unskilled workers (males and females) are paid a uniform, government-mandated minimum wage, w_t^U, which varies positively with income per capita and negatively with the total unskilled unemployment rate, θ_t^U, in proportion of the total population:

$$w_t^U = w_0^U(\frac{Y_t}{\bar{N}})(\theta_t^U)^{-\psi^U}, \tag{25}$$

where $\psi^U \geq 0$.

The skilled wage for each gender type is set by a monopoly union.[12] The union's objective is to maximize worker compensation, subject to wage and employment targets. Specifically, the union sets $w_t^{f,S}$ and $w_t^{m,S}$ with the objective of maximizing a utility function that depends on deviations of both employment and wages from their target levels, subject to the demand schedule for each type of labor.[13] Normalizing the employment target to zero for simplicity, the union's utility function takes the standard form

$$\mathfrak{V}_t^j = (w_t^{j,S} - w_t^{j,T})^{\psi}(N_t^{j,S})^{1-\psi},$$

where $w_t^{j,T}$ measures the union's target wage, $\psi \in (0,1)$ the relative weight attached by the union to wage deviations from that target, and $N_t^{j,S}$ is given from conditions (19).

The first-order condition for this maximization problem is

$$\psi(\frac{N_t^{j,S}}{w_t^{j,S} - w_t^{j,T}})^{1-\psi} + (1-\psi)(\frac{N_t^{j,S}}{w_t^{j,S} - w_t^{j,T}})^{-\psi}(\frac{\partial N_t^{j,S}}{\partial w_t^{j,S}}) = 0,$$

[12] A more general specification would be to assume a right-to-manage framework or that the union and employers bargain over both wages and employment through a generalized Nash bargaining solution, as for instance in Chang and Hung (2016). However, given our focus on gender issue we adopt a simpler specification for simplicity.

[13] The union's optimization problem is static, in the sense that when it formulates its wage demands it takes the existing capital stock as given and does not internalize the effect of future wages on the firm's decision to accumulate capital—and thus future labor demand. This is tantamount to assuming sequential wage bargaining and the absence of reputational links across periods.

or equivalently, given that from (19) $\partial N_t^{j,S}/\partial w_t^{j,S} = -N_t^{j,S}/w_t^{j,S}$,

$$\psi(\frac{N_t^{j,S}}{w_t^{j,S} - w_t^{j,T}}) - \frac{(1-\psi)N_t^{j,S}}{w_t^{j,S}} = 0,$$

which can be rearranged to give $w_t^{j,S}$ as a mark-up over the target wage:[14]

$$w_t^{j,S} = (\frac{1-\psi}{1-2\psi})w_t^{j,T}. \tag{26}$$

The union's target wage for skilled worker j is positively and linearly related to the level of per capita income, $Y_t/\bar{N}$, and negatively related to the unemployment rate for that category of workers, $\theta_t^{j,S}$:

$$w_t^{j,T} = w_0^{j,S}(\frac{Y_t}{\bar{N}})(\theta_t^{j,S})^{-\psi^S}, \tag{27}$$

where $w_0^{j,S}$, $\psi^S \geq 0$. Equation (27) implies that, because the probability of finding a job (at any given wage) is low when unemployment is high, the union has an incentive to moderate its wage demands in order to induce firms to increase employment.[15]

Inserting (27) in (26) yields

$$w_t^{j,S} = w_0^{j,S}(\frac{1-\psi}{1-2\psi})(\theta_t^{j,S})^{-\psi^S}(\frac{Y_t}{\bar{N}}). \tag{28}$$

Using (6), the equilibrium condition of the market for unskilled labor for each gender type is given by

$$Z_t^{j,U} = \frac{a_t^{j,C}\bar{N}}{2} = N_t^{j,U} + L_t^{j,U},$$

where $L_t^{j,U}$ is the number of unskilled workers of gender j who are unemployed. Equivalently, in terms of ratios to the adult population of each gender type, $\bar{N}/2$, and defining $n_t^{j,U} = N_t^{j,U}/0.5\bar{N}$,

$$z_t^{j,U} = a_t^{j,C} = n_t^{j,U} + \theta_t^{j,U}. \tag{29}$$

Similarly, using (7), the equilibrium condition of the market for (effective) skilled labor of each type is given by:

$$Z_t^{j,S} = \frac{1-(a_t^{j,C})^2}{4}\bar{N} = N_t^{j,S} + L_t^{j,S},$$

[14]Note that the mark-up is increasing in ψ. To ensure that $w_t^{j,S} > 0$ requires $\psi < 0.5$, a condition that we impose in the calibration.

[15]This inverse relationship between the *levels* of unemployment and wages is consistent with a variety of models of the labor market (see Agénor (2006)). Note that (25) implies a similar negative relationship, this time related to government's behavior.

where $L_t^{j,S}$ is the number of skilled workers of gender j who are unemployed. Again, in terms of ratios to population j, and noting that $n_t^{j,S} = N_t^{j,S}/0.5\bar{N}$,

$$z_t^{j,S} = \frac{1-(a_t^{j,C})^2}{2} = n_t^{j,S} + \theta_t^{j,S}. \tag{30}$$

Based on the above definitions, the shares of men and women in the adult population are given by

$$z_t^j = \frac{Z_t^{j,U} + Z_t^{j,S}}{\bar{N}} = \frac{z_t^{j,U} + z_t^{j,S}}{2}, \tag{31}$$

whereas the (weighted) aggregate skilled and unskilled unemployment rates are given by

$$\theta_t^h = (\theta_t^{f,h})^{\gamma^h}(\theta_t^{m,h})^{1-\gamma^h}, \qquad h = U, S \tag{32}$$

where $\gamma^h \in (0,1)$. The economy's total unemployment rate, in proportion of the adult population, can thus be defined as

$$\theta_t^L = (\theta_t^U)^{\gamma^L}(\theta_t^S)^{1-\gamma^L}, \tag{33}$$

where $\gamma^L \in (0,1)$.

Figure 1 summarizes individual decisions for each gender type with respect to skills acquisition, and its interactions with employment and unemployment.

3.5 Government

The government operates both a general budget and an unemployment insurance fund. It cannot issue bonds and must run balanced accounts in both cases. To finance its general outlays, the government levies a tax on skilled workers' wages at the rate τ. These outlays consist of subsidies to training, G_t^E, and spending on other (not directly productive) items, G_t^O. The government's general budget is thus given by

$$G_t^E + G_t^O = \tau \sum\nolimits_j \varepsilon^{j,S} w_t^{j,S} N_t^{j,S}. \tag{34}$$

Spending shares are constant fractions $\nu_s \in (0,1)$ of government revenues:

$$G_t^s = \nu_s \tau \sum\nolimits_j \varepsilon^{j,S} w_t^{j,S} N_t^{j,S}, \tag{35}$$

where $s = E, O$.

