A Household Search Model With Home Production.

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Abstract

In this paper, I study the dynamics of labor supply choices involving time allocation decisions within households, by developing a household search model of the labor market that includes home production. I estimate the model with household-level data from Colombia that contains rich information on both labor market outcomes and spouses' time use, where gender differences are present.

Some data features identify the model's parameters aiming to characterize how home production enters into households' decision making (i.e. gender differences in labor supply given the other spouse labor status, correlation of spouses' home production time, and how the home production of one spouse varies with the labor supply of the other spouse). Assessing the importance of home production over labor market equilibrium, my findings show how different technologies of combination between labor income and home production change labor supply and time allocations. The findings also show some degree of substitution between spouses' home production is necessary for spouses' labor market participation.

The model allows for a gender gap decomposition that takes into account optimizing behaviors. This decomposition captures the differential impacts of wage offers, labor market frictions, productivities in home production, and preferences over leisure and consumption in determining the observed gender differentials in the labor market. I find that differences in home production between spouses accounts for a substantial share of the gender participation gap in Colombia. Through an informative counterfactual experiment that introduces a Covid-19 type shock, I show that even a proportional deterioration of conditions by gender, produces a household's solution characterized by a large withdrawal of wives from the labor market.

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1 Introduction

The labor specialization between men and women is a well known empirical regularity. Men are more likely to participate and supply more hours in the labor market. Women are less likely to participate, spend fewer hours in the labor market, and dedicate more time to home production. In this paper, I study the dynamics of labor supply choices, which involves the time allocation decisions within households, by developing a household search model of the labor market that includes home production. The paper focuses on spouses' decisions as any existing gender gap widens for married individuals.

To study the household as a risk-sharing institution where households pool individuals' income and decide upon spouses' labor supply, home production, and leisure allocations to smooth consumption under labor market uncertainty, I use search models. Under this framework, participation is a costly decision in the short run: individuals have to pay a search cost. But, participation is beneficial in the long run: eventually, and acceptable job offer arrives.[1] An important characteristic of search models is their ability to generate equilibrium unemployment and wage dispersion. As there are documented gender gaps in the switching probabilities between labor market states (transitions), unemployment rates, and wages, the search models are an increasingly popular and suitable tool to simultaneously explain all the previous dimensions and their gender differences.[2]

In this paper, I develop and estimate a search model where I formally model the spouses' leisure and home production decisions, which is essential in understanding the spouses' benefits and opportunity costs of labor participation.[3] Each household maximizes intertemporal utility, with both spouses choosing their time allocation to leisure, home production, and work, finding optimal decision rules are based on reservation values over the possible joint labor statuses.[4]

The model structure includes five mechanisms that capture several labor market features, household consumption, the home production, leisure, and fertility evolution.

First, all labor market parameters are allowed to be gender-specific to account for the gender asymmetries in the labor market structure.[5] The wage offer distributions, job offers arrival rates, termination rates, and search costs define the labor market parameters. Search costs are only paid when unemployed. Husband and wife share the search costs as a dyad. The labor income of both spouses equals the market consumption of goods.

Second, household consumption is defined as a combination of market consumption and home

[1] One well-noted evidence of the risk-sharing decision making is the so called added-worker effect, that consist of the empirical observation where the wife increases labor supply after the husband loses his job (Lundberg (1985), Stephens (2002), Cardona-Sosa et al. (2016)).

[2] In Colombia, males have the highest participation rate and that married women have the highest probability to move from employment to unemployment (Lopez and Lasso (2016)), while being a married woman reduces the participation probability, having younger children reduces even more women's probability of participation (Tenjo, Alvarez, and Jimenez (2016)), and that the women's probability of remaining unemployment is higher (Arango and Rios (2016)).

[3] Most of the previous jobs have focused in joint labor decisions, this paper endogenizes home production to explain how labor gaps coexist with home production gender gaps.To better explain gender gaps, recent papers had consider other non-pecuniary dimensions such as personality traits gender differentials (Todd, Flinn, and Zhang (2020)), parental leave policies (Choi (2018) and Xiao (2020)), and differences in social values and time use (Gousse et al. (2018)). My paper contributes to this literature by using time usage surveys to derive the value of non-pecuniary activities by spouses.

[4] Spouses make labor supply decisions both on the extensive (participate or not) and intensive (how many hours) margins. In the empirical application, the intensive margin is constraint to part-time and full-time work hours, and decisions over leisure and home production time are performed choosing from a continuous set of hours.

[5] The estimation optimization algorithm might find that the parameters are equal between genders. In other words, the gender difference is not imposed. I restricted the data to low educated individuals, I can define homogenous labor parameters for all husbands and wives.

production output. This consumption production definition captures how labor supply and home production interrelates. This definition follows Gronau (1977) concept that market consumption and home production can perfectly substitute each other to produce consumption. However, my model allows for imperfect substitution to capture that even when the market has substitutes for home production, such as out-home laundry or children tutoring, spouses could still perform positive home production amounts when buying such market services. Even when this definition is theoretical, it target to fit empirical moments. This will be discussed later.

Third, spouses generate home production by allocating time to it, and each spouse is allowed to have specific home production productivity. The gender distributions over the home production productivities types are estimated. All else equal, this definition of unobserved heterogeneity seeks to capture 1.) that conditional on belonging to the same labor market state, not all individuals allocate the same amount of time between home production and leisure.[6], and 2.) individual differences in labor supply (e.g. conditional to the husband's wage, one wife decides to participate in the labor market and another wife does not participate). In the model, each spouse can be either a high type or low type in home production, where the high type typically is less likely to participate in the labor market and exert more time in home production.

Fourth, leisure taste parameters can also be gender-specific to capture gender asymmetries in leisure consumption.

Fifth, parameters that weight the importance of home production output and each spouse's leisure into the instantaneous utility are allowed to vary depending on the presence or absence of children. This model's characteristic seeks to account for the spouses' change in time allocation and labor supply due to children's presence: both husbands and wives with children allocate more time on home production, but wives increase home production to a greater extent and stop participating in the labor market. Husbands' reaction to increases in household size not only adjusts the home production and leisure time allocations but could also result in labor participation changes.[7] The model allows for the presence of children in the household or not by defining an exogenous probability of having at least one child and an aging children shock.[8]

I estimate the model using two individual-level datasets from the Colombian labor force survey (GEIH) and the time usage survey (ENUT) for 2012-2013.[9] Colombia though is a developing country, has a well-developed labor market where husband and wives participate, and public policy is aiming to close the gender gaps in the labor market (WEF (2019) and CEPAL (2019)). Additionally, Colombia has good available data in home production. I restrict the sample to spouses whose educational

[6]As I only have time allocation from the data, I cannot distinguish between productivity and one's taste for home production. In this paper, I will talk about home productivity, though the measure captures both taste and productivity without being able to disentangle them. When considering sexual division of labor, Becker (1974, 1981) proposed that spouses should specialize in market or non-market goods production depending on each spouse's comparative advantage. However, Becker did not consider different comparative advantage levels within men or women as a group. Then my modeling strategy adds within gender heterogeneity making the household types defined by the productivities pair of each spouse.

[7]For the US, Flabbi and Mabli (2108) showed that husbands' labor participation remains unaltered with or with children. For the Roma population in six Balkan countries, Salazar-Saenz and Robayo-Abril (2020) showed that husbands with children participate more in the labor market, increase the home production allocation, and reduce leisure. In terms of changes of labor market choices, Colombia looks more than the US. Husband's labor participation remains unaltered. However, in the three cases wives reduce labor participation and increase the allocation in home production.

[8]An aging children shock means that children come of age and leave the household.

[9]GEIH (Gran Encuesta Integrada de Hogares - Colombian Labor Market Household Survey) si similar to the US Current Population Survey and the ENUT (Encuesta Nacional del Uso del Tiempo - Time Usage National Survey) is similar to the US ATUS. ENUT was conducted between 2012 and 2013.

attainment is high school level or lower.[10]

The data indicate that husbands participate more in the labor market, and they are the highest earners, while wives participate less and earn lower wages.[11] Also, husbands are more likely to switch to full-time jobs than wives, achieving a higher proportion of full-time workers. Wives have higher unemployment rates. Regarding the time use dimension, husbands and wives participate in home production, but still, wives dedicate more time to home production: even when husbands and wives share the same labor status, wives devote more time to home production.[12]

The estimated parameters show that males receive job offers more frequently, jobs terminate less frequently, and receive higher wage offers; however, they have higher estimated values of the search costs. In addition, wives are more willing than husbands to reduce leisure across the different labor statuses. Concerning home production, there are more highly productive types of wives than husbands, resulting in lower labor force participation of wives, on average, more likely to devote relatively more time to home production. The estimation aligns with the data by predicting that wives perform more home production time, even when conditioning on the same husband's labor state.

I then decompose the participation and wages gaps by equating wives' subsets of parameters to husbands' values. The counterfactual experiments reveal that, when the wage distribution parameters are equated, wives' participation increases the most while husbands' is reduced slightly. Under those conditions, household optimization reduces husbands' salaries and compensates them with increased home production time for husbands, higher wages for wives, and more labor supplied by wives.

Experiments that equate the gender proportions of low productivity types find that wives increase labor supply.[13] In those experiments, a shift in home production supply occurs: husbands increase it in both cases. However, wives continue to allocate more time to home production. In these scenarios, wives augment labor participation because either wives, on average, reduce their willingness to perform home production or husbands, on average, increase their willingness to perform home production, reducing wives' need to perform home production.

The counterfactual scenarios indicate that husbands and wives change the time supplied in home production to adjust for participation rates and wages changes.

Finally, I implement a informative counterfactual experiment that introduces a Covid-19 type shock as exogenous changes to some parameters of the model. This experiment shows that even a proportional deterioration of the labor conditions by gender, produces a household's solution characterized by a large withdrawal of wives from the labor market. The purposed environment mimics a labor market contraction, additional household' needs for home production, and fewer leisure activities to do. The decomposition of the proposed channels to capture a Covid-type shock shows that most of the wives' reduction of labor participation comes from the slowdown of economic activity but the households' needs for more home production also explains a significant portion of the wives'

[10] I choose only low-educated couples because they were the most frequent group among Colombian married individuals. Among the married individuals, couples where both members had low education levels were 69 percent, couples where both members had high education levels were 13 percent, and couples where the education level were different between spouses was 18 percent. If individuals with different education levels are included in the model, I would need to estimate labor market parameters for diverse education levels and not only gender specific. Regarding household decision making on time allocations, households with higher income/education can hire someone to provide childcare or domestic services that substitutes spouses' home production. However, low educated households, on average, do not have the economic possibility to hire in the market external help, making low educated households decision making closer to the behavior of my model (For considerations on households decisions to hire external care see Berlinski et al. (2020)).

[11] Vandenbroucke (2018) reported this empirical regularity for the US, and it is pretty common worldwide.

[12] In Colombia, male economic contribution to home production is one of the highest in LAC (OECD (2020)).

[13] First, women's proportion equal to men's, and viceversa.

non-participation augment.

The literature using search models to study gender gaps on married individuals is growing. Erosa, Fuster, and Restuccia (2003), Greenwood, Seshadri, and Yorukoglu (2005), and Greenwood et al. (2016) included home production in the decision set; however, women were the only providers of home production and designated men as agents that were always supplying labor. Another branch of the search literature has excluded home production from the decision space but modeled spouses' interactions as fully connected, interdependent, and spouses with the same decision set. Within this literature, the first two household labor search models only considered employment and non-employment labor market status ((Dey and Flinn (2008))[DF] and Guler, Guvenen, and Violante (2012)[GGV]). However, these two models ignored how having children affects labor decisions and other labor margins. Flabbi and Mabli (2018)[FM] expanded spouses' labor market decisions to include both extensive and intensive margins as well as couples with and without children. Each of the previous three models found that couples are risk averse in income. A consequence of income risk aversion is that the reservation wage of one unemployed spouse depends positively on the other spouse's salary.[14]

I contribute to this literature by introducing the home production decision by both spouses. One interesting finding is that the unemployed spouse's reservation wages have an ambiguous relationship with the employed spouse's wage. I find that the reservation wage decreases or increases with the employed spouse's wages depending on the time commitment required for labor market participation. This finding highlights the importance of accounting for spousal tradeoffs over time allocation preferences. Interestingly, the model predicts that husbands have a positive reservation wage for unemployed-unemployed couples while wives have a zero reservation wage.

Empirically, the equilibrium behavior implied by my model replicates the fact that married males are the highest earners within the economy and that married females participate less in the labor market. If women participate, they work at lower wages since their reservation wage coming out from unemployment is lower than husbands. Additionally, for unemployed-unemployed couples, wives exit the market at lower husbands' wage offers than husbands do when the wife receives a job offer.

Another contribution to the previous literature is that, because of the model's structure, I am able to decompose the contributions to the observed gender gaps over participation, wages, and home production time allocations into its mechanism: the structure of the labor market, the leisure parameters, and the home production parameters.

My paper is also related to the growing literature using search models to study labor markets in developing countries: this paper is one of the first attempts to estimate a household search model for a developing country.[15]

The paper is organized as follows. Chapter 2 explains the model, chapter 3 describes the data and Chapter 4 discusses identification of the model. Chapter 5 introduces the estimation method, presents the estimates of the model's parameters, and interprets the model's fit with the Colombian

[14]One consequence of their finding is that omitting spouses' interdependence when modeling men and women's labor market decisions can lead to biased estimations. Recent empirical evidence highlights the increasing proportion of house-husbands and bread-winning wives within environments in which women's labor participation is increasing (in the USA, see: Golan and Kerdnunvong (2016), Kramer et al. (2015) and Kolpashnikova (2018)). This evidence shows that considering males' labor market independence might be a local equilibrium under particular conditions, where the lack of opportunities in the labor market among females leads males to participate without regard to their wives' decisions or the family's home production needs. As economic inclusion of women is increasing worldwide, the conditions for men's inelastic labor participation are changing.

[15]Conti et al. (2018) are developing a household search model to study health insurance behavior in Brazil. For labor search models in Latin America see Tejada and Navarro (2017), Albrecht, Robayo and Vroman (2017), Bobba et al. (2017), and Bobba et al. (Forthcoming)

data. Chapter 6 and chapter 7 describe the results of the gender gap decomposition and of the counterfactual experiment simulating a Covid-type shock, respectively. Chapter 8 discusses limitations and proposes future research. Finally, Chapter 9 summarizes the conclusions.

2 Model

I develop a search model of the labor market that introduces home production to the joint decisions of spouses over consumption and time allocations. Each spouse allocates time between work in the market, work in home production, and leisure. Consumption is a common good composed of goods bought in the market and produced at home.

2.1 Environment

The model is stationary and in continuous time. The household comprises two individuals, a husband and wife, that behave as a single unit, maximizing a common utility function (unitary model of the household).[16] The model considers three labor supply states for the spouses: employment (E), unemployment (U), and nonparticipation (N), leading to 9 feasible labor supply states per household.

A husband is denoted by index i and a wife by j. The households value the future at a discount rate (ρ) and are composed of two infinitely-lived agents. Most labor market parameters are allowed to be gender-specific: subscript A=M denotes the husbands' parameters and subscript A=W the wives'. Unemployed agents receive job offers at the Poisson rate λ_A and employed agents at the rate γ_A. Jobs can be exogenously terminated at the rate η_A. Subscript K determines the presence or absence of children in the household (denoted by k, nk, respectively). Fertility shocks to the household occur at the Poisson rate τ_k and children leave the household at the Poisson rate τ_{nk}. A wage (w) and an hour requirement (h) characterize a job offer. This pair (w, h) introduces the intensive margin of labor supply in the model. Each job offer is drawn from an exogenous distribution $F_A(w, h)$.

The instantaneous household utility is a function of 1) the joint consumption that a household produces (a combination of labor income and home production output, Z_{ij}), 2) the leisure of each spouse (l_i, l_j), and 3) each spouse's search cost conditional on his or her unemployment $s_i I(U_i), s_j I(U_j)$.[17] Flow utility is an increasing function of consumption and leisure and a decreasing function of search costs. I allow the presence or absence of children (K) to have an impact on the household's flow utility parameters. Formally:

$$U_K = u_K\left(c_K\left(Inc\left(w_i, h_i, w_j, h_j\right), Z\right), l_i\left(h_i,\ hp_i\right), l_j\left(h_j,\ hp_j\right), s_i I\left(U_i\right), s_j I\left(U_j\right)\right) \tag{1}$$

where each spouse's total time per spouse is divided between leisure (l_a), hours worked (h_a), and home production time (hp_a), Formally:

$$1 = l_a + h_a + hp_a, a = i, j \tag{2}$$

And, as a consequence, leisure is equal to:

$$l_a = 1 - h_a - hp_a, a = i, j \tag{3}$$

[16] Previous household unitary search models include: Dey and Flinn (2008), Guler, Guvenen, and Violante (2012), and Flabbi and Mabli (2018), Greenwood, Seshadri, and Yorukoglu, (2005), and Greenwood et al., (2016).

[17] The indicator function I(U_a) is equal to one if the agent a is unemployed. I normalize the search cost of on-the-job search equal to zero. An approach also followed by FM.

Following Gronau (1977) home production is understood as the sum of production activities inside a household that could be substituted by goods and services in the market. Therefore, households can not only obtain consumption by buying market goods and services using labor income, but they can also get consumption producing goods and services at home using time inputs.[18]

Equation 4 defines consumption at the household level. Equation 5 shows that labor income is equal to spouses' hourly rate times the working hours. Equation 6 illustrates that the output of home production depends positively on each spouse's hours spent in home production as well as some parameters that measure how productive each spouse is with regard to home production (π_i, π_j).[19] In this paper, I will refer to those parameters as the productivity of each spouse in home production. Each dyad of spouses' productivity levels defines the different household types. The consumption modeling strategy allows labor earnings and home production to have a positive or negative correlation, a feature not so explored by previous literature. Additionally, I allow the presence or absence of children (K) to have an impact on the consumption parameters.[20]

$$C_K = c_K \left(Inc\left(w_i, h_i, w_{j,} h_j\right), Z\left(hp_i, hp_j, \pi_i, \pi_j\right)\right) \tag{4}$$

$$Inc(w_i, h_i, w_(j,)h_j) = w_i h_i + w_j h_j \tag{5}$$

$$Z = Z(hp_i, hp_j, \pi_i, \pi_j) \tag{6}$$

2.2 Value Functions

Each household values the contingent state as a function of the flow utility, the expected future shocks, and the optimal behavior in reaction to those shocks. The notation for the value functions and their components are presented in Table 1. The first letter corresponds to husband's labor status and the second to wife's. The value function EE represents households where both spouses are employed; EU, EN, NE, and NU represent the value functions where one spouse works, and the other is unemployed, or a nonparticipant; UU the situation where both spouses are unemployed; UN, NU the cases where one spouse is unemployed and the other is nonparticipant; and NN represents the value function where both spouses are nonparticipants.[21]

When facing a shock, each household type defines his decision rules by comparing the value function of the labor status that they have available. The optimal decision rules can be also defined as reservation values where the household defines indifference regions between the possible joint labor statuses.

