

# Assessing the “Engines of Liberation”: Home Appliances and Female Labor Force Participation \*

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## Abstract

The secular rise in female labor force participation, highlighted in the recent macroeconomics literature on growth and structural change, has been associated with the declining price and wider availability of home appliances. This paper uses a new and unique country dataset on the price of home appliances to test its impact on female labor supply. We assess the role of the price of appliances in raising participation by comparing it to the impact of fertility and other macroeconomic factors. A decrease in the relative price of appliances - the ratio of the price of appliances to the consumer price index - leads to a substantial and statistically significant increase in female labor force participation. The impact of the price of appliances is quantitatively of the same order of magnitude as that of fertility. This result is robust to the inclusion of additional controls, such as income per capita, government spending, and male and female unemployment rates. To assess causality, we test for exogeneity and use the lagged relative price of appliances and the food price index as instrumental variables, confirming that lower appliance prices lead to increased female participation.

**JEL Classification Numbers:** O11, J22

*Keywords:* Female Labor Force Participation, Home Appliances, Fertility, Business Cycles.

## 1 Introduction

Over time, economies tend to experience an increase in women’s participation in the labor force. Female labor force participation has risen from 34 to 41 percent in the last two decades alone in OECD countries.<sup>1</sup> This comes after substantial increases in female labor supply in the immediate postwar era, in countries where female labor force participation is already relatively high when compared to the situation in developing countries.<sup>2</sup> Several factors

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<sup>1</sup>World Bank (2001).

<sup>2</sup>Goldin (1995), in an historical overview of female labor market participation in the United States, shows a rise from 3.1 to around 50 percent of the labor force between 1900 and 1980. As reported by Killingsworth and Heckman (1987) most of this increase in aggregate female labor force participation rate in the last century is attributable to an increase in the participation of married women.

have been pointed to as the root cause of this increase, and cultural and social changes are certainly important.<sup>3</sup> The marked decrease in fertility rates, both cause and result from the increase in female labor supply, is an important factor.<sup>4</sup> Other candidates have been put forward as well<sup>5</sup>. In addition, economic factors may also play a key role. The increase in average real wages over time that accompanies economic growth has led to a rise in the opportunity cost of staying at home and encouraged labor force participation, as suggested by several studies.<sup>6</sup> However, as Blau (1998) argues, there is a substantial portion of the increase in female labor supply that is not explained by variables that are conventionally used in the empirical analysis. This paper investigates the role of technological progress in household appliances in the increase in female labor force participation. As stated in Greenwood and Seshadri (2003) “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.” We use a new and unique country dataset that allows us to assess the evolution of the relative price of appliances and relate it to women’s participation in the market.

The rise in female labor force participation should respond to the availability and relative price of household appliances. A simple model of household production à la Becker (1965) suggests that a rational response to the relative costs and benefits of the use of time would result in increased female labor-force participation as household appliances become relatively cheaper.<sup>7</sup> Technological progress in home appliances implies the saving of time and the substitution of labor for durable goods. Greenwood, Seshadri and Yorukoglu (2002b) first raised this hypothesis: the emergence of cheap durable goods that perform household tasks facilitates the entry of women into the labor force. These authors present data on home utilities such as electricity, flush toilet and central heating that show their availability rising from under 20 to more than 80 percent of US households in the period between 1920 to 1970. Different appliances that reduce the cost of household chores - such as refrigerators, vacuums, washer, dryer, dishwasher and microwave - became widely available from the late 1940s (the first three) and from the 1970s and 1980s (the last three). The investment of household in home appliances and their accumulated stock in percent of GDP almost doubled between 1955 and 1990. In addition, Greenwood et al. (2002b) documents a significant decrease in

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<sup>3</sup>Jaumotte (2003) surveys the determinants of female labor force participation in OECD countries and finds that cultural attitudes, in addition to general labor market conditions, female education and the nature of tax and subsidy policies, all affect participation.