Combining (34) and (35) therefore yields

$$\nu_E + \nu_O = 1. \tag{36}$$

The total cost of training subsidies is given by $G_t^E = \sum_j \mu^j \varepsilon^{j,S} w_t^{j,S} N_t^{j,S}$. Combining this expression with (35) for $s = E$ gives therefore

$$\mu^f + \mu^m = \nu_E \tau. \tag{37}$$

As defined earlier, let $n_t^{j,h}$ denote the proportion of employed individuals, and $\theta_t^{j,h}$ the unemployment rate, of gender j and skill level h in population j. The unemployment insurance fund's budget is given by

$$\left\{ x_t^U \sum\nolimits_j \theta_t^{j,U} + x_t^S \sum\nolimits_j \theta_t^{j,S} \right\} \frac{\bar{N}}{2} = \varsigma_t \left\{ w_t^U \sum\nolimits_j n_t^{j,U} + \sum\nolimits_j n_t^{j,S} \varepsilon_t^{j,S} w_t^{j,S} \right\} \frac{\bar{N}}{2},$$

which implies that, using (2),

$$\varsigma_t = \frac{x_t^U \sum_j \theta_t^{j,U} + x_t^S \sum_j \theta_t^{j,S}}{w_t^U \sum_j n_t^{j,U} + (1-\varepsilon) \sum_j n_t^{j,S} w_t^{j,S}}. \tag{38}$$

Thus, all else equal, a higher benefit rate (x_t^U or x_t^S) raises the payroll contribution rate, thereby reducing labor demand. In turn, the reduction in labor demand (through a fall in employment ratios) mitigates the initial increase in the contribution rate at the initial unemployment and wage rates.

To ensure the existence of a nondegenerate solution, the unemployment benefit is set as a linear function of the level of per capita income, so that

$$x_t^h = \kappa^h \frac{Y_t}{\bar{N}}, \tag{39}$$

where $\kappa^h \in (0,1)$, with $h = U, S$, is the benefit indexation parameter.

3.6 Bargaining Power and Gender Bias

The relative bargaining power of women evolves as a function of the average (economy-wide) ratio of earned incomes by each spouse and the relative share of women in the labor force:

$$\varkappa_t^h = \varkappa_0^h \left(\frac{w_t^{f,h}}{w_t^{m,h}}\right)^{\mu_B^W} \left(\frac{n_t^{f,S}}{n_t^{m,S}}\right)^{\mu_B^N}, \tag{40}$$

where $\varkappa_0^h > 0$, $\mu_B^W > 0$, and $\mu_B^N \geq 0$ are sensitivity parameters. Thus, in line with the evidence, the higher women's relative wage is, the greater their bargaining power in the family.[16] In addition, we assume that the presence of women in the workplace also generates a positive externality in terms of women's bargaining power. Our view, consistent with the evidence, is that increases in (skilled) women's employment help to alter prevailing attitudes about what are considered "appropriate" roles for males and females, and that this translates into higher bargaining power in the family.

Gender bias against skilled women in the marketplace is inversely related to their relative presence among the employed:

$$b_t = b_0(\frac{n_t^{f,S}}{n_t^{m,S}})^{\mu_S}, \tag{41}$$

where $\mu_S \in (0,1)$. This specification is consistent with the view that women—albeit only skilled ones—are *agents of change* in the labor market, as discussed for instance by International Labour Organization (2015).

We focus in what follows on the benchmark case where $\mu_B^W = \mu_B^N = \mu_B$. Substituting (22) and (41) in (40) yields therefore

$$\varkappa_t^U = \varkappa_0^U, \qquad \varkappa_t^S = \varkappa_0^S[b_0(\frac{\delta}{1-\delta})]^{\mu_B}(\frac{n_t^{f,S}}{n_t^{m,S}})^{\mu_B\mu_S}, \tag{42}$$

which shows that women's bargaining power in the family is either constant (unskilled women) or depends on the skilled female-male employment ratio (skilled women), through its effect on the degree of gender bias in the marketplace.

3.7 Saving-Investment Balance

Given full depreciation, the saving-investment balance requires private capital in $t+1$ to be equal to savings in period t by all families, employed or unemployed in adulthood. As noted earlier, there are four family types, by level of skills and by labor market status (employed or unemployed). The total number of men (or women) in the population is $\bar{N}/2$. Among those, the numbers of employed women and men with skill level h are $n^{f,h}\bar{N}/2$ and $n^{m,h}\bar{N}/2$; thus, the number of employed families with skill level h is $(n_t^{f,h}\bar{N}/2 + n_t^{m,h}\bar{N}/2)/2$. Similarly, given that the numbers of unemployed women and

[16] For a discussion of the evidence, see for instance Doss (2013). Theoretical contributions that follow a similar approach include Iyigun and Walsh (2007), Prettner and Strulik (2017), and Agénor (2018).

men with skill level h are $\theta_t^{f,h}\bar{N}/2$ and $\theta_t^{m,h}\bar{N}/2$, the number of unemployed families with skill level h is $(\theta_t^{f,h}\bar{N}/2 + \theta_t^{m,h}\bar{N}/2)/2$. The savings-investment equilibrium condition takes therefore the form

$$K_{t+1} = \sum\nolimits_h s_t^h(E)(n_t^{f,h} + n_t^{m,h})\frac{\bar{N}}{4} + \sum\nolimits_h s_t^h(L)(\theta_t^{f,h} + \theta_t^{m,h})\frac{\bar{N}}{4}. \tag{43}$$

4 Equilibrium

In this economy, an *equilibrium with unemployment* is a sequence of consumption and saving allocations $\{c_t^h(\upsilon), s_t^h(\upsilon), c_{t+1}^h(\upsilon)\}_{t=0}^{\infty}$, $h = U, S$, $\upsilon = E, L$, prices of production inputs $\{w_t^U, w_t^{f,S}, w_t^{m,S}, r_{t+1}\}_{t=0}^{\infty}$, private capital $\{K_t\}_{t=0}^{\infty}$, such that, given an initial stock $K_0 > 0$,

a) all families, skilled or unskilled, employed or unemployed, maximize utility by choosing consumption subject to their intertemporal budget constraint, taking factor prices, the tax rate, the education subsidy, and the unemployment benefit as given;

b) firms maximize profits by choosing male and female labor, and capital, taking factor prices as given;

c) the trade union sets skilled wages so as to maximize its utility, subject to the demand for each type of labor by firms;

d) savings equals investment; and

h) unemployment of both categories of workers prevails.

A *balanced growth equilibrium* is an equilibrium with unemployment in which

a) $\{c_t^h(\upsilon), s_t^h(\upsilon), c_{t+1}^h(\upsilon)\}_{t=0}^{\infty}$, for $h = U, S$, $\upsilon = E, L$, and K_t, w_t^U, $w_t^{f,S}$, $w_t^{m,S}$, x_t^h, and Y_t grow at the constant, endogenous rate $1 + \gamma$, implying that the output-capital ratio is constant;

b) the rate of return on capital, $1 + r_{t+1}$, is constant;

c) the threshold levels of female and male individuals who choose to remain unskilled, $a_t^{f,C}$, $a_t^{m,C}$, are constant;

d) for each gender type skilled and unskilled unemployment rates, $\theta_t^{j,U}$ and $\theta_t^{j,S}$, are constant.

As shown in the Appendix, the solution to the family's optimization problem gives the standard Euler equation as

$$c_{t+1}^h(\upsilon) = (\frac{1 - \eta_t^{C,h}}{\eta_t^{C,h}})(\frac{1 + r_{t+1}}{1 + \rho})c_t^h(\upsilon), \tag{44}$$

and the savings rate for skill level h as

$$\sigma_t^h = \frac{(1 - \eta_t^{C,h})/(1 + \rho)\eta_t^{C,h}}{1 + (1 - \eta_t^{C,h})/(1 + \rho)\eta_t^{C,h}}, \tag{45}$$

where $\eta_t^{C,h}$ is family h's preference parameter for consumption, given by

$$\eta_t^{C,h} = \varkappa_t^h \eta_C^{f,h} + (1 - \varkappa_t^h)\eta_C^{m,h}. \tag{46}$$

Given that $\varkappa^U$ is constant (see (42)), $\eta_t^{C,U}$ and σ_t^U are also constant. But through $\eta_t^{C,S}$, the bargaining parameter $\varkappa_t^S$ for skilled women affects the family's savings rate. In addition, because gender bias in the workplace, b_t, affects $\varkappa_t^S$ directly, it also affects these variables as well.

