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HOUSEHOLD RESPONSE TO HIGHER COSTS OF DOMESTIC SERVICES IN ECUADOR

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## **Household response to higher costs of domestic services in Ecuador**

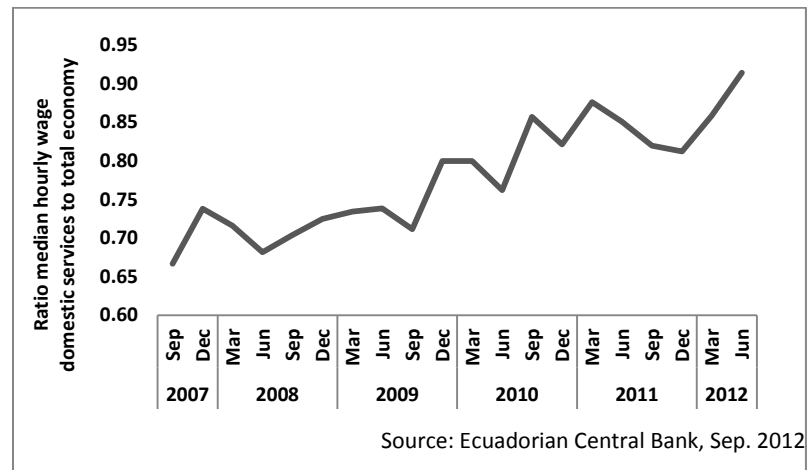
Maria Daniela Anda

An increase in the wage for domestic workers represents an increase in the prices of a close market substitute for home production. This paper analyzes the response of households in the hours of work at home of the female head or wife of the head to changes in the hourly price for domestic services. The results differ between women in the labor force and women not in the labor force, this second group showing an increase in home production associated with an increase in the price for domestic services. Surprisingly, though, the estimation of a home production model predicted a negative response for Ecuadorian women who are employed or looking for a job. That is, higher prices of domestic services were associated with a decrease in the hours of work at home for employed women. A possible explanation for this striking result is that the market for domestic workers has excess demand.

### **I. Introduction**

Previous to the Convention 189 and the Recommendation 201 on Decent Work for Domestic Workers, adopted by the International Labor Organization (ILO) in June 2011, Ecuador had started a campaign to improve working conditions and wellbeing for domestic workers. The political efforts in this regard started with consecutive increases in the minimum wage level for domestic workers relative to the minimum wage for other sectors. This policy pushed the median hourly wage for domestic workers up, a sector whose wage has always remained below other economic sectors. A plot of the ratio between the median hourly wage for domestic

workers and the median hourly wage for the whole economy suggests that the wage gap might be closing (Figure 1).



**Figure 1. Ratio of median hourly wage of domestic workers to median hourly wage in the economy**

According to ILO, domestic work is defined as “work performed in or for a household or households”. It includes cleaning, cooking, washing and ironing clothes; taking care of children, elderly, and persons with disabilities; driving, guarding the house and gardening. Also, ILO defines a domestic worker as “a person engaged in domestic work within an employment relation” (ILO, 2011). In Ecuador, this sector represents close to 3% of the total labor market and 6% of the female employment given that most of the workers are female (95%).

All the tasks performed by domestic workers are close substitutes to what is known as home production. Households allocate time between consumption and production. Consumption time is known as leisure, whereas production time can be assigned to work at home (home production) or work in the market (labor force participation). A rational agent decides how to allocate her limited time between these three activities by choosing the combination of hours that allows her to get the maximum benefit from consumption given her

budget and time constraints. That is, individuals only have 168 hours a week to consume and produce, and households cannot spend more than what they earn<sup>1</sup>. Among other things, market prices play a big role in the household decision of time allocation.

This paper focuses on the effect of a particular market price on time allocation decisions of women: the wage for domestic workers. As mentioned earlier, the wage for domestic workers in Ecuador is rising which means that households face a higher price for this close substitute of home production. Intuitively, one would expect the demand for these services to decline, and therefore, the hours of work at home to increase. However, time allocation data from Ecuador analyzed in this paper shows that there is a negative association between the price for domestic services and home production. This result holds in particular for women who are the head of their households and are either employed or looking for a job.

The following section presents a theoretical model introduced by Gronau in 1977 to estimate home production. This model predicts an increase in home production as the result of higher market prices for home production substitutes, which contradicts some of the evidence found in this research. However, Gronau's model states the basic assumptions and the rationale used to interpret the estimation of a home production model for Ecuadorian women. Section IV present the results of the estimation of the response in the weekly hours of home production to higher prices for domestic services and suggests a possible explanation.

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<sup>1</sup> Assuming there is no possibility of borrowing.

## II. A model for the allocation of time to home production

Domestic workers differ from other workers in their close relation and interaction with their employers, which in this particular market are households. In a labor market diagram, households are usually the ones representing the supply side of labor. For the domestic services market, however, households are the employers. Thus, the demand for domestic services is determined by the household's substitution rate between leisure and consumption, the marginal productivity of work at home and market prices.

Home production is usually modeled using an extension of the classical dichotomy model between work and leisure, where the time used in activities such as cleaning, cooking, doing laundry, shopping and taking care of children and elderly is considered to be home production instead of leisure. The main reason for this disaggregation is that leisure and home production have different responses to changes in income and wages, which has been empirically tested by various authors (Gronau, 1977; Graham and Green, 1984; among others)<sup>2</sup>.

Gronau (1977) introduced a time use model that differentiates home production from leisure. As in the classical dichotomy model, leisure provides direct utility while labor is required to buy goods and services, the consumption of which also reports direct utility. Gronau's model further assumes that goods and services can also be produced at home and that a household is indifferent between market goods or home-produced goods. That is, both types of goods provide the same level of utility. However, home production is something that a household would rather hire in the market if the cost is low enough. Then, the household's decision

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<sup>2</sup> Some authors further distinguish between time allocated to childcare and time allocated to work at home (Connelly and Kimmel, 2010). Others have analyzed other time uses such as traveling time (Solberg and Wong, 1992). In this research, the reported time dedicated to child care was included as part of home production for two reasons: childcare hours are reported together with hours allocated to taking care of elders and is not possible to separate them, and, more important, childcare is also consider one of the activities that can be substituted for with paid domestic services.

consists of whether to exchange work in the market for goods and services or produce the goods and services at home. Goods and services from the market are preferred when that option is more convenient in time units, i.e., the same level of goods consumption leaves more time for leisure.

To illustrate this model, figure 2 shows a home production function where the hours of work at home are measured by the horizontal distance from point T to the left. The home production function –  $f(H)$  – associates a level of output (home goods and services –  $X_H$ ) to each additional unit of time (input  $H$ ). Notice that the increase in the level of goods and services at each additional hour is smaller the more hours allocated to work at home. This is known as decreasing marginal productivity<sup>3</sup>.

In *panel a* of figure 2, with no market participation, the home production function represents as well a frontier of possibilities between leisure and consumption. Combinations of time and goods outside the home production function are not accessible considering the constraint of resources<sup>4</sup>, yet the household would prefer a combination as far away from the origin as possible.

The utility level is given by a function of leisure and goods. Define  $Z$  to be such a function, whose inputs are the number of hours allocated to leisure ( $L$ ) and the amount of goods consumed ( $X$ ).

$$Z = Z(L, X)$$

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<sup>3</sup>  $f' > 0, f'' < 0$

<sup>4</sup> The household faces a time constraint  $T=L+H+N$ , where  $T$  is the total time available (168 hours a week),  $L$  is leisure time,  $H$  is time allocated to work at home, and  $N$  is time allocated to work in the market ( $N=0$  for both individuals in panel a). Also, labor income should be at least the same as expenditure in market goods and services.



where  $X = X_H + X_M$ , the suffix  $H$  stands for the goods and services produced at home and  $M$  for those obtained in the market.

When there is no interaction with the market (panel a), the household chooses the number of hours of work at home associated to his preferred (maximum) combination of leisure and consumption. Such combination is given by the point at which the highest possible level of satisfaction represented by an indifference curve is tangent to the frontier or home production function, i.e. where the marginal product of work at home equals the marginal rate of substitution between consumption and leisure:

$$f' = \frac{\partial Z / \partial L}{\partial Z / \partial X}$$

For household 1, who values consumption more than leisure, the optimum is obtained at point

A. For household 2, who values leisure more than consumption, optimum is obtained at point B.

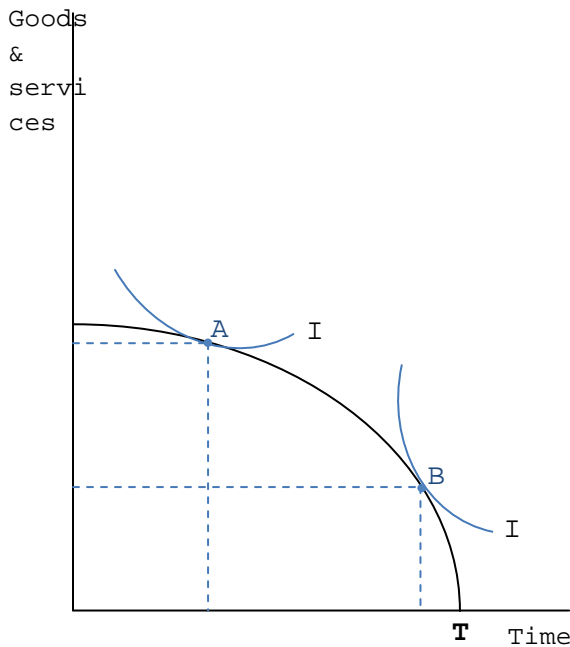


Figure 2a. Home production function

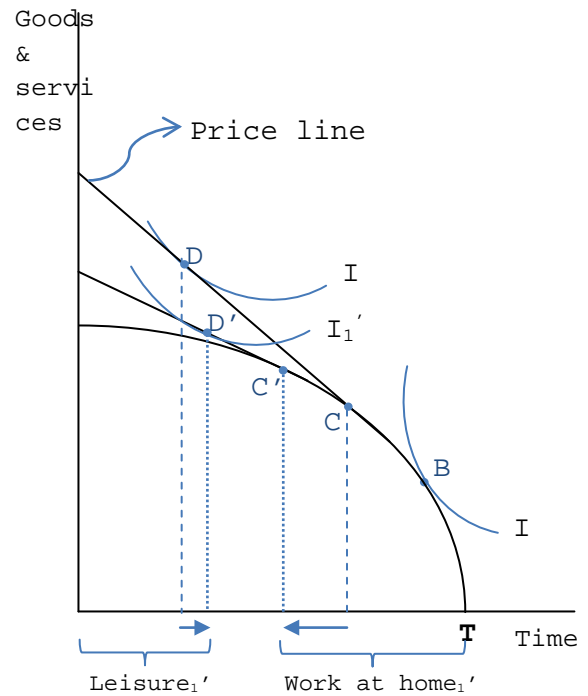


Figure 2b. Home production function and market interaction

*Panel b* introduces the concept of a market where the household can trade work for goods and services along the market price line  $p$ . Interacting with the market, the household with a high preference for goods can reach higher levels of satisfaction by specializing in the activities its members are more productive at and substituting market goods for home goods they were less productive at. Exchanging work in the market allows the household to obtain more goods that are close substitutes to which it would have otherwise been produced at home using the same amount of hours spent in the labor market. The household with goods-intensive preferences can now access a higher level of goods and will divide the production time between work at home and work in the market. The second household is unaffected since its preferred set of consumption and leisure can still be obtained only by working at home.

