

Women Prefer Larger Governments: Growth, Structural Transformation and Government Size*

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Abstract

The increase in income per capita is accompanied, in virtually all countries, by two changes in economic structure: the increase in the share of government spending in GDP, and the increase in female labor force participation. We argue that these two changes are causally related. We develop a growth model where female participation in market activities, fertility and government size, in addition to consumption and saving, are endogenously determined. Rising incomes lead to a rise in female labor force participation as the opportunity cost of staying at home and caring for the children increases. In our model, higher government spending decreases the cost of performing household chores, including, but not limited to, child rearing and child care, as in Rosen (1996). We also use a wide cross-section of data for developed and developing countries and show that higher market participation by women is positively and robustly associated with government size. We then investigate the causal link between participation and government size using a novel unique dataset that allows the use of the relative price of productive home appliances as an instrumental variable. We find strong evidence of a causal link between female market participation and government size. This effect is robust to the country sample, time period, and a set of controls in the spirit of Rodrik (1998).

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1 Introduction

Growth of income per capita is accompanied, in developed and developing countries alike, by an increase in the participation of women in the labor force. This paper argues that these two empirical phenomena are causally related. The share of total government spending in GDP has increased by 10 percent in OECD countries, in the last two decades alone (see World Bank (2001)), and in the wake of a significant secular rise in government spending during the twentieth century.¹ Apace with this rise in the government's share of GDP, female labor force participation has also risen from 28 to 41 percent in the same countries and the same period.² As for the long-run, Goldin (1995) reports an increase in female labor force participation in the United States, from 3.1 to 50 percent of the labor force between 1900 and 1980,³ while Tanzi and Schuknecht (2000) reports an increase in government spending in the same period, from 8 to 30 percent. The twin increase in female labor force participation and government size are not just a coincidence: they are causally related. The mechanism at work is twofold: as wages rise with development and women choose to work more hours in the market, they increase their demand for services that tend to be provided by the government, including education, health care, care for the elderly and the unemployed. The additional provision of government services further encourages female labor market participation since it decreases the time necessary to perform those home and family activities whose burden falls disproportionately on women.⁴ This circle of causation leads to higher female participation and larger governments.

We develop a growth model which extends Galor and Weil (1996), where female participation in market activities, fertility and government size - in addition to consumption and saving - are all endogenously determined. The rise in hourly wages leads to an increase in female labor force participation as the opportunity cost of caring for the children increases. In our model, higher government spending decreases the cost of performing household chores, including, but not limited to, child rearing. As couples - women in particular - participate more in market activities, they choose higher government spending and, under certain conditions, also higher tax rates, so that participation and government size increase apace.⁵ As female labor force participation

¹Tanzi and Schuknecht (2000) report, for a sample of industrialized countries, a rise in general government spending from 13 to 46 percent of GDP between the years 1913 and 1996.

²In contrast, male labor force participation has remained almost constant at 57 percent. See World Bank (2001). Blau (1998) shows that participation rates of men actually decreased about 6 percent between 1970 and 1995.

³See Goldin (1990) for a historical overview of female participation in the labor market in the United States.

⁴Blau (1998) reports that, in the decade from 1978 to 1988, the number of women work hours at home and in the market reversed from 27/20 to 21/26. Chen, Conconi and Perroni (2007) show that this imbalance in the distribution of the burden of household related chores may change very little, as improvements in women's labor market opportunities do not translate into an improvement of intra-household outcomes in their favor.

⁵Goldin (1995) shows that female labor force participation of married women tends to decrease and then increase as national income rises. This decline is due to a strong initial income effect that is later dominated by a substitution effect. Goldin (1995) suggests that when women had lower levels of human capital and their wage was thus connected to the provision of manual work, social stigma added

leads to a larger government, there is a reduction in the total cost of raising children for two reasons: the total time at home decreases, and the time cost per child also falls as public spending partly substitutes for home “production” of child care, education, among other activities.⁶ Our model is drawn on a solid literature on fertility, growth and female labor force participation, supported by several micro-evidence. It is important to keep in mind that, in our model, childrearing is a metaphor for any time-consuming task at home that tends to be performed mostly by women. Naturally, there are other important candidates for explaining the link between female labor force participation and government size, such as the important role of women in supporting old, sick and unemployed family members, their role in insuring families against risk and, last but not least, the tendency of the state sector to employ relatively more women than men.⁷

We also uncover a causal link in aggregate data suggesting that higher female labor market participation across countries and over time leads to larger governments. In this empirical exercise we do not argue for a particular story and instead confront the challenge of finding an empirical relation between the variables at the most aggregate level.⁸ We use a wide panel dataset of developed and developing economies in the last forty years to test our working hypothesis and find that female labor force participation is significantly and positively related to government spending as a share of GDP - be it in the form of government consumption, subsidies and transfers, or total expenditure.⁹ Our result is robust to the inclusion of time and country fixed-effects, the inclusion of a set of control variables as in Rodrik (1998), as well as additional controls. An increase of 10 percent in female labor force participation leads to an increase in government spending of about 2.5 percent as a share of GDP.¹⁰ We assess causality by instrumenting for female labor force participation. As suggested in Greenwood, Seshadri and Yorukoglu (2005) and Greenwood and Seshadri (2005), there is a strong relation

further resistance to female participation. As women become educated, stigma disappears. Goldin (1995) shows that high-school graduation rates were higher for women during the whole period from 1910. Blau (1998) shows that the more educated the woman, the more she tends to participate in the labor market, with those with more than 16 years of education having an 83% participation rate compared with 47% for those with less than 12 years. Acemoglu, Autor and Lyle (2004) find that, after the increase in female labor force participation in the wake of World War II, women were closer substitutes for male high-school graduates than for less than high-school or the lowest skilled males.

⁶Rosen (1996) shows that all employment growth in Sweden since the earlier 1960’s is attributable to labor market entry of women working to provide household services for other families.

⁷Which, clearly, may itself be endogenous.

⁸In this paper we do not address the causal relation running from government size to female labor force participation. There is ample micro-evidence available on this relation, namely between the provision of certain types of government provided services - such as child-care - and female labor force participation. More on this below.

⁹Iversen and Soskice (2001) find, for a small sample of European countries, that female labor force participation displays a positive correlation of 0.51 with the amount of state redistribution, measured as the difference between pre and post-tax income. Del Boca and Locatelli (2006) survey microeconomic evidence and show that social policies, after taking into account several other social and cultural variables, have an important role in explaining the joint decision of female market participation and fertility. The difficulties of conciliating motherhood and career are reduced by policies that diminish the potential opportunity costs of children.

¹⁰This effect is quantitatively of the same order of magnitude as the effect of trade on government spending uncovered in Rodrik (1998).

between technological progress in productive home capital - such as appliances, labor force participation and fertility.¹¹ We compile a new and unique index of the relative price of home appliances in OECD countries to capture technological progress in this sector, and use it to instrument for the effect of female labor supply on government size. The effect of participation on size of government is present in the OECD sample, in the wider sample of developed and developing countries - where lagged fertility is used as the instrumental variable, and even in the sample for the 90s alone. We test for the exogeneity of instruments in both samples and for overidentification in the OECD sample, discarding this hypothesis. We confirm that there is a positive, significant and robust effect of female labor supply on public expenditures.

