

# Female labor participation and the distribution of gender roles within the household\*

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## Abstract

The increase in female labor participation that is being experienced by developing countries could be affected by gender roles attitudes. Females with more conservative/traditional attitudes could be less prone to participate in the labor market, and also supply fewer hours of work.

Using a novel dataset that accounts for gender roles attitudes this paper provides evidence in this respect. The relationship between labor supply (both labor force participation and hours worked) and gender roles attitudes is studied in both parametric and semi-parametric models that account for endogeneity of gender roles and non-labor income.

The results indicate that gender roles attitudes affect labor participation, where women with traditional views tend to participate less in the labor market, but once they decide to work, these attitudes do not affect hours worked. The size of the impact of gender roles attitudes on female labor participation is fairly large. Switching from percentile 75 to 25 of the attitudes index (This is becoming less conservative) has a similar impact on labor participation to an increase in education from primary to secondary. Alternative, an increase in one standard deviation in the gender roles attitude index implies a decrease of 6.4 percentage points in the labor participation rate, from an aggregate level of 59%. Similarly, in the case of non-labor income, it was found that the greater the income, the lower the probability of working, and once women decide to do it, non-labor income again affects negatively the hours worked.

However, the results show that there is no strong evidence of endogeneity between labor market participation and gender role attitudes. The findings support the idea that gender role attitudes are developed early, and are correlated with family history (similar evidence was found by Vella, 1994 y Farré y Vella, 2007). In addition, it was found that non-labor income is endogenous to the decision of participation, but it is not endogenous in the determination of hours worked.

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## 1. Introduction

Female labor participation in Chile has increased continuously in recent years, reducing the gap with other Latin American countries and developed countries. Nevertheless, it still remains low for international standards. This low female participation has been called “the Chilean exception”, given the level of schooling of Chilean women and income growth in the last 20 years. Several papers have studied female labor force participation in Chile. For instance, Contreras, Puentes and Bravo (2005) postulated that increases in female labor force participation are correlated with schooling and age, and that economic activity is not highly correlated with participation. On the other hand, Neilson and Ruiz Tagle (2009) show that the job turnover among women is significantly higher than that of men, which has important implications for the wage gap, which in turn determines the opportunity cost of women who do not work.

Despite the existence of literature on female participation in Chile, the topic of roles and cultural factors has not been broadly considered. Only Contreras and Plaza (2010) have studied how cultural factor could affect female labor participation. This paper looks to fill that gap, not only considering how cultural factors affect participation, but also correcting for the potential endogeneity between labor participation and gender role attitudes. This study takes advantage of a novel survey in Chile called “Voz de Mujer” (Women Voice-EVM), which was especially designed to study female labor participation, and women’s perceptions of gender roles.

The estimation results show that more conservative/traditional gender role attitudes are negatively correlated with female labor force participation. This is, the more conservative/traditional the gender role views of the women, the lower her probability of participating in the labor market. These results support the evidence found by Contreras and Plaza for Chile, this paper includes the possible endogeneity in the estimations. Therefore, the evidence of causality is significantly more robust in this article. The results are also consistent with those found by Vella (1994) in Australia. However, going one step further, the results show that, once women have decided to participate, the effect of gender role attitudes in the decision of hours worked vanishes.

The evidence obtained suggest that the impact of gender role attitudes on labor participation is significantly and large. As an order of magnitude, moving from percentile 75 to 25 of the attitudes index (this is, becoming less conservative) has a similar impact on labor participation to an increase in education from primary to secondary. Alternatively, and increase in on standard deviation in the gender roles attitudes index implies a decrease of 6.4 percentage in the labor participation rate, from an aggregate level of 59% meaning a large impact.

Similarly, it was found that the higher the level of non-labor income of women, the lower the probability of them working. Moreover, once the women have decided to work again, non-labor income negatively affects the hours that women work. This result is consistent with traditional models of labor supply and strongly emphasizes the role of household composition on women’s participation decision

Simultaneously, we find that gender role attitudes would not be endogenous in the estimation of labor participation, which implies that labor participation would not change attitudes as could be assumed. These results support the idea that gender role attitudes are developed early and are correlated with family background (similar to the results found in Vella, 1994 and Farré and Vella, 2007).<sup>1</sup>

At the same time, we find that non-labor income is endogenous to the decision to participate, but is not endogenous in the determination of hours worked. This evidence suggests that the structure of household income is relevant to the decision to participate, but once the women have already decided to participate, the decision of hours worked is taken more independently from the household.

This paper is divided into 6 sections. The first one is this introduction; the second one corresponds to a literature review of female labor market performance and gender roles. A third section describes the empirical strategy proposed to estimate the model. The fourth section describes the data, the fifth section shows our results and the sixth section presents our conclusions.

## 2. Female labor performance and gender roles

To establish a framework that allows to study the relationship between gender role attitudes and female labor market performance it is necessary to recall briefly how would gender roles can be included within a household in a context of what is called a “household production function”. This scheme considers that households consume some goods and services that can only be bought in the market. In addition, households consume other goods and services that can be provided within the home or bought on the market. Finally, there are other goods that can only be generated by household members.

Certainly, the level of completeness of markets and the preferences of the individuals determine the ability of households to substitute goods and services with their own work or buying in the market. For example, in terms of preferences, if a household believes that the mother is irreplaceable in the care of children in the first six months of life, there is no substitutability of childcare even if there is a market that provides childcare.

Nevertheless, beyond a theoretical model of household production function, the preferences that households have are revealed in their decisions about labor participation. That is, decisions on who and how is caring for other household members, taking into account the special needs of each of them (children, elderly, disabled, etc.). However, it can be proposed a reduced model where relationships are established, and eventually explore the causality of the relationships within the household and decision-making mechanisms and decisions related to the labor market.

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<sup>1</sup> Vella (1994) finds that the attitudes affect the educational level of women, but the years of schooling do not affect the attitudes.

