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Gender Equality and Economic Growth in Brazil

A Long-Run Analysis

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Abstract

This paper studies the long-run impact of policies aimed at fostering gender equality on economic growth in Brazil. The first part provides a brief review of gender issues in the country. The second part presents a gender-based, three-period OLG model that accounts for women's time allocation between market work, child rearing, human capital accumulation, and home production. Bargaining between spouses depends on relative human capital stocks, and thus indirectly on access to infrastructure. The model is calibrated and various experiments are conducted, including investment in infrastructure, conditional cash transfers, a reduction in gender bias in the market place, and a composite pro-growth, pro-gender reform program. The analysis showed that fostering gender equality, which may partly depend on the externalities that infrastructure creates in terms of women's time allocation and bargaining power, may have a substantial impact on long-run growth in Brazil.

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GENDER EQUALITY AND ECONOMIC GROWTH IN BRAZIL: A LONG-RUN ANALYSIS

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Contents

1 Introduction

In recent years Brazil has achieved much success in reducing poverty and income inequality. According to World Bank data, relative poverty (based on a PPP US$2 per day metric) has fallen markedly, from 21 percent of the population in 2003 to 11 percent in 2009. Extreme poverty (based on a PPP US$1.25 per day metric) also dropped significantly, from 9.8 percent in 2004 to 6.1 percent in 2009. At the same time, income inequality fell significantly. Between 2001 and 2009, the income growth rate of the poorest decile of the population was 7 percent per year, while that of the richest decile was 1.7 percent; as a result, income inequality (as measured by the Gini index) fell markedly, from 0.594 in 2001 to 0.521 in 2011—a 50-year low. Key drivers of these achievements have been low inflation, sustained economic growth (at a yearly average of 4.0 percent during 2002-08 and 5.1 percent during 2010-11), well-focused social programs, and real increases in the statutory minimum wage.

Despite these achievements, however, inequality remains at relatively high levels, and there is still a large gap in access to education. Although universal coverage in primary education has been achieved, quality at both the basic and secondary levels remains a concern. Growth and private sector activity continue to be hampered by various barriers and regulations, as well as inadequate infrastructure and a weak business climate.[1] Gender inequality remains high, despite some significant improvements. In 2003, under his first presidency, Luiz Inácio Lula da Silva created a federal governmental body with the objective of dealing with gender equality issues. This also led to the creation of a National Plan for Women's Policies (NPWP), which was adopted in 2004. The Plan reaffirmed the commitment by the Brazilian Federal Government and by the other governmental bodies to incorporate a gender perspective in public policies. The Plan foresaw several concrete actions to be implemented by different government sectors in cooperation with the private sector, and addressed some specific needs of mothers, specifically with reference to health care before and during pregnancy and at

[1] According to the World Economic Forum's *Global Competitiveness Report* for 2012, Brazil ranks 64 out of 142 countries for the quality of its infrastructure (118 for roads, 122 for air transport, and 130 for ports). See Ter-Minassian (2012) for a perspective on Brazil's current challenges in the area of structural reform.

birth, and child care and education. Brazil's first female president, Dilma Roussef, also promised when elected in 2010 to make gender equality a priority. At the same time, however, there has been limited effort to quantify the impact of gender-based policies on gender inequality and economic growth in Brazil.

This paper attempts to fill this gap by offering a quantitative analysis of the long-run impact of policies aimed at fostering gender equality on economic growth in Brazil, especially through their impact on women's time allocation and intrahousehold bargaining power. The analysis is based on the gender-based overlapping generations (OLG) model described in Agénor (2012*a*), in which women's time allocation takes center stage.[2] The model is rich enough to provide a serious starting point for the analysis of a range of policies that policymakers in Brazil may be contemplating, in terms of their impact on gender and growth. The approach proposed here is to calibrate the steady-state solution of the model and focus therefore on the long-run effects of public policy. The underlying view is that gender-based policies are unlikely to produce tangible economic results in the short run—often not even in the medium run; what matters therefore is a good understanding of the long-run effects. At the same time, we also extend the model in Agénor (2012*a*) in several important directions; most crucially, we endogenize women's bargaining power in a different way—by relating it to time allocated by women to human capital accumulation and indirectly to access to infrastructure, which has a direct impact on time devoted to home production.[3] This creates a novel channel through which public policy can affect gender equality and economic growth.

The remainder of the paper is organized as follows. Section 2 provides a brief review of gender issues in Brazil. Section 3 presents the model. Section 4 presents the calibration and Section 5 presents several policy experiments designed to reduce gender inequality: spending reallocation toward to infrastructure, conditional cash transfers, a reduction in gender bias in the market place, an increase in mothers' time allocated to

[2] See Agénor and Canuto (2012) for a less formal description of the model.

[3] In Agénor (2012*a*), in equilibrium women's bargaining power depends solely on the relative amount of time that mothers allocate to their sons and daughters—a parameter that is determined by social norms and is therefore exogenous. In addition, in the present version of the model, dynamic stability conditions can be explicitly established and numerically evaluated.

their daughters, and a composite pro-growth, pro-gender adjustment program involving some element of tax reform.[4] Section 6 offers some concluding remarks.

2 Background

In the past two decades, Brazil made much progress in reducing gender inequality. According to the results of a 2010 study by Brazilian Institute of Geography and Statistics (IBGS), illiteracy rates for women 15 years old and above fell from 20.3 percent in 1991 to 13.5 percent in 2000 and 9.8 percent in 2008. Brazilian women are now generally more educated, with female participation in tertiary education exceeding significantly male participation. As a result, the share of the female labor force with tertiary education increased from 7.4 percent in 1992 to 8.5 percent in 1999 and 11.9 percent in 2007, compared to 5.3, 6.2, and 7.3 percent for males, respectively. Working women have an average of 8.8 years of schooling, while their male counterparts have an average of 7.7 years. This is important because, as discussed in the next section, educated mothers tend to have greater bargaining power within the household over intrafamily allocation of monetary resources, be better able to act on their preference for investing in children, and have a greater impact on family decisions regarding the allocation of children's time to household chores. Professions that traditionally were dominated by males, such as law, medicine, and engineering, are becoming more balanced in terms of gender, and some already have more women than men. The proportion of women in the workforce rose from 52.8 percent to 57.6 percent between 1998 and 2009, whereas the share of women in wage employment in the non-agricultural sector rose from 35.1 percent in 1990 to 41.6 percent in 2007. The ratio of female to male labor force participation rate increased from 52.2 in 1990 to 63.9 in 1995, 66.7 in 2000, and 73.3 in 2010.

[4] In Brazil, under the *Bolsa Família* program, families with income less than R$60 (roughly US$38) per capita receive R$62, plus R$20 per child (aged 15 and lower) up to three children, and R$ 30 per adolescent (aged 16 and 17) up to two children. Therefore, poor families can receive up to R$182, which is about half of the minimum wage in Brazil (Cavalcanti and Correa (2010)). The conditionalities associated with these transfers ensure the compliance of beneficiary families with requirements such as school attendance, vaccine, and pre-natal visits. The total coverage is large: roughly 11.1 million families or about 44 million people. In the Brazilian Northeast (the poorest region of the country) about half of all families are enrolled in this program.

However, gender gaps in access to formal employment and market income still persist in Brazil. The proportion of women with formal jobs increased from 41.5 percent in 1999 to 48.8 percent in 2009, but it is still lower than that of employed men, which stood at 53.2 percent in 2009. At the same time, women in formal sector employment work less than men—an average of 36.5 hours a week in 2009, against 43.9 hours for men. Even though there has been progress in the share of women employed in the non-agricultural sector, their comparative advantage in education has not been reflected in relative market wages—in spite of the average higher skill level of the female labor force. In 2008, women's wages were 84 percent of men's and the gap increases at higher levels of education.[5] Among those with 12 or more years of schooling, women earned merely 58 percent of men's salaries. Brazilian women, even those working full time, continue to bear the brunt of time allocated to family chores (Bruschini (2007)); in 2008, they devoted an average of 25.1 hours per week to caring for their families and housekeeping, whereas men devoted an average of only 10 hours per week to such tasks. The unemployment rate for females consistently exceeds by an average of 4-5 percentage points the unemployment rate for males; the gap is up to twice as high for those aged 15-24. According to the Gender Inequality Index (GII) introduced by the United Nations, in 2011 Brazil's rank is only 80 out of 187 countries, with a score of 0.449—same as in 2008.[6] The Gender Gap Index (GGI) developed by the World Economic Forum since 2006 gives similar results; in 2011 Brazil was ranked 82 out of 135 countries, with a score of 0.668—compared to 0.654 in 2006.[7]

[5] There are also considerable gender differences across regions. For instance, wage gaps tend to be lower in Rio de Janeiro than in Sao Paulo; the largest gaps are found in the Northeast. Note that these disparities are not unique to Brazil; see Ñopo (2012).

[6] On the GII index, see http://hdr.undp.org/en/statistics/gii/. The GII is a composite measure reflecting inequality in achievements between women and men in three dimensions: reproductive health, empowerment and the labour market. It varies between zero (when women and men fare equally) and one (when men or women fare poorly compared to the other in all dimensions). The health dimension is measured by two indicators: maternal mortality ratio and the adolescent fertility rate. The empowerment dimension is also measured by two indicators: the share of parliamentary seats held by each sex and by secondary and higher education attainment levels. The labour dimension is measured by women's participation in the work force.