Our paper argues that female labor force participation and government size mutually cause each other. The economics literature on the causes of government size has a long tradition. A first strand of this literature associates the demand for larger governments with the relative income of the median voter and the extension of the franchise, in the tradition of Tocqueville (1835).¹² It is well-established that men and women vote differently (e.g., Edlund and Pande (2002)) use the right to vote. It is important to note that public spending has not always grown; its sustained increase came after World War I, the massive mobilization of women into the labor force, and social developments such as the extension of the franchise and increasing divorce rates.¹³ After the war, the size of government did not revert to pre-war levels, contrary to what had happened before.¹⁴

A second strand in the literature sees public spending - in its redistributive or consumption form - as providing insurance and smoothing the consequences of income and employment shocks. The government provides a safety net in the form of subsidies, services or public employment.¹⁵ How does female market participation increase government size? The decision to work outside the home is likely to lead women to demand wider and better provision of the public services that alleviate their unequal

¹¹As stated in Greenwood, Seshadri and Yorukoglu (2005): “*It seems unlikely that the small rise in the relative income of a female worker could explain the dramatic rise in labor force participation. It is more likely that the rise in overall real wages, in conjunction with the introduction of labor-saving household appliances, explains the rise in female labor-force participation.*” In our paper the relative price of appliances is used as instrumental variable in the empirical test of the hypothesis that female labor market participation affects the size of government.

¹²Meltzer and Richards (1981) developed a seminal model that links increases in redistributive policies to the inclusion of voters from the lower end of the income spectrum. A recent study by Husted and Kenny (1997) of the United States between 1950 and 1988 analyzes the impact of abandoning poll taxes and literacy tests as requirements to vote, and finds that the resulting expansion of the franchise led to a rise in redistributive expenditures.

¹³See Lott and Kenny (1997), which argues that awarding women the right to vote was the decisive policy that led to a surge in government spending. These authors examine changes in government spending in the US as the franchise was extended to include the female population and find that government spending rose hand in hand. In the same direction, see also Aidt and Dallal (2008) for a sample of six Western European countries.

¹⁴In a related but different argument, Fernández, Fogli and Olivetti (2004) raises the possibility that there were changes in male preferences as regards marrying working women during this period.

¹⁵Rodrik (1998) uses this rationale in his study of the causes of the increase in government size, demonstrating that government spending is positively related to the degree of exposure to external shocks.

burden as caregiver at home. In addition, the role of women as insurer of family risks, may lead to a demand for more government intervention as women become less present at home. There is an additional mechanism, through the composition of the public labor force. Government jobs in teaching and health - which are a large portion of total public jobs - tend to be filled mostly by women.¹⁶

The second causal relation in our model runs from public spending to the intensity of female participation in the labor market. A large portion of the tasks related to home and family traditionally have fallen on the shoulders of women. Some of these tasks - including care of the children, the old, the sick and the unemployed, as well as insurance against risk- have been progressively taken up by the state.¹⁷ It follows that wider availability of state services will facilitate female participation in the market.¹⁸

The paper is organized as follows. Section 2 presents the illustrative model outlining a possible relation between female labor supply and government size. In section 3 we use aggregate macroeconomic data to test the empirical relation between female labor force participation and government size, irrespective of the actual story behind the relation. In this section we also check the robustness of our results and provide a causality test. Section 4 concludes.

2 The Model

Our model adds an endogenously determined government sector into a growth model with labor specialization and endogenous participation as in Galor and Weil (1996). The economy is made up of men and women organized as couples. Agents live for three periods. In the first period, as children, women and men are indistinguishable:

¹⁶This is documented in Rosen (1996) for the case of Sweden. Lott and Kenny (1997) mention that 55 percent of white-collar government jobs in the US are filled by women. Goldin (1995) shows that the percent of women in the total clerical jobs workforce increased from 15 to 62 percent of the total between 1900 and 1950.

¹⁷As argued in Attanasio, Low and Sánchez-Marcos (2006), female labor supply works as an insurance mechanism against idiosyncratic earnings risk within the family. This would tend to make government expenditure and female labor force participation a complement. If in addition, we consider that many time-intensive activities in the family are performed mostly by women, the reverse would be true and government size becomes a complement to participation, as in our model.

¹⁸This is consistent with that Attanasio, Low and Sánchez-Marcos (2008), which calibrates a model to match the behavior of labor supply across several cohorts in the United States. They conclude that shifts in the cost of raising children relative to total female life time earnings explain most of the change female labor supply. Jaumotte (2003) examines the determinants of female labor force participation in OECD countries and finds that childcare subsidies, paid maternal and parental leaves all encourage participation. Gelbach (2002) shows that mothers increase their labor supply when government-sponsored childcare, in the form of kindergarten, is available. In surveys of working mothers in the United Kingdom and the United States, respectively 20 and 30 percent stated that childcare obligations restricted their labor force participation. A study by Chevalier and Viitanen (2002) finds that regional variation in female labor force participation was related to the availability of childcare facilities. Finally, Anderson and Levine (1999) finds that the responsiveness of female labor market participation to the cost of child care is of the same order of magnitude as its response to wages.

children do not make any decision, they only consume a fraction of their parents' time endowment, in the form of parental care and general childrearing.

In their second period of life agents become adults and men and women differ as to their labor endowment: men are endowed with one unit of physical labor and one unit of mental labor while women are endowed with mental labor only. As will become clear, this assumption makes our model deliver two facts that are borne out by the available evidence: the existence of a gender wage gap and its decrease over time as income per capita increases. In this second period, couples make their fertility choices and allocate their time between working and raising children. In the third period, each couple consumes the life savings.

Technology

The production technology uses capital, K_t , mental labor, L_t^m , and physical labor, L_t^p , to produce output, Y_t , according to a constant returns to scale production function. More specifically,

$$Y_t = A[\alpha K_t^\rho + (1 - \alpha)(L_t^m)^\rho]^{\frac{1}{\rho}} + B L_t^p, \quad A > 0, \quad B > 0, \quad \alpha \in (0, 1), \quad \text{and} \quad \rho \in (-\infty, 1). \quad (1)$$

Given the technology and the input prices, the representative firm chooses inputs so that profits are maximized.¹⁹ It is convenient, however, to rewrite the variables in per-couple term. Since the number of couples in the economy is the same as the number of total physical labor input, define: $y_t = \frac{Y_t}{L_t^p}$, $k_t = \frac{K_t}{L_t^p}$, $m_t = \frac{L_t^m}{L_t^p}$ as output per couple, capital per couple and the ratio of mental to physical labor. The first order conditions associated with the representative firm's problem are:

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

$$w_t^m = A(1 - \alpha)[\alpha k_t^\rho + (1 - \alpha)(m_t)^\rho]^{\frac{1-\rho}{\rho}} m_t^{\rho-1}, \quad (3)$$

$$r_t = A\alpha[\alpha k_t^\rho + (1 - \alpha)(m_t)^\rho]^{\frac{1-\rho}{\rho}} k_t^{\rho-1}. \quad (4)$$

The wage rate of physical labor is exogenous and constant, and the wage rate of mental labor and the interest rate depend on capital per couple and the ratio of mental to physical labor.