<sup>4</sup>See Goldin and Katz (2002). Olivetti (2001), for instance, argues that: “In the past, married women of childbearing age tended to specialize in childrearing and home production activities at the expense of engaging in market work. Now, they do not curb the hours worked in the market.”

<sup>5</sup>As an example, Fernández, Fogli and Olivetti (2002) argue that the evolution of male preferences plays an important role in the dramatic increase in female education and work decisions.

<sup>6</sup>Goldin (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) also suggests that, when women have poor human capital and their wage in the market is only connected with manual work, social stigma adds further resistance to female participation; as women become educated, this stigma disappears. Blau (1998) shows that the more educated the woman, the more she tends to participate in the labor market. Those with more than 16 years of education have an 83 percent participation rate compared with 47 percent for those with less than 12 years. Acemoglu, Autor and Lyle (2002) 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 to less than high-school or the lowest skilled males.

<sup>7</sup>Greenwood, Seshadri and Vandenbroucke (2002a) explains the baby boom as the result of a surge in technological progress in household appliances that lowered the cost of having children.

the number of domestic workers as well as hours worked at home for the postwar period: people working at home decrease by a factor of three while average weekly hours worked at home fall from 60 to 20 hours.<sup>8</sup>

A substantial portion of the tasks related to home and family care are unequally distributed between men and women, with the latter performing the larger share. Blau (1998) points out that while married women not in the labor force worked between 33 and 37 hours a week at home, men - independently of their status, single, married, with or without employed wife - worked between 5 and 8 hours.<sup>9</sup> Our question is simply put: does a lower relative price of home appliances encourage female labor force participation? Our dataset provides yearly information on the price index of home appliances for a wide sample of OECD countries between 1980 and 1999. This index considers only household appliances that are likely to save labor in household cleaning and maintenance.<sup>10</sup> The home appliance price index is divided by the consumer price index and the value in 1985 set to 1 for standardization purposes. Our data allow us to take advantage of the time and cross-country variation in the relative price index of home appliances to study its impact on female labor force participation.<sup>11</sup> In our sample this relative price index of appliances tends to decrease over time for all countries and the total decrease for the period under study is substantial for all countries. In Figure 1 we plot the evolution over time of the average relative price index of home appliances, plotted against the female and male rates of labor force participation.<sup>12</sup> It is evident that female labor force participation rose dramatically by about 15 percent, while the relative price of home appliances decreased by around 10 percent.<sup>13</sup> In contrast, male labor force participation remains almost constant, even decreasing slightly.<sup>14</sup>

Our main objective is to determine whether the decrease in the relative price of home appliances is correlated with the rise in female labor force participation and how important is this effect, in quantitative terms. In addition, we want to assess whether there is evidence of a causal relationship. We assess the robustness of this relationship to other determinants of labor force participation by women, including “structural” determinants such as income per capita and government spending as a share of GDP and “cyclical” determinants such as the rate of growth of GDP and the unemployment rate of men and women. In the spirit of Jones, Manuelli and McGrattan (2003), we also add the gender wage gap as an explanatory variable. Though this gap might be the result of differences in working characteristics among women and men, it may also be a consequence of labor market discrimination, which would discourage women from working.<sup>15</sup>

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<sup>8</sup>Landsburg (2003) confirms these data: housework took an average of 58 hours a week in 1900 and was down to about 18 hours by 1975. Blau (1998) reports that, in the decade from 1978 to 1988, the number of women’s work hours at home and in the market practically reversed from 27/20 to 21/26.

<sup>9</sup>Case and Paxson (2000) find that it is children’s mothers that make most investments in children’s health, namely as regards time consumed in doctors visits and the like.

<sup>10</sup>In particular, furniture and audiovisual appliances are excluded.

<sup>11</sup>Greenwood et al. (2002b) documented a decrease in the price of appliances for a sample of countries, but no individual country data are reported.

<sup>12</sup>All series are normalized to 1 in the year 1980.