An increase in the price of the market goods and services will flatten the price line as shown in *panel b* of figure 2. For household 1, more work is required to reach the same level of goods and services. Now, some of the close market substitutes are not much more convenient than the home produced goods. As a result, the first household will divest some of its time in the labor market to work at home and produce the goods and services previously obtained in the market. In this particular example, the household will also substitute leisure for work in the market given that the substitution effect dominates the income effect in the way the indifference curve for household 1 was drawn<sup>5</sup>.

This analysis is based on Gronau's *one-individual model*. Solberg and Wong (1992) went further and developed the framework for a *two-earner model* (husband and wife), where the household utility function aggregated leisure time for both individuals and the constraints

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<sup>5</sup> The effect on leisure is not always positive; it will depend on the magnitude of both the income and the substitution effect. Leisure will increase with higher prices of market goods only when the substitution effect is greater than the income effect. The income effect on leisure will be larger the greater the rate of substitution between goods and leisure.

consider the aggregation of available time and the couple's labor income. In such a framework, the home production function associates levels of home goods and services to two different inputs, the hours of work at home for each of the two individuals. The hours of home production of the couple can either be substitutes or complements determining the direction of the effect of one's real wage on the other's home production. Their results are similar to Gronau's and can also be used to associate an increase in work at home to an increase in the price of home production market substitutes.

In this section, Gronau's model was presented as if the unit of analysis and decision making was the household. Hence, time and budget constraints aggregate resources for all its members and indifference curves represent the family's preferences. Multiple-member households allows for a specialization of activities within the household based on the productivity level of each member. Like in most countries, home production in Ecuador is mainly performed by female members of the household. In fact, the average of the reported weekly hours of home production performed by women is from three to four times that performed by men. Therefore, it is assumed that women are more productive than men in home production. This would justify a female specialization in domestic tasks. However, it is worth noticing that there are also cultural and social aspects behind this specialization.

The main interest of this paper is on the effect of more expensive domestic services on the hours of home production of the Ecuadorian female population. Gronau does not explicitly consider the effect of changes in the price of domestic services, yet he mentions that the market for housemaids is an excess demand market. If that is the case, then an increase in the price for domestic services will actually increase its demand, reducing at the same time the hours of home production, as explained below.

Work in the market is what allows a household to substitute paid domestic services for home production. At the margin, a household will be willing to hire an additional hour of domestic services as long as the cost of that hour is lower than the opportunity cost of its time. It is easy to think of the expected wage as the opportunity cost or shadow price for an individual's time. In this sense, an hour of paid domestic services is preferred to an hour of home production when the market wage for domestic workers is below the expected wage for the members of the household. Focusing on the female population, if the expected wage for the female head of the household is higher than the price for domestic services, she will be willing to divest some time from work at home to work in the market and hire a housemaid. In equilibrium, more expensive domestic services are expected to increase the female hours of work at home.

If the market of housemaids has in fact an excess demand, then at the market price households are willing to hire more hours of domestic services but there are no domestic workers willing to work that many hours. With perfect competition, the excess demand will push the price up where more housemaids and other domestic workers will be willing to work or increase their hours of work, and households will be able to buy more domestic services. However, under perfect competition, excess demand in a market should not persist. There are a number of reasons why this market may not fit the assumptions of the perfectly competitive market. Domestic workers usually pertain to low income families and have few or no education. Most likely, these workers lack information on employment opportunities and market wages, as well as negotiation power. On the other hand, there is usually a close, and sometimes familiar, relationship between employer (a family) and employee (housemaid, babysitter or other). Domestic workers also receive other non-monetary benefits such as meals, uniforms, and transportation, but these non-legally required benefits are not considered when the

government set the minimum wage. All these characteristics may also affect the reaction of the market to changes in the prices in a different direction than what perfect competition would predict.

Traditional economic theory will predict unemployment as a result of a minimum wage if it is set above the equilibrium price, but no effect if it is under it. However, recent studies argue that labor market outcome will differ depending on the country and the characteristics of each market. Card and Krueger (1994) and other authors, failed to obtain empirical evidence of a negative response in employment to the changes in minimum wage legislation implemented in the United States during the late 80's and early 90's.

Gualavisi (2011) studied the market effects of the increase in the minimum wage for Ecuadorian domestic workers in 2010. She found no evidence of a negative effect on employment and a negative but not precisely estimated effect on the average hours worked by domestic workers. Galavisi's empirical approach used difference in differences and fixed effects by generating a treatment group through Propensity Score Matching. This lack of evidence of a negative association between the increase in the minimum wage and employment, agrees with Gronau's idea of a domestic services market with excess demand.

Finally, the only study of those reviewed for this paper that controlled for any price changes in a close substitute for home production was Connelly and Kimmel (2010). Their research focused on the allocation of time to childcare. Table 4.3 in their book shows a positive association between the price of childcare for children between 0 to 5 years and the mother's care giving time. However, they find significant evidence of a negative association between the price of child care for children between 6 and 12 years and care giving time of the mother. One possible explanation is that higher quality child care typically costs more, but mothers may be

willing to pay the additional costs. Their result has the same direction found in this research for the response of Ecuadorian women to the increase in the price for domestic services.

The following section describes the data and variables used to empirically test the relation between the prices for domestic services and the average female hours of home production in Ecuador. The assumptions of the model used for this purpose and the results of the estimation are presented in section IV.

### **III. The data**

#### **a. Source and characteristics of the survey**

The Ecuadorian National Institute of Statistics and Census (INEC) conducts a quarterly survey of employment and unemployment that is known as ENEMDU for its acronym in Spanish. This is a household survey that asks about labor force participation, job description, income, demographic and other social characteristics for each individual living in the household, characteristics of the dwelling such as the number of rooms and tenure, and incorporates, since 2003, questions regarding the usage of time by each individual.

The December rounds of the ENEMDU include more than 21,000 dwellings in 579 urban and rural population centers<sup>6</sup>, while other quarters' rounds include only urban areas. The database constructed for this research includes only the December rounds of the employment survey from 2007 through 2011<sup>7</sup>. The aggregation of these five rounds of the ENEMDU resulted

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<sup>6</sup> Rural areas are defined as population centers with less than 2,000 inhabitants.

<sup>7</sup> Previous years were not included because in September 2007 the INEC changed the methodology, sample size and definitions of employment statistics.

in a total of 386,969 observations, of which 22% corresponds to female heads of the household or wives of the head.

The ENEMDU sample follows a 2-2-2 rotation process, where 25% of the sample is surveyed during two quarters, rests for two quarters and is surveyed again for other two quarters. This rotation process results in an overlapping of 50% between consecutive quarters and between the same quarter in consecutive years. In addition, the sample is refreshed every 2 years. This sample methodology implies that the database used for this paper presents an overlapping of half of the surveyed households between December 2007 and December 2008, and between December 2009 and December 2010.

Despite the overlapping of the sample, observations were treated as independent for the estimation of the model presented in section IV. Each household has a unique identification number that was used to merge dwelling characteristics with individual observations<sup>8</sup>. This identification number can be used to link observations for the same household in two different years. Nevertheless, it is not possible to link observations at an individual level. The identification of individuals within a household relies on what the respondent of the survey considers the structure of the household to be. The respondent identifies the members of the household by their relationship with its head. If the respondent in a particular household that is surveyed for two consecutive years is not the same person in the second year or has a different perspective of who the head of the household is, the inter-annual matching of individuals within the household is not reliable. For this reason, the empirical analysis in this paper uses methods

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<sup>8</sup> In order to link dwelling characteristics to each individual, it was necessary to differentiate the household identification number by year. To do so, the identification number and the last two digits of the year of the survey were concatenated. This procedure was performed before calculating any characteristic of the household such as the number of kids, the family income and others.

for cross-sectional data. However, as shown in Annex B, the main results do not differ if observations for 2007 and 2009 are excluded, or for 2008 and 2010.

#### **b. Variables' definitions and assumptions**

Based on the ILO definition of domestic work, the variable *hours of home production* was constructed using the reported hours of each individual allocated to cleaning the house, cooking, doing laundry, buying groceries, and taking care of children and elders. That is, the *total hours of home production* performed by the female head of the house are assumed to be equivalent to the time that could have been substituted for with paid domestic services if the household had found it more convenient to do so. This is the response variable in the model of home production estimated in section IV.

As mentioned before, the main interest of this paper is on the effect of changes in the price for domestic services in the hours of home production of the household's female head. The sample used for this analysis includes 81,752 women who are either the head of the household or the wife in the cases where the head is male<sup>9</sup>. On average, these women dedicated 34.5 hours a week to work at home. The following subsections define the variables used as predictors and give descriptive statistics.

#### **i. Social and demographic characteristics**

As observed in figure 3, the average hours of home production performed by the female authority of the household exceed by far those performed by the male authority. Interestingly though, the gap shrinks with age and mainly because of a decrease in the average hours of work

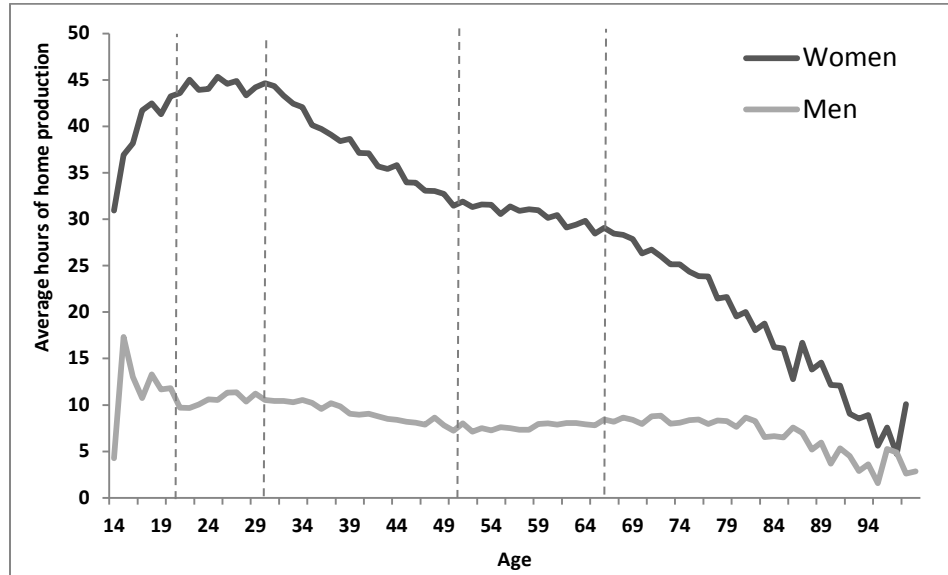
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<sup>9</sup> It is assumed that the head of the household and his/her spouse are the authority figures in the household. From now on, they will be referred to as the female/male head or authority.



at home performed by women. The weekly hours of home productions seem to be increasing with age only for the group of women that are younger than 20 years old. Considering that the sample includes only the female authority of each household, this youngest group contains the fewer number of observations (2%) and the highest proportion of currently enrolled students (16%).

