

Gender differences in competition: gender equality and cost reduction policies

António Osório[†]

[†] *Universitat Rovira i Virgili (Dept. of Economics) and CREIP
(antonio.osoriocosta@urv.cat).*

Abstract

This paper investigates the implications of the unequal division of the domestic labor in men and women's participation and effort incentives in competitive relations, in which the labor market is the main example. We found that moderate levels of affirmative action (i.e., bias in favor of women) incentivize men and women to exert more effort and women's participation. However, it cannot guarantee full participation and equal effort among men and women without inducing economic inefficiency or even distorting the labor market. Given these limitations, we consider the effects of an alternative policy that supports the men's involvement in the domestic tasks. The main conclusion is that if we want men and women to have the same opportunities in the labor market, we must solve the household problem first. While women hold a larger share of the domestic labor, they are in a weaker position to compete with men. We expect that our findings will guide researchers and decision-makers implementing effective policies that can allow men and women to have the same labor market opportunities.

Keywords: Gender equality; Affirmative action; Cost reduction policies; Efficiency; Women participation.

JEL classification: J16, J78, D63, C72.

1. Introduction

Women's increasing market participation has changed the traditional family structure from breadwinner-homemaker to the dual-earner model. Despite the fact that men are doing more housework than ever before, women's housework burden has not decreased proportionally to their increase in market labor (Bianchi, 2000), which is a paradoxical incompatibility because the traditional gender construction of male

breadwinner and female homemaker roles persists at home. [Gornick and Meyers \(2003\)](#) stress the social contradiction attached to these unbalanced developments:

"(...) if everyone is at the workplace, who will care for the children?"

Children are a metaphor for a domestic problem that persists in almost every dimension of the household. For instance, [Presser \(1994\)](#) and [Bianchi et al. \(2000\)](#) estimate that women perform 65-80 percent of all household labor (e.g., cooking, shopping, childcare, cleaning, among others). See [Shelton and John \(1996\)](#) for a survey. This situation overwhelms women that consequently find it difficult to compete with men in equal circumstances.

In spite of the important progress achieved in the last decades, in particular regarding women's labor market participation, gender policy is still not able to grant women the same opportunities as to men ([Blau and Kahn, 2016](#)). At the same time, policies supporting men's involvement in domestic tasks have developed modestly in comparison to market participation policies ([Pascall and Lewis, 2004](#)).

The objective of this paper is to investigate the implications of the unequal division of the household labor on men and women's participation and on their effort incentives in competitive environments.¹ We compare the effects of *affirmative action* and *cost reduction policies*. The latter gender policy is proposed in this paper and has the objective of promoting an equal division of tasks within the household and reducing the women's share in the domestic labor, which then feeds back into a reduction in the labor market cost of effort. In addition, we provide recommendations on how to reduce the persistent gender inequality.

Affirmative action opens the possibility to gender equality by acting directly in the labor market.² On the other hand, cost reduction policies have the same gender equality objective, but targets non-market inequality ([Pascall and Lewis, 2004](#)). While affirmative action introduces a labor market bias in favor of women,

¹The economic impact of affirmative action is largely centered on these two issues ([Holzer and Neumark, 2006](#)).

²President John F. Kennedy's Executive Order 10925/1961 introduced the term "affirmative action" to encourage employers to take action to ensure non-discrimination regarding sex, race, creed, color or national origin. It refers to a set of practices undertaken by employers, admissions offices and government agencies to improve the economic status of women and other disadvantaged groups regarding employment, education and business ([Holzer and Neumark, 2006](#)). We focus on discrimination of women; discrimination of other groups or minorities of the population targeted by affirmative action would require a differentiated treatment.

cost reduction policies remove the household bias against women. The latter policy promotes an equal division of domestic labor, which requires a change in the society traditional gender construction of male breadwinner and female homemaker roles.

For each of these two policies, we measure men and women *labor market participation*, because it is an important indicator of gender equality and is central in any discussion on gender equality.³ In addition, in order to understand the implications in terms of economic efficiency, we also measure men and women *total labor market effort* and competition intensity. This is an important indicator because, despite the great acceptance that affirmative action has received, since the "best" candidate is not necessarily the chosen one, several authors question its adequacy in reaching the best economic outcomes (Coate and Loury, 1993; Holzer and Neumark, 2000, 2006; among others). Affirmative action raises concerns in terms of economic efficiency and social welfare (Holzer and Neumark, 2000). Moreover, for some people, affirmative action is a form of reverse discrimination that reinforces stereotypes and goes against the idea of meritocracy.

We consider a theoretical setting in which men and women with unequal domestic labor responsibilities compete in the labor market for a market prize (e.g., career, promotion, compensation, power, etc.). In this context, the present paper is the first theoretical approach that links the individuals share in the domestic labor with their competitive capacity in the labor market.

We found that affirmative action can guarantee the same chances of success for men and women, but cannot guarantee the same participation, equal utility or effort without inducing inefficiency or distorting the labor market. However, we show that these objectives can potentially be achieved through cost reduction policies. The main conclusion is that if we want men and women to have the same opportunities and competitive capacity, we must solve the household problem first—while women are still holding a larger share of the domestic labor, they are in a weaker position to compete with men.

We also found that moderate levels of affirmative action incentivizes men and women's effort (and women's participation). There exists a leveling effect that results in higher effort and competition intensity. Franke (2012) and Niederle et al. (2013)

³In 2013, only 57.2% of women were in the labor market, in comparison with 69.7% of men (US Bureau of Labor and Statistics 2014). Also relevant is the qualitative nature of women's participation. For instance, women represent only 2.5% of the highest paid executives in U.S. firms (Bertrand and Hallock, 2001) and only 30% of students at top tier business schools (Hewlett and Luce, 2005).

report similar results regarding effort and participation, respectively.

However, we also found negative effects associated with affirmative action. If women are too much favored by affirmative action, they tend to save on costly effort in order to obtain a higher net utility, i.e., women free ride on affirmative action. Simultaneously, men's effort decreases because it becomes less effective. This result reproduces the [Sowell \(2004\)](#) prediction that:

"Both preferred (women in our model) and non-preferred (men in our model) groups can slacken their efforts - the former because working to their fullest capacity is unnecessary and the latter because working to their fullest capacity can prove to be futile."

We also found that cost reduction policies might be ineffective in raising the total labor market effort in the presence of affirmative action. This observation raises concerns about the potential complementary use of these two policy instruments because the positive incentive given to women does not compensate the reduction in men's effort. Similarly, cost reduction policies make the use of affirmative action policies less justified and less effective. Intuitively, our results suggest that the use of affirmative action policies is only justified if there are asymmetries between men and women in the household. Therefore, once the household problem is solved there is no reason to support the use of affirmative action.

This paper is organized as follows: Section [2](#) reviews the literature, Section [3](#) presents the theoretical framework, Section [4](#) defines affirmative action and cost reduction policies and the measurement instruments, Sections [5](#) and [6](#) analyze competition between individuals of the same and opposite gender, respectively, and Section [7](#) concludes.

2. Literature review

The related literature can be divided into two strands. The first deals with differences between men and women in terms of competition and performance. The second studies differences in the division of the domestic labor and their implications.

The growing literature that studies gender differences in competition shows that women present a lower willingness to compete than men ([Niederle and Vesterlund, 2007](#)). In addition to gender differences in willingness to compete, women also tend to underperform men in competitive environments ([Dohmen and Falk, 2011](#); [Gneezy](#)

and Rustichini, 2004; Gneezy et al., 2003; Vandegrift and Yavas, 2009). Croson and Gneezy (2009) and Niederle and Vesterlund (2011) review this literature. Moreover, men’s preference to compete with women is stronger than women preference to compete with men (Booth and Nolen, 2012; Datta Gupta et al., 2013; Ivanova-Stenzel and Kübler, 2011). The question becomes why women shy away from competition and why they underperform men.

For Gneezy et al. (2009) the origin of the problem is cultural. They show that women from matriarchal societies in India are more competitive than men, but not in patriarchal societies in Tanzania. Although, factors such as discrimination (Altonji and Blank, 1999; Goldin and Rouse, 2000), preferences (Croson and Gneezy, 2009), risk aversion (Vandegrift and Brown, 2005), strategic behavior (Cubel and Sánchez-Pagés, 2017) and genes (Bateup et al., 2002) also play a critical role. According to Flory et al. (2018), the competitive difference between men and women disappears in older populations.

Niederle et al. (2013) found that affirmative action through quotas unleashes reluctant (but qualified) women’s participation and willingness to compete. Their result supports the use of this type of policy (Holzer and Neumark (2000, 2006) survey the literature). However, as mentioned in the introduction, in terms of economic efficiency and incentives there are doubts about the adequacy of affirmative action (Altonji and Blank, 1999; Coate and Loury, 1993; Holzer and Neumark, 2000). In this context, Coate and Loury (1993) acknowledge that affirmative action may reduce discrimination, but it may also intensify stereotypes.

While most of the economic debate on affirmative action is largely centered on participation and competition (Holzer and Neumark, 2006), the gender inequality debate encompasses other fields of knowledge and non-economic considerations. In this strand of the literature—embedded in cultural, sociological and humanistic aspects—there is a clear recognition that household effort is not equally split, even among dual-earner couples (Bianchi, 2000; Bianchi et al., 2000; Shelton and John, 1996). A recent study, done by the Japanese Statistics Bureau and reproduced in Nakamura and Akiyoshi (2015), comparing ten developed countries (e.g., Finland, Sweden or Norway), shows that even in these countries women clearly do more housework than men do.