As an example, equation 7 presents the value function where both spouses are employed (the same case as the first row of Table 1). K represents the current household's status with respect to having children. The first term shows that when both spouses are employed, their flow utility is given

[18] Cleaning, repairing the dwelling, reading stories, or helping with the education of the children are activities that could be done by someone hired in the market; for the couple, time dedicated to those activities could be allocated toward leisure or work in the market.

[19] In economics, the home production productivity concept to explain labor market differential was introduced by Becker (1974). However, in my model I allow these productivities to be spouse specific and not gender specific as Becker.

[20] The presence of children affecting flow utility and consumption parameters was introduce in the model to captures household changes in participation and time use.

[21] To reduce the number of inputs for a value function, spouses' leisure are not reported as inputs, because $l_a = 1 - h_a - hp_a$.

by the combination of consumption, each spouse's leisure (l_i, l_j), and neither of the spouses pays the gender-specific search cost (where home production outcome Z has the spouses' time and productivity as inputs $Z(hp_i, hp_j, \pi_i, \pi_j)$). However, in the future, each spouse could receive a job offer (γ_M, γ_W) at any of the available wages offered defined with w', and the available hours requirements represented with h'.[22] When the household faces a new job offer, the spouses choose between four labor choices, the first of which is that both spouses work at their present wages (rejecting the job offer). If the spouse with the offer accepts it, then the other spouse's three remaining choices are: keeps his/her current job, moves to unemployment, or moves to nonparticipation. Each spouse also can lose his or her job exogenously (η_M, η_W). If a fertility shock arrives $(\tau_{\neg}K)$, then the household could change it's labor status as the valuation over labor market statuses change when the fertility status changes to $\neg K$.[23] Thus, for each shock, the couple will choose the state of labor and time allocation that maximizes the value function:

$$\begin{aligned}
(\rho + \gamma_M + \eta_M + \gamma_W + \eta_W + \tau_{\neg K}) EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right] \\
= u_K\left(C\left(Inc\left(w_i, h_i, w_j, h_j\right), Z\left(hp_i, hp_j, \pi_i, \pi_j\right)\right), l_i, l_j, 0, 0\right) \\
+\gamma_M \int \max \left\{ \begin{array}{l} EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right], EE\left[w', h', w_j, h_j, hp_i, hp_j, K\right], \\ EU\left[w', h', 0, 0, hp_i, hp_j, K\right], EN\left[w', h', 0, 0, h_j, hp_i, hp_j, K\right] \end{array} \right\} dF_M(w', h') \\
+\eta_M \max \left\{ \begin{array}{l} UE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right], NE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right], \\ UU\left[0, 0, 0, 0, hp_i, hp_j, K\right], UN\left[0, 0, 0, 0, hp_i, hp_j, K\right], \\ NU\left[0, 0, 0, 0, hp_i, hp_j, K\right], NN\left[0, 0, 0, 0, hp_i, hp_j, K\right] \end{array} \right\} \\
+\gamma_W \int \max \left\{ \begin{array}{l} EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right], EE\left[w_i, h_i, w', h', hp_i, hp_j, K\right], \\ UE\left[0, 0, w', h', hp_i, hp_j, K\right], NE\left[0, 0, w', h', hp_i, hp_j, K\right] \end{array} \right\} dF_W(w', h') \\
+\eta_W \max \left\{ \begin{array}{l} EU\left[w_i, h_i, 0, 0, hp_i, hp_j, K\right], EN\left[w_i, h_i, 0, 0, h_j, hp_i, hp_j, K\right], \\ UU\left[0, 0, 0, 0, hp_i, hp_j, K\right], UN\left[0, 0, 0, 0, hp_i, hp_j, K\right], \\ NU\left[0, 0, 0, 0, hp_i, hp_j, K\right], NN\left[0, 0, 0, 0, hp_i, hp_j, K\right] \end{array} \right\} \\
+\tau_{\neg K} \max \left\{ \begin{array}{l} EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, \neg K\right], EU\left[w_i, h_i, 0, 0, hp_i, hp_j, \neg K\right], \\ EN\left[w_i, h_i, 0, 0, h_j, hp_i, hp_j, \neg K\right], UE\left[0, 0, w_j, h_j, hp_i, hp_j, \neg K\right], \\ NE\left[0, 0, w_j, h_j, hp_i, hp_j, \neg K\right], UU\left[0, 0, 0, 0, hp_i, hp_j, \neg K\right], \\ UN\left[0, 0, 0, 0, hp_i, hp_j, \neg K\right], NU\left[0, 0, 0, 0, hp_i, hp_j, \neg K\right], \\ NN\left[0, 0, 0, 0, hp_i, hp_j, \neg K\right] \end{array} \right\}
\end{aligned} \tag{7}$$

The model's value functions for different household labor status combinations imply the following tradeoffs between time use and labor supply, illustrating a tension between the instantaneous utility and the continuation values.[24]

Nonparticipants only generate instantaneous utility from leisure and home production; they do not pay the search costs. As nonparticipants do not receive job offers, the labor continuation value does not affect the nonparticipation value function. The unemployed also generate instantaneous utility from leisure and home production, yet they reduce the flow utility as they must pay the search cost. However, in contrast to nonparticipation, the labor continuation value impacts the unemployment value because acceptable job offers might arrive probabilistically. Employment, relative to unemployment, generates two sources of gain in the flow value: labor income (hourly wages times hour

[22]The max operator represents couples' optimal behavior. This value function is defined in continuous time. Thus, the probability of two shocks arriving at the same time is equal to zero and, therefore, no joint shock occurrence is considered.

[23]That is, if the couple has children (K=k), the realization of $\tau_{\neg K}$ means that children come of age and leave the household. Likewise, if the couple has no children (K=nk) the realization of the shock means that at least one baby was born.

[24]In the value functions, the continuation value refers to the portion that calculates the expected future values at any given shock.

work) and zero search cost. Employment also produces losses, such as less time to allocate between leisure and home production, and continuation value reductions if the job offers when employed arrive less often than when unemployed. Even when the employed spouse has less time to allocate between leisure and home production, consumption must increase in the wage region that determines acceptable job offers. The extent of consumption increases depends directly on how the consumption function combines labor income and home production.

2.3 Equilibrium

A set of value functions (NN, NU, NE, UN, UU, UE, EN, EU, EE) and optimal time allocations at each labor status describe the model's equilibrium. To numerically solve the value functions, there are two options: closed form solution or fixed-point algorithms. I implement fixed point algorithms because the solution of the Present Discount Value (PDV) through closed-form solutions are unfeasible given the size of the decision space. Once the value functions numerically solve the PDV (as described in equation 7), the equilibrium optimal household decisions on the labor market and time allocations are characterized by reservation value rules that determine which option maximizes the PDV within the different decision-making scenarios that spouses might encounter.

I model spouses' behaviors using unitary models because cooperative models often have shown multiple equilibria when calculating value functions. Because of the high dimension of the spouses' decision set that I consider (wages, hours worked, leisure, and home production), the non-unique equilibrium property of cooperative models could make estimation intractable.[25]

The model's equilibrium follows the behavior of the unitary models of DF, GGV, and FM. In their papers, as in mine, spouses have symmetric decision sets. Their estimated equilibrium properties, they found that the unemployed spouse's reservation wage was an increasing function of the employed spouse's wage.[26] Also, their estimations showed that an employed, yet lower earning spouses married to an unemployed person, could quit his-her job when the unemployed spouse receives a high enough wage offer. GGV labeled this endogenous quitting behavior the breadwinner cycle. Even when my model's equilibrium shares most of DF, GGV, and FM properties, the inclusion of home production within the model potentially changes some equilibrium predictions that will be discussed in Chapter 5.

3 Data

This research utilizes two datasets: the Colombian labor market household survey (GEIH) and the Colombian time usage survey (ENUT) for 2012 and 2013. GEIH is used to compute the Colombian labor market environment, and ENUT is used for the couples' time allocations depending on spouses' labor market states.

[25] For recent cooperative models involving marriage and taxation, see Gayle and Shepard (2019); for models involving marriage, labor supply, home production, and family values, see Gousse, Jacquemet, and Robin (2017). Cooperative models also include the marriage market in their analysis; however, as the main focus of my research is on spousal time use and labor supply decisions, estimating the marriage market is out of the scope of my research.

[26] Theoretically, they stated that if households were risk neutral on income, each spouse would make labor market decisions as if they were single, and completely independent from their spouse's labor market decisions. In such a case, the reservation wage of one spouse would be independent of the labor status or wage of their spouse. GGV demonstrated mathematically that reservation wages of the unemployed spouse under income risk lover would decrease on the wage of the employed spouse. None of these three papers empirically found a non-increasing reservation wage.

3.1 GEIH - Household Labor Market Survey

GEIH is the survey that the Colombian government uses to evaluate the labor market and is the official data source used to calculate the unemployment rate. I use the years of 2012-13 so as to coincide with the first ENUT sample period. The final dataset had the following characteristics and restrictions: only urban married couples living without any other adult, spouses aged 25-55, with children aged 0-18 or without children, and individuals with a high school education or lower.[27] Additionally, I trimmed the top and bottom 2 percent of the wage distributions and full-time employment is defined as 40 or more hours per week. The final sample size of the GEIH is 72,408 individuals and the ENUT is 4,688 individuals (Table 2).

As Figure 1 shows, Colombian wives are less likely to participate in the labor market in addition to having higher proportions of unemployed. When children are present in the household, wives participate 8 percentage points less, and husbands tend to participate 2 percentage points more, which increases the proportion of husbands' full-time workers by about 5 percentage points.[28] Conditional on being employed, the histogram of work hours in Figure 2 shows that there is a greater mass of husbands working high hours than wives.

Table 2 presents joint husbands' and wives' labor market states to illustrate assortative mating.[29] The data inside the borders include the percentage of households with spouses in the associated labor market states (joint probabilities), while the 5th column and row represent the percentages of husbands and wives in each labor market state without conditioning on the spouse labor market state (marginal probabilities). Table 2 shows that both spouses work full-time in 30 percent of the sample, 36 percent of the households have husbands working full-time and wives in nonparticipation, and less than 1 percent of the households have both spouses as nonparticipants. Table 2 also shows that in terms of hourly wages, there are wage gender gaps both in part-time and full-time jobs.

In the absence of panel data in Colombia, retrospective information summarizing past labor market status is collected. In the GEIH household's individuals are observed at a particular point in time, and employed individuals at the time of the interview report wages and hours worked. The survey also asks about the labor market state before the one reported at the interview time, but no information about previous wages or hours work is collected. In light of this data limitation, I included in the model that previous employment status for job switchers are constraint to only previous employment. Researchers have usually built transitions between labor market states using the self-reported information about changes in the labor market from cross-sectional surveys when working with Colombian data.[30] I utilize the same method in this paper.

[27] I choose only low-educated couples, first, because they were the most frequent group among Colombian married individuals. Second, low educated households, on average, do not have the economic possibility to hire someone to provide childcare or domestic services to substitute spouses' home production. This characteristic makes low educated households decision making closer to the behavior of my model.

[28] Unemployment is defined as the nonworker who had been looking for a job for the last 4 weeks before the time of survey, while a nonparticipant is defined as a nonworker who is not unemployed. Between 2001 and 2003, for a sample of whites and all education levels in the US, wives with children increased nonparticipation by 15 percentage points (FM). Colombia exhibits a lower difference on wives participation when comparing it with and without children (about 8 percentage points).

[29] Assortative mating is the process by which people with similar characteristics choose a partner. In the present study, we used that definition to present the proportion of couples married on each of the cells defined by both spouses' labor market. From table 2, besides FF, Colombia doesn't present a positive assortative mating in the labor market.

[30] For Colombia, see Arango and Rios (2016), Lasso et al. (2016), and Albrecht, Robayo and Vroman (2017) for previous work constructing transitions from self-reported information.

3.2 ENUT - Time Usage Survey

An advantage of using structural models is the ability to use information that is not confined to a single dataset. For Colombia, the first-time usage survey was collected between 2012-2013 and is called the ENUT and recorded the activities that a person performed during the previous day. It has questions such as time devoted to work, sleeping, taking care of children, transportation time, and other possible answers. ENUT represents the same population as GEIH. Table 3 shows that the labor market proportions between ENUT and GEIH are equivalent.

In ENUT, to avoid inflation of leisure and home production time from workers resting on the weekends, I only retain surveys conducted during business days: Mondays to Fridays. For every individual, all reported activities are classified between leisure, home production, and working, and the time reported is normalized and sums up to one.[31]

The bottom panel of Table 2 shows that, at all labor market states, wives dedicate more time to home production. Table 3 shows the mean spouses' time allocation conditional on the joint spouses' labor market status. It shows that even when husbands and wives have the same labor market status, wives allocate more time in home production than husbands.

Table 3 also reveals that each spouse's home production allocation depends positively on the other spouse's labor status. Specifically, for wives with children, the home production allocation increases when the husband goes from nonparticipation to being employed.

For households, raising children demands additional economical resources and home production from the household. The presented evidence shows that Colombian couples increase the home production supply through husbands' and wives' time, but wives in the same labor market status increase the most the home production supply or reduce labor market participation.

4 Identification

The identification is organized by presenting the functional forms that I use in estimation, the groups of parameters to be estimated, and, finally, the moment' conditions used to identify these parameters. I specify eight functional forms.

First, the instantaneous utility function is a weighted Constant Relative Risk Aversion (CRRA) on consumption and each spouse's leisure, and has two linear search costs. I chose that functional form to keep comparability with the previous literature. Flabbi and Mabli (2018) showed that all the flow utility parameters of a CRRA are identified from the spouses' joint labor market decision.[32] In the current version of the model, the search costs are gender-specific parameters (s_A). Individuals who do not participate in the labor market do not have any search costs but do not receive job offers.

$$\begin{aligned} u\left(c_{ij}, l_i, l_j, s_i, s_j, Z; \beta', \alpha'\right) = \left(1 - \alpha_M^K - \alpha_W^K\right) \frac{c_{ij}^{\delta} - 1}{\delta} + \alpha_M^K \frac{\left(l_i\right)^{\beta_1} - 1}{\beta_1} + \alpha_W^K \frac{\left(l_j\right)^{\beta_2} - 1}{\beta_2} \\ - s_M I\left(U_i\right) - s_w I\left(U_j\right) \end{aligned} \tag{8}$$

The second functional form assumes a constant elasticity of substitution (CES) relationship between the consumption of market goods and home production output. The model assumes that consumption of market goods is equal to labor income. To capture how the presence of children affects household

[31] The ENUT total time report does not necessarily sum up to 24 hours. This is a normal characteristic of time usage surveys.

[32] Flabbi and Mabli (2018), included the following parameters: $\beta' = \{\delta, \beta_1, \beta_2\}; \alpha' = \{\alpha_M^K, \alpha_W^K\}$

decision making, I define a children-specific parameter that scales home production to be comparable with labor income (the price of home production: P_Z^K), and I allow children to affect the flow utility directly through changes in household type-specific tastes for spouses' leisure $\left(\alpha_A^K\right)$.

$$c_{ij} = \left(Inc^{\omega} + P_Z^K Z^{\omega}\right)^{\frac{1}{\omega}} \tag{9}$$

The third functional form assumed is then a CES for the spouses' home production function to adjust for different spouses degree of substitution on home production time allocations.[33] The fourth functional form assumption is that there are two spousal home productivity levels: high and low. This flexibility captures gender differences in participation rates, in home production, and within gender labor supply differences (i.e., conditional on the same husband's wage, one wife participates in the labor market and another does not participate).[34] Equation 10 presents the CES home production function that combines spouses' home time (hp_a) and spouses' productivity ($\pi_i, \pi_j = \{\pi^L, \pi^H\}$) as inputs. Low type productivity is fixed and equal to one. More specifically, the home production function is:

$$Z = f\left(hp_i, hp_j, \pi_i, \pi_j, \theta\right) = \left(\pi_i {hp_i}^{\theta} + \pi_j {hp_j}^{\theta}\right)^{\frac{1}{\theta}} \tag{10}$$

When only one spouse has high productivity and the other has low, his working time will reduce household utility compared to the situation where the other spouse works. Then, due to the gender differentials in labor participation and time allocations, a gendered probability per type can be identified. In the model, Π_A denotes the gendered probabilities of having low productivity at home.[35]

Even when the theoretical model was presented over continuous work hours and wages, the computational solution and estimation of the model requires discretizations over work hours and wages. The fifth functional form assumption comes from simplifying the work hours to part-time or full-time, where full-time is a working schedule of at least 40 hours per week. The discretization over work hours still captures gender's specialization because wives accept more part-time jobs than husbands. In the model, part or full-time hours are calculated as the average time for each partition of work hours of more or less than 40.[36]

The sixth functional form assumption defines the probability of receiving a part-time job offer (p) and the probability of receiving a full-time offer $(1-p)$. For computational tractability, the seventh functional assumption is a discretization of the wage range by a 50 point grid and a maximum wage value of 8 thousand pesos. The eighth functional form assumed is a Log-normal wage offer distribution conditional on gender and work schedule, with location and scale parameters μ_A^h and σ_A^h (equation 11).

$$f\left(w; \mu_A^h, \sigma_A^h\right) = \frac{1}{w\,\sigma_A^h}\phi\left[\frac{\ln(w) - \mu_A^h}{\sigma_A^h}\right], w > 0 \tag{11}$$

[33] Previous definition of home production functions with spouses time allocation as inputs included: Gayle and Shepard (2016) used a Cobb-Douglas, Albanesi and Olivetti (2009) and Knowles (2013) used a CES. Choi (2018) also used a composition between a CES and a Cobb Douglas in her paper; however, the CES part explained the time that spouses were performing house work, while the Cobb-Douglas involved the CES output and the economic resources that any additional children demand.

[34] Hereafter productivity is capturing the productivity/requirements/social norms/utility of time spent on chores. Becker (1974) defined two sectors: market and non-market. Inside the families, the individuals with more relative productivity between nonmarket and market production should devote more time to the nonmarket sector (household production). Becker argued that since females specialize more in the non-market sector, they are more productive in household production.

[35] $P(\pi_i = \pi^L) = \Pi_M; P(\pi_j = \pi^L) = \Pi_W$

[36] For the reminder of the paper the work hours are equal to either part-time or full-time ($h = \{P, F\}$) The mean time share from Part-time= 0.218; full-time= 0.404 of a total daily time endowment per individual equal to one.

Thus, with these functional assumptions, the model has to identify 35 parameters, represented by the following set (Ψ):

$$\Psi = \{\lambda_A, \gamma_A, \eta_A^{PT}, \eta_A^{FT},\ \mu_A^h, \sigma_A^h, p, \alpha_M^K, \alpha_W^K, P_Z^K, \alpha_M^{NK}, \alpha_W^{NK}, P_Z^{NK}\delta,\ \beta_1, \beta_2, \beta_3, s_A, \Pi_A, \pi^H, \theta, \omega, \tau_K\}$$

To identify the model, the first set of moments is extracted from GEIH, where h and w denote husband and wife, respectively, in household hh.[37] The variables $w, h, lab, lab_{t-1}, t_{lab}, K$ and t_K are, respectively, wages, hours worked (to identify part-time or full-time), labor status, labor status one year ago, the presence of children, and age of the younger children.[38] S_{GEIH} represents the household's sample size of the GEIH.

$$\left\{w_{hh}^h, w_{hh}^w, h_{hh}^h, h_{hh}^w, lab_{hh}^h, lab_{hh}^w, lab_{hh,t-1}^h, lab_{hh,t-1}^w, t_{lab,hh}^h, t_{lab,hh}^w,\ K, t_K\right\}_{hh=1}^{S_{GEIH}} \tag{12}$$

The second spouses' set of moments is extracted from ENUT, h, hp, lab, and K are, respectively, work time, home production time, labor status, and presence of children. S_{ENUT} represents the sample size of the ENUT.

$$\left\{h_{hh}^h, h_{hh}^w, hp_{hh}^h, hp_{hh}^w, lab_{hh}^h, lab_{hh}^h,\ K\right\}_{hh=1}^{S_{ENUT}} \tag{13}$$

I split the identification discussion by partitioning the set of parameters into different subgroups and explaining the moment conditions used to identify each parameters' subgroup.