Preferences

Couples draw utility both from consumption in the third period of life and the number of children. Let n_t be the number of children born at period t , and c_{t+1} be the consumption of a couple in their third period of life. Preferences are represented by

$$U_t = \gamma \ln n_t + (1 - \gamma) \ln c_{t+1}, \quad \gamma \in (0, 1). \quad (5)$$

Parameter γ represents the relative weight of children in the couple's utility function.²⁰

¹⁹Output is taken as the numeraire.

²⁰Given the functional form of the utility function, it is clear that the introduction of consumption in the second period of life does not change any of the results.

Government

Consider now that there is a government sector in this economy. The government raises public revenues through a proportional tax, τ_t and spends it as g_t , the per-couple government spending so that the budget is balanced throughout. Public spending is assumed to decrease the per-child cost of raising children.²¹ In the spirit of Greenwood, Seshadri and Vandenbroucke (2005), we assume that children are costly and the “production function” associated with raising children is

$$n_t = \phi[h_t(1 + g_t)]^\beta, \quad \phi > 0, \quad \beta \in (0, 1], \quad (6)$$

where h_t is the time that parents devote to raising children. Therefore, the household production function depends on own time and on government services, and they are not perfect substitutes. Here we are implicitly assuming that government services, such as child care and kindergartens, cannot be purchased in the market. Alternatively, we might assume that the government has a comparative advantage to produce such services.²²

Solving (6) for h_t gives the time cost of n_t children

$$h_t = \left(\frac{n_t}{\phi}\right)^{\frac{1}{\beta}} \frac{1}{1 + g_t}. \quad (7)$$

We can also interpret h_t as the time couples spend at home, and $2 - h_t$ as the time devoted to market activities.

Budget Constraint

Notice that the opportunity cost of raising children is higher for a man, $(1 - \tau_t)(w_t^p + w_t^m)$, than for a woman, $(1 - \tau_t)w_t^m$. Therefore, if $h_t \leq 1$, only the wife spends time raising children. In the case where $h_t > 1$ both will raise children but only the husband will work. The couple’s budget constraints are:

$$s_t \leq (1 - \tau_t)(w_t^p + w_t^m + (1 - h_t)w_t^m), \quad \text{if } h_t \leq 1, \quad (8)$$

$$s_t \leq (1 - \tau_t)(w_t^p + w_t^m - (h_t - 1)(w_t^m + w_t^p)), \quad \text{if } h_t \geq 1. \quad (9)$$

Variable s_t represents savings and the right-hand side shows net income of the couple.

In the last period of life, consumption by the couple must satisfy

$$c_{t+1} = (1 + r_{t+1})s_t. \quad (10)$$

²¹Observe that this is consistent to a recent study of Daly (2007) who shows that countries that make the combination of work and family easier by providing generous support structures, such as subsidies for child care, also note a higher birthrate.

²²Even if the market can produce such services, we can think that taxes might be used to finance child care subsidies, child allowances, or paid parental leaves. This of course would have no role in this homogenous household setting, but it can have some effects in a political equilibrium with heterogeneous households. We recognize that this is an important issue, but leave it for future research.

Couples choose the number of children, n_t , and savings, s_t , to maximize (5) subject to (7)- (10). The fertility decision satisfies

$$h_t = \left(\frac{n_t}{\phi}\right)^{\frac{1}{\beta}} \frac{1}{1+g_t} = \frac{\gamma\beta}{(1-\gamma) + \gamma\beta} \left[2 + \frac{w_t^p}{w_t^m}\right], \quad \text{if } h_t \leq 1, \quad (11)$$

$$h_t = \left(\frac{n_t}{\phi}\right)^{\frac{1}{\beta}} \frac{1}{1+g_t} = \frac{2\gamma\beta}{(1-\gamma) + \gamma\beta}, \quad \text{if } h_t > 1. \quad (12)$$

In order to guarantee that women will eventually participate in the labor market for any tax rate, *we must assume that* $\frac{2\gamma\beta}{(1-\gamma) + \gamma\beta} \leq 1$. This implies that $\gamma \leq \frac{1}{1+\beta}$, so that couples have to assign a minimum weight on consumption for it to be worthwhile to increase labor market participation. Thus,

$$h_t = \left(\frac{n_t}{\phi}\right)^{\frac{1}{\beta}} \frac{1}{1+g_t} = \min\left\{1, \frac{\gamma\beta}{(1-\gamma) + \gamma\beta} \left[2 + \frac{w_t^p}{w_t^m}\right]\right\}. \quad (13)$$

We can use (13) into (8) to define the optimal private savings function $s(w_t^m, w_t^p, r_{t+1}; \tau_t)$. The wage of physical labor is constant, since $w_t^p = B$, while the wage of mental labor increases with capital accumulation. Therefore, female labor force participation increases as the relative wage of mental labor increases (decreasing the gender wage gap), which increases the opportunity cost of staying at home.

Tax Rate Determination

The public sector maintains a balanced budget at every point in time. Therefore,

$$g_t = \tau_t(w_t^p + w_t^m) + \tau_t(1 - h_t)w_t^m. \quad (14)$$

Substituting (13) into (14) yields

$$g_t = \begin{cases} \tau_t \frac{(1-\gamma)}{(1-\gamma) + \gamma\beta} (2w_t^m + w_t^p) & \text{if } h_t < 1, \\ \tau_t (w_t^m + w_t^p) & \text{if } h_t = 1. \end{cases} \quad (15)$$

We assume that τ_t is endogenously determined in each period by a vote of the adult population. Since we assumed a homogenous population and given logarithmic utility, there is no conflict of interest. Given the list of factor prices $w_t = (w_t^m, w_t^p, r_{t+1})$ and the tax rate, the indirect utility of the representative couple is

$$V(w_t; \tau_t) = \begin{cases} \gamma \ln\{[h_t(w_t; \tau_t)(1 + g(w_t; \tau_t))]^\beta \phi\} + (1 - \gamma) \ln[(1 + r_{t+1})s_t(w_t; \tau_t)] & \text{if } h_t(w_t; \tau_t) < 1, \\ \gamma \ln[(1 + g(w_t; \tau_t))^\beta \phi] + (1 - \gamma) \ln[(1 + r_{t+1})s(w_t; \tau_t)] & \text{if } h_t(w_t; \tau_t) = 1. \end{cases} \quad (16)$$

The representative couple chooses the tax rate τ_t to maximize the indirect utility function (i.e., $\tau_t^* = \arg \max_{\tau_t \geq 0} V(w_t; \tau_t)$) subject to (15) and (13). There are two effects of an increase in the tax rate. The first is a direct effect, since a higher tax rate decreases net labor income. There is also an indirect effect: a higher tax rate increases government revenues, and public spending makes it easier to devote hours to

market activities while increasing the effective time available to both home and market activities. This tradeoff will result in a chosen tax rate, which is given by:

$$\tau_t^* = \begin{cases} \frac{\gamma\beta}{(1-\gamma)+\gamma\beta} - \frac{(1-\gamma)}{((1-\gamma)+\gamma\beta)(w_t^m+w_t^p)}, & \text{if } h_t(w_t; \tau_t) = 1, \\ \frac{\gamma\beta}{(1-\gamma)+\gamma\beta} - \frac{1}{2w_t^m+w_t^p}, & \text{if } h_t(w_t; \tau_t) < 1. \end{cases} \quad (17)$$

This implies that $\tau_t^* \in [0, \frac{\gamma\beta}{(1-\gamma)+\gamma\beta})$. It is easy to verify that the tax rate increases with the mental wage. Since the time that couples spend at home h_t is non-increasing with w_t^m , this implies that the tax rate increases as couples devote more time to market activities (see (13)). In other words, as female participation in the labor market increases (and male participation remains constant), the preferred tax rate increases.

