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Maid´s Services as a substitute factor in home-production

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Abstract

While maid's services are considered luxury goods in developed countries, that is not always the case in developing countries. Economists believe that the reason for that is the availability of cheap unskilled labor supply in developing countries. However, few attention has been given to the scarcity of durable goods used in home-production in developing countries households. The same durable goods that are considered necessity on developed countries. This paper investigates the role of women's bargaining power, women's shadow price of time, and family composition in deciding on expenditures in production durable goods and maid's services.

The test of bargaining power indicates that the expenditure on home-production factors is an outcome of a bargaining process. Households in which the wife has higher schooling than husband, the relative probability of having maid's services is higher. The results of the difference of husbands' and wives' education are consistent with the intrahousehold time allocation, where wives that have comparative advantage in market work are more likely to substitute market goods for home-production. Wives that do not have comparative advantage in market work specialize in home-production, demanding more time-saving durable goods. There is no evidence of parental preferences for sons or daughters. However, there is evidence that daughters' time substitutes wives's time and maid's services in home-production.

Key words: Intrahousehold allocation, durable goods ownership, maid's services, parental preferences.

JEL classification: D12, D13, J12, J16

Maids' Services as a Substitute Factor in Home-Production.

1. Introduction

While maid's services are seen as luxury goods in developed countries, that is not always the case in developing countries. Economists believe that the reason for that is the availability of cheap unskilled labor in developing countries. However, few attention has been given to the role of the relative scarcity of durable goods used in home production in developing countries households. The same durable goods that are considered necessity on developed countries. Even among the five percent richest households in Brazil less than 20% owns dish washers and dryers, 36% owns vacuum cleaners, 60% owns microwaves and 78% owns washing machines, see Table 1. On the other hand, 53% of these households hire maids and 20% hire cleaning services, see Table 1. What are the factors that drive the decision of having production durable goods and maids' services in Brazil? Specifically, what is the role of women's bargaining power, women's shadow price of time, and the family composition in deciding on these expenditures?

Maid is a traditional and important occupation in Brazil (de Melo (1998)). Maid is a female-dominated occupation in the sense that the participation of men is lower than 50%. Among the female-dominated occupations, maid is the occupation with the highest number of workers, as showed by the 1981 and 2001 PNAD data set. Laundress is another occupation among the twenty female-dominated occupations with higher number of workers in 2001. In both occupations the average educational level of the workers is primary education. The low educational level of maids is due to the fact that their services are based on roles culturally assigned to women (de Melo (1998)) lowering the need for formal education. The services provided by maids include cooking, dishes, and laundry (de Melo (1998)).

As in other countries, wives bear most of the housework. In Brazil, the number of hours

spent in housework per week by working women is four times the number of hours that working men spend (PNAD 2001). One of the biggest concerns of Brazilian women is the unfair division of time in housework (Oliveira (2000)[1]). Given their increasing participation in the job market, the result is a double burden that many times presents them with difficult choices between their careers and families (Oliveira (2000)). To alleviate the double burden wives can reduce their time in home-production by making use of production durable goods, by outsourcing their time using maid's services, or by increasing the consumption of market goods. Home-production can be more time-intensive (or labor intensive) than good-intensive (or capital intensive) in developing countries with a large supply of unskilled workers[2].

Wives with higher value of time will be more likely to substitute their time in home-production by production durable goods and maids' services. The wives' shadow value of time in home-production is measured by a proxy variable of their opportunity cost in home production, which is a set of indicators of wife's educational level. The assumption used is that the higher their educational level, the higher is their skill in the labor force, and, therefore, the higher are their wages and opportunity costs to work on home-production. Therefore, wives with higher educational level will substitute their time in home production in favor of production durable goods and maid's services.

Family composition is likely to affect home production. The presence of young children increases the demand for time in home-production. Increasing the demand for production durable goods and maid's services. However, the presence of teenager children or other relatives that can offer time in home-production decrease wives' time in home-production. Decreasing the demand for production durable goods and maid's services. The empirical

[1]Oliveira (2000) comments on the results of a study of 300 women in positions of responsibility in the public sphere by the Center for Women's Leadership (CELIM) in Rio de Janeiro.

[2]See Alexopoulos and Cavalcanti (2006) for a discussion of the relationship between inequality and cheap home goods.

specification allows to test these hypotheses as well as if there is parental preferences for sons or daughters.

This paper uses the *Pesquisa de Orçamento Familiares* (POF) data set. Focusing on the impact of the prices of production durable goods, price of maid services, wives' shadow prices of time, women's bargaining power, and family composition on the choice between production durable goods and maid's services. This paper contributes to the literature by looking at these factors in the Brazilian economy. The study of the Brazilian case makes an interesting counter-example to developed countries because Brazilian households have fewer home-production durable goods than households in developed countries.

2. The Home-Production Model

The theoretical model is based on Becker (1965)'s theory of time allocation in a Nash-bargaining equilibrium, equation (1). Spouses, s, choose the market goods, X, and home-produced commodities, Z, to maximize the product of the differences between the utility level of each spouse, U_s , and the threat point or reservation utility level that each spouse could achieve outside the household, V_0^s, where $s = W, H$ indicates if s is the wife or the husband. The threat point is influenced by a vector of prices, p, which contains the price of time of each spouse, w_s, as well as influenced by spouses' unearned income that can be carried out of marriage, I_s, and situations, which are not easily monetized, that an individual would face outside the market, A_s, such as the marriage market.

Husbands' and wives' preferences for market goods and home-produced commodities may differ because husbands do not engage in home production as much as wives do. Making difficult for husbands to distinguish between market goods and home-produced commodities. The consumption of the i_{th} market good and home-produced commodity by the m_{th} household member are, X_{im} and Z_{im}, respectively. Household welfare is maximized subject to the full-time budget constraint (2) and the home-production function (3). The

full-income in the full-time budget constraint depends on the total time of the household members, T_m, the price of time of each household member, w_m, and the unearned income of each household member. Home-produced commodities are produced using household members' time, t_m, maid's services, S, and market goods and services, X, which include the production durable goods[3]. Therefore household members other than spouses contribute to the full-time income by bringing earnings to the household or by offering time in home-production but their consumption enters the problem through the utility function of the husband and the wife.

$$\max \prod_{s=H,W} [U^s(X, S, Z) - V_0^s(p, I_s, A_s)] \tag{1}$$

$$pX = \sum_m w_m T_m + I_m \tag{2}$$

$$Z = f(X, t_m, S) \tag{3}$$

Home-produced commodities can be substituted by market goods or services, such as the following: meals away from home, daycare, frozen food, and dry cleaners. Alternatively, a good can still be home produced by outsourcing household members' time for maids' services. In this case, maids' services and household members' time are substitute factors in home production that can be combined with production durable goods in the home-production function. The choice of outsource time on home production will depend on the husband's and the wife's preferences, the shadow price of the household members' time and the price of maids' services.

[3]Production durable goods include oven-stoves, refrigerators, washing machines, microwaves, freezers, vacuum cleaners, dishwashers and dryers.

There are production durable goods which cannot be directly substituted by the household members' time or maid's services, such as refrigerators, oven-stoves, and freezers. From this point, these three home production durable goods are called non-time saving durable goods. There are production durable goods for which the services can be replaced by the household members' time or maid's services. From this point, these home-production durable goods are called time-saving durable goods. Time-saving durable goods include durable goods that can be replaced by time in home production, such as washing machines, microwaves, vacuum cleaners, dishwashers and dryers. Indeed, there are five percent of the households[4] in the sample that don't have time-saving durable goods but have expenditures on maid's services.

The wife's decision of how many hours to offer in home-production depends on her shadow price of time. That is how much she would earn by doing market work. In that case, the higher is the wife's shadow price of time, the more likely the wife is to look for more time-efficient home-production or to outsource home-production. Increasing demand for market goods, time-saving durable goods, and maid's services. The effect on the demand for each of them will depend on her preferences. If the wife has strong preference for home-produced goods and services or perceive market goods as lower quality, demand for market goods would not increase in the same rate as time-saving durable goods and maid's services. The same argument holds if households perceive maid's services as close substitutes to the household members' time. If services of time-saving durable goods are perceived as lower quality than maid's services, an increasing in the wife's shadow price will increase the demand for maid's services.

[4]The are 928 households out of $19,662$. See Table 3.

3. The Empirical Specification

The choice between time-saving durable goods, X, and maid's services, S, is represented by their first order conditions. The first order conditions are expressed in terms of random marginal utility as specified by equations 4 below. These first order conditions are jointly estimated by a bivariate probit regression. The choice will depend on a set of spouses' bargaining power measures, BP, a set of households' demographic variables, D, a vector of prices, P, the household per capita income, M, and two measures of States' economic performances, C, i.e., the State's average income and its proportion of working women in a given cohort.

$$
\begin{aligned}
U_X &= \alpha_X BP + \beta_X D + \gamma_X P + \delta_X M + \theta_X C + \epsilon_X \\
U_S &= \alpha_S BP + \beta_S D + \gamma_S P + \delta_S M + \theta_S C + \epsilon_S
\end{aligned} \tag{4}
$$

The spouses' bargaining power measures are the sex ratio in a given cohort and State, which captures the marriage market, indicators of households in which only the wife and households in which only the husband makes expenditure decisions, and indicators of whether the husband and the wife have unearned income. The demographic variables are the wife's age, the difference between the husband's and the wife's age, a set of dummy variables for wife's education[5], an indicator if the wife has more schooling than the husband, an indicator if the husband has more schooling than the wife[6], and a set of indicators showing family composition, such as the following: the number of daughters and sons three years old and younger, four to six years old, seven to twelve years old, thirteen to sixteen

[5]The omitted category is at least some college education.