Regarding labor frictions and wage offer parameters, Flinn and Heckman (1982) showed that to decompose the hazard rate from unemployment to employment between the arrival rate of job offers and the distribution over the offered wages, a recoverable wage offer distribution function must be assumed, and the discount rate should be fixed. I assume a fixed discount rate of five percent per year.[39] For this reason, I assumed the recoverable Log-normal wage distribution conditional on gender. Identification of primitive parameters μ_A^h, σ_A^h, and λ_A comes from means and variances of observed wages for each work schedule, from unemployment to employment transitions (see Table 9, panels 3 and 5 on the left).[40] Meanwhile, γ_A is identified from employment to employment transitions. Identifying the probability of receiving part-time offers relies on accepted part-time and full-time proportions (see Table 2). η_A^h is identified by the transitions from employment to unemployment and nonparticipation.

To identify s_A, I primarily use the nonparticipation and unemployment proportions. Setting s_A to zero will place all husbands and wives inside the labor market. Setting s_A to a high value will place all husbands and wives in nonparticipation. Then, a value in between will make a fraction of husbands and wives to be nonparticipants.

To identify children transition parameters, I use the law of motion restriction: $\tau_K = \tau_{NK}\frac{n_K}{n_{NK}}$, where τ_K is the arrival rate of young children, τ_{NK} is the aging children shock, and n_K is the proportion of households with children.[41] τ_K is identified from the share of the households with a newborn and the steady-state proportions of households with and without children.

[37] The information used goes from household 1 to the total sample size

[38] With this information we can identify if a newborn has arrived during the last year.

[39] Even though there is no consensus about the discount rate value, Flabbi and Mabli (2018) used it and it is in between other values used in the household search models' literature. Choi (2018) used 4 percent and Dey and Flinn (2008) used 8 percent.

[40] For this exercise the reference period is one month

[41] Note that $n_K = 1 - n_{NK}$.

The identification of the four weight parameters on spouses' leisure $\left(\alpha_A^K\right)$ and the two on home production price $\left(P_Z^K\right)$ uses differences in labor participation and times allocation of households with and without children. (see Table 2 and Figure 1).

The identification of the flow utility's risk aversion parameters relies on FM who demonstrated identification from the interdependence of labor market spouses' decisions. With the introduction of home production time and as the work hours are fixed, the observed degree of reduction in home production and leisure that spouses exhibit across different labor market states identifies the leisure curvature parameters. The bottom panel of Table 2 shows that home production time allocation of husbands without children can go from almost 21 percent when nonparticipating to 7 percent when fully employed. The intuition is as follows: if the household is risk-averse in males' leisure, the parameter β_1 will tend to zero. Then, males will demand almost the same leisure at any labor market state. On the contrary, if the curvature parameter tends to one, males will significantly reduce leisure consumption when changing the state's labor market. The identification of the consumption curvature, δ, is not as straightforward as the previous parameters. I keep it to compare my estimates with that of GGV, DF, and FM.

Regarding the imperfect substitution between market consumption and home production, consider an unemployed-unemployed couple that is receiving a job offer for one spouse. If the couple accepts the job offer and if ω tends toward one, both spouses will dramatically reduce the time allocation in home production relative to the time allocation where both spouses were unemployed-unemployed. But, if the couple accepts the job offer and if ω tends toward 0, both spouses will smoothly reduce or even could increase the time allocation in home production relative to the time allocation where both spouses were unemployed-unemployed. This responses happens because the two inputs of the consumption function are far from perfect substitutes.

The identification of θ initially comes from the correlation of spousal home production at the 16 labor market states: if θ tends toward one, then the home production function will tend to be linear, and, at all labor market states, the spousal correlation of home production will tend toward zero. If θ tends toward zero, then both spouses will need to allocate similar times in home production disregarding the joint labor market status. Thus, the similarity of spouses' home production allocations in the data will identity θ.

However, I am exploding the time allocation information even more to break the identification between θ and ω: a positive or non-decreasing relationship between one spouse's home production and the other spouse's labor supply, and having in the data labor participation higher than zero.

To prove that the first characteristic breaks identification between θ and ω, Figure 4 shows that different θ values does not change the positive slope of the husbands' time allocation and wives' labor status. Figure 3 shows that the positive relationship between full-time husbands' home production allocations and more wives' work hours, begins from about ω equal 0.5 to zero. The closer ω to zero, the higher increase in husbands' home production allocation. In fact, the data show that the home production supply of one spouse slightly increases or is not reduced when the other spouse increments the hours worked, meaning that the substitution between home production and labor income is not so acute.[42]

To prove that the second characteristic breaks identification between θ and ω, Table 4 shows that

[42] See bottom panel of table 9. Wives' labor market state is fixed by choosing one column, and moving down in the rows, changes husbands labor status. Husbands' labor market state is fixed by choosing one row, and moving right in the columns, changes husbands labor status. It can be seen that in most cases, once one spouse labor market is fixed, there is a positive relationship between the home production time allocations of one spouse and the other spouse's labor supply.

when θ tends toward zero labor participation reduces dramatically for both genders and labor participation goes to zero for wives. There a is a positive relationship between the value of θ and wives' participation.[43] These experiments show that some degree of substitution in the home production function is necessary for households to exert labor supply and prove the importance to introduce the spouses home production decisions to analyze joint labor market decisions. Interestingly, table 4 also proves that labor participation varies with ω but, first, there is not a monotone relationship and, second, labor participation does not move as much with ω than with θ.

Finally, the identification for π^H, Π_M, Π_W comes from the mean and standard deviation of home production for each gender at each joint labor market state and the participation decisions of individuals married with spouses with similar characteristics (i.e., one participates, the other does not participate and both are married with husbands earning the same wage), and the gender labor participation differences. Without any heterogeneity, every couple in the same labor market and children status would make the same home production and labor supply decisions.

5 Estimation Results and Model Fit

5.1 Estimation Method

I use the Simulated Methods of Moments to estimate the optimal vector of parameters $(\widehat{\Psi_{SMM}})$ as follows:

$$\widehat{\Psi_{SMM}} = \underset{\Psi}{\operatorname{argmin}} \left(Q_R\left(\Psi\right) - q_s\right)' W_B^{-1} \left(Q_R\left(\Psi\right) - q_s\right) \tag{14}$$

Where q_s are the chosen sample moments described in Equations 12 and 13, in total, I have 262 GEIH moments and 168 moments from the ENUT to identify 35 parameters. $Q_R(\Psi)$ are the simulated moments from a simulated sample size R equal to 15,000, computed from the parameter vector Ψ. W_B^{-1} is the bootstrap weighting matrix and the diagonal is the inverse of the bootstrapped standard errors and zeros elsewhere. B is equal to 10.000.

5.2 Results

This section describes the estimated parameters' values presented in Table 6. High household productivity types are 2.07 more productive than low productivity types. The home production CES parameter, θ, is equal to 0.69; this means that Colombian spouses' home production time presents higher substitution than in a Cobb-Douglas (θ=0), but they are far from being a linear production function (θ=1). Additionally, the consumption CES parameter, ω, is equal to 0.34; this indicates that consumption is generated with a lower substitutivity than spouses' home production time. The low-type home productivity proportions show that husbands are less productive in home production (0.92 vs. 0.52 for husbands and wives, respectively); this difference will fuel the decision-making process of time allocations between home production and labor market, making males more prone to

[43] Table 5 shows husbands and wives home production time allocations at the joint labor market states. It confirms that as θ tends toward one, at the same labor market state, Husbands and wives allocate more dissimilar time allocations in home production. It also shows that the positive relationship between one spouse labor status and the other spouse labor supply reduces with the value of ω. Fixing one column, fixes wives' labor status, and moving down the rows shifts husbands' labor market status from nonparticipation to full-time.

search in the labor market and less productive inside the household.[44] These gender type proportions imply that: 48 percent are low-low, 44 percent are low-high, 4 percent are high-low, and 4 percent are high-high. The estimated parameters also exhibit higher search costs for husbands than for wives.

The curvature parameter of the CRRA terms show that Colombian households are more risk-averse in terms of husbands' leisure. Husbands' leisure curvature parameter is closer to zero than wives. This hierarchy means that males are less willing to change their leisure time when transitioning between labor market states than females. Meanwhile, regarding the weights of leisure parameters, when the household is without children, the husbands' parameter is smaller than the wives' parameter. But, when the couple has children, the husbands' parameter value increases and the wives' parameter decreases to a point where the husbands' leisure weights more heavily than the wives'. The price of home production also increases from the status without children to the status with children. All those parameter movements should provide the model the flexibility to adjust to spousal changes in labor supply and time allocation with and without children.

As the unit of time in the model is months, Table 7 shows that unemployed males receive job offers slightly more frequently than unemployed women (2.0 vs. 2.4 months, respectively), and employed males also obtain more frequent on-the-job offers (33.5 vs. 37.4 months, respectively). Males have a less frequent layoff shocks when working in part-time employment than females (39.2 vs. 40.8 months, respectively), and full-time jobs (38.5 vs. 34.9 months, respectively).[45]

The estimated arrival rates of the labor market as well as differences in the estimated parameters of the wage offer distribution parameters show that husbands have an advantage in the labor market. Husbands receive job offers more often, with higher wage levels, and once they accept a job offer, the layoff shock will occur less frequently. Additionally, the model predicts that about 27 percent of the overall job offers for wives and 2 percent for husbands are part-time offers.

5.3 Model Fit

The fit of the model is analyzed in terms of labor market proportions, the mean and standard deviation of time use in home production, and mean wages. Figure 5 shows that the model successfully fits males' and females' labor market proportions. Additionally, the model also captures how wives with children reduce their labor market involvement and that husbands do not significantly alter labor market proportions. Table 8 also shows that the model does a remarkable job in fitting assortative mating and a decent job in fitting the labor market transition.[46]

Figure 6 shows that the model captures the home production time spent by wives and husbands observed in the data; the model captures that both spouses increase their home production time when having children. Therefore, the model captures labor supply and time allocations simultaneously; this fit was possible through the flow utility parameters and their change for couples with children. The model shifts the price of the home production upwards to capture the household need for more

[44] Remember that the measure used within the model cannot distinguish between productivity or taste for home production.

[45] Table 7 shows the relevant implied values for the estimated wage offer distributions and the implied durations (in months) consistent with Poisson arrival shocks in table 5. For example, λ_M means that unemployed males receive 0.46 job offers in a month or that unemployed husbands receive a job offer every 2.2 months in expectation.

[46] The model does a good job estimating the magnitudes of the wives' transitions and for husbands, most of the hierarchies of the data transitions were respected by the estimated model. As an example, for the husband's transition, in the data 45 percent were full time workers one year ago and remained as full-time workers at the time of the survey; the simulation estimated the proportion to be 50 percent. Meanwhile, for the husbands that were employed one year ago and found a full-time job, the data had 28 percent; in this case, the simulation estimated 19 percent.

home production when bearing children. However, the model simultaneously increases the husbands' weight of leisure and reduces the wives' weight of leisure. This movement happens because the rise in home production time supply is higher for wives than for husbands.

In terms of home production, table 9 presents the observed and simulated mean spouses' time allocation conditional on the joint spouses' labor market status. These moments were crucial in the identification of my model: the relationship between home production and the other spouse labor supply.[47]

The standard deviation of time use in home production across labor states are also presented in table 8; this data variation was exploited in the identification strategy to identify the unobserved heterogeneity. Even when the model replicates some part of the data variability, there is still room to improve the model's fit by adding more heterogeneous agents. For computational tractability, this is not implemented. Finally, the simulated overall wages fit the data closely over the unconditional moments (see Table 8 and Figure 7); however, the model predicts significantly higher wages for the working spouses married with a nonparticipant than does the data.

5.4 Optimal decision rules

To understand the model spouses' behaviors in the labor market, I present some optimal decision rules at equilibrium through simulations at the estimated parameters. This section presents the model's maximization behavior using an example of the behavior of a household with children and low home productivity for both spouses. Assuming that both spouses start nonworking, the first decision rules shows how the household would decide in terms of participation and job acceptances when sequential job offers arrive for husbands and wives. [48] The second decision rule shows how home production heterogeneity determines household labor decisions. The first and second rules presented full-time job offers, thus, the third decision rule illustrates how different household types' search strategies vary when facing job offers with part-time job offers.[49]

Starting with two nonworking spouses, the first decision the household has to make is participation. In figures 8 and 9, the histogram on the left reports the four possible household participation status values. In this studied case, both spouses decide to participate in the labor market as that is status with the highest PDV. Then the second decision they face is accepting a job offer.[50]

The middle panel of Figure 8 represents the optimal decisions where the husband receives the job offer first, and the same panel of Figure 9 illustrates the optimal decisions where the wife receives the job offer first. These two panels demonstrate that the spouses' labor supply decisions are different depending on which spouse receives a wage offer first. For the husbands' wage offers in Figure 8, the middle panel shows that the husband remains unemployed by rejecting low wage offers and takes jobs

[47] A crucial point my identification strategy relies on the definition of a household's consumption. Most of the previous dynamic models defined the flow utilities to be additive and separable between labor income, each spouse's leisure, and household home production (Gayle and Shepard (2016); Choi (2018)). Salazar-Saenz and Robayo-Abril (2020) also ended up using additive and separable flow utility because data availability. They only had time use information for one spouse per household. As a result, in their model, nonparticipants allocate significantly more home production than the data.

[48] As the model is stationary, households through their lifetime can transit to any labor status if it is optimal according to their decision rules. However, the aggregate households' steady state respects the laws of motion between labor and having children statuses embodied by the structural parameters and the model's structure.

[49] The intensive margin of labor supply in the model is introduced by the work hours. In the empirical specification, job offers with high or low intensive margin of the labor supply are denoted by F (full-time) and P (part-time), respectively. Full-time job offers for both spouses are of forty or more hours per week.

[50] Panels 1 of Figures 1 and 2 represent the same decision for the same household.

with high wages offers. If the husband's wage offer is not high enough, the wife remains unemployed; however, the wife becomes a nonparticipant if the offer is high enough. By comparing the second panels of both figures, the model finds that husbands have a reservation wage higher than zero while wives accept jobs at any wage offer.[51] Additionally, the model predicts that wives are more prone to switch to nonparticipation once the husbands receive a job offer. The husbands' wage offers that make the wives become a nonparticipant are above 3 thousand pesos, but the wife's wage offers that make the husband nonparticipant are above almost 8 thousand pesos.

Once the husband (Figure 8) or the wife (Figure 9) has received an acceptable offer and the other spouse decides to remain unemployed, the household faces a third decision: whether the unemployed spouse that is still searching should accept a job offer or not. In this situation, it is convenient to define the following sets of optimal labor decisions when he-she receives job offers. Let us consider the case when the unemployed wife married to an employed husband receives a job offer; the sets are defined over the wife's wage offers conditioned on the husband being employed.

In such case, there are four labor options for the couple: 1) rejecting the job offer for the unemployed wife set ($\Gamma_{EU}(w_j, h_j)$), 2) both spouses become employed (set $\Gamma_{EE}(w_j, h_j)$), 3) the unemployed wife takes the job offer, and the husband switches to unemployment (set $\Gamma_{UE}(w_j, h_j)$), or 4) the unemployed wife takes the job offer the husband switches to nonparticipation (set $\Gamma_{NE}(w_j, h_j)$). Options 3 and 4 corresponds to the breadwinner cycle. The decision rules are:

$$
\begin{aligned}
\Gamma_{EU}(w_j, h_j) &= (w_j, h_j) : EU\left[w_i, h_i, 0, 0, hp_i, hp_j, K\right] > max \left\{ \begin{array}{l} EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right], \\ UE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right], \\ NE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right] \end{array} \right\} \\
\Gamma_{EE}(w_j, h_j) &= (w_j, h_j) : EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right] > max \left\{ \begin{array}{l} EU\left[w_i, h_i, 0, 0, hp_i, hp_j, K\right], \\ UE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right], \\ NE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right] \end{array} \right\} \\
\Gamma_{UE}(w_j, h_j) &= (w_j, h_j) : UE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right] > max \left\{ \begin{array}{l} EU\left[w_i, h_i, 0, 0, hp_i, hp_j, K\right], \\ EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right], \\ NE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right] \end{array} \right\} \\
\Gamma_{NE}(w_j, h_j) &= (w_j, h_j) : NE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right] > max \left\{ \begin{array}{l} EU\left[w_i, h_i, 0, 0, hp_i, hp_j, K\right], \\ EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right], \\ UE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right] \end{array} \right\}
\end{aligned}
\tag{15}
$$

The last panel of Figures 8 and 9 present graphically the optimal decisions between the previous four sets based upon the reservation wages that delimit those sets. The last panel of Figure 8 on the right shows the wife's reservation wages (y-axis) as a function of the husband's wage (x-axis). Conditional on the husband's wage, above the curve FF, the wife will accept any job offer, and both spouses become breadwinners (set $\Gamma_{EE}(w_i, h_i)$). The last panel of Figure 9 presents the husband's reservation wages conditional on the wife's wages (path where the wife receives a job offer first). The model finds that above the curve FF, both spouses became breadwinners (set $\Gamma_{EE}(w_j, h_j)$) and that behind FF and above FU, the breadwinner cycle happens and now the husband is the breadwinner (set $\Gamma_{UE}(w_j, h_j)$). The last panels of Figures 8 and 9 show that the unemployed reservation wage is

[51] Vandenbroucke (2018) has described that in the US married males are usually the highest earners within the economy and that married females participate less in the labor market. He has also described how, if wives participate, they work at lower wages. My model's reservation wage rules demonstrate that the model can explain that empirical regularity.

a nonincreasing function of the employed spouse's wage. This mechanism is novel in the household economics literature.

Figure 10 concentrates on job offers for the unemployed husband that require full-time work hours. The length of the reservation wages over the x-axis shows up to what wife's wage the husband remains unemployed. The comparison of the four panels clearly shows how productivity in home production affects husband's participation decisions. For example, when the husband has low and the wife has high home productivities, he is more willing to search in the market. In this case, the husband remains unemployed until a wife's wage of 7. The reservation wages over the x-axis are shorter for the households where the husband has high productivity in home production because those husbands are more willing to devote more time to home production and are more willing to nonparticipate conditional to high earning wives.

Figure 10 also illustrates that the breadwinner cycle behavior depends upon the home production types. Wives in high-low couples never quit their job. For other types, if the husband's job offer is not good enough, but he still accepts the job, the wife quits her job and switches to unemployment. Only in couple's where the productivity pairing is high-high or low-high, the wife becomes a nonparticipant if the wife earns the lowest wage and the husband receives a high paying job offer (set $\Gamma_{EN}\left(w_j, h_j\right)$). Meanwhile, for all household types, when the wife initially had a better paid job, she keeps her job, and the husband also accepts job offers above the FF reservation wage.

