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Gender-Targeted Policies, Women's Empowerment, and Intrahousehold Inequality

Andrea Maria Flores
Washington University in St. Louis

WASHINGTON UNIVERSITY IN ST. LOUIS

School of Arts & Sciences
Department of Economics

Dissertation Examination Committee:
George-Levi Gayle, Chair
Sanghmitra Gautam
Limor Golan
Alexander Monge-Naranjo
Robert A. Pollak

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by
Andrea Maria Flores

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Andrea Maria Flores

Washington University in Saint Louis

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ABSTRACT OF THE DISSERTATION

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Andrea Maria Flores

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A growing number of development policies increasingly target women as beneficiaries or grant protections to women under the premise that monetary resources in the hands of mothers are more likely to be spent on children's human capital than monetary resources in the hands of fathers. This dissertation explores how observed household responses to these policies can be effectively attributed to their impact on households' decision-making structure. The first two chapters empirically and theoretically explore whether the 2002 urban expansion of Mexico's *Progresa/Oportunidades* conditional cash transfer program was effective at simultaneously empowering mothers and increasing household investments in children's human capital. The third chapter investigates the dynamic impact of unilateral divorce reforms on household formation and dissolution patterns in Mexico.

The first chapter uses the baseline and follow-up waves of the *Oportunidades* urban evaluation survey, ENCELURB, to document a gender-asymmetric impact of the program on the allocation of time within two-parent households characterized by an increase in mothers' leisure hours due to a decrease in their time spent in home production that is not offset by an increase in market work hours while fathers' time use is left unaffected by the program. I also observe a contrasting insignificant impact on single mothers' leisure hours. Rationalizing the evidence through a framework in which the income and substitution effects triggered by

program participation within two-parent households are intrinsically different from those of their single counterparts by also capturing a potential response of the household's bargaining structure to the program's gender-based targeting strategy, the observed time use results constitute suggestive evidence of an empowerment effect in favor of mothers. This coincides with our results indicating that participation in the program led to higher school-related expenditures on girls, increased attendance rates, and weekly hours spent at school, which for boys effectively translates into a lower likelihood of grade repetition. While altogether, the results provide empirical evidence in support of a relationship between women's empowerment and children's human capital accumulation, the extent to which an empowerment effect drives the observed responses to the program is limited by the complex benefits and conditionalities scheme of the program that triggers additional income and substitution effects.

The second chapter takes the time-use results from the first chapter as motivating evidence to disentangle the potential impact of a gender-targeted policy like *Oportunidades* on the decision-making structure of beneficiary two-parent households. To this end, I build upon a collective labor supply model with home production, which characterizes the household's structural demands for time and consumption as functions of the balance of power within the household. Importantly, I propose an alternative approach to identify the model by relying on the exogenous variation of *Oportunidades* on working mothers' leisure and home production hours. In this way, I provide an empirical application of this framework in which I identify and estimate the Pareto weight, which captures mothers' bargaining power, even when the intrahousehold allocation of consumption is unobserved. I document that participation in the program significantly increased beneficiary mothers' bargaining power, effectively increasing their individual welfare and the production of the public good used in the model as a proxy for child quality. Such an increase in domestic output is consistent with the results on child outcomes presented in the first chapter. To the best of my knowledge,

this constitutes novel evidence of the impact of targeted benefits on women's empowerment and its link with children's human capital accumulation since empirical applications of the framework developed in this paper are still relatively scarce, predominantly focused on developed countries, often relying on the availability of high-quality survey data and none used for evaluating the impact of a social experiment like *Oportunidades*. I exploit the structural approach implemented to conduct counterfactual exercises yielding relevant policy insights indicating that *Oportunidades* is an effective policy lever for women's empowerment compared to alternative cash transfer designs and wage subsidies and that the program's targeting can be improved by selecting beneficiaries based on individual rather than household poverty rates.

In the third chapter, a joint project with George-Levi Gayle and Andrew Shephard, we combine linked administrative data on marriages and divorces with survey data within an event study design to show that the adoption of unilateral no-fault divorce significantly increased couples' probability to divorce. This has led to a significant increase in divorce rates, consistent with recent evidence documenting an increase in divorce rates in response to the implementation of unilateral no-fault divorce in the United States and Europe. We contribute to the literature not only by documenting how the liberalization of divorce has affected marital dissolution within the context of a developing country but also by providing novel evidence of how such impact differs by spouses' characteristics at marriage, including couples' choice of asset division regime and wives' labor force participation. Furthermore, we find evidence that the adoption of unilateral divorce has also affected household formation by increasing assortativeness among newlyweds and contributing to the decrease in marriage rates and increase in cohabitation rates documented in the country during the past two decades. Altogether, our results provide motivating evidence for developing a model of household formation, behavior, and dissolution that accounts for differences among legally

married and cohabiting couples while highlighting the dynamic implications of allowing newlyweds to choose the asset division regime at the time of marriage.

Chapter 1

Conditional Cash Transfers and Intrahousehold Time Allocation

This chapter investigates the impact of Mexico's *Oportunidades* conditional cash transfer program on the allocation of time within poor urban households. The empirical strategy implemented exploits the availability of detailed individual time use data and the exogenous variation induced by the program on households' resource constraints and mothers' control over monetary resources in their role as transfer holders. The results are gender-asymmetric within two-parent households as participation in *Oportunidades* increased mothers' leisure hours through a reduction in their time devoted to housework, contrasting with the slight fall in fathers' leisure hours stemming from an increase in the time dedicated to child care. Ruling out an income effect based on a contrasting response documented among single mothers and assuming that leisure is a normal good, the observed effect of the program on the allocation of time within two-parent households provides suggestive evidence of an empowerment effect in favor of mothers. Thus, by focusing on intrahousehold behavior, I provide evidence of how gender-targeted programs effectively alter existing patterns of intrahousehold gender

inequality. I further link such effect with significant changes in children's education-related outcomes, such as school attendance, school-related expenditures, and incidence of grade repetition.

1.1 Introduction

Conditional cash transfer (CCT) programs are a form of social assistance with poverty alleviation as a core objective, typically conditioning benefits on observable outcomes such as children's school attendance and regular health checkups. These programs have become the flagship policies for breaking the intergenerational transmission of poverty through investments in children's human capital. In the case of Latin America and the Caribbean, there were 18 CCT programs in operation as of 2011, with countries such as Bahamas, Barbados, Belize, and Suriname in the process of designing one (Stampini and Tornarolli (2012)). Despite differences in the design, implementation, and evaluation of CCTs, a common feature shared by most is their gender-based targeting under which female household heads tend to be selected as transfer holders, thereby setting women's empowerment as an auxiliary objective. Such a gendered focus is unsurprising as policymakers become increasingly aware of the well-documented nexus between women's empowerment and key development outcomes (Doss (2013), Duflo (2003), Duflo and Udry (2004), Duflo (2012)). Under this premise, it is expected that these programs to alter existing patterns of gender inequality within poor households. However, the extent to which these patterns are exacerbated or mitigated remains a question of interest.

Understanding the impact of development policies on intrahousehold gender inequality requires going beyond a unitary household framework's implications.[1] This is mainly because

[1]A unitary household model takes as a premise that household behavior stems from the maximization of a common utility function so that a set of common preferences supersedes household members' individual

household responses to a policy targeting its benefits to a particular household member could be driven by more than just the potential income and substitution effects of the policy's benefits and eligibility scheme, but also by the impact of its targeting strategy on the households' decision-making structure. That is, who receives a policy's benefits matters. Mainly, if a household's decision makers' preferences potentially diverge, observed household outcomes might reflect such impact as household behavior becomes more aligned with the preferences of the decision-maker whose relative bargaining power improves in response to the policy. Thus, the gendered targeting implemented by most CCTs serves as a lever for inducing higher investments in children's health and education by potentially shifting the balance of power within beneficiary households in favor of mothers.

Mexico's *Oportunidades* is one of the most well-known CCT programs due to its national scale and evaluation design, garnering a considerable amount of attention in the literature. Mainly driven by data availability and the program's intervention focus, there exists substantial evidence documenting the impact of *Oportunidades* on children's school enrollment and performance (Todd and Wolpin (2006), Dubois, De Janvry and Sadoulet (2012), Skoufias et al. (2001), Skoufias (2005), Behrman, Sengupta and Todd (2005), Behrman et al. (2012)), health (Behrman and Parker (2011)) and fertility (Todd and Wolpin (2006)). Furthermore, it has been documented that the program had a significant impact on households' consumption patterns, particularly on food expenditures (Attanasio and Lechene (2002), Attanasio and Lechene (2014), Angelucci and Attanasio (2009), Angelucci and Attanasio (2013)). Most of the evidence presented in these papers points towards a systematic rejection of the unitary household framework and its income pooling hypothesis, which rules out any additional policy effect other than the one it could have on a household's resources and/or preferences. Instead, the results suggest that the implications of observed household responses to a targeted benefit

tastes. Thus, resources are pooled at the household level within this framework, rendering the recipient's identity of a targeted benefit irrelevant for decision-making purposes.

like the *Oportunidades* cash transfer should be analyzed through the lens of a non-unitary framework.

While the responses of aggregate household consumption patterns to CCT programs have led to a rejection of the unitary model's implications, given the conditionalities and benefit schemes of these programs, such changes could potentially be rationalized within a non-unitary framework in the absence of an effect on the intrahousehold distribution of bargaining power. This motivates shifting the focus towards the analysis of intrahousehold behavior to obtain additional evidence of the impact of gender-targeted policies like *Oportunidades* on the decision-making structure of beneficiary households. As will be discussed in further detail throughout this chapter's theoretical framework, within a collective household model in which household outcomes are a function of the decision-makers relative bargaining power and preferences under the premise that household behavior is Pareto efficient, there exists a direct link between intrahousehold outcomes, like the private demand for leisure, and the sharing rule. The latter captures information on the distribution of monetary resources among decision-makers, yielding a measure of their ability to secure enough monetary resources for their consumption and a link between intrahousehold behavior and the balance of decision-making power within the household. Thus, by focusing on the responses of individual time use to gender-targeted benefits, it is possible to capture the responses of the sharing rule to these benefits, thereby providing additional suggestive evidence of an empowerment effect in favor of mothers within beneficiary households.

Evidence on the impact of CCTs on the allocation of time within households is relatively scarce, with the main evidence obtained so far documented in Parker and Skoufias (2000), Skoufias and Di Maro (2006), and Rubio-Codina (2010). While the evidence is mixed concerning the program's effect on adult home production hours, as Skoufias and Di Maro (2006) find a slight decrease in women's participation in domestic work and Rubio-Codina (2010) observes

some cross-substitutability of home production hours between mothers and teenage daughters, there is no evidence suggesting an impact on adults' leisure hours. Thus, there has been no evidence of a change in households' sharing rule in response to CCT programs that could provide motivating evidence of an effect on their decision-making structure. To the best of my knowledge, a further limitation of this evidence relates to its focus on the program's rural implementation, leaving its urban counterpart understudied in this regard. Differences in the access to public infrastructure and market opportunities exacerbated by the rapid urbanization experienced by countries throughout the development stage lead poor urban households to face a different set of resource constraints than those faced by their rural counterparts, potentially inducing different responses to the program's conditionalities and benefits. Gaining a better understanding of the extent to which *Oportunidades* has had a differential effect on intrahousehold behavior in urban areas and the mechanisms behind this effect could potentially provide some insight on the conditions that ultimately impact the program's efficacy in fostering household investments in children's human capital through shifts in intrahousehold bargaining power.

This chapter's findings on two-parent households with children constitute a three-fold contribution to the literature. First, the results suggest a gender-asymmetric effect of *Oportunidades* on parental time allocation. While both the one- and two-year effects indicate a significant increase in mothers' leisure hours, fathers' leisure hours are virtually unaffected within a year and slightly reduced within two years of program participation. Assuming that leisure is a normal good, such an impact on time allocation within two-parent households can be attributed to a significant effect on beneficiary households' sharing rule, simultaneously providing suggestive evidence of a shift in intrahousehold bargaining power and constituting a further rejection of the unitary household framework. Second, upon carefully accounting for differences in the program's implementation between rural and urban areas, this chapter

provides evidence of a differential impact of the program on parental leisure within an urban context. In contrast with the evidence focusing on rural households, the results show that significant changes in parents' domestic work effectively translate into changes in their leisure hours. Specifically, observed parental leisure responses to program participation mainly stem from significant changes in home production hours for mothers and in child care for fathers. Third, the results further highlight the importance of focusing the analysis on a definition of leisure that accounts for home production, attuned to the concerns raised by Apps and Rees (1996). Specifically, focusing on a leisure definition based on a simple dichotomization of time between market and non-market activities would have mistakenly led to the conclusion that the program had no significant effect on the time allocation of any of the spouses, as the results suggest no significant impact of the program on the labor supply of married parents. However, the results here presented focusing on a disaggregated leisure definition that accounts for home production suggest otherwise.

The aforementioned gender-asymmetric effect observed within two-parent households characterized by the significant reduction in mothers' home production hours in response to the program motivates the analysis of single mothers' behavior to assess the result's robustness within an environment in which the bargaining effect is nil. Such robustness to differences in household structure would imply that it is the byproduct of an income and substitution effect triggered by the simultaneous increase in households' monetary resources and the additional pressure imposed by the conditionalities on their budget and time constraints. While the income effect would suggest an increase in an individual's consumption and leisure, this could be dampened by a substitution effect if the conditionalities imposed restrictions on both the minimum time and monetary investments the agent needs to make in the production of the domestic good to remain eligible for the program. The one-year results suggest that, in the absence of a bargaining effect, the substitution effect offsets the income effect of the transfer

as single mothers experience a significant decrease in leisure hours stemming from an increase in their labor supply hours, while the two-year results suggest no significant impact on their leisure hours despite a considerable decrease in their child care hours.

Within the theoretical framework considered in this chapter, the effect of *Oportunidades* on the distribution of leisure hours within two-parent households combined with the interplay of the income and substitution effects isolated in the results obtained for single mothers suggest that the program's impact on two-parent households' sharing rule constitutes further suggestive evidence of an empowerment effect in favor of mothers. A caveat that does not permit making a direct link between the two results is that potential economies of scale in the domestic production function of two-parent households absent in single-mother households could also drive the inferred effect on the sharing rule. Nevertheless, the main takeaway from the analysis implemented in this chapter is that the collective nature of two-parent households plays a crucial role in the differential impact of *Oportunidades* between the two types of households. Thus, when addressing questions about the impact of gender-targeted policies on household behavior, it is indispensable to do so through a framework with empirical implications that acknowledge the economies of scale in production and consumption and the distribution of decision-making power characterizing a household's collectivity.

The remainder of the chapter proceeds as follows. Section 1.2 describes the theoretical framework through which a cash transfer might affect the intrahousehold allocation of time, Section 1.3 describes Mexico's *Oportunidades* conditional cash transfer program and its evaluation data, Section 1.4 describes the empirical strategies implemented, Section 1.5 presents the results and Section 6 provides the concluding remarks.

1.2 Conceptual Framework

Acknowledging the potential mix of effects induced by the benefits and conditionalities scheme of *Oportunidades*, this section lays out a collective household model of labor supply and home production to describe the channels through which a conditional cash transfer could affect the allocation of time within the household. This model provides a natural framework through which such gender-targeted policy can have an effect not only on the resource constraints of the household but also on its decision-making structure. Therefore, the discussion centers on the extent to which it is possible to infer the strength and direction of the different effects based on the results obtained from this paper's empirical analysis of the effect of *Oportunidades* on beneficiaries' intrahousehold time allocation by comparing the behavior of single-parent and two-parent households.

1.2.1 A Collective Household Model of Labor Supply and Home Production

Following Blundell, Chiappori and Meghir (2005), consider a household in which parents are the decision-makers and children have no bargaining power of their own but are accounted for in the form of public expenditures. Let A denote the mother and B denote the father, with both spouses having preferences over their private consumption (q^i, l^i) and a public good Q that is produced within the household using parental time h_D^i where $i = (A, B)$ and market purchases q^H using the production technology F_Q, where $\mathbf{s}$ denotes a vector of production shifters that affect the productivity of the household's inputs. These production shifters can contain information on the number, age, and gender composition of the children in the household attending school through which the program can affect household behavior. Given the focus of *Oportunidades* on fostering investments in children's human capital, this domestic

good Q can be interpreted as a measure of child development in the form of educational outcomes of a household's school-aged children. Therefore, $\mathbf{t}^i = [h_M^i, h_D^i, l^i]$ describes parent i's allocation of his/her total time endowment T among activities related to market work (h_M^i), home production (h_D^i) and leisure (l^i). The core assumption of this model is that household outcomes are Pareto efficient, thereby allowing the characterization of household behavior as stemming from the solution to the following problem

$$\max_{q^A, q^B, \mathbf{t}^A, \mathbf{t}^B, q^H} \lambda(w^A, w^B, y, \mathbf{z}) U^A(l^A, q^A, Q) + (1 - \lambda(w^A, w^B, y, \mathbf{z})) U^B(l^B, q^B, Q) \tag{1.1}$$

s.t.

$$\begin{aligned} q^A + q^B + q^H &= y^A + y^B + w^A h_M^A + w^B h_M^B \\ l^i + h_M^i + h_D^i &= T \ (i = A, B) \\ y^A &= y_C^A + CCT \mathbb{1}\{\text{Treat}\} \\ y^A &= z^A y, y = y^A + y^B \\ Q &= F(h_D^A, h_D^B, q^H; \mathbf{s}) \end{aligned}$$

where $\lambda(w^A, w^B, y, \mathbf{z})$ denotes the wife's Pareto weight, or relative bargaining power within the household and is a function of the spouses' wages (w^A and w^B), total non-labor income y defined as the sum of each parent's individual contribution y^i, and a vector of distribution factors $\mathbf{z}$. The latter are defined as variables that are exogenous to the household but that affect its outcomes only through their effect on $\lambda(w^A, w^B, y, \mathbf{z})$ while leaving preferences unchanged.[2]

[2]Contrary to changes in prices and income, changes in these exogenous variables are expected to change the location of a household's outcomes on the Pareto frontier without changing the frontier itself. These factors are typically related to changes in a spouse's outside option, which might include indicators related to divorce laws, alimony rights, the state of the marriage market, control of land and the relative networks of the decision makers to name a few (Browning, Chiappori and Weiss (2014)).

The Role of *Oportunidades* as a Distribution Factor

The wife's share of non-labor income, defined above as z^A, is commonly used in the literature as a distribution factor. As will be discussed in further detail throughout Section 1.3, as the *Oportunidades* cash transfer is placed in the hands of mothers in their role of transfer holders due to the program's gender-based targeting, there exists a close relationship between treatment (i.e., transfer receipt) and z^A. Formally, in the absence of treatment, the wife's share of non-labor income can be defined as

$$z_C^A = \frac{y_C^A}{y_C^A + y^B}$$

Whereas, in the case of treatment, the wife's share of non-labor income z_T^A can be defined as

$$z_T^A = \frac{y_C^A + CCT}{y_C^A + CCT + y^B}$$

The difference between z^A in the case of treatment and z^A in the absence of treatment is defined as

$$z_T^A - z_C^A = \frac{CCT(Y_C - y_C^A)}{Y_C(Y_C + CCT)} \geq 0$$

where $Y_C = y_C^A + y^B$. Therefore, by placing the cash transfer entirely in the hands of mothers, *Oportunidades* can affect the intrahousehold allocation of resources through its impact on z^A and, subsequently, on $\lambda(w^A, w^B, y, \mathbf{z})$.

Defining and Signing the Collective and Empowerment Effects

Empirical implementations of the collective model often center the discussion of the analysis on the sharing rule. The latter captures how the household's monetary resources are allocated between the two decision-makers (parents in this case) for their own private consumption. Its attractiveness relies on its role as the link between the household's decision-making structure and intrahousehold behavior. It constitutes a measure of a decision maker's ability to secure enough monetary resources to allocate to his/her private demands for leisure and market consumption given their individual preferences. While detailed information on the intrahousehold allocation of both time and consumption allows observing the sharing rule in the data as in Cherchye, De Rock and Vermeulen (2012) and Lise and Yamada (2019) which aids the identification of the household's decision-making structure, individual-level information on either time or consumption could be informative of changes in the household's sharing rule as mentioned in Cherchye et al. (2015). As the sharing rule's response to a policy could be suggestive of an impact on the household's decision-making structure, this paper exploits the availability of individual time use information in the program's evaluation data as described in further detail in Section 1.3 and the *Oportunidades* cash transfer's role as a distribution factor as aforementioned to infer changes on beneficiary households' sharing rule from changes in parents' leisure.

The derivation of the sharing rule stems from a two-stage characterization of the model. The Pareto efficiency assumption of household outcomes posited by this model permits decentralizing the social planner's problem in 2.2 into two stages: a resource allocation stage and an intrahousehold allocation one. The first stage pins down the optimal levels of home production inputs and the optimal transfers of monetary resources (net of production costs) between decision-makers in the form of the *conditional sharing rule*. In the intrahousehold

allocation stage, conditional on the first stage's outcomes, each decision-maker optimizes individually to choose his/her leisure and private consumption.

Formally, the household's problem can be broken down into the aforementioned stages with the household solving the following problem in the resource allocation stage

$$\max_{\rho^A,\rho^B,Q} \lambda(w^A, w^B, y, \mathbf{z})V^A(w^A, \rho^A; Q) + (1 - \lambda(w^A, w^B, y, \mathbf{z}))V^B(w^B, \rho^B; Q)$$

s.t.

$$\rho^A + \rho^B = y_C^A + CCT\mathbb{1}\{\text{Treat}\} + y^B - C_Q(w^A, w^B, Q, \mathbf{s})$$

where C_Q denotes the expenditures incurred by the household in the production of the public good Q that takes as inputs both parental time and market purchases and is characterized by productive efficiency (i.e. cost minimization) as the solution to the following auxiliary problem

$$C_Q(w^A, w^B, Q; \mathbf{s}) = \min_{h_D^A, h_D^B, q^H} [w^A h_D^A + w^B h_D^B + q^H | Q = F(h_D^A, h_D^B, q^H; \mathbf{s})]$$

More importantly, ρ^A and ρ^B characterize the household's sharing rule, which describes the way in which the household's total non-labor income net of production costs is allocated between the decision makers of the household for their private consumption conditional on the optimal level of consumption and production of Q. Thus, the solution to this stage of the

household's problem can be generally characterized by

$$\rho^A = \rho^A(w^A, w^B, y, \lambda(w^A, w^B, y, \mathbf{z}), \mathbf{s}) = \rho^A(w^A, w^B, y, \mathbf{z}, \mathbf{s}) \tag{1.2}$$

$$\rho^B = \rho^B(w^A, w^B, y, \lambda(w^A, w^B, y, \mathbf{z}), \mathbf{s}) = \rho^B(w^A, w^B, y, \mathbf{z}, \mathbf{s}) \tag{1.3}$$

$$Q = Q(w^A, w^B, y, \lambda(w^A, w^B, y, \mathbf{z}), \mathbf{s}) = Q(w^A, w^B, y, \mathbf{z}, \mathbf{s}) \tag{1.4}$$

Furthermore, $V^i(w^i, \rho^i; Q)$ for $(i = A, B)$ are defined in the intrahousehold allocation stage as

$$V^i(w^i, \rho^i; Q) = \max_{l^i, q^i} U^i(l^i, q^i, Q)$$

s.t.

$$q^i + w^i l^i = \rho^i + w^i \bar{T}$$

where ρ^i and Q are taken as given at this stage.

The existence of the conditional sharing rule implies that the observable demand for each adult's leisure in the household has the following form

$$l^A = \tilde{l}^A(w^A, \rho^A(w^A, w^B, y^A, y^B, \mathbf{z}, \mathbf{s}))$$
$$l^B = \tilde{l}^B(w^B, \rho^B(w^A, w^B, y^A, y^B, \mathbf{z}, \mathbf{s}))$$

where $\tilde{l}^A$ and $\tilde{l}^B$ denote the decision makers' conditional leisure demand functions. It is worth noting that as 1.2 and 1.3 show the close relationship between ρ^i and the Pareto weight $\lambda(w^A, w^B, y\mathbf{z})$ for $i = (A, B)$ and 1.5 and 1.6 are a function of the conditional sharing rule, the sharing rule's role as the link between outcomes in the intrahousehold allocation stage and the household's decision-making structure becomes clear. Thus, suggestive evidence of a

particular policy's impact on the household's decision making structure can be obtained by observing its effect on intrahousehold outcomes, such as leisure.

Each of these equations behaves as a standard Marshallian demand function for a given λ as characterized in 1.2 and 1.3.[3] Changes in w^i affect l^i not only by shifting spouse i's budget constraint in the intrahousehold allocation stage but also by generating variation in the Pareto weight and in the costs of producing Q by the changes in the price of parent i's time input at the household's resource allocation stage. Moreover, variation in y induces changes in l^i through its dual effect on ρ^i as such variation would affect the household's budget constraint in the resource allocation stage and generate a shift in the Pareto weight.

To frame the latter within the context of a CCT program like *Oportunidades*, consider a change in y^A. Given the leisure demand equation $\tilde{l}^i$, through the subsequent change on y this translates into a dual income effect containing the standard income effect from consumer demand theory, affecting ρ^i directly through the household's budget constraint and an additional effect derived from the change in ρ^i stemming from the response of the Pareto weight, $\lambda(w^A, w^B, y, \mathbf{z})$ to such change. Yet, for single-parent households where the Pareto weight of the single parent is trivially fixed at unity, this effect is null, and the corresponding income effect collapses to the one in a single-agent model. Furthermore, as shown before, *Oportunidades* also affects mothers' contribution to nonlabor income, z^A. In this way, the program could potentially affect two-parent households' outcomes through its additional impact on λ induced by the effect on z^A. In this way, the effect of *Oportunidades* on the observed outcomes of two-parent households potentially reflects the program's dual effect

[3]The intuition ties back to what Browning, Chiappori and Weiss (2014) define as a household's collective demand function which characterizes the relationship between the Pareto weight and household outcomes stemming from the solution to 2.2. This allows for decomposing any price and income effect into a Marshallian component and a collective one capturing the Pareto weight's response to changes in prices and income. Since changes in the sharing rule include shifts in the Pareto weight, we can think about these changes in the sharing rule as a decentralized version of the collective effect aforementioned.

on the Pareto weight through changes in z^A and y and the standard income effect triggered by the change in y. Hereafter, the former will be referred to as the empowerment effect, capturing the shift in the household's decision-making structure induced by the program's gender-based targeting denoted by $\frac{\partial \lambda}{\partial y^A}$.

Besides the income and substitution effects described so far, there is one additional channel through which the program can affect the resource allocation stage's outcomes. To describe this additional channel, consider the household's production of Q. As shown in 2.8, the household's consumption of the public good Q is a function of λ and s. This holds since the production level of Q depends on each parents' preferences for this good, their relative bargaining power within the household, and the household's production technology. As the program is intended to foster investments in Q by imposing a set of conditionalities for the household to remain eligible for the program and by targeting the household member whose preferences are potentially in favor of the consumption of this good, productive efficiency dictates that the household's conditional factor demands for h_D^i and q^H could potentially be affected by *Oportunidades* through the increased demand for Q. Besides the higher demand for Q, the program could also affect children's school attendance, which is typically used as a production shifter when dealing with home production in a household model. That is, the other channel through which the program can affect the allocation of time within the household involves its indirect effect on the conditional factor demands for parental time and market purchases through the effect on $\mathbf{s}$ induced by the conditionalities.

Therefore, besides the effect on the Pareto weight and y aforementioned, the program can potentially affect the household's conditional factor demands for parental time and market purchases used in production through its expected effect on $\mathbf{s}$. Thereby leaving three potential channels through which *Oportunidades* can simultaneously affect the allocation of time in two-parent households, all of which are encoded in the responses of the sharing rule to the

effect of the program on y, z^A and $\mathbf{s}$. It is worth noting that these three effects collapse to only two in single-parent households in which the concept of the sharing rule is void as the amount of monetary resources available to the parent is exactly non-labor income net of production costs.

As will be discussed in further detail throughout Section 1.5, the main findings presented in this paper include the effect of the *Oportunidades* cash transfer receipt on a measure of leisure constructed based on the observed h_M^i and h_D^i for $i = \{A, B\}$. Within a treatment effect framework as described in Section 1.4, this constitutes the equivalent of this model's predictions regarding the responses of the observed l^A and l^B to changes in y^A as the treatment indicator captures the change in y^A induced by the program. The latter can be characterized as

$$\frac{\partial l^A}{\partial y^A} = \frac{\partial \tilde{l}^A}{\partial \rho^A}\frac{\partial \rho^A}{\partial y^A} \tag{1.5}$$

$$\frac{\partial l^B}{\partial y^A} = \frac{\partial \tilde{l}^B}{\partial \rho^B}\frac{\partial \rho^B}{\partial y^A} \tag{1.6}$$

The sharing rule allows breaking down the effect of a policy on the intrahousehold allocation of consumption and time into two theoretical components: one that can be signed as in a standard labor supply model and one that can be signed based on the observed effect. The latter captures the policy's effect on the household's sharing rule. More formally, the first component is the standard single-agent income effect, denoted by $\frac{\partial \tilde{l}^A}{\partial \rho^A}$ and $\frac{\partial \tilde{l}^B}{\partial \rho^B}$ and the second component can be thought of as the decentralized version of the aforementioned collective effect, denoted by $\frac{\partial \rho^A}{\partial y^A}$ and $\frac{\partial \rho^B}{\partial y^A}$. If leisure is a normal good, within a standard labor supply model, the first term can be signed as positive. However, the latter can be either magnified or mitigated by the collective effect. Therefore, signing the empowerment effect based on the collective effect within the current characterization of the model is infeasible without

imposing additional restrictions on the model since the inclusion of the public domestic good Q allows for a non-monotonic relationship between the conditional sharing rule and the Pareto weight.[4]

As aforementioned, the decentralized collective effect does not only contain the empowerment effect of the program but also the response of $C_Q(w^A, w^B, Q; \mathbf{s})$ to the changes induced by the program. Hence, it could be possible to infer a $\frac{\partial \rho^A}{\partial y^A} < 0$ that does not necessarily imply $\frac{\partial \lambda}{\partial y^A} < 0$ as the wife could have been willing to reduce her private consumption provided that expenditures on the home-produced public good increased. Only under particular conditions on parental preferences for the public good, it is possible to find instances in which an increase in both the wife's conditional sharing rule and household expenditures on the public good can be associated with an improvement in the wife's Pareto weight.[5]

To see the interaction of the different effects that might be behind the results obtained in the empirical analysis presented Section 1.5 that would allow us to sign the effect of *Oportunidades* on the sharing rule, consider the following cases:

[4]In the absence of public expenditures (and/or domestic production of a publicly consumed good), there exists a monotonic relationship between the sharing rule (i.e. private consumption) and the Pareto weight. That is, signing the collective effect would allow us to sign the empowerment effect. To see this, when all consumption is private, the sharing rule becomes only a function of λ and the household's full income as defined by $y^A + y^B + (w^A + w^B)T$. Therefore, if $\frac{\partial l^A}{\partial y^A} > 0$ in the data, then $\frac{\partial \rho^A}{\partial y^A} > 0$ given 1.5. Thus, $\frac{\partial \lambda}{\partial y^A} > 0$ given the monotonic relationship between λ and ρ^A. Similarly, given the first-stage budget constraint, $\rho^B = y^A + y^B - \rho^A$, $\frac{\partial l^A}{\partial y^A} < 0$ would imply $\frac{\partial \lambda}{\partial y^A} > 0$. That is, women's empowerment in the absence of public expenditures can be inferred when observing women working less and, therefore, consuming more leisure while their husbands work more.

[5]Blundell, Chiappori and Meghir (2005) show the necessary conditions under which an increase in the mother's Pareto weight could lead to an increase in both the sharing rule and the household's expenditures on the public good. For this to hold, private and public consumption should be normal goods, and mothers' marginal willingness to pay for the public good should be more sensitive to changes in the conditional sharing rule than their husband's. On the other hand, if fathers' marginal willingness to pay for the public good is more sensitive to changes in the conditional sharing rule relative to mothers, this generates the possibility of a decrease in the sharing rule and increased public expenditures and vice versa.

1. $\frac{\partial l^A}{\partial y^A} > 0$ implies that $\frac{\partial \rho^A}{\partial y^A} > 0$. In other words, observing this result would suggest that the amount of the household's non-labor income net of expenditures incurred in the production of Q allocated to the mother increases with y^A. As aforementioned, this can contain a mix of effects besides a change in the Pareto weight. This could result from a direct income effect through which the increase in the household's total income allows the spouses to obtain more monetary resources for their private consumption in a way that any potential change in C_Q cannot offset. This could be true if $\frac{\partial l^B}{\partial y^A} > 0$ in the data, implying that $\frac{\partial \rho^B}{\partial y^A} > 0$, thereby suggesting that the increase in y induced by the change in y^A is shared by both of the spouses as they are both able to increase their private consumption of leisure as a result of the increase in the household's net non-labor income.

2. $\frac{\partial l^A}{\partial y^A} < 0$ implies that $\frac{\partial \rho^A}{\partial y^A} < 0$. Such a result would suggest that the mothers' share of total net household non-labor income allocated for her private consumption reduces as y^A increases. This is possible because in this characterization of the model, the presence of a public good allows for the sharing rule to decrease even if the Pareto weight increases as a result of an increase in y^A as mothers might be willing to secure less monetary resources for their private consumption if this translates into a higher consumption of the public good. That is, it is possible for this result to not be driven by $\frac{\partial \lambda}{\partial y^A} < 0$. The implied decrease in mothers' sharing rule might be stemming from an increase in the costs of producing Q, potentially induced by an increase in the demand for Q. If mothers tend to have a higher preference for the public good than fathers, this increase in the demand for Q might be driven by an improvement in mothers' Pareto weight.

3. $\frac{\partial l^A}{\partial y^A} = 0$ implies that $\frac{\partial \rho^A}{\partial y^A} = 0$. That is, the household's sharing rule is unresponsive to changes in mothers' contribution to total non-labor income. This would not necessarily

suggest the absence of an empowerment effect. Instead, similar to the previous case, this could be stemming from an increase in C_Q either through a change in $\mathbf{s}$ (due to the conditionalities attached to such change in y^A) or an increase in the demand for Q that is large enough to offset any increase in ρ^A stemming from the change in y induced by the program.

1.2.2 Comparing the Behavior of Single and Married Mothers: Caveat

The household's problem presented in 2.2 collapses to the one solved by a single agent when focusing on single-parent households. To see this, consider a household headed by a single mother. This reduces the household problem in 2.2 to one in which only the preferences of A govern the choices made within the household. Furthermore, this reduces the household's production function to one taking only q^H and h_D^A as inputs given that $h_D^B = 0$. Thus, within this household structure, it is possible to isolate the effect of *Oportunidades* on a household's resource constraints while shutting down an empowerment effect by trivially fixing mothers' Pareto weight at unity.

The informal comparison of *Oportunidades*' impact on the behavior of both single-parent and two-parent households could provide some insight on the extent to which the results obtained for single-parent households can be informative of an empowerment effect within two-parent households. This resembles the analysis implemented by Angelucci and Attanasio (2013) and is further discussed throughout the interpretation of this paper's findings in Section 1.5. In particular, given this paper's focus on intrahousehold behavior, such interpretation focuses on the inferred impact of the program on two-parent households' sharing rule, a concept emphasized throughout this section.

Nonetheless, given the aforementioned potential non-monotonic relationship between the sharing rule and the Pareto weight in the presence of domestic production and public consumption, an explicit link between divergent results across the two subsamples of households and shifts in the Pareto weight is not warranted. The intuition ties back to the program's intricate mix of benefits and eligibility requirements that will be discussed more thoroughly in Section 1.3 as the two types of households might respond differently to the pressure exerted by the conditionalities on their resource constraints. At best, a differential impact of the program across household structures would suggest that the collective nature of two-parent households drives the divergent responses of mothers' time allocation to participation in *Oportunidades* either due to the presence of economies of scale in production and consumption and/or a more intricate decision-making structure, both of which are encoded in two-parent households' sharing rule. Given the goal of the program to foster investments in children's human capital, which within this framework could be thought of as the household's domestic output, it is expected for the program to increase the demand for Q. While a higher demand for Q would require households to adjust production accordingly, the way in which this would be done would differ, especially since two-parent households can reap the benefits of both the economies of scale in production and the publicness of the household's output. In a sense, differences in the production possibilities frontier of both types of households could potentially thwart the comparability of the results as the marginal rate of technical substitution could be systematically different between the two types of households, potentially explaining divergent responses of single and married mothers' home time to program participation.

1.3 *Oportunidades* and its Evaluation Data

1.3.1 Program Overview

Mexico's *Oportunidades*, one of the first and most well-known CCT programs launched in the region, has received a considerable amount of attention in the literature due to its national scale and evaluation data. It was initially implemented under the name *Progresa* in rural areas by the Zedillo administration in 1997. The program intervenes simultaneously in the areas of education, health, and nutrition (Skoufias and Di Maro (2006)). The program evaluation was administered by the International Food Policy Research Institute, yielding results that were positive in general (Parker and Todd (2017)). As its initial implementation was deemed a success in key areas such as school enrollment and child health outcomes, the next step was to increase the program's scale and scope by expanding it to semi-urban and urban localities. With such an expansion and change of federal administration, the program was renamed as *Oportunidades* in 2002 (Levy (2007)). This urban implementation differs from its rural counterpart mainly in two ways, in the evaluation design and the targeting and incorporation procedure of beneficiaries.

In both rural and urban areas, the selection of beneficiaries into the program was performed in two stages. The first stage consisted of geographic targeting. In the rural implementation, 506 villages in 7 of the 32 states were randomly assigned to control or treatment groups. On the other hand, financial constraints rendered complete randomization infeasible in urban areas. Therefore, using the 2000 census and the INEGI's 2000 National Survey of Household Income and Expenditure, taking city blocks as the unit of analysis, the program was intended to be first offered in city blocks with the highest incidence of poverty. The administration proceeded to compute a propensity score at the city block level, which predicted a city block's probability of being part of the intervention. Upon the identification of a representative

sample of intervention blocks, these were matched to a sample of city blocks in control zones on the basis of similar propensity scores (SEDESOL 2005).