The structure of roles within the home and its impact on schooling and labor market performance has prompted some studies based on a reduced form approach in recent years. For example, Vella (1994) finds, using data for Australia, that traditional attitudes of women are developed in their youth and involve significant reductions in investment in human capital, in their labor supply and in rates of return to education. More recently, Farrell and Vella (2008) used United States data and found that attitudes towards gender roles of working mothers affect their children's attitudes. Also for the United States, Judge and Livingstone (2008) show evidence that the traditional view of the roles of women and men continues to exacerbate the gender wage gap.

For European countries, Fortin (2005) finds a negative relationship between anti-egalitarian views of gender and women's labor participation. Fernandez (2007) found that women whose home country is more conservative tend to work less. Fernandez also finds that this effect is mitigated by including characteristics of the male partner, which she interprets as evidence in favor of assortative mating among couples of high education and income (Where women have a higher probability to participate in the labor market).

In Chile, the structure of roles and its impact on female participation has been scarcely studied. Contreras and Plaza (2010) found that cultural factors such as machismo and values play a significant role in labor force participation decisions of women. Thus, their results show that women with more traditional values in their environment are less likely to participate in the labor market. However, they do not attempt to correct for the potential endogeneity between participation and gender roles. Also, they use a limited survey in terms of sample size and explanatory variables. The study of Contreras and Plaza, does not consider the decision of hours worked.

Some indirect evidence of the perception of gender roles and its impact on labor outcomes has been also found for Chile. For example, Contreras and Ruiz-Tagle (2006), show that the presence of a disabled person in the household decreases labor force participation more for women than men. But more interestingly, the authors find that there would be an additional effect on the wages earned by those with a disability at home, where the effect would be negative for women and inexistent for men. The authors indicate that more flexible working conditions could represent an explanation for this result in a context where gender roles drive women to be in charge of other household members with special needs.

### 3. Empirical Strategy

To implement the reduced approach, labor force participation is modeled as a binary probabilistic model, where a variable  $p_i$  takes the value 1 if individual  $i$  participate in the labor market and 0 otherwise. The probability of participation may depend on a number of personal and household characteristics. For instance, the personal characteristics that will be considered are related to human capital, which affect productivity in the labor market and in that manner the opportunity cost of labor inactivity. Among the household characteristics, we include family structure and characteristics of other household members.

The structure of gender roles within the household is part of the personal characteristics in the participation model, but it could also be part of the set of household characteristics (of the other members, or from the environment in which the participation decision is made). The availability of information determines the type of characteristic that can be considered. Contreras and Plaza (2019) use perception of the environment, while in this study we use the woman's preference. These variables that determines the attitudes of gender roles will be called  $z_i$ .

In parallel, among the characteristics of other household members we included their income. To the woman who makes the labor participation decision, this income is considered as "non-labor income" (although it is mainly labor income of the other members of the household), and will be called  $y_i$ .

On the other hand, there is the model of labor supply, in particular, hours worked, which will be called  $h_i$ . Similarly, one can propose a reduced model of supply of hours worked that depends on a set of individual and household variables, which again includes the structure of roles within the household and non-labor income.

The main estimation problem is that the structure of gender roles within the household could be considered as endogenous. If this is the case, the parameters of the estimated models, both labor participation and supply of hours will be biased. The prior belief is that there is a double causality, where labor market performance (in this case labor participation) affects gender roles attitudes.

By the same token, non-labor income could be also considered as an endogenous variable. This is because labor participation decisions are made within the household in joint manner, where the participation decision of one members could affect the labor decisions of other members.

Facing this problem and to estimate the parameters of the labor force participation and the supply of hours worked in an unbiased manner, it is proposed to use two types of estimation methods: The first approach is a semi parametric method based on the methodology proposed by Das, Newey and Vella (2003) to estimate parameter of the participation decision. This method allows flexible functional forms based on polynomial

approximations, where the polynomial components to include are selected through cross validation. The second method of estimation is a maximum likelihood model for censored variables, which corrects for endogeneity of some explanatory variables; this method is used to estimate the parameters of the equation of hours worked.

The model to be estimated can be summarized in equations (1) to (4) below. Equation (1) corresponds to the binary variable indicating whether the person participates in the labor market (being equal to 1). Equation (2) corresponds to the variable that determines the supply of hours worked. Equation (3) corresponds to the endogenous variable structure of roles within the household. Finally, equation (4) corresponds to the endogenous variable of the rest of the household income. The functions  $f(\cdot)$  are the corresponding flexible functional forms described in terms of polynomials. The vectors  $X_i$  correspond to the vector of variables of individual and household characteristics for each equation. The terms  $e_i$  correspond to the error terms.

$$p_i = I(f_1(X_{1i}, z_i, y_i) + e_{1i} > 0) \quad (1)$$

$$h_i = f_2(X_{2i}, z_i, y_i) + e_{2i} \quad (2)$$

$$z_i = f_3(X_{3i}) + e_{3i} \quad (3)$$

$$y_i = f_4(X_{4i}) + e_{4i} \quad (4)$$

The equations (1), (3) and (4) are estimated by OLS through a two-stage estimation. The first stage, estimates equations (3) and (4) to recover the estimated error terms. In a second stage, equation (1) is estimated incorporating endogenous variables as explanatory and adding polynomial forms of the respective error terms. More explicitly, in the case of participation, we estimate a model described by equation (5):

$$p_i = I(f_1(X_{1i}, z_i, y_i) + e_{1i} > 0) \quad (1)$$

$$h_i = f_2(X_{2i}, z_i, y_i) + e_{2i} \quad (2)$$

$$z_i = f_3(X_{3i}) + e_{3i} \quad (3)$$

$$y_i = f_4(X_{4i}) + e_{4i} \quad (4)$$

Where the function  $\text{pol}_1(e_{3i}, e_{4i})$  is polynomial function that includes different order terms, with its respective interactions. The final choice of polynomial components is carried out through a process of cross validation, as was mentioned above.

Equation (2) is estimated by a Tobit model adjusted for the endogeneity of the variables of roles and non-labor income. To estimate by maximum likelihood, we add a joint normality assumption of the error terms of equations (2), (3) and (4). This

assumption, although restrictive, allows us to adequately control for the censoring of the variable hours worked, and the endogeneity of the variables of roles and non-labor income.