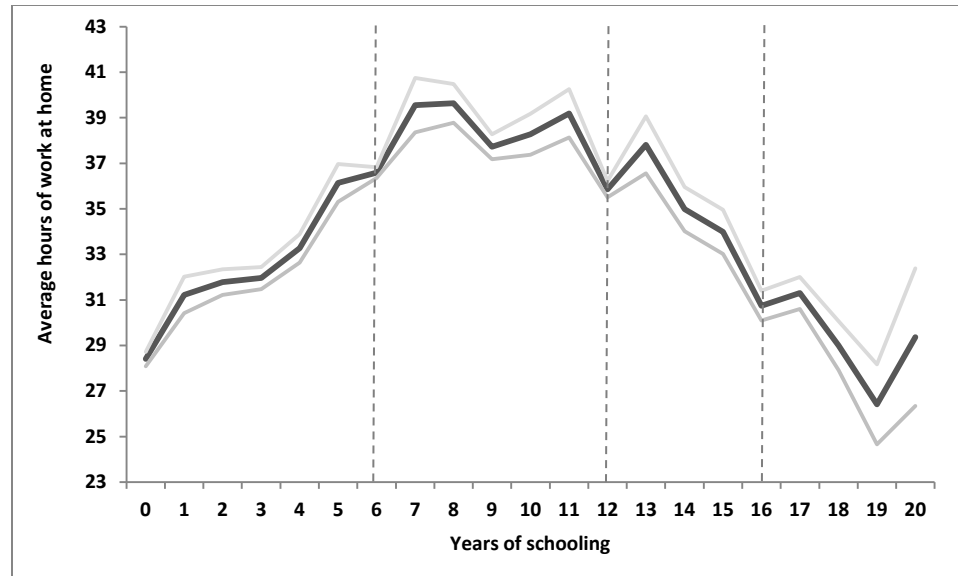
When women are in their twenties, the average hours of home production shows no trend and the gap between men and women is at its highest (35 hours a week). When women reach their thirties, the gap between the hours of work at home by gender starts decreasing. For women aged from 50 through 64 the downward trend in the average hours of home production appears to slow down and starts decreasing sharply again at age 65.



**Figure 3. Average weekly hours of work at home performed by the head of the household or the spouse by age (2007-2011)**

The analysis by age of the average hours of home production tells the story of a life cycle for the women in the sample. A typical young Ecuadorian woman increases her hours of work at home when she finishes high school, moves out of her parents' house, and gets married. She has children during her twenties, who require intensive care while babies. Once her children start school and as they grow old enough to take care of themselves and later on move out of the house, her home workload decreases. At age 50, she probably does not need to take care of children anymore and her home production does not change much until she reaches retirement age. Although, it could be surprising that her work at home does not increase with retirement, it is reasonable that it declines faster starting at 65 because of the physical limitations presented with age.

Similar to the analysis by age, the average weekly hours of work at home differs substantially between men and women by years of schooling. Women with no education, and who are the female authority figures in their households, perform an average of 28 hours of home production in a week, whereas the average for men with no education is 8.1 hours a week. The average for men does not change significantly with education. It increases progressively until it reaches 10.7 hours at 16 years of schooling, and drops again to 8 hours a week for the most educated men. For female heads, however, the average home production varies in more than 13 hours a week depending on her level of education. Figure 4 shows this variability and presents it together with a 95% Wald confidence interval.



**Figure 4. Average weekly hours of work at home performed by the female head of the household by years of schooling (2007-2011)**

A woman who is the female authority of her household and who has completed six years of education, equivalent to primary school, dedicates on average 30% more hours a week to home production than women with no education. Female heads with some high school or only one year of post-secondary education have the highest average of home production, close to 40 hours a week which is equivalent to a full time shift in the labor market. With 12 years of schooling, equivalent to a high school diploma, the average home production is close to 36 hours a week. For women with more than 13 years of schooling, the average hours of work at home shows a downward trend, except for those with 20 or more years of education<sup>10</sup>. Notice however, the bigger variability in the hours of work at home for the most educated women.

Previous empirical research on home production estimated a negative association between education and hours of work at home (Gronau 1977, Graham and Green 1984). However, figure 4 suggests that a quadratic form will fit the Ecuadorian data better.

<sup>10</sup> Schooling is top coded at 20 years.

Besides age and education, another demographic variable used to identify differences in the hours of home production is race. Only 3.3% of the sample is black and 7.7% is indigenous, the rest are mainly white or mestizo. Black women who are the household's female authority have an average of 35.8 hours of home production in a week. That is, 1.3 hours over the sample mean for all women. The weekly average for indigenous women, on the contrary, is 31.1 hours, below the total mean.

## ii. Family and household characteristics

As assumed in the previous section, the total hours that a household allocates to home production is determined by the preferences of the household as well as its marginal productivity. Preferences have social, economic and cultural components, some of which can be controlled for using family and house characteristics. Further, variables such as the number of children in the household, other adults or elders, number of rooms in the house, and house tenure are also determinants of the household's general productivity (Graham and Green, 1984). Table 1 presents means and proportions of family characteristics that have been used in the estimation of home production models in previous literature.

**Table 1. Variables of interest, means and proportions**

<b>Family characteristics</b>	<b>Mean/ proportion</b>	<b>Std. deviation</b>
Married or living together	76%	
Family size	4.20	(2.05)
Children less than 16 years old in the HH	1.39	(1.46)
Number of rooms in the house	3.18	(1.41)
The family owns the house where it lives	84%	
The household owns a washing machine	23%	
No. of observations	84,135	

Observations collected from the December rounds of the ENEMDU 2007 through 2011.

Connelly and Kimmel (2010) showed that an important determinant of female home production is her marital status. In the sample of Ecuadorian female heads used for this research, almost 8 out of 10 women are either married or living together with a partner and have an average of 36.5 hours of home production in a week, while the average work at home for non-married heads is 27.8 hours in a week. The size of the family and the age of the members are also determinants of the hours of work at home performed by the female authority. The average family in the sample has 4 members of whom 1.4 are children under 16. A bigger family size means more house work is required, in particular this is true if there are more children than adults, but it can also mean that there are more people to help with home production or contribute to the family income. The extent at which a household can substitute paid domestic services for home production is given by its total budget constraint. Therefore, family income is included in the model so that the household's possibility of substituting domestic services for home production is also controlled for<sup>11</sup>.

The size of the house, approximated by the number of rooms, is expected to be positively related with the hours of work at home (Graham and Green 1984). A bigger house requires more home production because it increases the cleaning time. Cleaning is the home activity with the third highest number of hours for Ecuadorian female heads, it accounts for 19% of the total reported work at home. The activity that consumes most of these women's home production time at home is cooking (42%), followed by care giving (21%). The rest is spent in laundry (16%) and shopping (8%).

Technological appliances like a washing machine increase the marginal productivity of home production by reducing the time required to perform domestic tasks. Washing clothes by

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<sup>11</sup> Family income for each individual in the sample excludes her own labor income.

hand, sweeping, chopping and warming food in a pan, are time consuming activities that can now be performed in a significantly shorter time with washing machines, vacuums, electric choppers and microwaves. Having a washing machine at home is likely to reduce the number of hours of home production. In fact, women who do not live in a house with a washing machine reported an average home production 2 hours longer than the reported by women who own a washing machine (23% of the sample). The model includes a dummy variable for whether the household owns a washing machine.

### iii. Economic factors

Home production is likely to differ between women who participate in the labor market (economically active population) and women who are not in the labor force (economically inactive population), this follows from the rationale in Gronau's model presented in section II. Table 2 shows the weekly hours of home production, together with the average family income with and without the labor income of the female authority in the household, by her participation in the labor market. On average women not in the labor force (NILF) show a premium of six hours of home production over women in the labor force.

**Table 2. Family income by labor force participation**

Variable	Total	Labor force participation	
		Not in the LF	In the LF
Hours of home production	34.50 (19.07)	37.39 (20.55)	31.69 (17.04)
Family monthly income in US dollars	561.01 (911.91)	466.52 (726.20)	652.74 (1,053.48)
Family monthly income (excluding own income)	454.02 (836.03)	466.52 (726.20)	441.60 (932.30)
Predicted hourly wage in US dollars	454.02 (836.03)	466.52 (726.20)	441.60 (932.30)
<b>No. of observations</b>	<b>84,135</b>	<b>41,470</b>	<b>42,665</b>

Observations collected from December rounds of the ENEMDU from 2007 through 2011. Family income includes labor and non-labor income such as interest, rent, pensions, remittances and other. Standard deviations in parenthesis.

Total family income is, on average, larger for families whose female head is in the labor market. However, this is reversed if her labor income is excluded. One should not draw any inference from these comparisons given the large variability in the family income. However, it seems like the female head is more likely to participate in the labor force when her family income is lower and when her contribution is significant. The average family income increases by nearly 50% when her labor income is included for the group that is in the labor force.

Once family income has been controlled for, one of the main determinants in the decision of time allocation is the expected wage, or the shadow price of time. Gronau (1977) estimated a semi log function of wages using education, experience and husband's wage and included the fitted values in his model of home production. Graham and Green (1984) used self-reported wages given that their sample included only working individuals. Connelly and Kimmel (2010) corrected for the selection bias in the wage equation by estimating a first stage probability model for being in the labor force, and then included the predicted wages in their model for the allocation of time. In all three estimations the coefficient on wage (either expected or observed) is negative and significant.

For the purposes of this research and given the data available, the expected hourly wage was estimated following the correction for selection approach of Connelly and Kimmel (2010). The dependent variable hourly wage was constructed using the usual hours of work in a week and the reported monthly income<sup>12</sup>. These values were then used to estimate a wage equation using as predictors the years of schooling, age, race and other demographics<sup>13</sup>. The

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<sup>12</sup> Monthly income was transform into weekly income by dividing it by 4.33.