[7] On the GGI index, see http://www.weforum.org/. The GGI is designed to measure gender-based gaps in access to resources and opportunities in individual countries. The highest possible score is 1 (equality) and the lowest possible score is 0 (inequality). Beneria and Permanyer (2010) criticize the GGI for only capturing inequality in certain aspects of women's lives therefore making it an incomplete measure of gender inequality. Their calculations suggest that the levels of gender inequality are mostly

What explains the gender pay gap in Brazil? According to some recent economic studies, only a small portion (between 11 percent and 19 percent of wage differentials in the formal labor force) can be attributed to differences between men and women in their endowments (such as education or experience). For the most part, the wage gap appears to reflect discriminatory practices and social norms (see van Klaveren et al. (2009)). In the model presented in the next section, we will consider both potential causes—in the form of gender bias in the workplace and mothers' time allocation between boys and girls. We will also consider a third potential cause, related to access to infrastructure services, and its implications for women's time allocation to household production, child rearing, human capital accumulation, and market work. The assumption that we will consider is that poor access to core infrastructure services forces women to allocate a large fraction of their available time to family chores. As a result, they have less time available to take care of their children (a productive use of time if it helps to improve children's health, and if health and productivity in adulthood depend on health in childhood), further their education, and occupy formal sector jobs.[8] By implication, improved access to infrastructure services may free women's time in such a way that they may devote more time to building their own human capital. If bargaining power between men and women depends (directly or indirectly, through wages) on relative human capital stocks of men and women, and if higher bargaining power for women translates into more savings, and more investment in girls' education, the consequences for the gender gap and growth could be fairly large in the long run.

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explained by differences in the earned-income subcomponent.

[8]As discussed by Maani and Cruickshank (2010), housework may affect market wages (and thus the gender wage gap) indirectly as well, by influencing choices women make about their selection of job characteristics (and thereby via job-related compensating wage differentials). Women who spend more time on household chores, particularly during the working week, may seek out jobs that offer more flexible work arrangements, such as shorter commuting time or greater flexibility in scheduling. These more flexible working arrangements are likely to be costly to firms and so wages may be lower in such jobs to compensate employers.

3 The Model

The starting point of the analysis is an economy where two goods are produced, a marketed good and a home good, and individuals live for (at most) three periods: childhood (period $t-1$), adulthood (period t) and retirement (period $t+1$). The marketed good can be either consumed in the period it is produced or stored to yield capital at the beginning of the following period. Each individual is either male or female, and is endowed with one unit of time in childhood and adulthood, and zero units in old age. While husbands allocate inelastically all their time to market work, female spouses must consider four alternatives to allocate their time: market work, raising children, home production, and human capital accumulation.[9]

In what follows we consider in turn family preferences, home production, market production, human capital accumulation, health status and productivity, government activities, and bargaining power.

3.1 Family Preferences

At the beginning of adulthood in t, all men and women are randomly matched into married couples. Each couple produces n_t children, which depend on their parents for consumption and any spending associated with schooling and health care. It is also assumed that parents have control over the gender composition of their family, so that half of their children are daughters and half of them sons. A mother must spend $\varepsilon_t^{f,R} \in (0,1)$ units of rearing time on each child (which involves home tutoring, taking children to medical facilities, etc.). Raising a child also involves a cost of $\theta_t^R \in (0,1)$ of the family's net income.

All individuals, males and females, work in middle age; the only source of income is therefore wages in the second period of life. Savings can be held only in the form of physical capital. Agents have no other endowments, except for an initial stock of physical capital at $t=0$, which is the endowment of an initial old generation. A male (female) adult is endowed with e_t^m (e_t^f) units of human capital. Each unit of human

[9] As noted in the previous section, men in Brazil allocate only about 10 hours per week to household chores; the brunt of these activities continues to be performed by women.

capital earns an effective market wage, w_t^m for men and w_t^f for women, per unit of time worked.

Let $\varepsilon_t^{f,P}$ denote time allocated by women to home production and $\varepsilon_t^{f,E}$ time allocated to human capital accumulation; mothers' time allocated to market activity, $\varepsilon_t^{f,W}$, is thus

$$\varepsilon_t^{f,W} = 1 - \varepsilon_t^{f,P} - \varepsilon_t^{f,E} - n_t \varepsilon_t^{f,R}. \tag{1}$$

The family's (collective) utility takes the composite form

$$U_t = \varkappa_t U_t^f + (1 - \varkappa_t) U_t^m, \tag{2}$$

where U^j is partner j's utility function and $\varkappa_t \in (0, 1)$ is a weight that measures the wife's bargaining power in the household decision process.

Assuming that consumption of children is subsumed in the family's consumption, the sub-utility functions are given by, with $j = f, m$,

$$U_t^j = \eta_C^j \ln c_t^{t-1} + \eta_Q \ln Q_t + \eta_N \ln n_t \tag{3}$$

$$+\eta_E^j \ln e_t^f + \eta_H^i (\ln h_t^{C,f} + \ln h_t^{C,m}) + \frac{p^j}{1+\rho} \ln c_{t+1}^{t-1},$$

where c_t^{t-1} (c_{t+1}^{t-1}), is the family's total consumption in adulthood (old age), Q_t consumption (and production) of home goods, $h_t^{C,j}$ health status of a child of gender j, $\rho > 0$ the discount rate, and $p^j \in (0, 1)$, $j = m, f$ the probability of survival from adulthood to old age. Parents care about all of their children and their health. For simplicity, the utility function is assumed to be separable in health status and the number of children.

Coefficients η_C^j measure relative preference for today's consumption, η_N relative preference for surviving children, η_Q the family's relative preference for the home-produced good, η_H^j relative preference for children's health, and η_E^j relative preference for women's education. The restrictions $\eta_C^f < \eta_C^m$, $\eta_H^f > \eta_H^m$, and $\eta_E^f > \eta_E^m$ are also imposed. Thus, both parents benefit equally from consumption of the home good and value fertility in the same way. But women are less concerned than men about current consumption and care more about the health of their children and their own level of education. They also have longer longevity than men ($p^f > p^m$), implying a higher weight on consumption in old age. For simplicity, only the marketed good is consumed in old age.

The family's budget constraints for period t and $t+1$ are given by[10]

$$c_t^{t-1} + s_t = (1 - \theta_t^R n_t)(1-\tau)w_t^T, \tag{4}$$

$$c_{t+1}^{t-1} = [(1 + r_{t+1})s_t]/p_t, \tag{5}$$

where $\tau \in (0,1)$ is the tax rate on wages, s_{t+1} saving, r_{t+1} the net rental rate of private capital, $p_t = \varkappa_t p_t^f + (1-\varkappa_t)p_t^m$ is weighted life expectancy, and w_t^T total gross wage income of the family, defined as

$$w_t^T = e_t^m a_t^m w_t^m + e_t^f \varepsilon_t^{f,W} a_t^f w_t^f, \tag{6}$$

with a_t^i denoting productivity of labor i.[11] Combining (4) and (5), the family's consolidated budget constraint is thus

$$c_t^{t-1} + \frac{pc_{t+1}^{t-1}}{1 + r_{t+1}} = (1 - \theta_t^R n_t)(1-\tau)w_t^T. \tag{7}$$

The coefficient θ_t^R is a weighted average of male- and female-specific parameters, $\theta_t^{m,R}$ and $\theta_t^{f,R}$:

$$\theta_t^R = \varkappa_t \theta_t^{f,R} + (1-\varkappa_t)\theta_t^{m,R} = \theta_t^{m,R} + \varkappa_t(\theta_t^{f,R} - \theta_t^{m,R}). \tag{8}$$

Thus, if to begin with women prefer to spend more on children ($\theta_t^{f,R} > \theta_t^{m,R}$), an increase in their bargaining power will raise the family-wide spending share θ_t^R.

Families maximize (2) subject to (3) and (7), with respect to c_t^{t-1}, c_{t+1}^{t-1}, $\varepsilon_t^{f,P}$, $\varepsilon_t^{f,R}$, $\varepsilon_t^{f,E}$, and n_t, with $\varepsilon_t^{f,W}$ solved residually from (1).

[10] To abstract from unintended bequests, the saving left by agents who do not survive to old age is assumed to be confiscated by the government, which transfers them in lump-sum fashion to surviving members of the same cohort. The rate of return to saving is thus $(1 + r_{t+2})/p$, as shown in (5). See Agénor (2012*b*, p. 73) for a derivation.

[11] Note that in (6) we do not account directly for conditional cash transfers as a source of family income; thus, these transfers—which in practice represent a small fraction of income, see Cavalcanti and Correa (2010, p. 176)—do not serve to finance general family consumption. Rather, we model their direct impact on health in childhood, assuming that they supplement, rather than substitute for, family income.

3.2 Home Production

Home production involves combining women's time allocated to that activity with infrastructure services:

$$Q_t = [\varepsilon_t^{f,P} + \zeta^P (\frac{K_t^I}{K_t^P})]^{\pi^Q}, \tag{9}$$

where K_t^I is the stock of public capital in infrastructure, K_t^P the aggregate stock of private capital, $\pi^Q \in (0,1)$, and $\zeta^P \geq 0$ is an efficiency parameter. Access to infrastructure is not excludable but subject to congestion (and thus partially rival), as discussed next.[12]

3.3 Market Production

Firms engaged in market production are identical and their number is normalized to unity. Each firm i produces a single nonstorable good, using male effective labor, $A_t^m L_t^{m,i}$, where A_t^m is average male labor productivity in the economy, and female effective labor, defined as $A_t^f \varepsilon_t^{f,W} L_t^{f,i}$, where A_t^f is economy-wide female labor productivity, and $L_t^{i,j} = E_t^j N_t^{i,j}$ (where E_t^j is average human capital for $j = m, f$), private capital, $K_t^{P,i}$, and public infrastructure. Public capital is subject to congestion, which is taken to be proportional to the aggregate private capital stock, $K_t^P = \int_0^1 K_t^{P,i} di$. Thus, the intensive use of public infrastructure assets by firms reduces the availability of those assets for use by all firms, as well as (from (9)) households.

The production function of individual firm i takes the form

$$Y_t^i = (\frac{K_t^I}{K_t^P})^{\alpha} (A_t^m L_t^{m,i})^{\beta} (A_t^f \varepsilon_t^{f,W} L_t^{f,i})^{\beta} (K_t^{P,i})^{1-2\beta}, \tag{10}$$

where $\alpha, \beta \in (0,1)$.