Equilibrium

In equilibrium, demand must be equal to supply in all markets. In the market for mental labor this means that $L_t^m = L_t^p(2 - h_t)$, or $m_t = 2 - h_t$. Then, using the input market equilibrium conditions, (2) and (3) into (13), yields

$$h_t = \min\left\{1, \frac{\gamma\beta}{(1-\gamma) + \gamma\beta} \left[2 + \frac{B}{A(1-\alpha)[\alpha k_t^\rho + (1-\alpha)(2-h_t)^\rho]^{\frac{1-\rho}{\rho}} (2-h_t)^{\rho-1}}\right]\right\}. \quad (18)$$

Using the implicit function theorem it can be shown that (18) defines a function

$$h_t = \min\{1, \psi(k_t)\}, \quad \text{with } \psi'(k_t) < 0 \quad \forall k_t \geq 0. \quad (19)$$

Equation (19) determines a critical value k^* such that for $k_t \leq k^*$ women do not participate in the market and for $k_t \geq k^*$ women supply a positive number of hours to the market. Therefore, time devoted to home activities decreases with capital accumulation. The condition that equilibrates the capital market is

$$K_{t+1} = L_t^p s_t. \quad (20)$$

When the optimal tax rate is positive,²³ we have that

$$k_{t+1} = \frac{s_t}{n_t} = \begin{cases} D(w_t^m + B)^{1-\beta} & \text{for } k_t \leq k^*, \\ D\left(\frac{w_t^m}{2w_t^m+B}\right)^\beta \frac{(\gamma\beta+(1-\gamma)(1+2w_t^m+B))^{1-\beta}}{((1-\gamma)+\gamma\beta)^{1-2\beta}} & \text{for } k_t \geq k^*, \end{cases} \quad (21)$$

where $D = \frac{(1-\gamma)}{\phi(\gamma\beta)^\beta((1-\gamma)+\gamma\beta)^{1-\beta}}$ is positive constant, and

$$w_t^m = \begin{cases} A(1-\alpha)[\alpha k_t^\rho + (1-\alpha)]^{\frac{1-\rho}{\rho}}, & \text{for } k_t \leq k^*, \\ A(1-\alpha)[\alpha k_t^\rho + (1-\alpha)(1-\psi(k_t))^\rho]^{\frac{1-\rho}{\rho}} (1-\psi(k_t))^{\rho-1}, & \text{for } k_t \geq k^*. \end{cases} \quad (22)$$

Using (22) into (21) defines a non-linear difference equation $k_{t+1} = \xi(k_t)$. As in Galor and Weil (1996), it is clear that $\xi(\cdot)$ is continuous, and it can be shown that $\xi'(k_t) > 0 \quad \forall k_t \geq 0$. Moreover, $\xi(0) > 0$, $\lim_{k_t \rightarrow 0} \xi'(k_t) = \infty$, and $\lim_{k_t \rightarrow \infty} \xi'(k_t) = 0$. Therefore,

²³When the tax rate is zero, results are similar to those obtained by Galor and Weil (1996).

a locally stable steady-state equilibrium, $\xi(\bar{k}) = \bar{k}$, exists.²⁴ However, here as in Galor and Weil (1996), one cannot guarantee that the steady-state equilibrium is unique. In order to see this, notice that if the degree of complementarity between capital and mental labor is sufficiently small, then the $\xi(\cdot)$ function is strictly concave for $k_t \in (0, k_t^*)$. Specifically, if $\rho \in [0, 1)$, then $\xi''(k_t) < 0$ for $k_t \in (0, k_t^*)$. Otherwise, $\xi(\cdot)$ is strictly convex for $k_t \in (0, k_t^*)$. In contrast, for $k_t \in (k_t^*, \infty)$ we cannot define whether the function $\xi(\cdot)$ is concave or not. Regardless of whether multiple steady states exist, the model generates the following result.

Proposition 1 *Suppose that k_0 is in the neighborhood of \bar{k} , then over time*

- i. the women's fraction of time spent with home activities decreases;*
- ii. per-couple government spending increases; and*
- iii. the share of government expenditure in total output increases.*

Proof. Item (i) follows directly from (19). (ii) follows from (15) and (17). In order to see this, notice that

$$g_t = \begin{cases} \frac{\gamma\beta(1-\gamma)}{((1-\gamma)+\gamma\beta)^2}(w_t^m + B) - \frac{(1-\gamma)^2}{((1-\gamma)+\gamma\beta)^2}, & \text{for } k_t \leq k^*, \\ \frac{\gamma\beta(1-\gamma)}{((1-\gamma)+\gamma\beta)^2}(2w_t^m + B) - \frac{(1-\gamma)}{((1-\gamma)+\gamma\beta)}, & \text{for } k_t \geq k^*, \end{cases}$$

which is increasing in capital accumulation. Dividing g_t by y_t yields item (iii). ■

Per-couple government spending increases because both income and the tax rate increase as the economy develops. The model, however, might display equilibria where both female labor force participation and fertility increase as the economy develops. The reason is simple. For parents, the only cost of a child is the opportunity cost of being at home. This opportunity cost is a decreasing function of per-couple government spending and goes to zero as spending goes to infinity. Then, even when female labor force participation is increasing (i.e., $h_t = \left(\frac{n_t}{\phi}\right)^{\frac{1}{\beta}} \frac{1}{1+g_t}$ is decreasing), fertility n_t might increase, as long as the rate of change in fertility is lower than that of $1 + g_t$.²⁵ In addition, the model abstracts from child quality. Considering quality would add force to the transition from high to low fertility proposed in Galor and Weil (2000) and would generate an equilibrium with decreasing fertility, increasing female labor force participation and increasing per-couple government spending.²⁶

²⁴There exists a number $\epsilon > 0$, such that for any $k_t > 0$ and $|k_t - \bar{k}| < \epsilon$, then k_t converges to \bar{k} as $t \rightarrow \infty$.

²⁵This, of course, depends on the functional form of the home production function $n_t = \phi[h_t(1 + g_t)]^\beta$. If we have assumed that $n_t = \phi_1 + \phi_2[h_t(1 + g_t)]^\beta$, then for some ϕ_1 and ϕ_2 fertility would decrease with capital accumulation. Alternatively, we could have followed Greenwood, Seshadri and Vandenbroucke (2005) and modified preferences to lower the marginal utility of consumption, such that $U_t = \gamma \ln n_t + (1-\gamma) \ln(c_{t+1} + \mathbf{c})$. Parameter $\mathbf{c} > 0$ would represent some level of home production. Such functions, however, would complicate the algebra without adding any new insights.

²⁶This would not change the effect of female labor force participation on the size of government. In this case, however, we could not treat male and female as identical agents in childhood, since the time invested in education would depend on the participation in market activities.

The point that we emphasize, however, is the link between female labor force participation and per-couple government spending. **Proposition 1** suggests that the model generates a simple and powerful result: as the relative wages of mental labor increase, couples demand higher government spending in activities that facilitate child-rearing, further easing the transition of women into the labor force.