Two main theoretical approaches attempt to explain the unequal household labor division (Benschop et al., 2001; Bianchi et al., 2000). The first draws on economic and specialization principles (Becker, 1985); the member of the household who brings the most resources to the relationship has more power, and therefore, can opt to participate in the labor market (Lundberg and Pollak, 1996), and consequently perform

less domestic labor (Greenstein, 2000). The second approach is based on the idea that gender is a social constructed principle, institutionalized and continually reconstructed through cyclical routines (Lorber, 1994). It emphasizes how attitudes around who should do what shapes how market and domestic labor are distributed within the household (Davis and Greenstein, 2009). Some people believe that certain tasks and responsibilities are more appropriate for women than for men, e.g., nursing, social work, librarianship, and elementary school teaching. According to Lorber (1994) the reason is that these professions allow women more freedom for childbearing and child rearing.

Consequently, segregation inside the household reinforces gender differences in the labor market and in competitive capacity, which perpetuates weaker career opportunities for women. There is a cyclical and bidirectional conflict between work and family life (Greenhaus and Beutell, 1985). In this context, ample evidence shows that women are more likely than men to adjust their careers around the household responsibilities, e.g., work part-time or change jobs to find a more amenable match with the household responsibilities (Presser, 1994; Schieman et al., 2009; Tausig and Fenwick, 2001). In particular, married women with children are more likely to take a permanent or temporary leave from their jobs or cut back on their careers due to domestic duties (Becker, 1985; Becker and Moen, 1999; Reynolds, 2005). In a report published by the UK Government Equalities Office, Olsen et al. (2010) show that—directly or indirectly—the household division of labor explains most of the gender wage gap (see also Blau and Kahn, 2016).⁴

According to The World Bank 2012 Development Report on Gender Equality and Development, the aspects mentioned before weaken the women’s chances to succeed in the competitive labor market, which reinforces even more female specialization in household tasks. Intervention is needed to break this interactive segregation trap and to equate men and women in the household. Bielby and Bielby (1989) defend this same perspective: while women remain unequally responsible for the domestic labor, they are unable to establish a strong identity with their careers. In the same line, Gornick and Meyers (2003) claim that there exists a need to promote more egalitarian household policies. Pascall and Lewis (2004) stress that gender equality needs to

⁴The effects of gender inequality in economic variables and market performance may occur through other channels (Wunderink and Niehoff, 1997). For instance, women who view the distribution of household labor as unfair are more likely to experience depression (Bird, 1999; Lennon and Rosenfield, 1994; Ross et al., 1983). Divorce is also more likely when the division of domestic effort is seen as unfair (Frisco and Williams, 2003). Altogether, the unequal division of the domestic labor creates a sense of unfairness and injustice with implications on female performance.

look at the distribution of responsibility within the household. These observations motivate the present paper and the study of what we call *cost reduction policies*.

In the present paper, the division of the domestic effort crucially influences gender inequality and women’s attitude towards competition. In spite of the large empirical evidence presented in support of our claim, theoretical analyses that link market performance and domestic labor are missing in the literature, with few exceptions (Albanesi and Olivetti, 2009). The present paper is an attempt in this direction.

Albanesi and Olivetti (2009) develop a theoretical model of market and home production within households in which the marginal cost of effort is increasing in home hours. Consequently, it is more difficult for firms to incentivize workers with high home hours and firms will prefer workers with low cost of effort. In the self-fulfilling ”gendered” equilibrium, firms believe that the intra-household allocation of home hours favors men over women, which in turn is going to determine the intra-household efficient allocation of home hours in favor of men in a perpetual and cyclical way. In our model there are no considerations regarding optimal contracts and the household response in terms of the distribution of hours. Instead, we place more emphasis on the labor market competition process between individuals of different genders.

The theoretical literature on affirmative action shows a great diversity of results. For instance, Welch (1976) found that hiring and promoting less-qualified minorities through affirmative action is inefficient. In contrast, Franke (2012) finds the opposite. Models that assume imperfect information, discrimination or externalities present mixed results regarding efficiency (Athey et al., 2000; Coate and Loury, 1993; Fain, 2009; Fu, 2006; Lundberg, 1991; Schotter et al., 1992). In the present paper, we also found mixed results. Moreover, since our approach considers in simultaneous, unequal division of domestic labor and household equalizing policies, we are able to establish a wider set of conclusions.

The theoretical literature on non-cooperative models of household labor division (Vierling-Claassen, 2013; Youm and Laumann, 2003) highlight the difficulty of achieving equal sharing when there are established gender roles. In the present paper, we question what the implications in terms of participation and effort are as we vary the distribution of the household labor.

3. The description of the model⁵

We consider an economy where individuals of different gender groups—men M and women W —are matched in pairs to compete with each other for a market prize (i.e., we consider the cases in which men compete with men, women compete with women and men compete with women). The market prize is obtained with active labor market participation and effort. Alternatively, individuals can opt for an outside option, which is the payoff from staying out of the labor market. In what follows, we describe our model in more detail.

Let the subscript $g(i)$ denotes the individual i of gender group $g \in \{M, W\}$. Let $g(i) = m(i) \in M$ and $g(i) = w(i) \in W$ denote the cases in which individual i belongs to the men and the women's group, respectively, and the individual i identity is relevant, and let $g(i) = m$ and $g(i) = w$ denote the cases in which is relevant the distinction between gender groups, but not the identity of the individual i .

Inside each gender group there is a continuum of individuals, indexed by $i \in (0, 1)$, differing in terms of total cost of the domestic labor $h_{g(i)} \in (0, \bar{h})$, where \bar{h} denotes the upper bound on the cost of the domestic labor. The distribution of the cost of the domestic labor is given by some distribution function, which we assume to be uniform, i.e., $h_{g(i)} \sim U(0, \bar{h})$ where $\bar{h} = v/2$ for all $g(i) \in \{M, W\}$. In our context, the uniform distribution is the most natural and neutral assumption, in particular, if we have no theory to support other distribution. The upper bound on the cost of the domestic labor $\bar{h} = v/2$ is chosen neither to be too high—such that all individuals would have no participation incentives—nor to be too low—such that participation would be guaranteed for all individuals.

Since for each level of cost of the domestic labor $h_{g(i)}$ there is a unique man and a unique woman, each level of the cost of the domestic labor represents a unique household composed of a man and a woman.

Men and women differ in terms of their shares in the cost of the domestic labor, which is denoted as $s_{g(i)} \in (0, 1)$. In our context, the share in the cost of the domestic labor is the same for all members of the same gender group, i.e., $s_m = 1 - s$ and

⁵The present paper applies game-theoretical concepts to study men and women's strategic decisions. However, the understanding of the main ideas does not require great technical sophistication other than the comparison of some inequalities. Readers not familiar with technical concepts may skip this section in a first read. In this case, the relevant parameters to keep in mind for the following sections are $\mathbf{a} \geq \mathbf{1}$, that measures the magnitude of affirmative action in favor of women, and $\mathbf{s} \in (\mathbf{1}/2, \mathbf{1}]$, that measures the share of the household effort that is supported by women.

$s_w = s \in [1/2, 1)$. for all $m(i) \in M$ and $w(i) \in W$. Note that the women share in the cost of the domestic labor is higher (or equal) than men, i.e., $s \geq 1 - s$.⁶ This situation corresponds to the current *status quo* in which women are expected to provide more effort than men inside the household (see Section 2). It is this unequal division of the household labor that motivates the present paper and the study of affirmative action and cost reduction policies.

In addition, individuals must choose the amount of labor market effort. In this context, individuals decide whether to accept the zero-normalized outside option $x_{g(i)} = 0$ for all $g(i) \in \{M, W\}$ or not, i.e., to stay out of the labor market or to compete in the labor market for the market prize $v_{g(i)} = v > 0$ for all $g(i) \in \{M, W\}$. The zero-normalized outside option is also the payoff obtained from domestic activities (e.g., shopping, childbearing and child rearing, etc.). Note that the cost of the domestic labor is individual, i.e., $s_g h_{g(i)}$, but the benefits from the household output are common to men and women.⁷

The labor market prize is obtained with active labor market participation, i.e., with costly effort $e_{g(i)|k(j)} > 0$, where the subscript $g(i)|k(j)$ denotes the dependence on the gender match $g(i), k(j) \in \{M, W\}$. The marginal cost of effort in the labor market is $c_{g(i)} > 0$, which is the same for all individuals in the same gender group, i.e., $c_{m(i)} = c_m > 0$ and $c_{w(i)} = c_w > 0$. Therefore, conditional on the gender match,

⁶The share of each gender group in the cost of domestic labor can be endogenized. For instance, we can consider that the share in the household effort is determined ex-ante by social constructed roles or by the result of bargaining among spouses. Since there are several possible matches, and the specific match cannot be anticipated, let $y_{\bar{m}}$ and $y_{\bar{w}}$ denote the ex-ante household effort of the average men and women, respectively. Let $w = r(y_{\bar{m}} + y_{\bar{w}})$ be the ex-ante expected household output that would result from the effort of these individuals and let the ex-ante expected cost associated with this output to be related with each household member share in the household effort as follows $s = by_{\bar{w}}/(by_{\bar{w}} + y_{\bar{m}})$, where $b \geq 1$ denotes the average level of discrimination against women in the household. Subsequently, maximize $w - sh_{g(i)}$ with respect to $y_{\bar{m}}$ and $y_{\bar{w}}$ to obtain that in equilibrium $s = b/(b + 1) \geq 1/2$. In other words, the discrimination against women induced by social constructed roles imply that women will end up having an higher share of the ex-post total cost of the domestic labor $h_{g(i)}$.