<sup>13</sup> The wage regression was estimated using a Maximum Likelihood Estimation (MLE) procedure to control for selection bias. This procedure simultaneously estimates participation in the labor force including additional variables than those in the wage regression such as a dummy for being the head of the household, marital status, number of kids, family income, and a dummy for having kids 5 years old or younger. Such variables included in the equation for labor force participation act as instrumental

results of the estimation, using observations for all women regardless of being the head of the household, are presented in appendix A<sup>14</sup>. This estimation was used to predict wages for female heads included in the estimation of the home production model.

The equation used to predict wages for all Ecuadorian women includes age and schooling both in quadratic form and the results show that both variables are positively associated with wage, yet age in a decreasing way and schooling in an increasing way. The turning point for age is at 48. The variables language skill and parent's language skill were included as proxies for ability, both are associated with an increase in the expected wage and are statistically significant. The wage for a woman that can speak a foreign language besides Spanish is expected to be 23% higher than that for a woman with similar characteristics who does not have this language skill. Having parents who can speak a foreign language is associated with an increase of 17% in the expected wage. Further, there is no significant association between wages and being black, whereas characteristics such as being indigenous, living in the rural area and living in the Coast region, have a negative association with wage.

### **c. Measuring the price for domestic services**

The ENEMDU survey defines a domestic worker as an individual who works in private households and who receives a payment in cash and/or in kind for his/her work. As for all other respondents in the labor force, domestic workers are asked to describe the main activities and tasks of their job. There is also a specific category for domestic workers in a categorical question regarding the type of occupation. This information is used by the National Institute of Statistics

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variables, capturing the association between labor force participation and wages that is not correlated with the unobservable part of wages determination.

<sup>14</sup> As for the estimation of the hours of home production, the wage regression was also estimated excluding 2008 and 2010 and the results were still significant and very similar in magnitude to the results including all years. Similar results were obtained when 2007 and 2009 are excluded.



and Census to identify domestic workers with the binary variable *srvdom* (from “domestic server” in Spanish).

For each year and each province with more than 20 observations for domestic workers, the median of their hourly wage was used as a measure of the price for an hour of domestic services and the value was then imputed to all other observations in that particular province and year<sup>15</sup>. In the cases where the observations for domestic workers were fewer than 20, the median of the natural region was used instead, and if there were still cases with fewer than 20 observations, a broader definition of region was used<sup>16</sup>. There was one case, a province in the Amazon rainforest in 2011, where neither the natural region nor the broader region had more than 20 observations for domestic workers. In that case, the 2011 national median wage for domestic workers was used as the hourly price for domestic services in that region and year. The resulting average price of an hour of domestic work was 0.94 U.S. dollars. Table 3 shows the average price by year and compares it to the legal minimum wage for domestic workers.

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<sup>15</sup> The median wage for domestic workers considered only the reported income and worked hours for the main job, whereas the response variable used in the wage regression presented in appendix A includes total labor income and the total hours worked in all jobs if an individual had more than one job.

<sup>16</sup> The December round of the ENEMDU survey includes the three continental regions in Ecuador: Pacific Coastline, Andes Highlands and Amazon Rainforest, these were used as broader regions. The Galapagos Islands are excluded from the survey. Each of these three regions was geographically divided in natural regions: north, center and south, which is the second level of disaggregation to obtain the median of reported wages for domestic workers.

**Table 3. Average of the hourly price of domestic services by year and region**

Year	Legal min. wage	National	Coast	Highlands	Other regions
2007	0.69	0.75 (0.169)	0.74 (0.148)	0.77 (0.183)	0.58 (0.000)
2008	0.98	0.85 (0.162)	0.82 (0.148)	0.88 (0.169)	0.70 (0.007)
2009	1.16	0.92 (0.165)	0.93 (0.091)	0.92 (0.208)	0.75 (0.002)
2010	1.39	1.08 (0.244)	1.04 (0.137)	1.11 (0.301)	1.01 (0.000)
2011	1.52	1.29 (0.236)	1.28 (0.143)	1.30 (0.282)	1.29 (0.000)
N observations		4,345	1,892	2,301	152

The legal wage for domestic workers and other sectors is set by the State on a yearly basis and is effective as of January (Ecuadorian Political Constitution of 2008, art. 328; Ecuadorian Labor Code, art. 117 and 118). The legal wage is set at a monthly value. The second column shows hourly wage obtained by dividing the legal minimum wage by 4.33 (weeks in a month) and by 40 (hours of work in the legal weekly shift).

The average price for domestic services, computed using province median wage, follows the legal minimum wage in an upper trend during the period of analysis. However, the average of the computed price is below the legal minimum wage for all years but 2007. This might be the result of an underground market where labor institutions are not followed. However this sector has other characteristics that might explain the difference between legal wages and observed ones, such as the existence of non-monetary benefits that might be considered by employers and employees when setting the hourly wage. If the percentage of domestic workers hired informally is affected by changes in the minimum wage for this market, the results of a home production estimation will be biased given that the model does not account for changes in the percentage of informality in the domestic services market, and it is expected to be correlated with the average hours of work at home. For example, if a household finds it too expensive to hire a housemaid at the new minimum wage but it is able to find someone that is willing to work at a lower wage than the legal one, the hours of work at home of the female head of that household will not change.

There are provinces with many more observations for domestic services than others and the averages computed in table 3 are not weighted. Yet, using all observations for domestic workers, both the national median and the national average wage are still under the legal wage.

It is assumed that the variation of the observed wages for domestic workers across years is mainly explained by the consecutive changes in the legal minimum level. This variation, as well as the variation across provinces, adds explanatory power to the dependent variable of interest in the prediction of hours of work at home. Nevertheless, it is important to consider that the measurement error in the computed hourly price for domestic services will bias toward zero the estimated parameters.

#### d. Other controls

In order to control for underlying trends of the economy as a whole, year and region dummy variables were included in the model. Figure 5 shows the variation in reported home production of female heads by year and region, demonstrating that there are important trends over time and across regions.

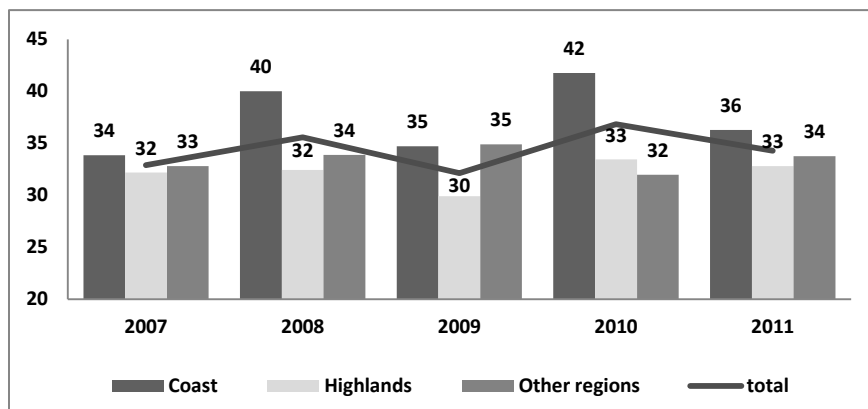


Figure 5. Average weekly hours of work at home performed by the female head of the household by year and geographical region

Women who live in the Pacific Coast line region in Ecuador have the highest average of home production in the country and they also present the largest variability from year to year. Women in the Andes highlands, on the contrary, report an average that is always under the national mean. The group “other regions” includes the Amazon rainforest and only accounts for 4% of all the observations in the sample, yet their reported home production is similar to the one for women in more populated areas.

About 44% of the sample lives in rural areas. Women in rural areas present a 7% higher average in the hours of home production than women living in urban areas, 35.7 vs. 33.4 hours a week.

Another variable included as a control in the model is the median female wage by province and year<sup>17</sup>. Given that the price for domestic services was computed by province, underlying differences between provinces might be attributed to the price for domestic services and bias its coefficient, therefore a variable that captures these differences was needed.

Finally, a variable named “language skills” was included to control for the selection of women into the labor force. The official language in Ecuador is Spanish, and few people speak foreign languages. Naranjo and Collahuazo (2011) found evidence that speaking a foreign language is an important determinant of labor income in the Ecuadorian market, associated with higher levels of income in particular in urban areas. Presumably, the variable that indicates whether a woman can speak a foreign language contains information about her skills and cultural characteristics that are correlated with her decision to participate in the labor force.

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<sup>17</sup> The median wage for women by province and year, as well as the descriptive statistics for women in the labor force and every other calculation and estimation here after, was computed excluding from the sample all domestic workers.

The sample used in this paper shows that there is a larger proportion of women who speak both Spanish and a foreign language in the economically active group than in the group who does not participate in the labor market (1.4% vs. 0.5%). The average hours of home production for women with language skills (who speak both Spanish and a foreign language) was 27, whereas the average for women who only speak either Spanish or an indigenous language was 34.5.

The following section states the assumptions and presents the results of the model used to estimate the effect of the changes in the price for domestic services in the hours of female work at home. The estimation of the home production model uses the observations of Ecuadorian female heads of their households from 2007 through 2011.

#### **IV. Empirical Model and Results**

##### **a. Assumptions**

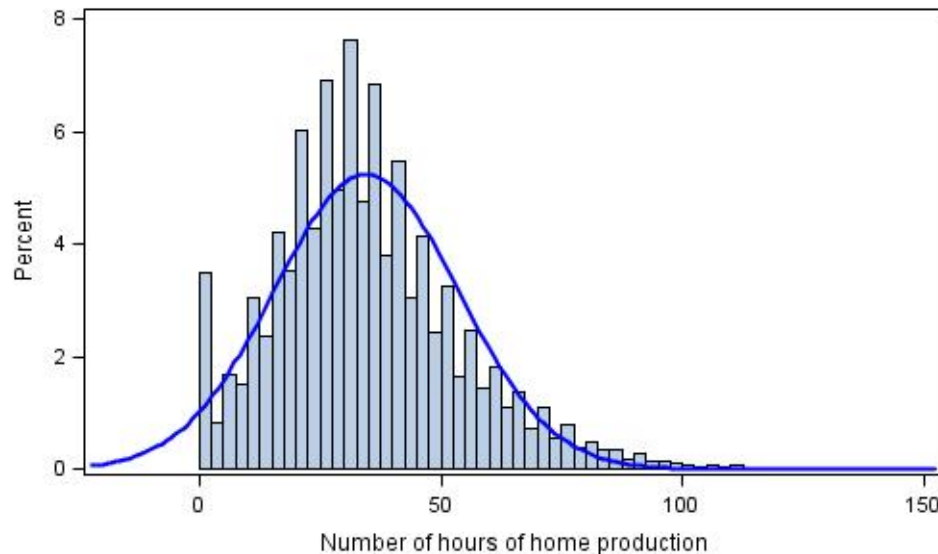
The hours of work at home reported by Ecuadorian female heads are assumed to be independent realizations of a random variable  $Y$  defined as

$$Y = X'\beta + u$$

Where  $u|X \sim \mathcal{N}(0, \sigma^2)$ , and  $X$  is the set of explanatory variables described in section III.