Due to direct discrimination in the workplace, women only earn a fraction $b \in (0,1)$ of their marginal product. Thus, profit maximization with respect to private inputs gives

$$A_t^m E_t^m w_t^m = \frac{\beta Y_t^i}{N_t^{m,i}}, \quad A_t^f \varepsilon_t^{f,W} E_t^f w_t^f = b\frac{\beta Y_t^i}{N_t^{f,i}}, \quad r_t = (1-2\beta)\frac{Y_t^i}{K_t^{P,i}}. \tag{11}$$

[12] The assumption that public capital is non excludable (an individual, or firm, cannot prevent other agents from using it concomitantly) is important here and justifies introducing the aggregate stock in the home production function.

In a symmetric equilibrium, and given that men and women are in equal numbers in the adult population ($N_t^m = N_t^f$),

$$\frac{A_t^f \varepsilon_t^{f,W} E_t^f w_t^f}{A_t^m E_t^m w_t^m} = b. \tag{12}$$

Thus, all else equal, the smaller b is, the larger will be the observed wage differential between men and women in the workplace.[13]

Given that all firms are identical, and that their number is normalized to 1, $K_t^P = K_t^{P,i}$ $\forall i$ and aggregate output is, from (10) and $L_t^j = E_t^j N_t^j$,

$$Y_t = \int_0^1 Y_t^i di = (k_t^I)^\alpha (\frac{E_t^m N_t^m}{K_t^P})^\beta (\frac{E_t^f N_t^f}{K_t^P})^\beta (\varepsilon_t^{f,W})^\beta (A_t^m)^\beta (A_t^f)^\beta K_t^P, \tag{13}$$

where $k_t^I = K_t^I / K_t^P$ is the public-private capital ratio.

3.4 Human Capital Formation

Schooling is mandatory, so all children must devote all their time to education.[14] Boys and girls have identical innate abilities and have access to the same learning technology. However, each group's education outcomes depend also on the amount of time that parents devote to tutoring.

Let e_{t+1}^j, $j = m, f$ be the human capital of men and women born in period t and used in period $t+1$. The production of either type of human capital requires several inputs, in addition to children's time. First, it depends on the time that mothers allocate to tutoring their children. Mothers determine first the total amount of time allocated to child rearing, $\varepsilon_t^{f,R}$, and then subdivide that time into a fraction $\chi^R \in (0,1)$ allocated to sons and $1-\chi^R$ allocated to daughters.[15]

[13] As mentioned earlier, there may be an indirect effect of housework on the wage gap in the market place (Maani and Cruickshank (2010)). This effect could be captured by relating b negatively to women's relative time allocation between home production and market work, $\varepsilon_t^{f,P}/\varepsilon_t^{f,W}$. Gender bias in the workplace would thus be also related indirectly to access to infrastructure. However, there is no evidence on this channel for developing countries.

[14] The model therefore abstracts from child labor. See Cavalcanti (2010) for a discussion of this issue in Brazil.

[15] More generally, it could be assumed that, as a result of scale economies, mothers allocate a fraction $\theta \in (0,1)$ of total rearing time to *both* boys and girls, and the fraction $1-\theta$ between them, in proportions χ^R and $1-\chi^R$, respectively. If so, the ratio that would appear in equation (18) is not $\chi^R/(1-\chi^R)$, but rather $[\theta + (1-\theta)\chi^R]/[\theta + (1-\theta)(1-\chi^R)]$. The analysis here assumes that $\theta = 0$.

Second, the production of human capital depends on the stock of public infrastructure, taking into account a congestion effect measured again by the (aggregate) private capital stock. This effect captures the importance of infrastructure for education outcomes.[16]

Third, knowledge accumulation depends on average government spending on education per child, $\varphi_E G_t^E / n_t N_t$, where $\varphi_E \in (0,1)$ is an indicator of efficiency of spending and N_t is the number of adults alive in period t, itself given by

$$N_t = n_{t-1} N_{t-1}. \tag{14}$$

Fourth, human capital accumulation depends on a mother's human capital. Because individuals are identical within a generation, a mother's human capital at t is equal to the average human capital of the previous generation. Finally, women's human capital at $t+1$ depends also on the amount of time that they choose to invest in the acquisition of skills.

Assuming no depreciation for simplicity, the human capital that men and women have in the second period of life is

$$e_{t+1}^m = (\frac{\varphi_E G_t^E}{n_t N_t})^{\nu_1} (E_t^f)^{1-\nu_1} (k_t^I)^{\nu_2} (\chi^{R,m} \varepsilon_t^{f,R})^{\nu_3}, \tag{15}$$

$$e_{t+1}^f = (\frac{\varphi_E G_t^E}{n_t N_t})^{\nu_1} (E_t^f)^{1-\nu_1} (k_t^I)^{\nu_2} (\chi^{R,f} \varepsilon_t^{f,R})^{\nu_3} (\varepsilon_{t+1}^{f,E})^{\nu_4}, \tag{16}$$

where $\nu_1 \in (0,1)$, $\nu_i > 0$, $i = 2, 3, 4$, and

$$\chi^{R,j} = \begin{cases} \chi^R & \text{for } j = m \\ 1 - \chi^R & \text{for } j = f \end{cases}. \tag{17}$$

Combining equations (15), (16), and (17) yields, for period t,

$$\frac{e_t^m}{e_t^f} = (\frac{\chi^R}{1-\chi^R})^{\nu_3} (\varepsilon_t^{f,E})^{-\nu_4}, \tag{18}$$

which implies that, an increase in χ^R raises a boy's human capital later in life relative to a girl's human capital, whereas an increase in women's time allocated to education has the opposite effect. As shown later, because access to infrastructure has a positive effect

[16] See Agénor (2011, 2012*b*, Chapter 2).

on $\varepsilon_t^{f,E}$, improved access to public capital raises women's relative human capital—and thus their bargaining power, as discussed later.[17]

3.5 Health Status and Productivity

Health status in childhood, h_t^C, depends on the mother's health, on the effective amount of time allocated by the child's mother to child rearing, and the provision of (congested) health services by the government, H_t^G, and on the share of family resources spent on each child, θ_t^R, augmented by a conditional cash transfer per child provided by the government, cc^G:

$$h_t^{C,j} = (h_t^{A,f})^{\kappa}(\chi^{R,j}\varepsilon_t^{f,R})^{\nu_C}(\frac{H_t^G}{K_t^P})^{1-\nu_C}[(1+cc^G)\theta_t^R]^{\nu_G}, \tag{19}$$

where $\kappa \in (0,1)$ and $\nu_C, \nu_G > 0$.[18] Thus, in terms of their impact on health, cash transfers from the government are assumed to complement family resources rather than displace them. Because they are targeted to specific goals, there is no "crowding-out" effect.

Health status of both males and females in adulthood, $h_{t+1}^{A,j}$, is determined by health status in childhood and by the relative level of women's human capital:

$$h_{t+1}^{A,j} = h_t^{C,j}(\frac{E_t^f}{E_t^m})^{\nu_A}, \tag{20}$$

where $\nu_A > 0$.

The second effect indicates that when women are relatively more educated, it benefits not only their own health but also the health of their husbands.[19]

Adult productivity, a_{t+1}^j, is positively related to health status, with decreasing marginal returns:

$$a_{t+1}^j = (h_{t+1}^{A,j})^{\nu_P}, \tag{21}$$

where $\nu_P \in (0,1)$.

[17] Note also that, in the foregoing discussion, women's time was assumed to be perfectly divisible. If instead a fixed amount of time ε^S must be allocated to education (because completing a degree requires mandatory school attendance, for instance), the model can generate a corner solution in which the optimal time $\varepsilon_t^{f,E}$ is less than ε^S, in which case the equilibrium outcome involves $\varepsilon_t^{f,E} = 0$.

[18] Note that we do not account for other effects of cash transfers, such as those on employment and participation rates. See Cavalcanti and Correa (2010) for labor market effects.

[19] McMahon (2004) discusses externalities associated with women's education in terms of husbands' health.

3.6 Government

As noted earlier, the government taxes only the wage income of adults. It spends a total of G_t^I on infrastructure investment, G_t^E on education, G_t^H on health, and G_t^U on unproductive items, which includes spending on cash transfers to all children, $cc^G n_t N_t$. All its services are provided free of charge. It cannot issue bonds and must therefore run a balanced budget:

$$G_t = \sum G_t^h = \tau(w_t^m A_t^m L_t^m + w_t^f A_t^f \varepsilon_t^{f,W} L_t^f). \tag{22}$$

Shares of spending are all assumed to be constant fractions of government revenues:

$$G_t^h = \upsilon_h \tau(w_t^m A_t^m L_t^m + w_t^f A_t^f \varepsilon_t^{f,W} L_t^f), \tag{23}$$

where $h = E, H, I, U$.

Combining (22) and (23) therefore yields

$$\sum \upsilon_h = 1. \tag{24}$$

Assuming again full depreciation for simplicity, public capital in infrastructure evolves according to

$$K_{t+1}^I = \varphi_I G_t^I, \tag{25}$$

where $\varphi_I \in (0,1)$ is an indicator of efficiency of spending on infrastructure.

The production of health services by the government is assumed to exhibit constant returns to scale with respect to the stock of public capital in infrastructure, K_t^I, and government spending on health services, G_t^H:

$$H_t^G = (\varphi_H G_t^H)^{\mu_H} (K_t^I)^{1-\mu_H}, \tag{26}$$

where $\mu_H \in (0,1)$ and $\varphi_H \in (0,1)$ is an indicator of efficiency of spending on health. This specification captures the fact that access to infrastructure is essential to the production of health services.

3.7 Bargaining Power

The relative bargaining power of women is assumed to evolve as a function of the human capital stocks of husbands and wives:[20]

$$\varkappa_t = \bar{\varkappa}^{1-\gamma_B}[(\frac{e_t^f}{e_t^m})^{\mu_B}]^{\gamma_B}, \tag{27}$$

where $\bar{\varkappa} \in (0, 1)$ measures the autonomous component of women's bargaining power and $\gamma_B \in (0, 1)$ the relative importance of the endogenous component. The parameter $\mu_B \geq 0$ measures the sensitivity of the endogenous component of bargaining power to relative human capital stocks.