The solutions for the labor market variables are given by, for $j = f, m$,

$$\tilde{n}^{f,S} = \frac{1}{w_0^{f,S}}(\frac{1-2\psi}{1-\psi})\frac{\tilde{b}\delta\beta^S}{(1-\varepsilon)(1+\tilde{\varsigma})}(\tilde{\theta}^{f,S})^{\psi^S}, \tag{47}$$

$$\tilde{n}^{m,S} = \frac{1}{w_0^{m,S}}(\frac{1-2\psi}{1-\psi})\frac{(1-\delta)\beta^S}{(1-\varepsilon)(1+\tilde{\varsigma})}(\tilde{\theta}^{m,S})^{\psi^S}, \tag{48}$$

$$\tilde{\theta}^{j,S} = \tilde{z}^{j,S} - \tilde{n}^{j,S}, \tag{49}$$

$$\tilde{n}^{f,U} = (\frac{\delta\beta^U}{w_0^U})(\frac{1}{1+\tilde{\varsigma}})(\tilde{\theta}^U)^{\psi^U}, \tag{50}$$

$$\tilde{n}^{m,U} = [\frac{(1-\delta)\beta^U}{w_0^U}](\frac{1}{1+\tilde{\varsigma}})(\tilde{\theta}^U)^{\psi^U}, \tag{51}$$

$$\tilde{\theta}^{j,U} = \tilde{z}^{j,U} - \tilde{n}^{j,U}, \tag{52}$$

$$\tilde{a}^{f,C} = (\lambda - \mu^f)^{1/\chi}\left\{1 - \frac{0.5\delta\beta^U(1+\tilde{\varsigma})^{-1}(q^{f,U}/\tilde{n}^{f,U}) + \Lambda^f}{(1-\tau)0.5\beta^S(1+\tilde{\varsigma})^{-1}b(q^{f,S}/\tilde{n}^{f,S})}\right\}^{-1/\chi}, \tag{53}$$

$$\Lambda^j = (1 - q^{j,U})\kappa^U - (1-\varepsilon)(1 - q^{j,S})\kappa^S, \tag{54}$$

$$\tilde{a}^{m,C} = (\lambda - \mu^m)^{1/\chi}\left\{1 - \frac{0.5(1-\delta)\beta^U(1+\tilde{\varsigma})^{-1}(q^{m,U}/\tilde{n}^{m,U}) + \Lambda^m}{(1-\tau)0.5\beta^S(1+\tilde{\varsigma})^{-1}(q^{m,S}/\tilde{n}^{m,S})}\right\}^{-1/\chi}, \tag{55}$$

$$\tilde{z}^{j,U} = \tilde{a}^{j,C}, \tag{56}$$

$$\tilde{z}^{j,S} = \frac{1-(\tilde{a}^{j,C})^2}{2}, \tag{57}$$

$$\tilde{z}^j = \frac{\tilde{z}^{j,U} + \tilde{z}^{j,S}}{2}, \tag{58}$$

$$\tilde{\theta}^h = (\tilde{\theta}^{f,h})^{\gamma^h}(\tilde{\theta}^{m,h})^{1-\gamma^h}, \tag{59}$$

$$\tilde{\theta}^L = (\tilde{\theta}^U)^{\gamma^L}(\tilde{\theta}^S)^{1-\gamma^L}, \tag{60}$$

$$\frac{\tilde{\varsigma}}{1+\tilde{\varsigma}} = \frac{\kappa^U\sum_j \tilde{\theta}^{j,U} + \kappa^S\sum_j \tilde{\theta}^{j,S}}{0.5[\beta^U + \beta^S(\delta\tilde{b} + 1 - \delta)]}. \tag{61}$$

The steady-state solutions for the degree of gender bias and women's bargaining power are given by

$$\tilde{b} = b_0(\frac{\tilde{n}^{f,S}}{\tilde{n}^{m,S}})^{\mu_S}, \tag{62}$$

$$\varkappa^U = \varkappa_0^U, \qquad \tilde{\varkappa}^S = \varkappa_0^S[b_0(\frac{\delta}{1-\delta})]^{\mu_B}(\frac{\tilde{n}^{f,S}}{\tilde{n}^{m,S}})^{\mu_B\mu_S}, \tag{63}$$

with the government general budget constraint

$$\mu^f + \mu^m = \nu_E\tau. \tag{64}$$

The exact expression for the steady-state growth rate of capital and output is provided in the Appendix. It is worth noting that, from (47), (48), (50), and (51), employment of either labor type h, j is *positively* related to the unemployment rate of type h, j; the reason is that a higher unemployment rate exerts downward pressure on each wage type and raises labor demand. Equations (47) and (48) also show that the ratio of female-male skilled employment, which affects the degree of gender bias in the marketplace and skilled women's bargaining power in the family (as shown in (62) and (63)), is also positively related to the female-male skilled unemployment rate.

Given the complexity of the model, the effects of anti-discrimination policies in the labor market cannot be studied analytically. To do so we therefore resort to a numerical analysis.

5 Calibration

To assess the impact of anti-discrimination policies on employment, unemployment, gender inequality and growth, we calibrate the model for Morocco (whose case was discussed earlier) using a variety of sources and solve it numerically.[17]

Regarding the *household side*, population is normalized to unity, so that $\bar{N} = 1$. The annual discount rate is set uniformly to a standard value of 0.04. Interpreting a period as 20 years in this framework yields an intergenerational discount factor of $[1/(1 + 0.04)]^{20} = 0.456$.[18] The aggregate family savings rate, σ, is set at 15.7 percent, as in Agénor and El Aynaoui (2016). By definition, this rate is the weighted average of

[17] Sensitivity analysis with respect to some key parameters is reported later.

[18] Recall that the model abstracts from the first period of life (childhood).

the savings rate for skilled and unskilled families (employed or unemployed, given that their savings rate is the same), $\sigma = 0.5\sigma^U + 0.5\sigma^S$.[19] We assume that, in line with the evidence on the relationship between the propensity to save and the level of income, the savings rate for the skilled is higher by 20 percent than the rate for the unskilled; thus, $\sigma^S = 1.2\sigma^U$. As a result, $\sigma^U = 2 \cdot 0.157 \cdot 2.2^{-1} = 0.143$ and $\sigma^S = 0.172$. Thus, $\sigma^S > \sigma^U$. The equation defining the savings rate (equation (45)) can then be solved backward with respect to parameter $\eta^{C,h}$, again assumed uniform for the employed and the unemployed. This gives $\eta^{C,S} = 0.584$ and $\eta^{C,U} = 0.589$.

