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## Family matters: endogenous gender discrimination in economic development

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# Family matters: endogenous gender discrimination in economic development\*

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## Abstract

We present a growth model where savings, fertility, labour force participation and gender wage discrimination are endogenously determined. Households consist of husband and wife, who disagree on how to allocate resources to their individual consumption. Household decisions are made by bargaining and the bargaining power of each spouse depends on the market income he/she brings home. This provides the basis for the reluctance of men to grant women equal access to labour markets despite the fact that this hurts them in terms of reduced family income. Economic development makes discrimination costlier, initiating a positive cycle of high female participation, low fertility and high growth. Our empirical study is in two parts. Firstly, we use cross-country micro data to test the hypothesis that development is negatively related to male ‘preference for discrimination’. We show that men’s views converge to those of women over the development process and that, for low levels of income, a large majority of men have discriminatory views. Our conclusion is that a turning point occurs at an annual per capita GDP of around \$15000. Secondly, we exploit the National Longitudinal Survey of Youth 1979 to find out what cause individuals to change their discriminatory preferences over time.

JEL Codes: D13, J7, J13, J16, 015

Keywords: Economic Development, Fertility, Female Labor Force Participation, Gender Discrimination

## 1 Introduction

Economic development and the role and rights of women in society are interconnected. In particular, economic development appears to be associated

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with high levels of female labor force participation (FLP) and lower gender wage gaps.

Galor and Weil (1996) offer a theory of rising female labor force participation and declining fertility in economic development. It is based on the positive feedback on capital accumulation and the gender wage gap. Casual observation suggests that, although declining, the gender wage gap remains sizable even in advanced economies<sup>1</sup>. Our proposition is that the gender wage gap is not just the result of physical differences between men and women, but it is also caused by a gender bias in the workplace. We suggest that this bias is rooted in a family conflict regarding resource allocation and we show how economic development influences this conflict.

More precisely, we introduce a collective model of the family where husband and wife bargain on resource allocation. Essential in our analysis is the assumption that the husband loses some bargaining power when the wife's contribution to family income increases. This provides the basis for the reluctance of men to grant women equal access to labour markets despite the fact that this hurts family income. For low levels of development, men would forgo the increased income from women earning the market wage they deserve in favor of having more bargaining power at home. Increased capital accumulation makes it financially costlier for them to stick to their gender bias. Support for discrimination wanes out, initiating a positive cycle of high female participation, low fertility and high growth.

The idea that dominant groups can choose to give up some of their privileges for purely selfish considerations can be found in a variety of contexts, such as the abolition of slavery (Wright 2006), the spread of public education to the masses (Galor and Moav 2006) or the extension of voting rights (Acemoglu and Robinson 2000, Lizzeri and Persico 2004). More specifically, there is a growing literature on the extension of voting and legal rights to women. Bertocchi (2007) attribute the extension of voting rights to women as the consequence of a falling gender wage gap, which reduces the divergence between men and women on the size and scope of government<sup>2</sup>. Geddes and Lueck (2002) claim that, when the returns to human capital are sufficiently high, it is in the interest of men to loosen their control over women as an incentive for the latter to invest more in education. They support their claim by showing that the cross-state variations in the timing at which property rights were granted to women in the 19th century in the U.S. are related to differences in female human capital. Doepke and Tertilt (2009) offer a model where men are torn between having the upper hand at home with their wives and the welfare of their daughters. An important implication is that, when fertility falls and wealth is accumulated, men are faced with an increasing welfare gap between their sons and daughters since the financial

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<sup>1</sup>According to O'Neill (2003), at least 10% of the gender wage gap in the U.S. is unaccounted for by differences in schooling, tenure and occupational choice

<sup>2</sup>There is a growing literature on the consequences of the extension of voting rights to women on government size and policy (Lott and Kenny 1999, Aidt, Dutta, and Loukoianova 2006, Funk and Gathmann 2006). More generally, Cavalcanti and Tavares (2003) show how increasing FLP alters government size.

transfers made to their daughters are captured by sons-in-laws. This compels them to commit to better women rights. Fernández (2009) supports this claim by showing that states that had lower levels of fertility reformed earlier in the U.S. Our paper builds on this literature but we instead focus on what can be termed as the ‘right to equal pay’. Unlike in Doepke and Tertilt (2009) and Fernández (2009) in which there a discrete shift from a so-called ‘patriarchal’ regime to an ‘egalitarian’ one, our approach considers changes in household bargaining as a gradual, continuous process.

Attributing the root cause of a gender bias in the workplace to the family, as we do, is not uncommon in the literature. In Becker (1985), division of labor within the family, which leaves effort-intensive tasks (such as child care and household chores) to women, forces them to expend less effort than men in the market place or to select into less-demanding occupations. Along the same lines, Albanesi and Olivetti (2006) present a model in which there is division of labor at home and utility cost of work is increasing in home hours. They show that, under imperfect information about effort, employers pay women less as they expect women to exert less effort than men at work. This reinforces further household division of labor, making employers’ expectations self-fulfilling. Economic development, by improving the relative return to market work, may break this cycle. Others have emphasized technological improvements as key factors that led women into the labor force (e.g. in the form of time-saving home goods (Greenwood, Seshadri, and Yorukoglu 2005), contraceptive methods Goldin and Katz (2002) or medical improvements in childbearing (Albanesi and Olivetti 2007)). In Fernández, Fogli, and Olivetti (2004), intergenerational transmission of values is key to understanding changes in gender bias: men who grew up with working mothers have more progressive attitudes towards FLP and housework.

Finally, our work is related to the literature which consider how changes in the economic, legal or technological environment alter bargaining within the household. Chiappori and Oreffice (2008) model the impact of technological improvements in birth control on the empowerment of women, while Akerlof, Yellen, and Katz (1996) and Oreffice (2007) assess on the impact of legalization of abortion on married women’s bargaining position.

## 2 Model

### 2.1 The Environment

**Production technology:** Consider the following production function with three factors of production, physical capital ( $K$ ), mental labor ( $L^m$ ) and physical labor ( $L^p$ ). Mental labor is a complement to physical capital while physical labor is neither a complement nor a substitute to physical capital.

$$Y_t = K_t^\alpha (A_t L_t^m)^{1-\alpha} + B A_t L_t^p \quad (1)$$

where  $A_t = (1 + \mu)^t$ ,  $B > 0$

The returns to the factors of production are

$$w_t^p = A_t B \quad (2)$$

$$w_t^m = (1 - \alpha) A_t k_t^\alpha m_t^{-\alpha} \quad (3)$$

$$r_t = \alpha k_t^{\alpha-1} m_t^{1-\alpha} \quad (4)$$

where  $k_t = K_t / (A_t L_t^p)$  and  $m_t = L_t^m / L_t^p$

As in Galor and Weil (1996), it is assumed that men are endowed with both physical and mental labor while women are endowed with mental labor only. As the return to mental labor is increasing in physical capital, a higher capital stock leads, *ceteris paribus*, to a lower gender gap.