⁷In this sense, the household output has public good properties as non-excludable and non-rivalrous (Grossbard-Shechtman, 1984). For instance, no household members can be effectively excluded from benefiting from children education, cleaning, maintenance, among other common household activities. Clearly, not every household output benefits both members some may return private benefits. However, the household outputs with public good properties are the most relevant to the problem of domestic labor division.

the individual $g(i) \in \{M, W\}$ total cost of effort is:

$$tc_{g(i)|k(j)} = c_g e_{g(i)|k(j)} + s_g h_{g(i)},$$

which is the sum of the labor market and the domestic cost components.

We assume that the labor market cost of effort is a function of the share in the cost of the domestic labor, i.e., $c_m = f_m(s)$ and $c_w = f_w(s)$, and satisfies the following properties $\partial f_m(s)/\partial s < 0$ and $\partial f_w(s)/\partial s > 0$. These properties imply that the lower the individual share in the household effort cost, the lower the labor market cost of effort. Intuitively, the lower the individual share in the household effort cost, the more time the individual has to succeed and focus in the labor market, and the more time the individual has to spend in leisure activities, self-education, information acquisition and other activities that then become crucial to succeed in the labor market. In our context, the most simple formulation with these properties is $c_m = c(1 - s)$ and $c_w = cs$. This assumption links what happens inside the household with the labor market and adds a qualitative component to effort.⁸ A similar assumption appears in [Albanesi and Olivetti \(2009\)](#) who also develop a theoretical model of market and home production within households in which the marginal cost of effort is increasing in home hours. The rationale for their assumption is that when individuals are involved in multiple tasks the marginal cost of each task increases, which is in line with our argument.

In the [Appendix A](#), we discuss possible variations of this assumption.

The outcome of the labor market competition depends on the effort level exerted by the individuals in the labor market, i.e., $e_{g(i)|k(j)}$. In this context, we follow [Franke \(2012\)](#) by considering that the competitive process is captured by the [Tullock \(1980\)](#) type contest success function. In this context, the winning probability of individual $g(i) \in \{M, W\}$ when competing with the individual $k(j) \in \{M, W\}$ is given by:

$$p_{g(i)|k(j)} = a_{g(i)} e_{g(i)|k(j)}^{r_{g(i)}} / (a_{g(i)} e_{g(i)|k(j)}^{r_{g(i)}} + a_{k(j)} e_{k(j)|g(i)}^{r_{k(j)}}), \quad (1)$$

for all $g(i), k(j) \in \{M, W\}$.

⁸There is a cyclical and a bidirectional conflict between work and family life ([Greenhaus and Beutell, 1985](#)). In this context, ample evidence shows that women are more likely than men to adjust their careers to the household responsibilities ([Presser, 1994](#); [Schieman et al., 2009](#); [Tausig and Fenwick, 2001](#)). [Bielby and Bielby \(1989\)](#) defend this same idea: while women remain unequally responsible for the domestic labor, they are unable to establish a strong identity with their careers. In our model, the consideration of these aspects translates into a higher labor market cost of effort for women and a necessary linkage between the labor market and domestic work.

The parameter $r_{g(i)} > 0$ measures the efficiency of the individual i effort. For simplicity, we consider the standard assumption in the contest literature, i.e., $r_{g(i)} = 1$ for all $g(i) \in \{M, W\}$. The parameter $a_{g(i)} > 0$ is used to introduce bias. The affirmative action bias in favour of women is obtained by setting $a_{m(i)} = 1$ and $a_{w(i)} = a \geq 1$ for all $m(i) \in M$ and $w(i) \in W$. This assumption is analytically convenient because the bias induced by the affirmative action policy is captured in a single parameter ($a \geq 1$).

Consequently, the individual $g(i) \in \{M, W\}$ objective is to maximize the utility function:

$$u_{g(i)|k(j)} = p_{g(i)|k(j)}v - (c_g e_{g(i)|k(j)} + s_g h_{g(i)}), \quad (2)$$

where $p_{g(i)|k(j)}$ is given by (1).

After having chosen the labor market effort that maximizes the utility in expression (2), each individual decides whether or not to participate in the labor market. In this context, the individual participates if the labor market utility is higher than the utility derived from the outside option, i.e., if the participation constraint $u_{g(i)|k(j)} \geq x_{g(i)} = 0$ is satisfied.⁹

4. Policy instruments and performance measures

Affirmative action is not a well-defined concept. For instance, it is not clear what is "too much" or "not enough" affirmative action. The same happens with the concept of cost reduction policies introduced in this paper. This issue is not a problem in general. However, in an analytical study, in order to establish a working basis, these objects must have a clear mathematical meaning. In this context, we start by defining the ultimate objective of the gender policy. After that, we define what affirmative action and cost reduction policies are. These concepts build on ideas of equity and fairness.

Equity is a fair balance between effort and reward. The sense of fairness depends on the comparison that individuals do between the own balance and the other people balance, with whom they seem to be relevant references (Adams, 1963; Nakamura and Akiyoshi, 2015; Wunderink and Niehoff, 1997). In our context, the reference effort is the sum of the labor market and the household efforts, while the reference reward is the labor market and the household prizes (the latter is normalized to zero).

⁹In order to avoid rematching considerations, we assume that if the individual is matched with an opponent that prefers to stay out of the labor market, this individual obtains the market prize with probability one after having supplied the expected equilibrium effort.

In a relation between man and woman, the reference individual is the individual in better position, i.e., the man. Therefore, it is natural to expect women to see men's utility as their reference.

Translated into our context, the ultimate objective of gender equality is the ex-ante equality of men and women expected utilities.¹⁰

Definition 1 (gender equality). *Gender equality means that $E(u_{w|m}) = E(u_{m|w})$.*

Since the household effort cost (and consequently the market outcome) is ex-ante uncertain, we consider the expected utilities. These expected utilities aggregate information regarding market and household activities.

Policy instruments

Affirmative action refers to the economic status of minorities and women regarding employment, education, ownership and success (Holzer and Neumark, 2000, 2006). These policies operate directly into the market relations by favoring the members of the disadvantaged group. The concept is not well defined. However, affirmative action is clearly understood as a movement towards equity and fairness between these two groups of individuals. Translated into our context, we have the following definition.

Definition 2 (affirmative action). *Affirmative action are policies that bias the labor market in favor of women (i.e., in our context, an increase in $a \geq 1$) with the objective of promoting gender equality.*

For several authors, affirmative action policies are insufficient. For instance, Gornick and Meyers (2003) and Pascall and Lewis (2004) suggest the need to promote egalitarian household policies that can change the unequal treatment of men and women and the perception based on gender. Most inequality stems from differences in socially constructed gender roles that create dichotomous hierarchies that manifest in numerous dimensions of daily life (Davis and Greenstein, 2009; Lorber, 1994). According to Bielby and Bielby (1989), while women remain unequally responsible for the household labor, they are unable to establish a strong identity with their careers. Translated into our context, we have the following definition.

¹⁰Ex-ante, because it must be universally defined and accepted before individuals compete with each other. Not all these concepts are indisputable—the debate dates back to the early philosophers. We step away from this discussion by defining their meaning into our context.

Definition 3 (cost reduction policies). *Cost reduction policies are actions that reduce the women share in the domestic labor (i.e., in our context, a reduction in $s \in [1/2, 1)$) with the objective of promoting gender equality.*

In our context, given the linkage between the household and the labor market made in Section 3, a reduction in the women’s share in the domestic labor feeds back into a reduction in the labor market cost of effort. For that reason, since there is a simultaneous impact on women’s household and labor market costs, we call these type of actions as *cost reduction policies*. The objective is to present a concept equivalent to the well-known *affirmative action*, but with effects and implications inside the household and in women’s costs, which are crucial ideas in this paper.

The cost of the domestic labor that we are considering is the part of the domestic labor that the household cannot procure or outsource to third parties, but that simultaneously benefit both members of the household. The amount of the cost of the domestic labor depends on the household income, the available time, the gender defined roles and the household hierarchy.¹¹

In conclusion, while affirmative action introduces a bias into the labor market competition in favor of women, cost reduction policies remove the bias that exists inside the household against women. Moreover, in comparison with affirmative action and other policies, cost reduction policies promote a strong and important sense of fairness and justice in the society.

Measures of policy performance

In order to measure the effects of affirmative action and cost reduction policies, we control for the individuals’ labor market participation and effort levels.

In our context, *welfare is measured by the labor market participation*.¹² This is an important aspect because one of the greatest concerns of the gender policy

¹¹For instance, some households can afford to buy full child care and house cleaning/maintenance services from the labor market while others cannot. Most policies benefit men and women in the same proportion leaving the domestic labor inequality unchanged in relative terms. For instance, public child care, fiscal incentives and exemptions are household policies that do not solve all household problems. These policies help, but do not deal with the essence of the problem, because domestic inequality remains, which affects women’s capacity to compete with men in equal conditions.

¹²In alternative to labor market participation, but without significant changes in the results, is to consider utility-based welfare measures. However, utility measures are not commonly used in the contests literature, because the market prize is fixed and independent of the level of competition.

is the uneven level of market participation among men and women. Labor market participation is also central in any discussion about gender differences and has always received media and statistical coverage.