3 Empirical Results

The theoretical model in Section 2 suggests a positive association between the participation of women in the labor force and the size of government. It is important to emphasize that the story behind the model is illustrative and as mentioned there are other candidates to explain the relationship between female labor participation and government size. In this section we conduct an empirical test of that relationship, concentrating on the direction from labor force participation to government size. In light of the review of the literature presented above, the effect of female labor force participation on government size is the novel element advanced in our model, as yet untested. In our empirical exercise we use yearly data for the years between 1960 and 1999, available from World Bank (2001) for a wide cross section of developed and developing countries. The variable of interest to be explained is an indicator of the relative size of government, including the ratio of Total Government Expenditures in GDP, and its decomposition into Public Consumption and Public Subsidies plus Transfers. As proposed in the model above, if subsidies and/or public consumption decrease the burden of household chores, their share in GDP tends to increase in response to the desires of women that work. Our prediction is that, as female labor force participation increases, so will public spending. Our coefficient of interest is associated with the level of female labor force participation in a specification that aims to explain government size. The equation to be estimated is:

$$GOVSIZE_{it} = \alpha + \beta_0 \cdot FEMALELFP_{it} + \beta_1 \cdot Zj_{it} + \varepsilon_{it}, \quad (23)$$

where $GOVSIZE_{it}$ is one of the three alternative measures of the relative size of government (total spending, public consumption or subsidies) in country i at period t , $FEMALELFP_{it}$ is the share of working age women that participate in the labor force in country i at period t and Zj_{it} is a vector of additional determinants of government size. $Z1_{it}$ corresponds to two alternative sets of control variables. The baseline specification is limited to the four independent variables proposed in Rodrik (1998), i.e., *GDP per capita*, the *Dependents to Working Age Population Ratio*, the share of *Urban Population* and the share of *Imports in GDP*. Results for this specification are presented in the first three columns of Table 1. The second set of control variables $Z2_t$ is the benchmark specification, which adds five variables to the Rodrik (1998) specification: *Male Labor Force Participation*, *Growth of GDP per capita*, the *Female Unemployment Rate*, the *Male Unemployment Rate*, and *Life Expectancy*.²⁷ Results for the benchmark specification are displayed in the last three columns of Table 1 and in the other tables.

²⁷Jaumotte (2003) finds evidence that general labor market conditions are a major determinant of female labor force participation.

The variable Male Labor Force Participation is meant to control for effects of labor force participation on government size that are unrelated to the gender element. The growth rate of national income captures cyclical fluctuations in public expenditure in response to the business cycle. The male and female unemployment rates correct for any indirect impact of female labor supply on public expenditure through increased rates of unemployment, male or female. Life expectancy is included to control for the increase in government spending due to an aging population. All specifications include *a year trend* - or year dummies - as well as *regional dummies* for countries in the OECD, Latin America, Sub-Saharan Africa and East Asia. The year trend is included to correct for the trend of both government expenditure and female labor force participation to increase over time. The regional dummies correct for possible regional variations in government size unrelated to the determinants included in the specification.

Our estimation method is, first, Ordinary Least Squares where standard errors are robust to the presence of heteroskedasticity. This method uncovers the association between female participation in the labor market and the size of government. To assess causality, more specifically how the increase in labor force participation leads to a larger government, we estimate a linear regression model using instrumental variables. Female labor force participation is the endogenous variable to be instrumented for and, as mentioned above, we assemble a new dataset of exogenous variables to fix any causation problem.

3.1 Basic Results

In Table 1 we present results for the baseline and benchmark specifications. In columns (1) to (3), the addition of labor force participation to Rodrik's (1998) specification is associated with a highly significant and positive coefficient, irrespective of the measure of public expenditures used. According to the coefficient estimate in, say, Column 1, a 10 percent increase in female labor force participation increases the size of government by 2 percent of GDP. The coefficient on total expenditure is of the same order of magnitude as that on subsidies and public consumption and approaches the sum of the latter two. Columns (4) through (6) present results for the benchmark specification, which adds male labor force participation, GDP growth, gender-specific rates of unemployment, and life expectancy as determinants of government size. We find that the coefficients on female labor force participation remain highly significant and become more important as far as the estimated size of the effect. The impact of a 10 percent increase in the participation of women in the labor market is now 4.2 percent of GDP for total spending, 2.2 percent for public consumption, and 1.7 percent for subsidies and transfers. Between 1960 and 1999 the rate of female labor force participation increased 7 and 17 percent, respectively for the complete sample and for OECD countries.²⁸ Our estimates suggest that labor force participation explains a 7.6 percent increase in the share of public expenditures in GDP for the case of OECD countries and about 3 percent for the sample as a whole. The R2 summary statistics denote that

²⁸See World Bank (2001).

the share of public expenditures and its components is reasonably well explained by our benchmark specification. Interestingly, male labor force participation is negatively related to public expenditure, a result that is confirmed below as robust. In contrast, the Unemployment Rate for men is positively related to government size, as one would expect. In a sense it is as if active women and inactive men demand more government intervention.

Table 1: Dependent Variable: Government Spending (Total, Consumption, Subsidies and Transfers). Ordinary Least Squares Estimation.

	Baseline Specification			Benchmark Specification		
	Total Public Expenditure	Public Consumption	Public Subsidies and Transfers	Total Public Expenditure	Public Consumption	Public Subsidies and Transfers
Female Labor Force Part.	0.20** (10.52)	0.07** (6.01)	0.10** (13.43)	0.42** (8.65)	0.22** (9.64)	0.17** (7.25)
GDP per capita	0.00025** (7.75)	0.00010** (6.46)	0.00010** (7.24)	0.00026** (6.39)	0.00011** (5.04)	0.00016** (7.75)
Dependent-Work. Age Ratio	13.19** (9.19)	8.67** (10.28)	-1.31** (-2.46)	11.29* (1.88)	9.87** (2.41)	-6.91** (-3.05)
Urban Population	0.13** (10.70)	0.05** (7.56)	0.06** (13.53)	0.12** (5.51)	0.05** (3.14)	0.05** (5.17)
Imports	0.064** (7.56)	0.073** (14.48)	-0.000 (-0.15)	0.020 (1.46)	0.014* (1.76)	-0.010 (-0.87)
Male Labor Force Part.	-	-	-	-0.62** (-6.06)	-0.37** (-5.24)	-0.32** (-7.29)
Real GDP Growth	-	-	-	-0.11 (-1.53)	-0.08** (-2.01)	-0.01 (-0.29)
Unempl. Rate - Women	-	-	-	-0.09 (-1.26)	0.03 (0.84)	-0.09** (-2.78)
Unempl. Rate - Men	-	-	-	0.38** (3.59)	0.06 (1.05)	0.24** (4.53)
Life Expectancy				0.41** (4.10)	0.27** (4.16)	0.03 (0.79)
Regional Dummies	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Year Trend	-0.02 (-0.95)	0.03** (3.47)	-0.03** (-3.74)	-0.41** (-6.42)	-0.18** (-5.05)	-0.18** (-6.25)
R-Squared	0.46	0.25	0.66	0.65	0.46	0.69
Number of Obs.	2316	4566	2316	547	683	547

T-Statistics are in parentheses. Regional dummies are: Dummy for Latin America, OECD, Sub-Saharan Africa, and East Asia countries.