<sup>13</sup>Greenwood et al. (2002b) 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 (this is for one year, not yearly as we use). International comparisons show that countries where durable goods are cheapest are those where more women work for wages.

<sup>14</sup>Blau (1998) shows that the participation rates of men in the United States actually decreased about 6 percent between 1970 and 1995.

<sup>15</sup>In a broad survey of studies of the gender wage gap, Weichselbaumer and Winter-Ebmer (2003) find that

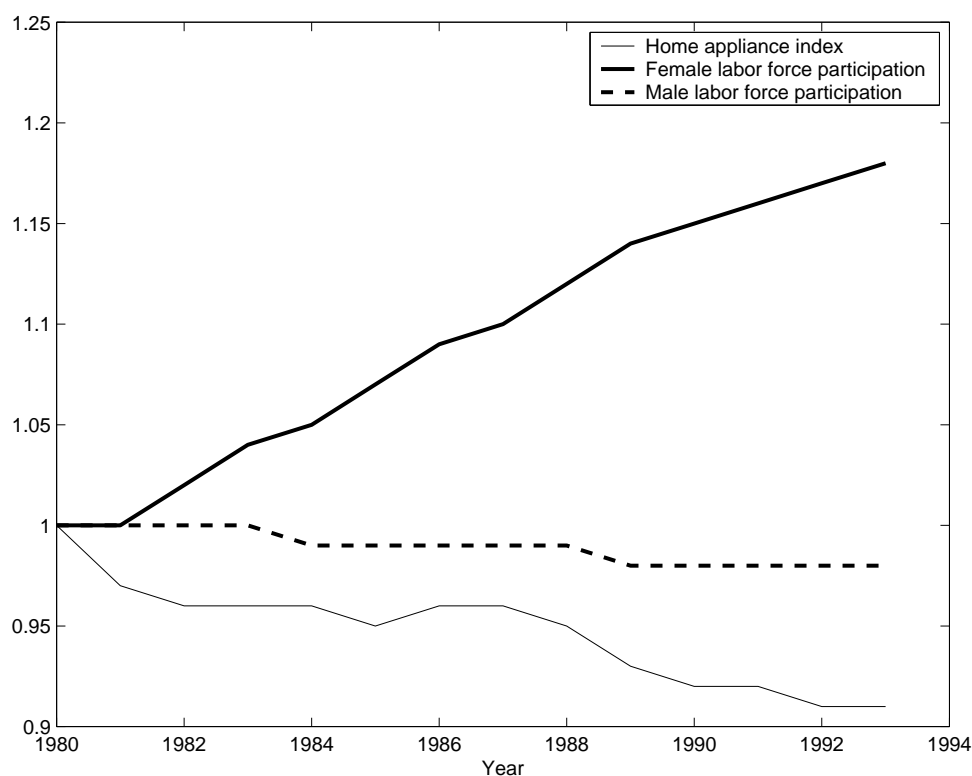


Figure 1: Relative price of home appliances, female and male labor force participation rates (1980=1). Average of OECD countries.

We find that a decrease in the price of home appliances leads to a sizeable, statistically significant and robust increase in female labor force participation. A decrease of 10 percent in the price of appliances leads to an increase in participation of about 5 percent. This is an effect on the same order of magnitude as that of fertility, income per capita, government spending, and unemployment rates, and stronger than that of GDP growth, the tax rate, and the gender wage gap. Moreover, this effect seems to be more robust than that of the change in fertility. Interestingly, while an increase in male unemployment encourages women to participate in the market, an increase in female unemployment has an even stronger effect in the opposite direction: it discourages participation. We see our work as complementary to the microeconomic literature on the determinants of female labor force participation, suggesting new avenues for further research.

## 2 Empirical Results

We now present the empirical results on the impact of home appliances on female labor force participation. The data are available for 17 OECD countries - including all the largest

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wage differentials between men and women tend to decrease, and that this is mostly due to an increase in the market productivity of females. The theoretical model and simulation exercises of Jones et al. (2003) suggest that the reduction in the gender wage gap is the main determinant of the increase in female labor market participation. Bassi (2003) finds evidence that, instead, the gender wage gap is not strongly related to female labor force participation.