**Discrimination:** It is assumed that a fraction of what women earn from market work is “melted” away due to discrimination. Thus, women earn a fraction  $\phi_t$  of their mental wage.

**Individual preferences:** Agents have equal probabilities of being born male or female and they live for three periods. During childhood, an agent is raised by father and mother. During adulthood, which also correspond to the productive years of the agent both in terms of production and fertility, two agents of opposite sexes form a couple, make choices regarding labour supply, fertility and savings and decide on the allocation of old-age savings between the two. During old age, each consumes income saved during adulthood.

Husband and wife have the following utility functions (respectively  $u_t^h$  and  $u_t^w$ ), valuing their own old-age consumption (respectively  $d_{t+1}^h$  and  $d_{t+1}^w$ ) and the number of children ( $n_t$ ).

$$u_t^h = \ln d_{t+1}^h + \gamma \ln n_t$$

$$u_t^w = \ln d_{t+1}^w + \gamma \ln n_t$$

where  $\gamma \in (0, 1)$

**Fertility:** The household labor supply is  $l_t$  and as in Greenwood, Seshadri, and Vandenbroucke (2005), children are assumed to be costly in terms of parental time only.

$$n_t = D(2 - l_t)^\theta \quad (5)$$

where  $D > 0$ ;  $\theta > 0$ ;  $l_t \in (0, 2)$

**Household preferences:** Following Chiappori (1988), we consider a collective utility function of the household which takes the following form

$$u_t = \eta(\phi_t) \ln d_{t+1}^h + (1 - \eta(\phi_t)) \ln d_{t+1}^w + \gamma \ln n_t \quad (6)$$

where  $\eta(\phi_t)$  is the husband’s Pareto weight;  $\eta'(\cdot) < 0$

## 2.2 Household maximisation

**Budget Constraints:** We note that since the opportunity cost of raising children is always higher for the husband than for the wife, husbands only get involved in raising children if  $l_t < 1$ .

$$d_{t+1}^h + d_{t+1}^w \leq \begin{cases} (1 + r_{t+1})(w_t^p + w_t^m)l_t & \text{if } l_t \leq 1 \\ (1 + r_{t+1})(w_t^p + w_t^m + (l_t - 1)\phi_t w_t^m) & \text{if } l_t > 1 \end{cases} \quad (7)$$

Thus, the household problem reduces to choosing its collective labor supply,  $l_t$  and the husband's old-age consumption,  $d_{t+1}^h$ .

In order to allow for women to participate in the labor force, we assume that the utility from children is low enough and raising children is costly enough in time that the household chooses a fertility level that is compatible with the husband devoting all his time endowment to market work.

**Assumption 1.**  $\gamma\theta \leq 1$

**Choices:** The chosen level of FLP and male old-age consumption are thus

$$l_t = \max \left\{ 1, 2 - \frac{\gamma\theta}{1 + \gamma\theta} \left( \frac{1 + \phi_t}{\phi_t} + \frac{w_t^p}{\phi_t w_t^m} \right) \right\} \quad (8)$$

$$d_{t+1}^h = (1 + r_{t+1}) \cdot \eta(\phi_t) \cdot s_t \quad (9)$$

$$s_t = \begin{cases} w_t^p + w_t^m & \text{if } l_t = 1 \\ \frac{1}{1 + \gamma\theta} \cdot (w_t^p + (1 + \phi_t)w_t^m) & \text{if } l_t > 1 \end{cases} \quad (10)$$

## 2.3 Endogenous discrimination

At a household level, gender wage discrimination is taken as given. It reduces the amount of time spent by women in the labor force (consequently increasing fertility) and it also increases the share of household savings that goes to the husband. At the economy-wide level, men are called upon to choose the coefficient  $\phi_t$ . For the sake of simplicity, they are given the choice between two possible values:  $\phi_l$  and  $\phi_h$ , where  $\phi_h > \phi_l$ .

Male utilities in the two possible configurations are

$$u_t^h = \begin{cases} \ln \eta(\phi_l) + \ln(1 + r_{t+1}) + \ln s_t(\phi_l) + \gamma \ln D + \gamma\theta \ln(2 - l_t(\phi_l)) & \text{if } \phi = \phi_l \\ \ln \eta(\phi_h) + \ln(1 + r_{t+1}) + \ln s_t(\phi_h) + \gamma \ln D + \gamma\theta \ln(2 - l_t(\phi_h)) & \text{if } \phi = \phi_h \end{cases}$$

Men benefit from high discrimination as this increases their share of household resources. However, high discrimination is costly in terms of total earnings of the family. When FLP is zero, the cost of discrimination to men is also zero, meaning that they will vote always choose  $\phi_l$ . We therefore focus on the case where  $l_t > 1$ . Define  $\tilde{u}_t^m$  as the utility difference for men between choosing low discrimination and choosing high discrimination:

$$\tilde{u}_t^h = u_t^h(\phi_h) - u_t^h(\phi_l) = \ln \left( \frac{(1 + (1 + \phi_h)\omega_t)^{1 + \gamma\theta} \phi_l^{\gamma\theta} \eta_h}{(1 + (1 + \phi_l)\omega_t)^{1 + \gamma\theta} \phi_h^{\gamma\theta} \eta_l} \right)$$

where  $\omega_t = w_t^m/w_t^p$

Note that

$$\frac{\partial \tilde{u}^h}{\partial \omega_t} = \left( \frac{(1 + \gamma\theta)(\phi_h - \phi_l)}{(1 + (1 + \phi_l)\omega_t)(1 + (1 + \phi_h)\omega_t)} \right) > 0$$

Denote the ratio mental wage - physical wage for which men are indifferent between high and low discrimination as  $\tilde{\omega}$ :

$$\tilde{\omega} = \frac{\left( \frac{\phi_h^{\gamma\theta} \eta_l}{\phi_l^{\gamma\theta} \eta_h} \right)^{1/(1+\gamma\theta)} - 1}{1 + \phi_h - \left( \frac{\phi_h^{\gamma\theta} \eta_l}{\phi_l^{\gamma\theta} \eta_h} \right)^{1/(1+\gamma\theta)} (1 + \phi_l)}$$

## 2.4 Equilibrium

**Equilibrium in the market for mental labour:** In the market for mental labor:  $L_t^m = L_t^p l_t$ . Using this equilibrium condition, replacing equations 2 and 3 into 8 yields

$$l(k_t) = \max \left\{ 1, 2 - \frac{\gamma\theta}{1 + \gamma\theta} \left( \frac{1 + \phi(k_t)}{\phi(k_t)} + \frac{B}{\phi(k_t)(1 - \alpha)k_t^\alpha l(k_t)^{-\alpha}} \right) \right\} \quad (11)$$

where

$$\phi(k_t) = \begin{cases} \phi_l & \text{for } B^{-1}(1 - \alpha)k_t^\alpha l(k_t)^{-\alpha} \leq \tilde{\omega} \\ \phi_h & \text{for } B^{-1}(1 - \alpha)k_t^\alpha l(k_t)^{-\alpha} \geq \tilde{\omega} \end{cases} \quad (12)$$