[6]Differences between the husband's and the wife's variables, such as age and education, are also used as measures of bargaining power to identify the sharing rule, such as Browning, Bourguignon, Chiappori, and Lechene (1994). However, in cross-sections the identification of the sharing rule requires an exclusive or assigned good as discussed in Bourguignon, Browning, and Chiappori (2006).

years old, and seventeen to nineteen years old, as well as the number of other relatives by gender fifty-one to sixty years old, sixty-one to seventy years old and seventy-five years old and older[7].

The vector of prices contains the price of time-saving durable goods, the price of an hour of maids' services, and the prices of complement and substitute goods, such as non-time-saving durable goods, entertainment durable goods[8], and electricity. Because the marriage market variable is the sex ratio across cohorts and States, its variation may be correlated with cohorts' and States' characteristics. Therefore, the two measures of States' economic performance, i.e., the State's average income and its proportion of working women in a given cohort, are added to the regression as control variables to guarantee the identification of the marriage market effect.

The error terms, ϵ_X and ϵ_S, contain unobserved households' characteristics, specifically, the wife's decision to offer time in market work. This information is not available in the data set that contains the expenditure on durable goods and maids' services. By omitting this decision from the set of estimating equations, the coefficients of the indicators of the wife's educational level are also capturing the shadow price of her time in home-production. In that case, the higher is the wife's educational level, the higher is her shadow price of time, and the more likely the wife is to look for more time-efficient home-production. Increasing demand for time-saving durable goods, for outsourced home-production, or increasing demand for maid's services for those home-produced goods and services that are not offered on the market[9].

[7]The omitted category is households that are composed only of husband and wife.

[8]Entertainment durable goods include the following: color TV, black and white TV, radio, sound system, VCR, CD player, DVD, computer, and satellite dish.

[9]In reality, demand for maids' services would also increase for goods and services that are available in the market if households' have strong preference for home-produced goods and services or perceive market goods as lower quality. In both case, market goods would not be substitutes for home-produced goods.

The differences in the impact of bargaining power and the presence of sons and daughters on the probability of having expenditure on time-saving durable goods and maid's services are tested following Thomas (1997) post-estimation teste. To perform the test, equations 4 are jointly estimated and it is tested if the difference of sons's and daughters' coefficients is statistically different between equations. Thomas (1997) reasoning for the test is similar to Lundberg, Pollak, and Wales (1997) reason to specify the dependent variable as the ratio of two dependent variables, robustness to measurement errors. If the variables that capture bargaining power or the presence of sons and daughters have measurement errors, then their impact will bias the coefficients in the same direction. For that reason, the test of the equality of the relative coefficients is performed to offset the measurement errors.

In the case of the impact of sons and daughters in the probability of having time-saving durable goods and maid's services, it is possible to test whether the difference in the impact of sons and daughters is due to parental preferences for sons over daughters or if is due to social roles assigned to teenager daughters. The test is performed by estimating the impact of sons and daughters broken by age groups. Babies and toddlers (children three years old and younger) cannot contribute to home production, but their presence increase demand for home-production goods and services. If the presence of babies and toddlers sons increase the demand for time-saving durable goods and maid's services more than the presence of babies and toddlers daughters, then more resources is employed in sons' care and it is considered evidence of parental preferences toward sons (Lundberg (2005a,b)). However, if the gender of babies and toddlers do not matter in the choice of home-production factors, then parents have no preferences for sons or daughters. But if the presence of teenagers daughters decrease demand for time-saving durable goods and maid's services more than the presence of teenager sons, despite the equality of babies and toddlers sons and daughters impact, then it is evidence of women specialization in home-production.

4. Data

Data set and Variables Construction

The main data set, *Pesquisa de Orçamento Familiares* (POF), provides information on the household's expenditure on maids' services, the ownership of durable goods, the year of last purchase, the price paid if the household bought the durable good during the survey year, the household's composition and state of residence, household members' income, age and educational level. The POF 2002/2003 survey is the most recent consumer expenditure survey available that is nationally representative.

The durable goods purchases are infrequent, and the survey follows households' purchases of durable goods for one year. Moreover the expenditure on durable goods depends not only on their purchase, but also, on the household's stock of durable goods. Therefore, the annual expenditure on home-production durable goods should be estimated as their rental equivalent value. To calculate these annual expenditure on home-production durable goods, this paper uses the information on the stock of durable goods, year of last purchase, current prices by region[10], and the real depreciation rate[11] in a depreciation decay model. Finally, the annual expenditure on home-production durable goods is obtained by multiplying the quantity of each good by its rental value and summing over all of the home-production durable goods owned by the household.

From the *Pesquisa Nacional Por Amostra de Domicílios* (PNAD), state- and region-

[10]This information is obtained as the average price paid by each type of home-production durable good per region of residence. Because of the small number of observations that include the purchase of certain durable goods in some states, especially the goods that have being recently introduced, the rental value was calculated by regions of Brazil.

[11]Fava and Arends-Kuenning (2008) estimates a real depreciation rate of approximately 15.6%. Where the real interest rate used is the average of the 'selic' interest rate over 1979 to 2003 discounted by the average inflation rate during the same period. Both data come from IPEA, www.ipeadata.com.

level information, such as the sex ratio in each State by cohort, the average income in a State, the proportion of working women in a State by cohort, and the price of an hour of maids' services are generated. These variables are merged to the main data set by State or region of residence. The sex ratio, i.e., the number of women to men, is used to capture the marriage market conditions. In the data sets used in this paper (POF and PNAD), State is the smallest region that can be identified and therefore these are the geographic units used to construct this variable[12].

In the construction of the marriage market variable the assumption that wife and husband can leave the actual marriage and remarry is made. Therefore, the marriage market variable is constructed as the ratio of women to men across cohorts and States of residence[13]. This variable is used in the regressions as a measure of women's bargaining power. According to the literature on marriage markets, the more scarce women are, the more likely they are to find a better match and to establish a higher bargaining power. Therefore, the definition of marriage market variable implies that the higher the marriage market variable, the lower the women's bargaining power.

The average income in a State and the proportion of working women in a given cohort in a State are used in the regressions to capture other factors that differ across States and affect expenditures on home-production durable goods and maids' services, as well as the wife's market working decision. Because the marriage market variable is a state-level variable and there exist differences among States in Brazil regarding development stage and wealth, the

[12]See Fossett and Kiecolt (1991), for a complete discussion of the considerations that must be taken to guarantee that the sex ratio is capturing the marriage market conditions. This paper recommended using the smallest relevant geographic unit to the analysis, but not so small that makes it ease to marry people from another region.

[13]See marital status statistics in Fava and Arends-Kuenning (2008) that justify this choice, which is based on a normal distribution in which about 60% of the wives' age range 5.5 years around the husbands' age.

regression must have these control variables to capture these differences. Otherwise, the marriage market variable would be capturing these differences as well. Finally, the price of electricity comes from the (Agência Nacional de Enegia Elétrica) ANEEL and it is the average price for 2002 and 2003.

Descriptive Statistics

The sample is composed of 19,662 households in which both husband and wife are present; one of the spouses is the head of the family; they report their family as an independent consumption unit[14]; and both spouses are 20 to 50 years old. The sample is restricted to this age group for two main reasons. The first and most important is due to the problem that different surviving ages between men and women may cause biased measures of bargaining power from the marriage market variable. The second reason is due to the interest in the impact of children and elderly relatives on the probability of having these home-production factors, and the 20 to 50 years old age group is more likely to live with children and elderly relatives. In Tables 2 and 3, the average expenditures on home-production durable goods, maids' services and time-saving home-production durable goods are presented. There are 560 households that have zero home-production durable goods, i.e., do not have even a refrigerator or an oven-stove; however nine of them have expenditures on maids' services, and less than 30% of the sample have expenditures on both home-production durable goods and maids' services. More than half of the sample, 11,610 households, do not have time-saving home-production durable goods, i.e., do not have at least a washing machine in their household, however 928 of them have expenditure on maid's services, and less than 10% of the sample have expenditures on both time-saving durable goods and maid's services.

Households that have expenditure on maids' services spend more on home-production

[14]This information is relevant when there are more than one family living in the same house but these families make independent consumption decisions and do not share income.

durable goods and time-saving durable goods. Similarly, households that have expenditure on home-production durable goods and time-saving durable goods spend more on maids' services. The average annual expenditure on all home-production durable goods are R\$169.91 and R\$294.22, respectively, for households that do not have and have expenditure on maid's services. Households that have time-saving durable goods have an average annual expenditure on these goods that is about half of the average expenditure on all home-production durable goods. The average annual expenditure on maids' services for households that do not have home-production durable goods is almost the average price of a non-time-saving home-production durable good. For those households that do not have time-saving durable goods, the average annual expenditure on maids' services is more than twice the average price of a time-saving durable good. Households that have expenditure on both home-production durable goods and maids' services spend more than twice as much on maids' services than households that only have expenditure on maids' services. The same pattern occurs regarding expenditure on maid's services between households that have expenditure on both, maids' services and time-saving durable goods, and households that only have expenditure on maids' services.