Having determined $\eta^{C,h}$, the values $\eta_C^{f,h}, \eta_C^{m,h}$ must be calculated. In the absence of specific data for Morocco, we follow Agénor (2018) and set the ratio $\eta_C^{f,h}/\eta^{C,h} = 0.45$. Given the values of $\eta^{C,h}$ reported earlier, this gives $\eta_C^{f,U} = 0.265$ and $\eta_C^{f,S} = 0.241$. In addition, given again $\eta^{C,h}$, and the bargaining power parameters $\varkappa^U$ and $\varkappa^S$ reported below, the value of $\eta_C^{m,h}$ can be determined residually using (46), so that $\eta_C^{m,U} = 0.784$ and $\eta_C^{m,S} = 0.713$. Thus, by construction, $\eta_C^{f,h} < \eta_C^{m,h}$; men value today's consumption more than women, in line with the evidence.

The relative cost of training (or tertiary education), λ, and the average time spent in such training, ε, an are based on the estimates provided by Agénor and El Aynaoui (2016). This gives $\lambda = 0.12$ and $\varepsilon = 0.15$, respectively. We use a lower estimate for the parameter characterizing efficiency of training, χ, which is set at 0.1.

Regarding the *production side*, the elasticity of output of final goods with respect to unskilled labor, β^U, is set equal to 0.25, and with respect to skilled labor, β^S, to 0.45. Thus, consistent with the evidence, $\beta^U < \beta^S$. These values imply an elasticity of output with respect to capital equal to $1 - \beta^U - \beta^S = 0.3$, in line again with the empirical evidence.

Regarding the *labor market*, the benefit indexation parameters, κ^U and κ^S, are set equal to 0.3 and 0.1, respectively. The first estimate is close to the average value of the ratio of the minimum wage to value added per worker in middle-income countries estimated by Cho et al. (2012, Table 3.4). The second estimate is set at a lower value to reflect the fact that the government attaches a higher weight to keeping the minimum

[19] Consistent with (43), the savings rate should be weighted by $(q^{f,U} + q^{m,U})0.25\bar{N} + [(1 - q^{f,U}) + (1 - q^{m,U})]0.25\bar{N}$ for the unskilled, and similarly for the skilled. With the normalization $\bar{N} = 1$, these weights boil down to 0.5. Note that some microeconometric studies, such as Bertrand and Morse (2016), found that middle- and low-income earners tend to *reduce* their savings rate in response to rising incomes. However, that evidence pertains mainly to advanced economies.

wage in line with per capita income. The elasticity of the minimum wage and the union's target skilled wage with respect to unemployment, ψ^U and ψ^S, are set respectively at 0.5 and 0.7, whereas the union's preference for wages, ψ, is set at 0.48. Thus, the union attaches almost equal weights to wages and employment, and is more responsive to changes in unskilled unemployment.[20]

The shift parameters $w_0^{j,S}$ in (47) and (48), the shift parameter w_0^U in equation (51), and the parameter δ in (50) are solved for together as a static nonlinear subsystem, for given employment and unemployment rates, and for given values of b and ς (as discussed later). This gives $w_0^U = 0.044$, $w_0^{f,S} = 0.123$, $w_0^{m,S} = 0.041$, and $\delta = 0.547$.

The initial value of the gender bias parameter in the marketplace b is set at 0.836, as in Agénor et al. (2017). The sensitivity of b with respect to the skilled female-male employment ratio, μ_S, is set initially at 0.445, which implies that while (skilled) women are indeed *agents of change*, their impact on wage discrimination occurs with diminishing returns. Given the initial values of b and a skilled employment ratio of $n^{f,S}/n^{m,S} = 0.368$ (from the calculations reported later) the steady-state solution (62) can be solved backward for b_0; this gives $b_0 = 1.524$.

Regarding the *government*, the effective tax rate on wages (which is adjusted for the share of labor), τ, is set equal to 0.398, as in Agénor et al. (2017), based on actual calculations for Morocco. The share of government spending on education, υ_E, is also taken from the same source and is set equal to 17.8 percent. The firms' payroll contribution rate, ς, is set at 0.006, as in Agénor and El Aynaoui (2016). In the absence of more detailed data, we assume that the subsidy rate to training for men and women are the same initially; thus, from (64), $\mu^m = \mu^f = 0.5\nu_E\tau$, which gives, $\mu^m = \mu^f = 0.035$.

Regarding *women's bargaining power*, its initial value is set at 0.376 as in Agénor et al. (2017). For simplicity, we assume that this value is the same for all types of families, so that, from (63), $\varkappa_0^U = \tilde{\varkappa}^S$. In addition, for $\tilde{\varkappa}^S$, its value must be matched with the right-hand side of the second expression in (63), which involves setting μ_B and $\varkappa_0^S$, given the value of $\tilde{b}$ provided earlier. The parameter μ_B is set initially to 0.7 to ensure decreasing marginal gains to greater wage equality. The second expression in (63) can therefore be solved for $\varkappa_0^S$ residually, for b_0 and δ given; this gives $\varkappa_0^S = 0.373$.

The benchmark parameter values are summarized in Table 1. Based on these para-

[20] As noted earlier, from (26) we must have $\psi < 0.5$ to ensure a positive skilled wage.

meter and initial values, the model is solved for an initial steady state that satisfies the properties of the balanced growth equilibrium defined earlier. These equilibrium values are shown in Table 2, together with the gender wage gap for skilled workers (given that all unskilled workers earn a uniform minimum wage), $w^{m,S}/w^{f,S}$, given in equation (22).

More specifically, the initial steady-state values are calculated as follows. The share of women in the active population is given by, from (31), $z^f = 0.263$. The total share of unskilled workers, and the total share of skilled workers, both in proportion of the total active population are set equal to $n^U = 0.568$ and $n^S = 0.432$, respectively. The total unemployment rate in proportion of the total active population, θ^L, is set at 0.094, whereas the unskilled (skilled, respectively) unemployment rate, in proportion of the unskilled (skilled, respectively) active population is set at $\theta^U = 0.038$ ($\theta^S = 0.168$, respectively). The shares of unskilled female and male workers employed in the respective active populations, $n^{f,U}$ and $n^{m,U}$, are set equal to 0.608 and 0.503; the corresponding shares for female and male skilled workers are given by $n^{f,S} = 0.114$ and $n^{m,S} = 0.31$. The unemployment rates for female and male unskilled workers, $\theta^{f,U}$ and $\theta^{m,U}$, both in proportion of the relevant active population, are set at 0.029 and 0.041, whereas the corresponding rates for female and male skilled workers, $\theta^{f,S}$ and $\theta^{m,S}$, are set equal to 0.249 and 0.146. By implication, $z^{f,U} = a^{f,C} = n^{f,U} + \theta^{f,U} = 0.637$, whereas $z^{m,U} = a^{m,C} = n^{m,U} + \theta^{m,U} = 0.544$. Similar results hold for $z^{f,S} = 0.363$ and $z^{m,S} = 0.456$.[21] All these values match the actual data on the distribution of employment and unemployment available for 2016, published by Morocco's Haut-Commissariat au Plan (HCP). Based also on HCP data, the share parameters γ^U, γ^S, and γ^L are set at 0.414, 0.631, and 0.184.

To estimate the subjective employment probability of labor type j, h suppose that hiring is random. Probability $q^{j,h}$ can thus be approximated by the share of employment of type j, h in total population j, h, that is, $q^{j,h} = n^{j,h}/z^{j,h}$. Using the previous results give $q^{f,U} = 0.954$, $q^{m,U} = 0.925$, $q^{f,S} = 0.313$, and $q^{m,S} = 0.681$. Thus, the unskilled (regardless of gender) have a higher likelihood of being employed than the skilled, whereas among the skilled men are twice as likely to be employed as women.