European economies and the United States between the years 1974 and 1999, totalling 311 observations.<sup>16</sup> All data are from World Bank (2001), with the exception of the price index of home appliances, our main variable of interest, obtained from the New Chronos Database at the Statistical Office of the European Union.<sup>17</sup> Our basic specification is:

$$FLFP_t = \alpha + \beta_0.PAPPLIANCES_t + \beta_1.Zi_t + \varepsilon_t, \quad (1)$$

where  $FLFP_t$  is female labor force participation in year  $t$ , and  $PAPPLIANCES_t$  is the relative price of home appliances measured as the yearly ratio of the home appliance price index to the consumer price index.  $Zi_t$  is a vector of additional determinants of female labor force participation: *Fertility Rate*, *GDP per capita*, *Growth of Real GDP*, *Male and Female Unemployment Rates*, *Government Spending as a Share of GDP*, and *the Ratio of Female to Male Earnings*. Table 1 shows the summary statistics of these variables.

Table 1: Summary Statistics.

	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Female Labor Force Part.	311	34.57	8.38	20.60	51.60
Relative Price of Home Appl.	311	1	0.07	0.77	1.18
Fertility Rate	303	1.70	0.35	1.15	3.31
Income per capita	311	21511.08	8338.48	7328.63	52710.84
Growth Rate	311	2.69	2.33	-6.57	10.74
Female Unempl. Rate	245	11.14	5.74	2.20	30.60
Male Unempl. Rate	245	7.75	4	1.10	19.60
Government Spending/GDP	289	31.63	7.23	13.84	47.82
Female/Male Earnings	34	0.72	0.50	0.62	0.89

We expect the fertility rate to be negatively associated with female labor force participation as time used to raise children takes away from market work and career. The level of income per capita may affect female labor supply as the opportunity cost of not working increases with market wages, which are closely associated with income per capita.<sup>18</sup> As to the growth rate of real GDP, this business cycle indicator captures the response of female labor supply to cyclical fluctuations. Women may respond to recessions either by moving into the labor force - and supplement dwindling family incomes - or by being discouraged

<sup>16</sup>The data points correspond to the availability of our key variable, the yearly price index for home appliances, which is used to construct our relative price of home appliances. The countries in the sample are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, Great Britain and the United States of America.

<sup>17</sup>The Data Appendix presents, for each variable, its description, unit and source.

<sup>18</sup>The response of female labor force participation to the increase in income per capita is a key element in Galor and Weil (1996) and Cavalcanti and Tavares (2003).

from participation. The rates of unemployment of the female and male labor force may also affect female labor supply by discouraging entry into the labor force or, indirectly, as a response to the situation regarding male unemployment. Higher government spending as a share of GDP might decrease the cost of performing household chores - including, but not limited to child rearing and child care - thereby increasing female labor supply, as suggested by Cavalcanti and Tavares (2003).<sup>19</sup> Finally, a lower gender wage gap can encourage female participation, especially as men and women make a joint decision to enter the labor market. We add the controls in succession to the simplest specification where only the relative price of home appliances is introduced as a right-hand side variable. This allows us to test the robustness of the effect of the price of home appliances on female labor supply.

We use two estimation methods: Ordinary Least Squares (OLS), using standard errors robust to the presence of heteroskedasticity; and Instrumental Variable Estimation (IV) to assess causality. The first method uncovers the association between the variables and female labor supply, whereas the IV procedure attempts to address whether the relationship between the price of home appliances and female labor supply is causal.