On the other hand, *efficiency is measured by the total labor market effort*. In this context, the contest theory approach in this paper is a particularly powerful tool addressing questions regarding effort incentives in competitive environments.

The total labor market effort is a crucial indicator because in the context of the existing literature (see Section 2), there are strong concerns regarding the capacity of affirmative action to incentivize effort and competition. Some people question whether these policies are actually sufficiently justified by a past of discrimination and unequal opportunities. Other people question how can affirmative action favor weaker individuals (i.e., replace potentially more productive males by less productive females) without inducing lower performance.

5. Competition between individuals of the same gender

For each gender match there are two parties competing for the labor market prize, i.e., men competing with men, women competing with women and men competing with women. We start by considering the first two cases, i.e., the relations between individuals of the same gender. These two cases are useful benchmarks to contextualize the most interesting case, i.e., the one in which men and women compete with each other.

Proposition 1 (men compete with men). *When men compete with each other:*

a) The men's participation is full for $s \in [1/2, 1)$, and labor market effort decreases with cost reduction policies.

b) The men's participation and labor market effort are not affected by affirmative action.

Men's full participation is guaranteed when their share in the household labor is less than half of the total, which in our model is always the case, i.e., even the man with the highest household effort cost prefers to participate in the market.

Since there is full participation, the competitive relations between men become the benchmark for other relations. For instance, in the competitive relations between

The reason is that higher levels of competition imply higher effort levels, which is desirable, but reduces the total welfare, which then is inconsistent with the higher effort objective. As an example, the maximum welfare is achieved when both parties deliver no effort.

women we would like to observe similar efforts and participation levels as in the competitive relations between men. As we will discuss in Section 6.3, this could be a legitimate and alternative policy objective (or a second best policy target) to the gender equality objective that we have established in Definition 1.

Not surprisingly, since affirmative action induces a bias in favor of women, the competitive relations between men are not affected.

The following result is equivalent to Proposition 1, but refers to competitive relations between women.

Proposition 2 (women compete with women). *When women compete with each other:*

a) The women's participation and labor market effort increase with cost reduction policies.

b) The women's participation and labor market effort are not affected by affirmative action.

Since the women share in the cost of the domestic labor is larger than men (i.e., $s \geq 1/2$), full participation is not guaranteed. We found that women with high cost of the domestic labor prefer the non-competitive outside option even when competing with other women. This preference tends to disappear when the household labor is split more evenly between both genders. In other words, Proposition 2 shows that the unequal division of the domestic labor produces effects (even) in the competitive relations between women.

However, since affirmative action benefits all women equally, the competitive relations between women are not affected by affirmative action.

Propositions 1 and 2 show that the relations between individuals of the same gender are not affected by affirmative action, but are affected by the unequal division of the domestic labor. These results also reproduce the observed reality that men's participation is persistently larger than women's participation. Moreover, men are more competitive than women; they provide higher effort competing between them than women compete with each other. The reason is that men's lower domestic effort allows them greater focus and freedom to be more competitive. This observation helps to explain the persistent higher career success rates among men than among women.

Another observation derived from the results in Propositions 1 and 2 is the superiority of cost reduction policies in reducing the cost of the domestic labor burden on women and in turning their market relations more competitive. This observation

gains even more momentum because affirmative action is inoperative in relations between individuals of the same gender. Consequently, we should consider other policy instruments—cost reduction policies emerge naturally as the alternative policy instrument.

In this context, alternatives that were frequently used are non-discriminatory family helping policies that simultaneously decrease men and women’s domestic labor efforts (e.g., fiscal incentives and exemptions). However, these policies cannot eliminate the asymmetries between men and women because the relative difference remains unchanged. Consequently, they do not create a necessary sense of fairness and justice among men and women (Adams, 1963). On the contrary, cost reduction policies that target the social constructed gender roles, which are institutionalized and continually reconstructed through cyclical routines, are the ones that can ultimately solve the problem (Lorber, 1994).

6. Competition between men and women

In this section, we analyze the implications of the affirmative and cost reduction policies in the labor market effort and participation incentives when men and women compete with each other. We will see that affirmative action affects the equilibrium values in different ways. In particular, efficiency and full participation are only possible if men and women share equally the cost of the domestic labor.

Note that the value $a = 1$ means no affirmative action, while $a \uparrow \infty$ means an infinite bias in favor of women. Therefore, affirmative action can take a large spectrum of values. In this context, we consider Definition 1 to establish the frontier between what is and what is not affirmative action. In this context, the condition that establishes gender equality through affirmative action is:

$$\phi^{GE} \equiv \frac{s(3 + 2s)}{(1 - s)(5 - 2s)}, \quad (3)$$

for $s \in [1/2, 1)$.¹³ Therefore, meaningful affirmative action must take values in the interval $(1, \phi^{GE}]$. A value of a above ϕ^{GE} is unjustified because the introduction of such a large bias subverts the market by moving women artificially into a potentially better situation than men and would not gather general support. Such situation

¹³Condition (3) is obtained by applying the expectation operator to expression (B.2) in the Appendix B, and after solving the equality in Definition 1 for a , i.e., $E(u_w|m) = E(u_m|w)$.

could be possible and acceptable through the evolution of the social process, but not as part of a policy objective.

In the case in which men and women compete with each other, the solution of the model in Section 3 delivers the following equilibrium efforts for men and women:

$$e_{m|w} = \frac{asv}{(a(1-s) + s)^2c} \text{ and } e_{w|m} = \frac{a(1-s)v}{(a(1-s) + s)^2c}, \quad (4)$$

respectively, and the following equilibrium participation rates for men and women:

$$\alpha_{m|w} \equiv \frac{2s^2}{(a(1-s) + s)^2(1-s)} \text{ and } \alpha_{w|m} \equiv \frac{2a^2(1-s)^2}{(a(1-s) + s)^2s}, \quad (5)$$

respectively, with $\alpha_{m|w} < 1$ and/or $\alpha_{w|m} < 1$ if there is no full participation, and $\alpha_{m|w} = 1$ and/or $\alpha_{w|m} = 1$ otherwise. These results are shown here to support the reader in the discussion that follows. The proof of these and other results can be found in the [Appendix B](#).

6.1. Effort and gender equality policies

The following result shows the effect of affirmative and cost reduction policies in men and women's market efforts. In the contests theory literature, total effort is frequently used as a measure of competition intensity and efficiency.

Proposition 3 (men compete with women - effort). *When men and women compete with each other:*

a) *The men's labor market effort increases with affirmative action for:*

$$a < \phi^* \equiv s/(1-s), \quad (6)$$

and decreases otherwise. The men's labor market effort decreases with cost reduction policies.

b) *The women's labor market effort increases with affirmative action for $a < \phi^*$ and decreases otherwise. The women's labor market effort increases with cost reduction policies for:*

$$a < \phi_w^e \equiv (2-s)/(1-s), \quad (7)$$

and decreases otherwise.

c) *The total labor market effort increases with affirmative action for $a < \phi^*$ and decreases otherwise. The total labor market effort decreases with cost reduction policies for $a > 1$ and is constant for $a = 1$.*

Figure 1 provides an illustration of Proposition 3 for varying s and a .

Men and women's effort increase while the affirmative action bias is not too strong, i.e., while $1 \leq a < \phi^*$ with $\phi^* \leq \phi^{GE}$, where these cutoffs are given by expressions 6 and 3. In this interval, affirmative action turns women effort more effective, i.e., more likely to result in a career success, which makes competition between men and women more even by incentivizing women's effort. Simultaneously, men react with higher effort. In other words, leveling men and women through affirmative action has a positive effect in the individuals' total effort because it increases the competition intensity.

Note that the cutoff ϕ^* given by expression 6 is higher, the larger the difference between men and women in the household.¹⁴ Consequently, affirmative action is more justified and effective, the more unequal is the division of the cost of the domestic labor.

However, we also found that if affirmative action is high, i.e., for $a > \phi^*$, both men and women reduce their efforts. In this case, the bias in favor of women becomes too strong, and consequently women free ride on this advantage to save in costly effort and obtain higher utility. Simultaneously, for such high levels of affirmative action, the men's effort becomes less effective, which decreases their effort incentives. In this case, affirmative action reduces total effort, inducing inefficiency, i.e., in the interval $\phi^* < a \leq \phi^{GE}$, or even distorting the market, i.e., in the most extreme case that $a > \phi^{GE}$.

On the other hand, cost reduction policies (i.e., a reduction in $s \in [1/2, 1)$) tend to incentivize women's effort, but not men effort. Nonetheless, if affirmative action is above the cutoff value ϕ_w^e with $\phi^* \leq \phi_w^e$, where these cutoffs are given by expressions 6 and 7,¹⁵ the women's labor market effort may fall after a more equal division of the domestic labor. In this very particular case, cost reduction policies counteract because men become less competitive—the effectiveness of their labor market effort incentives is being simultaneously affected by cost reduction policies and by the high levels of affirmative action. In this context, women react by free riding on these policies, i.e., reducing their labor market intensity to save in costly effort.

¹⁴The higher $s \in [1/2, 1)$, the larger the value of ϕ^* , which expands the affirmative action efficient interval $[1, \phi^*)$.

¹⁵Note that ϕ_w^e is always above the efficient cutoff ϕ^* , and also tends to be above the gender equality cutoff ϕ^{GE} for $s < 5/6$ (and the opposite otherwise), which includes the vast majority of interesting cases.