A histogram of such realizations is presented in figure 6. Notice that the proportion of zeros in the sample is 3.5%, which could lead us to change the assumptions of a normal distribution to a censored/limited one, and therefore use a Tobit estimation model instead of Ordinary Least Squares (OLS). However, relying on the law of large numbers and assuming that women who

report zero hours of home production are a random subgroup of the sample, the estimation of the model of home production assumes normality<sup>18</sup>.



**Figure 6. Weekly hours of work at home performed by the female authority of the household (2007-2011)**

The explanatory variables included in the model can be grouped by economic factors, demographic factors, household characteristics, and trend and spatial factors. The economic factors include the price for domestic services, participation in the labor force, and predicted wage. Demographics such as age, years of schooling (using a quadratic form), a dummy variable for black and a dummy variable for indigenous, control for differences in time preferences. The household characteristics are marital status, family income, number of other female adults in the house if the head is older than 16 and younger than 65 years old, number of male adults in the household, number of male and other female elders if the female head is older than 65, number of children in the house younger than 16, a dummy for children younger than 6 years old, a dummy for owning the house, a dummy for owning a washing machine, and the number

<sup>18</sup> The estimation of a Tobit model, where  $Y = \max(X'\beta + u, 0)$  produced very similar results to the OLS estimation presented in here.

of rooms in the house. Finally, the trend and spatial factors controlled for in the model are year dummies for 2008 through 2011, a dummy for living in the Coast region, a dummy for living in rural areas, and the median female wage by province.

Conditional on the values of the explanatory variables, the expected value of the weekly hours of work at home is given by:

$$\begin{aligned}
 E(\text{hr. home production}|\mathbf{X}) &= \beta_0 + \beta_1 \log.\text{price.domestic.services}_{pt} + \beta_2 \text{labor.force.participation}_i \\
 &+ \beta_3 \text{predicted.wage}_i + \gamma \text{demographics}_i + \delta \text{HHcharacteristics}_i + \theta_t \\
 &+ \alpha_1 \text{Coast}_i + \alpha_2 \text{rural}_i + \alpha_3 \text{female.wage}_{pt}
 \end{aligned}$$

where the suffix  $i$  stands for the individual,  $p$  for the province where she lives, and  $t$  for the year of the survey. The way the model is specified assumes that the effect of each of the explanatory variables on the hours of home production is constant over time.

The main coefficient of interest is  $\beta_1$  which will tell what the effect of an increase in the price for domestic services is expected to be in the weekly hours of home production of Ecuadorian female heads.

The sample used for the estimation of this model includes 81,752 Ecuadorian women heads of household or wives of the head, of whom 50% was either employed or looking for a job and 50% was not in the labor force, meaning that they didn't have a job voluntarily. The group of economically inactive women includes housewives, retired workers, disabled, pensioners, students, and youths.

### b. Estimation methods

Based on the assumption of normality, the first method used to estimate the parameters of the home production model was Ordinary Least Squares (OLS). White and Breusch-Pagan tests were performed to confirm the suspicion of heteroscedasticity. Both rejected the null hypothesis at any significance level, which implies that the OLS standard errors are incorrect and shouldn't be used for statistical inference. Not only the variation in the hours of home production differs among provinces (the aggregation used when computing the price of domestic services and the median wage for women in general), but also different plots of the residuals against schooling, age and other variables, show non-constant variation of the unexplained part in the hours of work at home. Constant variance of the residuals is one of the main assumptions in OLS, if this assumption is not met, standard errors are incorrect and the estimates of the parameters are no longer asymptotically efficient even if still consistent.

The covariance matrix was therefore estimated using White's approach and the results tables report these heteroskedasticity-consistent standard errors of the parameters<sup>19</sup>. These are the standard errors used to test the significance of the OLS parameter estimates in the model.

One concern that arises when estimating the model with OLS is that the dummy variable that indicates whether the women participates in the labor force or not is likely to be endogenous, i.e. be correlated with the error term or unobservable determinants of the hours of home production. If that is the case, then the OLS parameter estimates are bias and inconsistent. A popular solution for dealing with endogeneity is the use of instrumental variables (IV). A good IV should be exogenous in the regression of interest and correlated with the

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<sup>19</sup> The covariance matrix is estimated using  $(\mathbf{X}'\mathbf{X})^{-1}(\mathbf{X}'\text{diag}(e_i^2)\mathbf{X})(\mathbf{X}'\mathbf{X})^{-1}$  where  $e_i = y_i - \mathbf{x}_i b$ . In our model,  $y_i$  is the number of hours of home production and  $\mathbf{x}_i$  is a vector of all the explanatory variables included in the model with values for individual  $i$ .



endogenous explanatory variable, in this case the IV should be correlated with being in the labor force and affect the hours of home production only through this correlation.

The dummy variable *language skill*, which takes the value of 1 if the woman speaks a foreign language besides Spanish and 0 otherwise, was used as an IV for being in the labor force. Only 9.2% of the sample has this language skill. However, the OLS coefficient on language skill from the reduced form equation of a Linear Probability Model of labor force participation, is -0.17 and is statistically significant at any level. Hence, the second condition for a good IV is met. However, it is not possible to determine if possible to check if *language skill* is uncorrelated with the error term in the model of home production. It is assumed that the IV only affects hours of work at home through its correlation with labor force participation.

### c. Estimation results

The estimation of a home production model for the Ecuadorian women who are the authority figure in their households is presented in table 4. This estimation uses the December rounds of the employment survey from 2007 through 2011. The two methods of estimation that were used, OLS and IV, are presented in the same table so that comparisons are easy to perform.

As expected, labor force participation is an important determinant in the hours of home production for the population of interest, where being employed or looking for a job is associated with less hours of work at home in a week. The OLS parameter estimate is minus 6 hours a week, whereas once labor force participation has been instrumented for using language skill, the gap in home production between women in the labor force and women not in the labor

force is estimated to be over 20 hours in a week. The IV estimate has a larger variance but it is still significant at any level.

**Table 4. Parameter estimates for a model of home production**

	OLS with HCC		IV estimates using 2SLS	
	Parameter estimate	Standard error	Parameter estimate	Standard error
<b><u>Economic factors</u></b>				
Hourly price for domestic services in logarithmic form	-0.5077	(0.3145)	-0.5748 *	(0.3481)
Dummy for labor force participation	-6.0637 ***	(0.1304)	-20.4433 ***	(2.8753)
Predicted hourly wage in logarithmic form	8.7912 ***	(0.4122)	5.5935 ***	(0.4547)
<b><u>Demographics</u></b>				
Age in years	-0.2648 ***	(0.0059)	-0.2374 ***	(0.0063)
Years of schooling	0.4047 ***	(0.0427)	0.5567 ***	(0.0478)
Schooling squared	-0.0681 ***	(0.0028)	-0.0665 ***	(0.0031)
Dummy for race equal black	-1.6369 ***	(0.3456)	-1.6783 ***	(0.3634)
Dummy for race equal indigenous	-1.4453 ***	(0.2304)	-2.9670 ***	(0.2692)
<b><u>Household and family characteristics</u></b>				
Married or living together	2.7321 ***	(0.1713)	3.8615 ***	(0.1893)
Monthly family income	-0.3663 ***	(0.0726)	-0.2160 ***	(0.0830)
Number of other female adults in the household	-2.6988 ***	(0.0852)	-2.7711 ***	(0.0942)
Number of male adults in the household	-0.0986	(0.0752)	0.0562	(0.0842)
Number of female elder in the household	1.9521 ***	(0.3667)	1.7547 ***	(0.3709)
Number of male elder in the household	0.5536 ***	(0.2105)	0.5712 **	(0.2349)
Number of children in the HH less than 16 years old	1.2986 ***	(0.0569)	1.2837 ***	(0.0580)
Dummy for at least one child less than 6 years old	5.4307 ***	(0.1714)	5.7357 ***	(0.1762)
Dummy for owning a washing machine	-0.9443 ***	(0.1643)	-1.0591 ***	(0.1798)
Dummy for owning the dwelling	0.2541	(0.1793)	0.3315 *	(0.1897)
Number of rooms in the house	-0.1466 ***	(0.0501)	-0.1539 ***	(0.0543)
<b><u>Area and time controls</u></b>				
Dummy for rural area	3.3003 ***	(0.1661)	2.6208 ***	(0.1802)
Dummy for coast region	3.3304 ***	(0.1333)	4.1979 ***	(0.1416)
Median female hourly wage by province by year	-3.2534 ***	(0.4350)	-2.3425 ***	(0.4833)
Dummy for 2008	2.9775 ***	(0.2017)	3.2936 ***	(0.2148)
Dummy for 2009	-0.1097	(0.2151)	0.3412	(0.2279)
Dummy for 2010	4.7244 ***	(0.2669)	5.4533 ***	(0.2847)
Dummy for 2011	2.1881 ***	(0.3379)	3.0666 ***	(0.3671)
Intercept	50.2754 ***	(0.7259)	51.4634 ***	(1.6806)
<i>Number of Observations</i>	81,752			
<i>R<sup>2</sup></i>	0.2335		0.1861	

Notes: The dependent variable is the reported weekly hours of home production. Standard errors are in parenthesis. Monthly family income excludes the household female head own labor income and is measured in thousand dollars. For the OLS estimation the standard errors were computed using White's formula for Heteroskedasticity consistent standard errors. The 2SLS estimation uses language skill (being able to speak a foreign language besides Spanish) as an instrumental variable for participation into the labor force. Significance level: \* 0.1, \*\* 0.05, \*\*\* 0.01

The estimated coefficient of interest,  $\beta_1$ , is not statistically significant at the 5 percent level in either the OLS or IV methods. Before analyzing this lack of significant association between home production and the price for domestic services further, a brief discussion of the other determinants of home production is presented. For most of the other explanatory variables in the structural equation, the IV estimates are very close to the OLS ones and will be used in the analysis that follows.

The sign of the coefficient on the predicted hourly wage is another striking result from table 4. An increase of one percent in the opportunity cost of time is expected to increase the weekly hours of work at home by 6. As mentioned earlier, Gronau (1977), and Graham and Green (1984) estimated a negative relation between predicted wage and home production. The predicted wage of an individual can be interpreted as the shadow price of her time. More productive women are supposed to have higher expected wages, and therefore be more likely to participate in the labor force reducing their hours of leisure and home production. However, using a more precise estimation of wages, Connelly and Kimmel (2010) estimated an increase in the time dedicated to care given associated with higher wages. Their study separated care giving from home production, whereas this research includes caregiving into home production. Similar to Connelly and Kimmel (2010), using wages estimated with a correction for sample-selection bias, home production of Ecuadorian women show a positive association with predicted wages. For a typical Ecuadorian female head, the higher the shadow price of her time the more time she allocates to taking care of her children, cleaning the house, doing laundry and cooking.