One of the challenges of the proposed methodology is the careful selection of exclusion variables for equations (3) and (4), which has to obey economic and statistical criteria. On the one hand, it is required variables that are correlated with gender roles attitudes, but not with labor participation. On the other hand it is required variables that explain non-labor income, but that are not correlated with the participation decision. The discussion about these exclusion variables is carried out in the next section.

#### 4. Data and information sources

The data used in this paper corresponds to a novel survey conducted in Chile that was specially designed to analyze the situation of women. The survey is called Encuesta Voz de Mujer (Women's Voice - EVM) and the total number of surveyed women is 2,992, where the sample design is probabilistic and stratified geographically, with nationally representative. The survey interviewees are woman between 18 to 65 years old. When there was two or more women in the household the interviewee was selected randomly using a "Kish's Table".

The questionnaire includes topics of household composition, education, labor participation, health, and gender role attitudes, among others. The Center of Microdata at the Universidad de Chile conducted the fieldwork, which lasted between September and November 2009.

##### 4.1. Measuring gender role attitudes

One of the central challenges of this study is to develop a set of variables that reflects the gender roles structure within the household. The EVM includes an entire module of twelve questions related to the "Distribution of roles within the household".<sup>2</sup>

Questions available in the EVM allow for a full characterization of perceptions and relationships within the home, both from the point of view of preferences and as a family decision. This abundance of information will serve to test the impact of various aspects of the distribution of roles within the household. Also, new variables will be constructed to collect information from several questions or indicators across global indexes, which allow for greater variance in the variable associated with roles.

These problems have been addressed in the literature earlier on. Vella (1994) constructs an index of attitudes occupying 7 claims about the role of women at work and at home. For each statement that women respond: "(1) fully agree, (2) agree, (3) do not

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<sup>2</sup> This corresponds to Module J.

know, (4) disagree, (5) strongly disagree." The statements imply that "agree" corresponds to attitudes in which women bore the brunt of domestic work, or they should make sacrifices for their husbands. Vella generates a global index that corresponds to the sum of the responses and that takes values between 7 and 35, where 7 is a very traditional attitudes and 35 to modern attitudes.

On the other hand, Farre and Vella (2007) constructed three types of indicators of attitudes. The first is similar to Vella (1994). The second consists in generating dummy variables for each statement, merging "strongly agree" and "agree" or merging "strongly disagree" or "disagree", and then adding the binary variables. The third indicator uses factor analysis to generate an index that weights the response to each statement in a differentiated way. The results they find are robust to the type of indicator used.<sup>3</sup>

In this paper a strategy similar to Vella (1994) and Farré and vella (2007) is implemented. The module on gender role attitudes is used to generate an index that attempts to measure how conservative/traditional or modern are the views of the interviewees with respect to work, children and family. Each answer of the questions in the module is coded as a dummy that takes the value of one if a woman exhibits a traditional role and zero otherwise. In doing this, all the dummy variables can be added up to generate an index of gender role attitudes.

The questions about gender roles in the EVM Survey are divided in three parts. The first part is about the role of women in life, the statements that women have to evaluate are: "A woman should earn a wage and take care of her family", "A mother that works is able to have a solid and warm relationship with her children as a woman that does not work" and "The dedication of the father or the mother are equally important for the cognitive and affective development of their children", for these questions, women have to answer if they "strongly agree", "agree", "neither agree nor disagree", "disagree" or "strongly disagree" with the statement. Women were coded as having a traditional view if she "neither agree nor disagree", "disagree" or "strongly disagree" with the statements.

The second set of questions is related to chores that are/would be given to daughters and sons, the set of chores are: "prepare a meal", "wash the car", "laundry, iron or cleaning" and "small home repairs". Women are coded with a traditional view if they choose only sons or only daughters to do one of the chores.

The third section corresponds to the compatibility between working and being married, the questions were: "Do you agree that your daughter, when married (or with a partner), should work in the following cases: Without children, with children of pre-school age, with children of school age, with children over school age." Women were coded as having a traditional role if they agreed with the option of not working for her daughter.

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<sup>3</sup> In parallel, Fortin (2005) does not add questions in a global index, but analyzes how groups of questions may affect female labor participation in different countries of the OECD.



Adding up all the variables directly generates an index that can take any integer value from 0 to 13. Table 1 shows the distribution of the index. It can be observed that 18% of the women have an index equal to zero, showing a rather modern view of the role of women in society. At the same time a 15% of women have an index greater than 4.

[INSERT TABLE 1 HERE]

Table 2 shows how schooling and the number of children change for different values of the index. It can be noticed that women with a lower index tend to have higher education, especially vocational and university and less secondary education than women with more traditional values. Interestingly, women with more traditional values have fewer children. However, as it is shown in Table 3, this occurs because of the correlation between attitudes and age.

[INSER TABLE 2 HERE]

It is noticeable that young women have a lower mean of the index. Also younger women tend not to give only chores to sons and daughter, creating a more egalitarian distribution of chores at home. Finally, younger women agree more with the statement that married women can work even when they have children of pre school age.

[INSERT TABLE 3 HERE]

In Figure 1 it can be seen the negative the correlation between labor participation and the attitudes index. The slope of the relationship is rather steep, where women with an index equal to zero have a participation rate of about 70%, and those with an index larger than 4 exhibit rates below 50%. Nevertheless, this correlation is far from indicting causality. In fact, women could change their view of gender roles because of their work experience. In the next section it is explained how it is attempted to control for the potential endogeneity between these two variables.

[INSERT FIGURE 1 HERE]

## 4.2. Endogeneity analysis scheme

As stated above, including gender roles attitudes and non-labor income as endogenous in the participation model requires exclusion variables in equations (3) and (4), and excluded in (1) and (2).

Vella (1994) choose variables that are assumed correlated with attitudes or roles, but not with the decision to work are. These variables are: If you lived with the mother and father until age 14, parental education and number of siblings. Vella finds that the roles variable is weakly exogenous in the decision of schooling. In parallel, Fortin (2005) does not develop a model of endogenous variables, but compares results from immigrants and natives in order to assess the problem. Finally, Farré and Vella (2007) use the attitudes of the mother as instruments for the attitudes of their daughters.