In Table 4, the descriptive statistics are reported. The average household per capita monthly income is R\$418.00[15]. Most of the households are composed of only one family, but there are a few households with two or three families sharing a house. The average household size is about four members. Husbands are on average 3 years older than wives. In 30% of the households, the wife has a higher educational level than the husband and, in 20% of the households, the husband has a higher educational level than the wife, leaving 50% of the households in the sample in which spouses have the same educational level. The dummies for educational level indicate that there are no strong differences between the distribution of men and women's education. The majority of wives and husbands,

[15]This value is about U\$138.64 using the average exchange rate for 2002 and 2003.

about 60%, have some primary or middle school, 25% of the wives and 21% of husbands have some high school; seven percent of them have some college education; and ten percent of husbands and seven percent of wives do not have formal education.

Unearned income includes income from government welfare programs; transfers from other households, such as child support, parental transfer and inheritance; returns from savings and other financial assets; and exogenous income, such as money from gambling. About 16% of the husbands and wives in the sample report receiving some unearned income, and 12% of the wives and 6% of the husbands in the sample report receiving some transfers from other households. The husband's unearned income, $R\$4,224.00$, is more than twice the wife's unearned income, $R\$1,792.00$. Transfers from other households received by wife is about 70% of the transfers from other households received by husband, $R\$1,961.00$.

At the time of interview, all adults living in the household are asked if they make expenditure decisions in order to determine their eligibility for the personal expenditure survey. This information is used to construct an indicator of households in which only the wife makes expenditure decisions and an indicator of households in which only the husband makes expenditure decisions. In about 82% of the households, both spouses make expenditure decisions. The households in which only the husband makes expenditure decisions are 16% of the total, and in only two percent of the households only the wife makes expenditure decisions. These numbers indicate that it is common for both spouses to report making decisions about personal expenditure.

Table 5 shows the sample distribution among the covariates and the percentage of households that have some expenditure and their average expenditure on home-production and time-saving durable goods, as well as on maids' services. The majority of the sample, 37%, resides in the northeast region. The remainder of the sample is distributed about equally among the other regions. Households that reside in the south region are more likely to have home-production durable goods, especially time-saving durable goods, at 78%,

than any other region. Although the likelihood of having home-production durable goods is similar among the north and northeast regions at 95%, the percentage of households in the northeast region that have time-saving durable goods is less than half the percentage of such households in the north region, 13% and 34% respectively. The percentage of households in the southeast region that have time-saving durable goods is more than three times higher, 46%, than the percentage of households in the northeast region who own such goods. However, the percentage of households that have expenditure on maid's services is similar across regions: 16% in the southeast region, 15% in the north and south region, 14% in the central west and 13% in the northeast.

As income increases the percentage of households that have expenditure on home-production factors increase. Expenditure on maid's services is more common with 45% for the 20% richest households in the sample. Time-saving durable goods are more common among the upper-middle and richest households in the sample. For those households where the wife has a higher shadow price of time, i.e., the wife has some college, the expenditures on time-saving durable goods and maid's services are more frequent, 43% and 74% reports some spending respectively, and higher than those households in which the wife has some high school. As the wife's shadow price of time decreases, the households are less likely to have expenditure on time-saving durable goods and maid's services, their expenditure is, as well, lower. Households in which the wife has a higher educational level than the husband are slightly less likely to have time-saving durable goods than households in which the husband has a higher than or equal educational level to the wife. However, households in which husband and wife have the same educational level have higher, and slightly more frequent, expenditure on maid's services than households in which spouses have different educational levels. Moreover, if the wife is older than the husband, the household is slightly less likely to have expenditures and spends slightly less on time-saving durable goods and maid's services.

In only 18% of the households, the wife belongs to a cohort and a State that have a lower number of women to men. In cohorts and States that have lower number of women than men, i.e., have a sex ratio lower than one, the percentage of households that have expenditure on home-production durable goods and maid's services is about the same compared to households that belong to cohorts with sex ratios bigger than or equal to one. If the sex ratio is favorable to women, the percentage of households that have expenditure on time-saving durable goods is slightly bigger than the percentage of households that face a sex ratio bigger than or equal to one, 42% and 37%, respectively. However, households that have a sex ratio favorable to women have average expenditures that are about 20% lower than the households that face a sex ratio bigger than or equal to one.

5. What Determines The Choice of Household-Production Factors?

The results in Table 6 identify the elements that influence whether or not households make use of time-saving durable goods or maid's services in home production. The quintile of households' income is used instead of the households' income because there is not sufficient variation in the dependent variables for households where the income is low. The likelihood ratio chi-square of 9323.56 with a p-value of 0.0001 implies that the model as a whole is statistically significant, as compared to a model with no predictors. Moreover, there is a statistically significant covariation[16] of the error terms of the probability of having both home-production factors. Therefore, the decisions about expenditure on these two home-production factors is jointly determined and must be analyzed using a bivariate probit regression.

In summary, it is found that home production in Brazilian households is more time-intensive (or labor-intensive) than good-intensive (or capital-intensive). There is evidence

[16]The test of statistic significance of the covariation of the error terms, ρ, has a $\chi^2_{(1)}$ statistic equals to 65.2 and a 1% probability.

that maid's services are substitute factors for time-saving durable goods, but there is no evidence that time-saving durable goods are substitute factors for maid's services. Moreover, the other household's members that offer time in home production besides the couple of reference are females, older daughters and younger other female relatives. When they are present in the household, the probability of hiring maids' services is lower.

Households are less likely to have expenditures on time-saving durable goods if the wife belongs to a cohort and State that has an excess of women to men. That is, if the marriage market is favorable to women, then households are more likely to have time-saving durable goods. However, if the wife belongs to a cohort and State that has an excess of women to men, the household's probability of having expenditure on maid's services is equal to the probability of a household in which wife faces a higher bargaining power. Households are less likely to have expenditure on maid's services if only the husband makes expenditure decisions. However, households in which only the husband makes expenditure decisions are more likely to have expenditures on maid's substitute durable goods. Households in which the wife has unearned income are 13% less likely to have expenditures on time-saving durable goods, but are as likely as households in which the wife does not have unearned income to hire maid's services. Households in which the husband has unearned income are 8% and 10% more likely to have expenditures on time-saving durable goods and maid's services, respectively.

The older the wife the more likely is the household to have expenditure on these two home-production factors. Moreover, households have about one percent higher probability to have expenditure in any of these two home-production factors for each additional year the husband is older than the wife. The higher the wife's educational level, the higher is the probability that the household spends on these two home-production factors. However, households in which the wife has higher time shadow price, i.e., the wife has a higher educational level than the husband, the household's likelihood to have expenditures on both

home-production factors is lower. Moreover, the household's probability of having expenditures in these home-production factors is higher if the husband has higher educational level than the wife, i.e., if the husband has higher time shadow price.

Family composition affects the probability of having expenditure for these home-production factors. If younger children are present in the household, it is more likely to have expenditure on both home-production factors. This is true for sons and daughters twelve years older and younger. However, households that have daughters thirteen to sixteen years old are as likely as childless households to have expenditure on maid's services, but more likely to have expenditures on time-saving durable goods. As daughters get older, seventeen to nineteen years old, households are less likely to have expenditure on maid's services, but equally likely as a childless household to have expenditures on time-saving durable goods. The presence of sons increases the household's probability of having expenditure on both home-production factors, except for the effect of the presence of sons seventeen to nineteen years old on the expenditure for maid's services. These results are evidence that daughters' time substitutes for maid's services in home-production, but sons' time does not.

If other female relatives, such as grandmothers, are present in the household, the household's probability of having maid's services is lower as long as they are in their productive age, 51 to 60 years old, and the household's probability of having maid's services is higher if other female relatives' age ranges from 61 to 70 years old. However, the presence of other female relatives do not affect the probability of having expenditure on maid's substitute durable goods. Moreover, the presence of other male relatives does not have any effect on the household's probability of having expenditure on any of these two factors in home-production. These results are evidence that other female relatives' time, like daughters' time, substitutes for maid's services in home-production, but other male relatives' time does not.

If the wife belongs to a cohort in a State that has a higher proportion of working women,

the household is less likely to have time-saving durable goods, but equally likely to have expenditure on maid's services. This result, as well as the impact of daughters and other female relatives in the choice of home-production factors, suggests that home-production is more time-intensive than capital-intensive in Brazilian households. Households that belong to a higher income quintile are more likely to have expenditure on both home-production factors.

Households that face higher prices for maid's services are more likely to have time-saving durable goods and less likely to have expenditure on maid's services. The higher the price of time-saving durable goods, the household is less likely to have time-saving durable goods, but the household expenditure on maid's services is not sensitive to the price of time-saving durable goods. The prices of non-time-saving production and entertainment durable goods have no effect on the household's probability of having maid's services. But, the price of non-time-saving production durable goods increases the household's probability of having expenditure on time-saving durable goods, while the price of entertainment durable goods decreases the probability of having time-saving durable goods. The price of electricity increases the household's probability to have time-saving durable goods[17], but does not have an impact on the household's probability of hiring maid's services.