**Proposition 1.**  $l_t$  is increasing with  $k_t$ . There exists  $\tilde{k}$  such that

$$\phi(k_t) = \begin{cases} \phi_l & \text{for } k_t \leq \tilde{k} \\ \phi_h & \text{for } k_t \geq \tilde{k} \end{cases}$$

*Proof.* Using the Implicit Function Theorem on equation 11, we have<sup>3</sup>

$$\frac{\partial l_t}{\partial k_t} = \begin{cases} \frac{B\gamma\alpha k_t^{-1} l_t}{(1 + \gamma\theta)\phi_l(1 - \alpha)k_t^\alpha l_t^{1-\alpha} + B\gamma\alpha} > 0 & \text{if } B^{-1}(1 - \alpha)k_t^\alpha l_t^{-\alpha} < \tilde{\omega} \\ \frac{B\gamma\alpha k_t^{-1} l_t}{(1 + \gamma\theta)\phi_h(1 - \alpha)k_t^\alpha l_t^{1-\alpha} + B\gamma\alpha} > 0 & \text{if } B^{-1}(1 - \alpha)k_t^\alpha l_t^{-\alpha} > \tilde{\omega} \end{cases}$$

Using the above and the fact that  $\omega_t = B^{-1}(1 - \alpha)k_t^\alpha l(k_t)^{-\alpha}$ , we have

$$\frac{\partial \omega_t}{\partial k_t} = \begin{cases} \frac{\alpha(1 + \gamma\theta)\phi_l \omega_t^2 l_t k_t^{-1}}{(1 + \gamma\theta)\phi_l \omega_t l_t + \gamma\alpha} > 0 & \text{if } k_t < \tilde{k} \\ \frac{\alpha(1 + \gamma\theta)\phi_h \omega_t^2 l_t k_t^{-1}}{(1 + \gamma\theta)\phi_h \omega_t l_t + \gamma\alpha} > 0 & \text{if } k_t > \tilde{k} \end{cases}$$

where  $\tilde{k} = \left( \frac{B\tilde{\omega}l(\tilde{k})^\alpha}{1 - \alpha} \right)^{1/\alpha}$  □

<sup>3</sup>Note that  $l(k_t)$  is not differentiable for  $B^{-1}(1 - \alpha)k_t^\alpha l_t^{-\alpha} = \tilde{\omega}$

**Capital Market Equilibrium:** The condition that equilibrates the capital market is

$$K_{t+1} = L_t^p s_t \quad (13)$$

This gives us

$$k_{t+1} = \frac{s_t}{(1+\mu)A_t h_t^\theta D}$$

We first identify the value of  $k_t$  after which FLP is positive:

$$\bar{k} = \left( \frac{B\gamma\theta}{(1-\alpha)(\phi_l - \gamma\theta)} \right)^{1/\alpha}$$

We can deduce that for  $\bar{k} < \tilde{k}$ ,

$$k_{t+1} = \begin{cases} \frac{B+(1-\alpha)k_t^\alpha}{(1+\mu)D} & \text{if } k_t \leq \bar{k} \\ \frac{(\phi_l(1-\alpha)k_t^\alpha l(k_t)^{-\alpha})^\theta ((1+\phi_l)(1-\alpha)k_t^\alpha l(k_t)^{-\alpha} + B)^{1-\theta}}{D(1+\mu)(\gamma\theta)^\theta (1+\gamma\theta)^{1-\theta}} & \text{if } \bar{k} < k_t < \tilde{k} \\ \frac{(\phi_h(1-\alpha)k_t^\alpha l(k_t)^{-\alpha})^\theta ((1+\phi_h)(1-\alpha)k_t^\alpha l(k_t)^{-\alpha} + B)^{1-\theta}}{D(1+\mu)(\gamma\theta)^\theta (1+\gamma\theta)^{1-\theta}} & \text{if } k_t > \tilde{k} \end{cases} \quad (14)$$

In the above situation, FLP is zero until  $k_t$  reaches  $\bar{k}$ . On entering the labor market, women face high discrimination, until  $\tilde{k}$  is reached at which point the economy switches to low discrimination. We can also envisage a situation where  $\tilde{k}$  is reached before  $\bar{k}$ , in which case the dynamics of  $k_t$  is as follows

$$k_{t+1} = \begin{cases} \frac{B+(1-\alpha)k_t^\alpha}{(1+\mu)D} & \text{if } k_t \leq \bar{k} \\ \frac{(\phi_h(1-\alpha)k_t^\alpha l(k_t)^{-\alpha})^\theta ((1+\phi_h)(1-\alpha)k_t^\alpha l(k_t)^{-\alpha} + B)^{1-\theta}}{D(1+\mu)(\gamma\theta)^\theta (1+\gamma\theta)^{1-\theta}} & \text{if } k_t > \bar{k} \end{cases} \quad (15)$$

Using the fact that for  $k_t < \bar{k}$ ,  $l(\bar{k}) = 1$ , we can find the condition under which  $\bar{k} > \tilde{k}$ :

$$\frac{\eta_l}{\eta_h} < \left( \frac{1 + \gamma\theta \frac{\phi_h}{\phi_l}}{1 + \gamma\theta} \right)^{1+\gamma\theta} \left( \frac{\phi_l}{\phi_h} \right)^{\gamma\theta} \quad (16)$$

Figure 1 shows two different configurations depending on condition 16. The first (figure i) is when the male share of household income does not vary much from the high discrimination regime to the low discrimination one (i.e.  $\eta_l/\eta_h$  is low). In this case, the switch to low discrimination occurs early, at a time when women are not yet participating in the labor force. The second (figure ii) is when men stand to lose significantly from the switch from high discrimination to low discrimination (i.e.  $\eta_l/\eta_h$  is high). In this case, when women join the labor force, they face high discrimination and only later does the regime switch occur. Casual empiricism suggests that the first configuration is not the norm as rising FLP usually precedes falling gender wage gaps.<sup>4</sup>

<sup>4</sup>For instance, in the case of the U.S., the gender wage gap started falling in the 1970s while FLP rose substantially from the 1940s onwards.