In this paper it will be used a methodology similar to Vella (1994), using as exclusion variables information on parent's education, information on living with parents until age 15 (lived only with the mother, only with the father, with both, with none) and number of sisters and brothers. It is not possible to use similar exclusion variables as in Farré and Vella (2007) and Fortin (2005) as they are not available in the EVM.

The proposed exclusion variables measure the influence of the family environment in which the woman grew up, which may condition her gender roles attitudes. For example, it is expected that the educational level of the parents and whether the mother worked should affect the view of women in society. Vella (1994) finds that women, who grow up in homes where both parents are absent, have more modern attitudes. This may be because there was no role model or because economic necessity making them more independent. Additionally, Vella (1994) found that women with working mothers and parents with college education have more modern attitudes, in this case showing that the model of father and mother affects gender attitudes. Finally, Vella (1994) shows that households with higher number of siblings, women tend to be more conservative, this could be because the allocation of household tasks, define in higher measure the roles in large homes.

Family characteristics of the house where grown women, should not affect labor participation. The decision depends largely on current costs and benefits and not the circumstances of her home for 14 years.

From information on the presence of the father and mother at home 4 dummy variables were created: the first identifies interviewee who lived alone with their mother, the second identifies interviewee who lived alone with their father, the third identifies women who lived with both father and mother, and the last identifies women who did not live with either the mother or the father. The latter group is comparison group.

The variables of education of the mother and father identified the level achieved by each. The levels used are three: The first, includes individuals with no education or incomplete basic education or basic education completed, the second level, includes individuals with incomplete secondary education or completed secondary. Finally, the third group considers people with incomplete and complete tertiary education. The comparison group used is the first group.

In addition to the number of sisters and brothers who lived with the interviewee, we add information from other children who lived with the interviewee, but were not

siblings.

Since, not all interviewee provide information on education, presence and occupation of the mother and father, we add dummy variables that identify these cases. These dummies do not give more information about the home, but let to control for non-response without biasing the sample.

In parallel, the exclusions in the case of non-labor income are information on age, education and type of education of the principal provider of income at home (different from the woman) in addition to a binary variable for the presence of a main provider different from the interviewee. That is, if there are more members in the home, but these do not generate income, then there is no other provider in the home. At the same time, if another member of the household generates income, then we use information on age and education of this provider in the estimation. If more than one person in the household generates income, we use the information of the individual with higher incomes. These variables should not affect the decision of the woman to participate once we control for non-labor income.

Non-labor income is measured as the sum of subsidies, interests, rental income and other types of non-labor income of the woman; also we include the total income earned by the rest of the members in the household. This last component is the most important in relative terms.

Figure 2 shows the correlation between non-labor income and labor participation. It can be noticed that the canonical model of labor decision seems to hold, since the larger the non-labor income, the lower the participation.

[INSERT FIGURE 2 HERE]

### 4.3. Additional explanatory variables

In the regressions we include variables for the interviewee, these are age and age squared, which captures the behavior along the life cycle. It also includes information on educational level achieved, leaving as comparison group interviewee with no education or have incomplete or complete primary education. To study the effect of children on participation and hours worked, we calculated the number of children in accordance with relevant levels of educational system. Thus, children between 0 and 3 correspond to the children, who may attend daycare and kindergartens, children between 4 and 12 years attend pre-kindergarten, kindergarten or basic education, while the number of children

between 14 and 18 are children in secondary education. Finally, we include the number of people living in the home that are not for children between 0 and 18.

## 5. Estimation Results

In this section we present the results of the methodologies presented in Section 3. First analyze the results for the model of labor participation. The two-step estimation procedure proposed above implies to first obtain estimates of equation (3) and (4) by OLS. The descriptive statistics of the variables is presented in Table A.1 in the Appendix. The estimation of the endogenous variable Attitudes Index, equation (3), gives some interesting results. First, there is little evidence that the gender roles attitudes can be explained by socio-demographic characteristics (Table 4). In fact, only few characteristics seem to be statistically significant. Age squared is significant, but age by itself is not. Northern regions have a larger Attitudes Index since there is a positive significant effect in the regression, indicating that those regions are more conservative/traditional in their gender roles attitudes.

The second interesting result is that the number of siblings (both males and females) does not have a significant effect on the attitude index, so that the idea that household composition could determine gender role attitudes is not supported in Chilean case. Third, while education of the mother does not have any significant impact, education of the father does. In fact, there is a negative significant impact of the father being of tertiary education. This is, a highly educated father would have induced a woman to be less conservative and then to exhibit a lower attitude index, supporting the role of education in attitudes formation.

Fourth, there is a negative significant impact of the working status of the mother on the attitudes index. If the mother worked while the interviewee was young, there is less probability of the woman having more conservative attitudes. Finally, with whom the interviewee lived with while young has somehow unclear impact. While living only with the mother has a positive (significant) impact on the attitude index, living only with the father has a negative impact, and living with both father and mother has positive (significant) impact. One potential explanation for these results is that mother of the household is who define the roles of sons and daughters, and therefore increase the index of attitudes. In the case of live just with father or live without both father and mothers, there is no effect in the indicator. It is worth to remark that these last two results are sufficient for identification of attitudes index given that some exclusion variables are statically significant.

At the same time, the estimation of non-labor income, equation (4), gives somewhat expected results. The presence of another person in households that is employed (other than the interviewee) has a positive impact but not significant on non-labor income (Table 5). Higher education achievement of the household main provider has a positive and highly significant impact on income.

The estimation results of the main equation for participation (5) are summarized in Table 6. The first column, model 1, presents the model with no correction for endogeneity. The following models 1 to 4 are the best models according to the CV-value criteria for choosing the specification of the correction terms in the polynomial (the values of cross validation statistic are presented in the last row of each model). Focusing initially on the model without correction, some results are worth to be remarked. There is a negative significant effect of the Attitudes Index on labor force participation with a coefficient of -0.0333. This is the most important result, which seems to support the hypothesis that more conservative attitudes make females less prone to participate in the labor force.