3.2 Causality and Robustness

Tables 2 and 3 investigate the causal link between female labor force participation, government spending and its components. We use two variables as instruments for labor force participation. The first exogenous variable, the ratio of a home appliance price index to the consumer price index, is here collected for the first time and is available only for OECD countries.²⁹ A decrease in the relative price of household appliances encourages their dissemination and is likely to reduce the burden of household chores, which encourages female labor force participation. Moreover, the evolution of the relative price of appliances is unlikely to impact public expenditures directly, making it a suitable candidate as an instrumental variable.³⁰ In order to assess causality in a sample of developed as well as developing countries, we consider the lagged fertility rate as an additional instrument. We conjecture that a lower past fertility rate facilitates the decision of women to participate in the labor market and is unlikely to have a relevant direct effect on the amount of current public expenditures.³¹

A model of household production à la Becker (1965) can explain the rise in married female labor-force participation in the twentieth century as a rational response to the relative costs and benefits of the use of time. Greenwood, Seshadri and Yorukoglu (2005) have raised the hypothesis that the development of cheap durable consumer goods facilitated the entry of women into the labor force.³² In addition, Greenwood, Seshadri and Yorukoglu (2005) documents a decrease in the number of domestic workers and number of hours worked at home in the post-war period - a threefold decrease in the numbers working at home and a decrease from 60 to 20 hours per week in household work - associating all of these with the generalization of access to home appliances.³³ Landsburg (2003) also points out that by 1900 very few women worked

²⁹These are, specifically, household appliances that are likely to save labor in household cleaning and maintenance. Furniture and audiovisual appliances are excluded.

³⁰It can be argued that the technological innovation that increases the quality or lowers the price of appliances might be partly driven by demand (i.e., by a large female labor force participation). Therefore, to ensure the orthogonality condition between female labor force participation and the appliance price index, we use the lagged value of this index in the three years before the participation observation.

³¹One can argue that women who wish to participate in the labor force are more likely to choose contraception and attempt to decrease their fertility. We will specifically test whether this holds, and we do find that current fertility rate and female labor force participation are endogenous. However, as will be seen below, past fertility is not endogenous.

³²According to Greenwood, Seshadri and Yorukoglu (2005) from 1920 to 1970 the availability of utilities such as electricity, flush toilet and central heating went from less than 20 percent to more than 80 percent of households in the United States. Running water became available sooner but also increased at a substantial rate. This author presents figures on the availability of different appliances that reduce the cost of household chores - such as refrigerators, vacuums, washer, dryer, dishwasher and microwave. The first three became widely available from the late 1940s and the last three from the 1970s and 1980s. Also, the investment in appliances and stock of appliances relative to GDP almost doubled between 1955 and 1990. Moreover, Greenwood, Seshadri and Yorukoglu (2005) uses cross-section evidence to document a positive relationship between the stock of appliances and female labor force participation, as well as a worldwide negative relationship between changes in the relative price of appliances worldwide and female participation. Our dataset compiles yearly data on these two variables for the first time.

³³In a related paper, Greenwood, Seshadri and Vandenbroucke (2005) proposes an explanation

outside the home and housework took an average of 58 hours a week, while by 1975 that average was down to 18 hours. Moreover, international comparisons show that the countries where durable goods are cheapest are the countries where more women work for wages. We compute the ratio of the household appliance index to the consumer price index using the first available year as the base year with a value of 1. This variable is generally available for the period 1975 to 1999 and it decreases at an average rate of 1 percent per year. This delivers a dramatic average decrease of around 20 percent for the typical country in the OECD sample.³⁴ A different viewpoint is that of Jones, Manuelli and McGrattan (2003) who argue that technological improvements in home production will have too small an impact on female participation, unless home and market goods are highly substitutable (which is the case in our model). The issue is certainly partly empirical and is addressed in Cavalcanti and Tavares (2008).

Table 4 in Appendix B reports the first stage regression results. For the OECD sample (columns (1) to (3)) - the lag of the household appliance price index and the lag of the fertility rate are used as instruments. We can verify that the coefficients of both variables have the expected sign and are statistically different from zero. For instance, as it becomes less expensive to buy home appliances, it becomes easier for women to participate in market activities. Below we formally test for exogeneity and overidentification.

Table 2 presents the results for instrumented labor force participation for two samples: the OECD and the full country samples. The results show strong evidence in favor of a causal link: female labor force participation increases public expenditure in both the OECD and the full samples and these increases are quantitatively important. The coefficient associated with female labor force participation is larger in the OECD sample. This result might be expected given the greater average political development of OECD countries and the potential use of political action to induce changes in the size of government. As to the quantitative effect, the impact of a 10 percent increase in female labor supply on government size is about 8.5 percent for the OECD and 7.3 percent in the whole sample.

In Table 3 we conduct two additional robustness tests: the inclusion of year dummies instead of just a year trend and the analysis of the 1990 in isolation. Since the full sample is used, only lagged fertility is used as an instrument for female labor market participation, exactly as in the last three columns of Table 2. The inclusion of year dummies controls for year fluctuations in expenditure and labor force participation, an alternative (and more demanding) control than the time trend used in Tables 1 and 2. The study of the 1990s aims at checking whether the effect of female labor force participation is present in recent years, after government expenditure - at least in OECD countries - reached considerably high levels, making any further increases

for the baby boom in the context of a secular decline in fertility due to a rise in real wages and, consequently, the opportunity cost of having children. The baby boom itself, it is argued, is associated to a surge in technological progress related to household appliances in the middle of the twentieth century which dramatically lowered the cost of having children.

³⁴Greenwood, Seshadri and Yorukoglu (2005) also document this average decrease in prices for a sample of available countries, though no individual country data are discussed. There is also some information on the price change for different home appliances.

much the more unlikely. We find evidence for a strong causal effect of female labor force participation on expenditure and components, with the size of the coefficients of interest decreasing only slightly. A 10 percent rise in female labor supply results in a 7.0 percent increase in the ratio of total spending to GDP, equally split between a rise in public consumption and subsidies.

Table 2: Dependent Variable: Government Spending (Total, Consumption, Subsidies and Transfers). Instrumental Variables Estimation - OECD and Whole Sample.