Figure 11 concentrates on for job offers for the unemployed husband that require part-time work hours. Relative to the situation presented in Figure 10, this situation impose less labor income at same wages than a full-time offer, but more time to allocate between leisure and home production. Accepting a job offer also reduces the probability of receiving job offers with higher hours, so the husband needs a high enough wage offer to accept it.[52] Thus, the model finds the usual positive slope of the husbands' reservation wages as a function of the wife's wages. There are few wage combinations across the different home productivity types where the breadwinner cycle is optimal for the spouses.

5.5 Empirical Implications of Equilibrium

In this section, I point out five relevant empirical implications associated with the model's equilibrium dynamics.

The first empirical implication of my model pertains to the reservation wages. Previous household search models (DF, GGV, and FM) have found that the reservation wage increases with the employed spouses' wage because the employed spouses' wage funds the unemployed spouse's search for better job offers.

With the features that my model shares with the previous literature, the unemployed spouse's reservation wage decreases if the arrival rate for the unemployed or the mean of the wage offer distribution has low values, i.e. the unemployed receive few job offers or receives them with lower wages. Having on-the-job search decreases the reservation wage because the job conditions are not permanent and accepting a job with a low wage could still derive in a high paying job in the future. The higher the value or the more inelastic leisure is, the higher the reservation wage because the worker needs to give up leisure and accepting a job should compensate the loss.

Nevertheless, explaining simultaneously that wives exhibit high nonparticipation rates and low labor earning has not been fully answered by previous household search models. The only previous search model that considers the participation decision is FM. They modeled individual heterogeneity

[52] At estimated values, on-the-job searching is not as frequent as searching when unemployed.

as different search costs over the households. Individuals with high search costs tend to remain out of the labor market. Obviously, the higher the search costs over the households, the higher the nonparticipation rate.

In the FM model, the nonparticipation increases if the arrival rate for the unemployed or the mean of the wage offer distribution has low values because participation has fewer returns making the value of unemployment low relative to nonparticipation. Having on-the-job search decreases nonparticipation because the job conditions are not permanent and participating in the market has higher returns. The higher the value or the more inelastic leisure is, the higher the nonparticipation rate because, eventually, a job offer will imply giving up the valuable leisure. Thus, in the FM model, participating individuals have on average lower search costs, making them wait more time for job offers with higher wages as the search activity is not too costly for them. This prediction is incompatible with wives earning lower wages, because participating wives should earn higher wages. In addition, the previous mechanism took the employed spouse's wage to fund the search of the unemployed, wives wages should be even higher.[53]

In addition to the previous channel, my mechanism includes a consumption function that combines the employed spouse wage with the endogenous allocation of home production. The effect of the employed spouse on the reservation wage through the consumption function is ambiguous. It depends on how parameters' values shape the production technology that combines home production with labor income produced by work hours and time in the market.

With the estimated parameters, my model exhibit nonincreasing reservation wages for the unemployed that receives a full-time offer while married an employed. This reservation wage's shape means that the higher the employed spouse's wage, the less willing the couple is to wait for good-enough job offers. The household prefers to take the labor income, combine it with the endogenous home production allocations, and stop paying the search cost. The previous result is true even when full-time jobs produce more labor income but reduce the time available to allocate on leisure and home production.[54]

Conversely, when the job offer has low work hours, then the household strategy exhibits an increasing reservation wage. In this scenario, the job produces less labor income and gives up the opportunity of getting a better job offer. Then my model's reservation wages have different slopes depending on the work hours requirements that job offers can potentially have because the produced labor income and the endogenous home production generate different flow utility that alters households' patience to wait for job offers that would produce higher labor income, either coming from more work hours or higher wages.

A negative relationship in the reservation wages is a possibility that DF and FM conceived but never really showed. GGV conceived that relationship if the couple were risk lover in income, but their estimation found risk aversion. My models find this relationship due to the inclusion of home production in the spouses' decision making even though I still estimate income risk aversion (see table 6).

The second empirical implication has to do with the gender differentials that the household optimization finds when reacting to similar situations. When the couple is in dual unemployment, the

[53] Previous household search models predicted that married individuals should earn more than single individuals as the reservation wage curve that they found depends positively of the employed spouse wage. On labor gender gaps for the US, Vandenbroucke (2018) reported: 1) married males are the highest earners in the economy, among both single and married males, 2) married females do not present a wage gap with single females, and 3) single and married females participate less in the labor market. This empirical regularity also applies to Colombia.

[54] Section 3 showed that most of the accepted jobs in Colombia require high working hours.

household optimization finds different gender strategies to accept a job offer, making the wives' reservation wage almost zero while husbands' reservation wages are higher. Conditional on the husband accepting a job offer, the model predicts that wives decide to exit the labor market at lower husbands' wages than the opposite situation (under the wage range where the wives accept a job offer, the husbands only leave the market at top wives' wage offers).

The third empirical implication of my model refers to the intriguing relationship among spouses' home production time allocations, wages, and joint spouses' labor supply. As most of the couples have a full-time husband, I will focus the analysis of this section on those couples. When only the husband is employed, figure 12 shows that the equilibrium relationship between wages and home production is negative, allowing both spouses to consume more leisure as spouses perceive more labor income. However, the relationship is far more complex given the possible joint labor market status.

The model predicts that the higher the wage of one spouse, the higher the probability of nonparticipation of the nonworking spouse, and the higher the wage of one spouse, the lower time in home production both spouses allocate. Therefore, employed-nonparticipant couples in average should dedicate less time to home production than employed-unemployed couples.

This model's prediction fits the data for husbands presented in table 9, full-time husbands married with non-participating wives devote less time to home production than the ones married an unemployed. But nonparticipant wives do not allocate less time in home production than the unemployed. The explanation of this data trend is more complex, has to do with household's heterogeneity and selection into nonparticipation, and it will be explained in the fourth empirical implication.

As explained in the identification section, there are many possibilities on how the home production allocation of one spouse changes when the other spouse changes the labor status. The model picks up that the home production time allocation increases when the other spouses increase the work hours because the estimated substitution parameter is not close to that for perfect substitutes. In terms of household behavior, this finding means that Colombian spouses respond to the other spouse's labor supply not only by changing reservations wages or labor supply, but adjusting as well home production time allocations.

Another interesting finding relates to the substitution parameter of spouses' home production times. As table 4 shows, if the parameter is far from perfect substitution, both spouses allocate similar home production times, and both spouses exit the labor market massively. Thus, for couples to exert labor supply, home production combination technology needs to be such that it allows a certain degree of substitution between spouses' times, allowing the household to maximize utility and consumption by adjusting time allocations and labor supply.

The fourth empirical implication pertains to household heterogeneity, time allocation, labor supply, and fertility. Previously, was presented the model prediction that couples' home productivity levels change the nonparticipation decision of wives married with husbands receiving wage offers. But, how important are the home production productivities to explain labor supply? Table 10 presents the equilibrium labor statuses and home production time allocations for the different household types.[55]

Table 10 shows that gender participation differentials remain even in households where wives have the same home production productivity level than the husbands, and even when the husband has higher home production productivity. Between household types, wives' nonparticipation differentials could be as high as a 100 percent (compare nonparticipation rate of high-low with high-high).

Table 10 also shows that not all households react the same way to fertility. Only the low-high type increases nonparticipation from 39 to 56 percent. The finding unveils that even when having

[55] The estimation found that the most frequent households in Colombia are low-low and low-high home production productivities.

children reshapes household's preferences, making the household to value more home production and to reevaluate each spouse's leisure weight, the observed data regularity that wives augments nonparticipation when having children is substantially explained by only one household type. However, all household types ended up allocating more time by both spouses in home production (see bottom of Table 10).

Coming back to the point on explaining that employed-nonparticipant couples in average should dedicate less time to home production than employed-unemployed couples, Table 10 shows that within household of the same type, unemployed wives always allocate more time in home production than nonparticipant wives when married a full-time husband (see bottom lines of each matrix). However, in the aggregate, this prediction on joint labor supply and joint time allocation applies to husbands and not to wives. This is explained because the gender differential composition of the nonparticipant over home production types.

The fifth empirical implication refers to explaining low wage earners. In developing countries, it is quite often to observe familiar, informal workers or self-employed that earns zero or wages close to zero. My model rationalizes that the need for more consumption by combining labor income and home production is a force that underlies low wage earners' behavior. In this regard, Figure 7 shows that the model even fits the left tail of the wage distributions among genders and work hours.

6 Gender gap decomposition

I perform a set of counterfactual experiments to understand the optimization process that households are implementing. My gender gap decomposition does not include firm's behavior (see Bowlus (1997), Bowlus and Eckstein (2002), and Flabbi (2010)), moreover it contributes by including home production time allocation by both spouses. I focus on gender gap decompositions that equalize females' parameters to males' values, and then I supplement my analysis performing an additional informative experiment. Table 11 presents the definitions for the gender gap decomposition. The first experiment equates all the parameters between genders. The second equalizes wives' parameters to husbands' that represent labor market frictions in the model ($\lambda_A, \gamma_A, \eta_A^{PT}, \eta_A^{FT},\ s_A$), and the third does the same with the parameters associated with the wage offers ($\mu_A^h\ , \sigma_A^h, p$). The fourth equates the proportion of part-time offers (p), while the fifth and the sixth equate respectively the low type proportions between wives and husbands ($\Pi_W \rightarrow \Pi_M$) and the wives' instantaneous utility parameters to husbands' ($\alpha_M^K, \alpha_W^K, \alpha_M^{NK}, \alpha_W^{NK}, \beta_1, \beta_2$). The seventh exercise, which is presented in addition to the gender gap decomposition, fixes the husbands' low type proportions to the wives' values ($\Pi_M \rightarrow \Pi_W$).

Even when the experiments are not considering the firm's side, there is a set of policies that I can relate to the counterfactual experiments proposed. Policies that could close the gender gap in the structural labor parameters are anti-discrimination measures that give employers' economic incentives to employ females. These policies are implemented in the form of, for instance, quota requirements (this one could explicitly represent the second experiment), laws against labor discrimination, and laws against any type of violence. Oelz et al. (2013) provide two examples: In Germany and the UK some laws required large enterprises to disclose the earnings of the employees to promote transparency and close wage gender gaps (third experiment).

Policies that equate preference parameters between genders could be a combination of women's self-help measures and promotional campaigns that highlight the success stories of Colombian women (the fifth, sixth, and seventh experiments).[56]

For the presentation on the effects of policies, Figure 13 presents the changes in labor market proportions between the experiments and the benchmark while Figure 14 illustrates the changes in time devoted to home production and table 14 shows the changes in mean wages.

As expected, when the structural parameters are the same for husbands and wives, there are no gendered differences in wages, labor participation, or home production time. In such a world, husbands' nonparticipation increases and full-time proportions diminish. Wives' time supply in home production decreases and husbands increase it at almost all labor statuses.[57] Focusing on husbands' participation, the experiment that provides the strongest explanation for the increase in husbands' labor nonparticipation is when there are no gendered differences in the wage distribution parameters. In the remaining experiments, husbands' labor market decisions are almost unaltered.

Focusing on wives' participation, and relative to the benchmark levels, labor market participation decisions vary a lot among the considered experiments. The experiments that induce more wives to participate in the labor market are those in which wage distribution parameters, labor friction parameters, and home productivity distributions are the same for both genders, respectively. On the contrary, equating the leisure parameters induces wives to increase the nonparticipation proportion.[58]

When the wage distribution parameters are equated, wives' participation increases the most, while the husbands' decreases in a small degree. Then, by labor market composition, as more wives are in the labor market, households are perceiving less housework time by those wives. Husbands' part-time salaries are also lower than in the benchmark model (Table 14). Relative to the benchmark, this scenario increases wives with children' participation to 73 percent.

The experiment that equates the proportion of low type wives to the husbands' proportions (making wives as a group more prone to participate in the labor market) increases wives with children' participation to 28 percent (then this scenario increases wives' nonparticipation almost a 40 percent of the increase given an equalization of the wage offer distribution). At the household level, this increase in wives' participation is coupled with changes in the spousal home production supply. Husbands increase it at all labor states besides nonparticipation and wives decrease it at all labor states.

The last experiment goes beyond the gender gaps decomposition to shed light on a related question—what would happen to gender gaps if husbands were more involved in home production? Then, the experiment performed equates the proportion of low type husbands to the wives' proportions. Relative to the baseline, the simulation shows that wives with children increase labor participation to 10 percent. At the household level, again, this increase in wives' participation goes with increases in husbands' home production supply at all labor states.

The last two experiments find no significant effect on the wage gender gap because, in the model, periods of employment or unemployment have no impact on the potential wages that an individual gets either when employed or unemployed. Although the experiments highlight the importance of

[56] These can shift social norms and gender taste for leisure and home production. For example, a qualitative study carried out in Serbia by the World Bank (2019) highlights the need for integrating Roma women into self-help groups composed of women from diverse communities, but also from similar socioeconomic groups. These programs help them build social capital through a new network, develop new capabilities that have a long-term impact on voice, and increase their bargaining power within households that could change conventions of gender. Only interventions that will create multiple, repeated instances of situations where women and Roma participate (more) equally and are acknowledged as equally competent to similar men and non-Roma counterparts at socially valued tasks are likely to be successful.

[57] Only nonparticipant husbands with children reduce home production time.

[58] This is because husbands are less willing to sacrifice leisure quantities at different labor statuses and, when having children, their leisure weights are higher than the wives'. The experiments also show that wives with children will reduce their labor participation even more than wives without children.

spousal home production decisions when optimizing household resources at different scenarios, this effect clearly is not trivial and should be taken into account when measuring the effectiveness of policies aiming to include wives in the labor market.

7 Covid-19 Type Shock

For Colombia, evidence has shown that, due to the Covid-19 shock, women have exited the labor market more than men, and women's unemployment has increased more than men's (Cuesta and Pico (2020) and Garcia-Rojas et al. (2020)). Time usage has changed towards more women's high home production while men have increased labor hours by comparing September to December of 2020 with the same period in 2016 (Dane (2020)).

As the pandemic itself has not finished, and the final economic effects have not yet occurred, in this section, I perform an informative exercise to simulate a Covid-19 type shock. In light of the model, this exercise aims to answer what would be the household responses to an environment similar to what Covid-19 has changed on the economy. The considered new steady-state affects husbands ans wives symmetrically. I introduce the slowdown of economic activity by reducing the job offer probabilities (λ and γ) and increasing the probability of job loss (η). I introduce the implosion of the care-economics sector and school closures that drive the need for home production by an increase of the home production price. I introduce social distancing and restrictions over gathering activities by a reduction of the leisure weight parameters. All parameters changes are set equal to 10 percent (see Table 13).

Figure 15 shows that, household optimization leads to dramatically increase wives' nonparticipation, while husbands' labor participation do not change significantly. In this regard, wives' nonparticipation without children and with children increases by 99 percent and 86 percent, respectively. Unemployment increases for both genders. Concerning home production, Figure 16 shows that husbands and wives allocate more time in home production. The results confirm the previous empirical findings that Covid-19 has deteriorated women's labor market, but the recent evidence does not show that men have increased home production time.[59] To understand the size and the causes of the pandemic over the household labor choices, this exercise highlights that even when husbands and wives face a shock in equal proportions, the optimal household behavior can increase the size of the previous participation gender gap.

The decomposition of the proposed channels to capture a Covid-type shock shows that most of the wives' reduction of labor participation comes from the slowdown of economic activity but the households' needs for more home production also explains a significant portion of the wives' nonparticipation augment.

As in the benchmark scenario, not all households react the same to fertility; there is heterogeneity in the household's reaction to the Covid-19 environment. Even when all household types augment wives' nonparticipation, in low-high and high-high households, the share of nonparticipant wives is higher than 70 percent. In most of the household types, the nonparticipation of wives with children increases even more than wives without children. Only wives in low-high households have similar participation rates with and without children.

[59] The papers and reports mentioned do not discriminate by marital status and education level, so the samples are not fully comparable.

8 Limitations and future research

This paper constructs and estimates a structural search model that introduces spousal home production decisions to understand labor market gender gaps between couples. To the best of my knowledge, it is the first time a search model with these features has been used to study gender dynamics among spouses. However, many challenges to developing a full comprehension of spousal behavior remain.

First, even with the selected sample of individuals with a low level of education, the presence of any source of non-labor income changes the marginal utility of labor income and as a result the labor supply decisions of individuals with different non-labor income levels will be different. For this reason, FM include two positive levels of non-labor income and the absence of it in their analysis. Additionally, international evidence has shown that the labor and non-labor income of other household members is an essential factor in determining female labor participation (Hafez and Ahmad (2002); Andres et al. (2017)). Also, besides taste for leisure and home production, it can be argued that households with members with acute diseases are different than households with healthy members. To this end, health status is a condition that changes the probability of employment and tenure (Blau and Gilleskie (2001)).

Second, it is well understood that more labor experience implies higher wages and that long periods of unemployment or nonparticipation can reduce the expected wage offers.[60] In my model, returning participants face no labor penalty. Applied to gender gaps, Xiao (2020) made an equilibrium model over the life cycle to assess the wage gap and its relationship with parental leave policies. Her story is the following: because employers expect that women stop their careers to have children, this expectation induces them to offer lower wages to females. Additionally, because of those anticipated career interruptions, women accumulate less labor experience, and consequently, lower wages. But, even for countries that allow for spouses' negotiation over the parental leave time that each spouse takes, wives take more parental leave time. When simulating changes in parental leave policies, Xiao (2020) took as exogenous the share of households where the husband takes more parental leave. The framework I develop can generate this decision endogenously, making spouses decide the share of the total parental leave that each spouse takes while optimizing on spousal work, leisure, and home production time. Thus, future research can incorporate the human capital, parental leave, and time allocation decisions within a single model.

Third, as mentioned in my model's theoretical explanation, home production has market substitutes, and households can do housework themselves or hire some goods and services in the market to have more time to work or to enjoy leisure. Future work can expand in this direction to incorporate the effect of market substitute availability. In this regard, the static setting presented by Berlinski et al. (2020) presents an endogenized decision for child care places to emerge and fill the households' necessity to contract them, replacing home production time with labor supply. Additionally, Turon (2019) modeled an environment with home production with a market price for the substitutes.

Finally, the current model is a partial equilibrium. Hanming and Shepard (2019) developed a general equilibrium search model, but replicating this extension would rely on future data availability. Hamming and Shepard also included labor supply, demand information, and employer-provided health insurance data. In the present exercise, I did not have firms' information and the estimated labor market parameters did not allow for the determination of whether the labor parameters I found

[60]For example, Bobba, Flabbi, and Levy (2017) designed a model where employed workers accumulate human capital by layers at different rates whether they are working formally or informally. When unemployed, the accumulated human capital can be depreciated at a given rate.

were coming from lower labor market productivity or employer discrimination against husbands or wives.