In parallel, there is a significant convex effect of income on participation. Also, there is a concave significant effect of age on participation. As expected, education has a positive increasing effect on education. While the coefficient associated to secondary education is 0.086 (above the base category of primary education), the coefficient of tertiary education has a coefficient of 0.166.

Northern and Southern regions imply lower participation, which is also expected as the Center regions are more educated and exhibit higher levels of urbanization and income (although, we control for education, geographic variables could capture part of the unobservable). The presence of a partner in the household has a negative significant effect on participation of -0.14.

The prevalent distribution of roles, where females are mostly in charge of bearing children is reflected in the effect of the presence of children in household. As can be observed, having children between 0 and 3 years old (pre-school ages) has a negative significant impact on participation of -0.0599. Also, the presence of children between 4 and 13 years old has a negative impact of similar size of -0.0586. Moreover, having children aged between 14 and 18 also has a negative impact on participation, but the size of the effect is about half of younger children (-0.0383). Finally, the presence of other members in the household also has a negative significant impact on participation, but smaller.

[INSERT TABLE 6 HERE]

Switching to model 2, the one with the best correction by the cross validation criterion achieved so far, it can be observed that there is no evidence if endogeneity of attitude index. The model selected contains a polynomial with the residual of non-labor income squared. Then, the non-labor income could be considered endogenous, but the attitude index could not. What is also worth noticing is that there is clear evidence of non-linearity as the model includes the residual of non-labor income squared. Respect to the value of the cross validation static is much lower than in the model without correction, indicating that the implemented methodology significantly improves the estimation.

The size and significance of the parameter estimates in general have almost no changes with respect to the model without correction, except for income. That is, the correction for endogeneity would not correct the bias in the effect of the attitudes of roles, but it does in the effect of non-labor income. In fact, the coefficient associated with gender attitudes index is equal to -0.0330, fairly similar to the model without correction. Meanwhile, the coefficient of linear non-labor income almost doubled in size.

Models 3 to 5 are the subsequent preferred models according to the cross validation process. We observe some role for the endogeneity in the gender attitudes role, but non linear. This is because these models include quadratic and cubic terms of the residue index of attitudes in the polynomial correction, with values close to the cross-validation of model 2. Nevertheless, we observe that coefficient of the index of attitudes does not experience large changes in magnitude (the bias would be small). Furthermore the size and significance of other factors, especially the non-labor income, almost do not change. However, there is no strong evidence of endogeneity of the index of attitudes, but of non-labor income.

The second approach is completely parametric and is used to estimate the model of hours worked. The model assumes joint normality between the error terms of equations (2), (3) and (4). These equations are estimated by maximum likelihood. Equations (3) and (4) that are estimated by maximum likelihood model are not similar to the equations in Tables 4 and 5, since in the parametric model includes all variables, both equations exclusion (3) and (4), as explanatory of the equation (2). The results of the main equation, hours worked, are presented in Table 7.

[INSERT TABLE 7 HERE]

The Wald test of exogeneity of the variables of attitudes and non-labor income cannot reject the hypothesis of exogeneity. The Wald statistic is 0.56, which gives a p-value of 0.7557, so that traditional levels of significance cannot reject the hypothesis of exogeneity

The estimation results show that the index of attitudes does not affect hours worked, so the effect of attitudes is relevant only for the labor participation decision but not to the level of hours offered. This result shows that in Chile the perceptions of roles would not affect women once they decide to enter the labor market, although it would affect the opportunities of decide to work. Vella (1994) finds that the perception of roles reduces the return to education of women, which may be due to perceptions that women with more conservative and prefer less demanding jobs which have higher returns. In contrast to, the findings of Vella for Australia, our results show that the perception of roles affect women once they decide to work.

On the other hand, the non-labor incomes decrease the hours worked, which is consistent with the classical model of labor supply. We also found a concave profile with age and higher educational level than higher hours worked. Additionally, the number of children

declines hours worked, and having a partner present in the home also has a negative effect. The presence of other household members negatively affects hours worked, which could be related to the care of others. Finally, in the north and south of the country would work fewer hours on average than the central area.

In summary, we can say that the results of our estimations show that there is no strong evidence of endogeneity between participation in the labor market and gender attitudes. Additionally, we found that other non-labor income would be endogenous to the decision to participate, but would not be endogenous in the determination of hours worked.

At the same time, the results show that women with more conservative attitudes about gender roles tend to participate less in the labor market, but once they decide to work, these attitudes do not affect hours worked. In the case of non-labor income, we find that higher non-labor income there is lower probability to work and once women decide to work, non-labor income also negatively affects work hours.

## 6. Discussion and Conclusion

This paper investigates how cultural factors are related to female labor force participation. Chile is an interesting case study because despite an important increment in female labor force participation in the last 20 years, it is still relatively low given its per-capita income and human capital levels being a developing country.

Taking advantage of a new survey that collects information on gender roles attitudes, labor force participation and family and labor history, this paper studies how attitudes could affect labor participation. It can be observed in the data that women with more conservative/traditional views tend to work less than women with more modern views. The estimation procedure implies to deal with a problem of endogeneity, since attitudes could affect participation, but also participation could affect attitudes. This study also takes into account the potential endogeneity on non-labor income on the decision of working in the labor market.

Evidence is obtained that the higher the level of education of the father, the woman would be less conservative/traditional in her gender roles attitudes. This result supports the role of education in the formation of attitudes, being compatible with findings in Farré and Vella (2007) for the United States in the case of the correlation between the attitudes of the mother and her children.

The estimation results of labor force participation indicate that there is moderate evidence of endogeneity of the gender attitudes index. This means, that probably there is no endogeneity bias estimation of the index of gender attitudes (this result is consistent with Farré and Vella). However, there is significant evidence of nonlinearities and endogeneity in non-labor income. Thus, despite controlling for endogeneity of gender attitudes and non-labor income, we confirm the sign of the effect of gender role attitudes from previous estimates of Contreras and Plaza (2010).