6. Differences Among Sons And Daughters

This section discusses the test for differences in the impact of sons and daughter on the probability of having expenditure on time-saving durable goods and maid's services. The results are reported on Table 7. The test follows Thomas (1997), where the equations are jointly estimated and post-estimation tests are performed to test the equality of the

[17]This data set was collected after the national blackout of 2001, which had a higher effect on the south and southeast region, the regions with higher percentage of household that have some durable goods. After the first blackouts the price of electricity was increased in regions where demand was higher than supply.

coefficients between equations, between gender, and the difference of the tow previous differences. Thomas (1997) reasoning to perform this test is not very different from the Lundberg, Pollak, and Wales (1997) test since this last test is performed on the difference between gender on the coefficients of the ratio of the dependent variables. Indeed, testing the equality of the relative coefficient between genders is more robust because if there are measurement errors, their impact will be offset by the relative measure since measurement errors bias the parameters in the same direction. However, the results for the equality of parameters between equations and the results for the equality of parameters between gender, like Thomas (1990), is also presented and discussed.

The only age group for which the difference-indifference test rejects the equality of daughters' and sons' impact on the probability of having expenditure on time-saving durable goods and maid's services is thirteen to sixteen years old. Daughters decrease the relative probability of having maid's services and sons have equal impact on the probability of having expenditure on time-saving durable goods and maid's services. Moreover, sons have positive impact on the probability of having expenditure on time-saving durable goods and maid's services, and daughters have positive impact on the probability of having expenditure on time-saving durable goods and negative impact on the probability of having expenditure on maid's services. This is evidence that sons impact on the probability of having expenditure on time-saving durable goods and maid's services is due to increasing demand for home production, while daughters impact on the probability of having expenditure on time-saving durable goods and maid's services is evidence that daughters are substitutes for maid's services in home production. It is also important to point out that this age group is not of legal working age, but are at the same time able to perform home-production task.

For the age groups that are not of schooling age, and demand more time-intensive home production, three years old and younger and four to six years old, the difference-

indifference test does not reject the equality of sons and daughters for the relative impact on the probability of having expenditure on time-saving durable goods and maid's services. However, there is evidence that children of both genders six years old and younger increases the probability of having maid's services. Difference between genders in this age group is due to differences on parental preferences for sons and daughters. There is no evidence of difference of parental preferences for sons and daughters in this age group.

Children seven to twelve years old have no difference on their impact on the probability of having expenditure on time-saving durable goods and maid's services, independently of their gender. Sons and daughters increase the the probability of having expenditure on time-saving durable goods and maid's services equally. As before, there is no evidence of difference on parental preferences for sons and daughters in this age group. For the older children, seventeen to nineteen years old, the test of the equality of sons and daughters impact on the relative probability of having expenditure on time-saving durable goods and maid's services is not rejected. However, daughters decrease the relative probability of having expenditure on maid's services, while there is no difference in the impact of sons and daughters on the probability of having expenditure on time-saving durable goods. However, there is evidence that daughters are substitutes for maid's services in home production.

7. Bargaining Power Variables' Results

This section discusses the post-estimation tests like Thomas (1997, 1990) for differences in the impact of bargaining power variables on the probability of having expenditure on time-saving durable goods and maid's services. The results are reported in Table 8. The test of the bargaining variables rejects the hypothesis of equality of the coefficients between genders. However, there is a different conclusion regarding wives' preferences for time-saving durable goods and maid's services. The test of the marriage market variable implies wives have preferences for time-saving durable goods. Remember that the lower is the

number of women to men, the higher is the women's bargaining power.

There is no evidence of differences in wives' preferences for time-saving durable goods and maid's services from the indicator of households in which only wife makes expenditure decisions, but the indicator of households in which only the husband makes expenditure decisions indicates that husbands prefer time-saving durable goods. The indicator of household in which only the husband makes expenditure decisions decreases the relative probability of having maid's services. Moreover, the test of equality of impact of the indicator of household in which only the husband makes expenditure decisions and indicator of household in which only the wife makes expenditure decisions on the probability of having maid's services is rejected, indicating that households in which the wife makes expenditure decisions have higher relative probability of having maid's services than households in which only the husband makes expenditure decisions. However, the probability of having time-saving durable goods is equal between these households.

Households in which the wife has unearned income have higher relative probability of having maid's services. However, households in which the husband has unearned income have equal probabilities of having time-saving durable goods and maid's services. The test of equality of the indicators of husband having unearned income and wife having unearned income on the probability of having time-saving durable goods is rejected; households in which wives have unearned income are less likely to have time-saving durable goods. In households in which the wife has higher schooling than husband, the relative probability of having maid's services is higher.

8. Differences in the Determinants of Household-Production Factors Among Income Groups

The results in Table 9 are the estimates of the bivariate probit for each income group. The bivariate probit for the lower income group is not estimated because there is not sufficient

variation in the dependent variables in this income group. For the same reason, quintile of households' income were used in the previous regressions instead of households' per capita income; by excluding the lower income quintile it is possible to use households' per capita income in the bivariate probit estimation. For all the income groups the likelihood ratio implies that the model as a whole is statistically significant, as compared to a model with no predictors.

However, the covariation of the error terms of the probability of having both home-production factors, ρ, is significant only for the middle and higher income groups. Therefore, the decisions about expenditure on these two home-production factors for the middle and higher income groups is jointly determined and must be analyzed using a bivariate probit regression, but estimating separated probit for the lower middle and upper middle income groups does not generate biased estimates. In the case of the middle and higher income groups, the ρ is positive and significant, implying that unobserved characteristics[18] that increases the households' probability of having time-saving durable goods also increases their probability of having maid's services for the middle and higher income groups but not to the low middle and upper middle income groups.

The direction of the impact of the marriage market variable is equal to the previous results. However, the effect is stronger, in terms of magnitude, the lower the income groups and not significant for the higher income group. An improvement on the marriage market for women increases the probability of having time-savers durable goods by 115% for the lower middle income households, 70% for the middle income households, and 67% for the upper middle income households. The indicator of households in which only the wife makes expenditure decisions is significant only for the impact of the probability of having expenditure on time-saving durable goods for the lower middle income group. For the

[18]The unobserved characteristics are likely to be related to the wife's decision to offer time in the labor market since this information is not available in this sample.

lower middle income households, the households in which wife makes expenditure decisions are 31% more likely to have time-savers durable goods than households in which both spouses make expenditure decisions in this income group. Households in which only the husband makes expenditure decisions are less likely to have expenditure on maid's services than households in which both spouses make expenditure decisions for any income group. Households in which only the husband makes expenditure decisions have a 28% for the lower middle income households and 18% for the higher income households lower probability to have expenditure on maid's services. However, for the lower middle and middle income group these households have higher probability of having expenditures on time-saving durable goods than households in these income groups in which both spouses make expenditure decisions, these probabilities are 18% lower.

The effect of the indicator of wife having unearned income is significant only for the middle and high income groups, and as in the previous results it decreases the probability of having time-saving durable goods. Recall that the estimation uses as control the households' per capita income in which unearned income is part of it. Therefore, the interpretation of the indicator of wife having unearned income is relative to the impact of earnings, since total income increases the probability of having both expenditures on home production factors. In this sense, wives' unearned income for the middle and high income groups is less likely to be spent on time-saving durable goods than earnings, for the probability of having expenditure on maid's services there is no difference on the impact of wife's unearned income and earnings. In the previous results, husband's unearned income increases the probability of having both home production factors, but in the results by income group and using households' per capita income, its effect is positive and significant only for the high income group, indicating that husband's unearned income is more likely to be spent on time-saving durable goods.

The results of the indicator of households in which the wife has higher schooling than

the husband is similar to the previous results, but its impact on the probability of having expenditure on maid's services is significant only for the higher income group. The results of the indicator of households in which the husband has higher schooling than the wife are significant only for the probability of having time-saving durable goods, and for the lower middle and high income groups. Although the results seem counterintuitive in terms of spouses' bargaining power, it is consistent with the impact of increasing wife's comparative advantage in market work on household time allocation, see Becker (1965). Wives that have higher comparative advantage in market work are more likely to substitute home production for market goods, and wives that have lower comparative advantage in market work specialize in home production[19].

The results of the impact of children's presence on the household decisions are similar to the previous results but the intensity of their impact is stronger for higher income groups. The presence of older relatives has no significant effect on the probability of time-saving durable goods as was found for the previous results. We conclude that these variables were capturing income effects in the previous results. In contrast with the previous results, the proportion of working women has no significant impact on the probability of having time-saving durable goods once the households' per capita income is used as control variable. The average State's income, however, has a positive and significant effect on the probability of having time-saving durable goods for the lower middle income group.

The results for prices hold as before in terms of the direction of their effects and significance. There is some evidence that the high income group's probability of having expenditure on maid's services is less sensitive to increases in the price of maid's services than in the lower middle group, and that the high income group is more likely to substitute maid's services for time-saving durable goods when the price of maid's services increases. The coefficients of household per capita income indicate that for the lower middle income

[19]See the theory of the intrahousehold division of labor in Becker (2002).

group, time-saving durable goods and maid's services are likely to be luxury goods; the coefficients are 4.1 and 9.5, respectively, while for the high income group, these goods are more likely to be necessity goods, the coefficients are 0.25 and 0.22, respectively.

9. Conclusion

In studying the relationship between maid's services and household-production durable goods and their determinants, this paper found that maid's services are substitute factors for time-saving durable goods, but there is no evidence that maid's substitute durable goods are substitute factors for maid's services. Furthermore, the probability to have expenditure on maids' services increases with the wife's educational level for all educational level. However, Cortes and Tessada (2007) found that only having a graduate degree has significant effect on expenditure on housekeeping's services in U.S. households.