Once eligible communities were identified, the second stage consisted of household selection through a discriminant analysis performed using census data. In both urban and rural areas, this consisted on comparing each household's marginality index against a local cutoff in terms of the minimum well-being line (*Linea de Bienestar Minimo*) is defined as "the lack of monetary capacity to afford the essential goods for an adequate nutrition even after using all their income to buy food" (CONEVAL, 2000) and the threshold for ongoing verification of socioeconomic conditions (*Linea de Verificaciones Permanentes de Condiciones Socioeconomicas*) which captures a broader concept of poverty by accounting for educational lags and lack of access to healthcare (Dávila Lárraga (2016)). This multidimensional definition is used to capture not only extreme poverty but also what is defined as the poverty of means by the National Council for the Evaluation of Social Development Policy (CONEVAL). The geographic distribution of this poverty measure is shown in Figure 1.1 suggesting a high concentration of poverty in the southern and eastern states of the country, which is reflected in the geographic distribution of eligible households in the evaluation sample as discussed in Section A.1.[6]

The main difference between both implementations is that once a household was deemed eligible in a village and was, therefore, contacted by the program representatives, there was no uncertainty from the household's side regarding its eligibility status. In urban areas, however, household's uncertainty regarding their eligibility status might have affected the program's take-up rate as urban households had to approach local registration offices to inquire about

[6]The CONEVAL defines poverty of means as "the lack of monetary capacity to afford the value of a basic food basket, cover medical and educational expenses even after devoting the totality of household income only to the latter" (CONEVAL, 2000).

their eligibility in terms of an estimated poverty index. Even though the administration invested a significant amount of resources in announcing the availability of the program and the location of registration offices, Angelucci and Attanasio (2009) argue that this might have potentially impacted eligible households' program participation at least during the first two years as they might have ignored the program's existence to begin with or because they were too uncertain about their eligibility status.[7]

Upon the selection of beneficiary households, CCTs typically implement a further gender-based targeting strategy by placing both the benefits and burden of conditionalities on female household heads. Thus, a feature of *Oportunidades* that is shared by its implementation in both rural and urban areas is that once a household is deemed as eligible and effectively enrolled in the program, the administration designates the female household head as the transfer holder or the household's representative before the program. All cash benefits provided by the program to beneficiary households are paid directly to transfer holders.[8] However, a significant amount of responsibilities are attached to this role as it is transfer holders who need to make sure that all health- and education-related forms have been

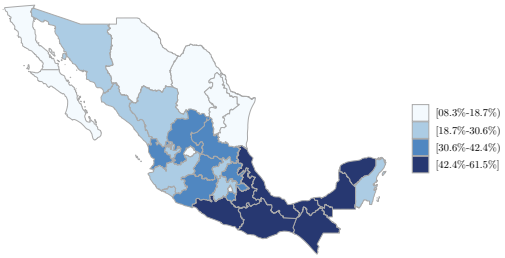


Figure 1.1: Percentage of State Population in Poverty. *Source:* Authors' calculations using information from the CONEVAL based on the XII Population and Household 2000 Census and the 2000 National Survey of Household Income and Expenditure, ENIGH

[7]This motivates checking potential differences in the one and two-year effects of the program as discussed in further detail in Section 1.4 as the latter are less likely to be affected by this lag in knowledge about the program.

[8]The only exception is the cash benefit related to *Jovenes con Oportunidades* which is paid directly to the scholarship holder.

properly filled by the corresponding institutions and submitted in a timely fashion to verify the household's compliance with the program's conditionalities regarding school attendance and medical visits. This is crucial as the bi-monthly disbursement of cash benefits is contingent upon the timely verification of conditionalities (Dávila Lárraga (2016)).

Another similarity between *Oportunidades*' urban and rural implementation involves the program's main areas of intervention: health, nutrition, and education. In the education component, grants are available for primary, secondary, and high school students, with the amount of these grants increasing with the grade attended. There are additional transfers provided by the program for the acquisition of school supplies at the beginning of the school year. Moreover, the urban implementation provides a savings plan called *Jovenes con Oportunidades* for high school students, which consists of a grant that grows every year starting on ninth grade and is paid to the students until graduation as a way to foster higher completion rates among poor urban students. There is a further gendered targeting embedded in the benefits scheme of this educational grant as the size increases not only by the grade attended but also by gender at the start of secondary school, with girls receiving a higher education grant than boys enrolled in the same grade. In the nutrition component, households receive a transfer for food purchases plus an additional transfer under *Apoyo Alimentario Complementario* to compensate for increases in international food prices. In the health component, beneficiary households receive a basic health package which consists of free preventive consultations and informational health talks.

Despite differences in the geographic targeting and household selection process of the rural and urban implementations of the program, both potentially affect intrahousehold behavior through three main channels. On the one hand, as discussed in Section 1.2, the program's benefits and conditionalities affect both the time and budget constraints of beneficiary households, potentially triggering both an income and substitution effect. On the other

hand, the program's gender-based targeting introduces a third channel, namely a female empowerment effect, by altering women's contribution to their households' monetary resources, which is typically interpreted as a distribution factor in the literature. Nonetheless, this paper acknowledges the urban implementation's imperfect randomization leading to the aforementioned differences by adopting an empirical strategy that addresses the potential endogeneity of beneficiaries' program participation decision to identify the program's effect on intrahousehold behavior described more thoroughly in Section 1.4. The implementation of this empirical strategy exploits the observable differences between the group of participant and non-participant households in the program's evaluation sample as emphasized throughout the upcoming discussion.

1.3.2 *Oportunidades*' Urban Evaluation Survey

This paper uses the 2002-2004 waves of the program's sociodemographic module of the Urban Evaluation Survey (ENCELURB by its acronym in Spanish), which provides a short panel of *Oportunidades*' beneficiary and non-beneficiary households, capturing information on household structure, income and consumption patterns in addition to individual information on labor supply, education, and time use. The ENCELURB data was gathered in three waves. The first wave captured baseline information and was gathered in the fall of 2002, once beneficiary households had been determined but prior to the provision of any benefits. The second and third waves contain the first and second follow-ups gathered during the fall of 2003 and 2004, respectively. Information on households' poverty classification and their city blocks' zone available in this data set allows for the construction of the final sample and the treatment indicator used in the empirical analysis. Given that the program take-up is relatively low compared to the program's rural implementation as not all eligible households in intervention city blocks enroll in the program, the ENCELURB's information

on a household's eligibility and zone is supplemented with the program's administrative records on the bi-monthly transfers made to households that have been incorporated into the program.[9,10] This allows to identify the program's beneficiaries at every point in time. Further information on this is provided in Section A.1.

The evaluation sample captured in the ENCELURB contains information on a total of 15,700 households corresponding to 76,002 individuals residing in areas covered by the program at the start of its expansion to urban areas in 2002. In particular, this paper focuses only on those that were deemed as sufficiently poor to be eligible for participation by the program administration. This is mainly because one of the identifying assumptions of the empirical strategy implemented in this paper relies on the exogeneity of the transfer by ensuring that an eligible household in an intervention zone would have had a similar probability of participating in the program as an observably similar eligible household in a control zone. Upon making the sample restrictions to obtain the subsamples of eligible two-parent and single mother households outlined in the Section A.1, the final sample used in this paper consists of 3,288 poor two parents households observed across the three waves (9,864 household-year observations) and 1,288 poor single mother households observed throughout the three waves (corresponding to 3,864 household-year observations). The construction of these two subsamples is described in further detail in Section A.1.

Attuned with the theoretical framework described in Section 1.2, the outcomes of interest in this paper's analysis pertain to the time allocation of the households' decision-makers. This includes information on the amount of weekly hours they spend in activities related to home

[9]According to Angelucci and Attanasio (2009), around 50% of the entire sample of eligible households register for the program and Behrman et al. (2012) mention that 40% of households that were eligible did not apply. For the subsamples here analyzed, approximately 70% of eligible two-parent households and 53% of eligible single mother households participate in the program.

[10]All ENCELURB and transfer administrative records can be retrieved from the program's External Evaluation website `https://evaluacion.becasbenitojuarez.gob.mx/es/eval_cuant/p_bases_cuanti.php` under *Encuestas Urbanas* and *Transferencias monetarias a hogares beneficiarios*.

production, market work and child care. In particular, following Aguiar and Hurst (2007), this information is exploited to construct two residual leisure measures that highlight the importance of accounting for home production. This paper exploits the availability of this information across all the three waves of the ENCELURB, contrary to its rural counterpart that included this data in only one wave of its evaluation survey. It is worth noting that while the theoretical framework described so far has focused on a definition of home production that includes time spent in child care, empirically, the ENCELURB allows for a further distinction between time spent in home production from time spent in child care. Such distinction matters within the context of a CCT program like *Oportunidades* since it allows to quantify the program's impact on home production while assessing whether the program is incentivizing parental time investments on children. Thus, this distinction is exploited throughout this paper to assess whether the program has had a differential impact on these time use categories. Section A.1 describes the construction of these time use variables in greater detail.

Table 1.1 presents the descriptive statistics of the main household and parental characteristics used as controls and the time allocation measures used as outcomes in this paper's empirical analysis. The first five columns provide a comparison of means of these variables between two parent households in intervention and control city blocks. Similarly, the last five columns compare the means of these characteristics between single mother households in intervention and control city blocks at baseline. Both two parent and single parent households in intervention zones live in more precarious conditions than their control counterparts (in terms of their lack of access to potable water, poor quality floors, highly likelihood of overcrowding as given a fewer number of rooms in the household) and are concentrated in states with a higher incidence of multidimensional poverty. This is expected given the two stage targeting strategy of the program. In terms of female employment, both single and married mothers in

Table 1.1: Descriptive Statistics, Intervention and Control City Blocks

	Two Parent Households					Single Mother Households				
	Intervention		*Control*			*Intervention*		*Control*		
	Mean	**Obs.**	**Mean**	**Obs.**	**Difference**	**Mean**	**Obs.**	**Mean**	**Obs.**	**Difference**
Household Characteristics:										
Household Size	5.14	1,989	5.31	1,299	-0.17***	4.43	891	4.93	337	-0.51***
Number of Children 0-5	1.06	1,989	1.13	1,299	-0.07**	0.38	891	0.34	337	0.05
Number of Children 6-12	1.41	1,989	1.55	1,299	-0.14***	0.79	891	0.74	337	0.04
Number of Children 13-15	0.36	1,989	0.34	1,299	0.02	0.36	891	0.32	337	0.04
Number of children in school	1.67	1,989	1.74	1,299	-0.07	1.36	891	1.38	337	-0.02
State Poverty Incidence	46.00	1,989	34.89	1,299	11.10***	46.05	891	34.42	337	11.63***
$\mathbb{1}\{$Income Shock$\}$	0.28	1,907	0.20	1,235	0.08***	0.28	858	0.18	319	0.10***
$\mathbb{1}\{$Home Ownership$\}$	0.72	1,985	0.73	1,288	-0.01	0.74	885	0.78	337	-0.05
Number of rooms	1.38	1,973	1.56	1,289	-0.18***	1.39	881	1.64	335	-0.25***
$\mathbb{1}\{$Dirt Floors$\}$	0.54	1,985	0.37	1,294	0.17***	0.57	885	0.41	336	0.16***
$\mathbb{1}\{$No water connection$\}$	0.90	1,553	0.83	1,148	0.07***	0.89	702	0.86	290	0.04*
Parents' Characteristics:										
Age, Mother	31.74	1,989	31.96	1,299	-0.22	46.54	891	50.14	337	-3.60***
Age, Father	35.40	1,988	35.33	1,299	0.07					
Years of Education, Mother	7.00	1,696	7.08	1,124	-0.07	6.63	513	6.79	193	-0.16
Years of Education, Father	7.19	1,713	7.35	1,149	-0.15**					
$\mathbb{1}\{$Employed 2002$\}$, Mother	0.37	1,895	0.27	1,216	0.10***	0.78	848	0.59	315	0.19***
$\mathbb{1}\{$Employed 2002$\}$, Father	0.98	1,907	0.98	1,224	0.01					
$\mathbb{1}\{$Employed 2001$\}$, Mother	0.24	1,975	0.18	1,285	0.06***	0.69	874	0.50	327	0.19***
$\mathbb{1}\{$Employed 2001$\}$, Father	0.97	1,975	0.97	1,289	0.00					
$\mathbb{1}\{$Employed 2000$\}$, Mother	0.23	1,968	0.15	1,273	0.08***	0.66	873	0.48	321	0.18***
$\mathbb{1}\{$Employed 2000$\}$, Father	0.97	1,959	0.97	1,273	0.00					
$\mathbb{1}\{$Employed 1999$\}$, Mother	0.20	1,964	0.14	1,257	0.06***	0.63	874	0.47	322	0.16***
$\mathbb{1}\{$Employed 1999$\}$, Father	0.97	1,957	0.95	1,270	0.01*					
Time Allocation, Weekly Hours:										
Total home production, Mother	38.76	1,752	35.38	1,147	3.38***	27.94	782	24.56	306	3.38***
Total home production, Father	2.92	1,868	2.04	1,178	0.88***					
Core home production, Mother	36.07	1,768	31.95	1,156	4.12***	25.61	789	22.63	307	2.99**
Core home production, Father	2.37	1,873	1.64	1,183	0.73***					
Procurement of goods, Mother	2.68	1,943	3.34	1,255	-0.65***	2.26	854	2.09	325	0.17
Procurement of goods, Father	0.55	1,963	0.43	1,257	0.12**					
Child care, Mother	18.54	1,951	19.23	1,257	-0.70	8.72	861	8.18	326	0.54
Child care, Father	1.96	1,952	2.30	1,245	-0.34					
Market Hours, Mother	10.41	1,895	8.36	1,216	2.05***	25.68	848	20.46	315	5.22***
Market Hours, Father	48.82	1,907	48.59	1,224	0.23					

intervention zones are more likely to have worked in 1999-2002 than their control counterparts. More importantly, the information of two parent households at baseline corroborate the patterns of gender specialization described in INEGI (2009) as mothers spend a higher fraction of their weekly time in activities to related home production and child care than in market work, while fathers spend a substantially higher fraction of their time in market work.

The theoretical framework described in Section 1.2 shows how a targeted benefit like a CCT can affect both the time and budget constraints of beneficiary households and emphasizes the transfer's role as a distribution factor as the transfer is placed in the hands of mothers. The evaluation data provided by the program administration, supplemented with administrative records on monetary transfers made to participant households and the availability of detailed time use data at the individual level, allows using the exogenous variation induced by *Oportunidades* to identify the program's effect on the intrahousehold allocation of time through the implementation of the empirical strategy described in Section 1.4. As will be discussed in further detail in the upcoming section, the empirical analysis of this paper exploits the longitudinal nature of the ENCELURB's evaluation sample and the availability of information on households' poverty classification and administrative transfer disbursements, which allows observing over time two groups of households distinguished by their program participation status based on transfer receipt. Moreover, these features of the evaluation data and the detailed sociodemographic information provided in the ENCELURB are also used throughout the empirical analysis to address the systematic differences between control and intervention households presented in Table 1.1 stemming from the program's geographic targeting strategy in a way that is attuned with the identifying assumptions of the estimators implemented.

1.4 Empirical Strategy

The objective of this paper's empirical strategy is to quantify the effect of *Oportunidades* on the allocation of time within beneficiary households. Therefore, the parameter of interest is the average treatment effect on the treated (ATT). For a given individual, let y^1 denote his/her outcome when participating in the program and y^0 his/her outcome when not, then $y^1 - y^0$ constitutes a participant's gain from treatment. The goal is to quantify what the

average of this gain is among individuals living in participant households. Formally, this can be denoted by $\mathbb{E}[y^1 - y^0|d = 1]$ where d denotes the program participation status of the household in which an individual resides. Since no household can be a participant and non-participant of the program simultaneously, this gain cannot be directly observed since $\mathbb{E}[y^0|d = 1]$ is unobserved, leading to the missing counterfactual problem encountered in the treatment effects literature.

Given the availability of longitudinal data, this section describes two difference-in-differences strategies that use the information of non-participants before and after the start of *Oportunidades* in urban areas to construct the aforementioned missing counterfactual. Nevertheless, when using the information on non-participants, there is scope for two types of selection bias, across time and across groups. Selection bias across groups stems from instances in which the two comparison groups themselves differ. Selection bias across time stems from instances in which there are compositional changes across time within the comparison groups. The latter is not of significant concern when the available data is longitudinal, as in the case of the evaluation data of the *Oportunidades* program. The former, however, can be of concern not only when the groups differ in terms of observables but also on unobservable characteristics that are either not fixed over time or common across groups and are, therefore, not differenced out in the DID specification. This section describes the extent to which a matching difference-in-differences strategy addresses this weakness in order to identify the effect of *Oportunidades* on intrahousehold behavior.

While treatment assignment is implemented at the household level, this section's analysis focuses on the behavior of individual household members with an emphasis on their time allocation. As mentioned in Section 1.2, the link between individual household members' time allocation and the decision-making structure of the household is made through the sharing rule. Thus, a theoretical prediction of interest involves the responses of leisure to

changes in mothers' nonlabor income, described in 1.5 and 1.6, as it is informative of the corresponding responses of the household's sharing rule. Within a treatment effects framework and given mothers' role as transfer holders described in further detail throughout Section 1.3, an increase in mothers' nonlabor income can be captured by a household's participation status in *Oportunidades*. The intrahousehold outcome of interest for individual i in survey year t can be specified as

$$y_{it} = \beta_0 + \beta_1 d + \beta_2 Post_t + \beta_3 (d_i \times Post_t) + u_{it}$$

where, as before, d_i is an indicator of the program participation status of the household in which individual i resides, being 1 if it is part of the participant group and 0 otherwise. Furthermore, $Post_t$ indicates whether t corresponds to a survey year after the start of the program, being 1 if t is a follow-up survey year and 0 if it is captured at baseline.

To understand the potential sources of bias that can arise when using information on the control group to construct the missing counterfactual, u_{it} can be decomposed into three main components

$$u_{it} = \theta_t + \phi_i + \mu_{it} \tag{1.7}$$

where θ_t denotes period-specific aggregate shocks, μ_{it} denotes temporary, individual-specific shocks and ϕ_i denotes individual time-invariant characteristics.

Differencing the before and after outcomes within each group and averaging across households yields

$$\mathbb{E}[y_{it_1} - y_{it_0}|d = 1] - \mathbb{E}[y_{it_1} - y_{it_0}|d = 0] = \beta_3 + \mathbb{E}[u_{it_1} - u_{it_0}|d = 1] - \mathbb{E}[u_{it_1} - u_{it_0}|d = 0] \tag{1.8}$$

Thus, differences between the two groups' observed evolution of y over time can be explained by either the effect of the program captured by β_3 or unobserved differences between the two groups stemming from differential macro shocks, from group-specific characteristics that vary over time or from differences in group responses to transitory shocks. Identifying the impact of *Oportunidades* on intrahousehold outcomes requires ensuring that, on average, both the treated and control groups are comparable by ruling out differences between the two groups in terms of the evolution of u_{it} as shown in 1.8. The following subsections describe the identifying assumptions imposed throughout the two empirical strategies implemented in this paper and how these pertain to the different components of u_{it} described in 1.7 to isolate β_3.

1.4.1 Difference-in-Differences

Identifying Assumptions

The treatment effect of the *Oportunidades* program can be identified using a difference-in-differences (DID) strategy under the assumption that the unobserved component of y_{it} evolves in the same way within both comparison groups. That is, $(u_{it_1} - u_{it_0}) \perp\!\!\!\perp d$. This is known in the literature as the conditional independence assumption. Taking a closer look at 1.8, this requires the three components of the unobservable u_{it} to evolve in the same way over time in both groups. In this way, the control group serves as a valid reflection of the time trends the treatment group would have experienced if they had not been exposed to the program in question. This is commonly known in the literature as the parallel trends assumption. Thus, the implicit assumptions of this estimator posit that both treatment and control households experience the same macro shocks (pertaining θ_t) and rule out both selection on idiosyncratic shocks (pertaining μ_{it}) and compositional changes over time (pertaining ϕ_i).

As aforementioned, relying on non-participants' data to circumvent the missing counterfactual problem leaves scope for two types of selection bias. Given the longitudinal nature of the *Oportunidades* evaluation data described in Section 1.3, selection bias across time does not pose a significant concern as the DID estimator is implemented on two comparison groups whose composition remains the same across all three waves. Nevertheless, selection bias across groups can be problematic not only when the groups differ in terms of observables but also on unobservable characteristics that are either not fixed over time or common across groups and cannot be differenced out in the DID specification. This could be of particular concern if these differences are driving the program participation decision. This motivates the use of the DID's matching counterpart, which explicitly deals with this potential source of bias.

Implementation

Exploiting the longitudinal nature of *Oportunidades*' evaluation data, it is possible to implement a standard DID regression of the following form to capture both the one year and two year effect of the program on intrahousehold time allocation

$$y_{i,t} = \beta_0 + \beta_1 d_i + \beta_2 W2_t + \beta_3 W3_t + \beta_4 (d_i \times W2_t) + \beta_5 (d_i \times W3_t) + \boldsymbol{\gamma} \mathbf{X}_{i,t} + \epsilon_{i,t}$$

where y_{it} corresponds to the amount of weekly hours individual i devotes to any of the time use categories available in the data at time t for adults or an education-related outcome of child i.

$\mathbf{X}_i$ contains a rich set of controls for household-level sociodemographic and economic characteristics, dwelling characteristics, and baseline employment and education. Household characteristics are divided into two: those related to the composition of the household and

those related to the household's wealth position. Among the former, the analysis includes household size, the number of children of age groups 6-12, 13-15, and 16-20, the presence of an infant in the household (child younger than 5), and the number of children enrolled in school. Among the second group of household characteristics, the analysis includes an indicator of whether the household had experienced an income shock at baseline (in the form of a household member's death, a job loss, business loss, or fire loss) and a measure of the household's nonlabor income based on the estimated value of the assets owned in the household. At the individual level, controls include age, age squared, total years of education, indicators of lagged employment in 2001, 2000, and 1999 and household headship, including i's spouse's age, education, period t labor force participation, and lagged employment indicators for 2001, 2000 and 1999.

As described in Section A.1, d_i indicates whether individual i is part of an *Oportunidades* beneficiary household or not. This variable is based on whether a household has received any transfer from the program, thereby serving as an indicator of program incorporation. By construction and as mentioned in 1.3, since take-up is relatively low compared to the rural implementation, the treatment group under this definition is a subset of the group of households located in intervention city blocks, therefore allowing for the identification of the average treatment effect on the treated as it focuses on those households in these zones that actually got the transfer.

$W2_t$ indicates whether $t = 2003$ and $W3_t$ indicates whether $t = 2004$. Thus, β_4 and β_5 denote the program's one-year and two-year DID estimates, respectively. Comparing the one and two-year effects allows the assessment of the estimates' robustness across waves. Such assessment is relevant given potential concerns associated with the lag in knowledge about

the program mentioned in Section 1.3 as the two-year effect is less likely to be affected by such lag.[11]

1.4.2 Matching Difference-in-Differences

Identifying Assumptions

The intuition behind the implementation of the matching difference-in-differences (MDID) estimator relies on relaxing the conditional independence assumption imposed by the DID by exploiting the strengths of the matching estimator. The MDID explicitly models the program participation decision, and while doing so, non-parametrically constructs a control group for each treated household such that the comparison group becomes more observably similar to its treated counterpart by matching these households on the basis of their propensity to participate in the program. This relates to the description of *Oportunidades* in Section 1.3 as this estimator therefore requires recreating the targeting strategy implemented by the program's administration by exploiting the differences in observables between intervention and control households presented in Table 1.1.

Contrary to the matching estimator, while each household's program participation decision is based on a set of observable characteristics, there is still scope for allowing some unobservable program participation determinants as long as these are treated as individual- and/or time-specific determinants of participation. Thus, the goal is to make sure that the conditional independence assumption of the DID holds on a sample in which the comparison groups are observably more similar. This is aligned with the main goal pursued throughout the analysis,

[11] One further restriction made in the regressions made to obtain the results presented in the next section involves keeping only those observations for which leisure is non-missing for both comparison years. By construction, this ensures that observations with non-missing values on all time use categories are being used in the analysis, keeping the same sample size across all categories. This allows for the same individuals to be compared across all categories so that the results are easier to interpret.

which is to ensure that the group of households being compared against the treatment group serves as a plausible reflection of the latter in the absence of treatment. The intuition is that the more similar the two groups are, the more likely this condition is to hold.

Formally, Heckman, Ichimura and Todd (1998) show that identification of ATT is feasible if two conditions hold. The first condition involves a modified version of the conditional independence assumption of the DID approach. Let X denote the set of observed household characteristics that determine program participation. Then, this conditional independence assumption within a MDID framework can be rewritten as $(u_{it_1} - u_{it_0}) \perp\!\!\!\perp d|X$. Given that matching on a high-dimensional X can be problematic due to the curse of dimensionality faced by nonparametric matching algorithms, Rosenbaum and Rubin (1983) propose the use of propensity scores. These propensity scores capture the likelihood that households participate in *Oportunidades* given their observables X. Thus, the conditional independence assumption can be rewritten as $(u_{it_1} - u_{it_0}) \perp\!\!\!\perp d|P(X)$ where $P(X) = Pr(d = 1|X)$. This condition implies that the sources of differences in the evolution of outcomes over time in the absence of treatment between participant and non-participant households are precisely those that affect program participation, these being either in the form of observed household characteristics or unobserved ones that remain fixed over time and can thereby be differenced out by the DID dimension of the MDID estimator.

The second condition needed for the identification of ATT is to implement the matching on the region of common support for both groups of households. In order for the MDID estimator's fundamental identification condition to hold, $\mathbb{E}[u_{it_1} - u_{it_0}|d = 1, X] = \mathbb{E}[u_{it_1} - u_{it_0}|d = 0, X]$, both sides of such equality must be simultaneously well-defined for all X, or $P(X)$ when matching on propensity scores. For this to hold, a key assumption is that $P(X) \in (0, 1)$. This is key to guarantee that all participants have a counterpart among non-participants. With this in mind, Heckman, Ichimura and Todd (1997) suggest that it is better to condition

directly on the support common to both participant and nonparticipant groups by estimating the region of common support $S = Supp(X|d = 1) \cap Supp(X|d = 0)$, or $S = Supp(P(X)|d = 1) \cap Supp(P(X)|d = 0)$ when matching on propensity scores.

In summary, these two assumptions together are known as the strong ignorability condition. This posits that the evolution in potential outcomes and treatment assignment are statistically independent by conditioning on a set of variables defined over the support common to participants and non-participants. Hence, after correcting for the selection induced by the households' decision to participate in *Oportunidades*, the group of non-participant households aid in constructing a valid counterfactual for their participant counterparts. In this way, the two groups of households are comparable while relying on a set of weaker assumptions than a simple difference-in-differences strategy.

Implementation

Exploiting the longitudinal nature of the ENCELURB dataset, the following MDID estimator for longitudinal data described in Blundell and Dias (2009) is implemented

$$\hat{\alpha}^{MDID} = \frac{1}{N_1} \sum_{i \in T} \left\{ [y_{it_1} - y_{it_0}] - \sum_{j \in C} \tilde{\omega}_{ij} [y_{jt_1} - y_{jt_0}] \right\} \tag{1.9}$$

where N_1 denotes the number of treated households in the common support region.

That is, estimating the effect of *Oportunidades* on intrahousehold outcomes in poor urban households involves comparing the difference in outcomes across waves of every treated household, $y_{it_1} - y_{it_0}$, to an average of the difference in outcomes across time of *observably similar* control households, $y_{jt_1} - y_{jt_0}$. For a given household, the inclusion of control households into this observably similar group is dependent upon the constructed weight, $\tilde{\omega}_{ij}$, which is obtained in the first stage of the implementation of this estimator as a function

of the propensity score $P(X)$ and used in the second stage to retrieve $\hat{\alpha}^{MDID}$ using a DID regression on the resulting matched sample.

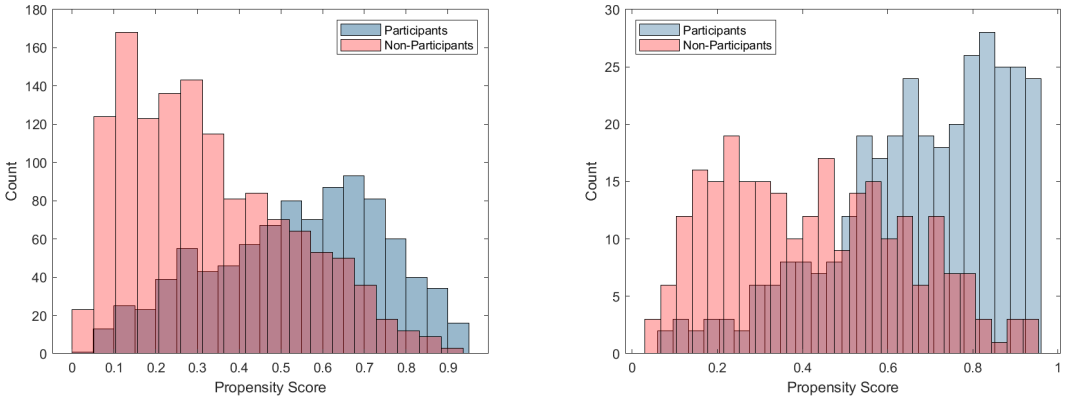
The construction of $\tilde{\omega}_{ij}$ in the first stage is carried out in two steps. The first step involves the estimation of $P(X)$ either parametrically or non-parametrically. Given the number of conditioning variables in X used to compute $P(X)$, this paper implements a parametric approach in this step by estimating $P(X)$ using a probit model and, following Heckman, Ichimura and Todd (1998) and Heckman et al. (1998), includes as covariates household characteristics that affect program participation and outcomes simultaneously.[12] Tables B.1 and B.2 in Section A.2 present the marginal effects at the mean of the covariates included in the probit model used to estimate the propensity scores for two-parent households and single-parent households, respectively. The estimates suggest that households' asset ownership, poverty index, number of children in school, dwelling characteristics, and state's incidence of poverty significantly affect the program participation decision. The final set of conditioning variables used was chosen on the basis of statistical significance and the model's hit and miss rate. In terms of statistical significance, though some covariates might not be individually significant, they are jointly significant and are, therefore, included in the model. In terms

[12]The choice of conditioning variables for the estimation of the propensity score builds upon the work of Behrman et al. (2012), and Angelucci and Attanasio (2013). From the latter, I focus on the subset of covariates pertaining to household composition, dwelling characteristics, financial indicators (whether the household has some previous loans, savings, or even a bank account), and different types of shocks experienced by the household (loss of job by some household member, death of some household member and business loss). From the former, taking into consideration that the authors in this paper adopt a similar treatment definition as mine, I focus on variables such as participation in other social programs (milk subsidy, breakfast subsidy, tortilla subsidy, and procampo), educational attainment of the mother and father, and an index of poverty incidence in the state in which the household resides. The reasoning for including such state index is that it could have affected the households' knowledge about the program. As mentioned in Section 1.3, Angelucci and Attanasio (2009) argue that household's knowledge about *Oportunidades* might have played a significant role in the relatively low program take-up observed in urban areas. Such knowledge could be considered along two dimensions: the first dimension being the existence of the program and the second dimension being the steps to be taken in order to be incorporated into the program. This stems from the fact that the program was more heavily publicized in poorer states, where the poverty index taken into account for this was precisely the one I currently have, which is provided by the CONEVAL using both census data and household-level income and expenditure data from the INEGI's ENIGH dataset.

of the hit/miss rate, the model correctly predicts program participation 72.11% of the time. This is close to what Behrman et al. (2011) achieve using the same evaluation data, which is around 73%.

The propensity score for each household is computed using the results obtained from the model described above. This yields the distribution of propensity scores across the group of participants and the group of non-participants for both two-parent and single-parent households presented in Figure 1.2. Based on this distribution, it is possible to impose the MDID's common support condition required for the identification of ATT using first a minima-maxima approach which only takes the range of propensity scores for which there is some positive amount of observations corresponding to these values in both comparison groups. Following Heckman, Ichimura and Todd (1997), after applying the minima-maxima definition of the common support, this paper imposes an additional trimming of the top and bottom 2% of the resulting propensity score distribution in order to implement the estimator on a region of higher overlap between the two comparison groups.

Figure 1.2: Propensity Score Distributions, Participant and Non-Participant Households



Two Parent Single Mother

Upon imposing the common support condition, the second step is to implement the matching algorithm of choice to construct $\tilde{\omega}_{ij}$. This is a function of a distance metric made in terms of the estimated propensity score. To reduce the bias stemming from bad matches, this can be implemented non-parametrically using a kernel-based matching strategy. This choice stems from the possibility of penalizing bad matches, which would not be possible in a relatively simpler matching algorithm such as a nearest neighbor one.[13] A kernel-based matching strategy constructs $\tilde{\omega}_{ij}$ using the following algorithm

$$\tilde{\omega}_{ij} = \frac{K\left(\frac{P_j - P_i}{h}\right)}{\sum_{k \in C} K\left(\frac{P_k - P_i}{h}\right)}$$

where the kernel of choice for the analysis implemented in this paper is the Epanechnikov kernel using Silverman's rule of thumb for bandwidth selection, $h = 2.345\sigma N^{-0.2}$.[14] It is worth mentioning that while the propensity score is estimated at the household level, the matching of outcomes is performed at the individual-level by allowing individuals of the same household to have the same propensity score.

Once the matched sample is constructed in which each treated individual has been matched to its constructed counterfactual in the previous stage, the following standard DID regression

[13]The nearest neighbor strategy follows the rule $C(P_i) = \min_j ||P_i - P_j||$, j $\in I_0$, where I_0 denotes the control group and $C(P_I)$ denotes the nearest neighbor of the treated household with propensity score P_i. Under this matching algorithm, for each individual treated household, it is possible to observe both its outcomes and its counterfactual one constructed from its nearest neighbors' outcomes. In the case of the one nearest neighbor estimator, such counterfactual outcome is simply the outcome of the one matched control household. In the case of the k-th nearest neighbor estimator (where $k > 1$), such counterfactual outcome is the average of the outcomes of the k matched control households as the counterfactual. Thus, this matching algorithm assigns the weight of $1/k$ to all such matched households irrespective of how dissimilar their propensity scores are to that of the corresponding treated household. A major drawback that becomes quite evident as k increases is that many of those neighbors matched to treated households were actually bad matches in the sense that their propensity scores were not quite "near" to the treated household's one.

[14]A Gaussian kernel was also used, applying the Silverman rule of thumb again for bandwidth selection, $h = 1.059\sigma N^{-0.2}$ in order to obtain results that are comparable to the ones obtained from using the Epanechnikov kernel. The results obtained using the two types of kernels are nearly the same, confirming the results' robustness to the choice of kernel.

is implemented

$$y_{i,t} = \beta_0 + \beta_1 d_i + \beta_2 W2_t + \beta_3 W3_t + \beta_4 (d_i \times W2_t) + \beta_5 (d_i \times W3_t) + \epsilon_{i,t}$$

The notation is the same as the one defined in the difference-in-differences subsection with β_4 denoting the one-year MDID estimate of *Oportunidades*' impact on intrahousehold time allocation and β_5 denoting the two-year MDID estimate. Furthermore, given the two-stage procedure used in the implementation of the estimator in which the earlier stage involves the estimation of the propensity score, standard errors are estimated via bootstrapping using 100 repetitions.[15]

While this section has described two empirical strategies that use the information of non-participants to construct the missing counterfactual needed to identify the ATT of *Oportunidades* on intrahousehold behavior, the discussion of the results in the upcoming section will be centered around the MDID estimates. This is motivated by the fact that this strategy explicitly models the household's program participation decision in a way that mimics the geographic targeting and household selection procedure implemented by the program administration as described in greater detail in Section 1.3, exploiting the differences in observables presented in 1.1. Nevertheless, the upcoming section will also contain a discussion regarding the DID estimates to understand how the MDID estimator corrects for the potential bias to which the DID estimator is prone, as discussed throughout this section.

[15] In each repetition, each of the three stages described above is performed. The definition of the common support with the 2% trimming applied so far has been automated so that it is correctly imposed in each repetition and does not induce unnecessary additional variation in the distribution of the propensity scores in each re-sample. Another important issue to address throughout this stage is that in some repetitions, the bootstrapped sample might have no variation for some dummy variables used in the estimation of the propensity score, which ends up causing some originally significant variables to be dropped from the probit, therefore affecting the estimation at this stage. In order to tackle this and ensure that there is sufficient variation for the relevant dummy variables in each bootstrapped sample, re-sampling is performed with stratification using these variables. This allows for the probit model to be properly estimated in each repetition, therefore allowing for the propensity scores to be estimated in each bootstrapped sample in the same way as in the original one.

1.5 Results

1.5.1 Two-Parent Households: Time Allocation

While there exists substantial evidence of the impact of *Oportunidades* on beneficiary households' consumption patterns, this subsection shifts the focus towards the program's effect on time, another important household resource whose allocation is also dictated by the intrahousehold balance of power. Thus, the outcomes of interest in this subsection include mothers' and fathers' allocation of time to home production, market work, and leisure. More importantly, a special focus is given to a comparison between two different leisure definitions. As aforementioned and described in detail in Section A.1, the first one treats leisure as non-market time while the second one accounts for time devoted to home production.

Tables 1.2 and 1.4 present the one- and two-year results for the impact of the *Oportunidades* cash transfer receipt on parents' weekly leisure hours under the two leisure definitions used. The first column reports the estimates for the first leisure definition, while the second column reports the ones for the second leisure definition. In order to understand the sources behind the reported effect on leisure, Tables 1.3 and 1.5 present the one and two-year impact of *Oportunidades* on parents' weekly hours in each individual time use category used in constructing the second leisure definition used in this paper. Column 1 corresponds to market work, Column 2 to child care, Column 3 to total home production, while Columns 4 and 5 pertain to the two main components of Column 3, core home production and the procurement of goods for the household, respectively. The results in Tables 1.2 and 1.3 correspond to the point estimates for β_4 described in the Empirical Strategy while the results in 1.4 and 1.5 correspond to the point estimates for β_5. Furthermore, in all four tables, the top panel

presents the DID and MDID results for mothers, and the bottom panel presents the ones for fathers.

The results from the implementation of both estimators are reported to show the robustness of the DID estimate to the correction for the potential endogeneity of the program participation decision embedded in the MDID estimator. Thus, the estimate obtained upon the implementation of the MDID strategy is the preferred one since, as mentioned in Section 1.4, it explicitly models the program participation decision by mimicking the household selection process of the program. Furthermore, as mentioned in Section 1.3 and Section 1.4, documenting the program's one-year and two-year effect can be particularly important as the latter is less likely to be sensitive to lags in the households' knowledge about the program, and therefore, their subsequent enrollment in it. Thus, these can be used to check how sensitive the one-year effects of the program are to such lag to make sure that the one-year estimates obtained are not being driven by this issue in the program's implementation.

The results in Table 1.2 suggest that *Oportunidades* had a strongly significant positive one year effect in mothers' weekly leisure hours when focusing on the second leisure definition and using both a DID and MDID approach, with such an increase falling within 6 to 7 and a half weekly hours of leisure gained by participant mothers compared to their non-participant counterparts. This differs from what is reported in rural households in Parker and Skoufias (2000), Skoufias and Di Maro (2006) and Rubio-Codina (2010) as their results suggest no significant impact on the leisure hours of men or women. On the other hand, while the DID result on the first leisure definition suggests a weakly significant increase in mothers' weekly leisure hours, the MDID estimates suggest not only that the magnitude of this increase in leisure hours is smaller but also statistically insignificant. For fathers, on the other hand, both the DID and MDID estimates suggest no significant impact of the program on their weekly leisure hours under any of the two definitions applied.