	OECD Countries			Whole Sample of Countries		
	Total Public Expenditures	Public Consumption	Public Subsidies and Transfers	Total Public Expenditures	Public Consumption	Public Subsidies and Transfers
Female Labor Force Part.	0.85** (2.02)	0.62** (2.44)	0.18 (0.70)	0.73** (3.61)	0.49** (2.19)	0.48** (3.77)
GDP Per Capita	0.00023 (1.03)	-0.00002 (-0.20)	0.00026** (2.21)	0.00022** (4.19)	0.00010** (3.60)	0.00014** (5.14)
Dependent-Work. Age Ratio	11.77 (0.59)	2.13 (0.20)	11.22 (1.17)	4.50 (0.47)	7.49* (1.76)	-5.07 (-0.99)
Urban Population	0.02 (0.40)	0.02 (0.73)	0.02 (0.64)	0.08** (2.75)	0.05** (3.35)	0.03* (1.77)
Imports	0.20** (2.31)	0.12** (2.74)	0.06 (1.50)	0.07** (2.69)	0.02 (1.46)	0.03** (2.47)
Male Labor Force Part.	-0.28 (-0.54)	-0.30 (-1.22)	0.07 (0.25)	-1.07** (-3.68)	-0.53** (-2.35)	-0.66** (-4.36)
Real GDP Growth	-0.56** (-2.70)	-0.33** (-3.10)	-0.19** (-1.75)	-0.04 (-0.48)	-0.01* (-0.29)	0.01 (0.28)
Unempl. Rate - Women	0.25 (1.51)	0.17* (1.90)	0.07 (0.81)	0.35** (2.02)	0.02 (1.25)	0.16* (1.84)
Unempl. Rate - Male	0.53** (2.62)	0.28** (1.90)	0.43** (2.77)	0.17 (1.03)	-0.05 (-0.29)	0.11 (1.29)
Life Expectancy	3.54** (4.61)	1.77** (3.81)	1.74** (4.99)	1.01** (3.83)	0.49** (3.44)	0.35** (2.61)
Regional Dummies	-	-	-	<i>yes</i>	<i>yes</i>	<i>yes</i>
Year Trend	-1.22** (-4.04)	-0.64** (-3.88)	-0.54** (-3.57)	-0.78** (-4.65)	-0.37** (-3.13)	-0.39** (-4.57)
R-Squared	0.70	0.64	0.72	0.56	0.45	0.54
Number of Obs.	128	135	128	405	475	405

T-Statistics are in parentheses. Regional dummies are: Dummy for Latin America, OECD, Sub-Saharan Africa, and East Asia countries.

Table 3: Dependent Variable: Government Spending (Total, Consumption, Subsidies and Transfers). Instrumental Variables Estimation - Year Dummies and the 1990s.

	Including Year Dummies			Decade 1990-1999		
	Total Public Expenditures	Public Consumption	Public Subsidies and Transfers	Total Public Expenditures	Public Consumption	Public Subsidies and Transfers
Female Labor Force Part.	0.85** (3.44)	0.48** (2.16)	0.42** (3.51)	0.70** (2.56)	0.34** (2.76)	0.36** (2.75)
GDP Per Capita	0.00022** (4.34)	0.00010** (3.54)	0.00015** (5.50)	0.0002** (4.68)	0.00010** (8.64)	0.00016** (6.41)
Dependent-Work. Age Ratio	6.13 (0.67)	8.41** (1.99)	-4.78 (-0.99)	10.89 (1.29)	2.86 (0.69)	-3.31 (-0.73)
Urban Population	0.08** (2.76)	0.05** (3.25)	0.03* (1.94)	0.07** (2.22)	0.04** (3.16)	0.02 (1.50)
Imports	0.07* (2.86)	0.02 (1.60)	0.03** (2.43)	0.08** (2.81)	0.01 (0.91)	0.03** (2.46)
Male Labor Force Part.	-0.96** (-3.41)	-0.49** (-2.20)	-0.59** (-4.15)	-0.61** (-2.05)	-0.48** (-3.49)	-0.43** (-2.91)
Real GDP Growth	-0.05 (-0.63)	-0.01 (-0.26)	-0.01 (-0.03)	-0.10 (-1.22)	0.01 (0.25)	0.04 (0.92)
Unempl. Rate - Women	0.33* (1.95)	0.21 (1.33)	0.13 (1.62)	0.15 (0.79)	0.12 (1.35)	0.14 (1.23)
Unempl. Rate - Male	0.16 (1.04)	-0.06 (-0.38)	0.12 (1.53)	0.27 (1.19)	-0.03 (-0.24)	0.09 (0.73)
Life Expectancy	0.99** (3.95)	0.49** (3.41)	0.34** (2.70)	0.75** (4.99)	0.59** (3.78)	0.21** (2.41)
Regional Dummies	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>	<i>yes</i>
Year				-0.62** (-2.88)	-0.23** (-2.46)	-0.25** (-2.49)
R-Squared	0.60	0.47	0.60	0.62	0.54	0.62
Number of Obs.	405	475	405	278	342	278

T-Statistics are in parentheses. Regional dummies are: Dummy for Latin America, OECD, Sub-Saharan Africa, and East Asia countries.

Our empirical investigation uncovers a robust relationship between the participation of women in the labor force and the share of public expenditures in GDP. A higher level of market participation by women is associated with higher spending by the government, both in its components of consumption and subsidies. When we instrument for labor force participation we find strong evidence of a causal link between female labor force participation and government size. The size of this effect is considerable. For the OECD, about one third of the 1999 levels of spending are explained by the large increase in female labor force participation since the 1960s.

3.3 Overidentification Test

The availability of two instruments in the case of the OECD sample allows us to conduct an overidentification test to investigate the validity of our causality test. Our model suggests that technological innovation in home appliances - or any variable that saves time on household chores - increases female labor force participation. This in turn increases the government spending. The overidentification test assumes, in turn, that one of the instruments is truly exogenous (e.g., lag of the relative price of home appliances), and tests whether the other instrument (e.g., lagged fertility rate) is in fact exogenous. In the tests conducted for the three specifications - total expenditures, consumption and subsidies - we could not reject the null hypothesis that the instruments are truly exogenous.³⁵ Table 5 in Appendix B is an easy way to suggest the results obtained in the overidentification test. It adds the lag of the home appliance index as an additional exogenous regressor in the equation of government spending as a share of GDP and tests whether this index has a direct effect on government spending, beyond its indirect effect through female labor force participation. In all cases, the coefficient of the lagged relative price of appliances is not statistically significant. This confirms our hypothesis that the price of home appliances affects government spending only insofar as it has an impact on female labor force participation.

4 Conclusion

This paper presents a model connecting female labor supply, fertility and government size, all determined endogenously, in conjunction with consumption and saving. The model draws on the literature on participation, fertility and growth to illustrate one of the possible causal links between the simultaneous rise in female labor force participation and government size in most economies. As the market wage paid to female workers rises with development and income per capita, there is an increase in the opportunity cost of household chores and women increase market participation in response. We assume, based on microeconomic evidence, that household chores fall disproportionately on women, and that different forms of government expenditures decrease the time cost of performing those chores, including, but not limited to, child

³⁵The test statistic for the model with total government spending, public consumption, and subsidies plus transfers as the dependent variable were 0.525, 1.108, and 0.112, respectively. The critical value of a $\chi^2_{(1)}$ with a confidence level of 90% is 2.706.

care.³⁶ As income per capita increases, couples may opt for increased female labor market participation joint with increased spending. Under certain conditions, the increase in public spending may be such that its share in total output increases.

We use aggregate data over time and across countries to uncover a positive empirical correlation between female labor supply and the size of government. We choose the less obvious causal link - from female participation to government size - and aggregate data since micro-evidence on the opposite causal relation is already available. In order to uncover a possible causal link between participation and government size we instrument for labor force participation with a new dataset on the relative price of household appliances, in line with the motivation in Greenwood, Seshadri and Yorukoglu (2005). There is no reason for a direct effect of the price of appliances on government size, as confirmed by our tests. We document an important decline over time and important cross-country variation in this price, which should lead, in response, to increases in female female labor force participation.³⁷ We find that, indeed, an increase in female labor force participation causes the size of government to increase and that this increase is sizeable, with a 10 percent rise in female labor supply leading on average to an increase in government size of 7 to 8 percent of GDP. This effect is quantitatively significant and robust to country sample, time period and the addition of control variables, including those in Rodrik (1998). We see our work as complementary to the important microeconomic literature on female labor force participation

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³⁶Child care should be taken as an example of different possible tasks that are alternatively undertaken by women or by the state, such as insurance against risk, the care for the old, the sick and the unemployed. Another possible link between female participation and government size may run through the tendency for the public sector to employ relatively more women than men. This fact may be, of course, an endogenous response to the same incentives present in our model.