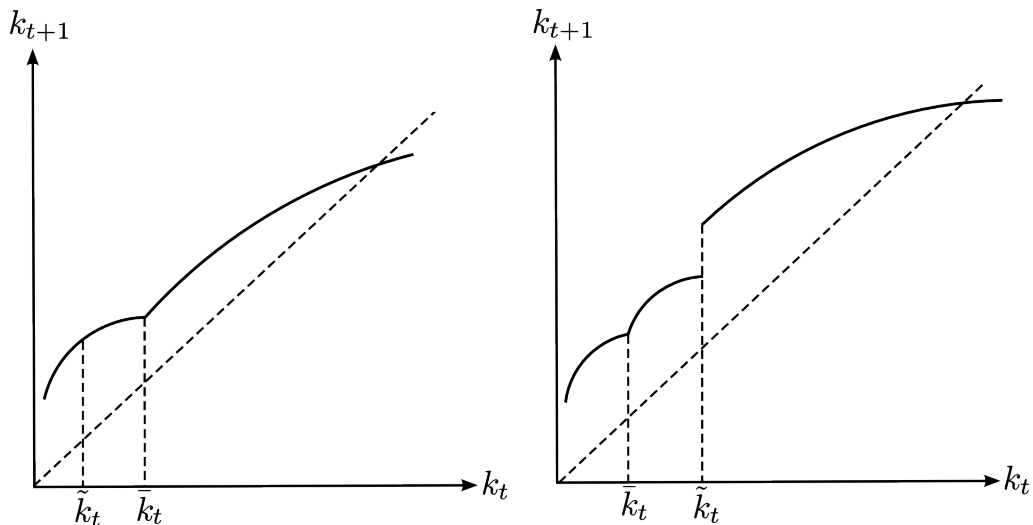


Figure 1: Steady-states (i)  $\tilde{k}_t < \bar{k}_t$  (ii)  $\tilde{k}_t > \bar{k}_t$

**Proposition 2.** *There exists at least one locally stable positive steady-state equilibrium*

*Proof.* See Appendix A □

### 3 Empirics

We shall test two important implications of our model. Firstly, at an economy-wide level, higher per capita income should reduce male preference for discrimination. Second, at a household level, if the opportunity cost of the wife staying at home is high, the husband is more likely to vote for lower discrimination.

To test the first, we exploit two repeated cross-section datasets, namely the World Value Survey (WVS) and the International Social Survey Program (ISSP). The WVS has been conducted every 5 years since 1985 and we use data from the four last rounds (1990, 1995, 2000 and 2005) amounting to around 180 000 observations for 79 different countries. The ISSP data has around 90 000 observations, spans three rounds (2002, 1994, 1988) for 35 countries.

For the second, we will use the National Longitudinal Survey of Youth 1979, which consists of around 12000 US adults repeatedly surveyed for the first time in 1979 (aged then between 14 and 22). These adults have been repeatedly surveyed since then and asked, among other things, about their views on women's role in the home, the labor market and in society in general. This offers us a unique opportunity to find out what life circumstances led them to either alter or retain their views over time.

## 3.1 Cross-Country Differences

### 3.1.1 Methodology

From the WVS and the ISSP datasets, we identify 6 variables which can capture individual ‘preference for discrimination’. All variables are set in a way that a *higher value represents a higher preference for discrimination*.

1. JBPRIOR: “When jobs are scarce, men should have more right to a job than women”. 1 - disagree, 2 - neither, 3 - agree. (Source: WVS)
2. HMEKIDS: “What women really want is home and kids”. 1 - strongly disagree, 2 - disagree, 3 - neither, 4 - agree, 5 - strongly agree. (Source: ISSP)
3. HSEWORK: “Housework satisfies as much as paid work”. 1 - strongly disagree, 2 - disagree, 3 - neither, 4 - agree, 5 - strongly agree. (Source: ISSP)
4. INDEP: “Work is best for women’s independence”. 1 - strongly agree, 2 - agree, 3 - neither, 4 - disagree, 5 - strongly disagree. (Source: ISSP)
5. CONTRIB: “Both husband and wife should contribute to household income”. 1 - strongly agree, 2 - agree, 3 - neither, 4 - disagree, 5 - strongly disagree. (Source: ISSP)
6. PLACEHOME: “Men’s job is at work and women’s job is in the household”. 1 - strongly disagree, 2 - disagree, 3 - neither, 4 - agree, 5 - strongly agree. (Source: ISSP)

**Repeated cross-section:** We estimate the following model

$$Y_i = \beta_0 + \beta_1 M_i + \beta_2 \log \text{GDP}_i + \beta_3 M_i * \log \text{GDP}_i + \beta_4 X_i' + \beta_5 D_i' + \varepsilon_i \quad (17)$$

where  $Y_i$  is the ordered response of individual  $i$  to the above questions;  $M_i$  is an indicator variable which takes a value of 1 if the respondent is male;  $\log \text{GDP}$  is the log of GDP of the country of residence of the respondent;  $X_i'$  is a vector of controls which varies according to the chosen specification;  $D_i$  is a set of dummy variables.

For variable JBPRIOR, the controls variables,  $X_i$  consist of the age of the respondent (AGE), his/her marital status (MARRIED), his/her education level (EDUC), his/her marital status the number of children he/she has (CHILD), the size of the town he/she lives in (TOWNSIZE), his/her reported degree of religiosity (RELIGIOSITY). The set of dummy variables consists of (1) country dummies, i.e. the respondent’s country of residence, (2) cultural dummies, i.e. the cultural group to which the country is associated with (based on Inglehart-Welzel Cultural Map of the World) and (3) the occupation type of the respondent.

For variables (2) - (6), the control variables consist of the age of the respondent (AGE), his/her marital status (MARRIED), his/her education

level (EDUC) and whether he/she lives in urban or rural areas (URBAN). The set of dummy variables consists of (1) country dummies and (2) religion dummies, i.e. the respondent’s religion.

For dependent variables (1) -(6), probit regressions are carried out. From variables (2) - (6), a latent variable is generated from factor analysis and is denoted Index, for which OLS regressions are carried out. We are particularly aware of the fact that clustering in repeated cross-section data leads to grossly under-estimated standard errors (see Moulton 1990, Bertrand, Duflo, and Mullainathan 2004, Kézdi 2004). In addition to the usual standard error estimates, we therefore report “cluster-robust” standard errors that cluster by country. We also report “cluster-robust” standard errors that cluster by country and time following the estimator developed by Cameron, Gelbach, and Miller (2010).<sup>5</sup>

**Pseudo panel:** From the repeated cross-section WVS and ISSP data, we construct pseudo-panel data, according to the method proposed by Deaton (1985). We build our cohorts around 4 birth-year bands (before 1939, 1940-1954, 1955-1969, after 1970), 4 education groups (primary education, secondary education, higher education), 2 sex groups and 80 countries for WVS / 38 countries for ISSP, giving 2560 cohort-year observations for the WVS data and 1216 cohort-year observations for the ISSP data. We run both fixed-effect and random-effect regressions and run Hausman test to choose between them.

$$Y_{it} = \beta_0 + \beta_1 M_i + \beta_2 \log \text{GDP}_{it} + \beta_3 M_i * \log \text{GDP}_{it} + \beta_4 X'_i + \varepsilon_i \quad (18)$$

where  $Y_i$  is the average response of cohort  $i$ ;  $M_i$  is an indicator variable which takes a value of 1 if the cohort is male;  $\log \text{GDP}$  is the log of GDP of the country of residence of the cohort;  $X'_i$  is a vector of time-invariant controls.