Table 1.2: One Year Results, Both Leisure Definitions

		Leisure, Definition 1	Leisure, Definition 2
Women	Diff-in-Diff	1.850*	7.539***
		(1.087)	(2.637)
	Observations	2,193	2,193
	Matching Diff-in-Diff	0.376	6.044***
		(0.702)	(1.651)
	Observations	1,418	1,418
Men	Diff-in-Diff	-0.848	-0.052
		(1.484)	(1.585)
	Observations	2,352	2,352
	Matching Diff-in-Diff	0.274	0.587
		(0.882)	(0.948)
	Observations	1,550	1,550

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Clustered standard errors at the city block level in parentheses for Diff-in-Diff. Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, age squared, spouse's education and age, and dwelling characteristics.
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

Table 1.3 reveals the main driver of the significant impact of the program on mothers' weekly leisure hours under the second definition used. Both the DID and MDID approach show that *Oportunidades* had a strongly significant negative impact on the amount of weekly hours mothers devote to total home production, which is itself driven by the negative impact on their core home production hours and effectively translates into the significant increase in their weekly leisure hours. This shows the importance of having sufficiently disaggregated data since it is possible to observe that this increase is not coming from a reduction in child care hours, which could be contrary to the program's core goals but from the amount of time mothers spend cooking, cleaning, disposing of trash and/or carrying water.

The results in Table 1.4 suggest that *Oportunidades* had a strongly significant positive two-year effect in mothers' weekly leisure hours when focusing on the second leisure definition and using both a DID and MDID approach, with such an increase falling within 4 to 8 weekly hours of leisure gained by participant mothers compared to their non-participant counterparts.

Table 1.3: One Year Results, All Time Use

		Market Work	Child Care	Total Home Production	Core Home Production	Procurement of Goods
Women	Diff-in-Diff	-1.850*	-0.140	-5.611***	-5.373***	-0.253
		(1.087)	(1.548)	(1.661)	(1.598)	(0.228)
	Observations	2,193	2,193	2,193	2,193	2,193
	Matching Diff-in-Diff	-0.376	-0.578	-5.090***	-5.125***	0.0352
		(0.702)	(0.920)	(0.983)	(0.958)	(0.116)
	Observations	1,418	1,418	1,418	1,418	1,418
Men	Diff-in-Diff	0.848	-0.177	-0.600	-0.521	-0.070
		(1.484)	(0.400)	(0.378)	(0.330)	(0.119)
	Observations	2,352	2,352	2,352	2,352	2,352
	Matching Diff-in-Diff	-0.274	-0.0384	-0.274	-0.208	-0.0666
		(0.882)	(0.291)	(0.245)	(0.230)	(0.060)
	Observations	1,550	1,550	1,550	1,550	1,550

Clustered standard errors at the city block level in parentheses for Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, age squared, spouse's education and age, and dwelling characteristics
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

On the other hand, both the DID and MDID estimates suggest that the program had no significant impact on mothers' weekly leisure hours under the first definition applied. For fathers, on the other hand, while the DID estimate suggests virtually no impact in their allocation of time, the MDID estimates reveal a negative impact on their weekly leisure hours under the second definition used.

Table 1.5 reveals the main driver of the significant impact of the program on mothers' weekly leisure hours under the second definition used. Both the DID and MDID approach show that *Oportunidades* had a strongly significant negative impact on the amount of weekly leisure hours mothers devote to total home production, which is itself driven by the negative impact on their core home production hours and effectively translates into the significant increase in their weekly leisure hours. This implies that the one year effect on mothers' time allocation is robust across waves. Moreover, for fathers, contrary to the one year estimate, the MDID estimates reveal that the main driver of the significant decrease in their weekly leisure hours

Table 1.4: Two Year Results, Both Leisure Definitions

		Leisure, Definition 1	Leisure, Definition 2
Women	Diff-in-Diff	-0.130	8.268***
		(1.068)	(2.597)
	Observations	2,254	2,254
	Matching Diff-in-Diff	-1.164	4.544***
		(0.839)	(1.355)
	Observations	1,430	1,430
Men	Diff-in-Diff	-1.129	-0.356
		(1.356)	(1.444)
	Observations	2,445	2,445
	Matching Diff-in-Diff	-1.337	-1.766*
		(0.920)	(0.929)
	Observations	1,580	1,580

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Clustered standard errors at the city block level in parentheses for Diff-in-Diff. Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, age squared, spouse's education and age, and dwelling characteristics.
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

as a result of program participation is the strong positive impact of the program on the amount of weekly hours they devote to home child care.

Both the one-year and two-year MDID estimates suggest that mothers in participant households significantly increase their weekly leisure hours by significantly reducing the amount of hours they devote to core home production relative to their non-participant counterparts. That is, by spending less time cleaning, cooking, and doing the dishes. This is similar to what is found by Skoufias and Di Maro (2006) and Parker and Skoufias (2000) who report a slight fall in domestic work hours for women in rural households. For men, on the other hand, while evidence from the rural implementation suggests no significant reallocation of their time among the different time use categories which is similar to what is obtained for the one year effect presented in Table 1.2 and Table 1.3, the two-year MDID estimates presented in Table 1.4 and Table 1.5 suggest that the program significantly increased the amount of hours fathers devote to child care, which leads to a slight decrease in their weekly leisure hours. As

Table 1.5: Two Year Results, All Time Use

		Market Work	Child Care	Total Home Production	Core Home Production	Procurement of Goods
Women	Diff-in-Diff	0.130	-2.395	-5.938***	-5.818***	-0.121
		(1.068)	(1.508)	(1.623)	(1.540)	(0.247)
	Observations	2,254	2,254	2,254	2,254	2,254
	Matching Diff-in-Diff	1.164	-0.667	-5.041***	-4.963***	-0.0775
		(0.839)	(0.798)	(0.885)	(0.872)	(0.114)
	Observations	1,430	1,430	1,430	1,430	1,430
Men	Diff-in-Diff	1.129	-0.184	-0.529	-0.456	-0.073
		(1.356)	(0.461)	(0.446)	(0.395)	(0.138)
	Observations	2,445	2,445	2,445	2,445	2445
	Matching Diff-in-Diff	1.337	0.758***	-0.329	-0.209	-0.120*
		(0.920)	(0.237)	(0.295)	(0.264)	(0.073)
	Observations	1,580	1,580	1,580	1,580	1,580

Clustered standard errors at the city block level in parentheses for Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, age squared, spouse's education and age, and dwelling characteristics
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

aforementioned, the reliability of these two-year estimates might be higher since these are less likely to be affected by potential lags in households' knowledge about the program. To the best of my knowledge, no comparable evidence has been found in rural households. In terms of labor supply, which tends to be of particular concern for policymakers due to potential disincentives to work, both the one and two-year estimates for both men and women suggest that the program has virtually no effect on the amount of hours worked in the market, which is consistent with the results obtained in rural households as Parker and Skoufias (2000), Skoufias and Di Maro (2006) and Rubio-Codina (2010) find that the program's effect on labor supply is insignificant.

It is worth noting that a main takeaway from the program's effect on beneficiary households' time allocation in rural areas is that despite evidence of some reallocation of time among different time use categories, this does not effectively translate into a significant impact on adults' leisure hours (Parker and Todd (2017)). The results here presented suggest otherwise

for urban households. Whenever there is a significant effect in any of the individual time use categories analyzed, this effectively translates into an impact on parents' weekly leisure hours. This is particularly true for mothers as most of the observed one and two-year effect on their leisure hours stems from the strong decrease in their core home production hours.

Going back to the theoretical framework described in Section 2, both maternal home production hours and leisure are functions of the unobserved Pareto weight λ. Furthermore, since home production hours of both parents are also a function of $\mathbf{s}$ and leisure is empirically defined as a residual of total time endowment after accounting for the other time use categories, leisure is, therefore, also affected by changes in $\mathbf{s}$. By simultaneously affecting $\mathbf{z}$ and $\mathbf{s}$, the observed one year effect of the program on mothers' leisure hours could be stemming from either the program's effect on the wife's share of nonlabor income, z^A, or its effect on the school attendance of children in the household, $s \in \mathbf{s}$, which could affect the household's production technology.

1.5.2 Two-Parent Households: Child School-Related Outcomes and Time Allocation

This section presents the estimated effect of *Oportunidades* on education-related outcomes and time allocation of children in two-parent households. The particular outcomes of interest covered in this subsection include children's likelihood of attending school, the number of hours spent in school, likelihood of receiving help from their parents when doing their homework, school-related expenses, the likelihood of repeating a grade, and the amount of weekly hours they devote to home production and child care. The analysis provides an estimate of the extent to which the program is effective in increasing children's school attendance both at the extensive and intensive margins. Tying this back to the theoretical framework discussed

in Section 1.2, this could give an estimate of the extent to which *Oportunidades* could have an effect on the intrahousehold allocation of time through its impact on a production shifter, namely, the number of children in the household attending school.

Following the same gendered focus implemented for the results on the time allocation of the household's decision-makers, this analysis makes a distinction between boys and girls with the top panel of the tables presented in this section containing the results for girls and the bottom panel containing those for boys. This is motivated by the fact that, as mentioned in Section 1.3, the educational grants for girls are higher than boys starting on secondary school, thereby creating the opportunity for a gender asymmetric impact on these outcomes as well.

Table 1.6 presents the one year effect of *Oportunidades* on the child outcomes previously described. While the DID estimates suggest a significant decrease in the amount of weekly hours girls spend in school and a significant increase in girls' school-related expenses as a result of the transfer receipt, these results are not robust as the MDID estimates suggest that these effects are insignificant. More importantly, the MDID results suggest that participation in *Oportunidades* increases the likelihood that girls receive help from their parents in doing their homework and a reduction in the amount of weekly hours they devote to taking care of other children in the household relative to their non-participant counterparts. The latter result is consistent with the evidence obtained from rural households in Rubio-Codina (2010), and Skoufias et al. (2001) suggesting a decrease in the amount of hours girls spend in domestic work. Even though the analysis does not further partition the subsample of girls by age groups due to sample size considerations, it is possible for the result in urban households to be driven by an increase in the school attendance of teenage girls, which is one of the main motivations behind the gender differential in the size of the education grants at the start of secondary school mentioned in Section 1.3.

For boys, on the other hand, the DID estimates suggest a significant decrease in participant children's likelihood of repeating a grade relative to their non-participant counterparts, though this result is not robust as the MDID suggests a smaller insignificant effect on this outcome. Nonetheless, the MDID suggests a strongly significant increase in boys' likelihood of attending school and of receiving help from their parents in doing their homework and a weakly significant increase in the amount of weekly hours spent in school. Thus, at least in the case of boys, *Oportunidades* increases school attendance both at the intensive and extensive margins, though the effect is more significant on the latter. The latter are consistent with the evidence suggesting an increase in school enrollment in rural areas (Todd and Wolpin (2006), Dubois, De Janvry and Sadoulet (2012) and Skoufias et al. (2001)).

Table 1.6: One Year Results

		Current School Attendance	Weekly School Hours	Homework Help	School-Related Expenses	Grade Repetition	Home Production	Child Care
Girls	DID	-0.015	-1.207**	-0.009	89.273**	-0.002	-0.327	-0.128
		(0.012)	(0.613)	(0.039)	(39.759)	(0.023)	(0.617)	(0.336)
	Observations	2,840	2,830	2,587	2,428	2,581	2,789	2,837
	MDID	0.009	0.270	0.053**	19.43	-0.0003	-0.551	-0.502**
		(0.010)	(0.356)	(0.024)	(32.736)	(0.021)	(0.500)	(0.243)
	Observations	1,658	1,643	1,583	1,431	1,527	1,579	1,650
Boys	DID	0.016	-0.185	-0.007	32.369	-0.046*	-0.590	-0.147
		(0.014)	(0.583)	(0.037)	(39.599)	(0.026)	(0.500)	(0.251)
	Observations	3,049	3,035	2,673	2,555	2,731	2,994	3,032
	MDID	0.024***	0.554	0.062***	-26.680	-0.016	-0.441	0.038
		(0.008)	(0.374)	(0.024)	(24.450)	(0.020)	(0.395)	(0.321)
	Observations	1,822	1,792	1,719	1,550	1,651	1,741	1,801

Clustered standard errors at the city block level in parentheses for Diff-in-Diff.
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, and dwelling characteristics

Table 1.7 presents the two-year effect of *Oportunidades* on the child outcomes previously described. While the DID estimates suggest a significant increase in the amount of weekly hours girls spend in school, a significant increase in girls' school-related expenses, and a reduction in the amount of weekly hours they spend helping their parents in home production

as a result of the transfer receipt, only the first one is robust to the MDID estimator. Interestingly, the MDID results suggest that participation in *Oportunidades* strongly increases participant girls' school attendance both at the extensive and intensive margins relative to girls in non-participant households. The results on school attendance are consistent with the evidence from the program's rural implementation (Todd and Wolpin (2006), Dubois, De Janvry and Sadoulet (2012) and Skoufias et al. (2001)). The lack of a one-year effect and the strong positive two-year effect might be suggestive of a lag in the program's efficacy in fostering an increase in girls' school attendance.

For boys, the DID results suggest a weakly significant reduction in receiving help from their parents when doing homework, a strongly significant increase in the amount of hours they spend in school, and a significant decrease in their likelihood of grade failure. Out of these three effects, only the last two are robust to the MDID estimator. More importantly, the decrease in the likelihood of grade repetition is consistent with what Behrman, Sengupta and Todd (2005) find in rural areas. Furthermore, the MDID results also suggest a strongly significant impact of the program on boys' likelihood of attending school.

1.5.3 Time Allocation: Single-Mother Households

As in the two-parent households' case, the outcomes of interest in this section include single mothers' allocation of time to market work, home production, and leisure. The focus on single mothers stems from the fact that given the gendered nature of the program, it is uncommon to observe in the data single father households in which there is no other adult household member and, therefore, it is not possible to carry out the analysis needed to obtain comparable results for single fathers. This does not pose a significant problem in this case since most of the impact of *Oportunidades* on the allocation of time within two-parent households focuses on the time allocation of mothers. Therefore, observing the extent to

Table 1.7: Two Year Results

		Current School Attendance	Weekly School Hours	Homework Help	School-Related Expenses	Grade Repetition	Home Production	Child Care
Girls	DID	0.001	1.497**	0.046	98.113**	-0.007	-1.172*	-0.712
		(0.013)	(0.706)	(0.044)	(39.356)	(0.025)	(0.657)	(0.449)
	Observations	3,081	2,512	2,254	2,677	2,847	3,036	3,082
	MDID	0.0328***	2.542***	0.0333	57.36*	-0.00979	-0.591	-0.392
		(0.011)	(0.486)	(0.024)	(24.942)	(0.018)	(0.526)	(0.270)
	Observations	1,640	1,527	1,464	1,410	1,509	1,577	1,633
Boys	DID	-0.008	2.205***	-0.081*	16.399	-0.064**	-0.755	-0.239
		(0.014)	(0.712)	(0.045)	(44.906)	(0.027)	(0.621)	(0.222)
	Observations	3,313	2,749	2,377	2,813	2,984	3,268	3,304
	MDID	0.0342***	2.648***	-0.00237	27.09	-0.0508***	-0.0675	0.117
		(0.011)	(0.573)	(0.029)	(27.891)	(0.021)	(0.706)	(0.334)
	Observations	1,815	1,693	1,587	1,535	1,634	1,739	1,795

Clustered standard errors at the city block level in parentheses for Diff-in-Diff.
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, and dwelling characteristics.

which the program affects the allocation of single mothers' time could still be informative of a potential empowerment effect in favor of married mothers. For this matter, Table 1.8 presents the estimated one-year impact of program participation on weekly leisure hours of single mothers under both leisure definitions, and Table 1.10 presents the two-year effect. Furthermore, Tables 1.9 and 1.11 present the one and two-year program impact on each individual time use category.

The DID results in Table 1.8 suggest that the program had no significant effect on participant single mothers' weekly leisure hours relative to their non-participant counterparts under any of the definitions used. However, upon correcting for the potential endogeneity of the household's program participation decision, the MDID estimates reveal a strongly significant decrease of weekly leisure hours under the first definition used. The results in Table 1.9 suggest that this is stemming from a significant increase in the weekly hours they spend working. This effect does not translate into a significant reduction in their weekly leisure hours under the second definition of leisure given the sign, magnitude, and imprecision of the estimates of the program's effect on the other time use categories. Thus, when focusing on

this subsample of women, the results are different to the program's insignificant effect on labor supply found by Skoufias et al. (2001), Skoufias and Di Maro (2006) and Rubio-Codina (2010) in the program's rural implementation and to the results obtained for their married counterparts in urban households.

Table 1.8: One Year Results, Both Leisure Definitions

		Leisure, Definition 1	Leisure, Definition 2
Women	Diff-in-Diff	-0.653	2.268
		(2.890)	(4.511)
	Observations	582	582
	Matching Diff-in-Diff	-4.190***	-3.743
		(2.016)	(4.088)
	Observations	516	516

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Clustered standard errors at the city block level in parentheses for Diff-in-Diff. Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, and age squared
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

Table 1.9: One Year Results, Components of Leisure Definition 2

		Market Work	Child Care	Total Home Production	Core Home Production	Procurement of Goods
Women	Diff-in-Diff	0.653	-0.552	-2.653	-1.579	-1.000**
		(2.890)	(2.223)	(2.564)	(2.432)	(0.486)
	Observations	582	582	582	582	582
	Matching Diff-in-Diff	4.190***	-1.503	1.056	0.963	0.093
		(2.016)	(1.668)	(2.398)	(2.320)	(0.410)
	Observations	516	516	516	516	516

Clustered standard errors at the city block level in parentheses for Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, age squared, spouse's education and age, and dwelling characteristics
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

Similarly, the DID results in Table 1.10 suggest that the program had no significant effect on participant single mothers' weekly leisure hours relative to their non-participant counterparts under any of the definitions used, which is robust to the implementation of the MDID estimator. However, the results in Table 1.11 reveal that the lack of a significant effect of the program on single mothers' weekly leisure hours under the second definition is stemming from a combination of a strongly significant decrease in the amount of hours they spend in child care and an insignificant increase in the amount of weekly hours they devote to other time use categories. In particular, the MDID estimates suggest an increase in market work that is almost half of the magnitude of the decrease in weekly child care hours though the imprecision of the estimate renders it economically insignificant.

Table 1.10: Two Year Results, Both Leisure Definitions

		Leisure, Definition 1	Leisure, Definition 2
Women	Diff-in-Diff	-3.508	1.600
		(2.894)	(4.322)
	Observations	621	621
	Matching Diff-in-Diff	-2.031	1.291
		(1.625)	(2.946)
	Observations	522	522

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Clustered standard errors at the city block level in parentheses for Diff-in-Diff. Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, and age squared
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

1.5.4 Child School-Related Outcomes and Time Allocation: Single-Mother Households

Given the small sample size of single mother households, it is not possible to partition the sample of children by gender since the resulting sample sizes are too small, especially after

Table 1.11: Two Year Results, Components of Leisure Definition 2

		Market Work	Child Care	Total Home Production	Core Home Production	Procurement of Goods
Women	Diff-in-Diff	3.508	-1.381	-3.275	-2.235	-1.010**
		(2.894)	(2.019)	(2.473)	(2.324)	(0.486)
	Observations	621	621	621	621	621
	Matching Diff-in-Diff	2.031	-4.011**	0.689	0.185	0.504
		(1.625)	(1.680)	(1.816)	(1.786)	(0.410)
	Observations	522	522	522	522	522

Clustered standard errors at the city block level in parentheses for Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, age squared, spouse's education and age, and dwelling characteristics
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

considering issues of missing values. Hence, the following tables provide the results for all children in the household. Tables 1.12 and 1.13 present the one and two-year effect of *Oportunidades* on children's likelihood of attending school, number of hours spent in school, homework help from parents, school-related expenses, the likelihood of grade failure and the amount of weekly hours they devote to home production and child care.

The DID results in Table 1.12 suggest that *Oportunidades* had a significant effect only on participant children's help received from their parents when doing homework relative to their non-participant counterparts. The MDID estimates, however, reveal a significant increase in children's likelihood of grade failure as a result of program participation. A similar result is obtained for the two-year effect of *Oportunidades* as presented in Table 1.13 with the main differences being that both the DID and MDID estimates also suggest a significant increase in the amount of weekly hours children spend in school and the MDID estimates suggest a significant decrease in the household's school-related expenses and time devoted to helping take care of other children in the household. It might be possible that the significant two-year increase in the amount of hours children spend in school is behind the significant

two-year decrease in the amount of weekly hours single mothers spend taking care of children as children are spending significantly more time at school. It is important to notice that even though both the one and two-year effects suggest a significant increase in children's grade repetition, there is evidence in Behrman, Sengupta and Todd (2005) and Dubois, De Janvry and Sadoulet (2012) of a similar effect for children attending secondary school in rural households.[16]

Table 1.12: One Year Results

		Current School Attendance	Weekly School Hours	Homework Help	School-Related Expenses	Grade Repetition	Home Production	Child Care
All	DID	0.019	1.223	0.076	21.410	0.025	2.024	0.786
		(0.022)	(0.847)	(0.067)	(60.853)	(0.040)	(1.766)	(0.702)
	Observations	1562	1548	1335	1177	1359	1473	1548
	MDID	0.007	-0.311	0.185***	-3.983	0.159***	0.209	-0.173
		(0.013)	(0.499)	(0.027)	(25.725)	(0.023)	(0.614)	(0.378)
	Observations	1169	1156	1062	950	1057	1078	1151

Clustered standard errors at the city block level in parentheses for Diff-in-Diff.
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, and dwelling characteristics.
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

1.5.5 Comparing Two-Parent and Single-Mother Household Outcomes

The main takeaway from the results discussed in this section is that the urban implementation of *Oportunidades* had a strong significant impact on the time allocation within two-parent beneficiary households. Angelucci and Attanasio (2013) had already shown that it had a significant effect on the household's demand for food, in particular high-protein food that cannot be attributed to a shift in preferences. Nonetheless, tying this back to the theoretical

[16]One possible explanation for this result is that children in the late years of secondary school might have an incentive to repeat a grade in order to extend their program eligibility period.

Table 1.13: Two Year Results

		Current School Attendance	Weekly School Hours	Homework Help	School-Related Expenses	Grade Repetition	Home Production	Child Care
All	DID	0.005	2.256*	0.131*	24.865	0.014	0.503	-0.795
		(0.030)	(1.182)	(0.079)	(65.107)	(0.041)	(1.804)	(0.935)
	Observations	1577	1371	1147	1197	1368	1506	1572
	MDID	0.005	3.425***	0.139***	-314.348***	0.175***	-0.705	-0.824**
		(0.016)	(0.607)	(0.030)	(36.109)	(0.022)	(0.570)	(0.353)
	Observations	1126	1077	965	901	985	1047	1111

Clustered standard errors at the city block level in parentheses for Diff-in-Diff.
Bootstrapped standard errors in parentheses (100 repetitions) for Matching Diff-in-Diff
Household and individual controls for diff-in-diff include: household size, household's nonlabor income, number of children, regional fixed effects, income shocks indicators, education, age, and dwelling characteristics.
Matching estimates obtained using an Epanechnikov kernel-based matching strategy.

framework described in Section 1.2, this is an aggregate household outcome whose lack of information on the way it is allocated among household members does not allow at least signing the program's effect on the sharing rule. This would be feasible if the data available would have information on the intrahousehold allocation of consumption similar to what Cherchye, De Rock and Vermeulen (2012) and Lise and Yamada (2019) have as they are able to observe the sharing rule in the data through the information they have on the intrahousehold allocation of both consumption and time, thereby observing all the outcomes stemming from the second stage of the decentralized household problem described in Section 1.2.

Focusing on the individual time allocation addresses the aforementioned shortcoming of using aggregate household-level consumption data as it encodes information on the household's sharing rule. By showing that the program also had a significant impact on this resource whose intrahousehold allocation is observed, the evidence here provided further confirms the rejection of the unitary household framework made by Angelucci and Attanasio (2013) using the same policy and evaluation data but this time by also capturing the direction of the program's effect on the sharing rule of beneficiary households. More specifically, in a

way that is consistent with the evidence in Attanasio and Lechene (2014), by comparing the results from these two types of households, it is possible to compare mothers' behavior within an environment in which a CCT has an effect only on a household's total income and domestic production (for single mother households) and one in which this effect is tangled with the program's impact on a distribution factor (for two-parent households).

When considering the divergent results obtained between single and married mothers, there exists suggestive evidence of an empowerment effect in favor of women as, within the context of the model outlined in Section 1.2, the results on leisure suggest a significant effect on beneficiary households' sharing rule, one that allows mothers in two-parent households to increase their share of monetary resources for their own private consumption. To the best of my knowledge, one of the papers that have been able to make a direct link between the effect of a policy in its role as a distribution factor on the intrahousehold time allocation and an improvement in women's bargaining power within the household is Rangel (2006). He finds a similar effect on women's home production and leisure hours as a result of an extension of alimony rights to cohabiting couples in Brazil which he attributes to an empowerment effect in favor of women as the distribution factor he focuses on does not trigger any income or substitution effect as a CCT like *Oportunidades* does.

1.6 Conclusion

Through the implementation of a gender-based targeting strategy aimed at increasing women's control over household resources as described in 1.3, development policies like *Oportunidades* are expected to alter existing patterns of gender inequality within beneficiary households. Acknowledging that a high degree of gender specialization in time use constitutes one of the main sources of intrahousehold gender inequality in Mexico, this paper presents robust evidence

of a significant gender-asymmetric effect of participation in *Oportunidades* on parental time allocation within two-parent beneficiary households, thereby providing suggestive evidence of an empowerment effect in favor of mothers. By shifting the focus to intrahousehold behavior, this paper's findings supplement the evidence presented by Attanasio and Lechene (2002), Attanasio and Lechene (2014) and Angelucci and Attanasio (2013) who use *Oportunidades* as a distribution factor to link changes in beneficiary households' consumption patterns and shifts in women's bargaining power.

Theoretically, within the collective household framework described in Section 1.2, a gender-targeted policy like *Oportunidades* could potentially affect household behavior not only by affecting the resource constraints of beneficiary households but also by triggering a redistribution of bargaining power among decision-makers as the transfer is placed in the hands of mothers. Specifically, the link between parents' time allocation and the household's decision-making structure is made through the concept of the sharing rule, exploiting the use of the *Oportunidades* cash transfer as a distribution factor and the close relationship between the sharing rule and the Pareto weight. Empirically, as described in Section 1.4, within a treatment effect model that accounts for the potential endogeneity of the program participation decision, information on households' receipt of the *Oportunidades* cash transfer is used to estimate the effect of program participation on the time allocation among parents within beneficiary households.

The results presented in Section 1.5 show that participation in *Oportunidades* significantly affected intrahousehold behavior in poor urban households. In particular, while there is no significant impact on adult labor supply hours in two-parent households, both the one and two-year estimates suggest that the program significantly reduced the amount of weekly hours mothers devoted to housework which effectively translated into a significant increase in their leisure hours and the two-year estimates show a significant increase in the hours

fathers devoted to child care, which effectively translated into a slight fall in their leisure hours. While the unresponsiveness of labor supply to program participation is consistent with evidence documented in rural households, the results for urban households differ from those of their rural counterparts in the sense that any significant individual reallocation of time across different activities effectively translated into significant changes in leisure hours. This further highlights the importance of focusing on a sufficiently disaggregated leisure definition that acknowledges the importance of home production, particularly within contexts characterized by sharp patterns of gender specialization in the allocation of time within households.

More importantly, the contrasting results obtained not only within two-parent households but also across the two subsamples here analyzed provide a valuable insight. The gender-asymmetric effect observed within two-parent households suggests a significant impact on the sharing rule of this subsample's beneficiary households, one allowing mothers to secure a higher amount of monetary resources for their own private consumption. As the sharing rule provides a link between the household's decision-making structure and intrahousehold behavior, this suggests an improvement in women's bargaining position within two-parent households, which is further supported by the divergent results obtained for single mothers. Besides ruling out an income effect, the contrasting evidence between the two subsamples of mothers confirms that when addressing questions regarding household responses to gender-targeted benefits, it is indispensable to interpret the evidence and its implications in light of a non-unitary framework that allows for an intervention's targeting strategy to alter existing patterns of gender inequality within beneficiary households through an empowerment channel.

Nevertheless, the link between women's empowerment and the responses of intrahousehold behavior here presented is limited by the fact that it can only sign the program's effect on the sharing rule. Thus, while the results suggest that the collective nature of two-parent households has a bearing on the divergent results between single and married mothers, the

extent to which this effect is driven by an improvement in married mothers' Pareto weight or by a change in the household's production is beyond the scope of this paper. This motivates further work providing a direct link between intrahousehold responses to gender-targeted benefits and changes in women's bargaining power that allows decomposing these responses into a component stemming from an intervention's gendered targeting strategy and another one capturing the program's effect on households' resource constraints. This is crucial for the design of complex development policies aimed at providing the incentives and targeting beneficiaries in a way that is conducive to the attainment of their multi-fold goals.

Chapter 2

Are Cash Transfers Effective at Empowering Mothers? A Structural Evaluation of Mexico's *Oportunidades*

This chapter explores the extent to which gender-targeted benefits can be used as policy levers to increase women's decision-making power, individual welfare, and household investments in children. To address this question, I develop and structurally estimate a collective household model with home production accounting for the different channels through which a cash transfer targeted to women could affect household behavior. I use the exogenous variation induced by *Oportunidades* on observed household behavior to identify and estimate the Pareto weight, or mothers' intrahousehold bargaining power, which allows us to compute individual welfare money metric indices. I then assess the impact of increasing women's control of non-labor income on the balance of decision-making power and individual welfare within two-parent households. I find that participation in *Oportunidades* increased mothers'

bargaining power, increasing their individual welfare and boosting the domestic production of a child-related good that is publicly consumed within the household. The counterfactual exercises implemented yield two policy-relevant takeaways. First, the *Oportunidades* program is as effective as alternative cash transfer programs and significantly more effective than wage subsidies at increasing mothers' bargaining power, individual welfare and domestic output. Second, individual-level poverty rates computed using the money metric welfare index I compute in this chapter can help improve the program's targeting strategy by accounting for the unequal sharing of resources within households.

2.1 Introduction

There exists substantial evidence suggesting that improvements in women's control of resources translates into increased household investments in children's human capital (Duflo (2003), Duflo and Udry (2004), Doss (2013), Armand et al. (2020)). This has been the premise under which policies aimed at breaking the intergenerational transmission of poverty by fostering investments in children's education and health increasingly target women as beneficiaries. While it has been well documented that gender-targeted policies have a significant impact on observed household behavior, the extent to which these responses are driven by improvements in women's bargaining power within beneficiary households remains an open question.[17] Since targeting benefits to particular household members may ultimately affect how these resources will be used, evidence in this regard has potentially valuable implications for the optimal design of development policies.

[17]To name a few, participation in *Progresa/Oportunidades* has been found to significantly increase the demand for food in rural and urban households (Attanasio and Lechene (2002), Attanasio and Lechene (2010), Angelucci and Attanasio (2013)), decreased adult women's participation in domestic work (Skoufias (2005)). The results in Attanasio and Lechene (2002) suggest that participation in *Progresa* improved mothers' reported bargaining position.

This paper formally explores the link between gender-targeted benefits and women's decision-making power by providing an empirical application of a collective labor supply model with home production based on the framework presented in Blundell, Chiappori and Meghir (2005) to quantify the impact of Mexico's *Oportunidades* cash transfer program on mothers' Pareto weight in urban two-parent households.[18] Despite the central role of the Pareto weight in fully summarizing the household's decision-making process, empirical applications of the model in which this primitive is identified and estimated remain relatively scarce, often relying on survey data containing individual-level time use and consumption information and predominantly focused on developed countries.[19] Importantly, none of these applications have assessed the implications of targeting benefits to specific individuals within the context of a policy experiment in a developing country. I address this gap by exploiting the exogenous variation of *Oportunidades* on household behavior within a structural approach to provide three main contributions.

First, I document a gender-asymmetric effect of *Oportunidades* on the allocation of time within two-parent households. Specifically, I find that participation in the program significantly increased mothers' leisure through a reduction in their home production hours that is not offset by an increase in their labor supply and is compensated with child-related expenditures while leaving fathers' time allocation virtually unaffected. On the other hand, I document an insignificant negative impact of the program on single mothers' leisure hours stemming from an increase in their market work hours that is not offset by the reduction in their home time,

[18]This framework's core assumption is the Pareto efficiency of household behavior. While this can be an unreasonable assumption in the context of developing countries (Udry (1996)), Bobonis (2009) and Attanasio and Lechene (2014) fail to reject the Pareto efficiency assumption for *Progresa/Oportunidades* beneficiary households in Mexico, thereby providing supporting evidence in favor of collective rationality in this paper's relevant context.

[19]Cherchye, De Rock and Vermeulen (2012) provide an empirical application and generalization of this framework using a novel Dutch dataset. Lise and Yamada (2019) extend it to a dynamic setting using unique panel data from Japan. Embedding the model within an equilibrium marriage market framework, Gayle and Shephard (2019) use the variation across marriage markets as the distribution factor that allows them to identify the Pareto weight.

which is not substituted with expenditures on children as I find a significant decrease in these expenditures. Such mixed responses to participation in the program indicate that there exist differences in the income and substitution effects triggered by the program's benefits and conditionalities scheme within the two types of households. Specifically, rationalizing this evidence through a collective household framework in which household demand is a function not only of prices and income but also of the decision-making structure of the household, I provide suggestive evidence of a change in the decision-making process within two-parent households in response to the program's gender-based targeting strategy that places the cash transfers directly in the hands of mothers.

Second, I use the observed impact of *Oportunidades* on household behavior to offer identification results that allow us to recover the household's production technology, parental preferences, and the Pareto weight when the intrahousehold allocation of time and consumption is partially observed. Besides assuming that preferences are invariant to marital status, my approach relies on two sources of heterogeneity in the impact of *Oportunidades* on parent's time use. The first source exploits the role of the wife's share of non-labor income as a distribution factor, allowing us to capture shifts in the decision-making process of beneficiary households generated by the program's gender-based targeting strategy. The second source exploits the role of the number of children in the household attending school as a production shifter, allowing us to capture shifts in the household's productivity generated by the program's conditionalities. Throughout my analysis, I find that these two sources of heterogeneity in the effect of *Oportunidades* on mothers' leisure are crucial in ensuring the identification of the Pareto weight. In this way, I show that the complexity of the benefits and requirement schemes of development policies like *Oportunidades* can serve as a valuable source of exogenous variation for identification purposes.

The identification results I propose yield a test of internal and external validity of a collective household model, which consists of defining a set of moment conditions capturing the observed gender-asymmetric effect of *Oportunidades* on time use and partitioning it into two sub-sets with only one of these being included in the estimation procedure. The first one, used in the estimation, captures the program's impact on spouses' leisure to home time ratios through its effect on the wife's non-labor income. The second one, excluded from the estimation, captures the program's impact on these ratios through its impact on the number of children in the household attending school. By ensuring that the predicted moments generated by the estimates obtained from the preferred specification fit the theoretical moments implied by the optimality conditions of the model and both sub-sets of moments related to *Oportunidades*, both the internal and external validity of the model are ensured. Such use of experimental variation as a source of model validation is in line with the work of Lise, Seitz and Smith (2004), Todd and Wolpin (2006) and, in particular, Angelucci and Attanasio (2013) who use the same implementation of the program to reject the validity of a unitary household model.[20] Importantly, my results for the Pareto weight indicate that specifications that fit well the moments associated with *Oportunidades*, thereby consistent with the non-parametric identification and external validity of the model, yield more robust estimates and suggest a stronger response of the Pareto weight to changes in mothers' contribution to total household non-labor income.

Third, through the evaluation of the program's impact on mothers' Pareto weight using the estimation results I present, I show that participation in *Oportunidades* increased mothers' bargaining power by almost 24% within beneficiary households. To the best of my knowledge, this constitutes novel evidence of the Pareto weight's response to the gender-based targeting

[20]Lise, Seitz and Smith (2004) use the experimental control group of the Canadian Self-Sufficiency Program to predict the outcomes experienced by those in the experimental treatment group. Similarly, Todd and Wolpin (2006) use the control group of the rural implementation of *Progresa* to estimate the model checking the accuracy with which they can predict the actual post-program school attendance of treated households.

strategy of development policies within a framework that accounts for the impact of these policies on both time use and consumption. While there exists evidence focusing on the impact of the rural implementation of *Progresa/Oportunidades* on women's resource share, commonly used as a measure of bargaining power within a consumption-based collective framework, this is mixed with no consistent evidence of a link between monetary benefits targeted to women and improvements in their decision-making power. For instance, Tommasi (2019) finds that the program increased women's resource shares by almost 12%, with the results of Sokullu and Valente (2021) indicating a more modest increase in women's resource shares when focusing on the same implementation of the program but using a different methodology that exploits the panel feature of the data. On the other hand, Tommasi and Wolf (2016) found that men benefited more from the program than women in this regard. Thus, by capturing changes in the Pareto weight in response to the program, my results contribute to this strand of the literature by providing evidence of a direct link between women's bargaining power and targeted benefits.

To quantify the extent to which such empowerment effect translated into individual welfare gains, I compute an extension of the money metric welfare index (MMWI) originally proposed in Chiappori and Meghir (2015). This individual welfare measure captures the amount of expenditures an individual household member would need to incur when living in singlehood to reach the same level of utility he or she would enjoy when living in collectivity. Despite assuming marital preference stability, my approach allows single mothers and fathers to have a different production technology. Thus, by using the estimates for single parents to define the economic environment that their married counterparts would face in the case of separation/divorce, the MMWI I implement differs from the related indifference scales used in Cherchye, De Rock and Vermeulen (2012) in the way it captures the loss incurred by married parents in terms of economies of scale in production and consumption when transitioning from

marriage into singlehood. I find that *Oportunidades* increased mothers' MMWI by almost 20%. In monetary terms, this change in mothers' MMWI constitutes an annual increase of approximately 3,067 MXN pesos (294 USD) in their individual welfare. Furthermore, I document that this empowerment effect coincides with an increase of approximately 24% in the production of a domestic good that is publicly consumed within two-parent households and which serves as a proxy for children's well-being by taking both parental time and monetary investments in children as inputs. Thus, the results here presented show that the documented increase in mothers' bargaining power within beneficiary two-parent households effectively translated into improvements in both mothers' individual welfare and higher production levels of the child-related public good. Based on my empirical findings, such an increase in domestic output suggests that beneficiary two-parent households effectively substituted monetary for parental time investments in children's human capital in response to the program. Importantly, the link I find between mothers' empowerment and the increased production of a child-related domestic good is in line with the empirical evidence suggesting a positive relationship between mothers' control of resources and investments in children (Duflo (2003), Duflo and Udry (2004), Doss (2013), Armand et al. (2020), Lundberg, Pollak and Wales (1997)).