[21] From (30) or (57), $z^{j,S} = 0.5[1-(a^{j,C})^2]$, which is not equal to $n^{j,S} + \theta^{j,S}$, as given in the data, given that in the model skilled labor is defined in effective terms. To ensure that the value of $z_t^{j,S}$ matches the actual share of skilled workers of gender j, a multiplicative constant is introduced.

Lastly, the annual growth rates for output in the initial steady state are set equal to 0.04 percent, based on Morocco's average growth rate over the period 2006-13.

6 Mitigating Gender Bias in the Marketplace

As stated earlier, the focus of our analysis in this paper is the impact of anti-discrimination policies aimed at mitigating gender gaps in the labor market. In recent years such policies have been put in place in a number of countries (including Morocco, see United Nations (2016, Chapter 6)) but compliance with them has not been enforced as tightly as the law requires. Moreover, how these policies operate, and how they ultimately affect gender equality and economic growth have not been examined quantitatively. We begin with a discussion of our core experiment and then report some sensitivity analysis The next section will consider the case where policies aimed at mitigating gender bias in the marketplace are combined with other types of gender-based policies.

6.1 Core Experiment

Our core experiment involves a 4 percent autonomous increase in the gender bias parameter, b, through a higher scale parameter b_0, as a result of stronger enforcement of anti-discrimination laws against pay differences in the workplace.[22] The results are shown in Table 3. The first column in the table presents baseline values for a number of key variables, including not only the initial steady-values reported in Table 2 but also values for some additional indicators, such as the family-wide preference for current consumption and gender employment ratios. The second column shows deviations from the baseline and captures therefore the general equilibrium effects of anti-discrimination policy.

Intuitively, a reduction in the gender wage gap raises (at the initial level of the minimum wage) the female skilled-unskilled wage ratio. In turn, an increase in that ratio induces more women to invest in training, implying therefore that the supply of female skilled workers increases, whereas the supply of female unskilled workers falls. This increase in supply lowers skilled wages, which stimulates the demand for female skilled labor. Through gross complementarity, the demand for male skilled labor rises

[22] The magnitude of this increase is of course somewhat arbitrary but it is sufficient to illustrate our purpose. In all experiments, subjective employment probabilities are kept constant.

as well, although less than proportionally. As a result, the female-male skilled labor ratio increases, which allows women as *agents of change* to exert further pressure on employers to mitigate discrimination in the workplace and bring their wage closer to their marginal product. As a result, in equilibrium the total rise in b exceeds the initial 4 percent increase associated with the autonomous policy; the general equilibrium effect is an increase of about 7.6 percentage points—almost double the initial effect. From that perspective, skilled women play an important *quantitative* role as agents of change.

Anti-discrimination laws in the labor market also have a positive influence on skilled women's bargaining power. Indeed, because of the reduction in the gender wage gap, skilled women become more capable to influence their family's decisions, with κ^S increasing from 0.376 to 0.411. In turn, this translates into a reduction in the family-wide preference parameter for current consumption. Thus, the savings *rate* increases and so does investment.[23] This effect, combined with the increase in the *level* of savings associated with higher family wage income for skilled workers, translate into an increase in the annual growth rate of about 0.2 points.

The results also indicate that, despite the increase in the supply of skilled women, the across-the-board expansion in labor demand (which is itself related to the improvement in labor productivity induced by to a higher stock of capital) reduces their unemployment rate. Thus, the increase in employment is large enough not only to absorb the higher supply of skilled women but also to get some unemployed workers back to work. This is the case as well for unskilled women and skilled men—although, in the latter case, the effect is less significant. Despite the increase in the unemployment rate of unskilled men, due largely to the increase in supply of that category of labor, the overall effect is a small drop in unemployment.

The lessons from this experiment are quite important—for Morocco of course but also for other countries, especially in the Middle East and North Africa, facing large gender gaps and other distortions in their labor market. Policies aimed at promoting gender equality in the labor market succeed in part because initial measures get magnified through the role of women as *agents of change*. This is largely because the increase

[23] Note that the preference parameter for current consumption by unskilled families, employed or unemployed, is kept constant; this is because (as discussed earlier) we exclude gender wage gaps for unskilled labor. As a result, the savings rate for these families is also constant. Accounting for an endogenous response would magnify the impact of the policy change on growth.

in the skilled-unskilled wage ratio induces more women to engage in training, which eventually increases the presence of skilled women in employment—relatively so by more than skilled men. The impact on growth (through an effect on both the *rate* and *level* of savings, the former due to an increase in skilled women's bargaining power in the family and a reduction in family preference for current consumption) is also positive. Moreover, the increase in the number of skilled women seeking employment is fully absorbed by the market—despite the fact that reducing the gender gap means that the relative cost of women's labor goes up as well, thereby dampening labor demand—as a result of higher growth. Consequently, the female unemployment rate falls. Put differently, in this experiment, there is no trade-off between gender equality and women's unemployment.

6.2 Sensitivity Analysis

To assess the sensitivity of the previous results, we perform the same experiment as above under alternative values of four key parameters: the elasticity of gender bias to relative time in market work, μ_S, which is increased from 0.6 to 0.8; the elasticity of skilled women's bargaining power to the skilled wage ratio, μ_B, which is increased from 0.7 to 0.9; the unemployment benefit indexation for unskilled workers, κ^U, which is lowered from 0.3 to 0.1; and the elasticity of the skilled wage with respect to the skilled unemployment rate, ψ^S, which is lowered from 0.7 to 0.4.[24]

The results are reported in the last four columns of Table 3. By and large, they are qualitatively similar to those obtained with the benchmark set of parameters (reported in the second column of the table), with the exception that the growth effect is smaller for changes in μ_S and κ^U, and of the same order with the increase in μ_B and the reduction in ψ^S. In the case of μ_B, the key difference is essentially due to the fact that, for highly educated women, gender equality in the workplace and at home are directly related. With a higher elasticity of skilled women's bargaining power to the skilled wage ratio, reduced gender bias in the workplace translates into a stronger effect on the savings rate (through a larger reduction in the preference parameter for current consumption, as noted earlier) and this leads to higher investment and stronger growth. However, this effect is fairly muted.

[24]Several other experiments were also conducted with the model but they are not reported here to save space.

Another experiment that we considered is the case where the externality associated with the skilled female-male employment ratio in (40) does not operate, so that $\mu_B^N = 0$. Setting again $\mu_B^W = \mu_B$, the skilled women's bargaining power in (42) takes now the form

$$\varkappa_t^S = \varkappa_0^S [b_0(\frac{\delta}{1-\delta})]^{\mu_B} (\frac{n_t^{f,S}}{n_t^{m,S}})^{\mu_B(\mu_S - 1)},$$

which shows that a change in the skilled female-male employment ratio has now an ambiguous effect on women's bargaining power, and that whether the effect is positive depends on whether $\mu_S \gtrless 1$.