### 3.1.2 Results

**Repeated cross-section:** Figure 2 shows the inverse relationship between the variables that characterize preference for gender discrimination and log GDP. Controlling for individual-specific characteristics such as education, age, religiosity, number of children, respondent’s town size, tables 3 and 4 confirm this relationship. Additionally, we can see that although men are more discriminatory than women (the negative coefficient on the male dummy), their views converge to those of women (as shown by the negative coefficient on the interaction variable LOGGDP\*MALE), which is line with our model.

Accounting for potential clustering in the data (i.e. models (2) and (3) in tables 3 and 4) increases considerably the standard errors, as expected

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<sup>5</sup>The code used for the ordered probit regressions is adapted from Mitchell Petersen’s Stata routine that allows for two-way clustering. Code available upon request.

(up to a ten-fold increase in some cases). Nevertheless, all the coefficients remain significant.

The coefficients on the control variables suggest that (i) older people, less educated people, people with more children, people living in smaller towns, and religious people tend to have more discriminatory views. Although not reported here, all regressions have also been carried out without the dummy variables, and the results do not change.

**Pseudo panel data:** From table 5, we are led to conclude that an increase in GDP leads to a reduction in the "preference for discrimination".

### 3.1.3 Predicted probabilities

Figure 6(a) shows the predicted probabilities of the respondent agreeing that job priority be given to men when jobs are scarce, conditional on the gender and on the country GDP of the respondents. Both men and women become less discriminatory as GDP increases, but the decline is more significant for men. Figures 6(b) to 6(f) show predicted probabilities from the ISSP variables. Again, men become less discriminatory as GDP increases and the gap between men and women declines with GDP.

## 3.2 Changes in preferences

The National Longitudinal Survey of Youth 1979 enables us to understand how life circumstances influence people's attitude to gender roles. In four occasions (1979, 1982, 1987 and 2004), the same adults (aged between 14 and 22 in 1979) are asked whether they strongly agree, agree, disagree or strongly disagree with the following statements:

1. "A woman's place is at home, not in the office" (PLACEHOME)
2. "It is much better for everyone if the man is the achiever outside the home and the woman takes care of the home and family" (TRADROLE)
3. "Women are much happier if they stay at home and take care of children" (HAPPIER).

We regroup responses into two categories, agree (consisting of those who agree and those who strongly agree with the given statement) and disagree (consisting of those who disagree and those who strongly disagree). For each variable, we construct the following latent variable:

$$W = \begin{cases} 0 & \text{for } Y_{1987} = \text{agree} \ \& \ Y_{2004} = \text{agree} \\ 1 & \text{for } Y_{1987} = \text{disagree} \ \& \ Y_{2004} = \text{agree} \\ 2 & \text{for } Y_{1987} = \text{agree} \ \& \ Y_{2004} = \text{disagree} \\ 3 & \text{for } Y_{1987} = \text{disagree} \ \& \ Y_{2004} = \text{disagree} \end{cases}$$

where  $Y_{1987}$  and  $Y_{2004}$  represent variables PLACEHOME, TRADROLE and HAPPIER as observed in 1987 and 2004.

Table 7 summarizes the proportion of respondent who fall in the different categories.

We restrict our analysis to married men and women and consider potential explanatory variables which can lead respondents to alter or keep their opinion from 1987 to 2004: race (given by HISP and BLACK), the level of education (EDUC) and the ratio of spouse's income to respondent's own income (RATIOINCOME).

We consider a multinomial probit model, using 0 as a base (table 8). Firstly, we find out that both for men and women, the level of education positively influences the probability of keeping non-discriminatory views from 1987 to 2004 (i.e. the respondent disagreed with the given statement both in 1987 and 2004). Secondly, the spouse-respondent income ratio also positively influences (1) the probability of keeping non-discriminatory views from 1987 to 2004, (2) the probability of switching from discriminatory views in 1987 to non-discriminatory views in 2004, *in the case of men only*. This ratio has no role in women's decision to keep or alter their views. This provides a foundation for the following statement: that, controlling for their own level of education, men married to high-income women tend to improve their attitude towards working women over time.

## 4 Conclusion

## A Proof of Proposition 2

1. For  $\tilde{k} \leq \hat{k}$ ,  $k_{t+1}$ , as given by equation 15, is continuous.

- When  $k_t < \hat{k}$  we have

$$\begin{aligned}\frac{\partial k_{t+1}}{\partial k_t} &= \frac{(1-\alpha)\alpha\hat{k}_t^{\alpha-1}}{(1+\mu)D} > 0 \\ \frac{\partial^2 k_{t+1}}{\partial k_t^2} &= \frac{-(1-\alpha)^2\alpha\hat{k}_t^{\alpha-2}}{(1+\mu)D} < 0 \\ \lim_{k_t \rightarrow 0} \frac{\partial k_{t+1}}{\partial k_t} &= \lim_{k_t \rightarrow 0} \frac{(1-\alpha)\alpha\hat{k}_t^{\alpha-1}}{(1+\mu)D} = \infty\end{aligned}$$

- When  $k_t > \hat{k}$ ,

$$\begin{aligned}\frac{\partial k_{t+1}}{\partial k_t} &= \frac{k_{t+1}}{k_t} \cdot \left( \frac{(1+\gamma\theta)\phi_h(1-\alpha)k_t^\alpha l_t^{1-\alpha}}{(1+\gamma\theta)\phi_h(1-\alpha)k_t^\alpha l_t^{1-\alpha} + B\gamma\alpha} \right) \cdot \left( \frac{(1-\theta)\alpha(1+\phi_h)(1-\alpha)k_t^\alpha l_t^{-\alpha} + \theta\alpha}{(1+\phi_h)(1-\alpha)k_t^\alpha l_t^{-\alpha} + B} \right) > 0 \\ \frac{\partial k_{t+1}}{\partial k_t} &= \frac{(\phi_h(1-\alpha)k_t^\alpha l_t^{-\alpha})^\theta ((1+\phi_h)(1-\alpha)k_t^\alpha l_t^{-\alpha} + B)^{1-\theta}}{D(1+\mu)(\gamma\theta)^\theta (1+\gamma\theta)^{1-\theta} k_t} \cdot \left( \frac{(1+\gamma\theta)\phi_h(1-\alpha)k_t^\alpha l_t^{1-\alpha}}{(1+\gamma\theta)\phi_h(1-\alpha)k_t^\alpha l_t^{1-\alpha} + B\gamma\alpha} \right) \cdot \left( \frac{(1-\theta)\alpha(1+\phi_h)(1-\alpha)k_t^\alpha l_t^{-\alpha} + \theta\alpha}{(1+\phi_h)(1-\alpha)k_t^\alpha l_t^{-\alpha} + B} \right) > 0 \\ \lim_{k_t \rightarrow \infty} \frac{\partial k_{t+1}}{\partial k_t} &= 0\end{aligned}$$

2. For  $\tilde{k} \geq \hat{k}$ ,  $k_{t+1}$ , as given by equation 14, is not continuous.

## B Alternative specifications

We check the robustness of the theoretical results by allowing for alternative specifications.