Taking my program evaluation results as a benchmark, I exploit the structural approach adopted to conduct a set of counterfactual exercises in which I consider alternative designs of cash transfer programs in terms of their revenue neutrality and conditionalities as well as changes in other sources of income, such as wages.[21] I find that *Oportunidades* is as effective as alternative cash transfer programs at empowering mothers, improving their individual welfare and increasing the domestic production of the public good associated with children.

[21] Revenue neutrality is ensured at the household level. This is mainly achieved by triggering a redistribution of non-labor income (in the case of cash transfers) or of wage income (in the case of wage subsidies) from the non-targeted spouse to the beneficiary spouse.

Furthermore, I find that cash transfers are significantly more effective than wage subsidies at empowering mothers, improving their welfare and increasing domestic output. As expected, monetary resources targeted to fathers have a contrasting impact on mothers' bargaining power and on the intrahousehold allocation of individual welfare. Importantly, the results from these exercises indicate that targeting cash transfers to mothers generates an increase in the production of the child-related public good, while targeting these transfers to fathers has the opposite effect on domestic output. These results provide further evidence that targeting benefits to mothers can be more beneficial for children than targeting fathers and complements the empirical evidence highlighting this relationship between the identity of benefit recipients and investments in children when randomizing the identity of recipients as in the context examined in Armand et al. (2020).

In the second type of counterfactuals, I implement an individual poverty analysis on the sub-sample of two-parent non-poor households. I find that upon accounting for the unequal sharing of resources within the household by computing individual poverty rates using the MMWI, I can classify almost 44% of mothers living in two-parent non-poor households as individually poor. I further show that targeting a cash transfer to these mothers improves their bargaining position by more than 10%, translating into an improvement of more than 9% in their MMWI and of more than 7% in the households' level of domestic production. In terms of cost-efficiency, these effects are stronger when considering cash transfers that are revenue neutral. Despite working within different characterizations of a collective household framework, my results are consistent with the findings presented in Tommasi (2019) for the program's rural implementation, as I find that the targeting strategy of *Oportunidades* can be improved by assessing mothers' eligibility on the basis of individual-level poverty rates. More broadly, these results contribute to the growing evidence highlighting the importance of

accounting for intrahousehold inequality in poverty calculations as poverty can be unequally shared within households (Cherchye et al. (2018), Tommasi (2019), Calvi (2020)).

The remainder of the paper is organized as follows. Section 2.2 describes the theoretical framework used to analyze the behavior of two-parent and single-parent households with children. Section 3 describes the institutional context and evaluation data of Mexico's *Oportunidades* program. Section 2.4 describes the identification and estimation strategy used to recover the household's production technology, parental preferences and decision-making structure. Section 2.5 describes the analysis of intrahousehold bargaining power and individual welfare used to evaluate the program's effect on beneficiary household's decision-making structure and individual welfare and conducts the counterfactual exercises used to explore alternative policy designs. Section 2.7 concludes.

2.2 Model Setup

This paper considers the behavior of two types of households with children. The first type consists of single-parent households whose behavior is described by a standard unitary model of labor supply with home production. The second type consists of two-parent households whose behavior is described by a collective household model of labor supply with home production based on the framework proposed in Blundell, Chiappori and Meghir (2005).

While the paper is focused on the decision-making structure and allocation of welfare within two-parent households, the inclusion of single-parent households in the analysis serves a two-fold purpose. First, as it will be discussed more thoroughly in Section 4, the behavior of these type of households informs the identification of individual parental preferences. Lastly, as argued in this section, these households' economic environment can be used to describe the

counterfactual environment that married parents would face in the case of separation/divorce considered by the individual welfare measure proposed in this paper.

2.2.1 Single-Parent Households

Consider a household comprised by a single parent and his/her children. Let i denote the parent who decides how to allocate his/her time between market work and the production of a domestic good Q. Parents have preferences over their own leisure and private market consumption (l^i, q^i) and the domestic good Q. Moreover, each individual decides how to allocate their total time endowment $\bar{T}$ to leisure l^i, time spent in market work h_M^i, and time spent in home production h_D^i. The model allows for the production technology to differ by gender as the domestic good Q is assumed to be produced using parental time h_D^i $(i = A, B)$ and market purchases q^D using the technology described by $Q = F_Q^{s,i}(h_D^i, q^D; \mathbf{S})$, where $\mathbf{S}$ denotes a vector of production shifters, which includes the number of children in the household attending school. Importantly, given that I model domestic output as a function of parental investments in children's human capital, Q can be interpreted as a proxy for child quality. Furthermore, total household income is derived from the parent's total labor market earnings $(w^i h_M^i)$ and non-labor income. I introduce the exogenous variation of the *Oportunidades* cash transfer by letting non-labor income be a function of the size of the transfer received from the program, $y^i = y_C^i + dy_{CCT}$, where d is an indicator of program participation, y_C^i denotes non-labor income in the case of non-participation and y_{CCT} denotes the cash transfer amount assigned. Thus, the behavior of single-parent households can be described as the solution to the following problem

$$\max_{l^i, h_D^i, q^i, q^D} U^i(l^i, q^i, Q; \mathbf{X}^i)$$

s.t.

$$q^i + q^D = y^i + w^i h_M^i; \quad y^i = y_C^i + dy_{CCT}; \quad Q = F_Q^{s,i}(h_D^i, q^D; \mathbf{S}); \quad l^i + h_M^i + h_D^i = \bar{T}$$

In this case, the optimality conditions governing household behavior within these households are the following

$$\frac{\partial U^i/\partial l^i}{\partial U^i/\partial q^i} = w^i; \quad \frac{\partial F_Q^{s,i}}{\partial h_D^i}\frac{\partial U^i}{\partial Q} = \frac{\partial U^i}{\partial l^i}; \quad \frac{\partial F_Q^{s,i}}{\partial q^D}\frac{\partial U^i}{\partial Q} = \frac{\partial U^i}{\partial q^i}; \quad \frac{\partial F_Q^{s,i}/\partial h_D^i}{\partial F_Q^{s,i}/\partial q^D} = w^i \tag{2.1}$$

2.2.2 Two-Parent Households

Consider a household comprised by the wife and husband, denoted by A and B, respectively, and their children. While children are assumed to have no bargaining power of their own, they are accounted for in the production of the public good Q. Spouses have preferences over their own leisure and private market consumption (l^i, q^i) and the domestic good Q. Under a marital stability assumption, these preferences are assumed to be the same as their single counterparts'. Nonetheless, the production technology is assumed to differ across marital status. In this way, the model attempts to capture the economic gains of marriage generated by the economies of scale in production. Within two-parent households, Q is produced in the household using the production technology F_Q^M, taking as inputs both parental time h_D^i, for

$i = (A, B)$, and market purchases, q^D. Thus, the full allocation of each spouse's total time endowment $\bar{T}$ is described by the amount of hours they spend in leisure activities (l^i), in home production activities (h_D^i) and in market work (h_M^i). In this way, the household's total income is derived from the parents' total labor market earnings $w^A h_M^A + w^B h_M^B$ and their total non-labor income $y^A + y^B$. I introduce the exogenous variation of the *Oportunidades* cash transfer into the model by assigning the cash transfer amount, y_{CCT}, to the wife's non-labor income if the household is participating in the program. In this case, participation in the program is captured by the indicator variable d, where $d = 1$ if the household has been incorporated into the program and $d = 0$ otherwise. Under the model's assumption that household outcomes are Pareto efficient, household behavior can be described as the solution to the following optimization problem

$$\max_{l^A, l^B, h_D^A, h_D^B, q^A, q^B, q^D} \lambda(w^A, w^B, y, \mathbf{z}) U^A(l^A, q^A, Q; \mathbf{X}^A) + (1 - \lambda(w^A, w^B, y, \mathbf{z})) U^B(l^B, q^B, Q; \mathbf{X}^B) \tag{2.2}$$

s.t.

$$\begin{aligned} q^A + q^B + q^D =& y^A + y^B + w^A h_M^A + w^B h_M^B \\ Q =& F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S}); \quad \bar{T} = l^i + h_M^i + h_D^i \\ y^A =& y_C^A + d y_{CCT}; \quad y^A = z^A y \end{aligned}$$

Following Browning and Chiappori (1998), some structure is added to the model without imposing any particular functional form by assuming that parental utility functions are strictly concave, twice continuously differentiable and strictly increasing in (l^i, q^i, Q). The model here developed allows for observed preference heterogeneity through the inclusion of a set of taste shifters, $\mathbf{X}^i$, that includes sociodemographic characteristics specific to each

spouse and household-level characteristics. As will be discussed throughout the estimation of the model in Section 4, similar to Cherchye, De Rock and Vermeulen (2012) and Lise and Yamada (2019), these variables include parents' age, completed years of education and the number of children in the household.

Similarly, the Pareto weight is assumed to be a differentiable and zero-homogeneous function on $(w^A, w^B, y, \mathbf{z})$. Notice that the collective framework recognizes that the Pareto weight can respond to two sets of variables. The first set includes variables that shift the Pareto frontier such as wages and income while the second set, $\mathbf{z}$, includes variables that trace movements along the Pareto frontier. The role of the former is to define the household's social welfare function described in 2.2 in terms of wages and income, while the latter allows for exogenous factors to affect household behavior only through their effect on the decision-making process. As discussed in Browning, Chiappori and Weiss (2014), this yields implications derived within the collective framework that are compatible with rejections of income pooling which cannot be rationalized within a unitary setting.

Importantly, as highlighted by Browning and Chiappori (1998) and Chiappori and Ekeland (2009) and more thoroughly discussed in Section 2.4, the vector of distribution factors, $\mathbf{z}$, plays a significant role in the identification of the model. Intuitively, these exogenous variables serve as an exclusion restriction needed to separately identify individual preferences from the Pareto weight by inducing shifts in intrahousehold behavior only through changes in the Pareto weight while leaving preferences unaltered. This is one of the main channels through which I allow a gender-targeted development program to have an effect on intrahousehold inequality throughout the analysis implemented in Section 2.5.2.

Furthermore, the production function F_Q^M is assumed to be twice continuously differentiable, strictly increasing and concave in (h_D^A, h_D^B, q^D). The model also allows for the inclusion of

production shifters in the vector **S**. Given the research question at hand, the production shifter used in this paper involves the number of children in the household attending school. In this way, through minimum school attendance requirements attached to the receipt of the cash transfer, I allow for the conditionalities of a program like *Oportunidades* to have an effect on the productivity of the household.

Thus, at an interior solution to 2.2, I derive three sets of optimality conditions that govern the intrahousehold allocation of time and consumption. The first set relates to the spouses' private consumption of leisure and a market good,

$$\frac{\partial U^A/\partial l^A}{\partial U^A/\partial q^A} = w^A; \quad \frac{\partial U^B/\partial l^B}{\partial U^B/\partial q^B} = w^B; \quad \frac{\partial U^A/\partial l^A}{\partial U^B/\partial l^B} = \frac{w^A}{w^B}\frac{1-\lambda}{\lambda}; \quad \frac{\partial U^A/\partial q^A}{\partial U^B/\partial q^B} = \frac{1-\lambda}{\lambda} \tag{2.3}$$

The second set relates to the spouses' public consumption.

$$\frac{\partial F_Q^M}{\partial h_D^A}\left[\lambda\frac{\partial U^A}{\partial Q} + (1-\lambda)\frac{\partial U^B}{\partial Q}\right] = \lambda\frac{\partial U^A}{\partial l^A} \tag{2.4}$$

$$\frac{\partial F_Q^M}{\partial h_D^B}\left[\lambda\frac{\partial U^A}{\partial Q} + (1-\lambda)\frac{\partial U^B}{\partial Q}\right] = (1-\lambda)\frac{\partial U^B}{\partial l^B} \tag{2.5}$$

$$\frac{\partial F_Q^M}{\partial q^D}\left[\lambda\frac{\partial U^A}{\partial Q} + (1-\lambda)\frac{\partial U^B}{\partial Q}\right] = \lambda\frac{\partial U^A}{\partial q^A} = (1-\lambda)\frac{\partial U^B}{\partial q^B} \tag{2.6}$$

Lastly, the third set relates to productive efficiency

$$\frac{\partial F_Q^M/\partial h_D^A}{\partial F_Q^M/\partial h_D^B} = \frac{w^A}{w^B}; \quad \frac{\partial F_Q^M/\partial h_D^A}{\partial F_Q^M/\partial q^D} = w^A; \quad \frac{\partial F_Q^M/\partial h_D^B}{\partial F_Q^M/\partial q^D} = w^B \tag{2.7}$$

The partitioning of these optimality conditions into three groups feeds directly into the identification strategy adopted in Section 4. Since the optimality conditions related to productive efficiency do not involve individual preferences or the Pareto weight, identification of the production function is focused on these conditions alone. On the other hand, most of the

identification of the Pareto weight and individual preferences relies on the optimality conditions related to public consumption, namely, the household's marginal rates of substitution for private and public consumption.

The Role of Distribution Factors and *Oportunidades*

One of the main channels through which a cash transfer like *Oportunidades* is expected to have an effect on intrahousehold behavior is through its effect on the wife's share of non-labor income. The wife's share of non-labor income, defined above as z^A, is commonly used in the literature as a distribution factor that plays a central role in the identification of the model further explored in Section 4. As will be discussed in further detail throughout Section 1.3, due to the program's gender-based targeting, as the *Oportunidades* cash transfer is placed in the hands of mothers in their role of transfer holders, there exists a close relationship between program participation and z^A. Formally, the wife's share of non-labor income can be defined as

$$z_d^A = \frac{y_0^A + dy_{CCT}}{y_0^A + y^B}$$

where $d \in \{0, 1\}$ and y_0^A denotes the wife's non-labor income in the absence of treatment. Then, the difference in z^A between participant and non-participant households can then be defined as

$$z_1^A - z_0^A = \frac{y_{CCT}(Y_0 - y_0^A)}{Y_C(Y_0 + y_{CCT})} \geq 0$$

where $Y_0 = y_0^A + y^B$. Thus, by placing the cash transfer entirely in the hands of mothers, *Oportunidades* can be expected to affect the intrahousehold allocation of resources through its impact on z^A and, subsequently, on $\lambda(w^A, w^B, y, \mathbf{z})$. Throughout the intrahousehold welfare

analysis implemented in Section 2.5, I discuss more thoroughly the role that z^A plays in effectively generating shifts in the Pareto weight, household behavior and parents' individual welfare.

2.2.3 Measuring Individual Welfare

While measuring individual welfare in single-parent households is relatively straightforward since this involves computing parents' indirect utility ($V^i(w^i, y^i) = U^i(l^{i*}, q^{i*}, Q^*; \mathbf{X}^i)$, where $Q^* = F_Q^{s,i}(h_D^{i*}, q^{D*}; \mathbf{S})$), this is relatively more complex within two-parent households and requires addressing the extent to which welfare gains are shared within the household. The intrahousehold gender inequality analysis implemented in Section 2.5 focuses on understanding the differences between the two types of money metric utility that can be defined within a collective household framework here described.

The Sharing Rule

The derivation of the sharing rule stems from a two-stage characterization of the model. The Pareto efficiency assumption of household outcomes posited by this model permits decentralizing the social planner's problem in 2.2 into two stages: a resource allocation stage and an intrahousehold allocation one. The first stage pins down the optimal levels of home production inputs and the optimal transfers of monetary resources (net of production costs) between decision-makers in the form of the *conditional sharing rule*. In the intrahousehold allocation stage, conditional on the first stage's outcomes, each decision-maker optimizes individually to choose his/her leisure and private consumption.

Formally, the household's problem can be broken down into the aforementioned stages with the household solving the following problem in the resource allocation stage

$$\max_{\rho^A,\rho^B,Q} \lambda(w^A, w^B, y, \mathbf{z})V^A(w^A, \rho^A; Q) + (1 - \lambda(w^A, w^B, y, \mathbf{z}))V^B(w^B, \rho^B; Q)$$

s.t.

$$\rho^A + \rho^B = y_C^A + CCT\mathbb{1}\{\text{Treat}\} + y^B - C_Q(w^A, w^B, Q, \mathbf{S})$$

where C_Q denotes the expenditures incurred by the household in the production of the public good Q that takes as inputs both parental time and market purchases and is characterized by productive efficiency (i.e. cost minimization) as the solution to the following auxiliary problem

$$C_Q(w^A, w^B, Q; \mathbf{s}) = \min_{h_D^A, h_D^B, q^H} [w^A h_D^A + w^B h_D^B + q^H | Q = F_Q^M(h_D^A, h_D^B, q^H; \mathbf{S})]$$

More importantly, ρ^A and ρ^B characterize the household's sharing rule, which describes the way in which the household's total non-labor income net of production costs is allocated between the decision makers of the household for their private consumption conditional on the optimal level of consumption and production of Q. Thus, the solution to this stage of the household's problem can be generally characterized by

$$\rho^A = \rho^A(w^A, w^B, y, \mathbf{z}, \mathbf{S}); \quad \rho^B = \rho^B(w^A, w^B, y, \mathbf{z}, \mathbf{S}); \quad Q = Q(w^A, w^B, y, \mathbf{z}, \mathbf{s}) \tag{2.8}$$

Furthermore, the *individual* indirect utilities $V^i(w^i, \rho^i; Q)$ for $(i = A, B)$ are defined in the intrahousehold allocation stage as

$$V^i(w^i, \rho^i; Q) = \max_{l^i, q^i} U^i(l^i, q^i, Q)$$

s.t.

$$q^i + w^i l^i = \rho^i + w^i \bar{T}$$

where ρ^i and Q are taken as given at this stage.

Besides yielding a benchmark measure of individual welfare within collective households, the decentralization of the household's problem and its implied sharing rule serve two purposes throughout the analysis presented in this paper. The first one is to provide the theoretical foundation through which I interpret the empirical evidence in Section 1.3 as a motivation for adopting a structural approach in disentangling the impact of targeted benefits on two-parent households' decision-making process. The second one involves the derivation of a concept capturing the way in which production costs are shared within collective households.

Through the concept of the sharing rule, it is possible to derive the following relationship between each parent's observed demand for leisure l^i for $(i = A, B)$ and its structural counterpart, defined as his/her conditional leisure demand function $\tilde{l}^i$

$$l^A = \tilde{l}^A(w^A, \rho^A(w^A, w^B, y^A, y^B, \mathbf{z}, \mathbf{S})) \tag{2.9}$$

$$l^B = \tilde{l}^B(w^B, \rho^B(w^A, w^B, y^A, y^B, \mathbf{z}, \mathbf{S})) \tag{2.10}$$

In this way, the sharing rule allows us to break down the effect of a policy that changes mothers' contribution to non-labor income on the intrahousehold allocation of time and

consumption into two components. The first component captures a standard income effect of the policy comparable to the one that can be signed in a unitary setting and a second component that captures the response of the household's sharing rule to the policy. Formally, the response of parents' observed leisure demand to changes in mothers' non-labor income can be characterized as follows

$$\frac{\partial l^A}{\partial y^A} = \frac{\partial \tilde{l}^A}{\partial \rho^A}\frac{\partial \rho^A}{\partial y^A} \tag{2.11}$$

$$\frac{\partial l^B}{\partial y^A} = \frac{\partial \tilde{l}^B}{\partial \rho^B}\frac{\partial \rho^B}{\partial y^A} \tag{2.12}$$

The second component of 2.11 and 2.12 captures responses of the household's sharing rule to changes in the resource allocation stage. In this way, the response of the sharing rule to a policy depends on its impact on total household monetary resources, the Pareto weight and the household's demand for and production of the public good, Q.[22] Thus, a policy that changes mothers' non-labor income within this framework is expected to alter the sharing rule by changing the total amount of resources to be distributed in the resource allocation stage and its distribution by the policy's impact on the optimal provision of Q and its dual effect in the decision-makers' relative bargaining power. The latter stems from the characterization of the Pareto weight as a function of wages, income and the set of distribution factors described above, which include mothers' share of non-labor income, z^A.

Given that I can sign the first component of 2.11 and 2.12 as positive under the assumption that leisure is a normal good since it captures a standard income effect, responses of parents'

[22]This stems from the relationship between household outcomes and the Pareto weight implied by the characterization of behavior within two-parent households as the solution to 2.2. Browning, Chiappori and Weiss (2014) formalize this relationship through the definition of a collective household demand function. This concept allows us to decompose both income and substitution effects into a Marshallian component and a collective one that captures the response of the Pareto weight to changes in price, wages and non-labor income. Intuitively, by capturing shifts in the Pareto weight, shifts in the sharing rule can be interpreted as a decentralized version of said collective effect.

leisure hours to changes in their contribution to total household non-labor income allows us to sign the corresponding response of the sharing rule. Nonetheless, the extent to which I can sign the response of the Pareto weight to changes in parents' individual non-labor income based on the response of the sharing rule is limited by the inclusion of the public domestic good Q which allows for a potential non-monotonic relationship between the conditional sharing rule and the Pareto weight.[23] This limitation is exacerbated by the presence of home production since, in this case, the response of the sharing rule also encodes information about the household's productivity. I use this shortcoming as a motivation for our structural approach throughout the discussion of the empirical evidence presented in Section 1.3.

Another advantage of decentralizing the household's problem is that it allows us to distinguish between parents' marginal utility from public consumption from the marginal utility they derive from additional income allotted for private consumption. Differentiating the individual indirect utilities with respect to the public good and the sharing rule permits computing each parent's marginal willingness to pay for the public good in the following way

$$\theta_Q^A = \frac{\partial V^A(w^A, \rho^A, Q)/\partial Q}{\partial V^A(w^A, \rho^A, Q)/\partial \rho^A}$$
$$\theta_Q^B = \frac{\partial V^B(w^B, \rho^B, Q)/\partial Q}{\partial V^B(w^B, \rho^B, Q)/\partial \rho^B}$$

Note that these marginal willingness to pay for the public good can also be interpreted as the Lindahl prices, which intuitively, serve as a way for each individual spouse to internalize the market price of the public good Q (in the absence of home production or in the case of the domestic production of a marketable good) or the per unit cost of producing the domestic good Q (which in this case is denoted by $P(w^A, w^B; \mathbf{S})$). Denote these Lindahl prices for

[23] Blundell, Chiappori and Meghir (2005) characterize the necessary conditions under which an increase in the mother's Pareto weight could lead to an increase in the household's expenditures on Q without implying a reduction in her sharing rule.

the wife and husband as θ_Q^A and θ_Q^B, respectively. Given that these are individual prices, an important condition that these must satisfy is the Bowen-Lindahl-Samuelson condition for the optimal provision of the public good. Adjusting this condition for the domestic production of Q yields the following

$$\theta_Q^A + \theta_Q^B = P(w^A, w^B; \mathbf{S})$$

Intuitively, these Lindahl prices describe the way in which the per unit cost of production is shared between parents when living in collectivity, which is governed by both their preference for the domestic good and their relative bargaining position in the household which is described by the Pareto weight.

The Money Metric Welfare Index

The intuition behind the money metric welfare index (MMWI) is to capture a measure of the expenses a married individual would need to incur in a counterfactual single household in order to be able to reach the same level of utility s/he would achieve when living in collectivity. Defining the single-parent household's problem and being able to identify its primitives is then essential since it provides the counterfactual environment needed for the computation of the MMWI. It is then possible to define the MMWI within the context of a collective household model with home production as

$$MMWI^i = \min_{h_D^i, l^i, q^i, q^D} w^i l^i + q^i + w^i h_D^i + q^D \tag{2.13}$$

s.t.

$$U^i(l^i, q^i, Q; \mathbf{X}^i) \geq U^i(l^{i*}, q^{i*}, Q^*; \mathbf{X}^i)$$
$$Q = F_Q^s(h_D^i, q^D; \mathbf{S})$$

where $(l^{i*}, q^{i*}, Q^* = F_Q^M(h_D^{A*}, h_D^{B*}, q^{D*}))$ denotes the optimal choices made within a two-parent household. A key point of departure of the extension of the MMWI here proposed with the indifference scales analyzed in Cherchye, De Rock and Vermeulen (2012) is that the production technology here considered to define the economic environment married parents would face upon divorce/separation is precisely the one faced by single parents contrary to using the same production technology and setting the absent spouses' time input to 0 or a fraction of his/her optimal input under marriage. In this way, the proposed MMWI is expected to capture the fact that one of the main economic gains of marriage involves the fact that the production possibilities frontier that an individual faces differs from one living arrangement to the other. Thus, the per unit production cost faced by an individual within collectivity θ_Q^i is expected to be different to that faced in singlehood, $P^{s,i}(w^i, \mathbf{S})$.

A feature of the MMWI worth noting involves its relationship with the sharing rule. By defining one of the constraints of the minimization problem in 2.13 in terms of the individual indirect utility of parent i, which itself takes the sharing rule as an argument, I implicitly characterize the MMWI as a function of the sharing rule. Nonetheless, by also capturing the differences in the productivity of parent i in both living arrangements, the MMWI adjusts the sharing rule as it accounts for the change in prices experienced by the parent when considering the hypothetical transition from collectivity to singlehood. Thus, the MMWI constitutes the compensating variation of facing the full cost of producing Q, $P^{s,i}(w^i, \mathbf{S})$, instead of θ_Q^i when moving across living arrangements. Section 2.5 shows that under the

parametric specification used in the empirical application of the model I implement, such adjustment made to the sharing rule in the MMWI involves a rescaling using a function of $P^{s,i}(w^i, \mathbf{S})$ and θ_Q^i.

2.3 Description of Estimation Sample and Evaluation of *Oportunidades*' Impact on Time Use and Consumption

This paper focuses on the subsample of single-parent households and nuclear families in the ENCELURB in which the decision-makers are working in the market. While this is a relatively restrictive criteria given the degree of female non-participation that there is in the sample, particularly those in two-parent households, it serves as a sample for estimation that has all the components of the model needed within the framework of Blundell, Chiappori and Meghir (2005). This criteria is similar to the one adopted in Cherchye, De Rock and Vermeulen (2012) given that the model does not account for the extensive margin of labor supply. This would require extending it to a discrete choice framework. As mentioned by Cherchye, De Rock and Vermeulen (2012) and Lise and Yamada (2019), the estimation of a collective household model of labor supply and home production as the one here presented and described in Section 2.2 poses significant data requirements as valid information is needed on time use, consumption and income. This explains the reduced number of observations in the final estimation sample used in subsection 2.4.3. Table 2.1 presents relevant descriptive statistics for the sample of households used in the estimation of the model pertaining to their sociodemographic characteristics, income sources, consumption and time allocation.

Table 2.1: Descriptive Statistics, Poor (Eligible) Households Included in Estimation Sample

	Two Parent			*Single Mother*			*Single Father*		
	Obs	**Mean**	**Median**	**Obs**	**Mean**	**Median**	**Obs**	**Mean**	**Median**
Household Characteristics:									
Household Size	661	5.13	5.00	848	3.89	4.00	130	2.98	2.00
Number of children	661	3.04	3.00	848	2.71	3.00	130	1.93	1.00
Mean Age of Children in Household	657	8.57	8.50	791	10.06	10.17	56	11.61	11.67
Household Consumption:									
Public Expenditures, Yearly	661	7,140.72	6,226.87	848	5,389.30	4,757.04	130	3,314.59	2,567.27
Private Consumption	661	22,046.49	20,867.19	848	16,246.73	14,718.75	130	16,949.58	14,990.40
Food Expenditures	661	17,795.96	16,484.00	848	13,478.18	12,246.00	130	10,412.40	8,840.00
Income									
Total Household Nonlabor Income	661	7,840.21	4,860.73	848	7,198.88	3,713.89	130	4,778.60	1,578.24
Wife's Share	661	0.29	0.05	0	-	-	0	-	-
Total Household Earnings	661	38,809.77	35,429.08	848	16,457.04	14,511.20	130	23,208.37	23,642.79
Parental Characteristics:									
Age, Mother	661	32.75	32.00	848	37.92	36.00	0	-	-
Age, Father	661	36.36	35.00	0	-	-	130	46.79	46.00
Years of Education, Mother	661	6.20	6.00	848	5.66	6.00	0	-	-
Years of Education, Father	661	6.82	6.00	0	-	-	130	5.18	6.00
Market Work Hours, Mother	661	1,081.64	780.00	848	1,490.95	1,456.00	0	-	-
Market Work Hours, Father	661	2,251.26	2,496.00	0	-	-	130	2,146.45	2,366.00
Child Care Hours, Mother	661	575.38	416.00	848	380.31	208.00	0	-	-
Child Care Hours, Father	661	137.12	0.00	0	-	-	130	98.20	0.00
Home Production Hours, Mother	661	1,683.75	1,664.00	848	1,427.33	1,352.00	0	-	-
Home Production Hours, Father	661	211.42	130.00	0	-	-	130	692.80	598.00
Real Wage, Mother	661	17.36	9.62	848	15.39	9.57	0	-	-
Real Wage, Father	661	14.92	11.42	0	-	-	130	14.64	11.14

[1] Monetary values reported in 2002 MXN pesos. 1USD = 10.43MXN pesos. [2] All measures are annualized.

For time allocation, the table distinguishes between time spent in home production and time spent in child care. In the estimation described in subsection 2.4.3, I consolidate these two time use categories into a single measure of home production so that it captures these two dimensions of housework. I document that the median of all types of consumption is higher in two-parent households than in their single counterparts which goes in hand with the higher median income of all sources being higher for two-parent households. In terms of the allocation of time, mothers in two-parent households tend to spend less time working in the market and more time in home production and child care than their single counterparts. Moreover, there is evidence of a high degree of gender specialization in home production and child care within two-parent households with mothers spending more hours in these activities and less time working in the market than their spouses. Specifically, I find that mothers,

on average, take on more than 80% of total parental time spent on child care and home production.

I proceed to investigate the extent to which the *Oportunidades* program has affected the allocation of time within two-parent households and of single mothers.[24] Table 2.2 presents the overall impact of the program on the intrahousehold time allocation and public expenditures of two-parent households. The results suggest that participation in the program increased mothers' yearly leisure hours stemming from a significant decrease in their home production hours that is not offset by the increase in the time they spend working in the market. On the other hand, the impact of the program on fathers' time allocation is rendered statistically insignificant. In terms of consumption, the results suggest that the program significantly increased yearly public expenditures in participant two-parent households compared to their non-participant counterparts.[25]

Table 2.2: Overall Impact of *Oportunidades* on Two-Parent Beneficiary Households

	Leisure		Home Production		Market Work		
	Mother	Father	Mother	Father	Mother	Father	Public Exp.
MDID	239.46*	-248.55	-419.03***	-70.57	179.57**	319.12	1967.24**
	(136.88)	(210.36)	(141.10)	(62.89)	(78.87)	(223.13)	(782.04)
Mean	2,321.40	3,196.48	2,452.89	360.61	1,049.70	2,266.90	6,610.25
N	478	478	478	478	478	478	478

Notes: [1] Monetary values reported in 2002 MXN pesos. 1USD = 10.43 MXN. [2] Annualized measures. [3] Bootstrapped standard errors (100 repetitions).

Table 2.3 presents the estimates of the program's impact on the allocation of time and consumption related to children in single-mother households. The results suggest that while

[24]This causal analysis is not implemented among single-father households since less than 5% of the sample report participating in the program which can be conjectured to stem from the gender-based targeting of the program under which mothers are prioritized.

[25]I provide evidence of a similar impact of the program within two-parent households in which mothers are not working in the market. The results are included in Table B.3 in Section B.4.

program participation reduced yearly home production hours for mothers, the simultaneous significant increase in their yearly market work hours more than offsets such reduction in a way that it decreases their leisure hours, though such decrease is rendered statistically insignificant. Moreover, in contrast with two-parent households, the results suggest that participation in the program significantly decreases single-mother households' child-related expenditures.

Table 2.3: Overall Impact of *Oportunidades* on Single-Mother Beneficiary Households

	Leisure	Home Prod.	Market Work	Public Exp.
MDID	-153.893	-303.262**	454.045***	-1837.540***
	(174.652)	(136.465)	(122.948)	(710.979)
Mean, Dep. Var.	2,446.977	1,946.624	1,430.397	4,599.455
N	632	632	632	632

[1] Monetary values reported in 2002 MXN pesos. 1USD = 10.43 MXN pesos.
[2] All measures are annualized. [3] Bootstrapped standard errors (100 repetitions).

The significant reduction in home production hours observed among both married and single mothers is consistent with the evidence presented by Skoufias and Di Maro (2006) in rural areas. Nonetheless, the main point of departure of the evidence here presented from that documented by Skoufias and Di Maro (2006) relates to the significant increase in yearly leisure hours I observe among married mothers which is not robust across marital status since I do not find a significant effect of the program on single mothers' leisure hours. A similar discrepancy in household responses to the program is observed in terms of public expenditures. I find that while two-parent households increase their public expenditures in response to participation in *Oportunidades*, their single counterparts reduce such monetary investments that go into the production of the domestic good described in Section 2.2. Such reduction in both time and monetary expenditures in the domestic good associated with

children is likely to have translated into a significant decrease in its production, which is discussed in Section 2.5.2.

The contrasting results documented for both types of households can be rationalized within the framework presented in Section 2.2. Specifically, the results suggest differences in the mix of income and substitution effects triggered by the program's benefits and conditionalities scheme within the two types of households. Throughout the treatment effects framework presented in this section, as the participation indicator captures changes in y^A generated by *Oportunidades*, the MDID estimates here presented for single-parent and two-parent households capture the empirical counterpart of the theoretical predictions relating the responses of parents' leisure to changes in mothers' non-labor income within a standard unitary labor supply model and a collective labor supply model, respectively, in the presence of home production. Focusing on two-parent households, the theoretical implications of an increase in y^A are presented in 2.11 and 2.12. Thus, the results for two-parent households suggest a significant increase in mothers' sharing rule in response to participation in the program. Such increase in mothers' sharing rule encode information about both changes in the productivity of the household in response to the program's conditionality and impact on the demand for the domestic good Q and changes in the Pareto weight stemming from the gender-targeted strategy of the program. In this way, differences in the responses of time use and consumption in both types of households indicate not only differences in home productivity but also an impact of the program on the decision-making process within two-parent households.

As mentioned in Section 2.2, the extent to which I can attribute the positive impact of the program on mothers' sharing rule to an increase in mothers' Pareto weight in response to the increase in y^A generated by the receipt of the *Oportunidades* cash transfer is limited by the fact that the response of the sharing rule is also capturing the impact of the program on

total household monetary resources and on the household's demand for and production of the public good, Q in the household's resource allocation stage. Thus, such positive impact of *Oportunidades* on mothers' sharing rule constitutes suggestive evidence of an empowerment effect in favor of mothers in beneficiary households. Therefore, the results from the analysis I have presented throughout this section yields motivating evidence for further investigating the extent to which such differential impact of the program can be attributable to a shift in the balance of power within two parent households. To this end, I formalize the link between a shift in mothers' bargaining power and the observed increase in their leisure hours and public expenditures within two-parent households through the structural estimation procedure described in Subsection 2.4.3 based on the model presented in Section 2.2. Upon the recovery of the bargaining structure of two-parent households, I quantify the program's impact on the model's primitives in Subsection 2.5.2.

2.4 Estimation and Identification

This section describes the identification and structural estimation procedure of the model presented in Section 2.2. While the model is parametrically estimated, I explore the non-parametric identification of parental preferences, the production technology of two-parent and single-parent households and the Pareto weight, which describes the decision-making structure of two-parent households. This non-parametric identification analysis informs the parametric identification of the model which ultimately leads to the two-step estimation procedure here described.

2.4.1 Identification

Proposition 1 (Identification of Two-Parent Households' Production Technology).
Let (h_D^A, h_D^B, q^D) *be observed functions of* $(w^A, w^B, y, \boldsymbol{S}, \boldsymbol{z})$ *for two-parent households. Then, the production function for two-parent households,* $F_Q^M(h_D^A, h_D^B, q^D, \boldsymbol{s})$ *is identified up to a strictly monotone (and thus, invertible) transformation* G_M *so that* $F_Q^M(h_D^A, h_D^B, q^D, \boldsymbol{s}) = G_M^{-1}[\bar{F}_Q^M(h_D^A, h_D^B, q^D; \boldsymbol{s})]$.

Proof: See B.2.1 in Section B.2.

This follows from the identification result considered in the application of the model to household production in Blundell, Chiappori and Meghir (2005). Intuitively, the optimality conditions derived from productive efficiency in 2.7 provide a direct relationship between the marginal rates of technical substitution of the three inputs of production, h_D^A, h_D^B and q^D and the spouses' wages w^A and w^B. By exploiting the observability of these inputs of production and their reduced-form relationship with wages and the continuous differentiability of the production function, F_Q^M, additional conditions can be derived to separately identify the marginal productivity of each input, which can then be integrated to recover F_Q^M up to an increasing transformation.

Proposition 2 (Identification of Single-Parent Households' Production Technology).
Let (h_D^i, q^D) *be observed functions of* $(w^i, y^i, \boldsymbol{S})$ *for single parents* $i = (A, B)$ *with sufficient variation induced by at least one production shifter,* $s_j \in \boldsymbol{S}$*, in their marginal productivity. Then, the production function for single-parent households,* $F_Q^{S,i}(h_D^i, q^D, \boldsymbol{s})$ *is identified up to a strictly monotone (and thus, invertible) transformation* G_S *so that* $F_Q^{S,i}(h_D^i, q^D, \boldsymbol{s}) = G_S^{-1}[\bar{F}_Q^{S,i}(h_D^i, q^D; \boldsymbol{s})]$.

Proof: See B.2.2 in Section B.2.

This follows a similar intuition to the one followed in the proof of Proposition 1. The identification result stems from the optimality condition in 2.1 relating the marginal rate of substitution between parental time and monetary investments, h_D^i and q^D and wages w^i for both single mothers and fathers ($i = A, B$). I further use the response of these marginal rates of technical substitution to shifts in the production shifter s_j to derive an additional condition that allows us to identify each individual marginal productivity which can then be integrated to recover $F_Q^{s,i}$ up to an increasing transformation.

Proposition 3 (Identification of Individual Preferences and the Pareto Weight).
Let l^i be an observed function of $(w^i, y^i, \boldsymbol{S})$ for $i = (A, B)$ for single-parent households and let (l^A, l^B) be observed functions of $(w^A, w^B, y, \boldsymbol{S}, \boldsymbol{z})$ for two-parent households. With the marginal productivities of mothers and fathers identified within both types of households, if (1) there exists an exogenous variation inducing changes in at least one production shifter $s_j \in \boldsymbol{S}$ and at least one distribution $z \in \boldsymbol{z}$ such that it affects married mothers' time allocation in a way that increases their consumption of leisure, (2) the Pareto weight is non-decreasing in z^A, (3) married mothers are more productive at home than their single counterparts, and (4) the responses of single and married mothers' marginal productivities to changes in the production shifter are contrasting, the Pareto weight and parental preferences are identified.