### **Demographics**

The estimated parameters for the demographic controls agree with the intuition obtained from the analysis of descriptive statistics in section III. Age is negatively related with home production. Conditional on holding all other variables fixed, a female head of her household is expected to decrease her home production by two hours a week every ten years.

The effect of education is positive and decreasing. The estimated turning point is at 4.2 years of schooling. Neither Gronau (1977) nor Graham and Green (1984) found similar results. They expected education to be negatively related to hours of work at home. Yet, in Gronau's paper the estimated parameter is not statistically different from zero once expected wage is controlled for. In this paper, it is shown that for Ecuadorian women, education has a negative impact in home production only after the first four years of schooling.

The parameter estimates for other demographic characteristics show that black women allocate 1.7 fewer hours a week to work at home than non-black but on average similar women, while indigenous women have on average 3 less hours of home production than otherwise observationally similar non-black and non-indigenous women<sup>20</sup>.

### **Family characteristics**

One of the main differences between this paper and Gronau's (1977) and Graham and Green's (1984), is that the sample includes both married and non-married women, while the other two references consider only married women<sup>21</sup>. Connelly and Kimmel (2010) found a

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<sup>20</sup> The majority of the population in Ecuador is mestizo, but there are other racial specifications as montuvio, mulato and white. Therefore, we refer to the comparison group for race in terms of non-black and non-indigenous.

<sup>21</sup> "Single women" refers also to divorced, separated or widowed.

positive association between marriage and home production, and marriage and caregiving. Results in table 4 show that married Ecuadorian women devote 3.9 more hours in a week to home production (including caregiving) than non-married women.

Additional adults and elders in the house have opposite effects in the hours of home production of the female head. While both male and female seniors represent more workload at home, male adults have no significant effect and other female adults are expected to reduce her workload. Living with another female adult is associated with a decrease of 2.8 hours of home production in a week, while the effect of a female elder is estimate to be an increase of 1.8 hours. Each male elder in the house increases the hours of work at home of the female head by 34 minutes in a week.

The model further predicts that the number of children in the house increases the hours of work at home of the female authority in the house. The effect of an additional child in the house is estimated at 1.3 hours in a week. Also, women who live in a house with at least one child under 6 years show a premium of 5.7 hours of home production over women with similar observable characteristics who live in houses with no children under schooling age.

As expected, having a washing machine at home reduces the home production time of Ecuadorian women. This technological appliance is associated with a reduction of one hour a week in the female head's work at home, which can be interpreted as an increase in the household productivity. However, having a washing machine is not always possible given that this is an expensive durable good and not all families can afford it. Related to this idea, table 4 shows evidence that an increase in family income reduces the hours of work at home of the female head. This is because the household has the possibility to substitute market goods and services, such as washing machines and housemaids, for home production.

Women whose family owns the house where they live, work at the house on average 20 more minutes in a week than women whose family doesn't own the house. Also, the estimated association between the number of rooms in the house and hours of work at home is negative. Holding everything else fixed, an additional room in the house is association with a reduction in the hours of work at home by 9 minutes in a week. This coefficient is significant at a 5% level. Gronau (1977) found no evidence of an association between the size of the house and home production for employed women, his conclusion from this finding was that additional work required by more rooms in the house is presumably done by maids. We assume that this could also be the case in Ecuador, where wealthier families are assumed to be more likely to have bigger houses (the correlation coefficient between rooms and family income is 28.4%) and hire domestic workers.

### **Other variables**

Women in rural areas, 44% of the sample, and women living in the coast, 41% of the sample, have on average 2.6 and 4.2 more hours of home production in a week than otherwise equal women who live in urban areas and other regions in the country, respectively.

Higher values of the median female wage by province might indicate wealthier regions, smaller wage gaps between genders, less unemployment, and other differences between provinces that are the reason this control was included in the model. In any case, higher values of the median wage for women in the province are presumably related to positive social and economic conditions. From the results in table 4, the average hours of work at home of the female authority in the household has a negative association with the median wage of women in the province. That is, women for wealthier regions allocate less time to home production than similar women for regions with lower female wages.

**a. Labor force participation and the effect of the price for domestic services**

Table 5 shows the results for separate regressions for women who are not in the labor force and women in the labor force. The model shows a better fit for the former group. Both models were also estimated correcting for selection into the labor force and out of the labor force, using the same IV that was used in the 2SLS estimation in table 4, i.e. language skill. For both groups, the coefficient of language skill in the selection equation was larger than 0.54 and had a p-value smaller than 0.0001. In addition, the correlation parameter was not statistically different from zero, indicating that the selection bias was not affecting the outcome<sup>22</sup>. Therefore, table 5 presents OLS estimates.

In his 1977 paper, Gronau emphasizes the extent at which employment status determines the total time available for work at home. He showed that, not only Israeli women work less at home if they are employed in the market, but also the estimates for the parameters on other controls differ between the regressions for each of the two groups. Instead of controlling for employment status, the models estimated in table 5 considers employment willingness, i.e. labor force participation. This variation is motivated in the assumption that women who are unemployed have similar preferences to employed women, and both have different time preferences than inactive women who are not looking for a job<sup>23</sup>.

As expected, results differ between the two groups. Some of the controls are significant for one group but not significant for the other. For example, being black is a significant

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<sup>22</sup> The estimation of the model for both groups correcting for selection is presented in Appendix B.

<sup>23</sup> A separate regression for women in the labor force and a dummy for unemployed estimated that unemployed women show a significant premium in work at home over employed women but there is no evidence that the effect of the price for domestic services is different (this was observed using an interaction term between unemployed and the price for domestic services).

determinant of the hours of home production for inactive women, but it is not for women in the labor force. On the other hand, the total family income, house tenure and the number of rooms in the house are significant determinants of the weekly hours of home production for women in the labor force but not for economically inactive women.

Age has a negative estimated parameter for both groups, though it is expected to reduce the hours of work at home for NILF women faster than for women in the labor force, the estimated annual reduction for the former group is 0.31 vs 0.17 for those who participate in the labor market. The turning point of the effect of education is 3 years of schooling for women NILF and 8 years for women in the labor force.

Notice that the family and household characteristics that affect home production negatively are larger for women in the labor force, while the household characteristics that are expected to increase the hours of home production are larger for women that are not in the labor market. Further, the coefficients of controls for underlying trends of the economy as well as the predicted wage are larger in magnitude for NILF women.

Surprisingly, the estimation of a model of home production for women not in the labor force predicts an increase of 10 hours a week associated with an increase of 1% in the hourly wage, while the estimation for the group of women in the labor force predicts no statistically significant effect of wages on the hours of home production. Observably similar women that are working or looking for a job but who have different predicted wages do not differ in the weekly hours of home production.

Unlike the estimation using both groups combined, where the effect of changes in the price for domestic services had little or no effect, when the sample is divided between women in the labor force and economically inactive women, the estimated coefficients are strikingly



different between the two groups and are statistically significant. While a 1% increase in the price for domestic services is associated with an increase in home production for women who are not in the labor force by 1.4 hours in a week, it decreases the home production of women who are either working or looking for a job by 1.9 hours in a week.

**Table 5. Regression estimation for women in the labor force and women NILF separately**

	Not in the labor force		In the labor force	
	Parameter estimate	Standard error	Parameter estimate	Standard error
<b><u>Economic factors</u></b>				
Hourly price for domestic services in logarithmic form	1.4443 ***	(0.4723)	-1.8841 ***	(0.4143)
Predicted hourly wage in logarithmic form	10.3297 ***	(0.5367)	0.0918	(0.6705)
<b><u>Demographics</u></b>				
Age in years	-0.3069 ***	(0.0088)	-0.1708 ***	(0.0081)
Years of schooling	0.4097 ***	(0.0658)	0.4217 ***	(0.0582)
Schooling squared	-0.0701 ***	(0.0046)	-0.0265 ***	(0.0039)
Dummy for race equal black	-2.1938 ***	(0.4637)	-0.7993	(0.5130)
Dummy for race equal indigenous	-1.9977 ***	(0.4204)	-2.5978 ***	(0.2780)
<b><u>Household and family characteristics</u></b>				
Married or living together	2.7525 ***	(0.3056)	2.4704 ***	(0.2093)
Monthly family income	-0.1937	(0.1227)	-0.5005 ***	(0.1050)
Number of other female adults in the household	-2.5359 ***	(0.1255)	-2.8495 ***	(0.1143)
Number of male adults in the household	0.0039	(0.1067)	-0.0692	(0.1051)
Number of female elder in the household	3.2428 ***	(0.6103)	1.0805 **	(0.4479)
Number of male elder in the household	0.5736 *	(0.2961)	0.6696 **	(0.3085)
Number of children in the HH less than 16 years old	1.4093 ***	(0.0851)	1.3487 ***	(0.0756)
Dummy for at least one child less than 6 years old	5.6602 ***	(0.2580)	4.7576 ***	(0.2277)
Dummy for owning a washing machine	-0.5002 **	(0.2468)	-1.2161 ***	(0.2173)
Dummy for owning the dwelling	-0.1502	(0.2843)	0.4438 *	(0.2280)
Number of rooms in the house	-0.0530	(0.0756)	-0.1634 **	(0.0659)
<b><u>Other controls</u></b>				
Dummy for rural area	3.0851 ***	(0.2318)	1.9145 ***	(0.2449)
Dummy for coast region	4.0089 ***	(0.1890)	2.5647 ***	(0.1894)
Median female hourly wage by province by year	-5.1728 ***	(0.6626)	-1.4796 ***	(0.5632)
Intercept	54.6319 ***	(1.0819)	33.0418 ***	(0.9631)
N	40,750		41,002	
R2	0.2814		0.1427	

Notes: The dependent variable is the reported weekly hours of home production. Standard errors are in parenthesis. OLS estimates with Heteroskedasticity consistent White standard errors. Monthly family income excludes the household female head own labor income and is measured in thousand dollars. Significance level: \* 0.1, \*\* 0.05, \*\*\* 0.01

The theoretical model presented in section II predicted an increase in the hours of home production for women in the labor market associated with higher prices of market substitutes. A

negative association between the price for domestic services and home production gives further evidence to the results obtained by Gualavisi (2010), who predicted no effect on employment from an increase in domestic workers' minimum wage. One possible explanation is that the market for domestic workers is not in equilibrium, a possibility suggested by Gronau's work.