9 Conclusions

In this paper, I develop and estimate a household search model of the labor market that considers the home production allocation for both spouses. The model structure is defined to capture several possible combinations of spouses' labor supply and home production time allocations. Colombia is an interesting case of study as households exhibit a positive or non-decreasing relationship between one spouse's labor supply and the other spouse's home production. The proposed model has the flexibility to capture this data trend by a definition of the consumption function that imperfectly combines market consumption and home production. Additionally, I find that some degree of substitution between spouses' home production is needed in the home production technology for couples to exert labor supply. This last finding proves the importance of introducing the spouses' home production decisions to analyze joint labor market decisions.

I show that it is possible to estimate imperfect substitution parameters between market consumption and home production between spouses' time allocation in home production and the gender distribution over home production productivity types, using standard functional forms and exploiting the different mean and standard deviation of the spouses' allocations to home production at any joint labor market state and genders' differentials in labor supply. With this defined structure, the model seeks to explain the genders' asymmetric contribution to home production on the labor market gaps. Simulated method of moments estimates derived from household and time usage surveys in Colombia find that wives' home production distribution has more members belonging to high home productive types, that households are less willing to reduce husbands' leisure across labor states, and that there are gender asymmetries in labor market opportunities in favor of husbands. With the parameter estimates, the model fits well the labor market and time usage trends.

The gender gap decomposition shows that differences in home production between spouses account for a substantial share of the gender participation gap and that differences in the labor market can explain the largest share of the gender participation gap. Also, the wage gender gap results from the gender differences in the parameters of the wage offer distribution. Additionally, I perform a informative counterfactual experiment to simulate the Covid-19 shock, and the model finds that a permanent Covid-19 shock will dramatically reduce wives' labor participation. This experiment highlights that even a proportional deterioration of conditions by gender, produces a household's solution that amplify labor gender gaps.

The model's definition of the heterogeneous spousal types in terms of each spouse labor productivity (low or high) predicts different wage level of the employed spouse that sends the non-working spouse to nonparticipation. Additionally, the model finds that the observed increase in wives' nonparticipation when having children is mainly and almost uniquely driven by households where the wives are more productive in home production than husbands. The other household types do not change wives' nonparticipation when having children. Under a Covid-19 type shock, the wives' nonparticipation responses also varies by household type, where high productive wives will exit the labor market even more than the low types.

All these results highlight the future potential to continue exploiting the time usage information to understand household's optimization and the differential responses that households would exhibit under changes in the economic or social circumstances.

References

[1] Aiyar, Antonio Spilimbergo, Allan Dizioli, Bergljot Barkbu, Enrica Detragiache, Christian Ebeke, Helge Berger, Huidan Lin, Nicoletta Batini, Linda Kaltani, Petia Topalova, Sebastian Sosa and Shekhar. 2016. ”The Refugee Surge in Europe: Economic Challenges.” IMF Staff Discussion Note 16/02, International Monetary Fund, Washington, DC.

[2] Agostinelli, F and Sorrenti, G 2018 ”Money vs. Time: Family Income, Maternal Labor Supply , and Child Development.”, Working paper.

[3] Albanesi and Olivetti Home production, market production and the gender wage gap: Incentiand expectations (2009)

[4] Albrecht, J., Robayo-Abril, M. and Vroman, S. (2016) ”Public-Sector Employment in an Equilibrium Search and Matching Model. ”, Econ J. Accepted Author Manuscript.

[5] Andres, Luis A.; Dasgupta, Basab; Joseph, George; Abraham, Vinoj; Correia, Maria. 2017. Precarious Drop: Reassessing Patterns of Female Labor Force Participation in India. Policy Research Working Paper; No. 8024. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/26368

[6] Auer,P., Berg,J., Coulibaly, I.: (2004) Is a stable workforce good for the economy? Insights into the tenure-productivity-employment relationship. ILO, Geneva.

[7] Becker, G. (1981), A Treatise on the Family, Cambridge: Harvard University Press.

[8] Becker, G. (1974), A Theory of Marriage. Economics of the Family: Marriage, Children, and Human Capital, University of Chicago Press.

[9] Berlinski, S., Ferreyra, M., Flabbi, L., and Martin, J. (Forthcoming). Child Care Markets, Parental Labor Supply and Child Development. Journal of Political Economy.

[10] Blau, D. and Gilleskie, D. 2001. ”Retiree Health Insurance and the Labor Force Behavior of Older Men in the 1990s,” The Review of Economics and Statistics, MIT Press, vol. 83(1), pages 64-80, February.

[11] Bobba, M., Flabbi, L., and Levy, S. (2017). Labor Market Search, Informality, and Schooling Investments. IZA Discussion Paper.

[12] Bobba, M., Flabbi, L., Levy, S., and Tejada, M. (Forthcoming). Labor Market Search, Informality, and On-The-Job Human Capital Accumulation. Journal of Econometrics.

[13] Bowlus, A., “A Search Interpretation of Male-Female Wage Differentials,” Journal of Labor Economics 15(4) (1997), 625– 57.

[14] Bowlus, and Z. Eckstein, “Discrimination and Skill Differences in an Equilibrium Search Model,” International Economic Review 43(4) (2002), 1309– 45

[15] CEPAL (2019) Gender equality plans in Latin America and the Caribbean, Road maps for development, CEPAL Publishing

[16] Choi, Y (2018), Essays on Parental Leave and Family Labour Supply.Working Paper.

[17] Christiansen, Lone, Huidan Lin, Joana Pereira, Petia Topalova, and Rima Turk. 2016 ”Individual Choice or Policies? Drivers of Female Employment in Europe.” IMF Working Paper

[18] Conti Gabriella and Ginja Rita, Narita Renata, 2018. ”The Value of Health Insurance: A Household Job Search Approach,” Working Papers, Department of Economics 2018_18, University of São Paulo (FEA-USP).

[19] Cuesta, J., Pico, J. The Gendered Poverty Effects of the COVID-19 Pandemic in Colombia. Eur J Dev Res 32, 1558–1591 (2020). https://doi.org/10.1057/s41287-020-00328-2

[20] DANE (2013) Encuesta Nacional de Uso del Tiempo (ENUT - Metodología)

[21] DANE (2020) Boletín Técnico ”Encuesta Nacional de Uso del Tiempo (ENUT) ”, septiembre a diciembre de 2020

[22] Del Boca, D. and C. Flinn (2012) Endogenous household interaction,”, Volume 166, Issue 1, Pages 49-65.

[23] Del Boca, D. and C. Flinn (2014) Household behavior and the marriage”, Journal of Economic Theory 150: 515-550.

[24] Dey, M. and C. Flinn (2008) ”Household Search and Health Insurance Coverage”, Journal of Econometrics 145: 43-63.

[25] England, P.,and Farkas, G. (1986). Households, employment, and gender: A social, economic, and demographic view. Hawthorne, NY, US: Aldine Publishing Co.

[26] Erosa, A., Fuster, L. and Restuccia, D. (2002), Fertility Decisions, and Gender Differences in Labor Turnover, Employment, and Wages, Review of Economic Dynamics 5, 856–891.

[27] Fernandez, Raquel. 2013. ”Cultural Change as Learning: The Evolution of Female Labor Force Participation over a Century.” American Economic Review 103 (1): 472–500

[28] Flabbi, L. (2010), Gender Discrimination Estimation in a Search Model with Matching and Bargaining, International Economic Review, 51(3): 745-783.

[29] Flabbi, L., Flinn, C, and Salazar M. (2017), Simultaneous Search in the Labor and Marriage Markets with Endogenous Schooling Decisions, Work in Progress.

[30] Flabbi, L., and Mabli, J. (2018), Household Search or Individual Search: Does it Matter? Journal of Labor Economics, 35.

[31] Flinn, C. and Heckman, J. (1982), New Methods in Analyzing Structural Models of Labor Market Dynamics. Journal of Econometrics, 18, 115-168.

[32] Flinn, C., Todd P., and Zang, W. (2016), Personality Traits, Intra-household Allocation, and the Gender Wage Gap. Working paper- Carlo Alberto Notebooks.

[33] García, A., Mantilla, E. and Plazas, J. (2013), Cuenta satélite de la economía del cuidado. Siete estudios realizados a partir de la Encuesta Nacional de Uso del Tiempo – DANE.

[34] Gayle, G. and Shephard, J. (2016), Optimal Taxation, Marriage, Home Production, and Family Labour Supply . Working Paper.

[35] Giménez-Nadal, J. and Molina, J. (2018) Gender norms and the gendered distribution of total work in Latin American households. Feminist Economics, vol. 24, issue 1, 35-62

[36] Gousse, M., N. Jacquemet, and J. M. Robin. 2017. ”Marriage, Labor Supply, and Home Production.” Econometrica 85(6): 1873–1919.

[37] Greenwood, J., Guner, N., Kocharkov, G. and Santos, C. (2016) ”Technology and the Changing Family: A Unified Model of Marriage, Divorce, Educational Attainment, and Married Female Labor-Force Participation.” American Economic Journal: Macroeconomics, 8 (1): 1-41.

[38] Greenwood, J., Seshadri, A., and Yorukoglu, M. (2005). Engines of Liberation. The Review of Economic Studies, 72(1), 109-133.

[39] Gronau, R. (1977). Leisure, Home Production and Work-The Theory of the Allocation of Time Revisited,” Journal of Political Economy 85.

[40] Gronau, R. (1980). Home Production–A Forgotten Industry. The Review of Economics and Statistics, 62(3), 408-416. doi:10.2307/1927108

[41] Hanming, F. and Shephard, A. J. 2019 ”Household Labor Search, Spousal Insurance, and Health Care Reform” ShanghaiTech SEM Working Paper No. 2019-004. Available at SSRN: https://ssrn.com/abstract=3470001 or http://dx.doi.org/10.2139/ssrn.3470001

[42] Hafeez, A., and Ahmad, E. (2002). Factors determining the labor force participation decision of educated married women in a district of Punjab. Pakistan Economic and Social Review, 40(1), 75–88.

[43] Heckman (1971), Sample selection bias as a specification error. Econometrica.

[44] Kimmel, J., and Connelly, R. (2007). Mothers’ Time Choices: Caregiving, Leisure, Home Production, and Paid Work. The Journal of Human Resources, 42(3), 643-681.

[45] Knowles (2013) Female relative wages, household specialization, and fertility

[46] McElroy, M., and M. Horney. 1981. ”Nash-Bargained Household Decisions: Toward a Generalization of the Theory of Demand.” International Economic Review 22(2): 333–349.

[47] Mohammad H. Rahmati , Shadi Farahzadi, Female Labor Participation in Iran: A Structural Model Estimation.

[48] Ngai, Liwa Rachel and Pissarides, Christopher, Trends in Hours and Economic Growth (January 2007). IZA Discussion Paper No. 2540, Available at SSRN: https://ssrn.com/abstract=957291

[49] OECD (2020), SIGI 2020 Regional Report for Latin America and the Caribbean, Social Institutions and Gender Index, OECD Publishing, Paris, https://doi.org/10.1787/cb7d45d1-en.

[50] Oelz, M., Olney, S., and Tomei, M. (2013). Equal pay: An introductory guide. Geneva: International Labour Office.

[51] O'Higgins, N. 2012. 'Roma and Non-Roma in the Labour Market in Central and South-Eastern Europe', Roma Inclusion Working Papers, UNDP.

[52] Oikonomou, R and Mankart, J (2016), Household Search and the Aggregate Labour Market. The Review of Economic Studies.

[53] Panter, Elaine; Primiani, Tanya; Hasan, Tazeen; Calderon Pontaza, Eduardo (2017) Antidiscrimination Law and Shared Prosperity: An Analysis of the Legal Framework of Six Economies and Their Impact on the Equality of Opportunitiesof Ethnic, Religious, and Sexual Minorities. Policy Research Working Paper; No. 7992. World Bank, Washington, DC.https://openknowledge.worldbank.org/handle/10986/26242 License: CC BY 3.0 IGO."

[54] Robayo-Abril and Millan, Closing the Gender Gaps among Marginalized Roma in the Western Balkans 2019.

[55] Rodriguez-Planas, N. and Hara, H. (2020). Long-Term Effects of School Home Economics on Adults' Time Use, Labor Market Outcomes and Fertility: Quasi-Experimental Evidence from Japan. Working Paper, Queens College, City University of New York

[56] Salazar-Saenz,M., and Robayo-Abril, M. (2020) A Structural Model of the Labor Market to Understand Gender Gaps among Marginalized Roma Communities. Policy Research working paper; no. WPS 9398 Washington, D.C. : World Bank

[57] Selod, H., Gobillon, Laurent, G. and Thierry Magnac, t. (2011) "The effect of location on finding a job in the Paris region." Journal of Applied Econometrics 26.7: 1079-1112.

[58] Selod, H. and Zenou, Y. (2006) "City structure, job search, and labour discrimination: Theory and policy implications." The Economic Journal 116.514: 1057-1087

[59] Sevilla-Sanz, A., Gimenez-Nadal J., and Fernandez, C. (2010) "Gender Roles and the Division of Unpaid Work in Spanish Households," Feminist Economics, Taylor and Francis Journals, vol. 16(4), pages 137-184.

[60] Solberg, E., and Wong, D. (1992). Family Time Use: Leisure, Home Production, Market Work, and Work Related Travel. The Journal of Human Resources, 27(3), 485-510. doi:10.2307/146173

[61] Tovar J.A., Urdinola B.P. (2019) Home and Market Production Time Use Differentials in Colombia. In: Urdinola B., Tovar J. (eds) Time Use and Transfers in the Americas. Springer, Cham.

[62] Turon, H. (2019). Home Production of Childcare and Labour Supply Decisions in a Collective Household Model. IZA Discussion Paper.

[63] UN Women (2013), A transformative stand-alone goal on achieving gender equality, women's rights and women's empowerment: imperatives and key components.

[64] Vandenbroucke, G. (2018) "Married Men Sit Atop the Wage Ladder" Economic Synopses, No. 24, 2018. https://doi.org/10.20955/es.2018.24

[65] World Bank (2019) "The Problem Is They See As A Whole": Explaining Gender and Ethnicity-based Inequalities Among the Roma in Serbia. World Bank, Washington, DC.

[66] World Economic Forum (2019) The Global Gender Gap Report 2020. https://www.weforum.org/reports/gender-gap-2020-report-100-years-pay-equality.

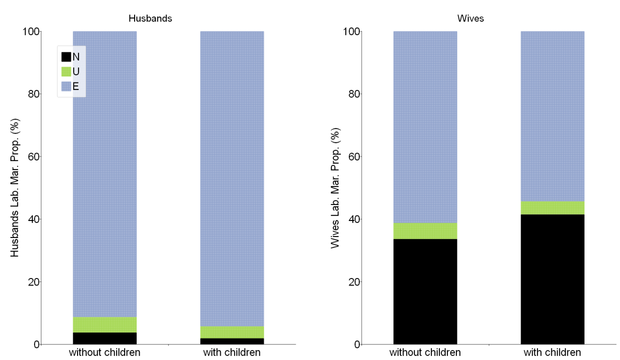
[67] Xiao, Pengpeng (2020) Wage and Employment Discrimination by Gender in Labor Market Equilibrium. Mimeo. Yale University.

Table 1: Value Functions, Flow Utility, and Shocks

	Value Function	Flow Utility	Shocks
1	$EE\left[w_i, h_i, w_j, h_j, hp_i, hp_j, K\right]$	$u\left(C\left(w_i h_i + w_j h_j, Z(hp_i, hp_j)\right), 1-h_i-hp_i, 1-h_j-hp_j, 0, 0\right)$	$\gamma_M, \eta_M, \gamma_w, \eta_W, \tau_K$
2	$EU\left[w_i, h_i, 0, 0, hp_i, hp_j, K\right]$	$u\left(C\left(w_i h_i, Z(hp_i, hp_j)\right), 1-h_i-hp_i, 1-hp_j, 0, s_W\right)$	$\gamma_M, \eta_M, \lambda_w, \tau_K$
3	$UE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right]$	$u\left(C\left(w_j h_j, Z(hp_i, hp_j)\right), 1-hp_i, 1-h_j-hp_j, s_M, 0\right)$	$\lambda_M, \gamma_w, \eta_W, \tau_K$
4	$EN\left[w_i, h_i, 0, 0, hp_i, hp_j, K\right]$	$u\left(C\left(w_i h_i, Z(hp_i, hp_j)\right), 1-h_i-hp_i, 1-hp_j, 0, 0\right)$	γ_M, η_M, τ_K
5	$NE\left[0, 0, w_j, h_j, hp_i, hp_j, K\right]$	$u\left(C\left(w_j h_j, Z(hp_i, hp_j)\right), 1-hp_i, 1-h_j-hp_j, 0, 0\right)$	γ_w, η_W, τ_K
6	$UU\left[0, 0, 0, 0, hp_i, hp_j, K\right]$	$u\left(C\left(0, Z(hp_i, hp_j)\right), 1-hp_i, 1-hp_j, s_M, s_W\right)$	$\lambda_M,\ \lambda_w,\ \tau_K$
7	$UN\left[0, 0, 0, 0, hp_i, hp_j, K\right]$	$u\left(C\left(0, Z(hp_i, hp_j)\right), 1-hp_i, 1-hp_j, s_M, 0\right)$	$\lambda_M,\ \tau_K$
8	$NU\left[0, 0, 0, 0, hp_i, hp_j, K\right]$	$u\left(C\left(0, Z(hp_i, hp_j)\right), 1-hp_i, 1-hp_j, 0, s_W\right)$	λ_w, τ_K
9	$NN\left[0, 0, 0, 0, hp_i, hp_j, K\right]$	$u\left(C\left(0, Z(hp_i, hp_j)\right), 1-hp_i, 1-hp_j, 0, 0\right)$	τ_K

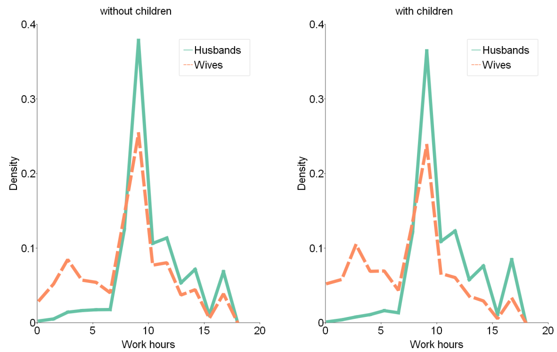
Note: Households are susceptible to receive a children shock (τ_K) in any labor market state. The parameters s_M, s_W indicate that when either agent is unemployed, that agent faces the gender-specific search cost to receive job offers. The unemployed spouse receives job offers at rates λ_M, λ_W. A nonparticipant does not face the search cost, nor receive any job offers. When both spouses are nonparticipant, they receive flow utility from home production and leisure, with the only available shock being the fertility shock.

Figure 1: Observed Extensive Margin of Labor Supply



Note: Data are from the 2012-2013 Gran Encuesta Integrada de Hogares (GEIH). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; E= Employed

Figure 2: Observed Intensive Margin of Labor Supply



Note: Data are from the 2012-2013 Gran Encuesta Integrada de Hogares (GEIH).