Proof: See B.2.3 in Section B.2.

Once the production technology of single-parent and two-parent households have been identified, I first focus on the relationship between the known individual marginal productivities of mothers and fathers and the marginal rate of substitution of leisure for public consumption within the two types of households presented in the optimality conditions 2.1, 2.4, and 2.5. I use these to derive a set of two conditions relating parents' marginal utility for leisure, the Pareto weight and both parents' marginal productivity both within a collective and a

single-parent household by exploiting the responsiveness of the Pareto weight to shifts in the distribution factor z and of the observed leisure and home time hours to the production shifter s_j. A third condition relating mothers' and fathers' marginal utility for leisure, the Pareto weight and their wage rate is obtained from the third condition in 2.3 to complete a system of 3 equations for which a solution exists if: (1) I find an empirical positive relationship between mothers' leisure hours and the distribution factor z and the production shifter s_j, (2) the Pareto weight is non-decreasing on the distribution factor z^A, (3) mothers are more productive when living in collectivity than when living in singlehood, and (4) the response of mothers' marginal productivity at home to shifts in the production shifter s_j differs across the two types of households here considered. Once parents' marginal utility for leisure is recovered, I combine these with information on their wages to recover their marginal utility for private market consumption using the first two conditions in 2.3. Moreover, I use the information on the Pareto weight, parents' marginal productivity at home and their marginal utility for leisure to recover their individual marginal utilities for public consumption using 2.4 and 2.5.

The reliance of this identification result on establishing an empirical relationship between the leisure hours of at least one parent (here being case, the mother) and changes in at least one distribution factor and one production shifter is attuned with the important role that both exclusive goods (here being leisure) and distribution factors play in facilitating the identification of the model's primitives as argued by Chiappori and Ekeland (2009). More importantly, as shown by Cherchye, De Rock and Vermeulen (2012), in the presence of home production, the existence of a production shifter combined with a distribution factor allows us to separately identify differences in home productivity from differences in the households' decision-making structure when observing changes in household behavior.

A caveat accompanying the third proposition involves its generalizability beyond the application I consider in this paper as it relies on the documented gender-asymmetric impact of *Oportunidades* on the allocation of time within two-parent households. It would be of interest to investigate how the required conditions would change within the context of an application in which a different empirical pattern is observed with respect to the way in which leisure is spent within the household. It would also be interesting to understand the extent to which I can use similar exogenous variation on other aspects of observed household behavior, such as public expenditures. This is of particular relevance given the existing empirical evidence focused on the impact of development policies on observed household behavior.

2.4.2 Parametrization of Preferences, Technology and Bargaining Structure

I now describe the parametrization of preferences, the households' production technology and two-parent households' decision making structure. Based on this parametrization, I explore the parametric identification of the model described in further detail in Section B.3.

Preferences

As mentioned in the non-parametric identification analysis, I assume that preferences are strongly separable on leisure, private consumption and the public domestic good such that this allows for an additively separable representation. Suppose that each sub-utility is described by a logarithmic function to form the following Cobb-Douglas utility function.

$$U^i(l^i, q^i, Q; \mathbf{X}^i) = \alpha_1^i(\mathbf{X}^i)\ln(l^i) + \alpha_2^i(\mathbf{X}^i)\ln(q^i) + (1 - \alpha_1^i(\mathbf{X}^i) - \alpha_2^i(\mathbf{X}^i))\ln(Q) \quad (i = A, B)$$

where

$$\alpha_1^i(\mathbf{X}^i) = \frac{\exp(\alpha_1^{i'}\mathbf{X}^i)}{1+\exp(\alpha_1^{i'}\mathbf{X}^i)+\exp(\alpha_2^{i'}\mathbf{X}^i)}; \quad \alpha_2^i(\mathbf{X}^i) = \frac{\exp(\alpha_2^{i'}\mathbf{X}^i)}{1+\exp(\alpha_1^{i'}\mathbf{X}^i)+\exp(\alpha_2^{i'}\mathbf{X}^i)}$$

For simplicity, let $\mathbf{X}^i$ denotes a vector of sociodemographic characteristics containing a constant other characteristics of spouse i such as his/her age and education as well as the number of children in the household. Since I have assumed that preferences are invariant to marital status, the preferences of single mothers and fathers are the same as the preferences of their married counterparts, thereby implying the same parametrization for the preferences of both types of parents.

Home Production Technology

For two-parent households, I use the following constant returns to scale specification to describe the household's production technology

$$Q = F_Q(h_D^A, h_D^B) = [\psi(\mathbf{S})(h_D^A)^\gamma + (1-\psi(\mathbf{S}))(h_D^B)^\gamma]^{\frac{\rho}{\gamma}}(q^D)^{1-\rho} \quad \text{where} \quad \psi(\mathbf{S}) = \frac{\exp(\psi'\mathbf{S})}{1+\exp(\psi'\mathbf{S})}$$

I let $\mathbf{S}$ denote a vector of production shifters including a constant and the number of children in the household attending school. Furthermore, as in Lise and Yamada (2019), I let $\rho \in [0,1]$ and $\gamma \leq 1$.

For households headed by a single parent, I assume that the production function can be characterized as by the following CES specification

$$Q = [\phi^i(\mathbf{S})(h_D^i)^{\beta^i} + (1-\phi^i(\mathbf{S}))(q^D)^{\beta^i}]^{\frac{1}{\beta^i}} \quad \text{where} \quad \phi^i(\mathbf{S}) = \frac{\exp(\phi^{i'}\mathbf{S})}{1+\exp(\phi^{i'}\mathbf{S})} \tag{2.14}$$

where, as in the production function of two-parent households, $\mathbf{S}$ denotes a vector of production shifters. To distinguish between single men and women, I estimate this separately for single mothers and for single fathers to allow for ϕ^i and β^i to vary by gender.

Pareto weight

I parametrize the Pareto weight of the collective model for two-parent households in the following way

$$\lambda(w^A, w^B, y, \mathbf{z}) = \frac{\exp(\lambda_0 + \lambda_1(w^A/w^B) + \lambda_2 y + \lambda_3' \mathbf{z})}{1 + \exp(\lambda_0 + \lambda_1(w^A/w^B) + \lambda_2 y + \lambda_3' \mathbf{z})}$$

where $\lambda(w^A, w^B, y, \mathbf{z})$ will be denoted as $\lambda(\mathbf{z})$ hereafter under the understanding that this primitive is dependent upon w^A, w^B and y but the primary sources of variation for its identification will be stemming from $\mathbf{z}$. Throughout the estimation of the model, I use the wife's share of non-labor income (which contains the variation induced by program participation through variation in transfer size as described in Section 2.2) and the state-level, age-specific sex ratios as distribution factors.

Optimality Conditions

Given the parametric specification adopted, I derive the three sets of optimality conditions for two-parent households mentioned in Section 2.2. I begin by deriving the conditions for single-parent households by first focusing on productive efficiency. Given the parametrization imposed so far on these households' production technology, these conditions show that the ratio of the input prices govern the ratio of the inputs used by the household in the production

of Q.

$$\frac{\phi^i(\mathbf{S})}{1-\phi^i(\mathbf{S})}\left(\frac{h_D^i}{q^D}\right)^{\beta^i-1}=w^i \tag{2.15}$$

Then deriving the optimality condition related to private consumption

$$\frac{\alpha_1^i(\mathbf{X})}{\alpha_2^i(\mathbf{X})}\frac{q^i}{l^i}=w^i \tag{2.16}$$

To then focus on the optimality conditions governing public consumption

$$\frac{\alpha_1^i(\mathbf{X})[\phi^i(\mathbf{S})(h_D^i)^{\beta^i}+(1-\phi^i(\mathbf{S}))(q^D)^{\beta^i}]}{(1-\alpha_1^i(\mathbf{X})-\alpha_2^i(\mathbf{X}))\phi^i(\mathbf{S})}\frac{(h_D^i)^{1-\beta^i}}{l^i}=1 \tag{2.17}$$

$$\frac{\alpha_2^i(\mathbf{X})[\phi^i(\mathbf{S})(h_D^i)^{\beta^i}+(1-\phi^i(\mathbf{S}))(q^D)^{\beta^i}]}{(1-\alpha_1^i(\mathbf{X})-\alpha_2^i(\mathbf{X}))(1-\phi^i(\mathbf{S}))}\frac{(q^D)^{1-\beta^i}}{q^i}=1 \tag{2.18}$$

I then proceed to derive the optimality conditions for two-parent households. As in the case of single-parent households, I begin by focusing on the conditions related to productive efficiency for which, given the production function's parametrization, I find that the ratios with which the inputs of production are used are governed by the ratio of their prices. For parental time, these ratios are re-weighted by their relative productivity in domestic production, captured by $\psi(\mathbf{S})$, by the coefficient of substitution γ and by the production share or parental time ρ.

$$\frac{\psi(\mathbf{S})}{1-\psi(\mathbf{S})}\left(\frac{h_D^A}{h_D^B}\right)^{\gamma-1}=\frac{w^A}{w^B} \tag{2.19}$$

$$\psi(\mathbf{S})\frac{\rho}{(1-\rho)}\frac{(h_D^A)^{\gamma-1}q^D}{\psi(\mathbf{S})(h_D^A)^{\gamma}+(1-\psi(\mathbf{S}))(h_D^B)^{\gamma}}=w^A \tag{2.20}$$

$$(1-\psi(\mathbf{S}))\frac{\rho}{(1-\rho)}\frac{(h_D^B)^{\gamma-1}q^D}{\psi(\mathbf{S})(h_D^A)^{\gamma}+(1-\psi(\mathbf{S}))(h_D^B)^{\gamma}}=w^B \tag{2.21}$$

I then focus on the conditions related to private consumption, q^i and l^i. Given the parametrization imposed on preferences, these conditions show that the ratio of the spouses' leisure hours $\frac{l^A}{l^B}$ is governed not only by the ratio of their wages but also by their relative bargaining power within the household $\lambda(\mathbf{z})$.

$$\frac{\alpha_1^A(\mathbf{X})}{\alpha_2^A(\mathbf{X})}\frac{q^A}{l^A} = w^A; \quad \frac{\alpha_B^1(\mathbf{X})}{\alpha_2^B(\mathbf{X})}\frac{q^B}{l^B} = w^B; \quad \left(\frac{\lambda(\mathbf{z})}{1-\lambda(\mathbf{z})}\right)\frac{\alpha_1^A(\mathbf{X})}{\alpha_1^B(\mathbf{X})}\frac{l^B}{l^A} = \frac{w^A}{w^B}; \quad \left(\frac{\lambda(\mathbf{z})}{1-\lambda(\mathbf{z})}\right)\frac{\alpha_2^A(\mathbf{X})}{\alpha_2^B(\mathbf{X})}\frac{q^B}{q^A} = 1 \tag{2.22}$$

Lastly, I derive the conditions related to public consumption, connecting the household's marginal utility for public consumption, the spouses' marginal productivity at home and their marginal utility for leisure.

$$\lambda(\mathbf{z})\frac{\alpha_1^A(\mathbf{X})}{l^A} = \frac{\psi(\mathbf{S})\rho(h_D^A)^{\gamma-1}[\lambda(\mathbf{z})(1-\alpha_1^A(\mathbf{X})-\alpha_2^A(\mathbf{X}))+(1-\lambda(\mathbf{z}))(1-\alpha_1^B(\mathbf{X})-\alpha_2^B(\mathbf{X}))]}{[\psi(\mathbf{S})(h_D^A)^{\gamma}+(1-\psi(\mathbf{S}))(h_D^B)^{\gamma}]} \tag{2.23}$$

$$(1-\lambda(\mathbf{z}))\frac{\alpha_1^B(\mathbf{X})}{l^B} = \frac{(1-\psi(\mathbf{S}))\rho(h_D^B)^{\gamma-1}[\lambda(\mathbf{z})(1-\alpha_1^A(\mathbf{X})-\alpha_2^A(\mathbf{X}))+(1-\lambda(\mathbf{z}))(1-\alpha_1^B(\mathbf{X})-\alpha_2^B(\mathbf{X}))]}{[\psi(\mathbf{S})(h_D^A)^{\gamma}+(1-\psi(\mathbf{S}))(h_D^B)^{\gamma}]} \tag{2.24}$$

$$\lambda(\mathbf{z})\frac{\alpha_2^A(\mathbf{X})}{q^A} = \frac{(1-\rho)[\lambda(\mathbf{z})(1-\alpha_1^A(\mathbf{X})-\alpha_2^A(\mathbf{X}))+(1-\lambda(\mathbf{z}))(1-\alpha_1^B(\mathbf{X})-\alpha_2^B(\mathbf{X}))]}{q^D} \tag{2.25}$$

I then exploit the inclusion of a production shifter, s_j, and the use of the wife's share of non-labor income, z^A, as a distribution factor to derive the experimental moments by taking the derivatives of some of these conditions with respect to z^A and s_j. I begin by taking the derivative of the optimality conditions relating productive efficiency for single-parent and two-parent households in 2.15 and 2.19, respectively. For the former, I focus on the spouses'

home time ratios and for the latter I focus on the parental time to monetary investments ratio and take the derivative of these conditions with respect to s_j. Letting $\Delta_{s_j}^{h_D}(d) = \frac{\partial}{\partial s_j}\left[\frac{h_D^A}{h_D^B}\right]$ and $\Delta_{s_j}^{h_D,q^D}(d) = \frac{\partial}{\partial s_j}\left[\frac{h_D^A}{q^D}\right]$.

$$\Delta_{s_j}^{h_D}(d) = -\frac{1}{1-\gamma}\left(\frac{w^B}{w^A}\frac{\psi(\mathbf{S})}{(1-\psi(\mathbf{S}))}\right)^{\frac{1}{1-\gamma}}\frac{\partial\psi(\mathbf{S})}{\partial s_j} \tag{2.26}$$

$$\Delta_{s_j}^{h_D,q^D}(d) = -\frac{1}{1-\beta^i}\left((w^A)^{\frac{1}{\beta^i}}\left(\frac{(1-\phi^i(\mathbf{S}))}{\phi^i(\mathbf{S})}\right)^{\frac{\beta^i}{1-\beta^i}}\frac{\partial\phi^i(\mathbf{S})}{\partial s_j}\right) \tag{2.27}$$

Intuitively, for two-parent households, 2.26 captures the response of $\frac{h_D^A}{h_D^B}$ to changes in the production shifter, s_j. Thus, capturing the extent to which the production shifter can be used to affect the degree of gender specialization within the household. For single-parent households, 2.27 captures the response of $\frac{h_D^A}{q^D}$ to changes in the production shifter s_j.

I then focus on two-parent households to take the derivative of the third condition related to private consumption in 2.22 and the conditions related to public consumption in 2.23 and 2.24 with respect to z^A. Letting $\Delta_{z^A}^{l}(d) = \frac{\partial}{\partial z^A}\left[\frac{l^A}{l^B}\right]$, $\Delta_{z^A}^{l,h_D}(d,A) = \frac{\partial}{\partial z^A}\left[\frac{l^A}{h_D^A}\right]$ and $\Delta_{z^A}^{l,h_D}(d,B) = \frac{\partial}{\partial z^A}\left[\frac{l^B}{h_D^B}\right]$, I define the following conditions

$$\Delta_{z^A}^{l}(d) = \frac{\partial\lambda(\mathbf{z})}{\partial z^A}\frac{1}{(1-\lambda(\mathbf{z}))^2}\frac{\alpha_1^A(\mathbf{X})}{\alpha_1^B(\mathbf{X})}\frac{w^B}{w^A} \tag{2.28}$$

$$\Delta_{z^A}^{l,h_D}(d,A) = \frac{\partial\lambda(\mathbf{z})}{\partial z^A}\frac{\alpha_1^A(\mathbf{X})(1-\alpha_1^A(\mathbf{X})-\alpha_2^A(\mathbf{X}))[\psi(\mathbf{S})+(1-\psi(\mathbf{S}))(h_D^B/h_D^A)^\gamma]}{C_1^2\rho\psi(\mathbf{S})} \tag{2.29}$$

$$\Delta_{z^A}^{l,h_D}(d,B) = -\frac{\partial\lambda(\mathbf{z})}{\partial z^A}\frac{\alpha_1^B(\mathbf{X})(1-\alpha_1^B(\mathbf{X})-\alpha_2^B(\mathbf{X}))[\psi(\mathbf{S})(h_D^A/h_D^B)^\gamma+(1-\psi(\mathbf{S}))]}{C_1^2\rho(1-\psi(\mathbf{S}))} \tag{2.30}$$

The condition in 2.28 captures the extent to which shifts in the distribution factor z^A can affect the intrahousehold allocation of leisure hours between spouses. Similarly, the conditions in 2.29 and 2.30 capture the extent to which shifts in the distribution factor can affect the spouses' leisure-to-home time ratios. A motivation for using these conditions in the estimation

procedure is based on the results presented in Section 1.3, participation in *Oportunidades* had an impact on this ratio for mothers by inducing an increase in their leisure hours stemming from the significant decrease observed in their home production hours.

I then exploit the fact that the conditions in 2.23 and 2.24 are also a function of the production shifter, s_j so that I also take the derivative of these two conditions with respect to s_j to obtain two additional exogenous moments. Letting $\Delta_{s_j}^{l,h_D}(d,A) = \frac{\partial}{\partial s_j}\left[\frac{l^A}{h_D^A}\right]$ and $\Delta_{s_j}^{l,h_D}(d,B) = \frac{\partial}{\partial s_j}\left[\frac{l^B}{h_D^B}\right]$, I derive the following

$$\Delta_{s_j}^{l,h_D}(d,A) = \frac{\lambda(\mathbf{z})\alpha_1^A(\mathbf{X})}{\rho C_1}\left(\frac{1-\psi(\mathbf{S})}{\psi(\mathbf{S})}\left[\left(\frac{w^A}{w^B}\right)^{\frac{1}{1-\gamma}}\frac{1}{1-\gamma}\left(\frac{1-\psi(\mathbf{S})}{\psi(\mathbf{S})}\right)^{\frac{\gamma}{1-\gamma}}\frac{\partial\psi(\mathbf{S})}{\partial s_j}\right]\right) \tag{2.31}$$

$$\Delta_{s_j}^{l,h_D}(d,B) = -\frac{(1-\lambda(\mathbf{z}))\alpha_1^B(\mathbf{X})}{\rho C_1}\left(\frac{\psi(\mathbf{S})}{1-\psi(\mathbf{S})}\left[\left(\frac{w^A}{w^B}\right)^{\frac{1}{\gamma-1}}\frac{1}{1-\gamma}\left(\frac{1-\psi(\mathbf{S})}{\psi(\mathbf{S})}\right)^{\frac{\gamma}{1-\gamma}}\frac{\partial\psi(\mathbf{S})}{\partial s_j}\right]\right) \tag{2.32}$$

As in the conditions in 2.29 and 2.30, the conditions in 2.31 and 2.32 capture changes in the spouses' leisure-to-home time ratios with the only difference is that these relate to changes in the production shifter s_j.

2.4.3 Estimation

Step 1

The first step of the estimation procedure involves quantifying the experimental estimates captured in the left-hand side of the conditions presented in 2.26-2.32 using the experimental variation of the *Oportunidades* program. While this step is motivated by the empirical evidence presented in Section 2.3, I take an additional step in using the participation in the program to provide the empirical counterpart of the derivatives captured by these conditions

exploiting the administrative information I have on the bi-monthly cash disbursements made to participant households. This approach resembles the one adopted in Attanasio, Meghir and Santiago (2012) who use information on the size of the education grants within a structural estimation strategy. As before, the chosen estimator for the evaluation of the program is based on the MDID estimator described in Section 1.4.2 with an adjustment made to allow for interacting the MDID interaction term with the continuous variable capturing the size of the transfer, say z_{it}. Formally, this involves estimating the following regression

$$y_{it} = \beta_0 + \beta_1 d_i + \beta_2 Post_t + \beta_3 (d_i \times Post_t) + \beta_4 (d_i \times Post_t \times z_{it}) + \epsilon_{it} \tag{2.33}$$

over a sample that has been matched using the propensity score that captures the households' likelihood to participate in *Oportunidades*.[26] In terms of notation, I let y_{it} denote $\frac{l^A_{it}}{l^B_{it}}$, $\frac{l^A_{it}}{l^B_{it}}$, $\frac{l^A_{it}}{h^A_{D,it}}$, $\frac{l^B_{it}}{h^B_{D,it}}$, $\frac{h^A_{D,it}}{h^B_{D,it}}$ and $\frac{h^A_{D,it}}{q^D_{it}}$. I make a distinction of what I use as z_{it} for the two types of households described in Section 2.2. For two-parent households, I use z^A_{it} as the variable capturing information on the size of the transfer given that the transfer is placed in the hands of mothers in their role as transfer holders. For single-parent households, I directly use information on the transfer size as z_{it}. Thus, β_4 serves to capture the heterogeneous impact of the program on y_{it} based on the transfer size received by the household. Thus, I can interpret β_4 as the estimate for $\Delta^l_{z^A}(d)$, $\Delta^{l,h_D}_{z^A}(d, A)$, $\Delta^{l,h_D}_{z^A}(d, B)$, $\Delta^{h_D}_{z^A}(d)$ and $\Delta^{h_D,q^D}_{z^A}(d)$ by letting y_{it} denote the corresponding time and consumption ratios of interest highlighted in 2.4.2.

However, an intermediate step is needed for obtaining estimates of the derivatives with respect to s_j. Again, the goal is to explicitly use the exogenous variation provided by the program to identify the model, for which I define these derivatives in terms of the program's

[26] At this stage, I build upon the matching procedure implemented in the evaluation of the program's impact on observed household behavior presented in Section 1.3.

indirect effect on s_j. For this, I can first start by recovering the effect of the transfer size on the relevant ratio by using 2.33. I can then estimate the effect of z^A on s_j using a similar specification:

$$s_{j,it} = \beta_{s0} + \beta_{s1} d_i + \beta_{s2} Post_t + \beta_{s3}(d_i \times Post_t) + \beta_{s4}(d_i \times Post_t \times z_{it}) + \xi_{it} \tag{2.34}$$

It is then possible to obtain an estimate of $\Delta^y_{s_j}$ by using $\frac{\beta_4}{\beta_{s4}}$. The intuition follows from applying the chain rule to $\frac{\partial y}{\partial z^A}$ so that $\frac{\partial y}{\partial z^A} = \frac{\partial y}{\partial s_j}\frac{\partial s_j}{\partial z^A}$ implies that I can write down $\frac{\partial y}{\partial s_j} = \frac{\partial y}{\partial z^A} / \frac{\partial s_j}{\partial z^A}$. In this way, I can capture the effect of the production shifters on the relevant ratios exploiting the variation induced by *Oportunidades*. With this, I complete the set of experimental moments captured in conditions 2.26-2.32. Thus, this stage then yields the estimates for $\hat{\Delta}^l_{z^A}(d)$, $\hat{\Delta}^{l,h_D}_{s_j}(d, A)$, $\hat{\Delta}^{l,h_D}_{s_j}(d, B)$, $\hat{\Delta}^{l,h_D}_{z^A}(d, A)$, $\hat{\Delta}^{l,h_D}_{z^A}(d, B)$, and $\hat{\Delta} {s_j}^{h_D}(d)$ for two-parent households and $\Delta^{h_d,q^D}_{s_j}(d)$ for single-parent households which I then take to the second step of the estimation strategy.

Step 2

This step consists of implementing a two-step estimator, described by Newey and McFadden (1994) as a sequential GMM estimator, which closely follows the parametric identification analysis presented in Section B.3. I partition the parameter vector into two: one containing only the home production parameters, denoted by θ_1 and the other one containing the preference and Pareto weight parameters, denoted by θ_2. In the first stage, which I call Step 2A, I implement the following GMM estimator for the production function of the two types

of households considered

$$\hat{\boldsymbol{\theta}}_1^{GMM} = \arg\min_{\boldsymbol{\theta}} Q_N^{(1)}(\boldsymbol{\theta}_1)$$
$$\text{where } \; Q_N^{(1)}(\boldsymbol{\theta}_1) = \left[\frac{1}{N}\sum_{n=1}^{N} \mathbf{g}(\mathbf{S}_n, \boldsymbol{\Delta}, \boldsymbol{\theta}_1)\right]' \boldsymbol{W}_N \left[\frac{1}{N}\sum_{n=1}^{N} \mathbf{g}(\mathbf{S}_n, \boldsymbol{\Delta}, \boldsymbol{\theta}_1)\right]$$

where $\boldsymbol{\theta}_1 = \boldsymbol{\theta}_1^M = (\rho, \gamma, \boldsymbol{\psi})$ for two-parent households and $\boldsymbol{\theta}_1 = \boldsymbol{\theta}_1^S = (\beta, \boldsymbol{\phi})$ for single-parent households. Furthermore, $\mathbf{g}()$ contains the orthogonality conditions described in 2.16 and 2.19-2.21 for single-parent and two-parent households, respectively. $\mathbf{W}_N$ is a symmetric positive definite weighting matrix, for which I use an optimal weight matrix, evaluating the differences between the data and theoretical moments used in this stage by first implementing a version of the estimator in which the weight matrix used is the identity matrix $\mathbf{I}_N$, so that

$$W_N = g(\mathbf{S}, \hat{\boldsymbol{\theta}}_1, \boldsymbol{\Delta}) g(\mathbf{S}, \hat{\boldsymbol{\theta}}_1, \boldsymbol{\Delta})'$$

In the second stage, which I call Step 2B, I implement the following GMM estimator for parental preferences and the Pareto weight using the results for the production function parameters obtained in Step 2A

$$\hat{\boldsymbol{\theta}}_2^{GMM} = \arg\min_{\boldsymbol{\theta}} Q_N^{(2)}(\hat{\boldsymbol{\theta}}_1, \boldsymbol{\theta}_2)$$
$$\text{where } \; Q_N^{(2)}(\hat{\boldsymbol{\theta}}_1, \boldsymbol{\theta}_2) = \left[\frac{1}{N}\sum_{n=1}^{N} \mathbf{h}(\mathbf{X}_n, \mathbf{z}_n, \boldsymbol{\Delta}, \hat{\boldsymbol{\theta}}_1, \boldsymbol{\theta}_2)\right]' \boldsymbol{W}_N \left[\frac{1}{N}\sum_{n=1}^{N} \mathbf{h}(\mathbf{X}_n, \mathbf{z}_n, \boldsymbol{\Delta}, \hat{\boldsymbol{\theta}}_1, \boldsymbol{\theta}_2)\right]$$

where $\boldsymbol{\theta}_1 = (\boldsymbol{\lambda}, \boldsymbol{\alpha}^{\boldsymbol{A}}, \boldsymbol{\alpha}^{\boldsymbol{B}}, \rho, \boldsymbol{\psi})$ and where $\boldsymbol{\theta}_2 = (\boldsymbol{\lambda}, \boldsymbol{\alpha}^{\boldsymbol{A}}, \boldsymbol{\alpha}^{\boldsymbol{B}})$. and $\hat{\boldsymbol{\theta}}_1 = [\boldsymbol{\theta}_1^M \boldsymbol{\theta}_1^S] = (\hat{\rho}, \hat{\gamma}, \hat{\boldsymbol{\psi}}, \hat{\beta}, \hat{\boldsymbol{\phi}})$ are the estimates obtained in Step 2A. Furthermore, $\mathbf{h}()$ contains the orthogonality conditions derived from the optimality conditions and $\mathbf{W}_N$ is a symmetric positive definite weighting matrix for which I use an optimal weight matrix. I estimate $\mathbf{W}_N$ by implementing a correction to the standard weight matrix used in a simple GMM to account for the fact that the estimator

being used is a two-step one. This correction is based upon the results of Newey and McFadden (1994) for the asymptotic variance of two-step GMM estimators to correct for the efficiency loss incurred by the two-step nature of the estimator. For this matter, I use the following as the optimal weight matrix throughout the estimation process:

$$W_N = \{h(\mathbf{X}, \mathbf{z}, \hat{\boldsymbol{\theta}}_1, \hat{\boldsymbol{\theta}}_2, \boldsymbol{\Delta}) + G_{\theta_1}\xi(\mathbf{S})\}\{h(\mathbf{X}, \mathbf{z}, \hat{\boldsymbol{\theta}}_1, \hat{\boldsymbol{\theta}}_2, \boldsymbol{\Delta}) + G_{\theta_1}\xi(\mathbf{S})\}'$$

where

$$G_{\theta_1} = \nabla_{\theta_1} h(\mathbf{X}, \mathbf{z}, \hat{\boldsymbol{\theta}}_1, \hat{\boldsymbol{\theta}}_2, \boldsymbol{\Delta})$$
$$\xi(\mathbf{S}) = -(\nabla_{\theta_1} g(\mathbf{S}, \hat{\boldsymbol{\theta}}_1, \boldsymbol{\Delta}))^{-1} g(\mathbf{S}, \hat{\boldsymbol{\theta}}_1, \boldsymbol{\Delta})$$

where $h(\cdot)$ denotes the objective function (set of moment conditions) used in the GMM implemented in the second step of the estimator and $g(\cdot)$ denotes the objective function used in the GMM implemented in the first step of the estimator. Furthermore, $\boldsymbol{\theta_1} = (\rho, \gamma, \boldsymbol{\psi}, \beta^A, \boldsymbol{\phi}^A, \beta^B, \boldsymbol{\phi}^B)$ and $\boldsymbol{\theta}_2 = (\boldsymbol{\lambda}, \boldsymbol{\alpha}_1^A, \boldsymbol{\alpha}_2^A, \boldsymbol{\alpha}_1^B, \boldsymbol{\alpha}_2^B)$. Thus, the individual components of the correction take into consideration both the sensitivity of the moments used in the second-step GMM to the set of pre-estimated parameters and how well the parameter estimates obtained in the first-step GMM fit the moments used in that first step.

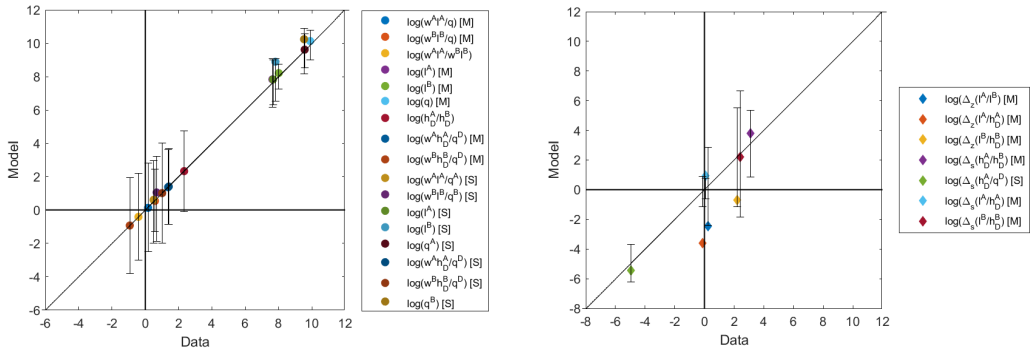
Throughout the estimation procedure, I use the two-step nature of the estimator to define four different specifications characterized by the exclusion/inclusion of the experimental moments described in 2.26-2.32 either in Step 2A or Step 2B. That is, these specifications are distinguished by the orthogonality conditions included in $\mathbf{g}$ and $\mathbf{h}$, respectively. The first specification excludes all the experimental conditions and, therefore, relies solely on the orthogonality conditions derived from the optimality conditions from the two types of households. The second specification includes 2.26 and 2.27 in the orthogonality conditions of

Step 2A estimated over the two-parent and single-parent households sub-samples, respectively but does not use any experimental condition in Step 2B. The third specification does not use any experimental moment in Step 2A but includes the experimental moments described in 2.28-2.30 in the orthogonality conditions of Step 2B. Lastly, the fourth specification, which is chosen as the preferred specification, includes 2.26 and 2.27 in Step 2A and 2.28-2.30 in Step 2B. To test the external validity of the model, 2.31 and 2.32 are left untargeted in Step 2B in all specifications considered. Furthermore, as in Lise and Yamada (2019), the orthogonality conditions used to form the respective GMM objective functions are derived by taking logs of the targeted optimality conditions and of the derived experimental moments.

Model Fit by Specifications Used

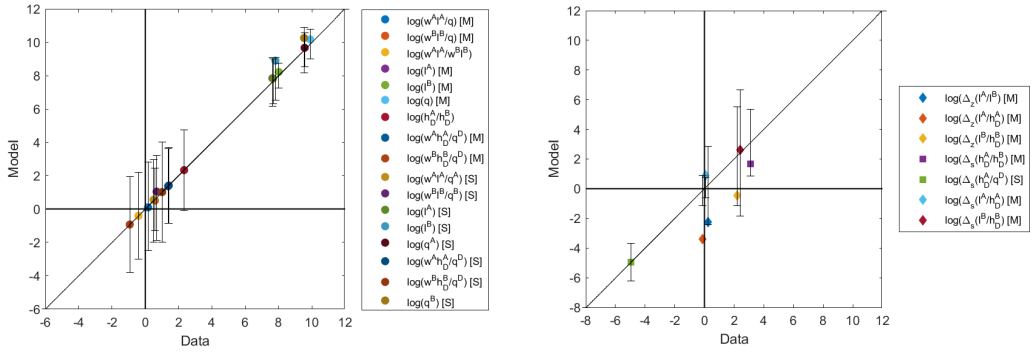
Upon the estimation of the model, I proceed to check how well the model fits the moments targeted in all four specifications considered. For the purpose of assessing the external validity of the model, I also check how well the model fits moments that were left untargeted in the estimation procedure. When implementing these model fit checks, I make a distinction between the *theoretical moments* derived from the optimality conditions that are targeted in all of the specifications considered and the experimental moments that are obtained from the impact of *Oportunidades* on parents' home production and leisure hours. Figure 2.1 - Figure 2.4 present the model fit checks implemented for each of the specifications. For the experimental moments, there is a further distinction between those that are untargeted in each specification (represented by diamonds) and those that were targeted (represented by squares) in each of the specifications considered.

Figure 2.1: Theoretical and Experimental Moments, Specification 1



Theoretical Moments Experimental Moments

Figure 2.2: Theoretical and Experimental Moments, Specification 2

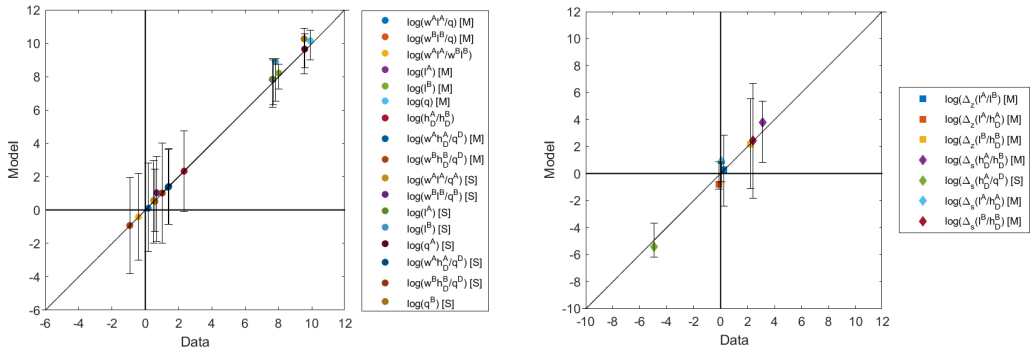


Theoretical Moments Experimental Moments

All specifications seem to be fitting the theoretical moments relatively well.[27] The only theoretical moments that seem to be off are the ones related to single-father households. However, this might be expected given that these households represent a relatively small share of the estimation sample (around 8% of the observations) so that most of the estimation related to fathers' preferences might be driven by the sample of married fathers. Overall, the model seems to be over-predicting single fathers' leisure hours and private market consumption.

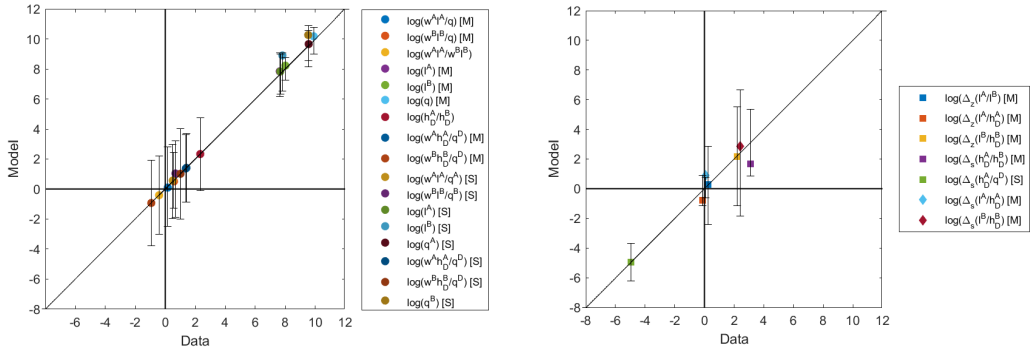
[27]Each of the graphs containing the model fit checks include their corresponding confidence intervals around the 45° line plotted, showing the extent to which the model predictions can deviate from the ones observed in the data for it to be considered a proper fit.

Figure 2.3: Theoretical and Experimental Moments, Specification 3



Theoretical Moments Experimental Moments

Figure 2.4: Theoretical and Experimental Moments, Specification 4



Theoretical Moments Experimental Moments

The model hits the experimental moments related to the effect of *Oportunidades* on the leisure-to-home time ratios of both fathers and mothers through the effect on the production shifter (number of children attending school) the fact that these remain untargeted in all of the specifications. However, specifications 1 and 2 fail to fit the experimental moments related to the effect of *Oportunidades* on the spouses' leisure ratio, and their individual leisure-to-home time ratios through the program's effect on the distribution factor z^A (i.e. the mothers' share of non-labor income). Both specifications 3 and 4 target these remaining experimental moments, improving the model fit in this regard as even though the model

seems to be slightly under-predicting the effect of the program on mothers' leisure-to-home time ratio through its effect on z^A, this still constitutes a better fit than the one yielded by specifications 1 and 2. As aforementioned, a significant difference in the results obtained from specifications that leave these moments untargeted and these that target them is that I obtain a coefficient for z^A in the Pareto weight that is higher in the ones in which these moments are targeted. Thus, when evaluating policies aimed at using z^A as a lever of mothers' empowerment to induce changes in household behavior, the first two specifications would underestimate these policies' impact on the Pareto weight.

Regarding the moments related to the program's impact on the domestic input ratios through the effect on the production shifter for both two-parent and single-parent households, I can see that specifications that target the experimental moment for single-parent households fit this moment better. However, this is not necessarily the case for two-parent households as it seems that the specifications that do not target this moment seem to fit it slightly better. For specifications 2 and 4 that target this moment, the model seems to slightly under-predict the magnitude of this effect within two-parent households.