The size of the gender attitudes impact on labor force participation is found to be rather large. In fact, moving from percentile 75 to 25 in the attitudes index (this is, becoming less conservative) has a similar impact on labor participation than an increase in education from primary to secondary. Alternatively, an increase in one standard deviation in the gender roles attitudes index (1.95) would imply a decrease of 6.4 percentage points in the labor participation rate (given an estimated coefficient of -0.0329), given a participation rate aggregate of 59% is considerable. These results are similar in size to those found by Contreras and Plaza, but slightly smaller.<sup>4</sup>

The fact that younger women show more modern views of gender roles helps to understand the recent increase in female labor force participation in Chile. The evidence in Contreras, Puentes and Bravo (2005) shows that labor force participation in Chile is related to higher human capital of women, but also there are important cohort effects. The results found in this paper suggest that cohort effect could be related to gender roles attitudes.

As a result, there is no evidence of endogeneity between participation in the labor market and gender attitudes, but in non-labor income. In the case of hours worked, neither gender attitudes nor non-labor income would be endogenous. In addition, there is strong evidence that women with more conservative attitudes about gender roles have a lower participation in the labor market, but once they decide to work, these attitudes do not affect worked hours. The decision of hours worked would not be affected by the attitudes of roles, but strongly in non-labor income.

The evidence suggests that the process of women's labor decisions within the household could have different mechanisms depending on the type of decision. Women would be conditioned to their gender role attitudes to decide to participate, which probably is related to the pairing ordered (more conservative women match with men more conservative). However, once women have decided to participate, labor decisions become independent of their gender role attitudes, and become income of the rest of household, which primarily guides their decisions.

All in all, results must be taken with care. Although there is strong evidence that conservative gender roles attitudes is negatively correlated with female labor force participation, causality could still be questioned. More research in this area is still needed. More research is needed to advance in the identification of causality, which is beyond the horizon of this study.

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<sup>4</sup> Contreras and Plaza find that going from not machista to machista (their index is dichotomous), decreases the probability of participation by 13%. An estimate roughly equivalent to the results of the estimates of this work produced a decrease of 10%.



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## 8. Tables and Figures

Table 1: Distribution of the Attitudes Index

Attitudes Index	N	Cum.Percent
0	525	17.87
1	740	25.19
2	495	16.85
3	437	14.87
4	323	10.99
5	218	7.42
6	101	3.44
7	56	1.91
8	27	0.92
9	10	0.34
10	5	0.17
11	1	0.03
Total	2,938	100

Table 2: Women characteristics and gender role attitudes

Education	Attitudes Index value			
	0	1-2	3-4	5 or higher
None	0.017	0.007	0.007	0.022
Primary	0.524	0.526	0.534	0.533
Secondary	0.231	0.211	0.257	0.335
Vocational	0.090	0.107	0.096	0.050
University	0.139	0.150	0.107	0.060
Years of primary and secondary education	9.462	9.597	9.518	8.806
Number of children (0-18 years)	0.907	0.954	0.901	0.844
No. of observations	525	1,235	760	418

Table 3: Age and attitudes

Gender role attitudes	Age			
	18-30	31-40	41-50	51-65
Preparing food (women and not men)	0.169	0.166	0.201	0.213
Laundry, ironing, cleaning (women and not men)	0.142	0.138	0.199	0.223
Home repairs (men and not women)	0.213	0.166	0.207	0.222
Car wash (men and not women)	0.149	0.135	0.162	0.174
Should married women not work when (percentage that agrees):				
They have no children	0.026	0.028	0.040	0.044
Preschool age children	0.326	0.351	0.401	0.381
School age children	0.209	0.255	0.299	0.306
Children older than school age	0.047	0.063	0.091	0.103
Mean	2.07	2.141	2.462	2.54