Table 2: Descriptive Statistics: Labor Market and Time Use Components

Labor Market Status:

	GEIH					ENUT			
	Husbands		Wives			Husbands		Wives	
	No Children	Children	No Children	Children		No Children	Children	No Children	Children
N	3.8	1.9	33.7	41.5	N	4.4	2.8	40.8	52.7
U	5.0	3.8	6.4	4.2	U	3.2	3.2	4.4	3.6
P	6.7	5.0	19.5	21.6	P	13.5	11.7	15.8	15.8
F	84.6	89.2	41.8	32.7	F	78.9	82.2	39.0	27.9
Total	4977	31227	4977	31227	Total	341	2003	341	2003

Labor marker assortative mating:

		Wives' labor state				
		N	U	P	F	All Husbands:
Husb.	N	0.9	0.1	0.4	0.8	2.2
labor	U	1.3	0.3	0.8	1.6	4.0
State	P	2.0	0.2	1.4	1.6	5.2
	F	36.2	3.7	18.6	30.0	88.6
All Wives:		40.4	4.3	21.3	34.0	100.0

Labor market transitions from a year to the present:

Husbands					Wives				
From\To	N	U	P	F	From\To	N	U	P	F
N	1.2	-	-	-	N	31.89	-	-	-
U	0.1	0.1	1.1	15.8	U	1.26	0.39	7.73	11.05
P	-	-	2.5	-	P	-	-	9.67	-
F	-	-	-	44.9	F	-	-	-	14.65
EMP	0.8	3.9	1.6	27.9	EMP	7.28	3.91	3.88	8.29

Wages (thousands of pesos):

	Mean					**Std Dev**				
	Overall	By Spouse Labor Market State				Overall	By Spouse Labor Market State			
		N	U	P	F		N	U	P	F
P Husbands	2.3	2.3	2.2	2.3	2.3	2.2	1.4	1.1	1.9	1.9
F Husbands	1.6	1.7	1.4	1.6	1.6	1.8	1.7	0.6	1.6	1.6
P Wives	2.0	2.0	1.9	2.1	2.0	2.2	.	2.1	2.2	2.2
F Wives	1.4	1.5	1.3	1.4	1.4	1.9	0.6	1.8	1.8	1.7

Percentage of time dedicated to home production:

	Mean				**Std Dev**			
Lab. Mar.	Husbands		Wives		Husbands		Wives	
Status:	No Children	Children	No Children	Children	No Children	Children	No Children	Children
N	21.5	20.8	30.2	39.5	11.2	15.7	17.9	16.0
U	27.6	22.6	29.9	39.4	10.9	15.5	16.9	15.0
P	12.7	15.7	21.4	30.8	9.2	14.1	7.1	12.3
F	7.4	9.3	12.7	19.3	6.8	11.3	6.6	8.6

Note: Data are from the 2012-2013 Gran Encuesta Integrada de Hogares (GEIH) and Encuesta Nacional del Uso del Tiempo (ENUT). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment. From the self-reported changes in the labor market, I built males' and females' transitions. All the matrices in of the labor market assortative mating and labor transitions sum up to 100. In the survey, the tenure time of the current job is reported and if the change from a different job or no-employment. Consequently, only changes from previous employment can be identified (no part-time or full-time), and as the model assumes that the current worker coming from no-employment, found the job from unemployment, we only have transitions from unemployment to work.

Table 3: Spouses' Home Production Allocation by Joint Labor Status

		Percentage of time devoted to home production by						
		Husbands				**Wives**		
		Without Children						
		wives' labor state:				wives' labor state:		
		N	U	E		N	U	E
Husbands'	N			18	N			12
labor	U			22	U			18
State	E	7	11	9	E	30	29	15
		With Children						
		wives' labor state:				wives' labor state:		
		N	U	E		N	U	E
Husbands'	N	21		22	N	37		14
labor	U	23	14	23	U	31	52	20
State	E	9	13	11	E	40	39	24

Note: Data are from the 2012-2013 Encuesta Nacional del Uso del Tiempo (ENUT). Abbreviations: N= nonparticipant; U= unemployed; E= Employed. Home production time allocation is only reported for joint labor market status with frequencies higher than 1%

Table 4: Nonparticipation Proportions: Sensitivity to Imperfect Substitution Parameters (ω and θ)

	Benchmark	omega=0.1	omega=0.25	omega=0.5	omega=0.75	omega=0.9
Husbands:						
No Children	0.1	0	0.1	0	0	0
Children	0.6	0	0.7	0.2	0.1	0
Wives:						
No Children	32.1	10.1	28.8	31.2	23	18.5
Children	40.1	10.5	33	44.3	37.1	28.8
	Benchmark	theta=0.1	theta=0.25	theta=0.5	theta=0.75	theta=0.9
Husbands:						
No Children	0.1	53.9	0.4	0.1	0.1	0
Children	0.6	91.9	0.4	0.8	0.6	0.6
Wives:						
No Children	32.1	100	72.3	35.2	32.1	28.8
Children	40.1	100	82.5	51.3	40	37

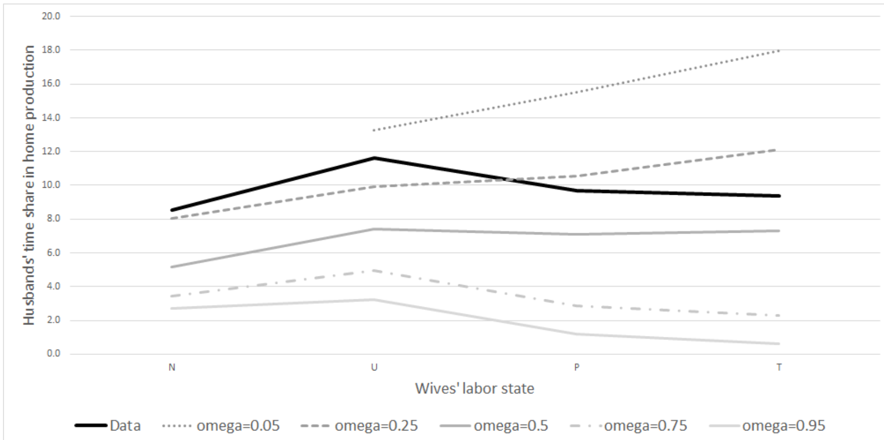
Note: Table reports husbands' and wives' nonparticipation rates at different levels of ω and θ. Simulations based on parameter estimates (see Table 6).

Table 5: Spouses' Home Production Allocation by Joint Labor Status: Sensitivity to Imperfect Substitution Parameters (ω and θ)

	omega=0.1				omega=0.25				omega=0.5				omega=0.75				omega=0.9			
									Husbands:											
	N	U	P	F	N	U	P	F	N	U	P	F	N	U	P	F	N	U	P	F
N																				
U			32	36		22	26	28	21		24	23	27		20	17	32		18	12
P			24	26	13		17	19	10		13	13	9		7	5	9		3	2
F	13	13	15	18	8	10	11	12	5	7	7	7	3	5	3	2	3	3	1	1
									Wives:											
N																				
U			34	26		41	27	20	55		23	14	62		20	11	66		19	10
P			38	28	43		29	20	38		22	14	35		14	7	35		9	3
F	55	51	40	30	43	40	31	22	37	34	21	14	30	27	12	6	24	22	8	3
	theta=0.1				theta=0.25				theta=0.5				theta=0.75				theta=0.9			
									Husbands:											
	N	U	P	F	N	U	P	F	N	U	P	F	N	U	P	F	N	U	P	F
N	82																			
U					48				26			30	14		25	27		15	22	25
P					35				18		19	20	10		15	16	6		12	14
F	42				25		22	22	12	13	14	14	5	7	8	10	2	4	5	7
									Wives:											
N	90																			
U					64				56			19	52		24	15		40	23	15
P					61				45		28	20	40		25	17	40		25	16
F	76				59		33	25	45	38	27	20	41	38	27	18	41	39	28	19

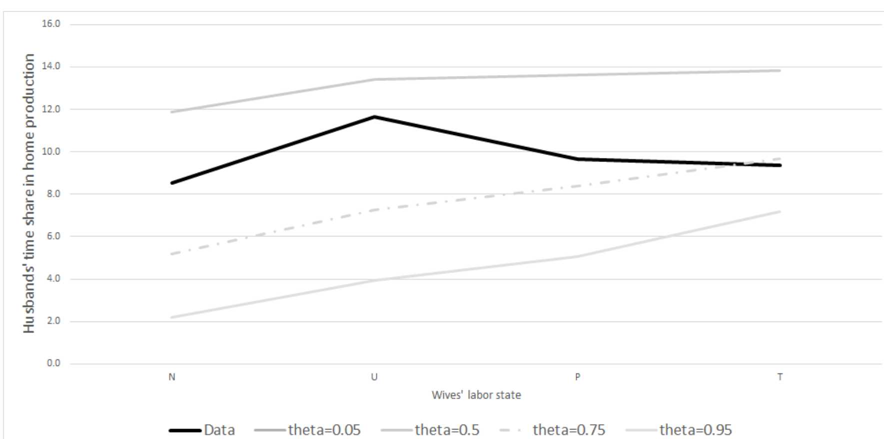
Note: Table reports husbands' and wives' home production time allocation by joint labor market status. Data is only reported for joint labor market status with frequencies higher than 1% at different levels of ω and θ. Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Figure 3: Home Production Time Allocation of Full-Time Husbands with Respect To Wives' Labor State: Sensitivity to Imperfect Substitution Between Market Consumption and Home Production (ω)



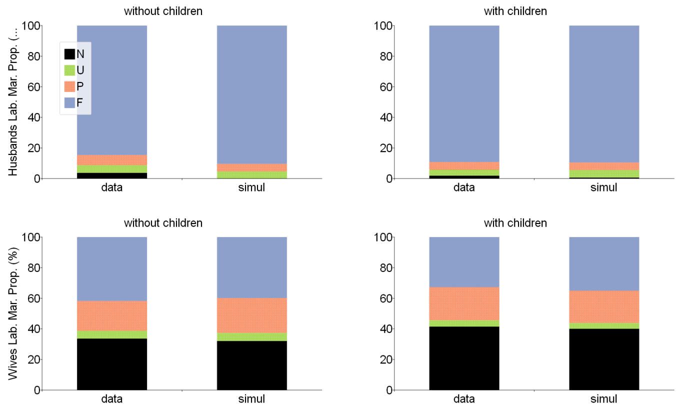
Note: Figure reports home production time allocation of full-time husbands with respect to wives' labor state. Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Figure 4: Home Production Time Allocation of Full-Time Husbands with Respect To Wives' Labor State: Sensitivity to the Imperfect Substitution Between Spouses' Home Production Time (θ)



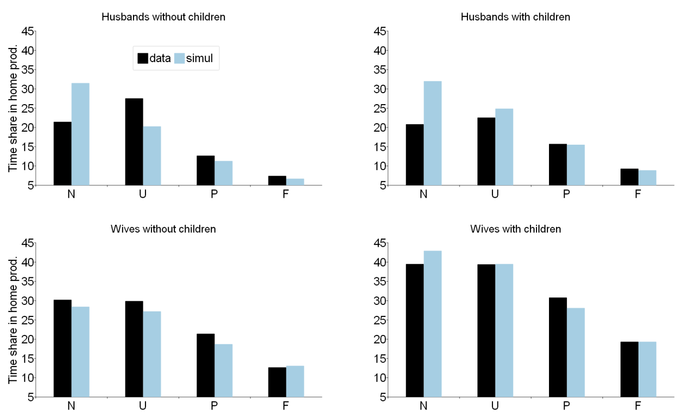
Note: Figure reports home production time allocation of full-time husbands with respect to wives' labor state. Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Figure 5: Observed and Simulated Labor Market Status Proportions by Gender and Children in the Household



Note: Data are from simulations at the point estimates reported in Table 6 and from on 2012-2013 Gran Encuesta Integrada de Hogares (GEIH) and Encuesta Nacional del Uso del Tiempo (ENUT). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Figure 6: Observed and Simulated Mean Time in Home Production by Labor Market State (percent)



Note: Data are from simulations at the point estimates reported in Table 6 and from on 2012-2013 Gran Encuesta Integrada de Hogares (GEIH) and Encuesta Nacional del Uso del Tiempo (ENUT). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Table 6: Method of Simulated Moments Estimation Results: Parameter Estimates

Parameter	Description	Value Male	Value Female
λ_A	job offers to unemployed	0.49	0.41
		(0.0001)	(0.0000)
γ_A	job offers to employed	0.03	0.03
		(0.0001)	(0.0000)
η_A^P	termination shock to part-time employed	0.03	0.02
		(0.0000)	(0.0000)
η_A^F	termination shock to full-time employed	0.03	0.03
		(0.0000)	(0.0000)
μ_A^P	lognormal part-time wage offer location parameter	3.9	2.3
		(0.0686)	(0.0000)
μ_A^F	lognormal full-time wage offer location parameter	2.6	2.1
		(0.0004)	(0.0000)
σ_A^P	lognormal part-time wage offer scale parameter	8.6	6.4
		(0.5737)	(0.0103)
σ_A^F	lognormal full-time wage offer scale parameter	3.5	3.5
		(0.0031)	(0.0108)
p	probability of part-time job offer	0.05	0.36
		(0.0008)	(0.0007)
s_A	search cost	2.66	2.43
		(0.0003)	(0.0002)
α_A^K	weight of leisure with children	0.19	0.18
		(0.0000)	(0.0000)
P_Z^K	price of home production with children	0.27	
		(0.0000)	
α_A^{NK}	weight of leisure without children	0.17	0.19
		(0.0015)	(0.0000)
P_Z^{NK}	price of home production without children	0.17	
		(0.0055)	
δ	CRRA consumption parameter	0.21	
		(0.0000)	
β_A	CRRA leisures parameters	0.06	0.24
		(0.0000)	(0.0000)
Π_A	probability of low type in home production	0.92	0.52
		(0.0001)	(0.0002)
π^H	home productivity of the high type	2.07	
		(0.0001)	
θ	home production CES substitution parameter	0.69	
		(0.0001)	
ω	consumption CES substitution parameter	0.34	
		(0.0001)	
τ_K	arrival rate of children	0.04	
		(0.0001)	

Note: Standard errors in parentheses are computed by boostrap with 40 replications. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; A={husbands, wives}.

Table 7: Estimation Results: Mean and Variance of Wage Offer Distribution (thousands of pesos) and Implied Months for Arrival Shocks

	Male	Female
mean of P wages	3.9	2.3
variance of P wages	8.6	6.4
mean of F wages	2.6	2.1
variance of F wages	3.5	3.5
job offers to unemployed (months)	2.0	2.4
job offers to employed (months)	33.5	37.4
laid-off shock to part-time employed (months)	39.3	40.8
laid-off shock to full-time employed (months)	38.5	34.9
arrival of children (years)	2.0	
aging of children (years)	12.5	

Note: Data are from simulations at the point estimates reported in Table 6 and from on 2012-2013 Gran Encuesta Integrada de Hogares (GEIH) and Encuesta Nacional del Uso del Tiempo (ENUT). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment.

Table 8: Descriptive Statistics: Observed and Simulated Labor Market Components

Labor Market Status:

	Husbands					Wives			
	Sample		Simulated			Sample		Simulated	
	No Children	Children	No Children	Children		No Children	Children	No Children	Children
N	1.9	3.8	0.6	0.1	N	41.5	33.7	40.0	31.8
U	3.8	5.0	5.0	5.5	U	4.2	6.4	3.9	3.6
P	5.0	6.7	4.9	4.9	P	21.6	19.5	20.7	22.6
F	89.2	84.6	89.5	89.4	F	32.7	41.8	35.4	39.7

Labor marker assortative mating:

	Sample					Simulated			
	Wives' Labor Mkt:					Wives' Labor Mkt:			
Husband's Lab. Mkt:	N	U	P	F	Husband's Lab. Mkt:	N	U	P	F
N	0.9	0.1	0.4	0.8	N	-	-	-	0.6
U	1.3	0.3	0.8	1.6	U	1.2	0.7	1.2	1.9
P	2.0	0.2	1.4	1.6	P	1.4	0.2	1.2	2.0
F	36.2	3.7	18.6	30.0	F	36.4	3.2	18.9	31.2

Labor market transitions from a year to the present:
Husbands:

	Sample					Simulated			
From\To	N	U	P	F	From\To	N	U	P	F
N	1.2	-	-	-	N	0.4	-	-	-
U	0.1	0.1	1.1	15.8	U	0.0	0.1	0.8	13.3
P	-	-	2.5	-	P	-	-	2.8	-
F	-	-	-	44.9	F	-	-	-	51.5
EMP	0.8	3.9	1.6	27.9	EMP	0.2	4.9	1.3	24.8

Wives:

	Sample					Simulated			
From\To	N	U	P	F	From\To	N	U	P	F
N	31.9	-	-	-	N	29.9	-	-	-
U	1.3	0.4	7.7	11.0	U	1.0	1.7	4.8	8.1
P	-	-	9.7	-	P	-	-	12.1	-
F	-	-	-	14.6	F	-	-	-	19.7
EMP	7.3	3.9	3.9	8.3	EMP	8.0	2.3	4.4	7.9

Mean wages (thousands of pesos):

	Sample					**Simulated**				
	Overall	By Spouse Labor Market State				Overall	By Spouse Labor Market State			
		N	U	P	F		N	U	P	F
P Husbands	4.4	4.5	4.3	4.3	4.3	4.5	6.6	3.0	3.6	3.7
F Husbands	3.4	3.5	3.2	3.4	3.5	3.3	4.4	1.8	2.7	2.6
P Wives	2.8	2.8	2.8	3.0	2.8	2.9	0.0	2.6	2.8	2.9
F Wives	2.7	2.7	2.7	2.4	2.7	2.7	7.7	2.5	2.6	2.6

Std. dev. Wages (thousands of pesos):

	Sample					**Simulated**				
	Overall	By Spouse Labor Market State				Overall	By Spouse Labor Market State			
		N	U	P	F		N	U	P	F
P Husbands	2.3	2.3	2.2	2.3	2.3	2.2	1.4	1.1	1.9	1.9
F Husbands	1.6	1.7	1.4	1.6	1.6	1.8	1.7	0.6	1.6	1.6
P Wives	2.0	2.0	1.9	2.1	2.0	2.2	.	2.1	2.2	2.2
F Wives	1.4	1.5	1.3	1.4	1.4	1.9	0.6	1.8	1.8	1.7

Note: Data are from simulations at the point estimates reported in Table 6 and from on 2012-2013 Gran Encuesta Integrada de Hogares (GEIH) and Encuesta Nacional del Uso del Tiempo (ENUT). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment. From the self-reported changes in the labor market, I built males' and females' transitions. All the matrices in of the labor market assortative mating and labor transitions sum up to 100. In the survey, the tenure time of the current job is reported and if the change from a different job or no-employment. Consequently, only changes from previous employment can be identified (no part-time or full-time), and as the model assumes that the current worker coming from no-employment, found the job from unemployment, we only have transitions from unemployment to work.