3.8 Market-Clearing Conditions

The asset-market clearing condition requires tomorrow's private capital stock to be equal to savings in period t by individuals born in $t-1$. Given that s_t is savings per family, that the number of families is $(N_t^m + N_t^f)/2$, and that $N_t^f = N_t^m$,

$$K_{t+1}^P = 0.5(N_t^m + N_t^f)s_t = N_t^f s_t. \tag{28}$$

4 Balanced Growth Equilibrium

As in Agénor (2012*a*), a *competitive equilibrium* in this economy is a sequence of prices $\{w_t^m, w_t^f, r_{t+1}\}_{t=0}^{\infty}$, allocations $\{c_{t+1}^t, c_{t+2}^t, s_{t+1}\}_{t=0}^{\infty}$, physical capital stocks $\{K_{t+1}^P, K_{t+1}^I\}_{t=0}^{\infty}$, human capital stocks $\{E_{t+1}^m, E_{t+1}^f\}_{t=0}^{\infty}$, a constant tax rate, and constant spending shares such that, given initial stocks $K_0^P, K_0^I > 0$ and $E_0^m, E_0^f > 0$, initial health statuses $h_0^{C,j}, h_0^{A,j} > 0$, families maximize utility, firms maximize profits, markets clear, and the government budget is balanced. In equilibrium, it must also be that $e_t^j = E_t^j$, and $a_t^j = A_t^j$, for $j = m, f$. A *balanced growth equilibrium* is a competitive equilibrium in which c_t^{t-1}, c_{t+2}^{t-1}, K_{t+1}^P, K_{t+1}^I, E_{t+1}^m, E_{t+1}^f grow at the constant, endogenous rate γ_Y,

[20] Women's barganing power may be alternatively related to, or measured by, the male-female ratio of earned incomes, the share of assets that they hold within the household or patterns of decision-making within the household (as revealed by surveys), and women's access to financial services. See for instance Quisumbing (2010) and Doss (2013).

the rate of return on private capital r_{t+1} is constant, women's time allocation is constant, and health status of both children, $h_t^{C,f}$ and $h_t^{C,m}$, and adults, $h_t^{A,f}$ and $h_t^{A,m}$, are constant.

As shown in the Appendix, the solution of the model yields

$$J = \frac{\varphi_I \upsilon_I \tau}{\sigma(1-\tau)(1-\theta^R n)}, \tag{29}$$

where σ is the family's propensity to save, defined as

$$\sigma = \frac{p}{(1+\rho)\eta_C + p} < 1, \tag{30}$$

and

$$p = \varkappa p^f + (1-\varkappa)p^m = p^m + (p^f - p^m)\varkappa. \tag{31}$$

Women's time allocation and the total fertility rate is given by[21]

$$\varepsilon^{f,P} = \begin{cases} \{1+\Lambda_1\Lambda_2^{-1}\}^{-1}\{\Lambda_1\Lambda_2^{-1} - \zeta^P J\} & \text{If } J \leq J_C \\ \varepsilon_m^{f,P} & \text{If } J > J_C \end{cases}. \tag{32}$$

$$\varepsilon^{f,E} = \nu_4[1+\eta_E(1-\sigma)\eta_C^{-1}](\frac{1-\varepsilon^{f,P}}{\Lambda_2}), \tag{33}$$

$$\varepsilon^{f,R} = \frac{\Lambda_3\theta^R\eta_H\nu_C(1-\sigma)}{\eta_C(1-\eta_H\nu_C/\eta_N)}(\frac{1-\varepsilon^{f,P}}{\Lambda_2}), \tag{34}$$

$$\varepsilon^{f,W} = 1 - \varepsilon^{f,P} - \varepsilon^{f,E} - n\varepsilon^{f,R}, \tag{35}$$

$$n = \frac{(1-\eta_H\nu_C/\eta_N)}{\Lambda_3\theta^R}, \tag{36}$$

where J_C is a threshold level of the public-private capital ratio given by

$$J_C = \frac{1}{\zeta^P}\left\{\frac{\Lambda_1}{\Lambda_2} - (1+\frac{\Lambda_1}{\Lambda_2})\varepsilon_m^{f,P}\right\},$$

and

$$\eta_h = \varkappa\eta_h^f + (1-\varkappa)\eta_h^m = \eta_h^m + (\eta_h^f - \eta_h^m), \quad h = C, E, H \tag{37}$$

$$\Lambda_1 = \eta_Q\pi^Q(1-\sigma)\eta_C^{-1} > 0,$$

$$\Lambda_2 = 1 + \nu_4[1+\eta_E(1-\sigma)\eta_C^{-1}] + \eta_H\nu_C(1-\sigma)\eta_C^{-1} > 1,$$

[21] To avoid convergence of population size toward zero, it is also assumed that $n \geq 2$ in the steady state.

$$\Lambda_3 = 1 - \frac{\eta_H \nu_C}{\eta_N} + \frac{\eta_C}{\eta_N(1-\sigma)}.$$

Equation (32) holds as long as $\varepsilon_t^{f,P} > \varepsilon_m^{f,P}$, where $\varepsilon_m^{f,P} \geq 0$ is the minimum amount of time that women must allocate to household chores in the family. Through η_C, η_E and η_H, the bargaining parameter, $\varkappa(J)$ affects the fertility rate, the survival probability, and the savings rate.

Equations (32)-(35) imply that a reduction in time allocated by mothers to home production translates in general into an equilibrium increase in time allocated to child rearing, own human capital formation, and market work—all of which being productive activities. Note also that, as can be inferred from (33), even if $\eta_E = 0$ optimal women's time allocated to human capital accumulation in adulthood is not zero. The reason is that even though devoting more time to such activity reduces time spent in market work (thereby reducing wage income), it increases effective labor supply (thereby increasing wage income). Internalizing this trade-off leads to a nonzero equilibrium value of $\varepsilon^{f,E}$. By contrast, $\nu_4 = 0$ always implies $\varepsilon^{f,E} = 0$. These results will be useful for understanding the simulation experiments reported later.

Substituting (18) in (27) yields

$$\varkappa(J;\chi^R) = \bar{\varkappa}^{1-\gamma_B}\left\{(\frac{\chi^R}{1-\chi^R})^{-\nu_3}[\varepsilon^{f,E}(J)]^{\nu_4}\right\}^{\mu_B\gamma_B}, \tag{38}$$

where $d\varepsilon^{f,E}(J)/dJ > 0$. This expression shows that in equilibrium women's bargaining power depends on the allocation of mothers' time to their sons and daughters, as measured by χ^R, and on women's access to infrastructure. The higher J, the lower the amount of time allocated to home production (as implied by (32)) and the more time they can devote in adulthood to accumulating human capital (as implied by (33))—thereby increasing their bargaining power in the family.

Let $x_t^f = K_t^P/E_t^f N_t^f$ denote the private capital-female effective labor ratio. As also shown in the Appendix, the model can be condensed into a dynamic system in two equations:

$$h_{t+1}^{A,f} = \Gamma_4(\varepsilon^{f,R})^{\nu_C}[(1+cc^G)\theta_t^R]^{\nu_G}J^{\Omega_1}(\varepsilon^{f,W})^{\Omega_2}(\varepsilon^{f,E})^{-\Omega_3}\frac{(h_t^{A,f})^{\kappa+\nu_P 2\Omega_2}}{(x_t^f)^{2\Omega_2}}, \tag{39}$$

$$x_{t+1}^f = \Gamma_6 J^{-\nu_2+\alpha(1-\nu_1)}(h_t^{A,f})^{\nu_P 2\beta(1-\nu_1)}(x_t^f)^{(1-2\beta)(1-\nu_1)}\frac{(\varepsilon^{f,W})^{\beta(1-\nu_1)}}{(\varepsilon^{f,R})^{\nu_3}(\varepsilon^{f,E})^{\nu_4}}, \tag{40}$$

where

$$\Gamma_1 = (\frac{\chi^R}{1-\chi^R})^{\beta(\nu_3+\nu_C\nu_P)},$$

$$\Gamma_3 = [\varphi_H \upsilon_H \tau(1+b)\beta]^{\mu_H}\Gamma_1^{\mu_H},$$

$$\Gamma_4 = (1-\chi^R)^{\nu_C}\Gamma_3^{1-\nu_C}(\frac{\chi^R}{1-\chi^R})^{-\nu_3\nu_A},$$

$$\Gamma_5 = [\frac{b\beta\Phi\sigma(1-\theta^R n)}{(1-\chi^R)^{\nu_3}n^{1-\nu_1}0.5^{\nu_1}}][\varphi_E \upsilon_E \tau(1+b)\beta]^{-\nu_1},$$

$$\Phi = (1-\tau)(b^{-1}+1),$$

$$\Gamma_6 = \Gamma_5\Gamma_1^{1-\nu_1},$$

$$\Omega_1 = (1-\nu_C)[1-\mu_H(1-\alpha)] > 0,$$

$$\Omega_2 = (1-\nu_C)\beta\mu_H \in (0,1),$$

$$\Omega_3 = (1-\nu_C)\beta\mu_H\nu_4 \in (0,1).$$

As also shown in the Appendix, the steady-state growth rate of output is given by

$$1+\gamma_Y = \Gamma_1 J^{\alpha}(\varepsilon^{f,W})^{\beta}\frac{\beta\sigma(1-\theta^R n)}{[(1-\tau)(1+b)]^{-1}}(\tilde{h}^{A,f})^{\nu_P 2\beta}(\tilde{x}^f)^{-2\beta}, \tag{41}$$

where $\tilde{h}^f$ and $\tilde{x}^f$ are the steady-state solutions obtained by setting $\Delta h_{t+1}^f = \Delta x_{t+1}^f = 0$ in (39) and (40):

$$\tilde{h}^{A,f} = \left\{\Gamma_4(\varepsilon^{f,R})^{\nu_C}[(1+cc^G)\tilde{\theta}^R]^{\nu_G}J^{\Omega_1}(\varepsilon^{f,W})^{\Omega_2}(\varepsilon^{f,E})^{-\Omega_3}(\tilde{x}^f)^{-2\Omega_2}\right\}^{1/\Pi_2} \tag{42}$$

$$\tilde{x}^f = \left\{\Gamma_6 J^{-\nu_2+\alpha(1-\nu_1)}(\tilde{h}^{A,f})^{2\nu_P\beta(1-\nu_1)}\frac{(\varepsilon^{f,W})^{\beta(1-\nu_1)}}{(\varepsilon^{f,R})^{\nu_3}(\varepsilon^{f,E})^{\nu_4}}\right\}^{1/\Pi_3}, \tag{43}$$

with

$$\Pi_2 = 1-\kappa-\nu_P 2\Omega_2,$$

$$\Pi_3 = 1-(1-2\beta)(1-\nu_1) > 0.$$

As shown in the Appendix, a sufficient (although not necessary) condition for dynamic stability of the system (39) and (40) is $\Pi_2 > 0$. This condition is verified numerically, as discussed next.