Overall, I find that the specifications that target the experimental moments related to the impact of *Oportunidades* on spouses' leisure and leisure-to-home time ratios through its effect on the distribution factor do a relatively better job at fitting the data than the specifications that leave these moments untargeted. In order to exploit the use of the exogenous variation of the program in both steps of the GMM estimator implemented, I choose the fourth specification to carry out the evaluation of the program's impact on intrahousehold bargaining and individual welfare.

2.4.4 Results

Step 1

Table 2.4 presents the intermediate step implemented to compute the experimental moments described in Section 2.4.2 that are targeted in the GMM estimation implemented in the second stage. I find that effectively, participation in *Oportunidades* significantly increased the amount of mothers' leisure hours to fathers' through its impact on the wife's share of non-labor income. Similarly, I find that participation in *Oportunidades* interacted with mothers' share of non-labor income significantly increased mothers' leisure-to- home time ratio and the number of children attending school. The latter effect is observed within both two-parent and single-mother households, though for the latter, the effect is mediated through the size of the transfer. Furthermore, I find a negative, though statistically insignificant, relationship between mothers' share of non-labor income upon participation in the program and fathers' leisure to home time ratios. I document a similar statistically insignificant negative relationship with parents' relative time spent in home production.[28]

Table 2.4: Overall Impact of the *Oportunidades* Transfer on Beneficiary Households

	Two-Parent					*Single-Mother*		
	l^A/h_D^A	l^A/l^B	l^B/h_D^B	h_D^A/h_D^B	s_j	l^A/h_D^A	q^D/h_D^A	s_j
$d_i \times Post_t \times z_{it}$	0.411*	1.227**	-1.710	-9.207	0.934**	7.658e-05	0.022***	1.797e-04***
	(0.211)	(0.586)	(16.678)	(8.619)	(0.416)	(5.886e-05)	(0.005)	(2.180e-05)
N	474	474	474	474	474	640	640	640

[28]It is worth noting that I can use the negative coefficients associated with the interaction of the MDID and z_{it}^A for l^B/h_D^B and h_D^A/h_D^B as orthogonality conditions in the GMM requiring transforming these into logarithmic terms since the theoretical counterparts of these moments derived through the model are negatively signed given the parametric specification adopted. Thus, when taking logs to generate these orthogonality conditions, the negative terms are offset and the conditions properly defined.

Step 2

Table 2.5 presents the results obtained from the two-step GMM estimator implemented in the second stage of the estimation described above. I break down the discussion of these results into different sets of parameters, those related to home production, those related to parental preferences and those related to the bargaining structure of two-parent households.

Home Production

For two-parent households, I find that women are, on average, equally or more productive at home than fathers. Furthermore, when comparing single and married mothers, I find that married mothers are, on average, more productive than their single counterparts. This ties back to one of the conditions facilitating the result outlined in Proposition 3 of Section 2.4.1. Among single parents, however, I find that when using the estimates obtained from the specifications including the experimental variation of *Oportunidades* in Step 2A mothers are, on average, more productive at home than their male counterparts. The opposite holds when I exclude the experimental variation of the program in Step 2A for single parents.

Focusing on the preferred specification presented in the fourth column, I find that the production shifter affects mothers' productivity at home differently depending on their marital status. For married mothers, I find that as the number of children attending school slightly increases their productivity at home. On the other hand, I find that children's school attendance decreases single mothers' productivity at home. A similar result holds for single fathers. It is worth noting that this is in accordance with the conditions outlined in Proposition 3 of the non-parametric identification analysis discussed in Section 2.4.1. Moreover, this is also going to have significant implications for the assessment of the impact of *Oportunidades* on individual welfare presented in Section 2.5 since the MMWI captures

the extent to which mothers' productivity is affected by the program's effect on children's school attendance when moving from collectivity to singlehood.

Preferences

With respect to parental preferences, I find that mothers, on average, have a lower utility weight on leisure than fathers and that the utility weight attached to private market consumption is slightly higher for mothers than for fathers. I now focus on assessing the premise that mothers tend to have a higher preference for public consumption than fathers. Within the parametric specification adopted in the analysis, I define the utility weight attached to the public domestic good is as $1-\alpha_1^i(\mathbf{X})-\alpha_2^i(\mathbf{X})$ for $(i = A, B)$. Based on the estimates obtained from all four specifications, I find that mothers do assign a higher utility weight to the consumption of the public good Q. Evaluated at the sample mean, I find that this utility weight among mothers is 0.398, 0.395, 0.389, and 0.389. On the other hand, evaluated at the sample mean for fathers, this weight is 0.071, 0.072, 0.066, and 0.064.

I then proceed to investigate how differences in parents' sociodemographic characteristics affect their preferences for leisure, private consumption and the public domestic good. Focusing on the chosen specification, I find that the number of children in the household increases both parents' preference for the domestic public good through a reduction on the utility weights attached to both leisure and private consumption. Similarly, I find that parental education increases the utility weight attached to the public good. Furthermore, while fathers' age increases their preference for the public good, I find that the opposite holds for mothers.

Pareto Weight

Regarding the decision-making structure of two-parent households, I now focus on the results obtained for the Pareto weight. Using the estimates obtained from the four specifications considered and evaluated at the sample mean, I find that the Pareto weight attached to

Table 2.5: Structural Estimation Results, Model with Home Production

	(1)		(2)		(3)		(4)	
	Estimate	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**
Home Production Parameters, Two-Parent HHs:								
γ	0.8545	4.194E-06	0.9854	1.185E-05	0.8545	4.194E-06	0.9854	1.185E-05
ρ	0.8193	1.279E-06	0.8213	6.459E-07	0.8193	1.279E-06	0.8213	6.459E-07
ψ_2 $[n_s]$	0.1530	5.333E-07	2.480E-09	1.718E-09	0.1530	5.333E-07	2.480E-09	1.718E-09
Sample mean $\psi(\mathbf{S})$ =	0.5750		0.5000		0.5750		0.5000	
Home Production Parameters, Single-Mother HHs:								
β	-1.4809	0.0104	-1.5047	0.0203	-1.4809	0.0104	-1.5047	0.0203
ϕ_2^A $[n_s]$	-0.0300	0.0074	-0.0435	0.0162	-0.0300	0.0074	-0.0435	0.0162
Sample mean $\phi(\mathbf{S})$ =	0.4870		0.4812		0.4870		0.4812	
Home Production Parameters, Single-Father HHs:								
β	-0.7525	0.0532	-0.7912	0.2633	-0.7525	0.0532	-0.7912	0.2633
ϕ_2^B $[n_s]$	-0.0449	0.0138	-0.1299	0.0963	-0.0449	0.0138	-0.1299	0.0963
Sample mean $\phi(\mathbf{S})$ =	0.4929		0.4794		0.4929		0.4797	
Wife's Preference for Leisure Parameters:								
$\alpha_{1,1}^A$ [Constant]	-0.0713	0.0459	-0.0756	0.0001	0.0477	0.0108	0.0455	0.0049
$\alpha_{1,2}^A$ [Age]	0.0105	1.6714	0.0103	0.0018	0.0086	0.4121	0.0085	0.1799
$\alpha_{1,3}^A$ [Education]	-0.0032	0.2679	-0.0031	0.0004	-0.0165	0.0607	-0.0161	0.0287
$\alpha_{1,4}^A$ [Number of Children]	-0.0684	0.1306	-0.0670	0.0002	-0.0572	0.0292	-0.0576	0.0138
Sample mean $\alpha_1^A(\mathbf{X})$ =	0.4143		0.4094		0.4081		0.4067	
Wife's Preference for Private Consumption Parameters:								
$\alpha_{2,1}^A$ [Constant]	-3.1591	0.0515	-3.1433	0.0001	-1.7563	0.0115	-1.7548	0.0057
$\alpha_{2,2}^A$ [Age]	0.0651	1.8566	0.0660	0.0027	0.0377	0.4204	0.0378	0.2134
$\alpha_{2,3}^A$ [Education]	0.0304	0.3022	0.0299	0.0004	-0.0033	0.0665	-0.0029	0.0321
$\alpha_{2,4}^A$ [Number of Children]	0.0138	0.1487	0.0142	0.0002	-0.0397	0.0325	-0.0393	0.0154
Sample mean $\alpha_2^A(\mathbf{X})$ =	0.1882		0.1954		0.2031		0.2047	
Husband's Preference for Leisure Parameters:								
$\alpha_{1,1}^B$ [Constant]	3.2582	0.0262	3.2399	0.0002	3.5966	0.0036	3.6594	0.0010
$\alpha_{1,2}^B$ [Age]	-0.0030	0.9946	-0.0030	0.0061	-0.0012	0.1350	-0.0012	0.0382
$\alpha_{1,3}^B$ [Education]	-0.0693	0.1723	-0.0691	0.0011	-0.0350	0.0248	-0.0365	0.0060
$\alpha_{1,4}^B$ [Number of Children]	-0.1008	0.0658	-0.1028	0.0004	-0.2575	0.0099	-0.2609	0.0021
Sample mean $\alpha_1^B(\mathbf{X})$ =	0.7478		0.7419		0.7890		0.7950	
Husband's Preference for Private Consumption Parameters:								
$\alpha_{2,1}^B$ [Constant]	1.1039	0.0044	1.1125	0.0000	1.3503	0.0004	1.3441	0.0001
$\alpha_{2,2}^B$ [Age]	0.0014	0.1633	0.0012	0.0018	-0.0019	0.0166	-0.0019	0.0053
$\alpha_{2,3}^B$ [Education]	0.0191	0.0420	0.0203	0.0005	0.0186	0.0034	0.0186	0.0010
$\alpha_{2,4}^B$ [Number of Children]	-0.1155	0.0164	-0.1128	0.0002	-0.1907	0.0021	-0.1861	0.0007
Sample mean $\alpha_2^B(\mathbf{X})$ =	0.1812		0.1863		0.1451		0.1413	
Pareto Weight Parameters:								
λ_0 [Constant]	0.6626	0.0026	0.6656	0.0003	0.9002	0.0032	0.9024	0.0020
λ_1 $[w^A/w^B]$	0.0484	0.0021	0.0463	0.0004	0.0457	0.0049	0.0468	0.0030
λ_2 [y]	-0.0076	0.0201	-0.0076	0.0022	0.0049	0.0301	0.0050	0.0175
λ_3 $[z^A]$	0.1064	0.0006	0.1208	0.0001	0.8062	0.0049	0.8098	0.0022
λ_4 [Sex ratio]	-0.6381	0.0023	-0.6336	0.0003	-1.2089	0.0029	-1.2063	0.0018
Sample mean $\lambda(\mathbf{z})$ =	0.5247		0.5266		0.5224		0.5243	
Additional Restriction, Step 2A	No		Yes		No		Yes	
Additional Restriction, Step 2B	No		No		Yes		Yes	

Notes: The normalization imposed for $\psi(\mathbf{S})$, $\phi^A(\mathbf{S})$ and $\phi^B(\mathbf{S})$, render $\psi_1^A = \psi_1^B = 0$, and $\phi_1 = 0$ for both mothers and fathers

mothers' preferences is 0.525, 0.527, 0.522, and 0.524. In particular, I find that both relative market returns (w^A/w^B) and women's contribution to total household income (z^A) significantly increase mothers' bargaining power. While the coefficient attached to the spouses' relative wages is robust across all four specifications (around 0.05), the coefficient attached to the wife's share of non-labor income, the distribution factor I focus on, increases substantially from 0.10 to 0.8 upon the inclusion of the experimental moments related to the effect of *Oportunidades* on the intrahousehold allocation of leisure and home production hours through the change in z^A. That is, the distribution factor is being informative about the responses of the decision-making process to a policy that targets mothers' contribution to non-labor income. Importantly, I find that the estimates for the Pareto weight yielded by these specifications that are consistent with the external validity and non-parametric identification of the model are more robust compared to those of specifications more reliant on functional form. Moreover, I find that the sex ratio I use in the estimation (defined as the number of women per men for different age groups at the state level) decreases women's bargaining power. In this way, I find that as women become relatively more scarce, their bargaining power increases. This is consistent with empirical evidence in the literature documenting a significant relationship between women's empowerment and sex ratios, such as in Chiappori, Fortin and Lacroix (2002).

2.5 Intrahousehold Gender Inequality and Gender-Targeted Policies

Throughout this section, I focus on quantifying bargaining power and individual welfare within two-parent households as described in Section 2.2 using the estimates obtained in Section 2.4.4. The measures of individual welfare include the conditional sharing rule (CSR) and

the money metric welfare index (MMWI). The first measure captures the amount monetary resources available to each decision maker for their own private consumption as a result of a bargaining process in which total household resources are allocated among spouses. Intuitively, the higher the bargaining power of a decision maker, the higher the amount of resources he or she should be able to secure for his or her own consumption. While the CSR constitutes a form of money metric utility, it disregards the utility parents derive from public consumption by focusing on private consumption. This shortcoming of the CSR stems from the decentralization used to derive this measure as it deals with the externalities of public consumption at the household level and fails to provide a way for household members to internalize such externalities. The MMWI, on the other hand, describes the minimum amount of expenditures an individual would need to incur in order to reach the same level of intrahousehold utility reached in collectivity in the case in which he or she were to become single, thereby taking into consideration how the change in living arrangement will ultimately affect not only their private consumption but also their consumption of the public good.

2.5.1 Derivation of Individual Welfare within a Collective Household Framework

I start by providing a more thorough overview of each measure and how these can be derived within the model given the parametrization described in Section 2.4.2. These are the measures computed to implement the intrahousehold inequality analysis to evaluate the *Oportunidades*' impact on individual welfare and assess the extent to which counterfactual policies are effective at empowering mothers and improving their individual welfare.

The Conditional Sharing Rule

As mentioned in Section 2.2, I derive the conditional sharing rule given the parametrization imposed so far by characterizing the household's problem as a two-stage process under the assumption that household outcomes are Pareto efficient. In the first stage, the household solves for ρ^A, ρ^B, and Q. In the second stage, the decision makers then solve for their own l^i and q^i privately taking the solution to the first stage as given. Thus, in the first stage, the household solves

$$\max_{\rho^A,\rho^B,Q} \lambda(\mathbf{z})V^A(w^A,\rho^A,Q) + (1-\lambda(\mathbf{z}))V^B(w^B,\rho^B,Q) \text{ s.t. } \rho^A + \rho^B + P(w^A,w^B;\mathbf{S})Q = y^A + y^B$$

where $P(w^A,w^B;\mathbf{S})Q$ is the cost function coming from the household's production stage which can be written linearly since I have a constant returns to scale production function. Specifically, given the specification imposed so far on the household's production technology, I can derive the per unit cost of producing Q in the following way

$$\begin{aligned} P(w^A,w^B;\mathbf{S}) = \Bigg(\rho^\rho \Bigg[\psi(\mathbf{S})\left(\frac{\psi(\mathbf{S})(w^A)^{-1}}{\psi(\mathbf{S}) + (1-\psi(\mathbf{S}))\left(\frac{1-\psi(\mathbf{S})}{\psi(\mathbf{S})}\frac{w^A}{w^B}\right)^{\frac{\gamma}{1-\gamma}}}\right) \\ + (1-\psi(\mathbf{S}))\left(\frac{(1-\psi(\mathbf{S}))(w^B)^{-1}}{\psi(\mathbf{S})\left(\frac{1-\psi(\mathbf{S})}{\psi(\mathbf{S})}\frac{w^A}{w^B}\right)^{\frac{\gamma}{\gamma-1}} + (1-\psi(\mathbf{S}))}\right)\Bigg]^{\frac{\rho}{\gamma}}(1-\rho)^{1-\rho}\Bigg)^{-1} \\ \times \left(\frac{\psi(\mathbf{S})\rho}{\psi(\mathbf{S}) + (1-\psi(\mathbf{S}))\left(\frac{1-\psi(\mathbf{S})}{\psi(\mathbf{S})}\frac{w^A}{w^B}\right)^{\frac{\gamma}{1-\gamma}}} + \frac{(1-\psi(\mathbf{S}))\rho}{\psi(\mathbf{S})\left(\frac{1-\psi(\mathbf{S})}{\psi(\mathbf{S})}\frac{w^A}{w^B}\right)^{\frac{\gamma}{\gamma-1}} + (1-\psi(\mathbf{S}))} + 1 - \rho\right) \end{aligned} \tag{2.35}$$

In the second stage, each individual decision maker then solves the following taking Q and ρ^i as given

$$\max_{l^A,q^A} \alpha_1^i(\mathbf{X}^i)\ln(l^A) + \alpha_2^i(\mathbf{X}^i)\ln(q^i) + (1-\alpha_1^i(\mathbf{X}^i) - \alpha_2^i(\mathbf{X}^i)\ln(Q) \quad \text{s.t.} \quad w^i l^i + q^i = w^i T + \rho^i$$

Intuitively, $\rho^i + w^i T$ captures a measure of full individual income that is available to each decision-maker for their individual consumption of leisure and the private market good q upon the optimal transfers of household non-labor income made among spouses in the first stage.

From the solution to the second stage, I then have the following

$$l^{i*} = \frac{\alpha_1^i(\mathbf{X}^i)(w^i T + \rho^i)}{w^i(\alpha_1^i(\mathbf{X}^i) + \alpha_2^i(\mathbf{X}^i))}; \quad q^{i*} = \frac{\alpha_2^i(\mathbf{X}^i)(w^i T + \rho^i)}{\alpha_1^i(\mathbf{X}^i) + \alpha_2^i(\mathbf{X}^i)}$$

I then use (l^{i*}, q^{i*}) to define each spouse's individual indirect utility from which I can derive the solution to the first stage

$$\rho^A = \lambda(\mathbf{z})(\alpha_1^A(\mathbf{X}^A) + \alpha_2^A(\mathbf{X}^A))\bar{Y} - w^A T; \quad \rho^B = (1-\lambda(\mathbf{z}))(\alpha_1^B(\mathbf{X}^B) + \alpha_2^B(\mathbf{X}^B))\bar{Y} - w^B T$$
$$Q^* = \frac{(\lambda(\mathbf{z})(1-\alpha_1^A(\mathbf{X}^A) - \alpha_2^A(\mathbf{X}^A)) + (1-\lambda(\mathbf{z}))(1-\alpha_1^B(\mathbf{X}^B) - \alpha_2^B(\mathbf{X}^B)))\bar{Y}}{P(w^A, w^B; \mathbf{S})}$$

where $\bar{Y} = (w^A + w^B)T + y^A + y^B$.

Moreover, I can compute the marginal willingness to pay for the public good from both spouses in the following way:

$$MWP^A = \frac{\partial V^A(w^A, \rho^A, Q)/\partial Q}{\partial V^A(w^A, \rho^A, Q)/\partial \rho^A}; \quad MWP^B = \frac{\partial V^B(w^B, \rho^B, Q)/\partial Q}{\partial V^B(w^B, \rho^B, Q)/\partial \rho^B} \tag{2.36}$$

As mentioned in Section 2.2 these marginal willingness to pay for the public good can also be interpreted as the Lindahl prices, which intuitively, serve as a way for each individual spouse to internalize the per unit cost of producing the domestic good Q (which in this case is denoted by $P(w^A, w^B; \mathbf{S})$). I show this formally by using (l^{i*}, q^{i*}) to derive the individual indirect utility of each parent $V^i(w^i, \rho^i, Q)$, differentiating accordingly and substituting into 2.36. Letting the Lindahl prices for the wife and husband be denoted as θ_Q^A and θ_Q^B, respectively, this yields

$$\theta_Q^A = MWP^A = \frac{\lambda(\mathbf{z})(1 - \alpha_1^A(\mathbf{X}) - \alpha_2^A(\mathbf{X})) \cdot P(w^A, w^B, \mathbf{S})}{\lambda(\mathbf{z})(1 - \alpha_1^A(\mathbf{X}) - \alpha_2^A(\mathbf{X})) + (1 - \lambda(\mathbf{z}))(1 - \alpha_1^B(\mathbf{X}) - \alpha_2^B(\mathbf{X}))} \tag{2.37}$$

$$\theta_Q^B = MWP^B = \frac{(1 - \lambda(\mathbf{z}))(1 - \alpha_1^B(\mathbf{X}) - \alpha_2^B(\mathbf{X})) \cdot P(w^A, w^B, \mathbf{S})}{\lambda(\mathbf{z})(1 - \alpha_1^A(\mathbf{X}) - \alpha_2^A(\mathbf{X})) + (1 - \lambda(\mathbf{z}))(1 - \alpha_1^B(\mathbf{X}) - \alpha_2^B(\mathbf{X}))} \tag{2.38}$$

This corroborates that these individual prices satisfy the Bowen-Lindahl-Samuelson condition for the optimal provision of the public good, which I adjust to account for the assumption that this good is domestically produced

$$\theta_Q^A + \theta_Q^B = P(w^A, w^B; \mathbf{S})$$

The Money Metric Welfare Index

The intuition behind the money metric welfare index (MMWI) is to obtain a measure of the expenses a married individual would need to incur in a counterfactual single household in order to be able to reach the same level of utility s/he would achieve when living in collectivity. Defining the single-parent household's problem and being able to identify its primitives is then essential since it provides the counterfactual environment needed for the computation of the MMWI. It is then possible to define the MMWI within the context of a collective

household model with home production as

$$MMWI^i = \min_{h_D^i, l^i, q^i, q^D} w^i l^i + q^i + w^i h_D^i + q^D \tag{2.39}$$

s.t.

$$u^i(l^i, q^i, Q; \mathbf{X}^i) \geq u^i(l^{i*}, q^{i*}, Q^*; \mathbf{X}^i)$$

$$Q = F_Q^s(h_D^i, q^D; \mathbf{S})$$

where $(l^{i*}, q^{i*}, Q^* = F_Q(h_D^{A*}, h_D^{B*}, q^{D*}))$ denotes the optimal choices made within a two-parent household. In order to define the counterfactual environment of singlehood that the spouses would face, I use the production function estimates from the model defined for single mothers and fathers to capture the potential economies of scale in production that can be lost from moving from a collective household to a single-parent one.

Modifying the definition of the MMWI in Cherchye et al. (2018) and given the estimates for preferences and the households' production technology obtained at this point, I can define the MMWI as

$$MMWI^i = \min_{h_D^i, l^i, q^i, q^D} w^i l^i + q^i + w^i h_D^i + q^D \tag{2.40}$$

s.t.

$$\hat{\alpha}_1^i(\mathbf{X}^i)\ln(l^i) + \hat{\alpha}_2^i(\mathbf{X}^i)\ln(q^i) + (1 - \hat{\alpha}_1^i(\mathbf{X}^i) - \hat{\alpha}_2^i(\mathbf{X}^i))\ln(Q) \geq$$

$$\hat{\alpha}_1^i(\mathbf{X}^i)\ln(l^{i*}) + \hat{\alpha}_2^i(\mathbf{X}^i)\ln(q^{i*}) + (1 - \hat{\alpha}_1^i(\mathbf{X}^i) - \hat{\alpha}_2^i(\mathbf{X}^i))\ln(Q^*)$$

$$Q^* = [\hat{\psi}(\mathbf{S})(h_D^{A*})^{\hat{\gamma}} + (1 - \hat{\psi}(\mathbf{S}))(h_D^{B*})^{\hat{\gamma}}]^{\frac{\hat{\rho}}{\hat{\gamma}}}(q^{D*})^{1-\hat{\rho}}$$

$$Q = [\phi(\mathbf{S})(h_D^i)^{\beta} + (1 - \phi(\mathbf{S}))(q^D)^{\beta}]^{\frac{1}{\beta}} \text{ for } i = (A, B)$$

$$l^i + h_D^i + h_M^i = T$$

The solution to this minimization problem yields the following characterization of the MMWI for both spouses:

$$MMWI^i = (\rho^i)\left(\frac{1}{\theta_Q P^S(w^i,\mathbf{S})}\right)^{(1-\alpha_1^i(\mathbf{X})-\alpha_2^i(\mathbf{X}))} \times \left(\frac{\phi^i(\mathbf{S})}{\phi^i(\mathbf{S})(C_s^i)^{\frac{\beta^i}{\beta^i-1}}+(1-\phi^i(\mathbf{S}))}+\frac{1-\phi^i(\mathbf{S})}{\phi^i(\mathbf{S})+(1-\phi^i(\mathbf{S}))(C_s^i)^{\frac{\beta^i}{1-\beta^i}}}\right) \tag{2.41}$$

where

$$P^S(w^i;\mathbf{S}) = \left[\phi^i(\mathbf{S})\left(\frac{\phi^i(\mathbf{S})}{w^i(\phi^i(\mathbf{S})+(1-\phi^i(\mathbf{S}))(C_s^i)^{\frac{\beta^i}{1-\beta^i}})}\right)^{\beta^i} + (1-\phi^i(\mathbf{S}))\left(\frac{1-\phi^i(\mathbf{S})}{\phi^i(\mathbf{S})(C_s^i)^{\frac{\beta^i}{\beta^i-1}}+(1-\phi^i(\mathbf{S}))}\right)^{\beta^i}\right]^{\frac{1}{\beta^i}}$$

and

$$C_s^i = w^i\frac{1-\phi^i(\mathbf{S})}{\phi^i(\mathbf{S})}$$

Intuitively, the MMWI constitutes a compensating variation in which each spouse faces a different price for the domestic public good Q as their living arrangement is changed from living collectively with their spouse to becoming a single parent. From paying the Lindahl price θ_Q^i, each spouse then faces the full per unit cost $P^{S,i}(w^i,\mathbf{S})$. Note that, in the case of home production, even the price of the public good changes as the living arrangement changes since the production possibilities of each spouse changes as well.

Focusing on the latter, the connection between the sharing rule and the MMWI described non-parametrically in Section 2.2 is presented more explicitly in 2.41 given the parametrization of the model used so far. Specifically, the MMWI incorporates an adjustment to the sharing rule

through a reweighing that can be characterized as a function of (i) the two-parent household's marginal utility for public consumption, (ii) the individual's own preferences for the public good, (iii) the opportunity cost incurred by each spouse for spending time in home production and (iv) the per unit cost incurred by the household in the production of the public good as internalized by each spouse.[29]

2.5.2 The Impact of *Oportunidades* on Bargaining Power and Individual Welfare

Using the estimates obtained from the fourth specification (column 4) presented in Table 2.5, I compute the Pareto weight, MMWI and sharing rule of each two-parent household included in the estimation sample and then implement a MDID estimator to quantify the impact of *Oportunidades* on beneficiary households' decision-making structure and individual welfare within two-parent households. For the purpose of documenting differences in the allocation of welfare within households, I report welfare measures as a fraction of household income. Figure B.2 in Appendix B.4 presents a description of the predicted measures of bargaining power and individual welfare obtained for the estimation sample, making a before and after comparison among participant and non-participant households. Besides the Pareto weight and individual welfare measures, I also quantify the effect of the program on other unobservable primitives generated through the model that are of interest, such as household's domestic production of Q, given the program's objectives. For the sake of comparison, I

[29]This is similar to the characterization of the MMWI in the presence of public consumption without home production presented in Chiappori and Meghir (2015). In that case, the sharing rule is reweighed by i's own willingness to pay and preferences for the domestic good. Once home production is introduced, this is further reweighed by the cost faced by the household in the production of the domestic good, by i's relative productivity in the household and the intensity with which parental time and monetary investments are used in the production of the domestic good. This highlights one of the main ways through which this welfare measure can be used to account for home production in the computation of individual welfare upon which policy implications can be derived.

also report the impact of *Oportunidades* on the domestic production of Q in single-mother households.

Table 2.6 presents the level effects while Table 2.7 presents the percentage changes obtained from the causal analysis implemented on these measures. The results suggest that the participation in the program is associated with a strongly significant increase of almost 24% (of almost 13 percentage points) in mothers' bargaining power which translates into a significant 20% increase in their individual welfare characterized by the MMWI. This constitutes an increase of approximately 3,067 MXN pesos (294 USD) in mothers' individual welfare. Such impact on individual welfare is asymmetric as fathers' individual welfare decreases by almost 25% as characterized by their MMWI, constituting a decrease of approximately 2,645 MXN pesos (254 USD). It is important to note that the gender-asymmetric effect documented on individual welfare suggests a mitigation in the degree of gender inequality in terms of welfare observed at baseline as, overall, the ratio of mothers' money metric welfare index to that of fathers' is approximately 0.785 (being 0.787 among beneficiary households and 0.784 among non-participants) prior to the start of the program.

Given the significant empowerment effect documented in favor of mothers, I now investigate whether such empowerment effect is consistent with a higher production of the public good Q. In this regard, I find that participation in *Oportunidades* can also be associated with

Table 2.6: Overall Impact of *Oportunidades* on Beneficiary Households

	Two-Parent						*Single-Parent*
		Money Metric Welfare		**Sharing Rule**			
	Pareto Weight	Mother	Father	Mother	Father	Domestic Output	Domestic Output
MDID	0.130***	0.101***	-0.115***	0.085***	-0.118***	711.007***	-338.417*
	(0.005)	(0.020)	(0.016)	(0.004)	(0.005)	(201.704)	(163.203)
N	478	478	478	478	478	478	478

Notes: [1] Bootstrapped standard errors (100 repetitions).

Table 2.7: Overall Impact of *Oportunidades* on Beneficiary Households, Percentage Change

	Two-Parent						*Single-Parent*
		Money Metric Welfare		**Sharing Rule**			
	Pareto Weight	Mother	Father	Mother	Father	Domestic Output	Domestic Output
MDID	23.807***	19.559***	-25.081***	25.513***	-28.869***	24.611***	-12.470*
	(0.963)	(4.133)	(3.644)	(1.297)	(1.326)	(6.843)	(7.388)
N	478	478	478	478	478	478	478

Notes: [1] Bootstrapped standard errors (100 repetitions).

a significant increase of almost 25% in the production of the public good Q. This is of particular relevance given the context in which I are working in since I use the public good Q in the model as a way to capture investments in children's human capital, which is what development programs target as a core objective. This result is in line with the overall positive impact of the urban implementation of *Oportunidades* on children's educational outcomes in two-parent beneficiary households documented in Behrman et al. (2012) and Flores (2021). Going back to the empirical evidence presented in Section 1.3, such increase in domestic output suggests that the observed increase in the monetary investments made by the household in the production of the public good Q offsets the documented decrease in parental time investments. Based on the estimation results and the observed empowerment effect, this suggests that by empowering mothers, who tend to have a higher preference for the public good Q, the program effectively increases domestic production within two-parent households by allowing them to substitute parental time investments with monetary investments in children. In this way, as mothers' bargaining position improves, they are able to enjoy more leisure hours while the level of domestic production within the household increases.

2.5.3 The Impact of Counterfactual Policies on Bargaining Power and Individual Welfare

In this subsection, I quantify the impact of counterfactual gender-targeted policies on women's empowerment and individual welfare. The collective household model I have developed and estimated allows us to explore different types of policies involving gender-targeted benefits to assess the extent to which these exacerbate or mitigate existing patterns of gender inequality within the household. In particular, I consider targeted benefits in the form of cash transfers (non-labor income) and wage subsidies. The benchmark that I will use to compare the impact of these counterfactual policies will be the ones documented for the *Oportunidades* program.

Throughout each of these exercises, I take the households observed at baseline (i.e. in the year 2002) and then, change either the spouses' non-labor income or wage rate depending on the counterfactual scenario of interest (keeping everything else fixed at 2002 values) for each of these households. The choice of baseline stems from the fact that 2002 sample of the ENCELURB constitutes the experimental baseline used in the evaluation of the *Oportunidades* CCT program. This allows us to use the same baseline used to conduct the intended counterfactual exercises, thereby capitalizing on the experimental setup of the program and its evaluation data.

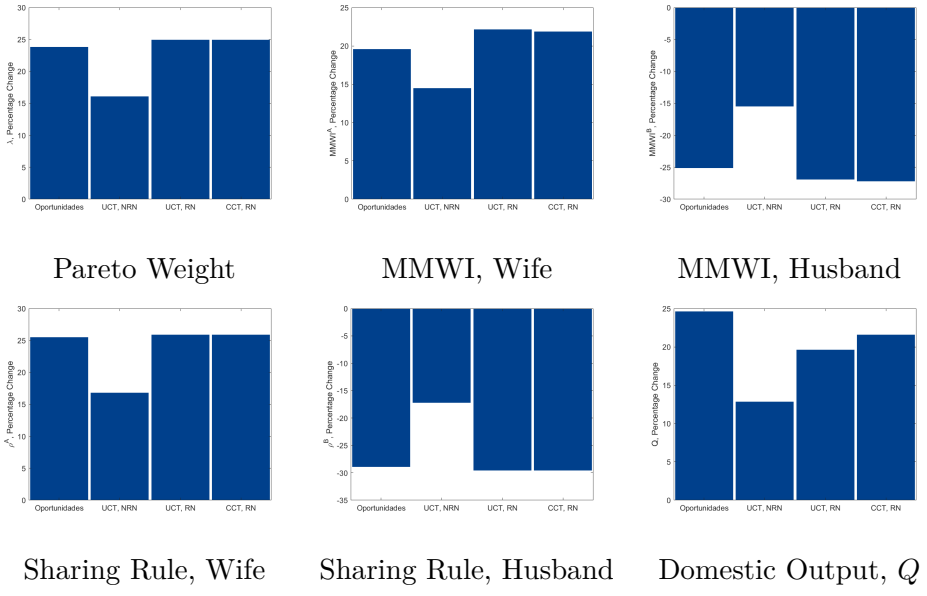
Cash Transfer Targeted to Mothers:

I first consider alternative designs of a cash transfer. Let y_{CT} be the average size of the transfer observed in the data.[30] Suppose I assign this to the mothers' non-labor income, so that $y^A = y^A_{old} + y_{CT}$, without imposing the conditionality that the number of children

[30]This is an annual 4,427 MXN pesos in the estimation sample. That is, an average bimonthly disbursement of 737.8 MXN pesos.

attending school is equal to the total number of children in the household. I have two options throughout the implementation of this exercise: (1) I can let this cash transfer not be revenue neutral or (2) I can make this revenue neutral by triggering a re-distribution of non-labor income within spouses so that $y^B = y^B_{old} - y_{CT}$. This has important implications in terms of the expected effect on bargaining power and intrahousehold behavior since the revenue-neutral cash transfer would affect only mothers' share of non-labor income, z^A, while the cash transfer that is not revenue-neutral would lead to an increase in total household non-labor income (thereby, triggering income effects). Figure 2.5 compares the results of the impact of a cash transfer targeted to mothers on the households' bargaining structure and individual welfare. UCT denotes an unconditional cash transfer, CCT denotes a conditional cash transfer, NR denotes a revenue neutral cash transfer, and NRN denotes a non-revenue neutral cash transfer.

Figure 2.5: Overall Impact on Intrahousehold Bargaining Power and Individual Welfare, Cash Transfer Targeted to Mothers



The results indicate that unconditional transfers are effective at inducing an empowerment effect comparable to that observed from participation in *Oportunidades* if revenue neutrality is guaranteed at the household level. This is expected given that revenue neutrality in this scenario increases z^A while keeping total household non-labor income constant, thereby not triggering an income effect. The results also show that a conditional cash transfer that is revenue neutral triggers a slightly larger increase in mothers' bargaining power and individual welfare captured by both the MMWI and the sharing rule.

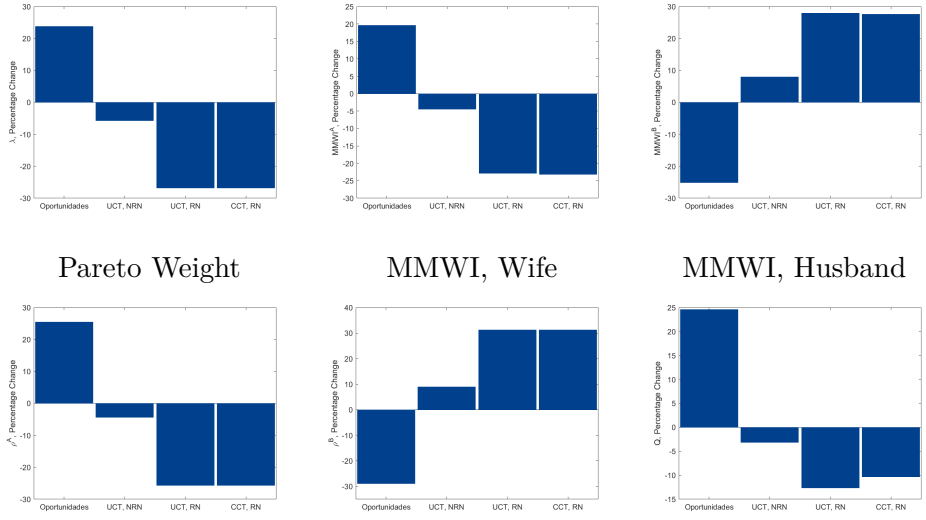
Cash Transfer Targeted to Fathers:

Similar to the first counterfactual exercise, y_{CT} will be assigned to one of the parents. In this instance, I target this cash transfer to fathers in two-parent households. For this matter, let $y^B = y^B_{old} + y_{CT}$. Again, I let this transfer targeted to the father be revenue neutral or not. As before, in the case of a revenue neutral transfer, I set $y^A = y^A_{old} - y_{CT}$. Note that since I are targeting the cash transfer to the father, this would constitute a decrease in z^A.

Furthermore, another exercise involves simultaneously imposing the conditionality that the number of children in the household currently attending school matches the number of children in the household.[31] Figure 2.6 compares the results of the impact of a cash transfer targeted to fathers on the households' bargaining structure and individual welfare. UCT denotes an unconditional cash transfer, CCT denotes a conditional cash transfer, NR denotes a revenue neutral cash transfer, and NRN denotes a non-revenue neutral cash transfer.

[31] In the case of a cash transfer that is not revenue neutral, I cannot really tell beforehand what the effect of the transfer on the Pareto weight will be since the decrease in z^A would coincide with an increase in household income for which the coefficient in the Pareto weight is positive. Furthermore, the conditionality would not affect the Pareto weight but can potentially affect household behavior and the money metric measures of welfare through its impact on the per unit cost of producing the domestic good *and* the per unit cost of producing the domestic good in the counterfactual environment of singlehood (this would be relevant only in the computation of the welfare measures).