## 2.1 Basic Results

In Table 2 we present results for the specifications estimated with the OLS estimation procedure. The first noticeable result is the robust negative relationship between the relative price of appliances and female labor force participation: as household appliances that perform household chores become less expensive, women are freer to participate in the labor market. The quantitative impact of the price of appliances is sizeable: a 20 percent decrease in the relative price of appliances leads to an increase in participation of between 3 and 6 percent. Remember that, for our sample covering the 1975 to 1999 period, a country-specific decrease in the relative price of appliances of 15 to 20 percent is quite common. As to the effect of the fertility rate, it is in fact less robust than the effect of home appliances and, though the coefficient tends to be negative, in some specifications it is not statistically different from zero. For those specifications (in columns 2 and 7) where the coefficient associated with the fertility rate is statistically significant, the estimated impact of fertility is of the same order of magnitude as that of home appliances.

All other additional controls display impressive stability as to the significance and size of the coefficients. Female labor force participation increases with income per capita and with government size, as expected. The relation with cyclical variables shows that in recessions women tend to enter the labor market, probably because the need for additional income outweighs a possible discouragement effect due to lower availability of good jobs. The unemployment rates seem to confirm this interpretation: while an increase in male unemployment leads women to enter the market - evidence of a joint decision on labor market participation - an increase in female unemployment discourages female participation in the market.<sup>20</sup> Though the female/male earnings ratio has the expected sign, it is not statistically

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<sup>19</sup>Evidence that specific tax and subsidy policies in OECD countries affect female labor force participation can be found in Jaumotte (2003), for instance.

<sup>20</sup>Note that when only the male unemployment rate is included in the specification (in column 5), the result is a negative coefficient but of lower size and not significant, confirming Killingsworth and Heckman (1987). This may derive from the combination of a negative coefficient on female unemployment and a positive - but less sizable - coefficient on male unemployment, both significant. The strong positive correlation between female and male unemployment - 0.69 in our sample - forces the latter to capture both effects when entered into the specification alone.

different from zero,<sup>21</sup> which confirms results in Bassi (2003). These results are robust to the introduction of a time trend. The R square indicates that our most complete specification captures a very large share of the total variability in female labor force participation. Notice however, that even when introduced in isolation, the relative price of appliances explains a good share of total variability in female participation in the labor market.

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<sup>21</sup>Notice, however, that there are few observations when this variable is included. The data for female/male earnings are based on Table 3 of Blau and Kahn (2000). There are data for very few countries and time periods.

Table 2: Determinants of Female Labor Force Participation - Ordinary Least Squares Estimation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Relative price of home appl.	-30.24** (-4.24)	-26.29** (-3.41)	-27.40** (-4.17)	-28.98** (-4.43)	-34.36** (-4.29)	-34.40** (-4.40)	-35.64** (-4.78)	-52.00** (-6.64)	-36.04** (-3.61)	-60.73** (-3.87)
Fertility rate		-4.13** (-3.37)	-1.49 (-1.41)	-0.93 (-0.86)	1.84 (1.17)	-1.40 (-0.88)	-4.70** (-2.32)	-2.92 (-1.52)	-1.59 (-0.73)	-2.66 (-0.67)
Income per capita			0.00046** (6.29)	0.00048** (6.87)	0.00044** (5.57)	0.00029** (3.74)	0.00028** (3.88)	0.00013 (1.33)	0.00028 (0.27)	0.00013** (7.26)
Growth rate of real GDP				-0.47** (-2.52)	-0.64** (-3.05)	-0.63** (-3.03)	-0.63** (-3.10)	-0.21 (-0.99)	-0.27 (-1.27)	-0.97** (-3.01)
Male unempl. rate					-0.18 (-1.38)		0.66** (3.73)	0.32* (1.92)	0.21 (1.22)	2.07** (5.21)
Female unempl. rate						-0.52** (-6.57)	-0.89** (-8.20)	-0.79** (-7.46)	-0.75** (-6.96)	-0.84** (-3.41)
Gover. spending/GDP								0.37** (3.61)	0.41** (4.03)	0.70** (3.41)
Year control									0.29** (2.29)	
Female/Male earnings										3.15 (0.25)
N. of Observations	311	303	303	303	239	239	239	219	219	29
$R^2$	0.06	0.09	0.29	0.31	0.27	0.35	0.39	0.46	0.48	0.63

All specifications include a constant, not reported. T-Statistics are presented in parentheses, using heteroskedasticity-consistent standard errors. \* indicates significant at the 90 percent confidence level and \*\* a 95 percent confidence level. The source, unit and definition for each variable are presented in the data appendix.