The test of bargaining power indicates that the expenditure on home-production factors is an outcome of a bargaining process. However, the conclusions regarding wives' preferences are ambiguous. While the impact of the marriage market variable is evidence that wives' prefer time-saving durable goods, households in which the wife makes expenditure decisions have higher relative probability of having maids' services than households in which only the husband makes expenditure decisions, and households in which wives have unearned income are less likely to have time-saving durable goods.

In households in which the wife has higher schooling than husband, the relative probability of having maid's services is higher. The results of the difference of husbands' and wives' education are consistent with the intrahousehold time allocation, where wives that have higher comparative advantage in market work are more likely to substitute market goods for home production. Wives that have lower comparative advantage in market work specialize in home production, demanding more time-saving durable goods.

The presence of children that are not of school age, and therefore demand more time-

intensive home production, six years old and younger, increases the probability of having maid's services equally for sons and daughters. This result is surprising when compared to recent findings for U.S. on the different effect of sons and daughters on mothers' and father's time allocation to market and household-production hours. Lundberg and Rose (2002) found a greater increase in men's labor supply and wage rates in response to the births of sons than to the births of daughters. They interpret this as evidence of fathers' preferences for sons. Moreover, Lundberg (2005a) found that children's genders have different impact on the labor supply of men and women and their intrahousehold division of labor, where highly educated parents devote more childcare time to young sons.

However, sons and daughters thirteen to sixteen years old have different impact on the probability of having expenditure on time-saving durable goods and maids' services. Daughters decrease the relative probability of having maids' services and sons increase the probability of having expenditure on time-saving durable goods and maid's services. For the older children, seventeen to nineteen years old, daughters decrease the relative probability of having expenditure on maid's services, while there is no difference in the impact of sons and daughters on the probability of having expenditure on time-saving durable goods. This is evidence of that daughters' time substitutes wives's and maid's services in home-production. This is consistent with Lundberg (2005b) argument that some gender differences are result of household constraints rather than preferences.

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Table 1: Durable Goods Ownership by Income.

	5 % poorest	10 % poorest	20 % poorest	20 % richest	10 % richest	5 % richest
Production:						
has stove-oven	79.67	83.53	88.00	99.54	99.49	99.19
has refrigerator	38.41	41.69	51.55	97.71	98.02	98.37
has freezer	2.54	2.85	3.38	36.71	43.98	51.27
has washing machine	6.40	6.20	8.77	67.39	73.72	78.33
has dish washer	0.20	0.10	0.10	8.16	12.66	17.80
has vacuum cleaner	0.51	0.31	0.18	22.27	28.93	35.91
has dryer	0.20	0.20	0.31	11.34	14.69	16.89
has microwave	0.30	0.25	0.41	37.77	48.60	59.51
Entertainment:						
has color TV	41.97	47.43	54.88	97.18	98.32	98.78
has black and white TV	19.31	19.78	17.59	4.12	4.02	4.27
has radio	20.02	20.54	19.90	33.81	37.98	43.03
has sound system	1.42	1.32	1.50	7.24	9.20	10.17
has computer	0.10	0.10	0.13	37.77	51.55	61.14
has VCR	1.63	1.53	2.95	62.66	70.77	76.09
has satellite dish	11.08	11.69	13.88	29.92	29.44	29.09
has CD	1.63	1.53	1.58	10.42	12.00	13.12
has DVD	0.00	0.05	0.05	9.89	15.81	23.09
Housekeeper:						
has maid	0.41	0.31	0.53	30.22	41.84	52.29
has cleaning service	0.20	0.20	0.15	11.29	15.00	18.01
has laundress	0.41	0.31	0.25	1.91	1.37	1.02
has someone to do iron clothes	0.00	0.00	0.00	2.21	3.10	3.46
has cook	0.00	0.05	0.05	0.31	0.56	0.81

The 5% and 10% poorest live with less than $1/day/capita. The 20% poorest live with less than $2/day/capita.
The 20% richest live with more than $5/day/capita. The 10% richest live with more than $10/day/capita.
The 5% richest live with more than $15/day/capita.

Table 2: Average Expenditure on Production Durable Goods and Maid's Services Brazil, 2002-2003.

		Expenditure On	
Have Expenditures On	Number of Households	Production Durable Goods	Maid's Services
Only Maid's Services	9		605.12
			(703.83)
Only Durable Goods	16,860	169.91	
		(112.45)	
Both	2,793	294.22	1,457.35
		(148.38)	(2,314.42)

Standard deviations in parentheses.
There are 19,662 households on the sample.
There are 551 households have no expenditures on both.
Production durable goods includes stove-oven, refrigerator, washing machine, microwave, freezer, vacuum cleaner, dishwasher and dryer.

Table 3: Average Expenditure on Maid's Substitute Production Durable Goods and Maid's Services Brazil, 2002-2003.

Have Expenditures On	Number of Households	Production Durable Goods	Maid's Services
Only Maid's Services	928		806.90
			(1,116.91)
Only Durable Goods	5,618	83.17	
		(46.38)	
Both	1,874	124.12	1,775.36
		(74.15)	(2,657.48)

Standard deviations in parentheses.
There are 19,662 households on the sample.
There are 11,242 households have no expenditure on both
Maid's substitute production durable goods includes washing machine, microwave, vacuum cleaner, dishwasher and dryer.

Table 4: Descriptive Statistics Brazil, 2002-2003.

Variable	Mean	Std. Dev.
Dependent Variables		
Relative Ownership Indicator	1.31	(1.42)
Difference in Ownership	-0.26	(1.57)
Rental Value Share	1.29	(2.05)
Bargaining Power Variables		
Marriage Market, same cohort	1.07	(0.10)
Marriage Market, wife in younger cohort	1.21	(0.13)
Wife's Unearned Income (in 1000)	1.79	(10.78)
Husband's Unearned Income (in 1000)	4.22	(15.50)
Transfers wife receives from other HH (in 1000)	1.34	(11.18)
Transfers Husband receive from other HH (in 1000)	1.96	(11.77)
Both make expenditure decisions	0.82	(0.39)
Only wife makes expenditure decisions	0.02	(0.14)
Only husband makes expenditure decisions	0.16	(0.37)
Wife has more education	0.42	(0.49)
Husband has more education	0.31	(0.46)
Wife's and Husband's Variables:		
Wife's Age	33.45	(7.59)
Wife has no schooling	0.07	(0.26)
Wife has primary education	0.32	(0.47)
Wife has secondary education	0.29	(0.45)
Wife has high school	0.25	(0.43)
Wife has college or more	0.07	(0.26)
Husband's Age	36.53	(7.55)
Husband has no schooling	0.10	(0.31)
Husband has primary education	0.35	(0.48)
Husband has secondary education	0.27	(0.44)
Husband has high school	0.21	(0.41)
Husband has college or more	0.07	(0.25)
Household Variables		
Number of Families in HH	1.00	(0.06)
Number of People in Household	4.23	(1.56)
Per capita total monthly income	418.01	(781.53)
Average State Income (in 1000)	0.89	(0.28)
Prices		
Rental Value of Entertainment Durable Goods	9.31	(1.02)
Rental Value of Production Durable Goods	4.59	(0.42)
Price of a hour of maid's services	0.93	(0.25)
Price of electricity (kwatts)	0.21	(0.02)
Number of Observations	19662	

Source: POF and PNAD.

Table 5: Descriptive Statistics and Average Expenditures Brazil, 2002-2003.

Region	North	Northeast	Southeast	South	Central West
Percent of Sample	14.68	36.79	17.49	13.48	17.57
Production Durable Goods					
Percentage of Households	95.18	95.02	98.95	99.92	99.33
Average Expenditure	164.96	124.37	222.72	297.56	215.41
Standard Deviation	(101.94)	(89.35)	(124.68)	(140.84)	(118.31)
Maid's Substitute Durable Goods					
Percentage of Households	33.75	12.87	45.96	77.74	56.28
Average Expenditure	61.19	84.41	111.44	115.12	76.41
Standard Deviation	(31.78)	(39.06)	(56.72)	(68.05)	(48.42)
Maid's Services					
Percentage of Households	14.73	13.06	16.11	14.91	13.98
Average Expenditure	1419.14	1142.22	1728.63	1764.06	1529.66
Standard Deviation	(2872.31)	(1816.69)	(1784.84)	(2855.16)	(2578.22)

Per Capita Income	20 % poorest	20 % low middle	20 % middle	20 % upper middle	20 % richest
Production Durable Goods					
Percentage of Households	89.32	97.51	99.36	99.72	99.85
Average Expenditure	86.36	133.93	177.71	222.98	307.45
Standard Deviation	(70.51)	(83.59)	(93.05)	(106.12)	(136.94)
Maid's Substitute Durable Goods					
Percentage of Households	9.15	20.73	35.11	50.08	75.38
Average Expenditure	58.72	63.63	71.99	86.91	120.25
Standard Deviation	(25.30)	(22.95)	(33.44)	(45.53)	(69.75)
Maid's Services					
Percentage of Households	1.14	3.28	7.04	15.28	44.51
Average Expenditure	738.93	384.09	656.83	982.34	1840.40
Standard Deviation	(2107.32)	(560.78)	(957.70)	(2186.52)	(2492.64)