Figure 2.6: Overall Impact on Intrahousehold Bargaining Power and Individual Welfare, Cash Transfer Targeted to Fathers



Pareto Weight | MMWI, Wife | MMWI, Husband

Sharing Rule, Wife | Sharing Rule, Husband | Domestic Output, Q

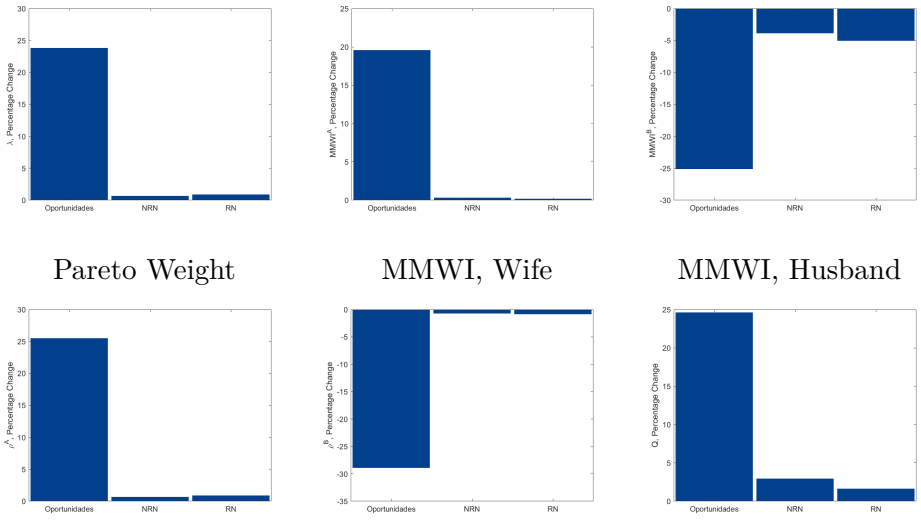
As expected, the results show that an increase in fathers' contribution to non-labor income reduces mothers' bargaining power and individual welfare. As observed in the first counterfactual exercise, the strength of the effect of unconditional cash transfers is larger when this is revenue neutral. Thus, when focusing at revenue neutral cash transfers, both conditional and unconditional cash transfers yield a similar effect. Moreover, while the direction of the effects on bargaining power and individual welfare are different, the magnitudes of those associated with revenue neutral cash transfers are similar to those documented for the *Oportunidades* program.

Wage Subsidy Targeted to Mothers:

I now move away from cash transfers to investigate the effectiveness of wage subsidies at empowering mothers. Let τ be a wage subsidy intended to be targeted to mothers. Suppose I define a new wage rate for mothers: $w^A = (1+\tau)w^A_{old}$. If I want this to be revenue

neutral, suppose I adjust the husband's wage rate to keep full household income constant, so that $w^B = \frac{\bar{Y}_{old} - y^A - y^B}{T} - (w^A_{old} + \tau)$, where $\bar{Y}_{old} = y^A + y^B + (w^A_{old} + w^B_{old})T$. By forcing a redistribution of labor market returns, I can induce a change in $\frac{w^A}{w^B}$ which is expected to increase the wife's Pareto weight based on the estimates obtained in all specifications.

Figure 2.7: Overall Impact on Intrahousehold Bargaining Power and Individual Welfare, Wage Subsidy for Mothers



Pareto Weight | MMWI, Wife | MMWI, Husband

Sharing Rule, Wife | Sharing Rule, Husband | Domestic Output, Q

I conduct this counterfactual letting τ amount to a 25% increase in mothers' wage rate reported in 2002 (bringing the average w^A/w^B just above unity in the scenario in which the subsidy is not revenue neutral, even higher when ensuring revenue neutrality at the household level). Figure 2.7 compares the results of the impact of a wage subsidy targeted to mothers on the households' bargaining structure and individual welfare. NR denotes a revenue neutral wage subsidy while NRN denotes a non-revenue neutral wage subsidy.

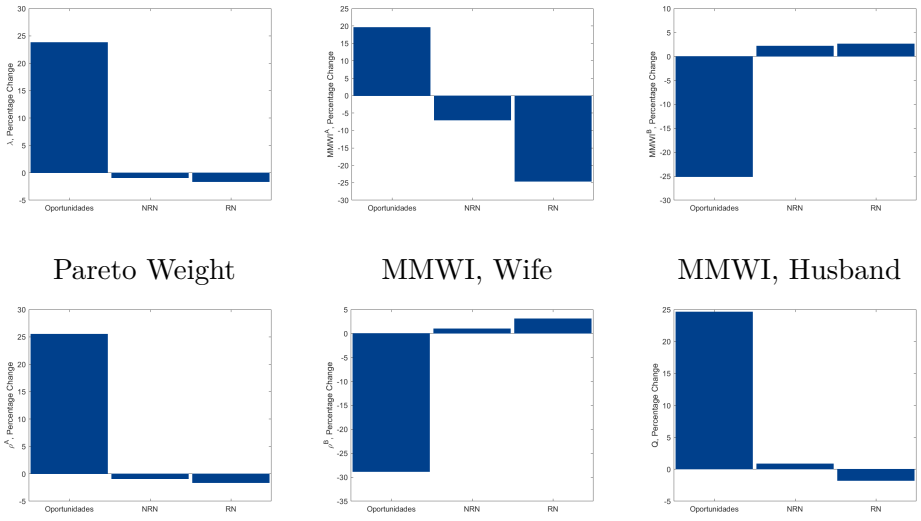
The results show that wage subsidies have a virtually negligible impact on mothers' bargaining position. This is aligned with the magnitude of the estimate obtained for the

coefficient associated with the spouses' relative labor market returns in the Pareto weight. Besides the impact on the Pareto weight, as shown in 2.41, I expect this change in the spouses' wage ratio to affect the individual welfare measures by generating changes in the per unit cost of producing the domestic good both in collectivity and in singlehood.

Wage Subsidy Targeted to Fathers:

Now, let τ be a wage subsidy intended to be targeted to fathers. Suppose I define a new wage rate for mothers: $w^B = (1+\tau)w^B_{old}$. I can make this revenue neutral by adjusting the wife's wage rate in a similar way as I do in the previous counterfactual exercise, $w^A = \frac{\bar{Y}_{old} - y^A - y^B}{T} - ((1+\tau)w^B_{old})$. Mirroring the subsidy granted to mothers, the subsidy used to conduct this counterfactual amounts to a 25% increase in the husband's wage rate reported in 2002. Figure 2.8 compares the results of the impact of a wage subsidy targeted to fathers on the households' bargaining structure and individual welfare.

Figure 2.8: Overall Impact on Intrahousehold Bargaining Power and Individual Welfare Wage Subsidy for Fathers



Pareto Weight | MMWI, Wife | MMWI, Husband

Sharing Rule, Wife | Sharing Rule, Husband | Domestic Output, Q

As in the counterfactual involving wage subsidies targeted to mothers, the results indicate that the Pareto weight does not respond significantly to changes in the spouses' wage ratio. Nonetheless, in this case, the MMWI of the wife seems to be very responsive to this ratio, which is aligned with the relationship between these relative wages and the per unit cost of producing the domestic good. Compared to the results on the response of fathers' MMWI to changes in relative wages, it seems that the MMWI of the spouse that is relatively more productive at home tends to be more sensitive to changes in relative wages. I can infer this from the strong decrease observed for mothers' MMWI when considering a revenue-neutral cash transfer.

Overall, the intrahousehold gender inequality analysis implemented throughout this section suggests that cash transfers like *Oportunidades* are as effective at empowering mothers and individual welfare as alternative designs of cash transfers targeted to mothers. Furthermore, as expected, I find that both cash transfers and wage subsidies targeted to fathers tend to have a negative impact on mothers' bargaining position and individual welfare. More importantly, I find that wage subsidies targeted to mothers are virtually ineffective at empowering them and improving their individual welfare. In terms of policy implications, this suggests that the income source targeted by development programs like *Oportunidades* matter as changes in non-labor income seem to be more effective than wage income at generating shifts in the decision making structure of two-parent households.

2.6 Individual Poverty Analysis: Revisiting the Targeting Strategy of *Oportunidades*

I build upon the forms of money metric utility derived within the collective household framework developed in this paper to revisit the original targeting strategy of *Oportunidades*. The

motivating question involves assessing whether by determining the selection of beneficiaries on household-level poverty rates and disregarding the unequal sharing of resources within households, the second stage of the program's targeting strategy discussed in Section 1.3 exclude mothers living in non-poor households who could have benefited from participating in the program. This generates two auxiliary questions that can be answered through the model. The first question involves investigating whether the individual welfare measures I focus on can help identify these individually poor mothers. The second question involves assessing whether a cash transfer can effectively translate into improvements in these mothers' bargaining position, individual welfare and a higher production of the domestic public good Q.

To answer this question, I start by implementing the estimation strategy described in Section 2.4.3 including households considered as non-poor by the program administration in the sample.[32] I then use the estimates obtained from the fourth specification (yielding the best model fit) to compute the two individual welfare metrics I have been focusing on so far: the sharing rule and the MMWI. I compare these money metrics with what would be an individual poverty line below which a particular parent would be deemed as poor. The focus is set particularly on mothers since they (1) are originally targeted by the program and (2) have a relatively higher preference for the public good as indicated by the estimation results I presented in the previous section.

The individual poverty analysis here proposed follows a similar analysis implemented in Cherchye et al. (2018). Nonetheless, my analysis departs from their approach in two main aspects. Firstly, while they define the poverty line for an individual as half of 60% of the median full household income observed in the sample, I use the country's official poverty

[32]The estimation and program evaluation results obtained when including non-poor households in the estimation sample can be found in Appendix B.5.

line for the years covered by the ENCELURB (2002-2004) (allowing for the presence of a parent and at least one child) reported by the CONEVAL.[33] It is worth noting that this agency's poverty line for 2000 was used to determine the eligibility for *Oportunidades* was originally defined. Lastly, I use a version of the MMWI that accounts for home production, which is not accounted for in the MMWI used in the authors' individual poverty analysis. I define the poverty line to determine a parent's poverty classification considering the case in which mothers are granted full custody of children. In this case, the poverty line for mothers is determined by obtaining the poverty line for a household comprised by the mother and all her children (multiplying the per person poverty line from the CONEVAL data by the household size equal to 1 plus the number of children in the household). For fathers, on the other hand, I define their poverty line as the poverty line obtained from the CONEVAL for a 1-person household. Table 2.8 presents the individual poverty rates obtained under this poverty line definition.

I find that 53% (corresponding to 216 households) and 44% (corresponding to 179 households) of mothers in two-parent non-poor households can be classified as individually poor when measuring poverty based on their sharing rule and MMWI respectively.[34] These individual poverty analysis results are consistent with those in Cherchye et al. (2018) in the sense that I find that individual poverty rates computed using the sharing rule tend to be larger than the individual poverty rates computed using the MMWI. This is attuned with the finding that the sharing rule tends to be lower than the MMWI for any value of the Pareto weight since the sharing rule does not account for the economies of scale in production and consumption generated by the domestic production of the public good Q. Furthermore,

[33]This is defined at approximately 17,496 yearly MXN pesos per person, where 1USD = 10.43 MXN pesos. The poverty lines defined by the CONEVAL can be found in `https://www.coneval.org.mx/Medicion/MP/Paginas/Lineas-de-bienestar-y-canasta-basica.aspx`

[34]Such relatively high individual poverty rates can be explained, to some extent, by the fact that more than 50% of these non-poor households have incomes barely falling just above the poverty line used by the administration of the program and were, therefore, originally categorized as almost poor.

Table 2.8: Individual Poverty Rates among Non-Poor Households Computed Using the MMWI and Sharing Rule

	All Households	HHs with 1 Child	HHs with 2 Children	HHs with 3+ Children
Sharing rule				
All	27.51%	16.99%	25.65%	36.51%
Mothers	52.81%	28.16%	50.00%	72.37%
Only Mothers	50.61%	22.33%	48.70%	71.71%
Both	2.20%	5.83%	1.30%	0.66%
Fathers	2.20%	5.83%	1.30%	0.66%
Only Fathers	0.00%	0.00%	0.00%	0.00%
Both	2.20%	5.83%	1.30%	0.66%
Intrahousehold Pov. Ineq.	100.00%	100.00%	100.00%	100.00%
MMWI				
All	22.49%	10.68%	20.45%	32.57%
Mothers	43.77%	18.45%	39.61%	65.13%
Only Mothers	42.54%	15.53%	38.31%	65.13%
Both	1.22%	2.91%	1.30%	0.00%
Fathers	1.22%	2.91%	1.30%	0.00%
Only Fathers	0.00%	0.00%	0.00%	0.00%
Both	1.22%	2.91%	1.30%	0.00%
Intrahousehold Pov. Ineq.	100.00%	100.00%	100.00%	100.00%
	N = 409	N = 103	N = 154	N = 152

Intrahousehold Pov. Inequality captures the percentage of households in which the only poor parent is the mother among households in which only one parent is deemed poor

the results further highlight a significant pattern of intrahousehold gender inequality that pervades among non-poor households. This relates to my finding that in all households in which I can categorize only one of the parents as individually poor, such parent is the mother.

Table 2.9: Overall Impact on Intrahousehold Bargaining Power and Individual Welfare, Cash Transfers to Poor Mothers in Non-Poor Households

	CCT, NRN	UCT, NRN	CCT, RN	UCT, RN
Pareto Weight	10.2601	10.2601	14.5260	14.5260
MMWI, Wife	10.8987	9.7452	12.2175	11.0615
MMWI, Husband	-7.2012	-6.7051	-12.1165	-11.6173
Sharing Rule, Wife	12.6668	12.6668	14.6068	14.6068
Sharing Rule, Husband	-8.8393	-8.8393	-14.6219	-14.6219
Domestic Output	14.1207	7.6971	13.8982	7.4922

Notes: [1] CCT denotes conditional cash transfers, UCT denotes unconditional cash transfers [2] RN denotes revenue neutrality, NRN denotes non-revenue neutrality.

Table 2.9 presents the percentage change in the Pareto weight and individual welfare measures associated with targeting a cash transfer constituting 30% of these households' non-labor income to mothers living in two-parent non-poor households who have been deemed as poor within the individual poverty analysis here presented.[35] As in the counterfactual exercises explored in Section 2.5.3, I consider four different alternative designs of this cash transfer based on whether I impose conditionalities and revenue neutrality.[36] I summarize my main findings below.

Pareto Weight

The results show that non-revenue neutral cash transfers yield the lowest response in terms of the Pareto weight irrespective of whether a conditionality is imposed (a 10% increase in mothers' bargaining power compared to the 14% increase generated by revenue neutral transfers). The unresponsiveness of the Pareto weight to the conditionality is expected since this is not used as a distribution factor. On the other hand, the higher impact of the revenue neutral cash transfer is primarily driven by the fact that while the income effect of the cash transfer on the Pareto weight is ruled out, the revenue neutral cash transfer increases z^A significantly more than the non-revenue neutral cash transfer by forcing a redistribution of non-labor income from the father to the mother.

Individual Welfare Metrics and Domestic Output

Consistent with the sharper increase in the Pareto weight generated by revenue neutral cash transfers than their non revenue neutral counterparts, I find that the shifts generated by revenue neutral cash transfers on both the sharing rule and the MMWI are larger than those generated by non revenue neutral transfers. As expected, I find no difference

[35] I assign this transfer size since I find that in the estimation sample, on average, the transfer amount accounts for 30% of households' non-labor income.

[36] The conditionality in this case is imposed by setting the number of children in the household attending school equal to the number of school-aged children in the household.

between conditional and unconditional transfers in terms of their effect on the sharing rule. Nonetheless, I find that conditional transfers generate sharper shifts in parents' MMWI than their unconditional transfers. This is mainly because the derivation of the MMWI accounts for changes induced by the production shifter on parents' relative marginal productivity at home. Thus, when imposing the conditionality, the MMWI adjusts to reflect changes in the number of children in the household attending school. Furthermore, I find that conditional cash transfers tend to have a relatively larger impact on the household's level of domestic output relative to unconditional cash transfers. Furthermore, the results also indicate that non revenue neutral cash transfers tend to generate larger shifts in domestic output than revenue neutral cash transfers. This can be explained by the income effect generated by non revenue neutral cash transfers which allow for more resources to be allocated for domestic production.

So far, I have found that while *Oportunidades* has been as effective as alternative cash transfer designs and considerably more effective than wage subsidies in improving mothers' bargaining position within the household, there is scope for improving the implementation of the program in terms of its targeting strategy. Specifically, I show that by determining the eligibility of mothers on the basis of household-level poverty rates thereby disregarding existing patterns of intrahousehold inequality, the current targeting strategy of the program misses mothers living in non-poor two-parent households who would benefit from participating in the program. Thus, these results show that this shortcoming could be addressed by adjusting the selection of program beneficiaries on the basis of individual poverty rates.

2.7 Conclusion

I provide novel evidence on the impact of gender-targeted policies on women's bargaining power by documenting the response of mothers' Pareto weight to participation in Mexico's *Oportunidades*. To do so, I present identification results that allow us to identify the household's production technology, parental preferences and the Pareto weight of two-parent households even when the intrahousehold allocation of time and consumption is partially observed. Importantly, this approach exploits the exogenous variation induced by the program on parents' time use by placing the cash transfer in the hands of mothers and by requiring school-aged children to attend school. Such alternative identification approach addresses a common data shortcoming that tends to thwart the extent to which I can use empirical applications of the collective labor supply model with home production presented in Blundell, Chiappori and Meghir (2005) to assess the impact of targeted benefits on intrahousehold inequality.

My results indicate that the receipt of the program's cash transfer is associated with a significant increase in mothers' Pareto weight which effectively translated into an increase in their individual welfare, characterized by the generalization of the money metric welfare index of Chiappori and Meghir (2015) I propose in this paper. Importantly, I also find that such empowerment effect associated with participation in *Oportunidades* coincides with an increase in domestic production within two-parent households. Given that the production of the public good is used in the model to account for the presence of children, I provide convincing evidence in favor of the argument that empowering mothers is beneficial for children. Specifically, I find that by empowering mothers, who tend to have a higher preference for the public good as shown by the estimation results in Section 2.4.4, the program effectively increases domestic production within two-parent households by allowing them to substitute parental

time investments with monetary investments in children. My counterfactual exercises show that *Oportunidades* is as effective as alternative cash transfer designs and considerably more effective than wage subsidies in serving as a policy lever for mothers' empowerment.

As is common in the applications of the model I consider, my analysis is limited by the focus on the sub-sample of working parents, thereby losing potentially useful information from households in which there are patterns of full specialization under which mothers devote most of their time to home production but none to market work. Thus, the analysis here developed would benefit from incorporating non-participation into the model. This would involve extending my proposed approach in a way that permits modeling the continuous choices related to parents' time allocation and consumption as well as their discrete choice relating their decision to participate or not in either market work or home production within a generalization of the framework developed in Blundell et al. (2007). Besides involving novel identification results, such extension could help yield more generalizable results of the impact of gender-targeted policies on women's bargaining power, individual welfare and household investments in children.

Chapter 3

Divorce Laws, Matrimonial Regimes, and the Family: Evidence from Mexico

(joint work with George-Levi Gayle and Andrew Shephard)

This chapter investigates how changes in divorce laws affect marital formation and dissolution patterns in the context of Mexico, where (i) couples choose an asset division regime at the time of marriage at no cost; (ii) states experienced a staggered adoption of no-fault divorce; and (iii) cohabitation has become increasingly prevalent during the past two decades. We use a unique linked data set using administrative records on marriages and divorces within an event study design that accounts for the heterogeneity induced by variation in treatment timing to show that the adoption of unilateral no-fault divorce significantly increased couples' probability to divorce. This has led to a significant increase in divorce rates, consistent with recent evidence documenting an increase in divorce rates in response to the implementation of unilateral no-fault divorce in the United States and Europe. We contribute to the literature

by documenting how the liberalization of divorce has affected marital dissolution within the context of a developing country and by providing novel evidence of how such impact differs by couples' choice of asset division regime at the time of marriage. Furthermore, we find evidence that the adoption of unilateral divorce has also affected household formation by increasing assortativeness among newlyweds and contributing to the decrease in marriage rates and increase in cohabitation rates documented in the country during the past two decades. Altogether, our results provide motivating evidence for developing a model of household formation, behavior, and dissolution that accounts for differences among legally married and cohabiting couples while highlighting the dynamic implications of allowing newlyweds to choose the asset division regime at the time of marriage.

3.1 Introduction

Reforms to divorce legislation have garnered considerable attention in the literature as growing evidence suggests that making divorce easier can help explain the rise in divorce rates experienced in developed countries over the past decades. Nonetheless, the extent to which we can observe similar patterns in developing countries remains an understudied and policy-relevant question. Developing countries offer a unique setting since, despite implementing a growing number of regulations to protect economically vulnerable members as divorce becomes easier, the enforcement of such protections remains relatively weak, ultimately affecting changes in family structure (Goode (1993)). Since significant household transitions can negatively affect child development (Gruber (2004)), understanding the extent to which recent reforms to family laws in developing countries ultimately affect household formation and dissolution patterns is of particular policy relevance, given that these countries have long been designing and investing in policies aimed at breaking the intergenerational transmission

of poverty and inequality through improvements in child development, as analyzed in the previous two chapters.

The analysis we implement throughout this chapter builds upon the literature focused on investigating the effect of unilateral divorce on divorce rates both in the United States and in Europe. These studies have empirically tested the direct implication of the Becker-Coase theorem of the marital bargaining literature, suggesting that the introduction of unilateral divorce should not affect the incidence of divorce since such change in divorce legislation simply constitutes a redistribution of property rights – namely, the right to remarry – which can be dealt with through bargaining within the family via side payments to the spouse who wants to exercise such right once divorce becomes an easier (Chiappori, Iyigun and Weiss (2015)).

In the case of the United States, early empirical evidence yielded inconclusive results on the impact of unilateral divorce on divorce rates with Peters (1986) and Peters (1992) estimating an effect of unilateral divorce laws on divorce rates of virtually zero, while Allen (1992) estimated an increase of almost 1.4% in the probability of divorce attributable to unilateral divorce laws. Furthermore, Friedberg (1998) finds that unilateral divorce reforms had a significant and permanent effect on divorce rates during the period spanned between 1968 and 1988. Nonetheless, Wolfers (2006) implemented a different methodology using panel data to show that the increase in divorce rates associated with unilateral divorce reforms was mainly transitory and did not persist in the long run. Similarly, in the case of Europe, González and Viitanen (2009) exploit the geographic variation in the legalization and liberalization of divorce using a long panel of European data. Their results show that the introduction of unilateral divorce significantly increased the divorce rate by almost 0.6 divorces per 1000 people, which is deemed as quite sizeable compared to the average crude divorce rate of 2 marriages per 1000 people documented for Europe in 2002.

In the case of Mexico, Lew and Beleche (2008) investigate the impact of early reforms to divorce legislation on divorce rates. These early changes to divorce laws included its legalization, the inclusion of domestic violence and character incompatibility as compelling grounds for divorce, and the introduction of administrative divorce (a less bureaucratic form of divorce). The authors find that these early reforms had no significant impact on the incidence of divorce in the country. Furthermore, focusing on the recent unilateral divorce reforms we analyze in this chapter, Garcia-Ramos (2017) finds that easing divorce increased the divorce rate, the stock of divorced women, and the incidence of physical, economic, and emotional violence in the long run (but had no effect on these forms of intimate partner violence in the short run). Hoehn-Velasco and Penglase (2019) also studied this set of reforms to show that unilateral divorce reforms led to an increase in the crude divorce rate and in the frequency with which wives filed for divorce, which also coincided with a decline in spousal alimony payments.

We contribute to this literature by constructing a unique panel data set containing information on the formation and dissolution of legal marriages registered in Mexico between 2002 and 2019 by matching official administrative records on marriages and divorces registered in state family and civil courts. Exploiting the geographic variation in the introduction of unilateral divorce since 2008, we use this data set to provide novel evidence on the impact of unilateral divorce law reforms on the incidence of divorce and investigate how such effect is heterogeneous by the characteristics of the spouses at the time of marriage, including their educational attainment, labor force participation, and choice of how to divide assets in the case of divorce (i.e., asset division regime). Our results show that the staggered adoption of unilateral divorce reform significantly increased the probability of divorce for marriages with a tenure of 0-9 years, increasing by up to 0.5 percentage points 5 years after the reform (robust to the couple's education match). Furthermore, for marriages with tenure of 0-3 years,

the impact is higher (1) among existing marriages, (2) among those choosing community property at the time of marriage, and (3) among those in which the wife was working at the time of marriage.

We also present evidence of the impact of the gradual adoption of unilateral divorce on household formation patterns, focusing on assortativeness in education, asset division regime choice, and couples' choice of relationship (marriage or cohabitation). We find that unilateral divorce reform increased assortativeness among married couples and did not significantly affect spouses' choice of community property regime at marriage. The same reforms have contributed to a decrease in the fraction of individuals aged 20-45 who are in their first marriage, coinciding with an increase in the fraction of individuals in this age group who are in cohabitation. Thus, we document that the ease of divorce has contributed to the retreat from marriage observed in the country during the past few decades. Nonetheless, we find that such retreat from marriage does not imply that individuals are not forming relationships but prefer to enter one in cohabitation rather than through marriage. This is consistent with the characteristics of a second demographic transition as described in Lesthaeghe (2014).

The remainder of the chapter is organized as follows. Section 3.2 describes the institutional context of marriage and divorce in Mexico. Section 3.3 describes the different data sources used in the analysis conducted in this chapter. Section 3.4 presents the empirical strategy implemented to capture the dynamic impact of unilateral divorce reform on household formation and dissolution. Section 3.5 presents the main results of our empirical analysis. Section 3.6 concludes.

3.2 Institutional Context of Marriage and Divorce

Two aspects of the institutional context of marriage and divorce in Mexico provide a unique setting for exploring the link between changes in divorce laws and marital formation and dissolution. The first aspect relates to the choice of asset division regime made by newlyweds at the time of marriage at no cost. The second one relates to the gradual changes in divorce legislation made throughout the last two decades. These have ranged from expanding the set of compelling reasons for filing for divorce to ultimately allowing any spouse to initiate the divorce process without having to provide a compelling reason. Geographic differences across states with respect to these two features of the Mexican context are presented in Figure 3.1.

3.2.1 Choice of Asset Division Regime

At the time of marriage, newlyweds choose how to divide, upon divorce, the assets accumulated during the marriage. There are two options available for this choice of asset division regime, community property and separation of property.[37] In a community property regime, assets accumulated throughout marriage are equally divided among spouses at the time of divorce. In a separation of property regime, assets accumulated throughout marriage are divided among spouses based on ownership.

As presented in Table 3.1 and mentioned in Ortega-Díaz (2020), there is considerable geographic variation in states' default regime applied in the absence of a choice made by newlyweds at the time of marriage. Upon a careful examination of the civil and family codes of each state, we distinguish among three groups of states based on the default asset division regime upheld at the time of divorce in the absence of a regime chosen at the time of

[37]Throughout the rest of the chapter, we refer to asset division regime and matrimonial regime interchangeably.

marriage. First, we group states requiring a choice of regime at the time of marriage, which are referred to as no default states. Second, we consider states that enforce a community property regime at the time of divorce if a regime is not chosen at the time of marriage, referred to as community property states. Lastly, we consider states enforcing a separation of property regime at the time of divorce when the matrimonial regime is not chosen at marriage, which are referred to as separation states. The last column of Table 3.1 present each state's default asset division regime and documents any changes made to such regime over the past twenty years. We capture additional geographic variation in newlyweds' choice of asset division regime at the time of marriage. We present this variation in further detail throughout the description of the marriage records in Section 3.3.

3.2.2 Divorce Legislation

The concept of divorce was introduced into Mexico's federal legal system in 1917 with the ratification of the Federal Law of Family Relations, under which divorce was presented as a viable legal resource to dissolve the contract generated by marriage, providing divorcees with the right to remarry (Lew and Beleche (2008)).[38] In general, divorce legislation in Mexico varies from one state to another, with each state Civil or Family Code stipulating the details of the divorce process. Given this, there are differences across states regarding the requirements for divorce filings. Prior to the introduction of unilateral no-fault divorce in Mexico, a divorce could be obtained through an agreement between both spouses (mutual consent) or at the request of one of the spouses, provided that there was a compelling cause for dissolving the marriage. The validity of a spouse's cause to separate was then assessed

[38]Before the introduction of divorce, legal separation was available to couples but was granted for severe reasons, such as infidelity and incurable illnesses (Lew and Beleche (2008)). Nonetheless, legal separation did not give spouses the right to remarry upon separation until the death of one of a spouse.

according to the standing divorce legislation in the particular state in which the spouse filed for divorce.[39]

During the 1990s, there were numerous reforms to states' family and civil codes to include incompatibility of characters, domestic violence, and separation/abandonment as grounds for divorce and introduce a relatively faster type of divorce known as an administrative divorce. Thus, there exist two types of divorces in the country's divorce legislation. The first type is administrative, which applies to couples who mutually consent to divorce with no children and who have preemptively agreed upon the divorce of their assets. The second type is judicial, or contentious, which serves either in the absence of mutual consent for divorce or for instances of mutual consent in which there are joint assets that are not readily divisible or have children over which to decide which spouse gets their custody.

Further reforms made to divorce legislation during the 2000s pertained to judicial divorces. Two main reforms include the introduction of no-fault unilateral divorce and the incorporation of a homemaker protection clause in the Civil Codes of numerous states. Table 3.1 provides an overview of these reforms by state.

Throughout the causal analysis implemented in Section 3.4, we focus on the introduction of no-fault unilateral divorce reform, which started in Mexico City in 2008, with other states gradually following this move over the last decade. Such staggered adoption of unilateral divorce allows for defining eight different cohorts based on the reform year throughout the

[39]Garcia-Ramos (2017) mentions that there was a federal law passed in 2007 under the name *Ley General de Acceso de las Mujeres a una Vida Libre de Violencia*, translated as General Law on Women's Access to a Life Free of Violence, requiring the inclusion of domestic violence as a cause for divorce, thereby forcing states to change their codes accordingly. However, some states had already included it in their codes prior to this federal law, while others made the change afterward (potentially reflecting other cultural/societal differences across states). The intention of the law was to make it easier for women to get out of abusive relationships (in any dimension). Moreover, it did not only require states to include domestic violence as a cause for divorce but also as grounds for the "aggressor" to lose custody of the children or to face more severe restrictions regarding his visiting rights.

methodology used to evaluate the impact of the reform on household formation, dissolution, and behavior. The first four columns of Table 3.1 present state-specific information regarding unilateral no-fault divorce.

Besides the introduction of unilateral divorce reform, further changes in divorce legislation have consisted in the incorporation of a homemaker compensation clause into some states' respective civil/family codes. Such clause consists of a potential compensation of up to 50% of the assets that were acquired throughout the length of the marriage if (1) the matrimonial regime originally chosen by the spouses was a separation of property one, (2) the claimant devoted most of his/her time throughout the marriage to home-related activities and the care of children (if any) and (3) the claimant was not able to acquire any own assets throughout the marriage or has substantially fewer assets under his/her name at the time of divorce.[40] While this reform is not the focus of the empirical analysis implemented in this paper; it is a policy change that could also affect divorce rates by affecting the allocation of resources upon divorce.

Figure 3.1: Geographic Variation

UD Reform Timing

UD Reform and Homemaker Prot.

[40] In 2017, the lower chamber of the Mexican Congress approved a motion to include such compensation in the Federal Civil Code (thereby potentially making it binding for all states). Nonetheless, to the best of our knowledge, there is no information on whether such a motion passed through the upper chamber as the compensation is not included in the recent versions of the Federal Civil Code.

Table 3.1: Divorce Legislation Reforms in Mexico by State

	No-Fault UD Reform				Homemaker Comp.		
Region & State	Year	Code	Article	1 Year	Year	Article	Default Regime
Central							
Distrito Federal	2008	Civil	266	Yes	2008	267, VI	N
Guanajuato		Civil			2009	342-A	S
Hidalgo	2011	Family	103	No			S
Mexico	2012	Civil	4.91	Yes	2014	4.46	C
Morelos	2016	Family	174	No	2016	178	C
Puebla	2016	Civil	442-454	No	2016	443, VIII	C
Queretaro	2016	Civil	246	No	2016	252, VI	C
Tlaxcala	2016	Civil	106, 123	Yes			N
North							
Aguascalientes	2015	Civil	288	Yes[1]	2015	289, VI	C[3]
Baja California		Civil			2007	279 Bis	N
Baja California Sur	2017	Civil	305A	Yes	2017	305A, VII	S
Coahuila	2013	Civil	234	No	2015	239	S
Chihuahua		Civil					C
Durango	2018	Civil	261	No	2018	202	N,C[4]
Nuevo Leon	2017	Civil	266-270	Yes	2018	288	C,S[5]
San Luis Potosi	2017	Family	86	No	2017	86 Bis, VI	S
Sinaloa	2013	Family	181	Yes	2013	182, VI	N
Sonora		Family					C
Tamaulipas	2015	Civil	248	Yes	2015	249, VI	C
Zacatecas	2017	Family	240 Bis	No			S
West							
Colima	2016	Civil	268	No	2016	287 Bis	N,C[6]
Jalisco		Civil					C[3]
Michoacan	2016	Family	254-258	No	2016	277, 258	S
Nayarit	2015	Civil	260	No	2017	281A	S
South & East							
Campeche		Civil					S,N[7]
Chiapas		Civil			2009	287 Bis	C
Guerrero	2012	Divorcio	27	Yes	2010	7 Bis	S
Oaxaca	2017	Civil	278	Yes	2017	279, VI	C
Quintana Roo	2013[2]	Civil	798	No	2017	822	C,S[8]
Tabasco		Civil					C
Veracruz		Civil					C
Yucatan	2012	Family	191	Yes	2012	192	S

Sources: Authors' use of: [1] state civil and family codes for official years and decrees; [2] Méndez Sánchez (2014) and [3] Garcia-Ramos (2017) followed for further verification of no-fault UD reform years.

Notes: [1]This 1-year duration requirement was repealed in 2018, but was imposed at the time of reform.

[2]At the time of reform, the civil code still listed causes for unilateral divorce, which were removed until a 2017 reform.

The "Regime" column captures the default regime applied by the state if it is not made explicit by the spouses.

For "Regime": "S" refers to separation of property, "C" to community property and "N" indicates that the state requires an explicit choice for the marriage to take place.

[3]Have what is called a default legal community property regime.

[4]Previously had no default regime but changed it to community property in 2017.

[5]Previously had community property as default but changed it to separation of property in 2017.

[6]Previously had no default regime as default but changed it to community property in 2013.

[7]Previously had separation of property as default but changed it to no default regime in 2016.

[8]Previously had community property as default but changed it to separation of property in 2010.

3.3 Data

The primary data sources used in this project consist of a mix of administrative records collected by Mexico's National Institute of Statistics and Geography (INEGI, by its acronym in Spanish) on marriage and divorce.[41] The information contained in these records is obtained from official certificates issued by civil registries as well as family, civil, and mixed courts. We combine these administrative records to construct a unique panel data set of the sociodemographic and economic characteristics of spouses in marriages registered in the country from the period spanning from 2002 to 2019. For couples that ultimately file for divorce, this data set allows us to observe the characteristics of the spouses at the time of divorce. We supplement this data with the nationally-representative Retrospective Demographic Survey (EDER) to document trends in marital status that have occurred in the country over the last two decades and which are consistent with a second demographic transition described by Lesthaeghe (2014).[42] We provide further details on the different data sources used in this chapter throughout the following subsections.

3.3.1 Administrative Marriage Records

The INEGI's administrative data on marriages contains information on the spouses' education, age, nationality, employment status, and occupation at marriage. It also provides information on the state, municipality, and locality where the marriage was registered. Importantly, it also allows us to observe couples' matrimonial regime choices made at marriage. While this

[41]The public-use data files and technical documentation can be retrieved from `https://inegi.org.mx/programas/nupcialidad/#Microdatos` .

[42]The author characterizes this transition as a shift towards higher cohabitation rates, heightened incidence of non-marital fertility, and more frequent cases in which previously married individuals transition into informal "living apart together" relationships rather than remarrying.

information is only available after 2009, this still gives us ten years' worth of data on this choice that is not commonly observed in registry data.

Given the time covered by the administrative data sets, a recurring challenge that is faced when working with this data is that either variable names change from one year to another, possibly reflecting marriage or divorce reforms, or the set of responses captured in a particular variable change across time. We harmonize the variables available in all data files to implement the analysis we conduct throughout this chapter. For instance, before 2010, wife-specific and husband-specific characteristics in the marriage records were captured in variables with gender-specific names and explicitly attributed to either the wife or husband. From 2010 onwards, such explicit reference to the husband and wife is lost, and variable names capture information of spouse 1 and spouse 2. To construct wife- and husband-specific variables for the years after 2010 that is comparable with how information was obtained before 2010, we use a variable capturing the gender of both spouse 1 and spouse 2.[43] [44]

Using data on spouses' education from the marriage records obtained for the period spanning between 2002 and 2019, Table 3.2 presents descriptive information on marital sorting patterns for all states and then distinguishes the type of state as categorized by its default asset division regime. We differentiate between marriages formed under a mutual consent regime from those formed under a unilateral divorce regime. We classify individuals into two types based on their educational attainment. The high education type includes individuals who

[43]The legalization of same-sex marriage in Mexico City in 2010 prompted the use of such gender-neutral language for variable names.

[44]Another set of issues that needed to be dealt with involves changes in the coding of responses for particular variables. For instance, after 2012, there was a change in the classification of occupations that reduced the number of possible occupations captured by the variable provided with the same name across all years. We construct a new variable that preserved a homogeneous coding across time to address this. Similarly, after 2008, the number of education levels captured in the data set increased from 5 to 8 as the levels of completed primary school were broken down compared to what was previously provided. Before 2008, we can only observe whether a spouse had completed primary school, but in later years, we can observe whether they had completed only the first three years of primary school or four to five years of primary school.

have completed high school, while their low-type counterparts are those without a high school diploma. A couple's education match is described by the pair formed by the wife's education type and her husbands' type. We document a considerable amount of assortativeness in the marriage market. Most newly-formed couples are of a low-low match, with the second-highest fraction of couples being of a high-high type. Furthermore, we can observe that this is specific to couples formed under a mutual consent regime. In contrast, we observe this pattern reverse among couples formed in a unilateral divorce regime in which the majority of couples are of a high-high type. Distinguishing by the type of state as defined by its default asset division regime, we observe that this pattern holds in both community property and separation of property states. Nonetheless, we observe that most couples formed in no default states are of a high-high type among those formed under mutual consent and unilateral divorce regimes. Still, this fraction is relatively higher in the latter regime. The results presented in Section 3.5 highlight the causal relationship between unilateral divorce and assortativeness in education at the top.

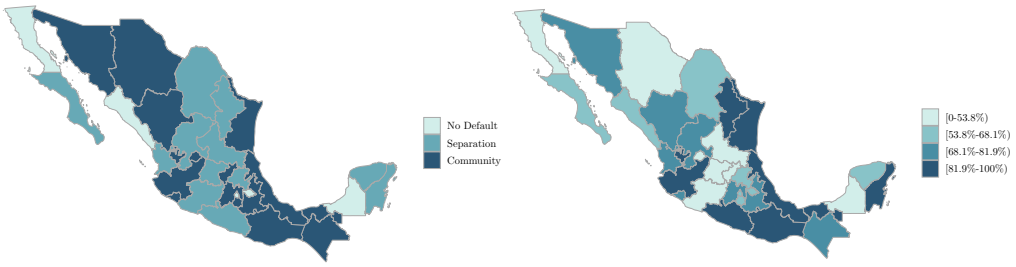
Focusing on the choice of asset division regime, Figure 3.2 presents geographic differences in newlyweds' choice of regime at the time of marriage. We compare this with the states' default regime upheld at divorce if couples do not specify a regime in the marriage license, as discussed in Section 3.2. While there are several states in which the intensity with which community property is chosen as the matrimonial regime correlates with the default regime, there are some states where the couples tend to forgo their state's default regime. In particular, in several states that require an explicit choice, most couples choose community property as their matrimonial regime. This motivates investigating the extent to which a couple's choice of regime is affected by the state's default regime and the spouses' education and their employment, particularly the wife's labor force participation, at the time of marriage.