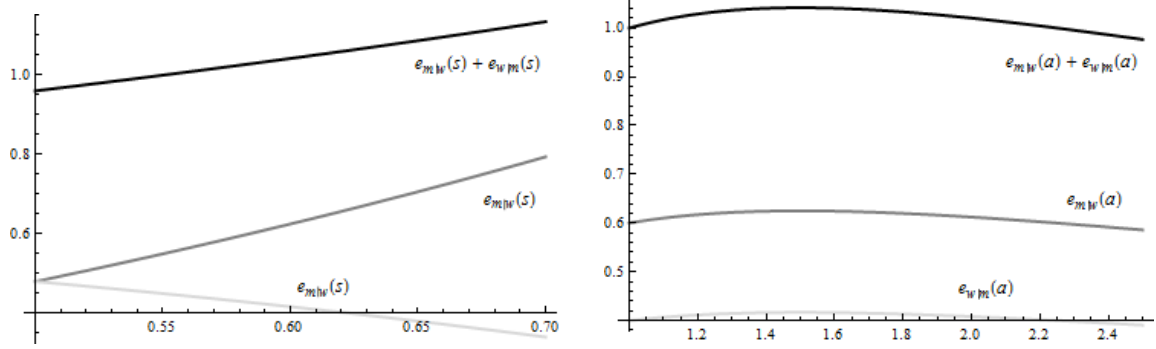


Figure 1: Men, women and total effort as a function of s with $a = 1.5$ (left-hand side) and as a function of a with $s = 0.6$ (right-hand side) ($c = v = 1$).

It is interesting to note that the negative effects of affirmative action on cost reduction policies are even stronger if we consider the total effort. The total effort is affected by cost reduction policies if there is affirmative action, i.e., for any $a > 1$. The increase in the women's incentives does not compensate the reduction in men's incentives. Therefore, in terms of economic efficiency, affirmative action compromises the potential benefits of cost reduction policies. These observations raise concerns about the complementary and simultaneous use of these two policy instruments.

6.2. Participation and gender equality policies

The following result summarizes the effects of affirmative and cost reduction policies in men and women's participation incentives in competitive relations.

Proposition 4 (men compete with women - participation). *When men and women compete with each other:*

a) *The men's participation decreases with affirmative and cost reduction policies for:*

$$a > \phi_m^\alpha \equiv \frac{s}{1-s} \left((2/(1-s))^{1/2} - 1 \right), \quad (8)$$

otherwise, there is men's full participation.

b) *The women's participation increases with affirmative and cost reduction policies for:*

$$1 \leq a < \phi_w^\alpha \equiv \frac{s}{1-s} \frac{1}{(2/s)^{1/2} - 1}, \quad (9)$$

otherwise, there is women's full participation.

c) The total participation increases with affirmative and cost reduction policies for $1 \leq a < \phi_w^\alpha$, the total participation is full for:

$$\phi_w^\alpha \leq a \leq \phi_m^\alpha,$$

otherwise, the total participation decreases.

Before any further considerations, note that all cutoffs in this paper are increasing in $s \in [1/2, 1)$. Moreover, they satisfy the following inequality relation:

$$1 \leq \phi^* \leq \phi^{GE} \leq \phi_w^\alpha \leq \phi_m^\alpha < \infty. \quad (10)$$

Note also that in the cases of full participation, we cannot improve on full participation and changes in a or s produce no variation in the individuals' participation levels.

Figure 2 provides an illustration of Proposition 4 for varying s and a .

Proposition 4 shows that cost reduction policies benefit women but not men's participation. The reason is that since part of women share in the domestic labor is passed to men, cost reduction policies increase women's relative ability to compete in the market at the expenses of a loss in men's ability.

On the other hand, Proposition 4 shows that affirmative action increases the women's likelihood of success by raising their expected payoffs, which also favors their participation. The potential increase in costly effort (see Proposition 3) is not enough to cancel the positive effect of affirmative action in the women's likelihood of success in the labor market.

Note that for high levels of affirmative action, i.e., for $a \geq \phi_w^\alpha$ (see expression 9), women full participation is guaranteed.¹⁶ However, such bias is outside the efficient and the gender equality regions, i.e., outside the regions $(1, \phi^*]$ and $(1, \phi^{GE}]$, respectively (see the inequality relation 10). Moreover, such high levels of affirmative action would reduce the individuals' effort incentives and swap the gender positions. In other words, women full participation is not possible through affirmative action without inducing inefficiency and distorting the labor market. However, this objective can be achieved through cost reduction policies.

¹⁶The cutoff ϕ_w^α establishes a relevant reference point because it is the lowest affirmative action bias that guarantees full participation to women. Consequently, it could be an alternative and legitimate policy objective different than the gender equality objective of Definition 1.

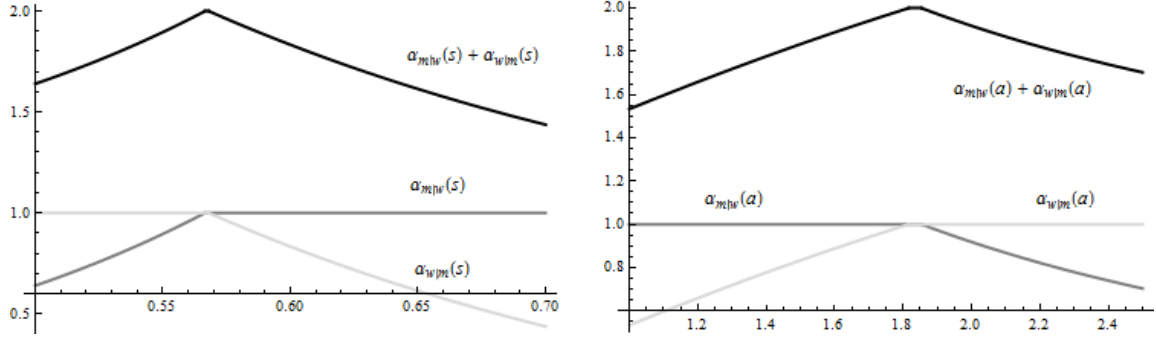


Figure 2: Men, women and total participation as a function of s with $a = 1.5$ (left-hand side) and as a function of a with $s = 0.6$ (right-hand side) ($c = v = 1$). Note that in both pictures, at certain point the men's participation goes under the women's participation. It happens when affirmative action is too high relative to the women share in the household effort, i.e. affirmative action is above the women and men full participation cutoffs ($\phi_w^\alpha \leq \phi_m^\alpha \leq a$).

Notice that men's participation is full because the cutoff value ϕ_m^α (see expression 8) is outside the affirmative action acceptable interval, i.e., $\phi_m^\alpha \geq \phi^{GE}$ (see the inequality relation 10). Consequently, men's participation is never affected. However, any bias against men reduces their expected payoffs even in cases in which there are reductions in costly effort and in competition intensity (i.e., in the interval $a > \phi^*$, see Proposition 3), because, in those cases, the reduction in the labor market effort reduces their likelihood of success.

Regarding participation incentives, cost reduction policies produce effects that are similar to affirmative action, which suggests that this particular objective can be achieved with either of these two policy instruments.

Proposition 3 shows that affirmative action has limitations in terms of efficiency and in terms of guaranteeing gender equality. On the other hand, cost reduction policies do not have these limitations, at least if affirmative action is not too high. In this context, we found that affirmative action is justified only if there are differences between men and women in the household and these differences cannot be solved. Otherwise, as these differences vanish, i.e., as $s \downarrow 1/2$, the affirmative action most relevant cutoffs in this paper (i.e., the efficient cutoff ϕ^* , the gender equality cutoff ϕ^{GE} and the women full participation cutoff ϕ_w^α), converge simultaneously to the unit

value, i.e., these cutoffs vanish. In other words, efficiency and full participation are achieved without the resource to affirmative action or any other labor market bias in favor of women.

As a conclusion, efficiency and full participation can be achieved through cost reduction policies without the need to induce inefficiency and distortions in the society. In this context, affirmative action can only be justified by operational and implementation reasons. This is the case because in practice, cultural and social aspects, and gender constructed roles difficult in a great extent the success of cost reduction policies. See [Davis and Greenstein \(2009\)](#), [Lorber \(1994\)](#) and the discussion in [Section 2](#). This is probably the main reason that supports the use of affirmative action and the greatest challenge to cost reduction policies.

6.3. *Other notes and comments*

In what follows, we briefly comment alternative policy objectives that reinforce the conclusions of [Proposition 3](#) and [4](#). In particular, (i) the superiority of cost reduction policies and (ii) that affirmative action should not go behind the effort efficient cutoff level ϕ^* .

6.3.1. *Individual preference for a particular gender match*

It is easy to show that women obtain a higher expected utility competing with women than with men for $a < \phi^*$. Otherwise, above the efficient cutoff ϕ^* , women prefer to compete with men because of the benefits induced by these high levels of affirmative action. In this perspective, we can think that while individuals show preference for a particular gender match, then either affirmative action is excessive or insufficient. This observation reinforces the idea that the optimal level of affirmative action should be set at $a = \phi^* = s/(1 - s)$. This result is particularly interesting because the magnitude of the efficient affirmative action adjusts progressively as the domestic labor inequality decreases, i.e., $\phi^* \downarrow 1$ as $s \downarrow 1/2$.

Moreover, since $\phi^* \in (1, \phi^{GE}]$, the rule $a = \phi^*$ does not induce any distortion and inefficiency in the labor market. This issue is relevant, because in practice, affirmative action is applied indiscriminately to solve gender asymmetries. Our results suggest that such use of affirmative action is inappropriate and may induce inefficiency.