Wife's Educational Level	No Schooling	Primary School	Middle School	High School	College or More
Percent of Sample	7.21	32.01	28.53	24.77	7.48
Production Durable Goods					
Percentage of Households	88.43	94.79	98.88	99.90	100.00
Average Expenditure	109.56	142.71	183.50	226.28	329.89
Standard Deviation	(84.92)	(107.31)	(110.99)	(118.65)	(150.34)
Maid's Substitute Durable Goods					
Percentage of Households	14.68	23.57	38.20	51.59	77.63
Average Expenditure	68.08	74.16	82.21	96.24	138.17
Standard Deviation	(32.13)	(36.00)	(44.57)	(55.19)	(80.54)
Maid's Services					
Percentage of Households	1.91	3.34	8.56	23.47	64.04
Average Expenditure	741.37	752.08	890.81	1258.81	2156.55
Standard Deviation	(849.53)	(1643.22)	(1377.64)	(2337.82)	(2618.98)

Who has higher educational level?	wife	same	husband
Percent of Sample	29.82	50.29	19.89
Production Durable Goods			
Percentage of Households	97.44	96.62	98.06
Average Expenditure	176.59	193.05	192.83
Standard Deviation	(116.04)	(133.25)	(121.86)
Maid's Substitute Durable Goods			

Continued on next page

Table 5:Descriptive Statistics and Average Expenditures Brazil, 2002-2003. – continued from previous page

Percentage of Households	33.85	39.41	41.20
Average Expenditure	86.66	97.56	91.72
Standard Deviation	(49.54)	(62.64)	(52.40)
Maid's Services			
Percentage of Households	13.83	15.06	12.84
Average Expenditure	1220.06	1657.96	1230.38
Standard Deviation	(1693.46)	(2777.68)	(1434.50)

Who belongs to a older cohort?	wife	same	husband
Percent of Sample	12.67	33.92	53.41
Production Durable Goods			
Percentage of Households	96.63	97.48	97.07
Average Expenditure	179.79	192.27	187.37
Standard Deviation	(120.15)	(129.86)	(125.26)
Maid's Substitute Durable Goods			
Percentage of Households	36.29	38.95	38.01
Average Expenditure	89.42	97.61	91.59
Standard Deviation	(52.43)	(59.75)	(56.88)
Maid's Services			
Percentage of Households	13.69	14.78	14.05
Average Expenditure	1375.42	1499.02	1443.24
Standard Deviation	(2685.18)	(2032.71)	(2392.94)

Marriage Market	sex ratio ≥ 1	sex ratio < 1
Percent of Sample	82.13	17.87
Production Durable Goods		
Percentage of Households	97.13	97.24
Average Expenditure	187.76	189.55
Standard Deviation	(127.15)	(122.14)
Maid's Substitute Durable Goods		
Percentage of Households	37.30	41.83
Average Expenditure	96.46	80.94
Standard Deviation	(59.20)	(47.74)
Maid's Services		
Percentage of Households	14.32	13.94
Average Expenditure	1462.46	1417.59
Standard Deviation	(2242.28)	(2615.77)

Has Daughter	0-3 years old	4-6 years old	7-12 years old	12-15 years old	16-19 years old
Percent of Sample	16.44	14.87	26.81	15.49	7.49
Production Durable Goods					
Percentage of Households	94.37	94.80	96.11	96.29	97.28
Average Expenditure	154.67	158.91	178.51	191.58	206.72
Standard Deviation	(112.84)	(117.94)	(125.96)	(130.41)	(136.63)
Maid's Substitute Durable Goods					
Percentage of Households	30.48	30.40	35.81	36.93	38.63
Average Expenditure	84.82	87.69	90.74	92.67	99.98
Standard Deviation	(50.76)	(57.18)	(55.43)	(57.81)	(64.11)
Maid's Services					
Percentage of Households	13.46	11.08	12.08	11.13	11.68
Average Expenditure	1150.36	1311.81	1512.75	1803.85	1745.72
Standard Deviation	(1394.90)	(1739.04)	(2447.26)	(2842.86)	(1886.80)

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Table 5:Descriptive Statistics and Average Expenditures Brazil, 2002-2003. – continued from previous page

Has Son	0-3 years old	4-6 years old	7-12 years old	12-15 years old	16-19 years old
Percent of Sample	17.39	15.7	28.07	17.08	9.28
Production Durable Goods					
Percentage of Households	95.09	95.24	96.21	96.13	96.93
Average Expenditure	154.86	160.31	178.31	188.88	201.37
Standard Deviation	117.82	120.21	123.68	129.76	130.66
Maid's Substitute Durable Goods					
Percentage of Households	29.60	31.85	35.67	36.60	40.49
Average Expenditure	88.39	86.85	89.54	93.99	92.44
Standard Deviation	52.69	54.83	54.74	56.29	55.23
Maid's Services					
Percentage of Households	12.87	12.31	12.48	12.98	12.93
Average Expenditure	1320.14	1495.15	1655.68	1715.74	1663.21
Standard Deviation	1826.73	1825.77	2931.93	3566.27	3152.17

Who has unearned income	none	wife	husband	both
Percent of Sample	70.62	13.67	13.23	2.48
Production Durable Goods				
Percentage of Households	97.32	95.42	98.00	97.34
Average Expenditure	188.43	150.86	218.28	217.01
Standard Deviation	121.66	114.24	143.59	160.96
Maid's Substitute Durable Goods				
Percentage of Households	38.90	24.60	46.83	43.44
Average Expenditure	89.64	90.29	106.63	123.36
Standard Deviation	52.50	56.87	70.46	74.99
Maid's Services				
Percentage of Households	13.32	11.80	19.45	26.43
Average Expenditure	1389.84	1386.57	1632.98	1851.08
Standard Deviation	2356.58	1607.86	2581.64	1914.83

Who makes expenditure decisions	both	wife	husband
Percent of Sample	81.95	2.12	15.93
Production Durable Goods			
Percentage of Households	97.77	98.32	93.84
Average Expenditure	195.43	181.19	149.64
Standard Deviation	127.40	110.96	114.68
Maid's Substitute Durable Goods			
Percentage of Households	39.79	39.09	29.31
Average Expenditure	96.01	83.29	77.06
Standard Deviation	58.71	48.20	46.18
Maid's Services			
Percentage of Households	15.98	10.79	5.81
Average Expenditure	1457.20	1867.43	1315.99
Standard Deviation	2329.44	3398.54	1627.34

Percentage of working women	25%	50%	75%	100%
Percent of Sample	0.14	7.48	90.38	2
Production Durable Goods				
Percentage of Households	96.43	96.60	97.27	93.89
Average Expenditure	186.70	142.02	191.13	222.56
Standard Deviation	100.67	102.46	126.88	142.72
Maid's Substitute Durable Goods				
Percentage of Households	71.43	27.28	38.87	41.73

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Table 5:Descriptive Statistics and Average Expenditures Brazil, 2002-2003. – continued from previous page

Average Expenditure	56.58	69.98	94.41	113.21
Standard Deviation	24.45	41.93	57.46	74.20
Maid's Services				
Percentage of Households	10.71	9.66	14.61	15.27
Average Expenditure	348.00	1293.14	1456.82	1796.39
Standard Deviation	303.40	2389.98	2303.22	2520.32

Table 6: Bivariate Probit Estimates for Expenditure on Production Durable Goods and Maid's Services Brazil, 2002-2003.

	Maid's Substitute Production Goods	Maid's Services
Bargaining Power Variables		
Marriage Market	-0.7733	0.0035
	(0.1128)***	(0.1401)
Only the wife makes expenditure decisions	0.0715	0.0745
	(0.0759)	(0.1001)
Only the husband makes expenditure decisions	0.0759	-0.2157
	(0.0326)**	(0.0480)***
Wife Has Unearned Income	-0.1332	0.0365
	(0.0334)***	(0.0388)
Husband Has Unearned Income	0.0843	0.1062
	(0.0303)***	(0.0348)***
Wife's and Husband's Variables:		
Wife's Age	0.0223	0.0144
	(0.0019)***	(0.0024)***
Husband's age - wife's age	0.0101	0.0089
	(0.0022)***	(0.0028)***
Wife has no formal education	-1.4471	-1.8418
	(0.0715)***	(0.1021)***
Wife has primary education	-1.2052	-1.5679
	(0.0527)***	(0.0557)***
Wife has middle school	-0.8254	-1.2456
	(0.0493)***	(0.0476)***
Wife has high school	-0.4938	-0.8399
	(0.0474)***	(0.0427)***
Wife has higher educational level than husband	-0.2671	-0.1629
	(0.0282)***	(0.0344)***
Husband has higher educational level than wife	0.0733	0.0817
	(0.0292)**	(0.0362)**
Household Variables		
Number of daughters 0-3 years old in HH	0.1028	0.312
	(0.0270)***	(0.0333)***
Number of daughters 4-6 years old in HH	0.0829	0.2109
	(0.0292)***	(0.0374)***
Number of daughters 7-12 years old in HH	0.1312	0.097
	(0.0201)***	(0.0264)***
Number of daughters 13-16 years old in HH	0.0875	-0.0527
	(0.0261)***	(0.0354)

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Table 6 – continued from previous page