Intuitively, the reason for this ambiguity is that there are now two opposite effects: on the one hand, an increase in the skilled female-male employment ratio tends to mitigate gender bias in the workplace (that is, to increase b, as implied by (41)), but on the other, the increase in the relative supply of skilled women tends to lower their relative wage (as implied by (22)). If the elasticity of bargaining power with respect to the relative wage μ_S is greater than unity, a higher skilled female-male employment ratio will raise women's bargaining power in the family. Otherwise (as is the case in the benchmark case, given that $\mu_S = 0.6$), despite the fact that an increase in the skilled female-male employment ratio mitigates gender bias in the workplace, it may *reduce* women's bargaining power in the family—the more negative the expression $\mu_B(\mu_S - 1)$ is, that is, the smaller μ_S is or the larger μ_B is (for $\mu_S < 1$). As a result, the effect on the savings rate identified earlier would operate in the opposite direction and would tend to adversely affect economic growth. Simulation results, however, indicate that the net effect on growth may still be positive, because of the level effect on savings.[25]

7 Combining Gender-Based Policies

We now consider two combined experiments involving the same 4 percent increase in b coupled with a) an autonomous increase in women's bargaining power in the family, $\varkappa^S$, implemented through an increase in $\varkappa_0^S$ by 10 percent; and b) a similar increase in women's bargaining power together with a higher subsidy to training targeted at women only, that is, an increase in ν_E by 2 percent (from 0.178 to 0.182) that takes the form of a rise in μ^f only in (37), keeping μ^m constant.

[25] These results are not reported here to save space but are available upon request.

Results of the first experiment are reported in Table 4, for both the benchmark set of parameters and the alternative values reported in Table 3.[26] They show that, because an increase in women's bargaining power does not affect directly the decision to invest in skills, its only effect is on the savings rate and therefore the rate of economic growth; it has no impact on the labor market.[27] However, this is partly because women's time allocation (except for the decision to undergo training) is taken as given in the present model; if, as in Agénor (2018) for instance, time allocation were endogenous, and the time that women allocate to household chores is inversely related to their bargaining power, the policy considered here would affect the time that they devote to market work and would thus also affect the distribution of employment and unemployment.

Results of the second experiment are reported in Table 5. This set of policies is of course more potent in terms of increasing the supply of skilled women (by about 2.9 percentage points), and in terms of growth (which increases by about 0.4 percentage points). This is due in the first case to the reduction in the cost of training (which induces more women to acquire skills) and in the second due to the impact of women's bargaining power on the savings rate (through a lower family preference parameter for current consumption), as discussed earlier. Once again, initial measures aimed at promoting gender equality in the labor market are magnified through women's role as *agents of change*, with the general equilibrium result yielding a value of b close to unity—or perfect equality.

However, even though the gender wage gap falls by more than before, the unemployment rate of skilled women increases now (by 0.3 percentage point), instead of falling; the increase in employment for that category of labor (which rises by 1.8 percentage points) is no longer sufficient to absorb fully the increase in labor supply. Put differently, although once again there is no trade-off between gender equality and growth, there is now a trade-off between gender equality and women's (skilled) unemployment.

The key lesson of this experiment is that to prevent an increase in female unemployment, promoting gender equality through a combination of anti-discrimination laws in the labor market and subsidies to women's training may need to be accompanied by

[26] To save space, for both experiments we only discuss the results pertaining to the benchmark set of parameters. Those corresponding to the sensitivity analysis reported in Tables 4 and 5 do not alter the broader implications highlighted in what follows.

[27] By itself, the autonomous increase in women's bargaining power raises the annual growth rate by 0.14 percentage point.

additional measures to promote labor demand and productivity across the board. In Morocco's context these measures, as discussed by Agénor and El Aynaoui (2016), include public investment in advanced infrastructure (advanced information and communication technologies in general, and high-speed communication networks in particular), which would raise the productivity of private inputs, as well as changes in labor market legislation (such as reductions in payroll taxes and severance payments), which would help to reduce the cost of labor and improve firms' ability to respond to shocks.[28] Similar polices would also be relevant for a number of other countries in the Middle East and North Africa. Put differently, anti-discriminatory policies may need to be part of an integrated reform and growth package to ensure that greater gender equality in wages does not translate into greater gender inequality in terms of unemployment.

8 Concluding Remarks

The purpose of this paper was to study the effects of policies aimed at mitigating gender bias in the marketplace and their impact on gender gaps in the labor market and economic growth. The analysis was based on a gender-based OLG model with endogenous bargaining power and labor market rigidities. In line with the *women as agents of change* view, in the model gender bias in the workplace varies inversely with the presence of skilled women in the labor market and has a direct impact on their bargaining power in the family. The main lesson, based on numerical experiments for Morocco, is that while the benefits of policies aimed at mitigating gender bias in the workplace can be significantly magnified through an improved presence of skilled women in the labor market, they may generate a trade-off with respect to female unemployment when combined with policies aimed at subsidizing training for women. To address this trade-off anti-discrimination policies may need to be accompanied by measures aimed at reducing labor costs and improving labor market flexibility, such as reductions in payroll taxes and severance payments, as well as measures aimed at promoting productivity, including public investment in advanced infrastructure.

For reasons explained earlier, the analysis in this paper did not explicitly address the issue of women's labor force participation, assuming instead that all adults would

[28] See Agénor and Lim (2018) for a quantitative evaluation of these policies, in the context of a group of Latin American countries with high unemployment.

prefer to work. Instead, our focus was on understanding the behavior of employment and unemployment rates among men and women. Nevertheless, a key extension would be to consider also both the *extensive* margin of women's labor supply (that is, labor force participation decisions) as well as the *intensive* margin (decisions on hours worked when employed). This would require modeling time allocation by both men and women to household production (see Agénor (2017, 2018)), disparities between them, and possibly the role of factors that may influence household decisions, such as access to infrastructure services. This would help to explain, as documented in a cross-country study by Rubiano and Viollaz (2018) for instance, the inverse relationship between the female labor force participation rate and the ratio of female-male unpaid domestic and care work.

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Figure 1
Education, Labor Supply, and Consumption Decisions