## 2.2 Causality

A strong and robust association between the price of appliances and female labor force participation does not imply that one causes the other. Indeed, one might argue that technological innovations that increase the quality and lower the price of appliances might be driven by demand, i.e. by an increase in female labor force participation. To assess causality we would like to find instrumental variables that are strongly related to the relative price of appliances and are unlikely to directly affect female participation rates. We will use two instruments, the food price index and the lag of the relative price of home appliances. Our reasoning is that, as food is given a considerable weight in the general consumer price index, an increase in the food price index is likely to have a strong impact on the *relative* price of home appliances. In addition, there is no reason to believe that the food price index should directly affect the participation choices of potential female workers. As to the second instrumental variable, there is a strong correlation between the current and the past prices of home appliances, and we conjecture that past prices of home appliances do not affect female labor force directly, but only through the current prices.<sup>22</sup>

We tested these two instrumental variables on the relative price of home appliances by regressing the latter on all right-hand side variables in the specification for female labor force participation plus the two instrumental variables. Table 4 in Appendix B shows the results of the first-stage regressions. We find a negative and statistically significant effect of the two instrumental variables on the relative price of appliances. As expected, an increase in the food price index is associated with a decrease in the relative price of appliances. Moreover, there is a robust relationship between the past and current prices of home appliances. The test of the null that there is no association between the instrumental variables and the relative price of home appliances is rejected at the 1 percent confidence level.

Table 3 presents our second-stage regression results.<sup>23</sup> The first thing to note is the remarkable consistency of the results in Table 3 as compared with those of Table 2. Again the relative price of appliances is robustly significant and negatively associated with female labor force participation. As we instrument for the price of appliances we find that quantitatively, the causal relationship with female participation is actually stronger than suggested by the OLS estimates. A decrease in the relative price of appliances of 10 percent can lead to an increase in participation from 4 to 7.6 percent in participation depending on the specification considered. This quantitative effect is at least as important as that of the other factors considered, including fertility and income per capita.

The results on the controls also confirm previous results from Table 2. Lower fertility, higher income per capita, and higher government size are all associated with increased female participation. As to cyclical factors, during booms and when female unemployment is higher, women participate less in the labor market, while higher male unemployment encourages female labor force participation. The overall fit statistics also point to a specification that captures a substantial amount of the variability in female labor force participation.

In sum, our empirical results suggest a strong negative causal relationship between the relative price of home appliances and female labor force participation. The impact of improvements in home appliance technology on participation is at least as strong as that of the

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<sup>22</sup>The availability of two instrumental variables allows us to test the validity of our empirical approach through an overidentification test. We analyze this test in the next subsection.

<sup>23</sup>Notice that the female/male wage gap is not included in this table. The reason is the low number of observations. There are only 18 observations for the gender wage gap with the presence of lag variables.

structural and cyclical factors considered, including the fertility rate and income per capita. Moreover, there is an important relationship between female labor force participation and cyclical factors such as the growth rate of GDP and gender-specific unemployment rates. It seems that booms and low male unemployment discourage female participation, while low female unemployment encourages it.

### 2.3 Overidentification Test

In this subsection we test the validity of our empirical approach. Our reasoning is that female labor force participation and the relative price of home appliances are jointly determined. However, we conjectured that the food price index is not correlated with female labor force participation and the lag of the relative price of home appliances affects female labor supply only through the current appliance prices.