	Maid's Substitute Production Goods	Maid's Services
Number of daughters 17-19 years old in HH	0.0528	-0.1486
	(0.0380)	(0.0493)***
Number of women 51-60 years old in HH	0.115	-0.3511
	(0.1467)	(0.1995)*
Number of women 61-70 years old in HH	0.0308	0.3073
	(0.1219)	(0.1396)**
Number of women older than 70 years in HH	0.0927	0.0327
	(0.1052)	(0.1327)
Number of sons 0-3 years old in HH	0.0686	0.2737
	(0.0271)**	(0.0342)***
Number of sons 4-6 years old in HH	0.1034	0.1906
	(0.0285)***	(0.0364)***
Number of sons 7-12 years old in HH	0.1129	0.1374
	(0.0194)***	(0.0251)***
Number of sons 13-16 years old in HH	0.0921	0.1403
	(0.0253)***	(0.0319)***
Number of sons 17-19 years old in HH	0.1031	0.0222
	(0.0332)***	(0.0433)
Number of men 51-60 years old in HH	-0.0792	-0.1263
	(0.2226)	(0.3086)
Number of men 61-70 years old in HH	0.0341	0.0077
	(0.1789)	(0.2197)
Number of men older than 70 years in HH	0.1109	-0.1196
	(0.1465)	(0.1891)
Quintiles of Per Capita Income	0.3232	0.4861
	(0.0111)***	(0.0155)***
State Level Variables		
Proportion of Working Women by State and Cohort	-0.3798	0.3069
	(0.1602)**	(0.2037)
Average State Income (in 1000)	0.0706	0.0758
	(0.0943)	(0.1165)
Price of maids	0.8617	-0.8888
	(0.1116)***	(0.1398)***
Region Level Variables		
Price of non-maid's substitute production goods	0.286	-0.0152
	(0.0134)***	(0.0165)
Price of maid's substitute production goods	-0.0611	0.002
	(0.0056)***	(0.0070)
Price of entertainment goods	-0.3631	0.057
	(0.0286)***	(0.0355)
Price of electricity (per kwatts)	26.2991	-1.5343
	(1.5033)***	(1.8227)

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Table 6 – continued from previous page

	Maid's Substitute Production Goods	Maid's Services
Constant	-29.6199	-0.6682
	(1.2249)***	(1.4955)
Observations	19662	19662
Log likelihood	-14001.23	
rho	0.159	(0.019)***
	t-statistic	Probability
LR test (rho=0)	65.1978	0.1%
Wald $\chi^2_{(74)}$	9323.56	0.1%

Standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Testing Differences Among Sons And Daughters Brazil, 2002-2003.

	Time-saver DG	Maid's Services	Time-saver DG - Maid's Services
		Three years old and younger	
girls	0.1028	0.312	-0.2092
	(0.0270)***	(0.0333)***	25.29
			0.0001
boys	0.0686	0.2737	-0.2051
	(0.0271)**	(0.0342)***	23.49
			0.0001
$girls - boys$	0.0342	0.0383	-0.0046
$\chi^2(1)$	0.92	0.75	0.01
$Prob > \chi^2$	0.3365	0.3856	0.9417
		Four to six years old	
girls	0.0829	0.2109	-0.128
	(0.0292)***	(0.0374)***	7.72
			0.0055
boys	0.1034	0.1906	-0.0872
	(0.0285)***	(0.0364)***	3.77
			0.0523
$girls - boys$	-0.0205	0.0203	-0.0407
$\chi^2(1)$	0.28	0.16	0.44
$Prob > \chi^2$	0.599	0.6856	0.5086
		Seven to twelve years old	
girls	0.1312	0.097	0.0342
	(0.0201)***	(0.0264)***	1.12
			0.2893
boys	0.1129	0.1374	-0.0245
	(0.0194)***	(0.0251)***	0.63
			0.4268
$girls - boys$	0.0182	-0.0404	0.0586
$\chi^2(1)$	0.46	1.3	1.83
$Prob > \chi^2$	0.4998	0.2546	0.1762
		Thirteen to sixteen years old	
girls	0.0875	-0.0527	0.140
	(0.0261)***	(0.0354)	10.7
			0.0011
boys	0.0921	0.1403	-0.0482
	(0.0253)***	(0.0319)***	1.48
			0.2233
$girls - boys$	-0.005	-0.193	0.188
$\chi^2(1)$	0.02	17.28	11.05
$Prob > \chi^2$	0.895	0.0001	0.0009
		Seventeen to Nineteen years old	

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Table 7 – continued from previous page

	Time-saver DG	Maid's Services	Time-saver DG - Maid's Services
girls	0.0528	-0.1486	0.2014
	(0.0380)	(0.0493)***	11.09
			0.0009
boys	0.1031	0.0222	0.0808
	(0.0332)***	(0.0433)	2.33
			0.1272
$girls - boys$	-0.0503	-0.1709	0.1206
$\chi^2(1)$	1.02	7.09	2.33
$Prob > \chi^2$	0.3127	0.0078	0.1268

Standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Bellow the difference of the coefficients is the χ^2 t-statistic and its probability.

Table 8: Testing Bargaining Power Brazil, 2002-2003.

	Time-saver DG	Maid's Services	Time-saver DG - Maid's Services
Marriage Market	-0.7733	0.0035	-0.777
			19.87
			0.0010
Only the wife makes expenditure decisions	0.0715	0.0745	-0.003
			0.0001
			0.9808
Only the husband makes expenditure decisions	0.0759	-0.2157	0.2916
			26.47
			0.0001
$wife - husband$	-0.004	0.2902	-0.2945
$\chi^2(1)$	0.001	7.1	4.98
$Prob > \chi^2$	0.9569	0.0077	0.0256
Wife Has Unearned Income	-0.1332	0.0365	-0.1696
			11.6
			0.0006
Husband Has Unearned Income	0.0843	0.1062	-0.0219
			0.24
			0.6243
$wife - husband$	-0.2175	-0.0697	-0.1478
$\chi^2(1)$	23.1900	1.7200	4.79
$Prob > \chi^2$	0.0001	0.1891	0.0287
Wife has higher educational level husband	-0.2671	-0.1629	-0.1042
			5.84
			0.0156
Husband has higher educational level than wife	0.0733	0.0817	-0.0083
			0.03
			0.8531
$wife - husband$	-0.3404	-0.2446	-0.0958
$\chi^2(1)$	148.3900	49.5000	4.9
$Prob > \chi^2$	0.0001	0.0001	0.0268

Standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Bellow the difference of the coefficients is the χ^2 t-statistic and its probability.

Table 9: Bivariate Probit Estimates for Expenditure on Production Durable Goods and Maid's Services By Income Group Brazil, 2002-2003.

	lower middle		middle		upper middle		high	
	time-savers dg	maid's services	time-savers dg	maid's services	time-savers dg	maid's services	time-savers dg	maid's services
Bargaining Power Variables								
Marriage Market	-1.1471	0.0877	-0.7056	-0.11	-0.6663	0.1199	-0.1186	0.0262
	(0.2645)***	(0.4260)	(0.2345)***	(0.3360)	(0.2381)***	(0.2768)	(0.2550)	(0.2383)
Only the wife makes expenditure decisions	0.3073	0.0836	-0.043	0.112	0.1263	0.139	0.1648	0.1783
	(0.1577)*	(0.2733)	(0.1380)	(0.2051)	(0.1692)	(0.1857)	(0.2666)	(0.2169)
Only the husband makes expenditure decisions	0.1716	-0.2763	0.1876	-0.2297	-0.0118	-0.2354	0.0789	-0.1773
	(0.0652)***	(0.1259)**	(0.0655)***	(0.1048)**	(0.0738)	(0.0978)**	(0.0988)	(0.0929)*
Wife Has Unearned Income	-0.1	-0.0391	-0.1287	-0.0572	-0.1113	-0.1288	-0.2177	0.0796
	(0.0788)	(0.1174)	(0.0717)*	(0.0977)	(0.0750)	(0.0888)	(0.0705)***	(0.0634)
Husband Has Unearned Income	0.0896	0.0645	0.0741	0.0188	-0.0446	0.0296	0.1039	0.0405
	(0.0812)	(0.1283)	(0.0666)	(0.0943)	(0.0605)	(0.0730)	(0.0610)*	(0.0528)
Wife's and Husband's Variables:								
Wife's Age	0.0124	0.0026	0.0211	-0.0007	0.0273	0.0155	0.0255	0.0182
	(0.0048)***	(0.0083)	(0.0041)***	(0.0063)	(0.0038)***	(0.0048)***	(0.0042)***	(0.0039)***
Husband's age - wife's age	0.0077	0.0091	0.0044	-0.0068	0.0132	0.0076	0.0097	0.0101
	(0.0051)	(0.0085)	(0.0046)	(0.0069)	(0.0046)***	(0.0057)	(0.0050)*	(0.0047)**
Wife has no formal education	-0.8292	-1.1313	-1.229	-1.4882	-0.9011	-1.6545	-1.0927	-1.3975
	(0.4025)**	(0.4575)**	(0.1897)***	(0.2495)***	(0.1680)***	(0.2902)***	(0.2125)***	(0.2241)***
Wife has primary education	-0.6521	-0.9213	-1.0102	-1.2612	-0.9445	-1.1581	-1.1419	-1.6975
	(0.3918)*	(0.4185)**	(0.1609)***	(0.1708)***	(0.1125)***	(0.1197)***	(0.1031)***	(0.1049)***
Wife has middle school	-0.3048	-0.7798	-0.6848	-1.1466	-0.5484	-0.8304	-0.7356	-1.1573
	(0.3902)	(0.4159)*	(0.1575)***	(0.1634)***	(0.1047)***	(0.1050)***	(0.0818)***	(0.0721)***
Wife has high school	-0.0803	-0.388	-0.363	-0.8581	-0.308	-0.4609	-0.3326	-0.7704
	(0.3923)	(0.4157)	(0.1586)**	(0.1626)***	(0.1014)***	(0.0982)***	(0.0685)***	(0.0571)***
Wife has higher educational level than husband	-0.1885	-0.0874	-0.1584	-0.0926	-0.2832	-0.0077	-0.3148	-0.2418
	(0.0690)***	(0.1127)	(0.0581)***	(0.0829)	(0.0562)***	(0.0671)	(0.0625)***	(0.0569)***
Husband has higher educational level	0.1773	0.0268	0.0224	-0.0798	-0.0586	0.0917	0.1358	0.0904
	(0.0706)**	(0.1220)	(0.0615)	(0.0916)	(0.0591)	(0.0740)	(0.0647)**	(0.0569)
Household Variables								
Number of daughters 0-3 years old in HH	0.0548	0.3373	0.1589	0.2904	0.2118	0.4396	0.2315	0.3898
	(0.0572)	(0.0815)***	(0.0595)***	(0.0777)***	(0.0632)***	(0.0701)***	(0.0732)***	(0.0673)***
Number of daughters 4-6 years old in HH	0.0558	0.1054	0.0567	0.2446	0.2228	0.3546	0.2363	0.2991
	(0.0603)	(0.0924)	(0.0624)	(0.0825)***	(0.0684)***	(0.0778)***	(0.0886)***	(0.0795)***
Number of daughters 7-12 years old in HH	0.0364	0.0541	0.157	0.135	0.2653	0.1581	0.2751	0.2222
	(0.0432)	(0.0746)	(0.0417)***	(0.0591)**	(0.0463)***	(0.0542)***	(0.0589)***	(0.0497)***
Number of daughters 13-16 years old in HH	0.0991	-0.1478	0.1265	-0.1735	0.1254	0.0891	0.1669	0.0483
	(0.0565)*	(0.1166)	(0.0526)**	(0.0939)*	(0.0575)**	(0.0658)	(0.0732)**	(0.0619)