Figure 1: Labor force participation and attitudes

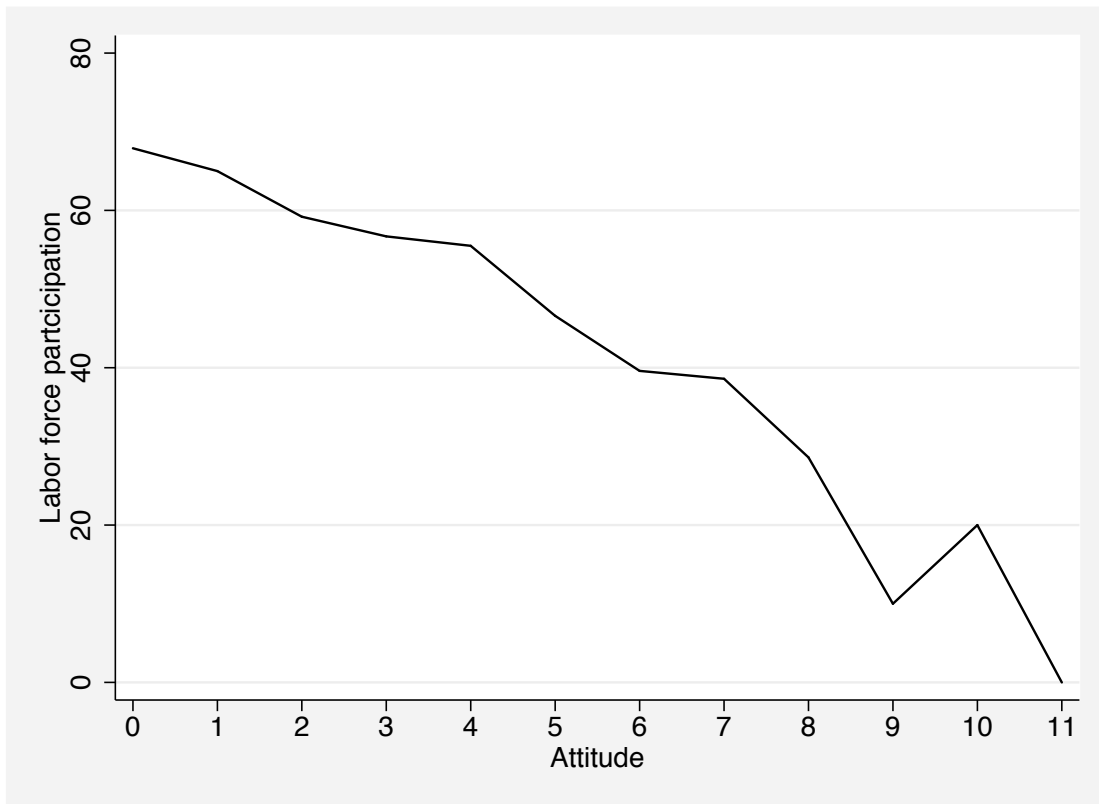


Figure 2: Labor force participation and non-labor income

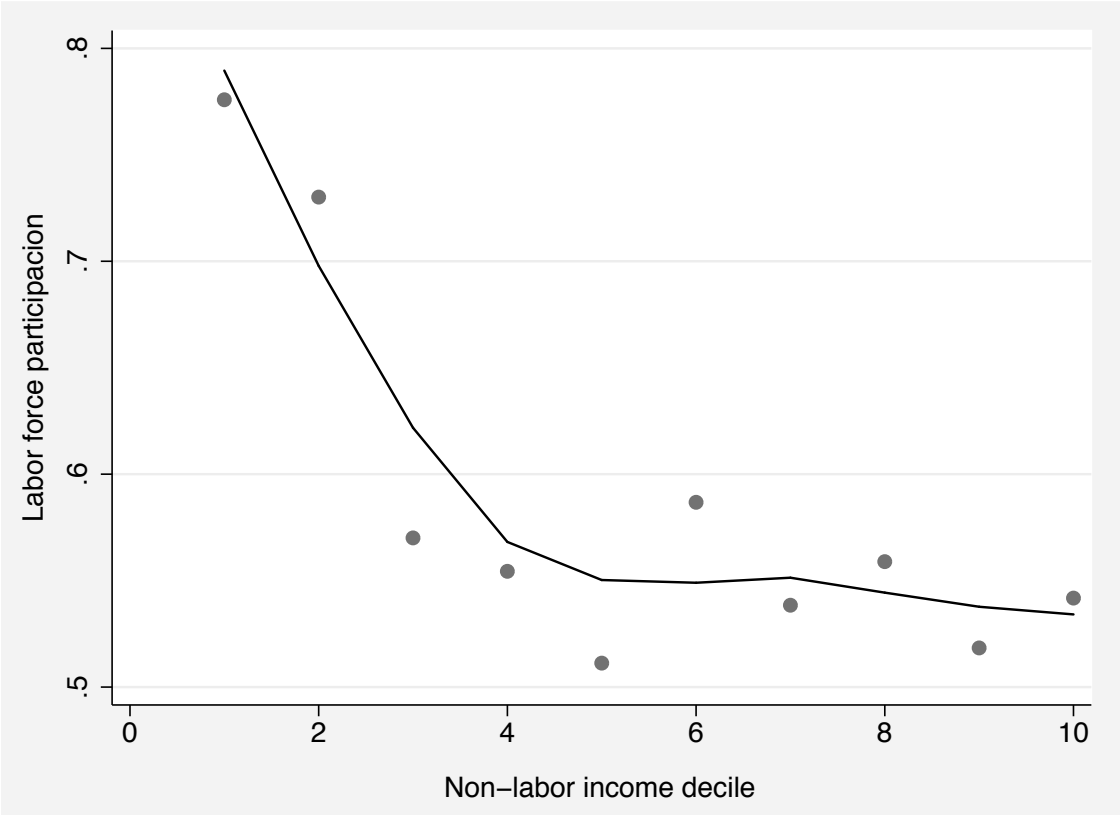


Table 4 : OLS results Attitude Index

Variables	Estimation Z	Variables	Estimation Z
AGE	-0.0287 (0.0183)	NOT ANSW. MOTHER EDUCATION	0.177 (0.129)
AGE2	0.000478** (0.000215)	MSECON	-0.107 (0.13)
NORTH	0.268*** (0.0904)	MTERC	-0.15 (0.205)
SOUTH	0.0347 (0.0902)	NOT ANSW. MOTHW	0.117 (0.18)
NOT ANSW. SIBS	-0.351 (0.716)	MOTHW	-0.206*** (0.0773)
SIBS	0.00775 (0.0135)	NOT ANSW. MOTH	0.941 (1.106)
NOT ANSW. OWOMAN14	-1.123 (0.891)	MOTH	0.281* (0.154)
OWOMAN14	0.0104 (0.0504)	NOT ANSW. FOTH	-0.794* (0.478)
NOT ANSW. OMEN14	0.958 (0.913)	FOTH	0.304 (0.252)
OMEN14	-0.00802 (0.0518)	BOTH	0.223* (0.133)
NOT ANSW. FATHER EDUCATION	0.0415 (0.12)	CONSTANT	2.890*** (0.742)
FSECON	0.0668 (0.132)	Observations	2,938
FTERC	-0.420** (0.182)	R-squared	0.027

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Table 5: OLS results non-labor income

Variables	Estimation Y
NORTH	-0.0623 (0.183)
SOUTH	-0.367** (0.183)
PROV	2.018* (1.161)
AGEPROV	-0.00558 (0.0505)
AGEPROV2	0.000461 (0.00061)
NOT ANSW. PROV EDUCATION	0.816 (0.844)
SECPROV	0.879*** (0.236)
TERTPROV	3.881*** (0.286)
OAPROV	-2.079*** (0.574)
WAPROV	-0.711 (0.542)
CONSTANT	1.177*** (0.147)
Observations	2,938
R-squared	0.187

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: Estimation of labor participation