### B.1 Bargaining power depends on female wage income

Following Chiappori (1988), we consider a collective utility function of the household which takes the following form

$$u_t = \eta(\max(0, )) \ln d_{t+1}^h + (1 - \eta(\max(0, ))) \ln d_{t+1}^w + \gamma \ln n_t \quad (19)$$

where  $\eta(\phi_t)$  is the husband's Pareto weight;  $\eta'(\cdot) < 0$

## B.2 Disutility from home production

We assume here that there is a home good that needs to be produced (e.g. washing up, cooking) and this requires time. Both men and women get disutility from time spent producing this household good

$$u_h = \ln d_t + \gamma \ln n_t - \rho(2 - l_t)\delta \quad (20)$$

$$u_t = \ln d_t + \gamma \ln n_t - \rho(2 - l_t)\delta \quad (21)$$

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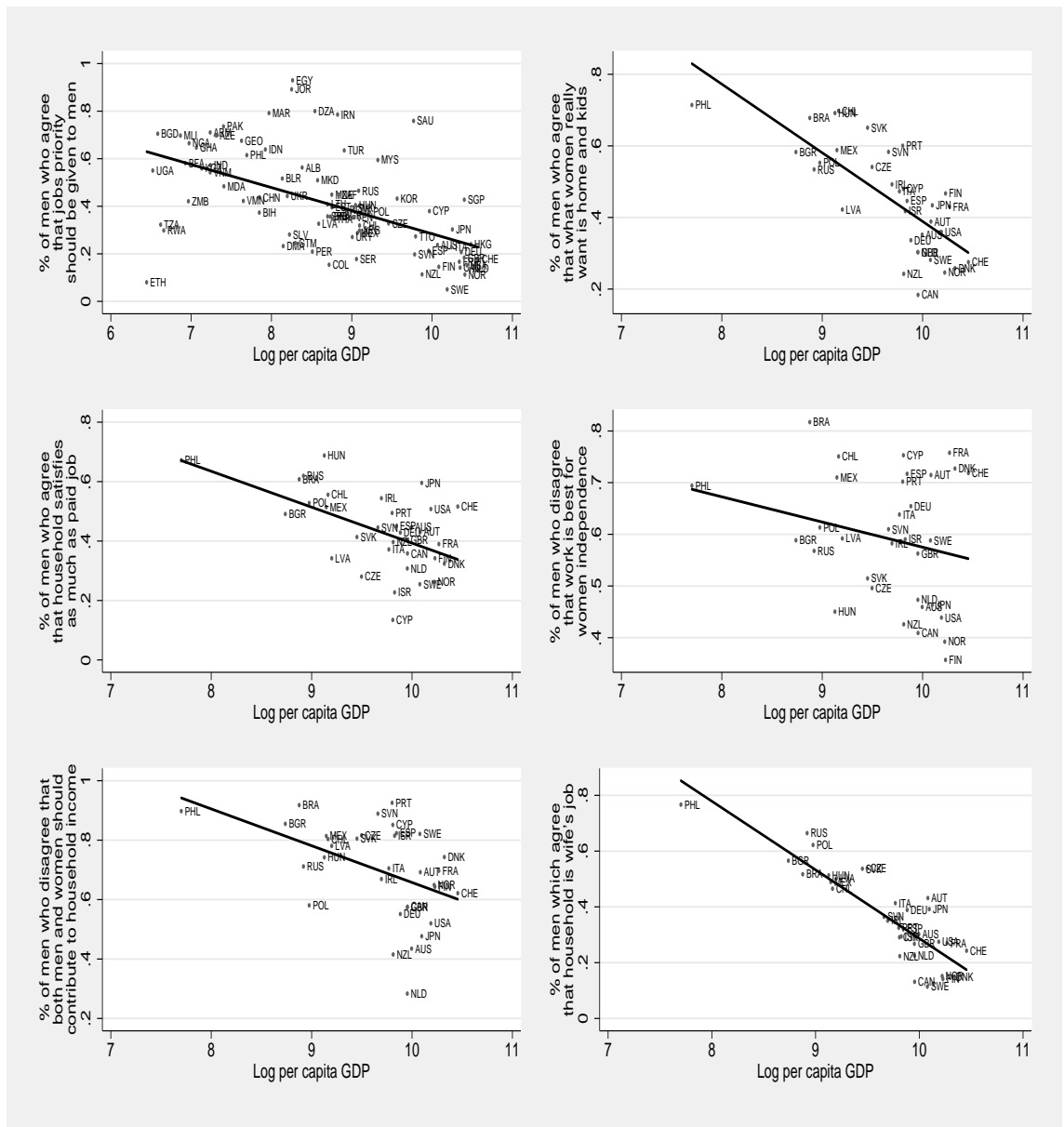


Figure 2: Male preference for discrimination and GDP



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	JBPRIOR (1)	JBPRIOR (1)	JBPRIOR (1)	JBPRIOR (2)	JBPRIOR (2)	JBPRIOR (2)	JBPRIOR (3)	JBPRIOR (3)	JBPRIOR (3)
v44									
<b>Main Effects:</b>									
LOGGDP	-0.237*** (0.0141)	-0.209*** (0.0145)	-0.234*** (0.0169)	-0.237** (0.0960)	-0.209** (0.0949)	-0.234** (0.1159)	-0.237** (0.1010)	-0.209** (0.0981)	-0.234* (0.1239)
MALE		0.933*** (0.0519)	1.005*** (0.0550)	0.933*** (0.1409)	0.933*** (0.1409)	1.005*** (0.1476)		0.933*** (0.1194)	1.005*** (0.1045)
LOGGDP*MALE		-0.072*** (0.0060)	-0.075*** (0.0064)	-0.072*** (0.0157)	-0.072*** (0.0157)	-0.075*** (0.0166)		-0.072*** (0.0153)	-0.075*** (0.0126)
<b>Controls:</b>									
MARRIED			-0.016*** (0.0018)			-0.016*** (0.0037)			-0.016*** (0.0059)
AGE			0.005*** (0.0003)			0.005*** (0.0009)			0.005*** (0.0008)
EDUC			-0.060*** (0.0018)			-0.060*** (0.0053)			-0.060*** (0.0062)
CHILD			0.010*** (0.0022)			0.010*** (0.0031)			0.010*** (0.0039)
TOWNSIZE			-0.016*** (0.0013)			-0.016** (0.0088)			-0.016** (0.0070)
RELIGIOSITY			0.092*** (0.0041)			0.092*** (0.0138)			0.092*** (0.0107)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cultural dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Occupation dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PseudoR-square	0.102	0.109	0.121	0.102	0.109	0.121			
LogLikelihood	-141676	-140448	-124903	-141676	-140448	-124903	-141676	-140448	-124903
Obs.	152321	152287	137552	152321	152287	137552	152321	152287	137552

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Figure 3: Ordered probit regressions using 4 rounds of WVS - 1990, 1995, 2000, 2005 (All respondents). All regressions include a constant. \* significance at 10%, \*\* significance at 5%, \*\*\* significance at 1%. Standard errors in parenthesis: (1) robust standard errors with no clustering, (2) clustered standard errors in country dimension, (3) clustered standard errors in country and time dimensions)