5 Numerical Calibration

To calibrate the model for Brazil, several data sources are used. The *World Development Indicators* (WDI) database of the World Bank, data from the 2009 National Household Sample Survey (PNAD), produced by IBGE, and data available in published papers, as needed.

On the *household side*, the annual discount rate is set at 0.03, as in Glomm and Rioja (2004). This implies that the discount factor is equal to 0.97 on a yearly basis. Interpreting a period as 25 years in this framework yields an intergenerational discount rate of $0.97^{25} = 0.467$.

To calibrate women's bargaining power, as defined in equation (38), requires setting six parameters: γ_B, $\bar{\varkappa}$, χ^R, ν_3, ν_4, and μ_B, and knowing the equilibrium value $\varepsilon^{f,E}$. As discussed below, coefficients ν_3 and ν_4 are set equal to 0.7 and 0.1, respectively, and $\varepsilon^{f,E} = 0.185$. The parameter μ_B is set to a "neutral" value of $\mu_B = 1$ and γ_B is set at 0.5, to capture the fact that endogenous "macro" factors play only a limited role in determining women's bargaining power. It is also assumed that there is some initial bias in mothers' rearing time allocation toward boys and therefore set $\chi^R = 0.6$. The initial bargaining power of women $\varkappa$ is calibrated as in Agénor (2012*a*), by using the relative literacy rate of adult females (ages 15 and above), divided by the sum of literacy rates of adult males and females—which can be viewed as a measure of the relative human capital of women. As noted earlier, this corresponds to the main determinant of bargaining power.[22] Using WDI data for 2009, this gives $\varkappa = 90.2/(90.2 + 89.8) = 0.501$. By this measure, therefore, there is not much evidence of gender bias in the family in Brazil, although some other measures (based, in particular, on control of household assets) would suggest otherwise. Expression (38) can therefore be solved backward for the parameter $\bar{\varkappa}$, thereby giving $\bar{\varkappa} = 0.395$.

Survival probabilities p^m and p^f are calibrated as follows. In 2010 life expectancy at birth in Brazil was 69.7 for men and 76.7 years for women, with an average of 73.1 years.[23] This gives an annual death rate of $1/69.7 = 0.014$ for men and $1/76.7 = 0.013$

[22] See the references provided earlier.

[23] In principle, the adult survival probability in the model should be calculated on the basis of life expectancy at middle age. However, no such data are available.

for women. The survival probabilities can thus be estimated as $p^m = 1 - 0.014 = 0.986$ for men and $p^f = 1 - 0.013 = 0.987$ for women. This yields, given that $\varkappa = 0.501$,

$$p = p^m + \varkappa(p^f - p^m) = 0.9863. \tag{44}$$

The family savings rate for Brazil, σ , is set equal to the private saving rate, which reached an average of 17 percent during the period 2003-10. Solving (30) backward for the preference parameter η_C yields, using the intergenerational discount factor 0.97^{25},

$$\eta_C = (\frac{1}{1+\rho})[(\frac{1}{0.17}) - 1]p, \tag{45}$$

which, using (44), yields

$$\eta_C = 2.3. \tag{46}$$

According to 2010 IBGE data, average expenditure of a Brazilian family, in proportion of average income, is R\$2626.3/R\$2763.4 = 0.942 percent, whereas the number of children per family, in proportion of the number of people per family is equal to 1.9/3.1 = 0.613. Assuming that family income is spent evenly between adults and children would suggest that the share of spending on children, in proportion of total income, is $0.942 \cdot 0.613 = 0.58$ percent. However, to account for scale economies in raising children, we reduce this share to 0.45 percent. In terms of the model, this can be taken as an approximation of the share of total family income devoted to child rearing, which corresponds to $n\theta^R$. The gross fertility rate (number of births per woman) for Brazil, n, is equal to 2.1 over the period 2000-09; given that value, the share of family spending on each child can therefore be estimated at $\theta^R = 0.45/2.1 = 0.214$. We assume that male spouses prefer to spend a smaller fraction, $\theta^{m,R} = 0.18$, on children; given (8), and that $\varkappa = 0.501$, this gives women's preference parameter for child spending $\theta^{f,R} = 0.25$.

The parameter η_N is set at 3.5, slightly above the calibrated preference parameter for current consumption, to capture a relatively high family preference for children. Given that value, η_H is calibrated residually, by solving (36) backward, using the definition of Λ_3 provided earlier, noting the above results for σ, n, η_C, and η_N, and using $\nu_C = 0.45$; this gives $\eta_H = 2.748$.

In the *home good production sector*, the efficiency parameter ζ^P is normalized at unity and the curvature of the home production function initially at $\pi^Q = 0.7$, to capture rapidly decreasing marginal returns in terms of women's time and infrastructure services. In the experiments reported in the next section, a smaller value of $\pi^Q = 0.12$, corresponding to the value used by Kimura and Yasui (2010, Table 4) for a production function with labor only, will also be used to capture smaller decreases in marginal returns initially.

To estimate *women's time allocation*, we use the 2009 PNAD data and the calculations in Ribeiro and Marinho (2012). They estimate that the time spent by women in household chores is 20.2 hours per week, and that the time spent in market work is 41.4 hours per week. To calculate total time available in a week, we subtract from raw time ($7 \cdot 24 = 168$ hours) time spent sleeping (8 hours a day, or a total of 56 hours), time spent on personal care (2 hours a day, or 14 hours). Weekly time available is thus 98 hours. The time spent by women in home production can consequently be estimated as $\varepsilon^{f,P} = 20.2/98 = 0.206$, whereas the time spent in market work can be estimated as $\varepsilon^{f,W} = 41.4/98 = 0.421$.

Time spent by women to accumulate human capital in adulthood is estimated by using an estimate on the number of years devoted to human capital accumulation, divided by the length of the period in adulthood, 25; thus, $\varepsilon^{f,E} = 4.6/25 = 0.185$. As discussed earlier, this estimate accounts not only for time spent in formal, tertiary education during adult life (an average of four years for women with higher education in Brazil) but also for the time spent during adulthood accumulating human capital through other means—seminars, on-the-job training, personal reading, etc. To estimate rearing time, we assume that women have one hour a day for leisure (or 7 hours a week), or 0.071 in percentage of total time available.[24] Thus, total rearing time can be estimated as $n\varepsilon^{f,R} = 1 - 0.206 - 0.421 - 0.185 - 0.071 = 0.117$, implying that time spent on each child is $\varepsilon^{f,R} = 0.056$. Using the data on $\varepsilon^{f,P}$ as well as J below, and the definitions of Λ_1 and Λ_2 provided earlier, formula (32) can be solved backward for the

[24]Even though leisure is not explicitly accounted for in the model's description of women's time allocation, we introduce it (exogenously) in the calibration in order to obtain more reasonable estimates of women's time allocated to child rearing.

preference parameter for the home good. This gives $\eta_Q = 3.315$.

Given the estimate $\varepsilon^{f,E} = 0.185$, $\nu_4 = 0.1$, and using the calibrated values for σ and η_C derived earlier, equation (33) can be solved backward for η_E, the family's preference parameter for women's human capital; this gives $\eta_E = 9.404$.

Having determined η_C, η_H, and η_E, the values η_C^m, η_C^f, η_H^m, η_H^f, and η_E^m, η_E^f can now be determined. Given that $\varkappa = 0.501$, and setting $\eta_C^m = 2.8$, $\eta_H^m = 2.2$, and $\eta_E^m = 7.0$, the last three values can be determined residually by solving using (37) backward; this gives $\eta_C^f = 1.802$, $\eta_H^f = 3.294$, and $\eta_E^f = 11.797$. Thus, by construction $\eta_C^f < \eta_C^m$, and $\eta_H^f > \eta_H^m$, and $\eta_E^f > \eta_E^m$.[25]

In the *marketed good production sector*, the elasticities of production of final goods with respect to public capital and each type of labor, α and β, are set equal to 0.15 and 0.3, respectively. The value of α is slightly above the value used by Glomm et al. (2009) in their study for Brazil but it is close to the average value of 0.14 reported in the empirical review of Bom and Ligthart (2010). The value of β is the same as in Glomm et al. (2009) and a value of the elasticity of output with respect to private capital equal to 0.4, as in Ferreira and Nascimento (2005). The parameter b, which captures the degree of gender bias in the workplace, is estimated as follows. As estimated by Costa et al. (2009), the average female-to-male *monthly* wage ratio in Brazil was 61.2 percent in 2006. This ratio, however, represents not only gender differences in endowments and remuneration but also in total time spent at work. Because women in Brazil are over-represented in part-time jobs, the female-to-male *hourly* wage ratio is preferable to describe the pure gender wage gap. The hourly wage ratio is actually 74.2 percent. We therefore set $b = 0.74$.