Similarly, men prefer to compete with women than with men for $a < \phi^*$, because their winning prospects are higher. Altogether, these observations are in line with a series of recent studies that, among other things, suggest that the men's preference for competing with women is stronger than the women's preference for competing with men ([Booth and Nolen, 2012](#); [Datta Gupta et al., 2013](#); [Ivanova-Stenzel and Kübler, 2011](#)).

6.3.2. Comparison between different and same gender relations

Following the discussion in Section 5, the efforts and participation levels observed in competitive relations between men can be interpreted as benchmarks to other gender matches. This can be a legitimate and well-justified policy objective. In particular, in contexts in which the individuals' sense of fairness and justice depends on the comparison with other reference individuals (Adams, 1963).

Consequently, if we want women (in men/women competitive relations) to obtain the same ex-ante expected utility as men (in men/men competitive relations), i.e., $E(u_{w|m}) = E(u_{m|m})$, we must raise the levels of affirmative action to the cutoff value ϕ_w^α (see expression 9 in Proposition 3). This cutoff also guarantees women full participation. However, as we have seen, such levels of affirmative action may cause social inefficiencies and distortions, because $\phi^* \leq \phi^{GE} \leq \phi_w^\alpha$, see Section 6.2.

Other policy objectives may lead to similar conclusions. For instance, equal labor market effort in the men/women competitive relations (i.e., to impose $e_{w|m} = e_{m|w}$) and in the men/men competitive relations (i.e., to impose $e_{w|m} = e_{m|m}$) cannot be achieved by the efficient level of affirmative action $a = \phi^*$, but with a strong affirmative action bias. However, these objectives can also be achieved with cost reduction policies. In the ideal scenario in which domestic labor is equally split among men and women, i.e., for $s = 1/2$, all these objectives are achieved in simultaneous.

Another possible policy target would be to equate the men and women labor market success probabilities in expression (1), i.e., to set $p_{w|m} = 1/2$.¹⁷ This objective can be achieved by the effort efficient level of affirmative action $a = \phi^*$, but it can also be achieved through cost reduction policies.

The main conclusion is that every objective that can be achieved through affirmative action can also be achieved through cost reduction policies in a more effective and efficient way.

7. Conclusion

This paper shows that men's higher labor market participation and competitive capacity (relatively to women) is explained by their lower share in the cost of the domestic labor. This advantage allows them greater focus and freedom to succeed in competitive markets.

¹⁷In equilibrium, the women's likelihood of success is given by: $p_{w|m} = a(1-s)/(a(1-s) + s)$.

In this context, we found that affirmative action has limitations in terms of efficiency. Moreover, affirmative action would not be needed if men and women would share equally the cost of the domestic labor. While this problem is not solved, real gender equality is impossible. What is happening inside the household affects men and women's behavior, and consequently their competitive capacities.

Household action policies benefit from universal support because they promote a sense of fairness and justice in the society. However, in terms of implementation they may encounter cultural and social barriers. Even in the most gender egalitarian societies these barriers exist (Nakamura and Akiyoshi, 2015; Pascall and Lewis, 2004). On the other hand, affirmative action has the advantage of being simpler to implement, enforce and measure, but is more limited in terms of being able to reach true gender equality. Nonetheless, we found that moderate levels of affirmative action are particularly powerful to promote participation and efficiency.

We also found that affirmative and cost reduction policies tend to not complement each other. As the society moves into a state of equality between men and women in the household, the less justified and effective becomes affirmative action policies. Once domestic equality is achieved, all the other dimensions of true gender equality will also converge.

The reality is complex. For that reason, we have made several simplifying assumptions in order to be able to focus exclusively on the qualitative features of the affirmative and cost reduction policies without additional considerations that could potentially bloat the analysis. For instance, we have ignored biological differences between men and women or the possibility of specialization within the household (Becker, 1985). Regarding the theoretical model, the assumptions have the objective of keeping the model analytically tractable. The consideration of these and other issues can be the subject of further research.

Finally, the difference between men and women in terms of labor market attitude raises various research questions that need to be properly addressed. Despite the fact that the literature in the division of domestic labor seems to be well established and developed (see Section 2), we found a weak treatment in terms of theoretical models that consider rational individuals with strategic incentives (Lundberg and Pollak (1996) review some of this literature). In our perspective, future research should explore this lead. This is a particularly relevant aspect because empirical findings present mixed results. Theory could help in refining conclusions. We call for a research agenda on these issues. Despite the complexity of the topic, the present paper is a step in this direction.

We hope that our findings will help researchers and decision-makers to better understand the reasons that explain why men and women seem to behave differently in the labor market. In particular, our results may guide researchers and decision-makers implementing effective policies that can allow men and women to have the same opportunities.

Acknowledgments: I wish to thank to Steven Brams, Douglas Heckathorn, Lawrence Kahn, Ricardo Ribeiro and Juan Pablo Rincón-Zapatero, as well as several seminars and congresses participants for helpful comments and discussions. Support from the Spanish Ministerio of Ciencia y Innovación project ECO2016-75410-P, GRODE and CEFAGE-ISCAL is gratefully acknowledged. The usual caveat applies.

Appendix A. The link between domestic and labor market efforts

In the paper, we have assumed that the labor market cost of the effort is a function of the share of the cost of the domestic labor effort, i.e., $c_m = c(1 - s)$ and $c_w = cs$. Intuitively, the argument supporting this assumption is that the lower the individuals' share of the household effort cost, the more time they have to succeed and focus on the labor market. This argument is reinforced by the fact that individuals with a lower share in the household effort have also more time for leisure activities, self-education, information acquisition and other activities that then become crucial to succeed in the labor market.

In this appendix, we question what would happen if we relax this assumption. In this context, we consider the case of perfect negative correlation between the share of domestic effort and the labor market cost of effort by assuming $c_m = cs$ and $c_w = c(1 - s)$ instead of $c_m = c(1 - s)$ and $c_w = cs$, respectively. In this context, Proposition 3 would have to be rewritten as follows (the same exercise can be done with the participation incentives of Proposition 4):

Proposition (men compete with women - effort). *When men and women compete with each other:*

a) The men's labor market effort decreases with affirmative action. The men's labor market effort decreases with cost reduction policies for:

$$a < \phi_w^e \equiv (2 - s)/(1 - s),$$

and increase otherwise.

b) The women's labor market effort decreases with affirmative action. The women's labor market effort decreases with cost reduction policies for:

$$a > (1 + s)/s,$$

and increases otherwise.

c) The total labor market effort decreases with affirmative action. The total labor market effort increases with cost reduction policies.

The obtained results change in qualitative terms (maybe not as much as we would initially expect). However, what is probably more relevant is that the intuition and the interpretation of the results have to be reversed, which in some cases might be difficult to reconcile.

For instance, in order to see this point, consider Part (b) of the above Proposition. It states that women's labor market effort always decreases with affirmative action. In this case, we can argue that women free ride on this advantage to save in costly effort and obtain higher utility. However, the result obtained in the case of positive correlation (Part (b) of Proposition 3) is richer and makes more sense, i.e., women free ride on this advantage to save in costly effort and obtain higher utility, but only if the affirmative action bias is strong enough (i.e., $a > \phi_w^e$). Otherwise, affirmative action favors women effort on the labor market. This is probably the kind of result that we would expect.

Also in Part (b) of the above Proposition, the women's labor market effort tends to decrease with cost reduction policies. It is only when affirmative action is sufficiently high that we observe the opposite, i.e., women's labor market effort increases. However, in the positive correlation case (Part (b) of Proposition 3), we have pretty much the opposite result. Consequently, it is hard to motivate this difference. In this context, it might make more sense to believe that women's labor market effort tends to increase with cost reduction policies, except when cost reduction policies are too high such that they remove the effort incentives, as stated in the positive correlation case of Part (b) of Proposition 3.

Another possibility it is to consider no correlation between the share of domestic effort and the labor market cost of effort by assuming $c_m = c$ and $c_w = c$ instead of $c_m = c(1 - s)$ and $c_w = cs$, respectively. In this zero correlation case, there are no household effects in the equilibrium effort because what happens inside the household does not affect the cost of the labor market effort. In addition, in this case, affirmative action has always a negative effect in terms men and women labor market

effort incentives (we do not formally state these result in a proposition because they are trivial).¹⁸

To summarize, the effectiveness of cost reduction policies and the results in this paper depends on the type of correlation between the cost of the labor market effort and the share of the domestic effort. However, as we have shown, it makes more sense to consider the positive correlation case. In other words, the higher the women share in the cost of the domestic effort, the higher is the cost of effort in the labor market (a similar argument also appears in [Albanesi and Olivetti \(2009\)](#)). We can also question the intensity of this correlation, but this correlation should be positive. Of course, such assumption (as any other assumption) has implications on the results.

Finally, an alternative way to link the household cost of effort with the labor market (but with similar implications) would be to assume that a higher share in the cost of the domestic effort would make women's labor market effort less effective than men's effort. This assumption would operate in the contest success function. In this paper, in order to separate the household and affirmative action effects, we found it more convenient to link the share in the cost of the domestic effort with the labor market cost of effort.