	HMEKIDS (1)	HSWORK (1)	INDEP (1)	HMEKIDS (2)	HSWORK (2)	INDEP (2)	HMEKIDS (3)	HSWORK (3)	INDEP (3)
main									
LOGGDP	-0.316*** (0.0267)	-0.329*** (0.0267)	-0.177*** (0.0269)	-0.316** (0.1340)	-0.329*** (0.0786)	-0.177** (0.0702)	-0.316*** (0.0110)	-0.329*** (0.0277)	-0.177*** (0.0269)
MALE	0.145*** (0.0098)	0.086*** (0.0098)	0.115*** (0.0100)	0.145*** (0.0180)	0.086*** (0.0198)	0.115*** (0.0207)	0.145*** (0.0098)	0.086*** (0.0227)	0.115*** (0.0100)
EDUC	-0.294*** (0.0075)	-0.166*** (0.0075)	-0.031*** (0.0077)	-0.294*** (0.0175)	-0.166*** (0.0184)	-0.031* (0.0179)	-0.294*** (0.0085)	-0.166*** (0.0116)	-0.031*** (0.0077)
AGE	0.013*** (0.0003)	0.009*** (0.0003)	-0.003*** (0.0003)	0.013*** (0.0010)	0.009*** (0.0010)	-0.003*** (0.0012)	0.013*** (0.0017)	0.009*** (0.0013)	-0.003*** (0.0003)
URBAN	0.030*** (0.0036)	0.029*** (0.0036)	0.013*** (0.0037)	0.030* (0.0172)	0.029** (0.0113)	0.013*** (0.0045)	0.030*** (0.0039)	0.029*** (0.0050)	0.013*** (0.0037)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LogLikelihood	-58868	-59709	-54655	-58868	-59709	-54655	-58868	-59709	-54655
Obs.	62155	61793	63032	62155	61793	63032	62155	61793	63032

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

	CONTRIB (1)	PLACEHOME (1)	INDEX (1)	CONTRIB (2)	PLACEHOME (2)	INDEX (2)	CONTRIB (3)	PLACEHOME (3)	INDEX (3)
main									
LOGGDP	-0.408*** (0.0282)	-0.530*** (0.0271)	-0.354*** (0.0166)	-0.408*** (0.0952)	-0.530*** (0.1296)	-0.354*** (0.0877)	-0.408*** (0.0282)	-0.530*** (0.1021)	-0.354*** (0.0384)
MALE	0.112*** (0.0106)	0.273*** (0.0099)	0.156*** (0.0061)	0.112*** (0.0209)	0.273*** (0.0166)	0.156*** (0.0108)	0.112*** (0.0106)	0.273*** (0.0100)	0.156*** (0.0059)
EDUC	0.034*** (0.0081)	-0.351*** (0.0078)	-0.218*** (0.0047)	0.034 (0.0251)	-0.351*** (0.0186)	-0.218*** (0.0130)	0.034*** (0.0081)	-0.351*** (0.0102)	-0.218*** (0.0078)
AGE	0.002*** (0.0003)	0.019*** (0.0003)	0.011*** (0.0002)	0.002** (0.0011)	0.019*** (0.0014)	0.011*** (0.0010)	0.002*** (0.0003)	0.019*** (0.0016)	0.011*** (0.0014)
URBAN	0.019*** (0.0038)	0.040*** (0.0036)	0.028*** (0.0022)	0.019*** (0.0060)	0.040*** (0.0138)	0.028** (0.0115)	0.019*** (0.0038)	0.040 (.)	0.028 (.)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Religion dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LogLikelihood	-46474	-56198	-62483	-46474	-56198	-62483	-46474	-56198	-62483
Obs.	64116	64329	57716	64116	64329	57716	64116	64329	57716

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

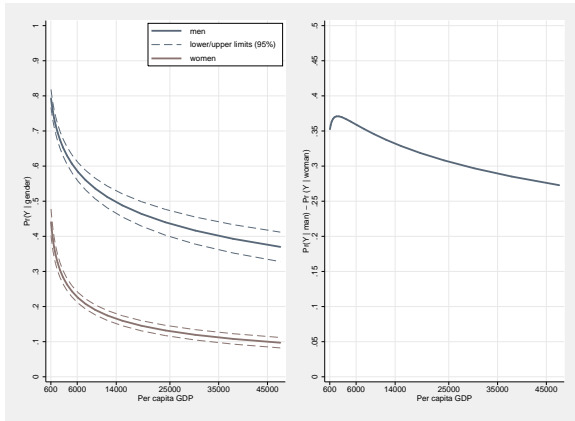
Figure 4: Regressions (Ordered Probit for columns HmeKids, Hswork, PlaceHome and OLS for Index) using 3 rounds of ISSP - 1988, 1994, 2002. Standard errors in parenthesis. \* significance at 10%, \*\* significance at 5%, \*\*\* significance at 1% (1) no clustering, (2) clustered standard errors in country dimension, (3) clustered standard errors in country and time dimensions.

	JBPRIORITY (R.E.)	HMEKIDS (F.E.)	HSWORK (R.E.)	INDEP (F.E.)	CONTRIB (F.E.)	PLACEHOME (F.E.)	INDEX (F.E.)
LOGGDP	-0.118*** (0.0110)	-0.407*** (0.0599)	-0.280*** (0.0343)	-0.280*** (0.0750)	-0.176** (0.0797)	-0.323*** (0.0474)	-0.294*** (0.0389)
LOGGDP*MALE	-0.051*** (0.0152)	0.093 (0.0795)	0.022 (0.0463)	0.068 (0.1034)	-0.072 (0.1082)	0.042 (0.0672)	0.012 (0.0517)
MALE	-0.658*** (0.1357)		0.073 (0.4496)				
EDUC	-0.137*** (0.0084)		-0.169*** (0.0193)				
constant	4.544*** (0.2115)	6.542*** (0.3852)	5.800*** (0.6907)	4.749*** (0.5006)	4.197*** (0.5240)	5.571*** (0.3250)	2.713*** (0.2502)
Obs.	4092	1375	1373	1375	1375	1375	1373

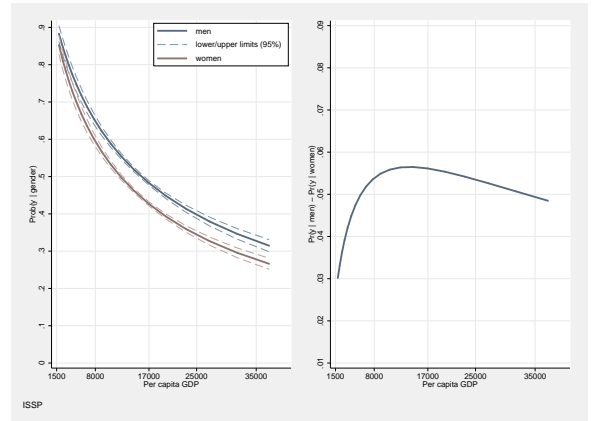
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Figure 5: Fixed Effects (F.E.) and Random Effects (R.E.) regressions using pseudo-panel data. Robust standard errors in parenthesis.