³⁷Cavalcanti and Tavares (2008) show that the countries where this relative price decreased the most are those where female labor force participation increased the most.

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A Data Appendix

Total Public Expenditures - Description: Total government spending, in percent of GDP. Unit: Percentage points. Source: World Bank (2001).

Public Consumption - Description: General government final consumption expenditure, in percent of GDP. Unit: Percentage points. Source: World Bank (2001).

Public Subsidies and Transfers - Description: Government spending in subsidies and transfers, in percent of GDP. Unit: Percentage points. Source: World Bank (2001).

Female Labor Force Participation - Description: Female labor force activity rate, percent of female population ages 15 to 64. Unit: Percentage points. Source: World Bank (2001).

GDP Per Capita - Description: Gross Domestic Product per capita. Unit: Constant 1995 US Dollars. Source: World Bank (2001).

Dependent to Working Age Ratio - Description: Age dependency ratio, dependents to working-age population. Unit: Ratio. Source: World Bank (2001).

Urban Population - Description: Urban population as percent of total. Unit: Percentage points. Source: World Bank (2001).

Imports - Description: Imports as a share of Gross Domestic Product. Unit: Percentage points. Source: World Bank (2001).

Male Labor Force Participation - Description: Male labor force activity rate, percent of female population ages 15 to 64. Unit: Percentage points. Source: World Bank (2001).

Real GDP Growth - Description: Growth in real per capita Gross Domestic Product. Unit: Yearly growth rate in percentage points. Source: World Bank (2001).

Female Unemployment Rate - Description: Female unemployment, percent of female labor force. Unit: Percentage points. Source: World Bank (2001).

Male Unemployment Rate - Description: Male unemployment, percent of male labor force. Unit: Percentage points. Source: World Bank (2001).

Regional Dummies - Description: Dummies taking the value 1 if the country belongs to given regional area and 0 otherwise, defined for Latin America, Sub-Saharan Africa, East Asia and OECD. Unit: Indicator dummy. Source: World Bank (2001).

Fertility rate - Description: Total fertility rate. Unit: Births per woman. Source: World Bank (2001).

Life expectancy - Description: Life expectancy at birth. Unit: Years. Source: World Bank (2001).

Household Appliance Price Index - Description: Ratio of price index of household appliances to consumer price index. Unit: Ratio with first available year taking value 1. Source: Eurostat (2003).

B Additional Tables

Table 4: Dependent Variable: Female Labor Force Participation. First State Regressions - OECD and Whole Sample.

	OECD Countries			Whole Sample of Countries		
	Total Public Expenditures	Public Consumption	Public Subsidies and Transfers	Total Public Expenditures	Public Consumption	Public Subsidies and Transfers
GDP Per Capita	0.00049** (6.95)	0.00051** (7.33)	0.00049** (6.95)	0.00010** (2.25)	0.00003 (3.60)	0.00010** (2.25)
Dependent-Work. Age Ratio	51.99** (3.75)	46.41** (3.41)	51.99** (3.75)	35.34** (3.29)	23.40** (2.35)	35.34** (3.29)
Urban Population	0.06** (2.25)	0.02* (1.90)	0.06** (2.25)	0.06** (2.31)	0.06** (1.12)	(2.31)
Imports	-0.17** (-10.34)	-0.17** (-10.58)	-0.17** (-10.34)	-0.08** (-6.39)	-0.06** (-5.30)	-0.08** (-6.39)
Male Labor Force Part.	0.81** (4.95)	0.73** (4.53)	0.81** (4.95)	1.02** (9.43)	0.96** (9.49)	1.02** (9.43)
Real GDP Growth	0.13 (0.85)	0.13 (0.84)	0.13 (0.85)	-0.13* (-1.88)	-0.13** (-2.52)	-0.13* (-1.88)
Unempl. Rate - Women	-0.35** (-3.03)	-0.39** (-3.44)	-0.35** (-3.03)	-0.71** (-7.98)	-0.67** (-7.99)	-0.71** (-7.98)
Unempl. Rate - Male	-0.10 (-0.65)	0.01 (0.08)	-0.10 (-0.65)	0.56** (4.95)	0.64** (6.08)	0.56** (4.95)
Life Expectancy	-1.14** (-2.69)	-1.30 (-3.12)	-1.14** (-2.69)	-0.65** (-4.59)	-0.52** (-4.14)	-0.65** (-4.59)
Lag of Fertility	-6.62** (-2.71)	-6.70** (-2.74)	-6.62** (-2.71)	-6.76** (-5.41)	-3.81** (-3.34)	-6.76** (-5.41)
Lag of Appliance	-16.77* (-1.77)	-14.39* (1.65)	-16.77* (-1.77)			
Regional Dummies	-	-	-	<i>yes</i>	<i>yes</i>	<i>yes</i>
Year	0.37** (2.92)	0.41** (3.29)	0.37** (2.92)	0.51** (8.76)	0.47** (8.68)	0.51** (8.76)
R-Squared	0.84	0.83	0.84	0.60	0.57	0.60
Number of Obs.	128	135	128	405	475	405

T-Statistics are in parentheses. Regional dummies are: Dummy for Latin America, OECD, Sub-Saharan Africa, and East Asia countries.

Table 5: Overidentification Test. Government Spending (Total, Consumption, Subsidies and Transfers). Instrumental Variables Estimation.

	Appl. Index Lagged as an Addit. Regressor		
	Total Public Expenditures	Public Consumption	Public Subsidies and Transfers
Female Labor Force Part.	1.05** (2.00)	0.75** (2.63)	0.23 (0.88)
GDP Per Capita	0.00012 (0.52)	-0.00010 (-0.74)	0.00023* (1.95)
Dependent-Work. Age Ratio	5.47 (0.26)	-1.11 (-0.10)	9.72 (1.01)
Urban Population	0.01 (0.19)	0.01 (0.51)	0.01 (0.56)
Imports	0.23** (2.55)	0.14** (2.90)	0.07* (1.69)
Male Labor Force Part.	-0.47 (-0.87)	-0.42** (-1.53)	0.02 (0.08)
Real GDP Growth	-0.59** (-2.87)	-0.35** (-3.03)	-0.20* (-1.80)
Unempl. Rate - Women	0.30* (1.73)	0.21** (2.11)	0.08 (0.97)
Unempl. Rate - Male	0.57** (2.64)	0.21 (2.01)	0.30** (2.78)
Life Expectancy	3.54** (4.22)	1.77** (3.37)	1.74** (4.90)
Lag of Appliance	12.89 (1.02)	9.64 (1.32)	3.06 (0.53)
Regional Dummies	-	-	-
Year	-1.22** (-3.83)	-0.63** (-3.54)	-0.54** (-3.51)
R-Squared	0.70	0.60	0.72
Number of Obs.	128	135	128

T-Statistics are in parentheses. OECD Sample.