Table 9: Descriptive Statistics: Observed and Simulated Time Use Components

Mean of the percentage of time dedicated to home production:

	Husbands					Wives			
	Sample		Simulated			Sample		Simulated	
	No Children	Children	No Children	Children		No Children	Children	No Children	Children
N	21.5	20.8	31.5	32.3	N	30.2	39.5	28.4	43.0
U	27.6	22.6	19.2	25.3	U	29.9	39.4	28.8	38.9
P	12.7	15.7	11.0	15.6	P	21.4	30.8	18.4	28.2
F	7.4	9.3	6.8	8.9	F	12.7	19.3	13.2	19.3

Std. Dev. of the percentage of time dedicated to home production:

	Husbands					Wives			
	Sample		Simulated			Sample		Simulated	
	No Children	Children	No Children	Children		No Children	Children	No Children	Children
N	17.9	16.0	2.8	7.1	N	11.2	15.7	7.6	8.7
U	16.9	15.0	6.3	8.1	U	10.9	15.5	8.4	9.1
P	7.1	12.3	5.3	6.3	P	9.2	14.1	6.4	7.3
F	6.6	8.6	3.7	4.6	F	6.8	11.3	5.1	6.0

Mean of the percentage of time devoted to home production by:

Husbands

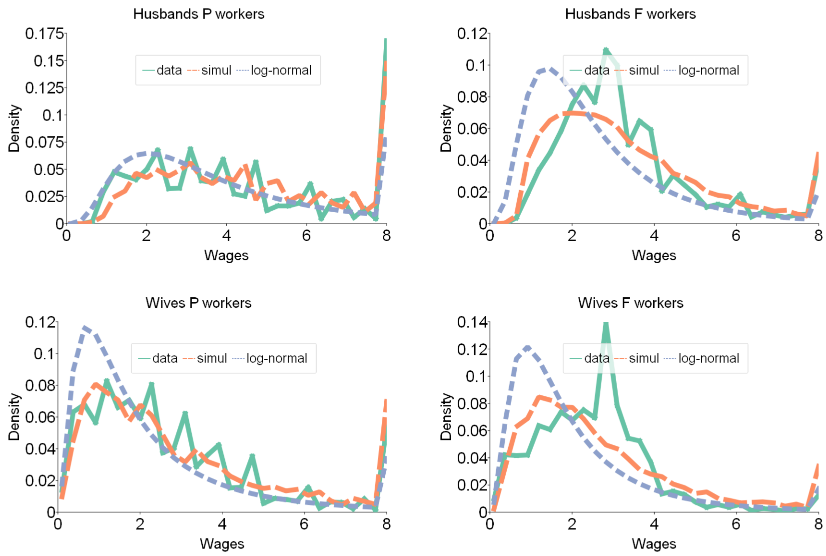
Husband's	Sample wives' labor state:					Simulated wives' labor state:			
Lab. St.:	N	U	P	F		N	U	P	F
N					N				
U	24.6			24.0	U	16.3			27.1
P	13.6		15.3	17.3	P	11.8		15.9	16.5
F	8.5	11.6	9.7	9.4	F	6.6	8.6	9.5	10.5

Wives

Husband's	Sample wives' labor state:					Simulated wives' labor state:			
Lab. St.:	N	U	P	F		N	U	P	F
N					N				
U	32.5			17.9	U	52.0			16.3
P	36.0		30.2	17.5	P	40.6		25.1	18.0
F	39.0	37.4	29.8	18.4	F	41.0	38.3	26.9	18.7

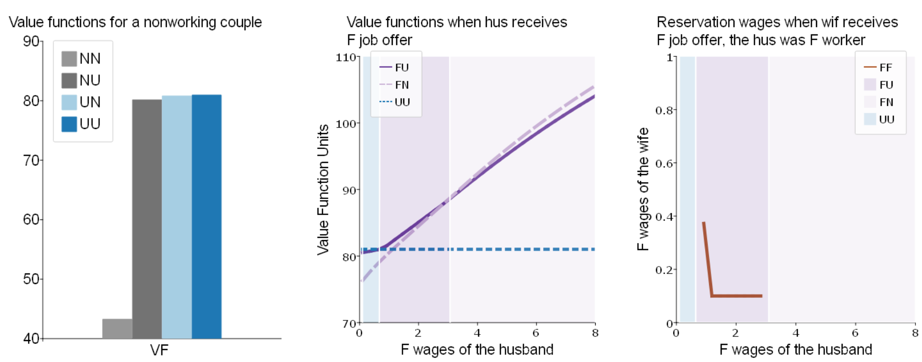
Note: Data are from simulations at the point estimates reported in Table 6 and from on 2012-2013 Gran Encuesta Integrada de Hogares (GEIH) and Encuesta Nacional del Uso del Tiempo (ENUT). Home production time allocation is only reported for joint labor market status with frequencies higher than 1%. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment.

Figure 7: Observed, Simulated, and Implicit Wage Offer Distribution by Spouse and Work Hours



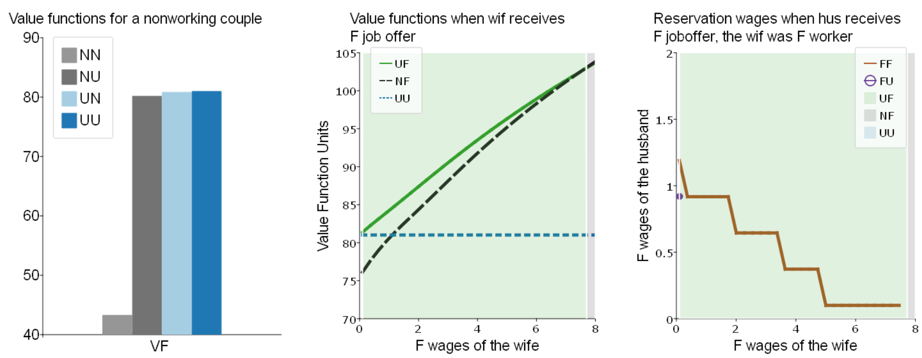
Note: Data are from simulations at the point estimates reported in Table 6 and from on 2012-2013 Gran Encuesta Integrada de Hogares (GEIH) and Encuesta Nacional del Uso del Tiempo (ENUT). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Figure 8: Sequential Spouses' Labor Supply Decisions: Husband Receives a Full-Time Offer First



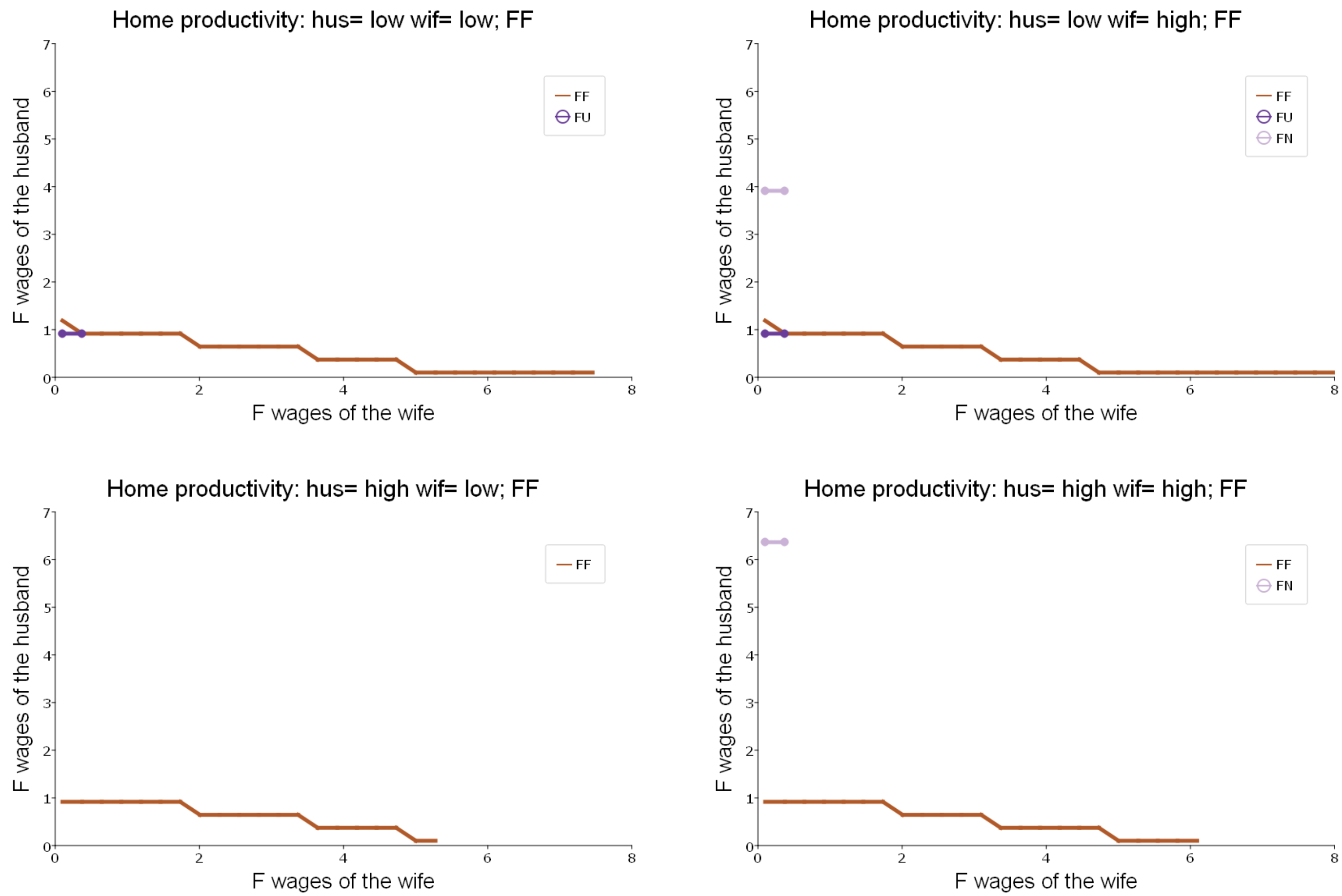
Note: This graph represents the maximization of spouses' labor decisions for a household with children with low home productivity for both spouses. The first panel on the left presents a case in which both spouses are nonworkers. The panel in the middle considers the event when the husband is receiving a full-time job offer. Once the husband has accepted a full-time job offer and the wife has decided to remain unemployed, the third panel considers the event in which the wife receives a full-time job offer. The maximum wage considered in the current exercise is 8 thousand pesos. Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment.

Figure 9: Sequential Spouses' Labor Supply Decisions: Wife Receives a Full-Time Offer First



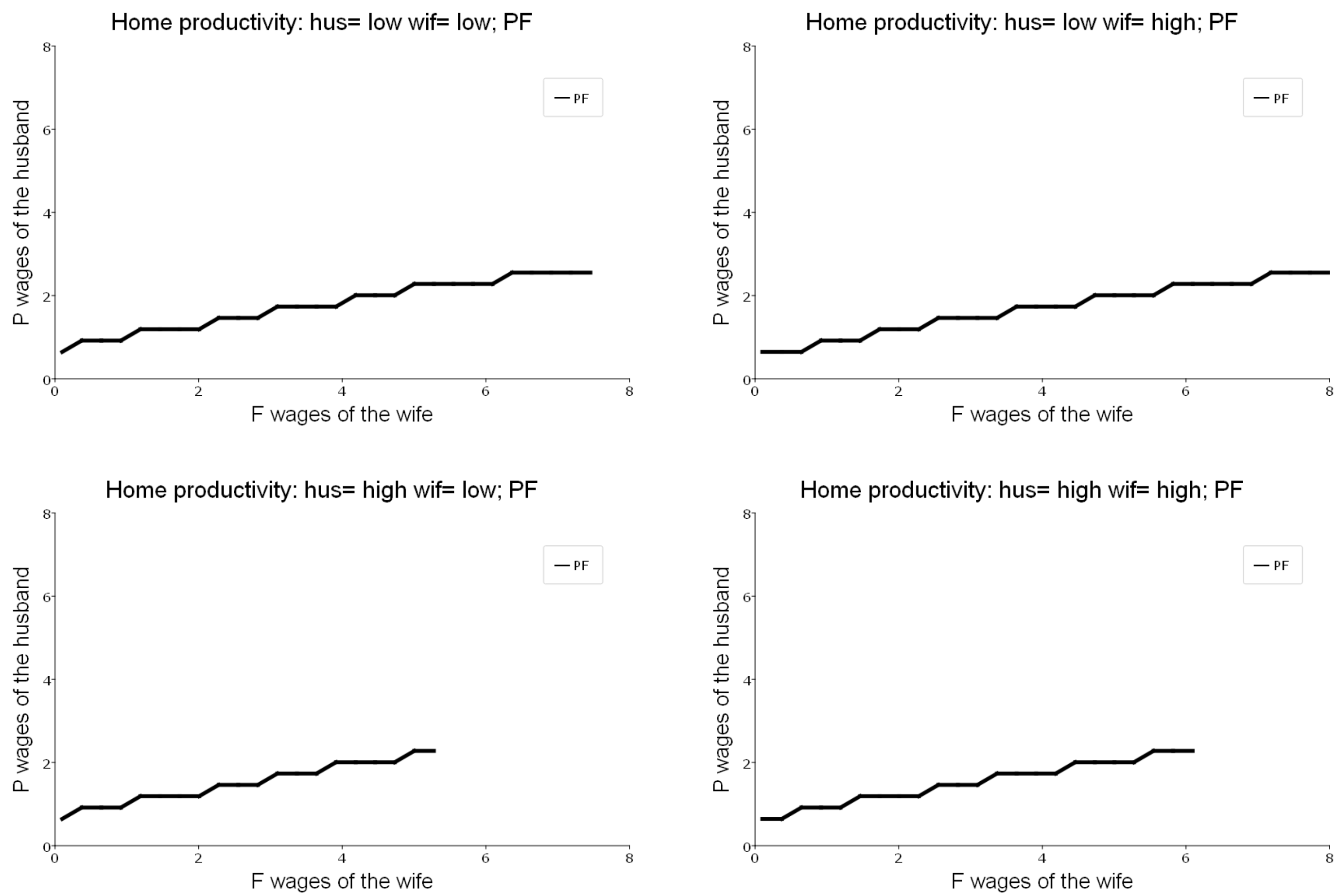
Note: This graph represents the maximization of spouses' labor decisions for a household with children with low home productivity for both spouses. The first panel on the left presents a case in which both spouses are nonworkers. The panel in the middle considers the event when the wife is receiving a full-time job offer. Once the wife has accepted a full-time job offer and the husband has decided to remain unemployed, the third panel considers the event in which the husband receives a full-time job offer. The maximum wage considered in the current exercise is 8 thousand pesos. Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment.

Figure 10: Husband's Reservation Wages when Receiving a Full-Time Job Offer Conditional on the Wife's Full-Time Wages, by Household Type



Note: Figure reports husbands' reservation wages schedules out of unemployment when married full-time wives. When facing a new job offer, there are four labor options for the couple: 1) rejecting the job offer for the unemployed husband (UF), 2) both spouses become employed (FF), 3) the unemployed husband takes the job offer, and the wife switches to unemployment (FU), or 4) the unemployed husband takes the job offer the wife switches to nonparticipation (FN). Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment; hus= husbands; wif= wives; low= low home production productivity; high= high home production productivity.

Figure 11: Husband's Reservation Wages when Receiving a Part-Time Job Offer Conditional on the Wife's Full-Time Wages, by Household Type



Note: Figure reports husbands' reservation wages schedules out of unemployment when married full-time wives. When facing a new job offer, there are four labor options for the couple: 1) rejecting the job offer for the unemployed husband (UF), 2) both spouses become employed (PF), 3) the unemployed husband takes the job offer, and the wife switches to unemployment (PU), or 4) the unemployed husband takes the job offer the wife switches to nonparticipation (PN). Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment; hus= husbands; wif= wives; low= low home production productivity; high= high home production productivity.

Table 10: Household Type, Labor Status, and Mean Time in Home Production

Labor Market Status:

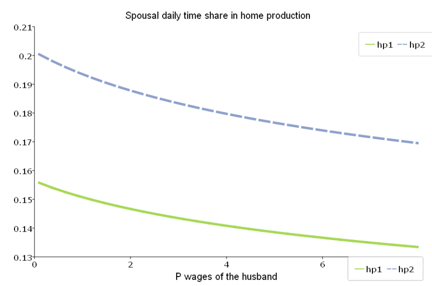
HH Type:	Husbands Total	low-low	low-high	high-low	high-high	Wives Total	low-low	low-high	high-low	high-high
No Children:										
N	0.1	0.0	0.0	1.3	1.9	31.8	25.0	38.9	20.5	41.3
U	5.5	5.8	5.8	1.3	3.8	5.9	5.9	6.0	5.1	5.8
P	4.9	4.4	5.7	5.1	2.9	22.6	26.8	18.0	29.5	18.3
F	89.4	89.8	88.6	92.3	91.3	39.7	42.2	37.1	44.9	34.6
Children:										
N	0.6	0.9	0.0	4.1	1.0	40.0	27.4	55.8	22.1	42.1
U	5.0	5.1	5.0	5.3	4.2	3.9	5.0	2.7	5.0	2.6
P	4.9	5.1	4.6	4.6	5.8	20.7	24.6	15.7	25.0	22.4
F	89.5	89.0	90.4	85.9	89.0	35.4	43.1	25.8	47.9	32.9

Mean of the percentage of time dedicated to home production:

HH Type:	Husbands Total	low-low	low-high	high-low	high-high	Wives Total	low-low	low-high	high-low	high-high
No Children:										
N	31.5	0.0	0.0	34.8	29.9	28.4	19.8	34.8	10.8	29.2
U	19.2	23.8	13.0	40.0	32.3	28.8	21.4	37.6	12.1	30.0
P	11.0	14.4	6.6	26.6	20.1	18.4	14.2	26.4	6.8	21.0
F	6.8	8.5	3.3	17.9	12.4	13.2	9.1	18.9	3.9	14.0
Children:										
N	32.3	27.3	0.0	43.0	36.7	43.0	32.4	49.6	21.0	43.6
U	25.3	29.5	17.2	45.9	39.2	38.9	34.1	51.7	21.5	44.8
P	15.6	18.6	9.1	31.8	25.0	28.2	23.7	37.6	14.0	32.1
F	8.9	11.1	4.6	21.9	15.8	19.3	15.9	27.4	8.4	22.0

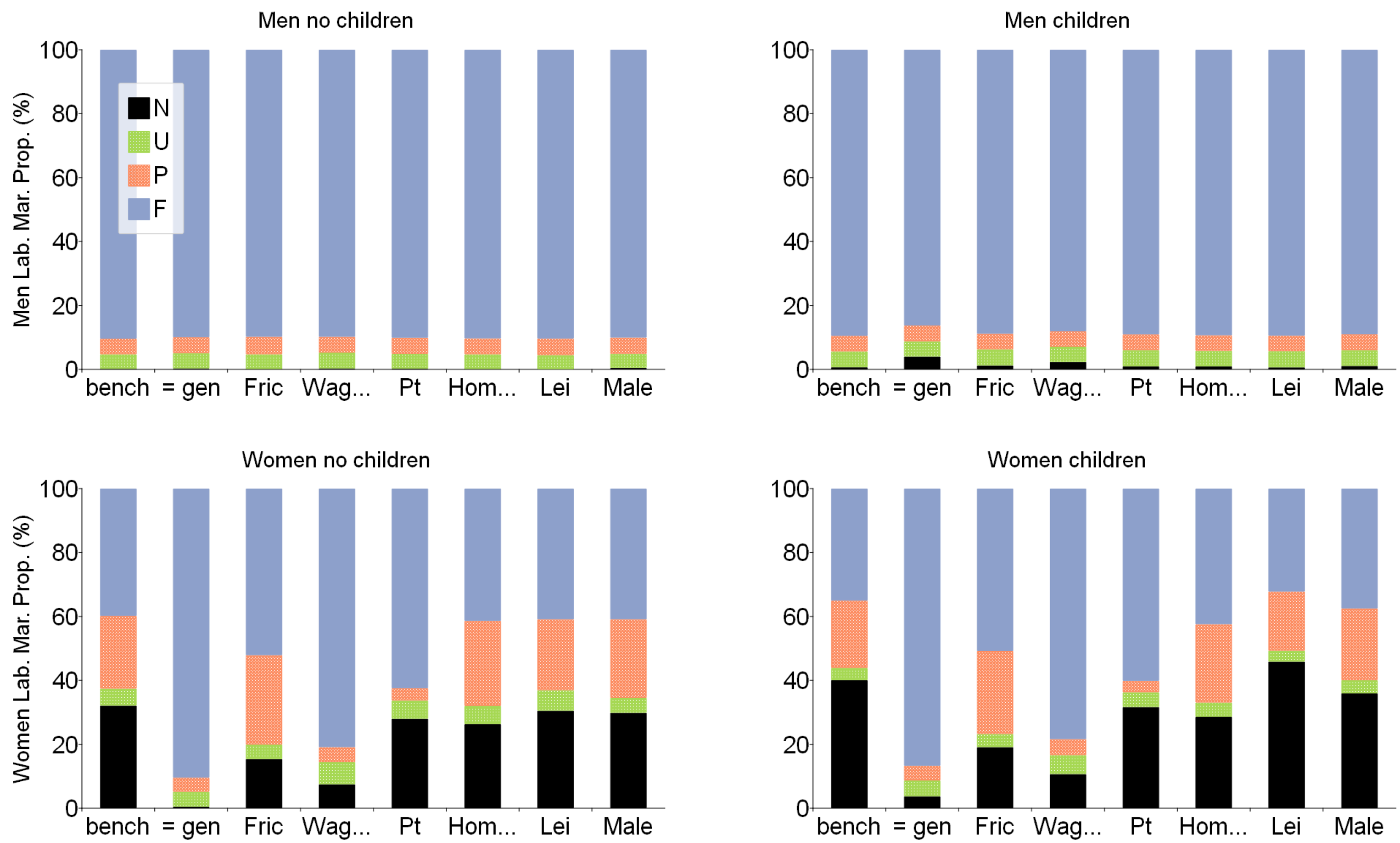
Note: Table reports steady state statistics by household type and the total simulated sample. Top panel reports steady state labor market status proportions. Bottom panel reports steady state mean of the percentage of time dedicated to home production by labor market state. Simulations based on parameter estimates (see Table 6). Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment; hus= husbands; wif= wives; low= low home production productivity; high= high home production productivity.