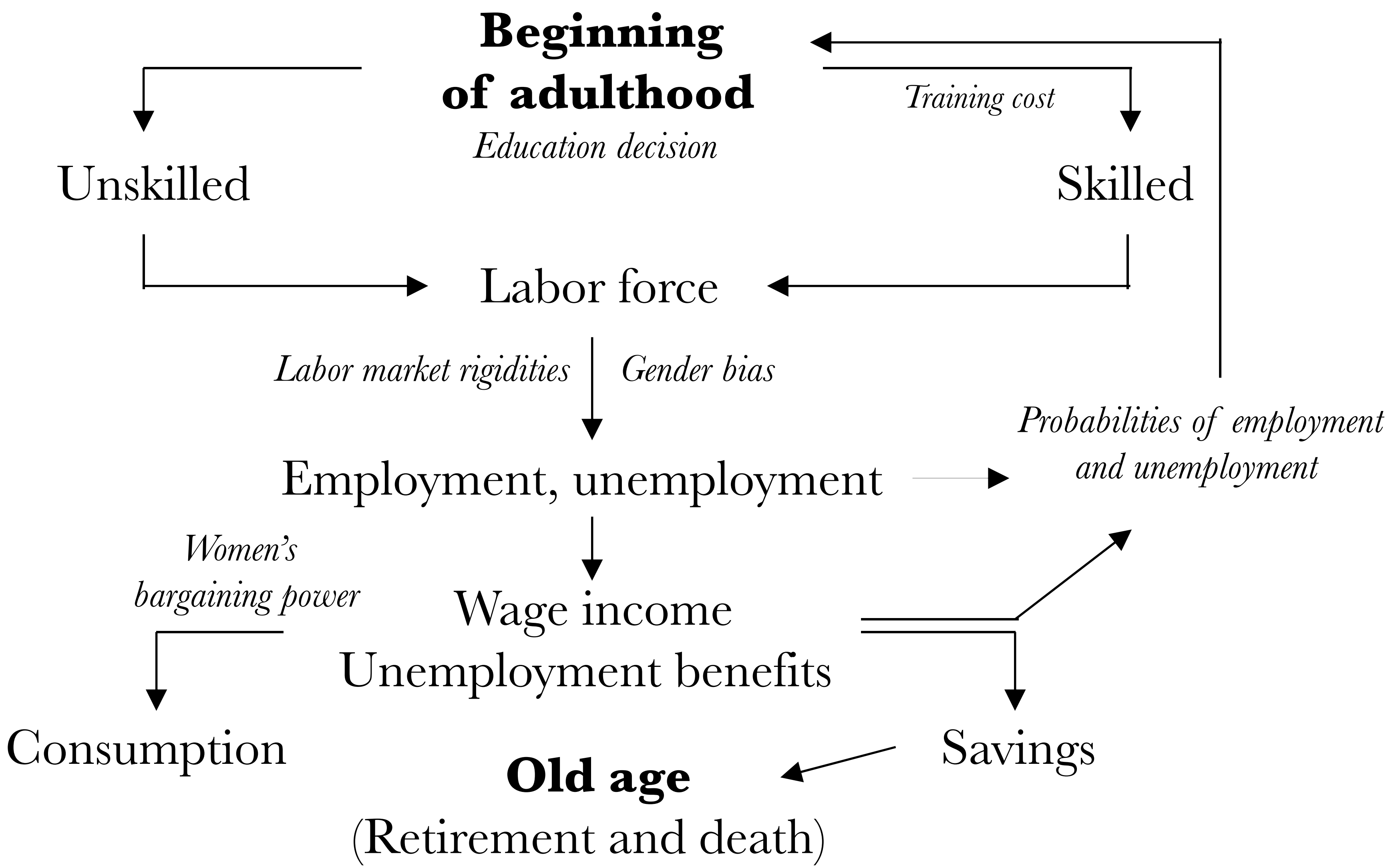

Table 1
Benchmark Calibration

Parameter	Value	Description
Families		
ρ	0.04	Annual discount rate
σ	0.157	Aggregate household savings rate
σ^U, σ^U	$0.143, 0.172$	Unskilled, skilled household savings rate
$\eta^{C,U}, \eta^{C,S}$	$0.584, 0.589$	Family preference for current consumption
$\eta_C^{f,U}, \eta_C^{m,U}$	$0.265, 0.784$	Preference parameters, current consumption, unskilled
$\eta_C^{f,S}, \eta_C^{m,S}$	$0.241, 0.713$	Preference parameters, current consumption, skilled
ε	0.15	Time spent in training
χ	0.10	Productivity parameter (efficiency of training)
λ	0.12	Education cost
Production		
β^U	0.25	Elasticity with respect to male and female unskilled labor
β^S	0.45	Elasticity with respect to male and female skilled labor
α	0.3	Elasticity with respect to physical capital
δ	0.547	Share of female labor in skilled and unskilled composite input
Labor market		
κ^U	0.3	Unemployment benefit indexation, unskilled labor
κ^S	0.1	Unemployment benefit indexation, skilled labor
w_0^U	0.044	Base minimum wage, unskilled labor
$w_0^{f,S}, w_0^{m,S}$	$0.123, 0.041$	Base wages, skilled labor
ψ	0.48	Relative weight of wages in trade union's utility function
ψ^U	0.5	Elasticity wrt unemployment rate, unskilled wage
ψ^S	0.7	Elasticity wrt unemployment rate, skilled wage
b	0.836	Gender bias in the workplace
b_0	1.524	Scale parameter, gender bias in the workplace
μ_S	0.445	Elasticity of gender bias to relative time in market work
γ^U	0.414	Share of unskilled women in unskilled unemployment
γ^S	0.631	Share of skilled women in skilled unemployment
γ^L	0.184	Share of unskilled unemployment in total unemployment
Government		
τ	0.398	Tax rate on wage income, adjusted for labor share
υ_E	0.178	Share of noninterest spending on education
μ^f, μ^m	0.035	Subsidy rates to education
ς	0.006	Employer contribution rate, unemployment benefit fund
Bargaining power		
$\varkappa^U, \varkappa^S$	0.376	Women's bargaining power
$\varkappa_0^S$	0.373	Scale parameter, skilled women's bargaining power
μ_B	0.7	Elasticity of women's bargaining power to wage ratio

Table 2
Initial Steady-State Values of Key Variables

Variable	Female	Male	Description
n^U	0.568		Share of unskilled workers in active population
n^S	0.432		Share of skilled workers in active population
z^f	0.263		Share of women (skilled and unskilled) in active population
θ^L	0.094		Total unempployment rate, share of total active population
θ^U	0.038		Unskilled unemployment rate, share of unskilled, active population
θ^S	0.168		Skilled unemployment rate, share of skilled, active population
$z^{j,U}, a^{j,C}$	0.637	0.544	Share of unskilled workers in gender j active population
$z^{j,S}$	0.363	0.456	Share of skilled workers in gender j active population
$n^{j,U}$	0.608	0.503	Unskilled employment rate, share of gender j population
$n^{j,S}$	0.114	0.310	Skilled employment rate, share of gender j population
$\theta^{j,U}$	0.029	0.041	Unskilled unemployment rate, share of gender j population
$\theta^{j,S}$	0.249	0.146	Skilled unemployment rate, share of gender j population
$q^{j,U}$	0.954	0.925	Probability of unskilled workers being employed, by gender
$1-q^{j,U}$	0.046	0.075	Probability of unskilled workers being unemployed, by gender
$q^{j,S}$	0.313	0.681	Probability of skilled workers being employed, by gender
$1-q^{j,S}$	0.687	0.319	Probability of skilled workers being unemployed, by gender
$1+g$	0.04		Initial steady-state growth rate

Table 3

Steady-state Effects: Autonomous Reduction in Gender Bias in the Market Place

	Baseline	Absolute deviations from baseline				
		Benchmark	$\mu_S = 0.8$	$\mu_B = 0.9$	$\kappa^U = 0.1$	$\psi^S = 0.4$
Families						
Preference parameter, consumption	0.536	-0.017	-0.020	-0.024	-0.016	-0.017
Savings rate, skilled families	0.171	0.009	0.010	0.014	0.009	0.010
Skilled women's bargaining power	0.376	0.035	0.043	0.050	0.034	0.036
Production						
Employment by gender						
Female employment, skilled	0.114	0.009	0.009	0.009	0.009	0.012
Female employment, unskilled	0.608	-0.002	-0.001	-0.002	-0.001	-0.004
Male employment, skilled	0.310	-0.001	0.000	-0.001	0.000	-0.002
Male employment, unskilled	0.503	-0.002	-0.001	-0.002	-0.001	-0.003
Gender employment ratios						
Female-male ratio, skilled labor	0.368	0.030	0.030	0.030	0.028	0.035
Female-male ratio, unskilled labor	1.209	0.000	0.000	0.000	0.000	0.000
Gender bias in the workplace	0.836	0.076	0.069	0.076	0.073	0.083
Labor Market						
Threshold for female unskilled workers	0.637	-0.007	-0.008	-0.007	-0.008	-0.008
Threshold for male unskilled workers	0.544	0.002	0.001	0.002	0.001	0.003
Skilled female-male wage gap	0.364	-0.003	-0.002	-0.003	-0.002	-0.004
Unemployment-Gender composition						
Female unemployment rate, skilled	0.249	-0.004	-0.003	-0.004	-0.003	-0.005
Female unemployment rate, unskilled	0.029	-0.004	-0.007	-0.004	-0.007	-0.004
Male unemployment rate, skilled	0.146	-0.001	0.000	-0.001	0.000	-0.001
Male unemployment rate, unskilled	0.041	0.004	0.002	0.004	0.002	0.006
Unemployment-Aggregates						
Skilled unemployment rate	0.168	-0.002	-0.001	-0.002	-0.001	-0.002
Unskilled unemployment rate	0.038	0.000	0.000	0.000	0.000	-0.001
Unemployment rate	0.094	-0.001	-0.001	-0.001	-0.001	-0.001
Output growth rate (in percent)	0.040	0.002	0.001	0.002	0.001	0.002