Gualavisi (2011) analyzed the effects of the 2010's minimum wage increase for domestic workers using a propensity score matching to generate a control group and obtain difference in differences estimates for employment, hours of work, income, social security and contract type. Her results show that the increase in the minimum wage for domestic workers in 2010 had no significant effect on the employment level of maids, or on the average hours worked per month. Both the treatment and control groups increased the level of employment and reduced the hours of work, but there are no significant differences among the two groups. However, she found evidence of a negative impact on income, which she interprets as a possible displacement from the formal sector to the informal one, reducing wages in the informal sector.

In order to better understand the relation between the hours of home production and the price for domestic services, and the hours of home production and the predicted hourly wage, separate regressions were estimated by income quintiles. Dividing the sample by income quintiles said nothing about the second relation. The coefficient on the log of predicted wages was positive and significant for all groups of quintiles for women not in the labor force, and was not statistically significant for any of the quintiles for women in the labor force.

The results for the estimation by quintiles of the effect of changes in the price for domestic services are presented in table 6. Interestingly, for the group of women that are neither working nor looking for a job, a change in the price for domestic services is associated with an increase in the hours of home production in the lowest quintiles and a decrease in the

upper quintiles. On the other hand, the effect is always negative for women in the labor force, but increases in magnitude and significance as income increases. These results suggest that there is heterogeneity in responses of households to the increased minimum wage for domestic workers. Women who are not in the labor force and live in households in the bottom income quintile, respond as predicted to the price increase by increasing their own hours of home production. Women in the highest income quintile, regardless of labor force participation, have a reduction in home production hours associated with the increase in price of domestic service.

**Table 6. Parameter estimates on the price for domestic services by labor force participation and quintile**

Quintile	Parameter estimate	Standard error	R-Square	N. Observations
<b>Not in the labor force</b>				
Q1	4.4891 ***	(0.9081)	0.3015	11,782
Q2	1.6128 *	(0.9626)	0.2701	10,444
Q3	1.6940	(1.0972)	0.2479	8,138
Q4	-1.2143	(1.1239)	0.2664	6,247
Q5	-4.2899 ***	(1.3033)	0.2996	4,139
				40,750
<b>In the labor force</b>				
Q1	-0.2441	(0.8615)	0.1562	8,957
Q2	-0.2472	(0.9885)	0.1638	7,705
Q3	-1.1392	(0.9859)	0.1456	7,882
Q4	-2.4113 **	(0.9768)	0.1194	8,119
Q5	-4.9521 ***	(0.8576)	0.1235	8,339
				41,002

Notes: The dependent variable is the reported weekly hours of home production. Standard errors are in parenthesis. OLS estimates with Heteroskedasticity consistent White standard errors. The estimation includes all other covariates presented in the model. Significance level: \* 0.1, \*\* 0.05, \*\*\* 0.01

The difference in the response of low-income and high-income groups reflects the asymmetry in the hiring power of families from the lower and upper quintiles. If, because of the increase in the minimum wage for domestic workers, there are more people willing to work in this sector, high-income families that are willing to and can afford it will substitute domestic

services for their own home production. Women from the lower income quintile are less likely to find it more convenient to pay higher prices for domestic services if their own opportunity cost hasn't increased at least as much.

## **V. Conclusions**

Assuming perfect competition, traditional time allocation models would predict an increase in the hours of home production associated with an increase in the price of market substitutes. Hence, an increase in the wage for domestic workers is expected to reduce the demand for domestic services and increase household's home production. However, evidence from recent time allocation data from Ecuador shows a negative association between hours of work at home and the market price for domestic services for women in the labor force. The only group of women who show an increase in the hours of work at home associated with an increase in the price for domestic services are those not in the labor force and in the first and second quintiles of per-capita income.

If women who are the head of their household or the wife of the head participate in the labor force as a result of within household specialization, their opportunity cost is higher than that for other members in the house or than the cost of outsourcing home production (by hiring domestic workers). On the other hand, women who are not in the labor force will hire domestic services to substitute for their work at home if the household budget constraint allows it (given that work at home is something one would rather have someone else do).

A household will hire an additional hour of domestic services if the cost of that hour is less than the opportunity cost of home production. Therefore, as long as the price for domestic services is below the expected wage of the female head in the market, the household will

substitute domestic services for home production. Given that the wage for domestic workers is lower than the expected wage for women, it is still convenient for individuals who are more productive in the labor market than in home production to hire domestic services and participate in the labor force. The same for women who decide not to participate in the labor force but who highly value time consumption (leisure), and their family income allows them to substitute market goods and services for work at home (upper quintiles). The question that arises with this explanation is why the household didn't hire that additional hour of domestic services before the price increased.

If the market for domestic services is not in equilibrium and has an excess demand, as suggested by Gualavisi's (2011) findings, an increase in the wage for domestic workers raises the supply for housemaid services. Hence, women can hire housemaids to do their home production for them (again, as long as the cost is lower than the expected wage or opportunity cost of their time).

In addition, it could also be the case that the woman's participation in the labor market is what pays for domestic services. Then, an increase in the price for these services requires her to work more time in the market if the household still finds it more convenient to hire domestic workers rather than replace market goods for work at home. Also, an increase in the price for domestic services might lead households to demand more work from housemaids and other domestic workers, including multitasking and a higher productivity, demanding more outcome from that employee to whom they are now paying more.

A possible explanation of why this market might have an excess demand in the presence of a minimum wage is that domestic workers might rely on the information given by the government through this labor institution to make their decision about participating or not in

the market. If they have no access to any other information on market wages, they will not participate in this labor market as long as the minimum wage is under their reservation wage. Then, an increase in the minimum wage level might motivate some of these women, the ones with reservation wages under the new minimum wage, to participate in the market and increase the supply for domestic services.

The heterogeneity in the response of women from different quintiles, even though the model controls for family income, suggests that there might be different explanations depending on the family economic status. The only group whose response to changes in the price for home production market substitutes coincides with the prediction of the basic model is the lower income quintile of women that are not in the labor force. On the other hand, for the upper quintiles the response is negative regardless of female head labor force participation. This is evidence of the fact that home production is something one would rather have someone else to do it for oneself, so that as long as a family can afford it and there is market supply, the household will hire domestic workers.

Future research could expand the analysis to all members of a household and their joint participation in home production. The negative response of female heads to higher costs of domestic services might as well be explained by an increase in the hours of work at home of other members of the family. Also, given the simultaneity at which a person allocates her time to production at home and at the market, and to consumption, a model of simultaneous equations where the response variables are the number of hours in the labor force, the number of hours at home production and the number of leisure hours, will give further explanation to where the time taken from home production is being reallocated, and if it is necessary for women to work more at the market to afford more expensive domestic services.

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**APPENDIX A****Table A1. Wage regression for predictions**

<b>Explanatory variable</b>	<b>Parameter Estimates</b>	<b>Standard Errors</b>
<b><u>Log hourly wage</u></b>		
Constant	-1.8089 ***	(0.0514)
Age	0.0509 ***	(0.0019)
Age2	-0.0005 ***	(0.0000)
Years of schooling	0.0192 ***	(0.0029)
Schooling2	0.0038 ***	(0.0002)
Language skill	0.2346 ***	(0.0288)
Parents language skill	0.1661 ***	(0.0594)
Black	0.0069	(0.0209)
Indigenous	-0.1186 ***	(0.0158)
Rural area	-0.2069 ***	(0.0087)
Coast region	-0.0250 ***	(0.0085)
Y2008	0.0709 ***	(0.0115)
Y2009	0.1105 ***	(0.0115)
Y2010	0.2144 ***	(0.0115)
Y2011	0.3050 ***	(0.0119)
Sigma	0.8142 ***	(0.0033)
<b><u>Labor force participation</u></b>		
Constant	-2.8760 ***	(0.0292)
Age	0.1532 ***	(0.0013)
Age2	-0.0017 ***	(0.0000)
Years of schooling	-0.0423 ***	(0.0031)
Schooling2	0.0059 ***	(0.0002)
Head of the household	0.3270 ***	(0.0130)
Married	-0.6692 ***	(0.0105)
Children	-0.0147 ***	(0.0033)
At least one child less than 6	0.0841 ***	(0.0099)
Family income	-0.0894	(0.0047)
Language skill	0.0241 **	(0.0391)
Parents language skill	-0.1511 ***	(0.0713)
Black	0.0764 ***	(0.0216)
Indigenous	0.3319 ***	(0.0171)
Rural area	-0.1076 ***	(0.0088)
Coast region	-0.3733 ***	(0.0082)
Y2008	-0.0834 ***	(0.0125)
Y2009	-0.0998 ***	(0.0125)
Y2010	-0.1726 ***	(0.0124)
Y2011	-0.1710 ***	(0.0128)
Rho	0.2059 ***	(0.0181)
No observations	133,774	

Note: family income excludes own income and was divided by 1,000.

Significance level: \* 0.1, \*\* 0.05, \*\*\* 0.01.



## APPENDIX B

Table B1. Estimation of the weekly hours of home production excluding observation for years with repeated households