In panel *A* of Table 5 in Appendix B we report the results when we regress the female labor force participation rate on our set of controls plus the two instrumental variables. First notice the stability of the coefficient of the relative price of home appliances: it is not only statistically significant, but it has a magnitude that is similar to that found previously. Finally, notice that the two instrumental variables do not affect female labor supply directly, since their coefficients are statistically not different from zero. Panel *B* of Table 5 reports the overidentification test statistic. This test assumes that one of the instruments is exogenous - e.g., the food price index - and tests the validity of the second instrument - e.g., the lag of the relative price of home appliances. We could not reject the null hypothesis on the orthogonality condition of the instruments.

Table 3: Determinants of Female Labor Force Participation - Instrumental Variable Estimation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relative price of home appl.	-59.94** (-3.39)	-48.36** (-2.57)	-41.69** (-2.53)	-44.14** (-2.93)	-43.96** (-2.87)	-46.60** (-3.55)	-45.74** (-3.71)	-61.26** (-4.09)	-76.26** (-3.53)
Fertility rate		-3.45* (-1.85)	-1.85 (-1.31)	-1.55 (-1.15)	-0.14 (-0.09)	-3.81** (-2.63)	-8.17** (-3.99)	-6.06** (-3.31)	-6.45** (-3.49)
Income per capita			0.00044** (4.76)	0.00047** (5.43)	0.00042** (4.53)	0.00027** (3.00)	0.00027** (3.22)	0.00021* (1.79)	0.00026** (2.02)
Growth rate of real GDP				-0.60** (-2.49)	-0.62** (-2.58)	-0.60** (-2.49)	-0.56** (-2.45)	-0.12 (-0.48)	-0.09 (-0.36)
Male unemployment rate					-0.20 (-1.44)		0.72** (3.83)	0.42** (2.40)	0.44** (2.48)
Female unemployment rate						-0.58** (-7.14)	-0.96** (-8.27)	-0.87** (-7.44)	-0.87 (-7.21)
Government spending/GDP								0.24** (1.98)	0.23* (1.81)
Year control									-0.18 (-0.97)
Number of Observations	186	180	180	180	176	176	176	158	158
$R^2$	0.04	0.06	0.27	0.30	0.30	0.40	0.45	0.52	0.52

All specifications include a constant, not reported. T-Statistics are presented in parentheses, using heteroskedasticity-consistent standard errors. \* indicates significant at the 90 percent confidence level and \*\* a 95 percent confidence level. The source, unit and definition for each variable are presented in the data appendix.

### 3 Conclusion

This paper conducts an empirical investigation of the role of technological improvements in home appliance technology on the rate of labor market participation of women. Our conjecture, in line with Greenwood et al. (2002b), is that wider availability and lower cost of home appliances facilitate the participation in the labor market by decreasing the amount of time necessary to perform household chores. As an unequal share of these chores tends to fall on women’s shoulders, female labor force participation should increase in response. We assemble a new dataset on yearly price changes of a composite of home appliances that are related to household chores and compute the relative price of appliances - as the ratio of the home appliance index to the general price index. In the last few decades, for which the index is available, there has been a marked decrease in the relative price of appliances accompanied by increases in female labor force participation. In contrast, male labor force participation has remained practically unchanged.

We estimate the relationship between the price of appliances and participation after controlling for a host of macroeconomic factors, both structural and cyclical. We uncover a robust negative relationship between the relative price of appliances and female participation, with a quantitative effect of the same order of magnitude as that of fertility rates and income per capita. Participation responds positively to average income, government size and lower fertility. The cyclical factors are also closely related with participation, with booms and female unemployment discouraging participation, while male unemployment encourages it. When we instrument for the relative price of appliances we find evidence of a causal relationship between the latter and female labor force participation, with the sign as expected. As to the additional controls, instrumenting for our variable of interest does not change the sign and significance of the coefficients.

We see this paper as complementary to the microeconomic literature on the determinants of female participation in the labor market. The new macroeconomic dataset exploited here delivers sensible results, while suggesting new avenues for research.