In the *human capital sector*, the parameter measuring the intergenerational externality associated with the transmission of human capital through mothers, $1 - \nu_1$, is set equal to 0.56, as in de la Croix and Donckt (2010). This implies an elasticity with respect to government spending on education, ν_1, equal to 0.44.[26] The elasticity with

[25] The numerical results discussed later are not highly sensitive to this particular choice of η_C^m, η_H^m, and η_E^m, because it is the *average* values that matter, and these are constant for all shocks—except for those involving changes in $\varkappa$, induced by either changes in mothers' time allocated to sons and daughters, and changes in the public-private capital ratio. However, for the experiments considered, changes in $\varkappa$ are relatively small.

[26] This value is much higher than the elasticity of 0.1 used by Glomm and Rioja (2004), for instance.

respect to the public-private capital ratio, ν_2, is set equal to 0.15, close to the value used in Agénor (2011). There is not much evidence regarding the elasticity with respect to time allocated by mothers, ν_3; we use a value of 0.7, which is close to the elasticity of child human capital with respect to "time spent developing the human capital of children" by adults imposed by Moe (1998) for a middle-income country, 0.66.

Regarding *health status and productivity*, the degree of intergenerational persistence κ is set equal to 0.5, a value that is relatively close to the implicit value used by Osang and Sarkar (2008), 0.45. The elasticity of child health status with respect to public health services, $1-\nu_C$, is set equal to the same value as theirs, 0.55. By implication, the elasticity with respect to mothers' rearing time, ν_C, is equal to 0.45. There are no good benchmarks in the literature to guide the choice of the elasticity of health status in adulthood with respect to the ratio of human capital stocks, ν_A, so it is set initially at a relatively low value, 0.2; some sensitivity analysis is conducted subsequently. Similarly, there is not much information regarding the elasticity with respect to total spending (family plus government cash transfer) per child, ν_G, so we set it initially to 0.6 and perform sensitivity analysis. The elasticity of both male and female productivity with respect to health status is set at $\nu_P = 0.8$, which is consistent with some of the cross-country econometric estimates reported in Cole and Neumeyer (2006).

Regarding the *government*, the effective tax rate on output, τ, is calculated by multiplying the average ratio of tax revenues to GDP given in WDI for the years 2004-07, 16.3 percent, divided (to match the model's definition) by the average share of labor income for developing countries estimated by Guerriero (2012, Appendix E), 0.6.[27] Thus, $\tau = 23.9$ percent. The initial share of government spending on health, υ_H, is based on the average estimate from WDI for the period 2002-09 and is set at 0.052. The initial share of government spending on education, υ_E, is also based on the average estimate from WDI for the years 2004-09, which gives 0.156. The initial share of government investment on infrastructure, υ_I, is set at 0.056. This is obtained by multiplying the share of public investment in GDP, estimated by Paiva (2010) at 0.021 on average over the past decade, by the inverse of the share of government spending

[27]The estimate used is the corrected measure LS4 proposed by Guerriero, which accounts for the self employed.

in GDP, estimated from the IMF's WEO database at 0.37 over the period 2000-10. These numbers imply from the budget constraint that the share of spending on other items, υ_U, is 0.736. The cash transfer per child, cc^G, is set equal initially to 0.05, with the total amount of spending taken to be subsumed in other spending, G_t^U, as noted earlier.

Dabla-Norris et al. (2011, Table 1.a) estimate the efficiency parameter for public investment in Brazil, φ_I, at 0.78.[28] Thus, according to these numbers, in Brazil more than 20 percent of public spending on infrastructure investment is "wasted," in the sense that it does not turn into public capital. In the absence of data specific to the education and health sectors, the efficiency parameters for spending on education and health, φ_E and φ_H, respectively, are also set at the same value. Using (29), the equilibrium public-private capital ratio can be computed to give $J = 0.147$. Thus, by this measure, public capital remains a relatively scarce factor in Brazil.

Finally, the elasticity of output of health services with respect to public spending on health is set at $\mu_H = 0.8$. There are no good benchmarks in the literature but this value appears to be a reasonable starting point, given that most of these services are measured based on salaries paid to medical workers, and the correspondence between elasticities and shares in the Cobb-Douglas function with constant returns to scale. By implication, the elasticity with respect to public capital in infrastructure is 0.2.

The benchmark parameter values are summarized in Table 1. Based on these parameter and initial values—from which it can be established that $\Pi_2 = 0.289$, which implies that the model is indeed stable—the model is solved for the steady-state growth rate of output. A multiplicative constant is also introduced, in order to yield an annual growth rate of marketed output equal to 2.7 percent, the average rate of growth of real GDP for Brazil over the period 1990-2008.[29]

[28] Dabla-Norris et al. (2011) define their metric on a range of 1 to 4, with a value of 3.12 for Brazil; this value was simply divided by 4 to obtain an indicator bounded by unity.

[29] Conceptually, this constant reflects an exogenous productivity factor affecting the production of marketed goods, as defined in equation (10).

6 Policy Experiments

To illustrate the role of public policy in the model, three types of experiments are considered: changes in public investment in infrastructure; child- and gender-related policies (an increase in conditional cash transfers, a reduction in gender bias in the market place, an autonomous increase in women's bargaining power, and an increase in mothers' time allocated to their daughters); and a composite reform program. The analysis is conducted throughout under the assumption that $J < J^C$, or equivalently $\varepsilon^{f,P} > \varepsilon_m^{f,P}$, which implies from equation (32) that women's time allocated to home production is sensitive to changes in access to infrastructure. To summarize the simulation results, we focus on the following variables: women's time allocation, women's bargaining power, the public-private capital ratio, and the growth rate of output.[30,31]

6.1 Investment in Infrastructure

Consider the case of a public policy aimed at promoting access to infrastructure, by investing in rural roads, power grids, etc. This is captured by considering a budget-neutral increase in υ_I. Specifically, we consider the impact of an increase in υ_I from an initial value of 0.021 to 0.031 of GDP (or equivalently from 0.056 to 0.084 percent of total government spending) under the assumption that it is matched by a cut in unproductive spending ($d\upsilon_I + d\upsilon_U = 0$).[32]

The impact of this experiment is shown in Table 1, for different values of some key parameters. Consider first the benchmark results. The direct effect of the shock is of course an increase in the public-private capital ratio, which therefore promotes growth directly. In addition, this increase reduces mothers' time allocated to home production and raises time allocated to market work, human capital accumulation, and child rearing. In the present setting, the latter is also productive; it leads to

[30] We also assume, as in Agénor (2012a), that labor supply decisions are divisible, as opposed to lumpy. Otherwise, changes in women's time allocation could be subject to thresholds.

[31] A number of other variables (family consumption, savings rate, wage inequality, and so on) could also be reported. However, because the choice of other variables to report is often experiment-specific, attention was limited to a small number of them.

[32] The case where such investment is financed by a cut in another productive component of spending (such as education and health) could easily be analyzed, as for instance in Agénor (2012a). This raises well-known trade-offs.

improved health in both childhood and adulthood. Thus, all of these effects also help to promote growth and health outcomes.

At the same time, the increase in time devoted to human capital accumulation raises women's bargaining power, which translates into a higher family preference for girls' education, η_E, and children's health, η_H, an increase in the average share of family income spent on children, θ^R, and a lower preference for current consumption, η_C. The first two effects raise further the amount of time allocated to education and child rearing, whereas the last effect contributes to a rise in the savings rate. The increase in the share of family income spent on children tends to reduce the fertility rate, which mitigates the increase in total rearing time.

Because the increase in the level of income and in the savings rate raise private savings and the private capital stock, there is a positive effect (weakened to some extent by congestion) on the growth rate of output. At the same time, female health in adulthood also improves—as a result of both more rearing time received in childhood and higher government spending on health. Overall, the steady-state growth rate increases by about half a percentage point, compared to the baseline value.

In Table 2 we also show the impact of the shock for alternative values of some key parameters. The overall growth effect is slightly higher for a lower value of $\pi^Q = 0.4$ (to capture smaller decreases in marginal returns initially between women's time and infrastructure services). The impact on women's time allocation is also stronger, whereas the effect on their bargaining power is about the same. If the increase in public investment is accompanied with an increase in efficiency of spending on infrastructure only (with φ_I increasing from 0.78 to 0.9), the growth and time allocation effects are magnified, given that the increase in the public-private capital ratio is more substantial. A higher elasticity of the production of health services or human capital to infrastructure (higher values of μ_H or ν_2) both lead to higher growth effects, despite having no additional impact (compared to the benchmark case) on women's time allocation. By contrast, lower efficiency in using infrastructure services in the home (a lower $\zeta^P = 0.5$) mitigates the benefits of public capital for women and for growth.

6.2 Conditional Cash Transfers

Suppose that the government doubles the conditional cash transfer to each child, so that cc^G increases from 0.05 initially to 0.1. This additional spending is assumed to result from a reallocation among unproductive outlays, G_t^U, so that shares of all spending components remain constant. Thus, the increase in cash transfers is budget neutral and can be considered in isolation from other changes.

The impact of this experiment on steady-state growth is also shown in Table 2. The direct effect of this policy is to improve health in childhood and, because of health persistence, in adult productivity as well. This helps to promote growth. However, quantitatively, this effect is relatively small (less than a tenth of a percent), at the initial value of $\nu_G = 0.6$. With a higher value of ν_G of 0.9, or a higher degree of persistence in health (with κ increasing from 0.5 to 0.6), the growth effect increases somewhat, but it remains muted.

In assessing this result, it is important to keep in mind that the model does not account for the possibility that better health in childhood may improve education outcomes—a fairly well documented fact (see for instance Behrman (2009)). In turn, improved education may lead to further gains not only in terms of the quality of the labor force but also in terms of health status in adulthood (see for instance McGuire (2006)). If the elasticity of human capital with respect to health is relatively large, the results reported here could underestimate the benefit of conditional cash transfers in improving human development outcomes and promoting growth.

6.3 Reduction in Gender Bias in the Market Place

Suppose now that the government implements anti-discrimination laws that lead to a complete elimination of gender bias in the market place, and that such a policy translates into an increase in b from an initial value of 0.74 to 1.0.