Appendix B. Proofs of the Propositions

Proof of Propositions 1 and 2. We start by showing our results in the most general setting. Subsequently, we add some working assumptions. Given the gender group $k(j) \in \{M, W\}$ of the opponent j , the individual i of the gender group $g(i) \in \{M, W\}$ chooses $e_{g(i)|k(j)}$ to maximize the expression $u_{g(i)|k(j)}$ in (2). Similarly, given the gender group $g \in \{M, W\}$ of the opponent i , the individual j of the gender group $k \in \{M, W\}$ chooses $e_{k(j)|g(i)}$ to maximize the expression $u_{k(j)|g(i)}$ in (2). The respective pair of first order conditions is given by:

$$\frac{a_{g(i)}a_{k(j)}e_{k(j)|g(i)}v}{(a_{g(i)}e_{g(i)|k(j)} + a_{k(j)}e_{k(j)|g(i)})^2} = c_{g(i)}, \quad \text{and} \quad \frac{a_{g(i)}a_{k(j)}e_{g(i)|k(j)}v}{(a_{g(i)}e_{g(i)|k(j)} + a_{k(j)}e_{k(j)|g(i)})^2} = c_{k(j)},$$

for $g(i), k(j) \in \{M, W\}$. Since the second derivative of each of the first order conditions is strictly negative, the objective function is strictly concave and the labor

¹⁸Other intermediate levels of correlation require the introduction of nonlinearities or a noise component (i.e., a random variable) in the functions characterizing c_m and c_w .

market effort is defined on a convex space, then the obtained first order conditions are simultaneously necessary and sufficient for a maximum. The solution of this system of first order conditions is given by:

$$e_{g(i)|k(j)} = \frac{a_{g(i)}a_{k(j)}c_{k(j)}v}{(a_{k(j)}c_{g(i)} + a_{g(i)}c_{k(j)})^2}, \text{ and } e_{k(j)|g(i)} = \frac{a_{g(i)}a_{k(j)}c_{g(i)}v}{(a_{k(j)}c_{g(i)} + a_{g(i)}c_{k(j)})^2}, \quad (\text{B.1})$$

for $g(i), k(j) \in \{M, W\}$. In the most general setting, each individual equilibrium utility is given by:

$$u_{g(i)|k(j)} = \frac{a_{g(i)}^2 c_{k(j)}^2 v}{(a_{k(j)}c_{g(i)} + a_{g(i)}c_{k(j)})^2} - s_g h_{g(i)}, \quad (\text{B.2})$$

for $g(i), k(j) \in \{M, W\}$.

Given the gender group $g(i) \in \{M, W\}$, the cost of the domestic labor $h_{g(i)}$ of the individual i , the gender of the opponent $k(j) \in \{M, W\}$, and subject to the participation constraint $u_{g(i)|k(j)} \geq 0$, the individual i of the gender group $g(i)$ participates only if the domestic cost of effort satisfies the condition $h_{g(i)} \leq a_{g(i)}^2 c_{k(j)}^2 v / ((a_{k(j)}c_{g(i)} + a_{g(i)}c_{k(j)})^2 s_g)$. Under the uniform distribution assumption, $h_{g(i)} \sim U(0, \bar{h})$ where $\bar{h} = v/2$, the proportion of participants of the gender group $g \in \{M, W\}$ is given by:

$$\alpha_{g|k} \equiv \int_0^{\frac{a_g^2 c_k^2 v}{(a_k c_g + a_g c_k)^2 s_g}} \frac{1}{v/2} dx = \frac{2a_g^2 c_k^2}{(a_k c_g + a_g c_k)^2 s_g} < 1, \quad (\text{B.3})$$

with $\alpha_{g|k} = 1$ otherwise.

Depending on the gender match $g, k \in \{M, W\}$, we obtain different equilibrium expressions for (B.1), (B.2) and (B.3). In the case in which individuals of the same gender compete with each other, i.e., either case $g = w$ and $k = w$ or case $g = m$ and $k = m$, as in Propositions 1 and 2, we have:

$$e_{g|g} = \frac{v}{4c_g} \text{ and } \alpha_{g|g} = \min \left\{ \frac{1}{2s_g}, 1 \right\},$$

where $a_m = 1$ and $a_w = a \geq 1$ for all $m, w \in \{M, W\}$. Recall also that $s_m = 1 - s$ and $s_w = s \in [1/2, 1)$, $c_m = c(1 - s)$ and $c_w = cs$, respectively. Consequently, we obtain that men's participation is full, i.e., $\alpha_{m|m} \geq 1$, for $s \in [1/2, 1)$, but women's participation is not full, i.e., $\alpha_{w|w} \leq 1$, except for $s = 1/2$. Now, differentiate $\alpha_{g|g}$ and $e_{g|g}$ with respect to a (in our context, affirmative action corresponds to an increase

in a) and s (in our context, cost reduction policies correspond to a decrease in s for $s \geq 1/2$), and make the respective sign verification. In this context, it is easy to show that $\partial\alpha_{g|g}/\partial a = 0$ for $g \in \{M, W\}$, while $-\partial\alpha_{m|m}/\partial s = 0$ is irrelevant because participation is full, but $-\partial\alpha_{w|w}/\partial s > 0$ for $s \in [1/2, 1)$. Similarly, $\partial e_{g|g}/\partial a = 0$ for $g \in \{M, W\}$, but $\partial e_{m|m}/\partial s < 0$ and $\partial e_{w|w}/\partial s > 0$. ■

Proof of Proposition 3 and 4. The proof of Propositions 3 and 4 simply require the computation of the derivatives of (B.1) and (B.3), respectively, with respect to a (in our context, affirmative action corresponds to an increase in a) and s (in our context, cost reduction policies correspond to a decrease in s for $s \geq 1/2$), and the respective sign verification. We start with Proposition 3. Since $s_m = 1 - s$ and $s_w = s \in [1/2, 1)$, $c_m = c(1 - s)$ and $c_w = cs$, $a_m = 1$ and $a_w = a \geq 1$, the men and women's equilibrium efforts resulting from expression (B.1) are given by expression (4). The total effort is the sum of these two efforts, i.e., $e_{m|w} + e_{w|m}$. We can show, for Part (a) of Proposition 3 that:

$$\frac{\partial e_{m|w}}{\partial a} = \frac{(s - a(1 - s))sv}{c(a(1 - s) + s)^3} > 0, \quad \text{and} \quad -\frac{\partial e_{m|w}}{\partial s} = \frac{(s - a(1 + s))av}{c(a(1 - s) + s)^3} < 0,$$

where the direction of the inequalities holds true while the inequalities (6) and $a > s/(1 + s)$ are satisfied, respectively, and the opposite otherwise. The latter inequality is always true because $a \geq 1$ and $s \in [1/2, 1)$. For Part (b) of Proposition 3 we have that:

$$\frac{\partial e_{w|m}}{\partial a} = \frac{(1 - s)(s - a(1 - s))v}{c(a(1 - s) + s)^3} > 0, \quad \text{and} \quad -\frac{\partial e_{w|m}}{\partial s} = \frac{((2 - s) - a(1 - s))av}{c(a(1 - s) + s)^3} > 0,$$

where the direction of the inequalities holds true while the inequalities (6) and (7), are satisfied, respectively, and the opposite otherwise. The latter inequality is always larger than the former. The proof of Part (c) of Proposition 3 goes along the same lines.

Consider now the proof of Proposition 4. The men and women's equilibrium participation rates obtained from expression (B.3) are given by expression (5). Total participation is the sum of these two numbers, i.e., $\alpha_{m|w} + \alpha_{w|m}$. It is easy to show for Part (a) of Proposition 4 that $\partial\alpha_{m|w}/\partial a < 0$ and that $-\partial\alpha_{m|w}/\partial s < 0$, and for Part (b) of Proposition 4 that $\partial\alpha_{w|m}/\partial a > 0$ and that $-\partial\alpha_{w|m}/\partial s > 0$. Moreover, note that men and women full participation, i.e., $\alpha_{m|w} = 1$ and $\alpha_{w|m} = 1$, respectively, are guaranteed only if affirmative action is below the cutoffs $a \leq \phi_m^\alpha$ and $a \geq \phi_w^\alpha$, respectively, where the mathematical formulation of these cutoffs is given by expressions (8) and (9), respectively, where the latter cutoff is always smaller than the

former, i.e., $1 \leq \phi_w^\alpha \leq \phi_m^\alpha$. Regarding Part (c) of Proposition 4, total participation increases for $1 \leq a < \phi_w^\alpha$ because there is men, but not women's full participation. As discussed before, in this region, the sign of the derivatives are: $\partial\alpha_{w|m}/\partial a > 0$ and $-\partial\alpha_{w|m}/\partial s > 0$ (and $\partial\alpha_{m|w}/\partial a = 0$ and $-\partial\alpha_{m|w}/\partial s = 0$). Total participation is full for $\phi_w^\alpha \leq a \leq \phi_m^\alpha$, because in this interval there is men and women full participation. Otherwise, i.e., for $a > \phi_m^\alpha$, total participation decreases because there is women, but not men full participation. As discussed before, in this region, the sign of the derivatives are: $\partial\alpha_{m|w}/\partial a < 0$ and $-\partial\alpha_{m|w}/\partial s < 0$ (and $\partial\alpha_{w|m}/\partial a = 0$ and $-\partial\alpha_{w|m}/\partial s = 0$). ■