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Table 9 – continued from previous page

	time-savers dg	maid's services	time-savers dg	maid's services	time-savers dg	maid's services	time-savers dg	maid's services
Number of daughters 17-19 years old in HH	-0.068	-0.2559	0.0827	-0.2048	0.1231	-0.1079	0.2476	-0.1242
	(0.0924)	(0.1798)	(0.0783)	(0.1341)	(0.0759)	(0.0953)	(0.0942)***	(0.0805)
Number of women 51-60 years old in HH	-0.0848	-0.181	0.2602	-0.2384	0.4269	-0.2823	-0.1866	-0.5056
	(0.3388)	(0.5010)	(0.3041)	(0.5209)	(0.2786)	(0.3406)	(0.3452)	(0.3494)
Number of women 61-70 years old in HH	0.083	0.0297	-0.1813	0.4223	0.2648	0.4495	-0.0209	0.3462
	(0.3117)	(0.4483)	(0.2198)	(0.2802)	(0.2531)	(0.2674)*	(0.2798)	(0.2562)
Number of women older than 70 years in HH	0.0298	-5.2076	0.1074	-0.0854	-0.0889	-0.031	0.4034	0.2861
	(0.2601)	(9652.6792)	(0.1970)	(0.3086)	(0.1958)	(0.2607)	(0.3054)	(0.2319)
Number of sons 0-3 years old in HH	0.0336	0.222	0.1859	0.2633	0.14	0.422	0.141	0.3783
	(0.0574)	(0.0863)**	(0.0568)***	(0.0773)***	(0.0640)**	(0.0711)***	(0.0783)*	(0.0700)***
Number of sons 4-6 years old in HH	0.0507	0.2139	0.1764	0.2171	0.3176	0.3194	0.0651	0.2436
	(0.0602)	(0.0906)**	(0.0602)***	(0.0809)***	(0.0678)***	(0.0765)***	(0.0779)	(0.0719)***
Number of sons 7-12 years old in HH	0.0806	0.0915	0.2099	0.216	0.1786	0.2432	0.1208	0.1711
	(0.0415)*	(0.0669)	(0.0417)***	(0.0581)***	(0.0445)***	(0.0514)***	(0.0536)**	(0.0475)***
Number of sons 13-16 years old in HH	0.1812	0.1048	0.1288	0.1834	0.006	0.2617	0.164	0.1521
	(0.0548)***	(0.0932)	(0.0510)**	(0.0731)**	(0.0553)	(0.0634)***	(0.0679)**	(0.0585)***
Number of sons 17-19 years old in HH	0.1231	0.0912	0.0978	-0.2064	0.1703	0.0055	0.1062	0.1964
	(0.0744)*	(0.1312)	(0.0676)	(0.1273)	(0.0686)**	(0.0835)	(0.0819)	(0.0734)***
Number of men 51-60 years old in HH	0.3573	-5.0246	-0.0113	0.0544	-0.5808	-6.0132	-0.1875	0.4967
	(0.5213)	(12897.0352)	(0.3641)	(0.5490)	(0.5012)	(15139.6774)	(0.5805)	(0.5361)
Number of men 61-70 years old in HH	-0.1792	-5.0194	0.0911	0.5076	0.0945	-0.2086	0.0422	0.1142
	(0.5282)	(11197.3985)	(0.3241)	(0.4358)	(0.3533)	(0.4613)	(0.3797)	(0.3510)
Number of men older than 70 years in HH	-0.7299	0.8161	0.3289	-0.2066	0.1909	-0.0845	6.439	-0.2619
	(0.4586)	(0.4172)*	(0.2689)	(0.4613)	(0.2558)	(0.3333)	(25932.4329)	(0.3766)
Per Capita Income (in 1000)	4.0995	9.4749	0.6559	1.6715	1.6927	2.1561	0.2506	0.2221
	(1.2272)***	(2.0883)***	(0.7015)	(1.0050)*	(0.3142)***	(0.3746)***	(0.0344)***	(0.0221)***
State Level Variables								
Average State Income (in 1000)	0.4579	-0.464	0.0228	0.4458	-0.1238	0.0415	-0.1024	-0.2035
	(0.2212)**	(0.5112)	(0.1931)	(0.2957)	(0.1983)	(0.2493)	(0.1954)	(0.1749)
Proportion of Working Women by State and Cohort	-0.2727	0.3251	-0.2248	0.6494	-0.2918	-0.0247	-0.2538	0.4844
	(0.3661)	(0.6190)	(0.3430)	(0.5086)	(0.3418)	(0.4050)	(0.3685)	(0.3457)
Price of maids	0.2706	-1.0823	0.9144	-1.333	0.9552	-0.7042	1.2137	-0.7797
	(0.2618)	(0.4603)**	(0.2346)***	(0.3739)***	(0.2288)***	(0.2723)***	(0.2497)***	(0.2238)***
Region Level Variables								
Price of non-maid's substitute production goods	0.3212	-0.0695	0.2875	-0.0033	0.2959	-0.0241	0.2627	-0.0225
	(0.0324)***	(0.1013)	(0.0271)***	(0.0488)	(0.0262)***	(0.0331)	(0.0308)***	(0.0246)
Price of maid's substitute production goods	-0.0654	0.0302	-0.0598	0.0081	-0.0673	-0.001	-0.0736	0.0057
	(0.0128)***	(0.0401)	(0.0111)***	(0.0190)	(0.0110)***	(0.0140)	(0.0132)***	(0.0108)

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Table 9 – continued from previous page

	time-savers dg	maid's services	time-savers dg	maid's services	time-savers dg	maid's services	time-savers dg	maid's services
Price of entertainment goods	-0.3505	0.3517	-0.3059	0.0324	-0.4255	0.0602	-0.4929	0.0279
	(0.0677)***	(0.2201)	(0.0564)***	(0.1015)	(0.0555)***	(0.0701)	(0.0680)***	(0.0525)
Price of electricity (in kwatts)	31.0802	1.6397	24.1119	-6.5894	27.5649	-4.6862	23.4522	-0.5734
	(3.6926)***	(9.3628)	(3.1103)***	(5.0765)	(3.0044)***	(3.6680)	(3.2696)***	(2.8273)
Constant	-33.6111	0.6569	-29.462	0.6937	-30.0508	1.2789	-24.9242	1.9628
	(2.9707)***	(8.4712)	(2.5179)***	(4.2886)	(2.4465)***	(3.0119)	(2.7754)***	(2.3262)
Observations	3932	3932	3933	3933	3932	3932	3932	3932
rho	0.0627	(0.0666)	0.1994	(0.0439)	0.0285	(0.0362)	0.1859	(0.0327)
	t-statistic	Probability	t-statistic	Probability	t-statistic	Probability	t-statistic	Probability
LR test (rho=0)	0.8809	0.3480	19.9096	0.0001	0.6186	0.4316	31.2842	0.0001
Log likelihood	-2036.6108		-2966.9063		-3633.4155		-3887.9624	
Wald $\chi^2_{(74)}$	835.8	0.0001	985.53	0.0001	1289.16	0.0001	1525.14	0.0001

Standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.