The results are shown in Table 2. The direct effect of this policy (at the initial level of wages) is to raise family income. In turn, higher income leads to a higher level of private savings and private capital stock, which has a direct positive effect on growth, as well as higher tax revenues. Women's time allocation is not affected. And because changes in b affect tax revenues and private savings in exactly the same way, the public-private capital ratio is not affected either. But higher tax revenues also lead to higher public spending on health and education, with the former exerting a positive effect on health in childhood and adulthood. Thus, in the long run, a reduction in gender bias leads to an improvement in women's health status and an increase in the growth rate of output, in the latter case by about 0.18 percentage points.

The table also reports the results of combining anti-discrimination laws with an education campaign designed to increase gender awareness in schools, and improving gender sensitivity in classroom material. This is captured by combining the increase in b with a two-percentage point increase in the share of public spending on education, υ_E, from 0.156 to 0.176. The results show indeed that the effect of improved equality in the workplace would be substantially magnified, with the steady-state growth rate of output increasing now by about 0.28 percentage points.

6.4 Increase in Women's Bargaining Power

Consider an increase in the autonomous component of women's bargaining power, that is, an increase in $\bar{\varkappa}$, from an initial value of 0.395 to a value of 0.6. This changes the initial value of $\varkappa$ from 0.501 to 0.619, which represents a substantial increase in women's bargaining power.

The impact of this experiment on steady-state growth is shown in Table 3. In the model, there are three main channels through which the change in $\bar{\varkappa}$ affects growth. First, because women's preference for current consumption is *lower* than that of men ($\eta_C^f < \eta_C^m$), it reduces the average family preference parameter for today's consumption, η_C, from the initial value of 2.3, as given in (46), to 2.182. As a result, the family's savings rate, defined in (30), increases from an initial value of 0.17 to 0.178. At the aggregate level, the increase in savings translates into a higher private capital stock. Second, because mothers' preference for the education of their daughters is *higher* than that of men ($\eta_E^f > \eta_E^m$), the average family preference parameter girls' education, η_E, increases from 9.404 to 9.968, which induces more women to invest in human capital accumulation and therefore magnifies the initial increase in bargaining power. Third, because women's preference for children's health is *higher* than that of men ($\eta_H^f > \eta_H^m$), it increases the average family preference parameter for children's health, η_H, from the initial value of $\eta_H = 2.748$ to 2.877. The higher value of η_H, together with the lower η_C combine to reduce the fertility rate. Fourth, because women's preference for spending on children is *higher* than that of men ($\theta^{f,R} > \theta^{m,R}$), it increases the average family share of spending on children, θ^R, from 0.214 to 0.223, which tends to reduce savings. In the present case the net effect on the total share of family income spent on children, $n\theta^R$, is negative, that is, the drop in the fertility rate dominates. Nevertheless, this effect is small relative to the increase in the savings rate, implying therefore a rise in total savings.

The increase in the private capital stock has a direct, beneficial impact on market production. At the same time, it tends to reduce both the public-private capital stock and the female labor-private capital ratio; both of these effects have a direct, negative impact on long-run growth. The first effect reflects the congestion of public capital. In addition, the drop in the public-private capital stock has an adverse effect on human capital accumulation, and on the supply of health services, which impacts negatively on health status in childhood and adulthood. The magnitude of this "human capital effect" depends on the parameter ν_2 (the elasticity with respect to the public-private capital ratio) whereas the magnitude of the "health effect" depends on the parameter $1-\nu_C$, with ν_C representing the elasticity of the health status in childhood with respect to mothers' rearing time, the parameter κ (the degree of persistence in health) and the parameter ν_P (the elasticity of labor productivity with respect to health status in adulthood).

An increase in $\bar{\varkappa}$ also has an impact on women's time allocation. Higher family preference for children's health and education means that mothers end up allocating more time to child rearing and human capital accumulation; this reallocation is *productive*, because it helps to improve children's health (to an extent that depends on parameter ν_C) and education outcomes, and thus their productivity in adulthood. This is beneficial for growth. However, this reallocation occurs partly to the detriment of women's time allocated to market work; this tends to have an adverse effect on growth.

As shown in Table 3, in the benchmark calibration the net effect on growth is positive but relatively small, of the order of 0.15 percentage points, despite a substantial increase in women's bargaining power. The effect on growth is stronger when γ^B (which measures the share of the autonomous component in bargaining power) or ν_C is higher.[33] In the latter case, the impact on growth is also substantially higher, because the health effect is magnified.

Thus, although an autonomous increase in women's bargaining power may generate important benefits at the microeconomic level, for both mothers and their children, at the macroeconomic level the results are somewhat mitigated. The key reason is that in this setting changes in time allocation and saving behavior that are associated with improved control by women over family resources may generate conflicting effects on the rate of economic growth. For the net effect to be positive and significant, the benefits of mothers devoting more time to their children (in terms of improved health and education outcomes in childhood, and greater productivity in adulthood) need to be relatively large.

6.5 Increase in Mothers' Time Allocated to Daughters

Consider a reduction in time allocated to sons, χ^R, and thus an increase in time allocated to daughters, from an initial value of 0.6 to parity, at 0.5.

The impact of this experiment is illustrated in Table 3. The key channel through which this policy affects growth is through an increase in the relative human capital stock of women and thus their bargaining power, $\varkappa$. In turn, because (as discussed earlier) an increase in women's bargaining power tends to lower η_C (from 2.3 to 2.223) and the fertility rate, n (from 2.1 to 2.06), while increasing η_E (from 9.404 to 9.773), η_H (from 2.748 to 2.833), and θ^R (from 0.214 to 0.22), the savings rate tends to increase (from 0.17 to 0.175), and so does women's time allocated to child rearing and education.[34] These effects all help to promote economic growth. However, in the benchmark case, the simulation results indicate that the increase in the savings rate is such that the public-private capital ratio falls (from 0.147 to 0.143); as a result, time devoted to

[33] The effect would also be stronger with $\nu_2 = 0$, which "shuts down" the negative effect of the public-private capital ratio on education outcomes.

[34] The increase in women's time allocated to child rearing results from a substitution of "quality for quantity," due to the lower number of children. Note also that although θ^R increases and n falls, the net effect on the share of family spending on children, $n\theta^R$, goes up.

household chores *increases*, which tends to reduce women's time allocated to market work and to dampen the increase in time allocated to child rearing and human capital accumulation. Both of these effects tend to mitigate the benefit of higher savings and physical investment for steady-state growth. Nevertheless, the net effect on growth is substantial, with an increase of about 0.4 percentage points.

A key issue with the benchmark results is the fact that the public-private capital ratio falls. Table 3 also show the results of an alternative simulation, in which the reduction in χ^R is accompanied by a relatively small increase in the share of spending on infrastructure, from 0.056 to 0.06 (or 0.4 percentage points). They indicate that this combination is quite potent; the public-private capital ratio now increases (from 0.147 to 0.154), and results similar to those presented in the benchmark case of Table 2 would hold—with a net effect on growth, compared to baseline, of the order of 0.5 percentage points.[35]

6.6 Composite Reform Program

Finally, we consider what we may call a pro-growth, pro-gender program, which involves combining a range of policies: an increase in the share of public outlays on infrastructure, υ_I, from 0.056 to 0.084 (equivalent, as noted earlier, to an additional one percentage point of GDP); increases in the share of spending on education, υ_E, from 0.156 to 0.186, and spending on health, υ_H, from 0.052 to 0.082; an across-the-board increase in the parameters measuring the degree of efficiency of government spending, φ_h, $h = E, H, I$, from 0.78 to 0.85; an increase in the cash transfer per child, cc^G, from 0.05 to 0.08; an increase in mothers' rearing time allocated to girls, $1 - \chi^R$, from 0.4 to 0.5; measures to mitigate gender bias in the workplace, which translate into an increase in b from 0.74 to 0.85; and a drop in the tax rate, τ, by 3 percentage points, from 0.239 to 0.209. We consider a reduction in taxes in light of the recent debate over the high level of taxes in Brazil.[36] At the same time, the increase in the shares of spending

[35] Although not reported, a higher value of μ_B (which measures the sensitivity of the endogenous component of women's bargaining power to relative human capital stocks) magnifies the impact of the reduction in χ^R on $\varkappa$. As a result, the family savings rate would increase further, thereby raising the growth rate (despite the congestion effect) by more.

[36] See for instance Glomm and Rioja (2004), Pereira et al. (2010), and Ter-Minassian (2012). Of course, our model is not detailed enough on the taxation side (or on the distortive effects of high

on all categories helps not only to avoid a reduction in the amount of revenues spent on productive items (given the government budget balance rule) but to promote the provision of key public services as well.[37] This spending reallocation involves a drop in the share of other spending from 0.771 to 0.648—a substantial adjustment in a country where the scope for discretionary spending is considered to be rather limited. Thus, this experiment helps also to illustrate the benefits of policy complementarities.

Table 3 shows the results. In the benchmark case, the impact on the growth rate is substantial; it increases by about 1.6 percentage points. At the same time, however, although women's time allocated to child rearing and human capital accumulation increases significantly, time allocated to market work falls. Similar results obtain with a lower value of π^Q and a lower μ_H, with the net effect on growth being now more substantial (about 2.0 percentage points, and about 2.5 percentage points, respectively), with the drop in time allocated to market work being particularly significant in the first case.

The table also shows the results with the benchmark set of parameters when the increase in the shares of spending on education and health, υ_E and υ_H, is larger (by an additional one percentage point, compared to the benchmark experiment), and the case where the increase in the share of spending on infrastructure is larger (this time by about an additional 1.5 percentage points of GDP, that is, from $\upsilon_I = 0.056$ to 0.097). While the results relative to the benchmark are slightly improved in the former case, the important difference with the second is that now time allocated to market work does increase, which further stimulates growth. Indeed, the increase in the growth rate in that case is of the order of 1.9 percentage points, compared to 1.5 in the benchmark case. Similar results obtain in terms of women's health status. By and large, this experiment illustrates well the potential benefits for Brazil of the

taxes, including tax evasion, etc.) to provide a full analysis of tax reform in Brazil. However, our experiment helps to illustrate the importance of considering such reforms within an overall program of fiscal adjustment.