References

- Adams, J., 1963. Towards an understanding of inequality. *Journal of Abnormal and Normal Social Psychology* 67 (5), 422–436.
- Albanesi, S., Olivetti, C., 2009. Home production, market production and the gender wage gap: Incentives and expectations. *Review of Economic Dynamics* 12 (1), 80–107.
- Altonji, J. G., Blank, R. M., 1999. Race and gender in the labor market. *Handbook of Labor Economics* 3, 3143–3259.
- Athey, S., Avery, C., Zemsky, P., 2000. Mentoring and diversity. *American Economic Review* 90 (4), 765–786.
- Bateup, H. S., Booth, A., Shirtcliff, E. A., Granger, D. A., 2002. Testosterone, cortisol, and women's competition. *Evolution and Human Behavior* 23 (3), 181–192.
- Becker, G. S., 1985. Human capital, effort, and the sexual division of labor. *Journal of Labor Economics* 3 (1), S33–S58.
- Becker, P. E., Moen, P., 1999. Scaling back: Dual-earner couples' work-family strategies. *Journal of Marriage and the Family* 61 (4), 995–1007.
- Benschop, Y., Halsema, L., Schreurs, P., 2001. The division of labour and inequalities between the sexes: An ideological dilemma. *Gender, Work & Organization* 8 (1), 1–18.
- Bertrand, M., Hallock, K. F., 2001. The gender gap in top corporate jobs. *Industrial & Labor Relations Review* 55 (1), 3–21.
- Bianchi, S. M., 2000. Maternal employment and time with children: Dramatic change or surprising continuity? *Demography* 37 (4), 401–414.
- Bianchi, S. M., Milkie, M. A., Sayer, L. C., Robinson, J. P., 2000. Is anyone doing the housework? trends in the gender division of household labor. *Social Forces* 79 (1), 191–228.
- Bielby, W. T., Bielby, D. D., 1989. Family ties: Balancing commitments to work and family in dual earner households. *American Sociological Review* 54 (5), 776–789.

- Bird, C. E., 1999. Gender, household labor, and psychological distress: The impact of the amount and division of housework. *Journal of Health and Social Behavior* 40 (1), 32–45.
- Blau, F. D., Kahn, L. M., 2016. The gender wage gap: Extent, trends, and explanations. Tech. rep., National Bureau of Economic Research.
- Booth, A., Nolen, P., 2012. Choosing to compete: How different are girls and boys? *Journal of Economic Behavior & Organization* 81 (2), 542–555.
- Coate, S., Loury, G. C., 1993. Will affirmative-action policies eliminate negative stereotypes? *The American Economic Review* 83 (5), 1220–1240.
- Croson, R., Gneezy, U., 2009. Gender differences in preferences. *Journal of Economic literature* 47 (2), 448–474.
- Cubel, M., Sánchez-Pagés, S., 2017. Gender differences and stereotypes in strategic reasoning. *The Economic Journal* 127 (601), 728–756.
- Datta Gupta, N., Poulsen, A., Villeval, M. C., 2013. Gender matching and competitiveness: Experimental evidence. *Economic Inquiry* 51 (1), 816–835.
- Davis, S. N., Greenstein, T. N., 2009. Gender ideology: Components, predictors, and consequences. *Annual Review of Sociology* 35 (1), 87–105.
- Dohmen, T., Falk, A., 2011. Performance pay and multidimensional sorting: Productivity, preferences, and gender. *The American Economic Review* 101 (2), 556–590.
- Fain, J. R., 2009. Affirmative action can increase effort. *Journal of Labor Research* 30 (2), 168–175.
- Flory, J. A., Gneezy, U., Leonard, K., List, J., et al., 2018. Gender, age, and competition: A disappearing gap? *Journal of Economic Behavior and Organization* 150, 256–276.
- Franke, J., 2012. Affirmative action in contest games. *European Journal of Political Economy* 28 (1), 105–118.
- Frisco, M. L., Williams, K., 2003. Perceived housework equity, marital happiness, and divorce in dual-earner households. *Journal of Family Issues* 24 (1), 51–73.
- Fu, Q., 2006. A theory of affirmative action in college admissions. *Economic Inquiry* 44 (3), 420–428.
- Gneezy, U., Leonard, K. L., List, J. A., 2009. Gender differences in competition: Evidence from a matrilineal and a patriarchal society. *Econometrica* 77 (5), 1637–1664.
- Gneezy, U., Niederle, M., Rustichini, A., 2003. Performance in competitive environments: Gender differences. *Quarterly Journal of Economics* 118 (3), 1049–1074.
- Gneezy, U., Rustichini, A., 2004. Gender and competition at a young age. *The American Economic Review* 94 (2), 377–381.

- Goldin, C., Rouse, C., 2000. Orchestrating impartiality: The impact of "blind" auditions on female musicians. *The American Economic Review* 90 (4), 715–741.
- Gornick, J. C., Meyers, M. K., 2003. *Families that work: Policies for reconciling parenthood and employment*. Russell Sage Foundation.
- Greenhaus, J. H., Beutell, N. J., 1985. Sources of conflict between work and family roles. *Academy of Management Review* 10 (1), 76–88.
- Greenstein, T. N., 2000. Economic dependence, gender, and the division of labor in the home: A replication and extension. *Journal of Marriage and Family* 62 (2), 322–335.
- Grossbard-Shechtman, S. A., 1984. A theory of allocation of time in markets for labour and marriage. *Economic Journal* 94 (376), 863–82.
- Hewlett, S., Luce, C., 2005. Off-ramps and on-ramps: keeping talented women on the road to success. *Harvard Business Review* 83 (3), 43–54.
- Holzer, H., Neumark, D., 2000. Assessing affirmative action. *Journal of Economic Literature* 38 (3), 483–568.
- Holzer, H., Neumark, D., 2006. Affirmative action: What do we know? *Journal of Policy Analysis and Management* 25 (2), 463–490.
- Ivanova-Stenzel, R., Kübler, D., 2011. Gender differences in team work and team competition. *Journal of Economic Psychology* 32 (5), 797–808.
- Lennon, M. C., Rosenfield, S., 1994. Relative fairness and the division of housework: The importance of options. *American Journal of Sociology* 100 (2), 506–531.
- Lorber, J., 1994. *Paradoxes of gender*. Yale University Press.
- Lundberg, S., Pollak, R. A., 1996. Bargaining and distribution in marriage. *The Journal of Economic Perspectives* 10 (4), 139–158.
- Lundberg, S. J., 1991. The enforcement of equal opportunity laws under imperfect information: affirmative action and alternatives. *The Quarterly Journal of Economics* 106 (1), 309–326.
- Nakamura, M., Akiyoshi, M., 2015. What determines the perception of fairness regarding household division of labor between spouses? *PloS ONE* 10 (7), 1–17.
- Niederle, M., Segal, C., Vesterlund, L., 2013. How costly is diversity? affirmative action in light of gender differences in competitiveness. *Management Science* 59 (1), 1–16.
- Niederle, M., Vesterlund, L., 2007. Do women shy away from competition? do men compete too much? *The Quarterly Journal of Economics* 122 (3), 1067–1101.
- Niederle, M., Vesterlund, L., 2011. Gender and competition. *Annual Review of Economics* 3, 601–630.

- Olsen, W., Heuvelman, H., Gash, V., Vandecasteele, L., Walthery, P., 2010. The gender pay gap in the uk 1995-2007. Government Equalities Office.
- Pascall, G., Lewis, J., 2004. Emerging gender regimes and policies for gender equality in a wider europe. *Journal of Social Policy* 33 (3), 373–394.
- Presser, H. B., 1994. Employment schedules among dual-earner spouses and the division of household labor by gender. *American Sociological Review* 59 (3), 348–364.
- Reynolds, J., 2005. In the face of conflict: Work-life conflict and desired work hour adjustments. *Journal of Marriage and Family* 67 (5), 1313–1331.
- Ross, C., Mirowsky, J., Huber, J., 1983. Dividing work, sharing work, and in-between: marriage patterns and depression. *American Sociological Review* 48 (6), 809–823.
- Schieman, S., Milkie, M. A., Glavin, P., 2009. When work interferes with life: Work-nonwork interference and the influence of work-related demands and resources. *American Sociological Review* 74 (6), 966–988.
- Schotter, A., Weigelt, K., et al., 1992. Asymmetric tournaments, equal opportunity laws, and affirmative action: Some experimental results. *The Quarterly Journal of Economics* 107 (2), 511–539.
- Shelton, B. A., John, D., 1996. The division of household labor. *Annual Review of Sociology* 22 (1), 299–322.
- Sowell, T., 2004. *Affirmative action around the world: an empirical study*. Yale University Press.
- Tausig, M., Fenwick, R., 2001. Unbinding time: Alternate work schedules and work-life balance. *Journal of Family and Economic Issues* 22 (2), 101–119.
- Tullock, G., 1980. Efficient rent seeking. In: J.M. Buchanan, R. T., Tullock, G. (Eds.), *Towards a Theory of a Rent-Seeking Society*. Texas A&M University Press, pp. 97–112.
- Vandegrift, D., Brown, P., 2005. Gender differences in the use of high-variance strategies in tournament competition. *The Journal of Socio-Economics* 34 (6), 834–849.
- Vandegrift, D., Yavas, A., 2009. Men, women, and competition: An experimental test of behavior. *Journal of Economic Behavior & Organization* 72 (1), 554–570.
- Vierling-Claassen, A., 2013. Division of labor in child care: A game-theoretic approach. *Rationality and Society* 25 (2), 198–228.
- Welch, F., 1976. Employment quotas for minorities. *Journal of Political Economy* 84 (4), S105–S141.
- Wunderink, S., Niehoff, M., 1997. Division of household labour: Facts and judgements. *De Economist* 145 (3), 399–419.
- Youm, Y., Laumann, E. O., 2003. The effect of structural embeddedness on the division of household labor: A game-theoretic model using a network approach. *Rationality and Society* 15 (2), 243–280.