VARIABLES	(1)	(2)	(3)	(4)	(5)
Valor de Validación Cruzada	839.33746	810.00635	810.2475	811.10168	811.27368
Z	-0.0333*** (0.00442)	-0.0330*** (0.00442)	-0.0298*** (0.00607)	-0.0299*** (0.00618)	-0.0310*** (0.00523)
Y	-0.0143*** (0.00322)	-0.0284*** (0.00692)	-0.0285*** (0.00692)	-0.0285*** (0.00692)	-0.0285*** (0.00692)
Y <sup>2</sup>	0.000117*** (3.06e-05)	0.00171** (0.000696)	0.00172** (0.000696)	0.00172** (0.000696)	0.00172** (0.000696)
EDAD	0.0602*** (0.00490)	0.0600*** (0.00490)	0.0599*** (0.00490)	0.0599*** (0.00491)	0.0599*** (0.00490)
EDAD <sup>2</sup>	-0.000762*** (5.91e-05)	-0.000759*** (5.90e-05)	-0.000759*** (5.90e-05)	-0.000759*** (5.91e-05)	-0.000758*** (5.91e-05)
SECUNDARIA	0.0855*** (0.0214)	0.0867*** (0.0214)	0.0860*** (0.0214)	0.0860*** (0.0214)	0.0863*** (0.0214)
TERCIARIA	0.166*** (0.0272)	0.167*** (0.0272)	0.166*** (0.0272)	0.166*** (0.0273)	0.166*** (0.0273)
NORTE	-0.0763*** (0.0214)	-0.0756*** (0.0214)	-0.0765*** (0.0214)	-0.0761*** (0.0216)	-0.0752*** (0.0214)
SUR	-0.0592*** (0.0214)	-0.0604*** (0.0214)	-0.0612*** (0.0215)	-0.0611*** (0.0215)	-0.0609*** (0.0214)
PAREJA (presente=1)	-0.140*** (0.0191)	-0.132*** (0.0194)	-0.132*** (0.0194)	-0.132*** (0.0194)	-0.132*** (0.0194)
HIJOS 0-3	-0.0599** (0.0234)	-0.0600** (0.0234)	-0.0598** (0.0234)	-0.0598** (0.0234)	-0.0598** (0.0234)
HIJOS 4-13	-0.0586*** (0.0133)	-0.0583*** (0.0133)	-0.0582*** (0.0133)	-0.0582*** (0.0133)	-0.0582*** (0.0133)
HIJOS 14-18	-0.0383** (0.0167)	-0.0388** (0.0167)	-0.0388** (0.0167)	-0.0388** (0.0167)	-0.0388** (0.0167)
# OTROS MIEMBROS DEL HOGAR	-0.00988 (0.00613)	-0.00807 (0.00618)	-0.00808 (0.00618)	-0.00806 (0.00618)	-0.00804 (0.00618)
RZ <sup>2</sup>				-0.000439 (0.00311)	-0.00125 (0.00175)
RZ <sup>3</sup>			-0.000253 (0.000329)	-0.000185 (0.000584)	
RY <sup>2</sup>		-0.00165** (0.000720)	-0.00166** (0.000720)	-0.00166** (0.000721)	-0.00166** (0.000721)
Constante	-0.236** (0.0974)	-0.218** (0.0977)	-0.221** (0.0978)	-0.219** (0.0984)	-0.216** (0.0977)
Observations	2938	2938	2938	2938	2938
R-squared	0.137	0.138	0.138	0.138	0.138

Errores estándares por bootstrap en paréntesis

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Tabla 7: Estimation hours worked

Variables	Estimación
Y	-0.930* (0.489)
Z	-4.756 (3.095)
EDAD	5.285*** (0.935)
EDAD2	-0.065 (1.236)
SECUNDARIA	6.816** (2.705)
TERCIARIA	15.48*** (4.53)
NORTE	-4.523** (2.113)
SUR	-3.829* (2.136)
PAREJA	-9.607*** (2.068)
HIJOS 0-3	-5.595*** (2.161)
HIJOS 4-13	-6.047*** (1.172)
HIJOS 14-18	-4.072*** (1.413)
OTROS MEM	-1.133* (0.646)
CONSTANTE	-68.24*** (17.89)
Observaciones	2,938

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table A.1: Variable definition and descriptive statistics

Variable name	Definition	Mean	Std. Dev.
PARTICIPA	Labor market participation	0.59	0.49
HOURSWORK	Hours worked	19	22.3
Demographic			
MOTH	Lived with mother only at age 15	0.16	0.36
FOTH	Lived with father only at age 15	0.03	0.17
BOTH	Lived with both parents at age 15	0.71	0.45
FPRIM	Father has basic education	0.54	0.5
FSECON	Father has secondary education	0.13	0.34
FTERC	Father has tertiary education	0.06	0.23
MPRIM	Mother has primary education or less	0.66	0.47
MSECON	Mother has secondary education	0.14	0.35
MTERC	Mother has tertiary education	0.04	0.2
MOTHW	Mother worked when individual aged 14	0.44	0.5
SIBS	Number of siblings	3.71	2.98
OWOMAN14	Lived with other women under 14 years	0.24	0.96
OMEN14	Lived with other men under 14 years	0.24	0.93
AGE	Age	41.23	13.29
NORTH	Living in northern regions	0.22	0.41
CENTRAL	Living in central regions	0.56	0.5
SOUTH	Living in southern regions	0.22	0.41
PRIMARY	Primary education	0.25	0.44
SECONDARY	Secondary education	0.53	0.5
TERTIARY	Tertiary education	0.22	0.41
Households			
MAR	Living with spouse	0.62	0.49
CHILD3	Number of children under 3 years	0.15	0.4
CHILD13	Number of children between 4 and 13 years	0.47	0.74
CHILD18	Number of children between 14 and 18 years	0.29	0.56

OTHERS	Other household members	2.97	1.57
Attitude index			
Z	Attitude Index	2.31	1.95
Non-labor-income-related characteristics			
Y	Non-labor income	3.14	4.35
PROV	Home with another provider	0.68	0.47
AGEPROV	Age of main provider	40.88	11.77
PRIPROV	Main provider with primary education	0.19	0.4
SECPROV	Main provider with secondary education	0.59	0.49
TERTPROV	Main provider with tertiary education	0.21	0.4
OAPROV	Main provider working as self-employed	0.17	0.37
WAPROV	Main provider working as an employee	0.8	0.4

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