Notes: Benchmark parameter values are those shown in Table 1. Results reported in the other columns are as follows. The elasticity of gender bias to relative time in market work, μ_S, is increased from 0.6 to 0.8. The elasticity of skilled women's bargaining power to the wage ratio, μ_B, is increased from 0.7 to 0.9. The unemployment benefit indexation for unskilled workers, κ^U, is raised from 0.3 to 0.1. The elasticity of the skilled wage with respect to the skilled unemployment rate, ψ^S, is lowered from 0.7 to 0.4.

Table 4

Steady-state Effects: Autonomous Reduction in Gender Bias in the Market Place Coupled with Autonomous Increase in Skilled Women's Bargaining Power in the Family

	Baseline	Absolute deviations from baseline				
		Benchmark	$\mu_S = 0.8$	$\mu_B = 0.9$	$\kappa^U = 0.1$	$\psi^S = 0.4$
Families						
Preference parameter, consumption	0.536	-0.043	-0.038	-0.054	-0.042	-0.045
Savings rate, skilled families	0.171	0.025	0.019	0.032	0.024	0.026
Skilled women's bargaining power	0.376	0.092	0.080	0.114	0.090	0.096
Production						
Employment by gender						
Female employment, skilled	0.114	0.009	0.009	0.009	0.009	0.012
Female employment, unskilled	0.608	-0.002	-0.001	-0.002	-0.001	-0.004
Male employment, skilled	0.310	-0.001	0.000	-0.001	0.000	-0.002
Male employment, unskilled	0.503	-0.002	-0.001	-0.002	-0.001	-0.003
Gender employment ratios						
Female-male ratio, skilled labor	0.368	0.030	0.030	0.030	0.028	0.035
Female-male ratio, unskilled labor	1.209	0.000	0.000	0.000	0.000	0.000
Gender bias in the workplace	0.836	0.076	0.069	0.076	0.073	0.083
Labor Market						
Threshold for female unskilled workers	0.637	-0.007	-0.008	-0.007	-0.008	-0.008
Threshold for male unskilled workers	0.544	0.002	0.001	0.002	0.001	0.003
Skilled female-male wage gap	0.364	-0.003	-0.002	-0.003	-0.002	-0.004
Unemployment-Gender composition						
Female unemployment rate, skilled	0.249	-0.004	-0.003	-0.004	-0.003	-0.005
Female unemployment rate, unskilled	0.029	-0.004	-0.007	-0.004	-0.007	-0.004
Male unemployment rate, skilled	0.146	-0.001	0.000	-0.001	0.000	-0.001
Male unemployment rate, unskilled	0.041	0.004	0.002	0.004	0.002	0.006
Unemployment-Aggregates						
Skilled unemployment rate	0.168	-0.002	-0.001	-0.002	-0.001	-0.002
Unskilled unemployment rate	0.038	0.000	0.000	0.000	0.000	-0.001
Unemployment rate	0.094	-0.001	-0.001	-0.001	-0.001	-0.001
Output growth rate (in percent)	0.040	0.003	0.002	0.004	0.003	0.003

Notes: Benchmark parameter values are those shown in Table 1. Results reported in the other columns are as follows. The elasticity of gender bias to relative time in market work, μ_S, is increased from 0.6 to 0.8. The elasticity of skilled women's bargaining power to the wage ratio, μ_B, is increased from 0.7 to 0.9. The unemployment benefit indexation for unskilled workers, κ^U, is raised from 0.3 to 0.1. The elasticity of the skilled wage with respect to the skilled unemployment rate, ψ^S, is lowered from 0.7 to 0.4.

Table 5

Steady-state Effects: Autonomous Reduction in Gender Bias in the Market Place Coupled with Autonomous Increase in Skilled Women's Bargaining Power in the Family and Public Subsidy to Women's Training

	Baseline	Absolute deviations from baseline				
		Benchmark	$\mu_S = 0.8$	$\mu_B = 0.9$	$\kappa^U = 0.1$	$\psi^S = 0.4$
Families						
Preference parameter, consumption	0.536	-0.050	-0.055	-0.064	-0.049	-0.052
Savings rate, skilled families	0.171	0.029	0.027	0.038	0.028	0.030
Skilled women's bargaining power	0.376	0.106	0.116	0.134	0.104	0.110
Production						
Employment by gender						
Female employment, skilled	0.114	0.018	0.022	0.018	0.020	0.023
Female employment, unskilled	0.608	-0.013	-0.006	-0.013	-0.006	-0.016
Male employment, skilled	0.310	-0.006	-0.003	-0.006	-0.003	-0.008
Male employment, unskilled	0.503	-0.011	-0.005	-0.011	-0.005	-0.013
Gender employment ratios						
Female-male ratio, skilled labor	0.368	0.067	0.072	0.067	0.064	0.078
Female-male ratio, unskilled labor	1.209	0.000	0.000	0.000	0.000	0.000
Gender bias in the workplace	0.836	0.126	0.140	0.126	0.123	0.136
Labor Market						
Threshold for female unskilled workers	0.637	-0.029	-0.038	-0.029	-0.037	-0.029
Threshold for male unskilled workers	0.544	0.013	0.006	0.013	0.008	0.013
Skilled female-male wage gap	0.364	0.010	0.012	0.010	0.011	0.010
Unemployment-Gender composition						
Female unemployment rate, skilled	0.249	0.003	0.009	0.003	0.008	0.001
Female unemployment rate, unskilled	0.029	-0.015	-0.032	-0.015	-0.031	-0.013
Male unemployment rate, skilled	0.146	-0.004	-0.002	-0.004	-0.002	-0.003
Male unemployment rate, unskilled	0.041	0.024	0.012	0.024	0.013	0.026
Unemployment-Aggregates						
Skilled unemployment rate	0.168	0.000	0.003	0.000	0.002	-0.001
Unskilled unemployment rate	0.038	-0.002	-0.001	-0.002	-0.001	-0.002
Unemployment rate	0.094	-0.001	0.001	-0.001	0.001	-0.001
Output growth rate (in percent)	0.040	0.004	0.003	0.005	0.004	0.004

Notes: Benchmark parameter values are those shown in Table 1. Results reported in the other columns are as follows. The elasticity of gender bias to relative time in market work, μ_S, is increased from 0.6 to 0.8. The elasticity of skilled women's bargaining power to the wage ratio, μ_B, is increased from 0.7 to 0.9. The unemployment benefit indexation for unskilled workers, κ^U, is raised from 0.3 to 0.1. The elasticity of the skilled wage with respect to the skilled unemployment rate, ψ^S, is lowered from 0.7 to 0.4.