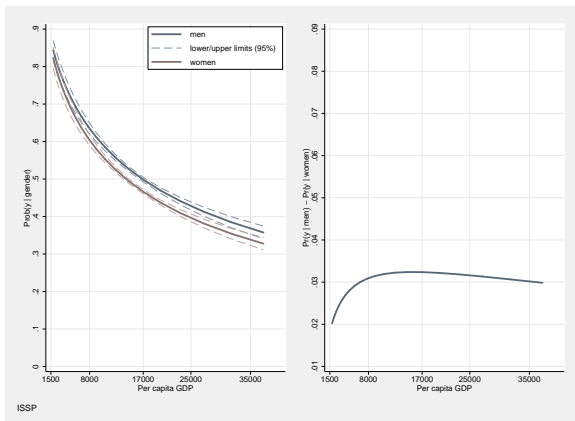
Figure 6: Predicted probabilities by gender



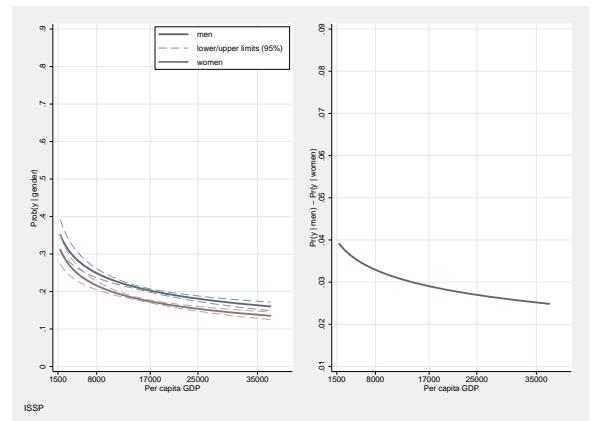
(a) JobPriority



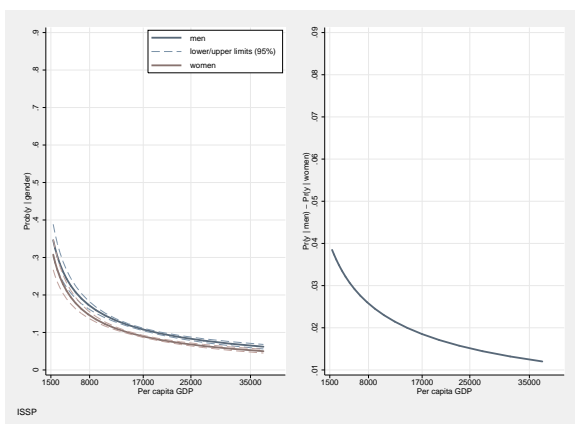
(b) HmeKids



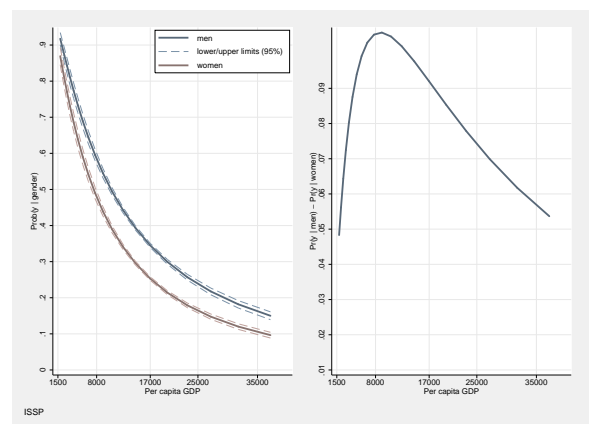
(c) Hsework



(d) Indep



(e) Contrib



(f) PlaceHome

1987 → 2004	PlaceHome		TradRole		HomeChildren		WorkUseful	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
Agree	256	508	814	1008	859	1060	981	1749
Disagree	415	5887	964	4153	778	3611	2342	1629

Figure 7: Transition from 1987 to 2004

	PlaceHome (1) Men	PlaceHome (2) Women	TradRole (3) Men	TradRole (4) Women	Happier (5) Men	Happier (6) Women
Disagree → Agree						
Hispanic	-0.123 (-0.28)	-0.610 (-1.26)	-0.394 (-1.54)	0.109 (0.37)	-0.546* (-2.33)	-0.520 (-1.73)
Black	-0.549 (-1.04)	0.270 (0.46)	0.122 (0.44)	0.143 (0.50)	0.145 (0.55)	0.075 (0.24)
Education	0.203 (0.90)	0.383 (1.40)	0.208 (1.58)	0.183 (1.23)	0.314* (2.55)	0.256 (1.67)
$\frac{\text{spouse income}}{\text{own income}}$	-0.002 (-0.02)	0.014 (0.12)	0.012 (0.16)	-0.032 (-0.47)	0.015 (0.23)	-0.007 (-0.11)
Agree → Disagree						
Hispanic	0.594 (1.48)	-0.657 (-1.38)	-0.194 (-0.77)	-0.026 (-0.09)	-0.428 (-1.60)	-0.187 (-0.61)
Black	0.147 (0.32)	-0.779 (-1.18)	0.059 (0.21)	-0.368 (-1.16)	0.422 (1.50)	-0.017 (-0.05)
Education	0.123 (0.56)	0.449 (1.64)	0.007 (0.05)	0.041 (0.26)	0.187 (1.34)	0.124 (0.76)
$\frac{\text{spouse income}}{\text{own income}}$	0.411*** (3.57)	-0.209 (-1.78)	0.389*** (5.44)	-0.053 (-0.75)	0.178* (2.47)	0.036 (0.50)
Disagree → Disagree						
Hispanic	-0.014 (-0.04)	-0.547 (-1.46)	-0.499* (-2.43)	-0.192 (-0.77)	-0.751*** (-3.82)	-0.389 (-1.60)
Black	0.314 (0.82)	0.251 (0.50)	-0.010 (-0.04)	-0.312 (-1.27)	0.156 (0.69)	-0.064 (-0.24)
Education	0.574** (3.14)	0.719** (3.10)	0.357** (3.27)	0.469*** (3.74)	0.321** (3.01)	0.464*** (3.54)
$\frac{\text{spouse income}}{\text{own income}}$	0.429*** (4.40)	-0.120 (-1.21)	0.328*** (5.61)	-0.119* (-2.12)	0.252*** (4.58)	-0.012 (-0.21)
PseudoR-square	0.046	0.023	0.029	0.016	0.021	0.010
LogLikelihood	-917	-735	-1624	-1397	-1574	-1330
LRchi2	89	35	98	46	69	28
Obs.	1514	1384	1495	1352	1343	1274

Figure 8: Multinomial logit using NLSY79. z statistics in parenthesis.