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## A Data Appendix

*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).

*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).

*Fertility Rate* - Description: Fertility rate, total births per woman. Unit: Births. Source: World Bank (2001).

*GDP Per Capita* - Description: Gross Domestic Product per capita. Unit: Constant 1995 US Dollars. 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).

*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).

*Tax Rate* - Description: Average tax rate computed as current tax revenues as percent of GDP. Unit: Percentage points. Source: World Bank (2001).

*Food Price Index* - Description: Food price index. Unit: 1995 = 1. Source: World Bank (2001).

*Female/Male Earnings* - Description: Ratio of the median of the female and male weekly earnings of full-time workers. Source: Blau and Kahn (2000).

## B Additional Tables

Table 4: Dependent Variable: Relative Price of Home Appliances. First Stage Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lag. of the relative price of home appl.	0.73** (11.15)	0.74** (12.63)	0.70** (11.30)	0.70** (11.28)	0.67** (10.50)	0.68** (10.82)	0.68** (10.49)	0.63** (9.29)	0.57** (8.27)
Food Price Index	-0.00053** (-4.38)	-0.00041** (-3.34)	-0.00064** (-3.80)	-0.00064** (-3.72)	-0.00076** (-4.15)	-0.00074** (-4.29)	-0.00072** (-3.88)	-0.00062** (-3.20)	-0.00059** (-2.45)
Fertility rate		-0.0035 (-0.40)	-0.0071 (-0.79)	-0.0066 (-0.73)	-0.0116 (-1.09)	-0.0068 (-0.66)	-0.0050 (-0.38)	-0.0001 (-0.01)	0.0017 (0.14)
Income per capita			8.19e-07** (1.98)	8.38e-07** (2.01)	1.09e-06** (2.27)	1.16e-06** (2.50)	1.14e-06** (2.35)	7.15e-07 (1.26)	9.06e-07 (1.62)
Growth rate of real GDP				-0.00064 (-0.58)	-0.00072 (-0.67)	-0.00077 (-0.71)	-0.00079 (-0.73)	0.00156 (1.36)	0.00138 (1.23)
Male unempl. rate					0.00046 (0.61)		-0.00024 (-0.22)	-0.00144 (-1.34)	-0.00128 (-1.21)
Female unempl. rate						0.00056 (1.05)	0.00069 (0.88)	0.00140* (1.89)	0.00124* (1.70)
Gover. spending/GDP								0.0010** (2.06)	0.0004 (0.76)
Year control									-0.0025** (-2.82)
N. of Observations	186	180	180	180	176	176	176	158	158
$R^2$	0.51	0.55	0.56	0.57	0.56	0.57	0.57	0.61	0.63

All specifications include a constant, not reported. T-Statistics are presented in parentheses, using heteroskedasticity-consistent standard errors. \* indicates significant at the 90 percent confidence level and \*\* a 95 percent confidence level. The source, unit and definition for each variable are presented in the data appendix.

Table 5: Overidentification Test. Dependent Variable: Female Labor Force Participation.

Panel A	
Relative price of home appl.	-45.01** (-3.20)
Fertility rate	-7.33** (-3.66)
Income per capita	0.00027* (1.89)
Growth rate of real GDP	-0.11 (-0.45)
Male unemployment rate	0.52** (2.87)
Female unemployment rate	-0.92** (-7.63)
Government spending/GDP	0.25* (1.86)
Year control	-0.03 (-0.20)
Lag. of the relative price of home appl.	-17.73 (-1.05)
Food Price Index	-0.02 (-0.56)
Number of Observations	158
$R^2$	0.52
Panel B	
Test statistic	0.158
$\chi^2_{(1)}$ at 90% confidence level	2.706

All specifications include a constant, not reported. T-Statistics are presented in parentheses, using heteroskedasticity-consistent standard errors. \* indicates significant at the 90 percent confidence level and \*\* a 95 percent confidence level. The source, unit and definition for each variable are presented in the data appendix.