[37] Formally, to ensure that the share of revenues going to each spending category h remains strictly constant, we must have $d(\upsilon_h\tau)/d\tau = 0$, that is $\tau(d\upsilon_h/d\tau)+\upsilon_h = 0$. This expression can be rearranged as $d\upsilon_h = -(\upsilon_h/\tau)d\tau$. With $d\tau = -0.03$, and using the values shown in Table 1, would give $d\upsilon_E = 0.019$, $d\upsilon_H = 0.007$, and $d\upsilon_I = 0.007$. The spending shares would then increase to $\upsilon_E = 0.175$, $\upsilon_H = 0.059$, and $\upsilon_I = 0.063$. The program that we consider is therefore more ambitious in all three areas.

simultaneous implementation of a combination of pro-growth, pro-gender policies.

7 Concluding Remarks

The purpose of this paper has been to study the long-run impact of policies aimed at fostering gender equality on economic growth in Brazil. The first part provided a brief review of gender issues in the country. The second part presented a gender-based, three-period OLG model that accounts for women's time allocation between market work, child rearing, human capital accumulation, and home production. Bargaining between spouses was assumed to depend on relative human capital stocks, and thus indirectly on access to infrastructure. Thus, the model provides an endogenous *macro* theory of bargaining power. The model is calibrated and various experiments were conducted, including investment in infrastructure, conditional cash transfers, a reduction in gender bias in the market place, and a composite pro-growth, pro-gender reform program. The analysis showed that fostering gender equality, which may partly depend on the externalities that infrastructure creates in terms of women's time allocation and bargaining power, may have a substantial impact on long-run growth, as well as educational and health outcomes, in Brazil.

Our analysis could be extended in several directions. First, in the foregoing analysis, we have assumed that the degree of gender discrimination in the workplace is exogenous. A fruitful extension would be to endogenize that source of gender bias and to relate it to gender inequality in the home; a potentially useful approach, from that perspective, is Chichilnisky (2008). Second, our treatment of conditional cash transfer programs was highly simplified; it would be useful address other types of programs. For instance, in May 2012 Chile launched a new program, Ethical Family Income, which attempts to go beyond existing approaches by linking cash transfers to low-income families not only to taking young children (under 6 years old) to health clinics for check-ups, but also to their children's school performance and to retraining courses for the unemployed. The program also involves a subsidy to working women, whose goal is to improve their ability to reallocate their time to market work. The model that we have developed in this paper is well suited to address these types of issues.

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Table 1

Benchmark Calibration

Parameter	Value	Description
Households		
ρ	0.03	Annual discount rate
$\varkappa$	0.501	Women's bargaining power in the family
μ_B	1.0	Sensitivity of bargaining power to human capital stocks
γ_B	0.5	Weight of endogenous component of bargaining power
χ^R	0.6	Proportion of mothers' rearing time allocated to boys
p	0.986	Average survival probability
σ	0.17	Family's savings rate
η_C^m, η_C^f	$2.8, 1.802$	Preference parameters, current consumption
n	2.1	Gross fertility rate
θ^R	0.214	Share of family income allocated to child rearing
η_N	3.5	Family preference parameter for number of children
η_H^m, η_H^f	$2.2, 3.294$	Preference parameters for children's health
η_E^m, η_E^f	$7.0, 11.79$	Preference parameters for women's human capital
η_Q	3.315	Family preference parameter, home good
Home production		
ζ^P	1.0	Efficiency parameter
π^Q	0.7	Curvature of production function
Market production		
α	0.15	Elasticity wrt public-private capital ratio
β	0.3	Elasticity wrt male labor and female labor
b	0.74	Gender bias in the workplace
Human capital		
ν_1	0.44	Elasticity wrt public spending in education
ν_2	0.15	Elasticity wrt public-private capital ratio
ν_3	0.7	Elasticity wrt mothers' rearing time
ν_4	0.1	Elasticity wrt women's time allocated to education
Health		
κ	0.5	Degree of persistence in health status
ν_C, ν_G	$0.45, 0.6$	Elasticity of child health status wrt rearing time, spending
ν_A	0.2	Elasticity of health status wrt human capital ratio
ν_P	0.8	Elasticity of productivity wrt health status
Government		
τ	0.239	Tax rate on marketed output (adjusted for labor share)
υ_I	0.056	Share of spending on infrastructure investment
υ_E	0.156	Share of spending on education
υ_H	0.052	Share of spending on health
μ_H	0.8	Elasticity of public health services wrt health spending
φ_h	0.78	Spending efficiency parameters, $h = I, E, H$

Table 2

Experiments: Increase in Investment and Conditional Cash Transfer Rate, Reduction in Gender Bias

Increase in infrastructure investment 1/		Absolute deviations from baseline					
	Baseline	Benchmark	$\pi^Q = 0.4$	$\varphi_I = 0.9$	$\zeta^P = 0.5$	$\mu_H = 0.7$	$\nu_2 = 0.25$
Time allocated by mothers to 2/							
Household chores	0.206	-0.0507	-0.0583	-0.0585	-0.0253	-0.0507	-0.0507
Child rearing (total)	0.117	0.0121	0.0139	0.0140	0.0061	0.0121	0.0121
Human capital accumulation	0.185	0.0119	0.0137	0.0137	0.0059	0.0119	0.0119
Market work	0.421	0.0267	0.0306	0.0306	0.0133	0.0266	0.0267
Women's bargaining power	0.501	0.0017	0.0016	0.0018	0.0008	0.0012	0.0016
Public-private capital stock ratio	0.147	0.0728	0.0731	0.0845	0.0731	0.0732	0.0731
Output growth rate	0.027	0.0048	0.0061	0.0056	0.0033	0.0085	0.0047

Conditional cash transfers and gender bias in the workplace 3/		Absolute deviations from baseline				
		Increase in cc^G			Increase in b	
	Baseline	Benchmark	$\nu_G = 0.9$	$\kappa = 0.6$	Benchmark	$\nu_E = 0.176$
Time allocated by mothers to 2/						
Household chores	0.206	0.0000	0.0000	0.0000	0.0000	0.0000
Child rearing (total)	0.117	0.0000	0.0000	0.0000	0.0000	0.0000
Human capital accumulation	0.185	0.0000	0.0000	0.0000	0.0000	0.0000
Market work	0.421	0.0000	0.0000	0.0000	0.0000	0.0000
Women's bargaining power	0.501	0.0000	0.0000	0.0000	0.0000	0.0000
Public-private capital stock ratio	0.147	0.0000	0.0000	0.0000	0.0000	0.0000
Output growth rate	0.027	0.0003	0.0006	0.0009	0.0018	0.0028

1/ Increase in υ_I from 0.056 to 0.084 (equivalent to 1 percent of GDP), financed by a cut in υ_U.

2/ In the baseline calibration, women are assumed to allocate 7.1 percent of their time to leisure.

3/ Increase in ccG from 0.01 to 0.1 and increase in b from 0.74 to 1.

Source: Authors' calculations.

Table 3

Experiments: Increase in Women's Bargaining Power, Time Allocated to Daughters, and Composite Program

Increase in women's bargaining power and time allocated to daughters 1/		Absolute deviations from baseline				
		Increase in $\varkappa$			Reduction in χ^R	
	Baseline	Benchmark	$\gamma^B = 0.2$	$\nu_C = 0.65$	Benchmark	$\upsilon_I = 0.06$
Time allocated by mothers to 2/						
Household chores	0.206	0.0042	0.0047	0.0013	0.0028	-0.0043
Child rearing (total)	0.117	0.0082	0.0122	0.0108	0.0054	0.0071
Human capital accumulation	0.185	0.0063	0.0093	0.0056	0.0041	0.0058
Market work	0.421	-0.0188	-0.0278	-0.0176	-0.0123	-0.0087
Women's bargaining power	0.501	0.1178	0.1732	0.1172	0.0772	0.0774
Public-private capital stock ratio	0.147	-0.0055	-0.0076	-0.0022	-0.0037	0.0065
Output growth rate	0.027	0.0015	0.00221	0.0063	0.0043	0.0051

Composite reform program 3/, 4/		Absolute deviations from baseline				
	Baseline	Benchmark	$\pi^Q = 0.4$	$\mu_H = 0.7$	Higher υ_E, υ_H	Higher υ_I
Time allocated by mothers to 2/						
Household chores	0.206	-0.0344	-0.0397	-0.0344	-0.0344	-0.0554
Child rearing (total)	0.117	0.0146	0.0169	0.0146	0.0146	0.0198
Human capital accumulation	0.185	0.0131	0.0152	0.0131	0.0131	0.0182
Market work	0.421	0.0067	0.0076	0.0066	0.0067	0.0175
Women's bargaining power	0.501	0.0786	0.0790	0.0785	0.0785	0.0792
Public-private capital stock ratio	0.147	0.0499	0.0502	0.0499	0.0499	0.0803
Output growth rate	0.027	0.0156	0.0201	0.0254	0.0175	0.0188

1/ Increase in $\varkappa$ from 0.395 to 0.6; reduction in χ^R from 0.6 to 0.5.

2/ In the baseline calibration, women are assumed to allocate 7.1 percent of their time to leisure.

3/ Benchmark: Increase in υ_I from 0.056 to 0.084; increase in υ_E from 0.156 to 0.186; increase in υ_H from 0.052 to 0.082; increase in all efficiency parameters φ_h from 0.78 to 0.85; increase in cc^G from 0.05 to 0.08; decrease in χ^R from 0.6 to 0.5; increase in b from 0.74 to 0.85; and reduction in τ from 0.239 to 0.209.

4/ Higher υ_E, υ_H: increase in υ_E from 0.156 to 0.196 and υ_H from 0.052 to 0.092; higher υ_I: increase from 0.056 to 0.097. Other changes same as in benchmark experiment.

Source: Authors' calculations.