	Not in the labor force						In the labor force					
	Whole sample		2007, 2009, 2011		2008, 2010, 2011		Whole sample		2007, 2009, 2011		2008, 2010, 2011	
Log hourly price for domestic services	1.4443 ***	(0.4723)	0.1959	(0.6560)	0.9541 *	(0.5605)	-1.8841 ***	(0.4143)	-1.8983 ***	(0.5626)	-3.7294 ***	(0.5072)
Predicted hourly wage in logarithmic form	10.3297 ***	(0.5367)	10.1780 ***	(0.6874)	11.1840 ***	(0.6704)	0.0918	(0.6705)	0.0856	(0.8595)	1.0391	(0.8534)
Age in years	-0.3069 ***	(0.0088)	-0.2970 ***	(0.0115)	-0.3105 ***	(0.0110)	-0.1708 ***	(0.0081)	-0.1718 ***	(0.0106)	-0.1676 ***	(0.0101)
Years of schooling	0.4097 ***	(0.0658)	0.4710 ***	(0.0854)	0.3105 ***	(0.0825)	0.4217 ***	(0.0582)	0.4915 ***	(0.0764)	0.2941 ***	(0.0744)
Schooling squared	-0.0701 ***	(0.0046)	-0.0746 ***	(0.0059)	-0.0686 ***	(0.0057)	-0.0265 ***	(0.0039)	-0.0297 ***	(0.0051)	-0.0257 ***	(0.0049)
Dummy for race equal black	-2.1938 ***	(0.4637)	-0.7046	(0.6136)	-3.2629 ***	(0.5441)	-0.7993	(0.5130)	0.0966	(0.6600)	-1.7919 ***	(0.6349)
Dummy for race equal indigenous	-1.9977 ***	(0.4204)	-1.5639 ***	(0.5645)	-2.4167 ***	(0.5204)	-2.5978 ***	(0.2780)	-2.5457 ***	(0.3657)	-2.9009 ***	(0.3515)
Married or living together	2.7525 ***	(0.3056)	2.8113 ***	(0.4005)	2.3054 ***	(0.3808)	2.4704 ***	(0.2093)	2.3062 ***	(0.2740)	2.4346 ***	(0.2636)
Monthly family income	-0.1937	(0.1227)	-0.2041	(0.2466)	-0.1666	(0.1411)	-0.5005 ***	(0.1050)	-0.4072 ***	(0.1287)	-0.4950 ***	(0.1327)
Number of other female adults in the household	-2.5359 ***	(0.1255)	-2.6139 ***	(0.1651)	-2.3415 ***	(0.1572)	-2.8495 ***	(0.1143)	-2.8863 ***	(0.1524)	-2.7485 ***	(0.1454)
Number of male adults in the household	0.0039	(0.1067)	-0.0433	(0.1398)	0.0997	(0.1353)	-0.0692	(0.1051)	-0.0398	(0.1387)	-0.1362	(0.1327)
Number of female elder in the household	0.5736 *	(0.2961)	0.1922	(0.3929)	1.2503 ***	(0.3723)	0.6696 **	(0.3085)	0.5778	(0.4010)	0.8114 **	(0.3911)
Number of male elder in the household	3.2428 ***	(0.6103)	3.5337 ***	(0.7866)	3.6574 ***	(0.7879)	1.0805 **	(0.4479)	1.2662 **	(0.5791)	1.0587 *	(0.5624)
N. of children in the HH less than 16 years old	1.4093 ***	(0.0851)	1.5721 ***	(0.1128)	1.2358 ***	(0.1061)	1.3487 ***	(0.0756)	1.3467 ***	(0.1004)	1.3048 ***	(0.0971)
Dummy for at least ! child less than 6 years old	5.6602 ***	(0.2580)	5.2071 ***	(0.3394)	5.7093 ***	(0.3197)	4.7576 ***	(0.2277)	4.6679 ***	(0.3008)	4.5496 ***	(0.2876)
Dummy for owning a washing machine	-0.5002 **	(0.2468)	-0.5237	(0.3283)	-0.5223 *	(0.2928)	-1.2161 ***	(0.2173)	-1.3619 ***	(0.2848)	-0.9209 ***	(0.2665)
Dummy for owning the dwelling	-0.1502	(0.2843)	0.1271	(0.3699)	-0.5148	(0.3491)	0.4438 *	(0.2280)	0.8213 ***	(0.2980)	0.4117	(0.2823)
Number of rooms in the house	-0.0530	(0.0756)	0.0637	(0.1014)	-0.2610 ***	(0.0934)	-0.1634 **	(0.0659)	-0.1234	(0.0891)	-0.3421 ***	(0.0821)
Dummy for rural area	3.0851 ***	(0.2318)	3.2525 ***	(0.3055)	3.6239 ***	(0.2846)	1.9145 ***	(0.2449)	1.9824 ***	(0.3168)	2.6263 ***	(0.3123)
Dummy for coast region	4.0089 ***	(0.1890)	1.4610 ***	(0.2482)	6.5255 ***	(0.2344)	2.5647 ***	(0.1894)	1.3814 ***	(0.2478)	3.0072 ***	(0.2359)
Median female hourly wage by province by year	-5.1728 ***	(0.6626)	-4.0898 ***	(0.8204)	-7.8490 ***	(0.7609)	-1.4796 ***	(0.5632)	-1.3947 **	(0.7079)	-1.3759 **	(0.6556)
Dummy for 2008	3.8608 ***	(0.3098)					2.7520 ***	(0.2611)				
Dummy for 2009	-0.8946 ***	(0.3265)	-0.7680 **	(0.3485)			1.4312 ***	(0.2837)	1.4475 ***			
Dummy for 2010	5.5012 ***	(0.3997)			2.2972 ***	(0.3448)	5.3778 ***	(0.3575)		(0.3038)	2.8596 ***	(0.3223)
Dummy for 2011	2.0781 ***	(0.5055)	2.1328 ***	(0.6222)	-0.5211	(0.4699)	4.3264 ***	(0.4558)	4.3066 ***	(0.5529)	2.0911 ***	(0.4453)
Intercept	54.6319 ***	(1.0819)	53.0624 ***	(1.3573)	62.0902 ***	(1.3053)	33.0418 ***	(0.9631)	32.7551 ***	(1.2174)	36.5831 ***	(1.1602)
N. observations	40,750		23,544		25,470		41,002		24,233		24,243	
R-squared	0.281		0.2604		0.2954		0.1427		0.1325		0.1447	

Notes: The dependent variable is the reported weekly hours of home production. Coefficients estimated using OLS. White std. errors in parenthesis. Significance level: \* 0.1, \*\* 0.05, \*\*\* 0.01.

## APPENDIX C

Table C1. Estimation of the weekly hours of home correcting for selection into the labor force

	Parameter Estimates	Standard Error	Parameter Estimates	Standard Error
	In the labor force		Not in the labor force	
<b><u>Structural Equation</u></b>				
Intercept	54.6352 ***	(2.9111)	33.0417 ***	(1.2535)
Hourly price for domestic services in logarithmic form	1.4431 ***	(0.4747)	-1.8842 ***	(0.4158)
Predicted hourly wage in logarithmic form	10.3291 ***	(1.1707)	0.0921	(1.0835)
Age in years	-0.3069 ***	(0.0113)	-0.1706 ***	(0.0100)
Years of schooling	0.4093 ***	(0.0909)	0.4227 ***	(0.0689)
Schooling squared	-0.0700 ***	(0.0046)	-0.0266 ***	(0.0041)
Dummy for race equal black	-2.1939 ***	(0.4551)	-0.7994 *	(0.4746)
Dummy for race equal indigenous	-1.9948 ***	(0.6480)	-2.5973 ***	(0.4239)
Married or living together	2.7530 ***	(0.4628)	2.4696 ***	(0.2961)
Monthly family income	-0.1956	(0.1338)	-0.5008 ***	(0.0934)
Number of other female adults in the household	-2.5359 ***	(0.1269)	-2.8491 ***	(0.1140)
Number of male adults in the household	0.0045	(0.1203)	-0.0694	(0.1121)
Number of female elder in the household	0.5710 *	(0.3009)	0.6692 **	(0.3162)
Number of male elder in the household	3.2427 ***	(0.5448)	1.0805 ***	(0.4144)
Number of children in the HH less than 16 years old	1.4124 ***	(0.0782)	1.3494 ***	(0.0699)
Dummy for at least one child less than 6 years old	5.6599 ***	(0.2542)	4.7574 ***	(0.2133)
Dummy for owning a washing machine	-0.5007 **	(0.2506)	-1.2160 ***	(0.2142)
Dummy for owning the dwelling	-0.1486	(0.2711)	0.4438 **	(0.2191)
Number of rooms in the house	-0.0507	(0.0746)	-0.1626 **	(0.0641)
Dummy for rural area	3.0878 ***	(0.3251)	1.9146 ***	(0.3007)
Dummy for coast region	4.0036 ***	(0.3148)	2.5636 ***	(0.2455)
Median female hourly wage by province by year	-5.1703 ***	(0.7100)	-1.4798 **	(0.5879)
Dummy for 2008	3.8618 ***	(0.3160)	2.7521 ***	(0.2664)
Dummy for 2009	-0.8938 **	(0.3492)	1.4312 ***	(0.2969)
Dummy for 2010	5.5010 ***	(0.4659)	5.3777 ***	(0.4027)
Dummy for 2011	2.0778 ***	(0.5915)	4.3263 ***	(0.5175)
Sigma_homeProduction	17.4045 ***	(0.0610)	15.7091 ***	(0.0549)
<b><u>Selection equation</u></b>				
Intercept	3.3535 ***	(0.0644)	3.3527 ***	(0.0644)
Language Skill	-0.5419 ***	(0.0580)	-0.5422 ***	(0.0567)
Hourly price for domestic services in logarithmic form	0.0755 ***	(0.0253)	0.0754 ***	(0.0253)
Predicted hourly wage in logarithmic form	2.0492 ***	(0.0426)	2.0484 ***	(0.0426)
Age in years	-0.0139 ***	(0.0005)	-0.0139 ***	(0.0005)
Years of schooling	-0.1021 ***	(0.0036)	-0.1020 ***	(0.0036)
Schooling squared	-0.0012	(0.0000)	-0.0012 ***	(0.0003)
Dummy for race equal black	0.0267	(0.0264)	0.0248	(0.0264)
Dummy for race equal indigenous	0.7653 ***	(0.0202)	0.7644 ***	(0.0201)
Married or living together	-0.5754 ***	(0.0142)	-0.5757 ***	(0.0142)
Monthly family income	-0.0613 ***		-0.0613 ***	(0.0059)
Number of other female adults in the household	0.0164 **	(0.0069)	0.0164 **	(0.0069)
Number of male adults in the household	-0.0953 ***	(0.0062)	-0.0951 ***	(0.0062)
Number of female elder in the household	0.0280	(0.0174)	0.0283	(0.0174)
Number of male elder in the household	-0.0041	(0.0188)	-0.0040	(0.0188)
Number of children in the HH less than 16 years old	-0.0044	(0.0042)	-0.0043	(0.0042)
Dummy for at least one child less than 6 years old	-0.1089 ***	(0.0127)	-0.1094 ***	(0.0127)
Dummy for owning a washing machine	0.0787 ***	(0.0131)	0.0796 ***	(0.0131)
Dummy for owning the dwelling	-0.0521 ***	(0.0137)	-0.0533 ***	(0.0137)
Number of rooms in the house	0.0056	(0.0039)	0.0056	(0.0039)
Dummy for rural area	0.4463 ***	(0.0142)	0.4469 ***	(0.0142)
Dummy for coast region	-0.4132 ***	(0.0103)	-0.4130 ***	(0.0103)
Median female hourly wage by province by year	-0.3888 ***	(0.0351)	-0.3886 ***	(0.0351)
Dummy for 2008	-0.2079 ***	(0.0157)	-0.2068 ***	(0.0157)
Dummy for 2009	-0.3012 ***	(0.0168)	-0.3017 ***	(0.0168)
Dummy for 2010	-0.5162 ***	(0.0215)	-0.5149 ***	(0.0215)
Dummy for 2011	-0.6482 ***	(0.0278)	-0.6478 ***	(0.0278)
<b>Rho</b>	<b>0.0020</b>	<b>(0.0618)</b>	<b>-0.0012</b>	<b>(0.0450)</b>
<i>N. observations</i>	<i>41,002</i>		<i>40,750</i>	

Notes: the dependent variable is the reported hours of home production. Standard errors in parenthesis. Family income is divided by 1000.

Significance level: \* 0.1, \*\* 0.05, \*\*\* 0.01.