Figure 12: Model's Relationship Between Wages and Home Production



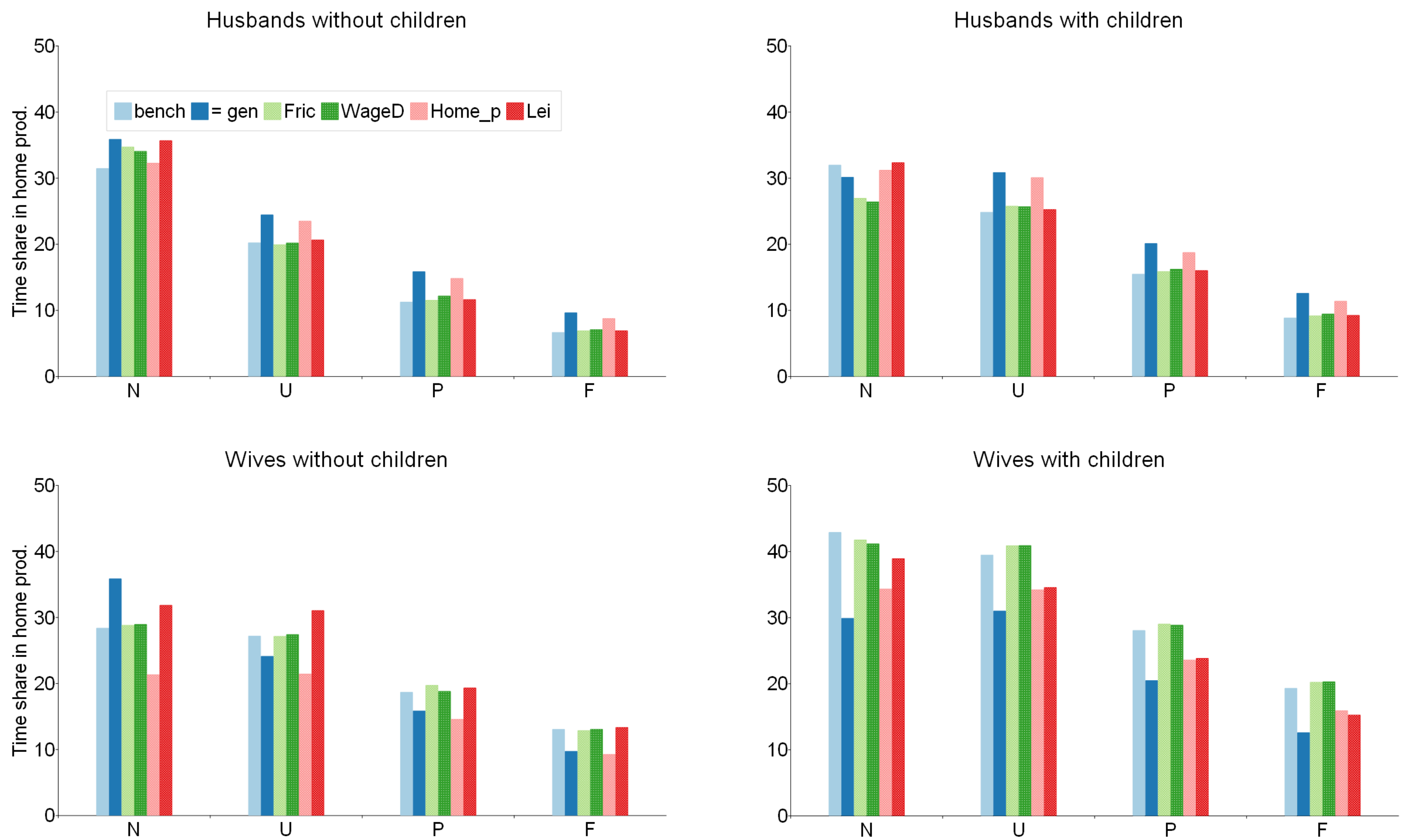
Note: Simulations based on parameter estimates (see Table 6. Abbreviations: hp= time share in home production; 1=husband; 2=wife; N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time; EMP= Past Employment.

Figure 13: Gender Gap Decomposition: Simulated Labor Market Status Proportions



Note: Simulations based on parameter estimates (see Table 6 (bench) and the gender gap decomposition defined in Table 11. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Figure 14: Gender Gap Decomposition: Simulated Mean Time in Home Production by Labor Market State (percent)



Note: Simulations based on parameter estimates (see Table 6 (bench) and the gender gap decomposition defined in Table 11. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Table 11: Gender Gap Decomposition Definitions

#	Label	Meaning
	Benchmark	
1	= gender	All female parameters have the males' values
2	Fric	Female job offers and termination shocks have the males' values
3	WageDist	Female wage distribution parameters and P proportions have the males' values
4	P	Part time availability have the males' values
5	Home_P	Female home productivity distribution have the males' values
6	Lei	Female leisure flow utility parameters have the males' values
7	Male	Male home productivity distribution have the females' values

Table 12: Gender Gap Decomposition: Simulated Mean Accepted Wages (thousands of pesos)

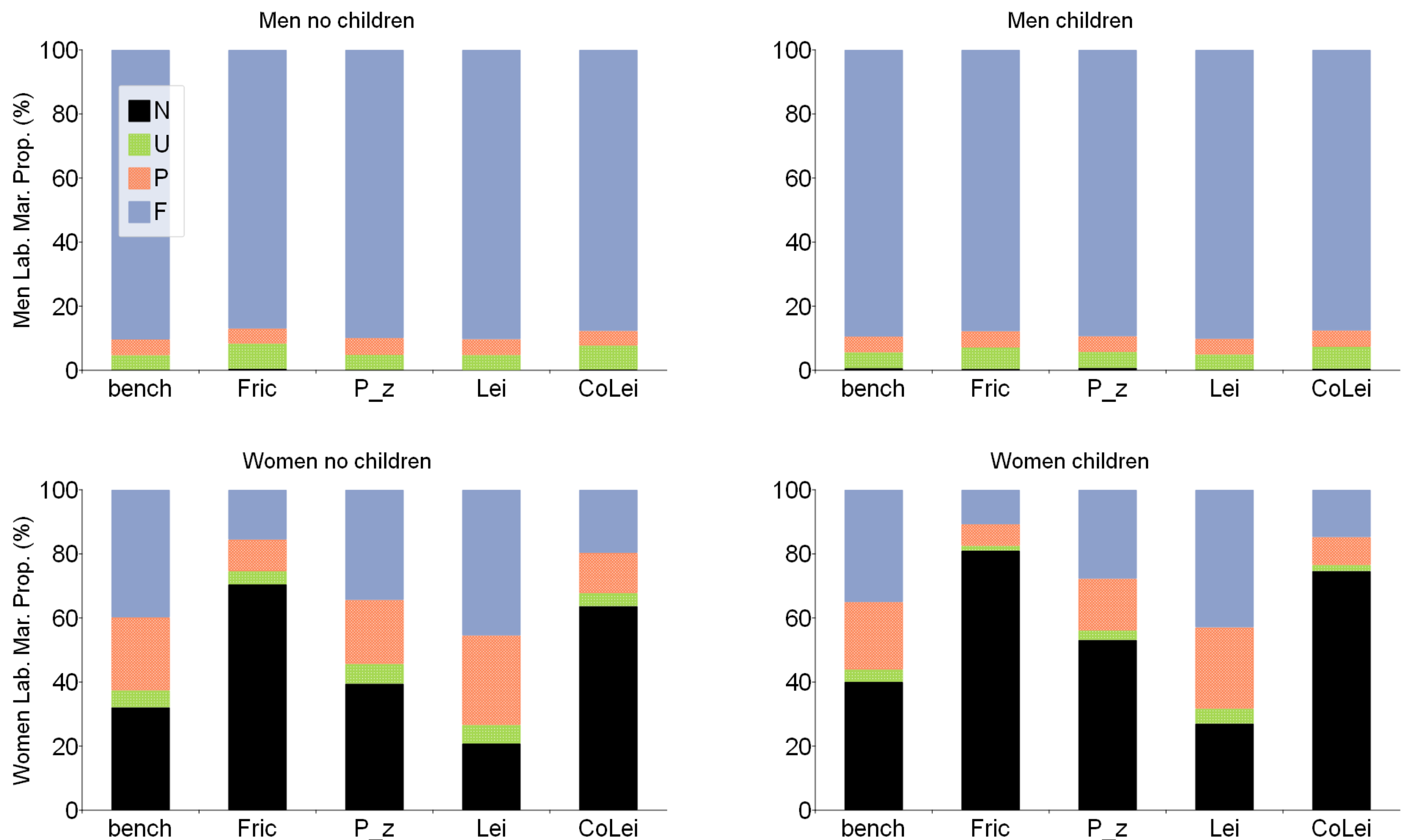
	Benchmark	= gender	LabMarFri	WageDist	P	Home_P	Leisure	Male
P Males	4.5	4.6	4.6	4.5	4.5	4.5	4.5	4.5
F Males	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
P Females	2.9	4.6	2.9	4.3	2.9	2.9	2.9	2.9
F Females	2.7	3.3	2.7	3.2	2.6	2.7	2.7	2.7

Note: Simulations based on parameter estimates (see Table 6 (bench) and the gender gap decomposition defined in Table 11. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Table 13: Covid-19 Type Shock's Definitions

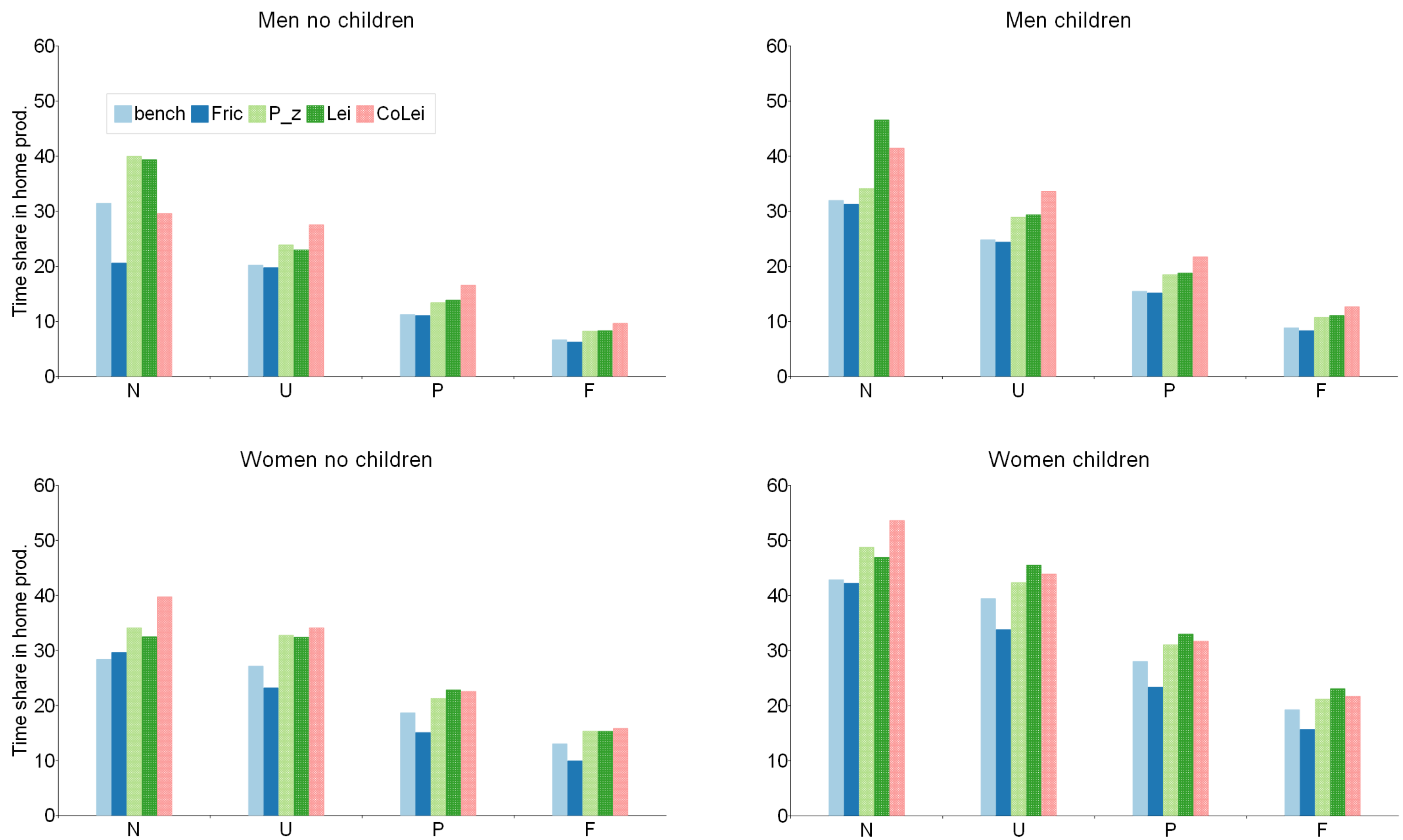
#	Label	Meaning
	Benchmark	
1	Fric	Arrival rate decreases and termination rates increases in 10%
2	P_z	Home production price increses in 10%
3	Lei	Leisure weight parameters decreases in 10%
4	CoLei	Fric+P_z+Lei

Figure 15: Covid-19 Decomposition: Simulated Labor Market Status Proportions



Note: Simulations based on parameter estimates (see Table 6 (bench) and the Covid-19 Type Shock's definitions in Table 13. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Figure 16: Covid-19 Decomposition: Simulated Mean Time in Home Production by Labor Market State (percent)



Note: Simulations based on parameter estimates (see Table 6 (bench) and the Covid-19 Type Shock's definitions in Table 13. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Table 14: Covid-19 Decomposition: Simulated Mean Accepted Wages (thousands of pesos)

	Benchmark	Fric	P_z	Lei	CoLei
P Males	4.5	4.3	4.6	4.3	4.3
F Males	3.3	3.3	3.3	3.3	3.3
P Females	2.9	2.7	2.8	2.6	2.7
F Females	2.7	2.5	2.7	2.6	2.5

Note: Simulations based on parameter estimates (see Table 6 (bench) and the Covid-19 Type Shock's definitions in Table 13. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.

Table 15: Covid-19, Household Type, Labor Status, and Mean Time in Home Production

Labor Market Status:

	Husbands					Wives				
HH Type:	Total	low-low	low-high	high-low	high-high	Total	low-low	low-high	high-low	high-high
No Children:										
N	0.2	0.5	0.0	0.0	0.0	63.2	45.1	83.4	34.6	74.0
U	7.1	7.3	7.0	6.4	7.7	3.9	5.0	2.2	9.0	4.8
P	4.4	4.3	4.5	3.8	4.8	12.8	20.2	5.1	19.2	7.7
F	88.3	87.9	88.6	89.7	87.5	20.1	29.8	9.3	37.2	13.5
Children:										
N	0.5	0.5	0.1	3.9	0.2	74.7	56.3	97.3	35.3	95.2
U	6.8	6.7	7.1	5.8	7.2	1.9	3.5	0.0	5.3	0.0
P	5.0	5.7	4.3	5.7	4.8	8.7	14.8	1.2	21.8	1.0
F	87.6	87.1	88.6	84.6	87.8	14.7	25.4	1.5	37.6	3.8

Mean of the percentage of time dedicated to home production:

	Husbands					Wives				
HH Type:	Total	low-low	low-high	high-low	high-high	Total	low-low	low-high	high-low	high-high
No Children:										
N	29.6	29.6	0.0	0.0	0.0	39.8	29.0	46.6	17.9	40.0
U	27.7	32.3	19.3	48.9	41.4	34.6	30.2	48.8	18.5	42.4
P	16.1	19.8	9.9	33.3	27.2	23.1	20.8	35.0	11.7	29.3
F	9.7	12.2	5.2	23.4	17.0	15.9	13.8	25.5	7.1	19.9
Children:										
N	41.9	36.7	25.4	53.0	46.9	53.7	43.7	60.9	31.6	55.0
U	33.5	38.5	25.0	55.6	47.8	44.1	45.7	0.0	32.4	0.0
P	21.9	25.2	13.7	39.4	31.8	31.8	32.1	46.0	21.6	40.0
F	12.7	15.6	7.4	27.6	20.8	21.8	22.2	33.5	13.6	28.8

Note: Table reports steady state statistics by household type and the total simulated sample. Top panel reports steady state labor market status proportions. Bottom panel reports steady state mean of the percentage of time dedicated to home production by labor market state. Simulations based on the Covid-19 Type Shock's definitions in Table 13, 4th definition. Abbreviations: N= nonparticipant; U= unemployed; P= employed part-time; F= employed full-time.