Table 3.2: Marital Sorting in Education, by Unilateral Divorce Reform

	All		*No UD Reform*		*UD Reform*	
	Obs.	**Mean**	**Obs.**	**Mean**	**Obs.**	**Mean**
All States:						
Low-Low	9,420,896	0.45	8,128,393	0.47	1,292,503	0.36
Low-High	9,420,896	0.10	8,128,393	0.10	1,292,503	0.08
High-Low	9,420,896	0.10	8,128,393	0.11	1,292,503	0.09
High-High	9,420,896	0.35	8,128,393	0.33	1,292,503	0.46
No Default States:						
Low-Low	1,425,404	0.35	1,024,484	0.38	400,920	0.27
Low-High	1,425,404	0.10	1,024,484	0.11	400,920	0.08
High-Low	1,425,404	0.10	1,024,484	0.11	400,920	0.08
High-High	1,425,404	0.45	1,024,484	0.40	400,920	0.57
Community Property States:						
Low-Low	5,388,728	0.46	4,876,393	0.46	512,335	0.42
Low-High	5,388,728	0.10	4,876,393	0.10	512,335	0.09
High-Low	5,388,728	0.10	4,876,393	0.10	512,335	0.10
High-High	5,388,728	0.34	4,876,393	0.34	512,335	0.39
Separation of Property States:						
Low-Low	2,606,764	0.49	2,227,516	0.51	379,248	0.36
Low-High	2,606,764	0.10	2,227,516	0.10	379,248	0.09
High-Low	2,606,764	0.11	2,227,516	0.11	379,248	0.11
High-High	2,606,764	0.30	2,227,516	0.28	379,248	0.44

Notes: [1] Unilateral corresponds to an indicator of whether a marriage was recorded in a reforming state after the corresponding year of reform. High education type is defined as completing high school or higher. [2] First type corresponds to the wife's and second type to the husband's.

Figure 3.2: Geographic Variation in Asset Division Regime, Default and Choice



Default Regime Comm. Prop. Choice Intensity

Table 3.3 shows that more than 60% of newlyweds choose community property as their matrimonial regime. Furthermore, breaking down the sample by the type of education match, we find that the fraction of marriages choosing community property is relatively higher among couples in which the wife has not completed a high school degree. Furthermore, averaging across all types of states, we find that, conditional on the husband's education, the incidence

with which couples choose community property reduces with the wife's education. This education gradient is similar to the one captured by Bayot and Voena (2015) within the Italian context. This pattern breaks when focusing on marriages in separation states. We find that among women married to a spouse with less than a high school degree, the fraction of couples choosing community property increases with the wife's education. Concerning the wife's work status at the time of marriage, we find another similar pattern to the one observed by Bayot and Voena (2015), documenting that couples in which the wife is working at the time of marriage have a lower incidence of choosing community property as their asset division regime in all types of states compared to couples in which the wife is not working due to housework. The difference in the intensity with which newlyweds choose community property by the wife's work status at marriage is large, with this being approximately 16 p.p., on average, and being the largest in no default states, where it increases to almost 26.

Table 3.3: Community Property Choice by Type of Marriage

			Education Matches								*Wife's Work Status at Marriage*			
	All Matches		Low-Low		Low-High		High-Low		High-High		Working Wife		Not Working	
	Obs.	**Mean**	**Obs.**	**Mean**	**Obs.**	**Mean**	**Obs.**	**Mean**	**Obs.**	**Mean**	**Obs.**	**Mean**	**Obs.**	**Mean**
All States	4,959,605	0.65	1,799,648	0.69	417,286	0.70	487,429	0.67	1,745,564	0.60	2,096,297	0.58	1,823,523	0.74
No Default	631,412	0.61	168,970	0.70	49,975	0.68	54,313	0.66	313,795	0.54	324,148	0.53	177,379	0.79
Community	2,916,895	0.76	1,110,848	0.78	248,347	0.81	281,242	0.79	995,161	0.70	1,212,516	0.69	1,081,013	0.86
Separation	1,411,298	0.46	519,830	0.49	118,964	0.47	151,874	0.43	436,608	0.43	559,633	0.39	565,131	0.48

[1] Not working, but dedicated to home activities at the time of marriage.

3.3.2 Administrative Divorce Records

The INEGI's divorce records capture information on the spouses' education, employment status, and occupation at the time of divorce. These also capture retrospective details of the dissolution of the marriage, such as the location, date, and age of the spouses. More importantly, these records provide an overview of the divorce process from the moment the spouse(s) filed for divorce until its settlement. Hence, we have two distinct relevant date

variables for each divorce record, the first one related to the filing date and the second related to the sentencing date. The latter captures the date in which the Following Hoehn-Velasco and Penglase (2019), we use the sentencing year as the official divorce year. Such distinction is important since the two years differ in judicial divorces but coincide for administrative divorces. Furthermore, the sentencing year coincides with the year in which the INEGI records the divorce.

Regarding the filing process, there is information on the date, the identity of the spouse who filed the divorce petition, the applicable type of divorce (judicial or administrative), and the stated cause for the dissolution of marriage following the corresponding state's civil code (if filing unilaterally before the passage of a reform). For the details of the divorce settlement, we observe general information on the stipulations made on who is granted custody, guardianship and spousal alimony and whether child support is granted (if applicable). Unfortunately, a limitation of this data is that it does not provide information on the monetary amount of alimony and child support.

Table 3.4 presents relevant summary statistics obtained from the information contained in the divorce microdata. Averaging all years, we find that roughly more than half of the divorces filed are done under mutual consent. As expected, this fraction is substantially lower in a unilateral divorce regime. We also document a higher fraction of divorces being filed by the wife (and the husband) among divorces initiated under a unilateral divorce regime. Furthermore, we find that both spouses' average age at divorce is in their late thirties (being slightly higher for the husband than for the wife). In most divorce settlements, we find that only child support is granted, while the wife jointly receives spousal alimony in only 5% of divorces. Furthermore, on average, we find that marriages that ultimately get dissolved tend to have a duration of more than ten years.

Table 3.4: Divorce Microdata Summary Statistics, 2003-2019 by Unilateral Divorce Reform

	All	*No UD Reform*	*UD Reform*
	Mean	**Mean**	**Mean**
Mutual Consent	0.58	0.71	0.23
With Cause	0.18	0.23	0.02
Judicial	0.87	0.87	0.89
Administrative	0.13	0.13	0.11
Wife Initiated	0.22	0.16	0.39
Husband Initiated	0.17	0.12	0.29
Age, Wife	36.68	35.98	38.50
Age, Husband	39.26	38.61	40.97
Minor Child	0.69	0.72	0.63
Housewife	0.32	0.33	0.29
Working Wife	0.65	0.64	0.68
Alimony Granted to Wife	0.01	0.01	0.01
Alimony Granted to Husband	0.00	0.00	0.00
Child Support Only	0.62	0.64	0.57
Child Support Granted and Alimony for Wife	0.04	0.05	0.02
Child Support Granted and Alimony for Husband	0.01	0.01	0.01
Neither Alimony nor Child Support Granted	0.32	0.29	0.38
Marriage Duration (in years)	13.30	12.83	14.54
N	1,584,679	1,151,789	432,890

Notes: Unilateral corresponds to an indicator of whether a divorce was recorded in a reforming state after the corresponding year of reform.

3.3.3 Matched Data Set

Using the two administrative data sets aforementioned, we match each divorce record with a marriage one based on time-invariant variables in a way that is similar to the approach adopted in Bisin and Tura (2019). Nonetheless, our set of matching variables is relatively smaller since we do not have information on the birthplace of the spouses in either of the data sets. Following this strategy, we exploit the availability of information regarding the location where the marriage was registered (at the state, municipality, and locality level), the year of marriage, and the age of the spouses at marriage available in *both* data sets. Linking each divorce record with a marriage requires finding a way to uniquely identify a marriage and a divorce in each data file separately and then merging both based on this identifier. The identifier of choice contains the state, municipality, locality, age of both spouses at the time of marriage, and the year of marriage so that $id = ent + mun + loc + age_m^w + age_m^h + day_m + month_m + year_m$. A less restrictive identifier considered is $id_{new} = ent + mun + loc + age_m^i + day_m + month_m + year_m$,

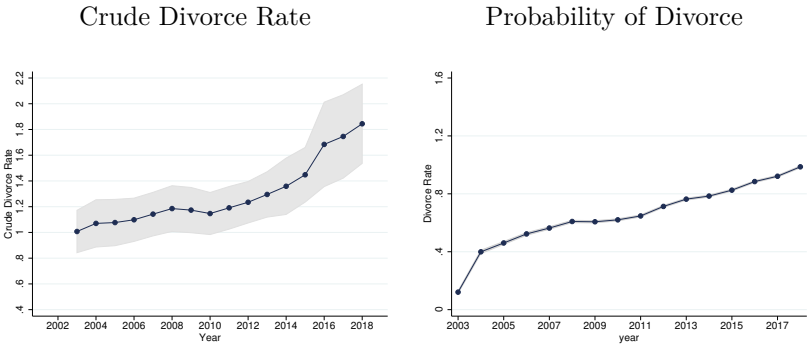
where $i = \{w, h\}$. Figure C.1 in Section C.1 describes the matching algorithm used to link marriage and divorce administrative records. This allows us to create up to five different potential identifiers for each divorce that we then match to a marriage. Given the years we currently have for the marriage records, we restrict the potential matched divorces to those reporting a year of marriage between 2002 and 2019, which reduces the potential sample of matched divorces to 640,695. We match 600,418 of these records upon implementing the matching algorithm, constituting a match rate of approximately 94%. Table C.1 in Section C.1 presents the distribution of matched divorces by their year of marriage. We use these matched records to construct a panel data set where each marriage enters the panel once it is registered as reported in the marriage license and exits the panel at the time of divorce as captured in its corresponding matched divorce record.

We compute two measures to capture the extent to which the adoption of unilateral divorce has impacted the incidence of divorce in the country. The first one corresponds to the crude divorce rate computed at the state level and is defined as the number of divorces registered per 1,000 persons over the age of 15, using the state's population aged 15 or older.[45] The second one corresponds to the divorce probability faced by each marriage recorded during the period covered by the analysis, thereby computing this measure at the individual marriage level. We compute this probability using the dataset we constructed upon matching the marriage and divorce records from 2003 to 2019. Figure 3.3 shows that there has been a steady increase in the incidence of divorce over the past decade.

Throughout our analysis, we focus on the second measure, which we will refer to as the divorce probability hereafter, computed on the matched records following the argument raised by

[45]We obtain an estimate of the mid-year population aged 15 or above throughout the 2005-2018 period using the second quarter of the National Survey of Occupation and Employment (ENOE) and supplement it with comparable information obtained from the second quarter of its predecessor, the National Employment Survey (ENE), for 2003 and 2004.

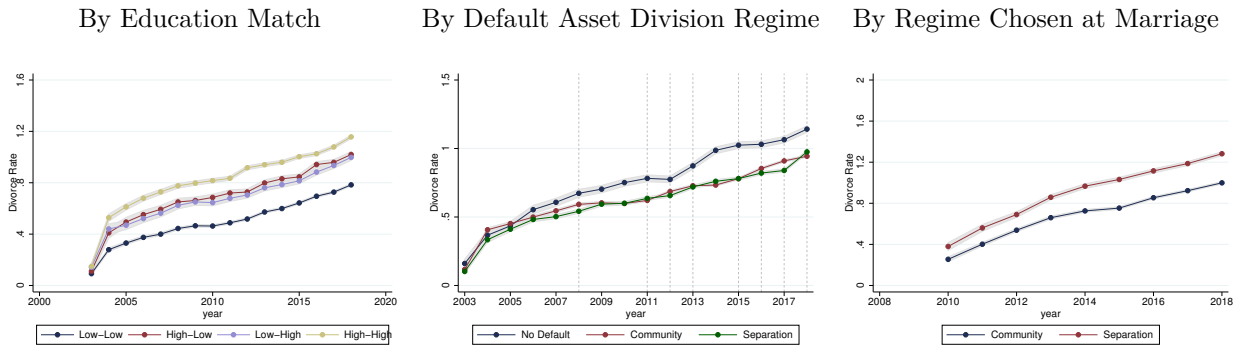
Figure 3.3: Divorce Rate (Overall), 2003-2018



Notes: [1] Crude divorce rate is computed per 1000 People 15 or older (at the state level). [2] Probability of divorce computed as the number of divorces per 100 marriages (at the individual marriage level).

Goode (1993) that a divorce rate calculated over the married population is more informative in circumstances in which selection into marriage exhibits significant socioeconomic disparities, such as in Mexico. We first document trends in the incidence of divorce by the spouses' educational attainment, choice of community property regime, and the state's default regime. We present these trends in the three panels of Figure 3.4. We observe that couples in which both spouses have completed high school or more are relatively more unstable, with high-high matches exhibiting the highest probability of divorce over the past 15 years. Furthermore, we find that marriages formed in no default states present a higher divorce probability than in the other types of states as characterized by their asset division regime. Similarly, we find that couples choosing separation of property at the time of marriage are relatively more unstable than those choosing community property. To the best of our knowledge, such a relationship between the asset division regime choice and the probability of divorce is novel as it is facilitated by the panel data we generated using the matched administrative records used in this chapter.

Figure 3.4: Divorce Rate, 2003-2018



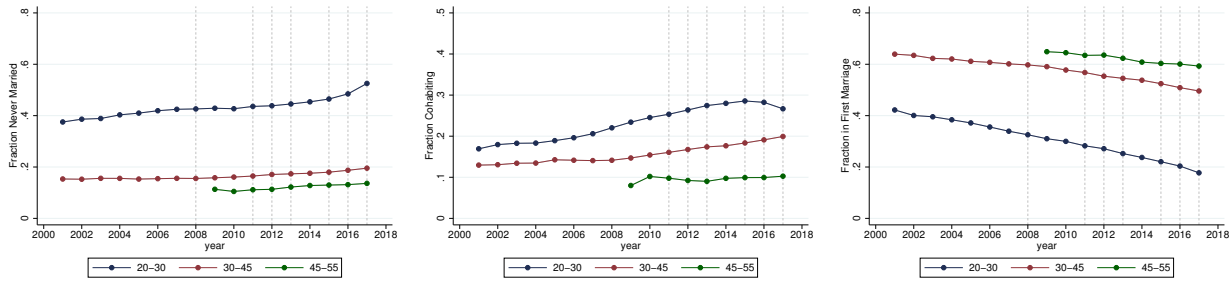
Notes: [1] Crude divorce rate is computed per 1000 People 15 or older (at the state level). [2] Probability of divorce computed per 100 marriages (at the individual marriage level).

3.3.4 Supplemental Survey Data

We supplement the administrative records with retrospective survey data to obtain information on individuals' marital status over the life cycle, allowing us to document patterns of household formation and dissolution over the past few decades. Specifically, we use the Retrospective Demographic Survey (EDER), collected as a special module of the nationally-representative 2017 cross-section of the National Household Survey (ENH). This retrospective module allows us to observe the marital history of a randomly-chosen individual aged 20-55 per household through responses to a series of retrospective questions regarding their marital status from their birth year until 2017. Besides marital histories, this data file also contains information on individuals' fertility history and educational attainment.

Figure 3.5 documents a fall in the fraction of individuals of all age groups who are in their first marriage over the past few years. For young adults between the ages of 20 and 30, this coincides with an increase in the fraction of individuals who are either never married or are living in cohabitation. We observe a similar pattern related to cohabitation among individuals between 30 and 45. As shown in Figure 3.6, we can further distinguish between

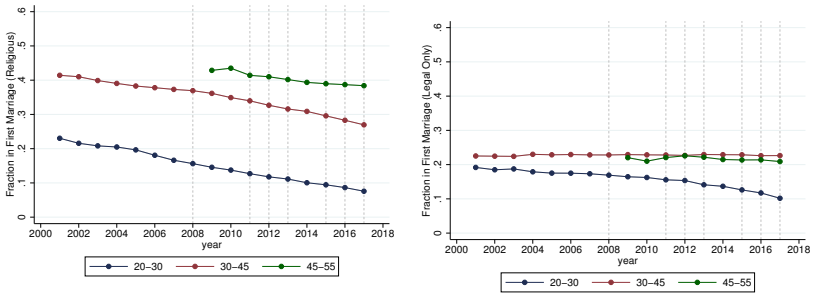
Figure 3.5: Marital Status (2000-2017), by Age Groups



Never Married | Cohabiting | First Marriage (All Types)

two types of marriages, those that are solely legal and those that are both legal and religious. The decrease in the fraction of individuals in their first marriage is mainly driven by those whose first marriage is both legal and religious.

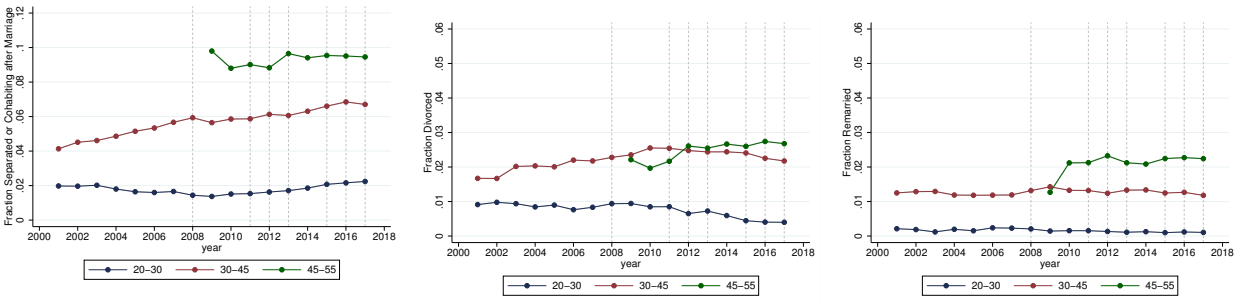
Figure 3.6: Marital Status (2000-2017), by Age Groups



First Marriage (Religious and Legal) | First Marriage (Legal Only)

Moreover, in Figure 3.7, we show that, the decrease in the fraction of individuals older than 30 in their first marriage coincides with an increase in the fraction of those who are either separated or in a cohabitation spell after their first marriage. We document a similar pattern for the 30-45 age group, along with an increase in the fraction who are divorced. However, for the 45-55 age group, we can observe that the decrease in the first marriage rates coincides with an increase in the fraction of individuals in this age group who are remarried. We show

Figure 3.7: Marital Status (2000-2017), by Age Groups



Separated/Cohabiting after Marriage

Divorced

Remarried

how these trends differ by gender in Section C.2.

3.4 Empirical Strategy

We use the geographic variation in the staggered adoption of unilateral divorce reform in the country to capture the dynamic effect of unilateral divorce reform on the choice of asset division regime, marital sorting, and the incidence of divorce. A common methodology used to evaluate the dynamic impact of a particular treatment like the one here considered involves the implementation of an event-study design based on a two-way fixed effects estimator. Within the context of our analysis, we initially consider the following specification

$$Y_{istk} = \sum_{j \neq -1} \alpha_j \mathbb{1}[j = k] + \boldsymbol{\beta} \mathbf{X}_{stk} + \eta_d + \eta_t + \eta_s + \epsilon_{stk} \tag{3.1}$$

where Y_{istk} is the outcome of interest for individual i, living in state s in year t for event time k (this outcome can be obtained from either the divorce or the marriage administrative dataset). For each state s in the dataset, we denote the year of no-fault unilateral divorce adoption presented in Table 3.1 by $t = 0$ and index all the relevant years relative to this year. Furthermore, $\mathbf{X}_{stk}$ denotes a vector of controls. Given this, the first term of the right-hand

side of 3.1 includes the full set of the event time dummies while omitting the event-time $t = -1$ so that these coefficients can be interpreted relative to the year before the introduction of no-fault unilateral divorce in the state. In addition, η_d denotes a state's default asset division regime group.

Recent work by Callaway and Sant'Anna (2020), Sun and Abraham (2020), and Goodman-Bacon (2021) has shown that a specification based on a two-way fixed estimator like 3.1 might be inadequate in applications in which different groups, or cohorts, are exposed to treatment at different points in time. The intuition behind such criticism is based on the argument that, unless treatment is homogeneous, the estimates of α_j for each j encodes information from other event times that will not cancel out when the timing of treatment varies, thus contaminating the estimate of α_j. A viable alternative in the presence of variation in the timing of treatment involves explicitly decomposing α_j as a weighted average of group-specific or cohort-specific average treatment effects ($CATT$). Specifically, we follow Sun and Abraham (2020) in implementing an alternative regression-based method that is more robust to the treatment heterogeneity generated by the staggered adoption of unilateral divorce in Mexico than the two-way fixed effects estimator.

Intuitively, within this alternative framework, the overall ATT at event-time j, α_j, can be decomposed into a weighted sum of cohort-specific ATT's of those states that experience at least j years relative to the adoption of UD:

$$\alpha_j = \sum_{e \in E} \omega^{e,j} CATT_{e,j} \tag{3.2}$$

where $E = \{2008, 2011, 2012, 2013, 2015, 2016, 2017\}$. In contrast with the two-way fixed effects estimator which has been shown to assign some weights $\omega_j^{e,j} \leq 0$, the weights used in

interaction-weighted estimator described in 3.2 are well-behaved in the sense that these are non-negative.

Implementation

We implement the interaction-weighted estimator proposed by Sun and Abraham (2020) in two main steps involving the computation of the individual components of 3.2.

Step 1: Letting Y_{istk} be the outcome of interest for individual i, in state s, in year t, k years relative to the year of reform, we estimate the following regression:

$$Y_{istk} = \sum_{e \in E} \sum_{j \neq -1} \delta_{j,e} \mathbb{1}[j = k] \times \mathbb{1}[E_s = e] + \boldsymbol{\beta} \mathbf{X}_{istk} + \eta_d + \eta_t + \eta_s + \epsilon_{stk}$$

The first terms collect the interactions between the event-time dummies and the cohort dummies, the second one corresponds to the vector of covariates used, η_t corresponds to the calendar-year fixed effects, η_d denotes a state's default asset division regime and eta_s denotes the state fixed effects. Specifically, $\widehat{\delta}_{j,e}$ serves as an estimate for the cohort e's average treatment effect at event time j, $CATT_{e,j}$.

Step 2: Construct $\widehat{\alpha}_j$ using $\widehat{\delta}_{e,j}$ such that

$$\widehat{\alpha}_j = \sum_{e \in E} \widehat{\delta}_{e,j} \widehat{Pr}(E_s = e | E_s \in [t - j, t + j])$$

where $\widehat{Pr}(E_s = e | E_s \in [t - j, t + j])$ denotes the sample share of each cohort that, in year t, is at least j years relative to the adoption of UD in the state. Thus, $\widehat{Pr}(E_s = e | E_s \in [t - j, t + j])$ serves as the weight, $\omega^{e,j}$ attached to each $CATT_{e,j}$ and are, by construction, well-behaved in the sense that $\omega^{e,j} \geq 0$.

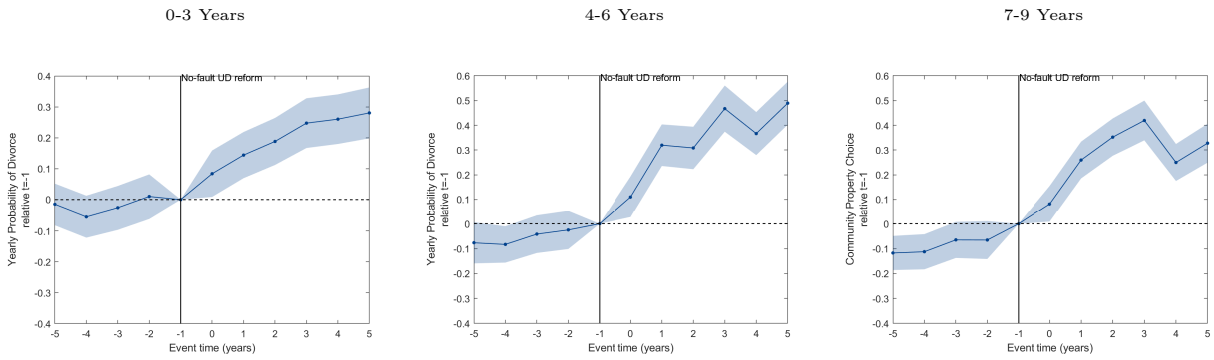
3.5 Results

We combine a descriptive and causal analysis of the primary data sources aforementioned to characterize the context of marriage, divorce, and household behavior in Mexico. Focusing on the unions formed over the last 15 years, we find that unilateral divorce has had a significant impact on marital sorting patterns and the choice of community property conditional on the spouses' educational attainment and the wife's work status at the time of marriage. More importantly, we find a strong impact of the reform on the probability of divorce faced by these marriages, with this effect being relatively larger among those in which the wife was working at the time of marriage, those choosing a community property regime as the matrimonial regime and those formed within a mutual consent regime.

Divorce

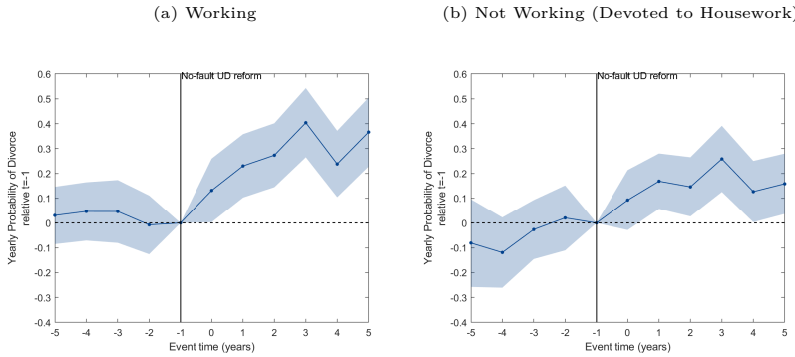
Figure 3.8 presents the results obtained from the implementation of the interaction-weighted estimator to quantify the dynamic impact of the introduction of unilateral reform on the yearly probability of divorce for marriages of different tenures: 0-3 years, 4-6 years and 7-9 years. We find that unilateral divorce significantly increases the probability of divorce for marriages with 0-9 years of marriage. Relative to the mean divorce probabilities computed at baseline, this impact is quite significant. It is almost 50% five years after the reform among all types of marriages distinguished by their tenure. While we have methodological differences, focus on a different divorce rate, and use a different unit of time compared to Hoehn-Velasco and Penglase (2019), our results are similar to theirs in the sense that we find a significant increase in the incidence of divorce as a result of the introduction of unilateral divorce reform in the country. This increase is robust to the education match of the couple at the time of marriage, as shown in Figures C.4-C.6 in Section C.2.

Figure 3.8: Dynamic Impact of Unilateral Divorce on the Probability of Divorce, by Marriage Tenure



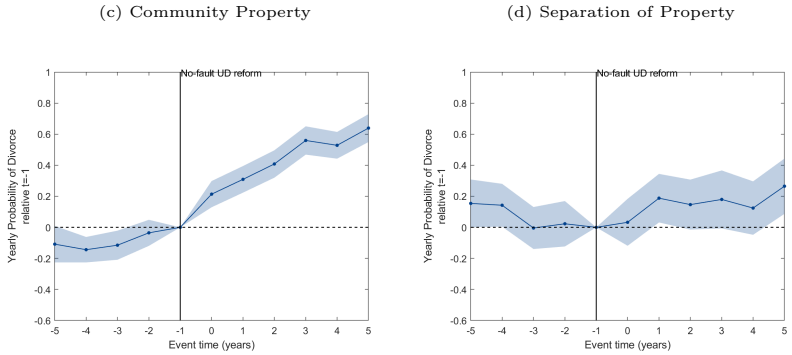
Notes: Queretaro, Quintana Roo, Tabasco and Yucatan have been excluded from the analysis due to inconsistencies in the quality of these states' marriage and divorce records for some years between 2003 and 2018. **Mean at baseline:** 0.64 (0-3 years), 0.84 (4-6 years), 0.95 (7-9 years).

Figure 3.9: Dynamic Impact of Unilateral Divorce on the Probability of Divorce, 0-3 Years of Marriage



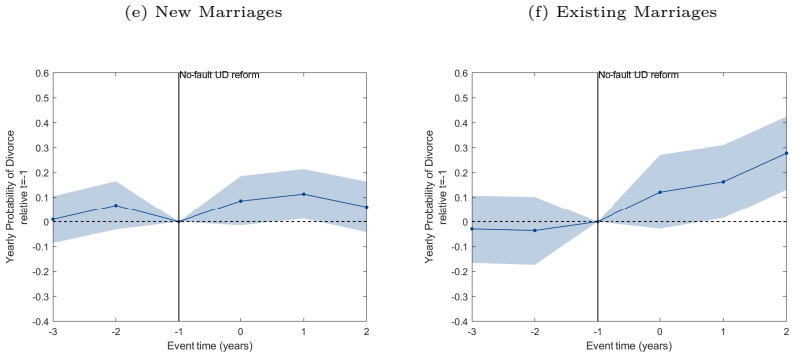
Notes: Queretaro, Quintana Roo, Tabasco and Yucatan have been excluded from the analysis due to inconsistencies in the quality of these states' marriage and divorce records for some years between 2003 and 2018. **Mean at baseline:** 0.76 (working wife), 0.57 (economically inactive wife, devoted to housework)

Figure 3.10: Dynamic Impact of Unilateral Divorce on the Probability of Divorce, 0-3 Years of Marriage



Notes: Queretaro, Quintana Roo, Tabasco and Yucatan have been excluded from the analysis due to inconsistencies in the quality of these states' marriage and divorce records for some years between 2003 and 2018. **Mean at baseline:** 0.54 (community), 0.77 (separation).

Figure 3.11: Dynamic Impact of Unilateral Divorce on the Probability of Divorce, 0-3 Years of Marriage



Notes: Queretaro, Quintana Roo, Tabasco and Yucatan have been excluded from the analysis due to inconsistencies in the quality of these states' marriage and divorce records for some years between 2003 and 2018. **Mean at baseline:** 0.47 (new marriages), 0.75 (existing marriages).

Figure 3.9 focuses the analysis on the sub-sample of marriages with 0-3 years of tenure. We focus on this tenure range since data availability for some information on wives' work status and the couples' asset division regime is available only after 2009, limiting the extent to which we can check for pre-trends for marriages with a higher tenure. Similarly, among these marriages, we can distinguish between existing (i.e., those with long enough tenure to have been formed under mutual consent and potentially dissolved under a unilateral divorce regime)

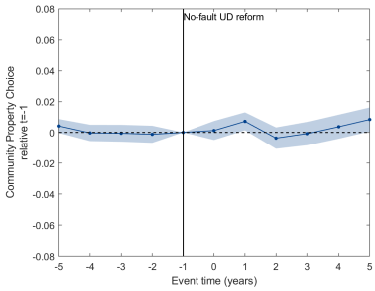
and new marriages (those with a marriage tenure shorter than a year). For these marriages, we find that the impact of the reform is higher (1) among those in which the wife was working at the time of marriage compared to couples in which the wife was not working at the time of marriage due to housework (comparing panels (a) and (b)), (2) among those choosing community property at the time of marriage (comparing panels (c) and (d)), and (3) among existing marriages rather than among new marriages (comparing panels (e) and (f)). Section C.3 provides a stylized conceptual framework through which we can rationalize the relatively stronger positive impact of unilateral divorce on the incidence of divorce among couples choosing community property at the time of marriage. Intuitively, we would expect this result in a context in which wives' non-pecuniary benefits from marriage are negative and in which women tend to be more economically favored upon divorce under a community property matrimonial regime rather than a separation of property regime (usually when women tend to be limited in their ability to accumulate assets of their own throughout marriage). Regarding the differential impact of the reform between new and existing marriages, given the one-year duration requirement imposed by several states as shown in Table 3.1, it is not surprising that the impact of the reform on new marriages is relatively smaller and mostly insignificant.

Household Formation: Marriage and Cohabitation

As noted in Lew and Beleche (2008), a potential endogeneity problem of capturing the impact of changes in divorce laws on marital dissolution is that these institutional changes can also affect the marriage market. Specifically, it is possible that making divorce easier might ultimately affect who marries whom and the choices made by newlyweds at the time of marriage, particularly how they are willing to divide assets upon divorce. We then document how the adoption of unilateral divorce has affected marital sorting patterns and newlyweds' asset division regime choice.

We begin by focusing on spouses' choice of asset division regime at marriage. Figure 3.12 presents the results obtained from the implementation of the interaction-weighted estimator to quantify the dynamic impact of the introduction of unilateral reform on couples' choice of community property at the time of marriage. We find no significant effect of the reform on the probability that newlyweds choose community property at marriage.

Figure 3.12: Dynamic Impact of Unilateral Divorce Reform on Community Property Choice



Notes: Baja California, Chihuahua, Sonora, Quintana Roo, Michoacan and Tlaxcala have been excluded from the analysis due to inconsistencies in the data related to missing values for the couple's choice of asset division regime in 2009 and 2010. Controls include spouses' age, education match, wife's work status at the time of marriage and the type of state defined by its default asset division regime. **Mean at baseline:** 0.67.

We then analyze how unilateral divorce has affected the types of marriages categorized by the spouses' education and wives' work status at marriage. We first focus on marital sorting on education. For this, we construct a measure of conditional and unconditional assortativeness at the state level based on the Singular Extreme Value (SEV) index discussed in Chiappori, Dias and Meghir (2020) that concisely summarizes the impact of unilateral divorce not only on the educational sorting patterns among newlyweds but also capture the extent to which these reforms have contributed to a retreat away from marriage and towards cohabitation, as documented in Section 3.3, in a way that differs by individuals' educational attainment.[46]

[46]The derivation of this index follows from a structural interpretation of sorting by relating it to the economic gains generated by marrying someone of the same type based on the framework of Choo and Siow (2006).

We compute these two indices by combining the administrative marriage records with the sociodemographic module provided in the ENOE to document changes in assortativeness across two education groups distinguished by the completion of high school. While we expect the conditional index to capture changes in the incidence with which individuals marry someone of the same education type conditional on getting married, its unconditional counterpart captures changes in how individuals of different education types decide to marry. In particular, we focus on the unconditional assortative index defined for those of a high education type, thus capturing assortativeness at the top. Given the simultaneous increase in high school completion rates and the retreat from marriage we document during the last two decades, the latter is of particular interest.

We define the conditional index using Definition 4 in Chiappori, Dias and Meghir (2020),

$$I^{C}_{SEV}(m,n,r) = \ln\left(\frac{r(1+r-m-n)}{(n-r)(m-r)}\right)$$

where, following the authors' notation, we let r denote the proportion of couples in which both spouses have at least a high school degree, m denote the proportion of married women who have completed high school, and n denote the proportion of married men who have completed high school. We then follow the generalization made for the $k \times k$ case using the approach based on merged tables to implement the following definition of the unconditional index that captures the degree of assortative matching at the top using[47]

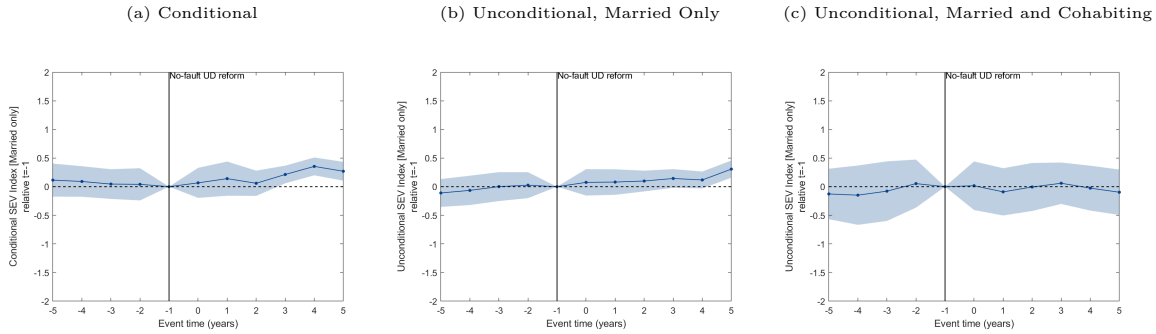
$$I^{H,U}_{SEV}(m_1,n_1,r_1) = \ln\left(\frac{r_1(1+r_1-m_1-n_1)}{(n_1-r_1)(m_1-r_1)}\right)$$

[47]The use of merged tables to work through the $k \times k$ case is described in further detail in Section 6 of Chiappori, Dias and Meghir (2020).

where the superscript H, U denotes that the index is specific to high education type matches and computed considering singles (U denoting the fact that we can think of this index as being the unconditional counterpart of I^{C}_{SEV}). In this case, r_1 captures the proportion of men and women in the sample who have completed high school and married their like, while $m_1 - r_1$ captures the proportion of the sample who are female high school graduates and either remained single or married someone with lower educational attainment. On the other hand, we then have that $n_1 - r_1$ captures the proportion of the sample who are male high school graduates and either remained single or married to someone with lower educational attainment.

Figure 3.13 presents the results obtained for the dynamic impact of unilateral divorce on assortativeness. We further distinguish between two alternative definitions of the unconditional index based on the inclusion of cohabiting individuals, either as singles or as couples. For simplicity, let the first type of unconditional index capture a marriage-based one and the second type of the unconditional index capture a relationship-based one (to capture the fact that we are using a broad definition for relationship by also including cohabiting couples as relationships). The results suggest that unilateral divorce can be associated with a significant increase of almost 20% in conditional assortativeness three years after the reform. However, the ease of divorce has a significant positive impact on marriage-based unconditional assortativeness only five years after the reform. In contrast, relationship-based assortativeness is virtually unaffected by the reform. This suggests that educational assortativeness at the top is driven by those who decide to marry rather than those choosing cohabitation. This is consistent with our finding that there is an increase of almost four percentage points in the fraction of high-high education matches associated with the adoption of unilateral divorce shown in Figure C.7 in Section C.2.

Figure 3.13: Dynamic Impact of Unilateral Divorce Reform on Marital Sorting

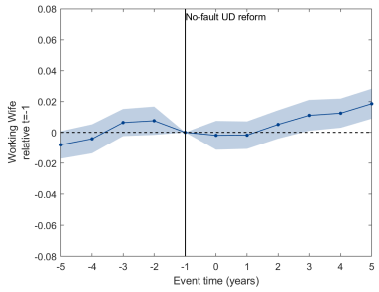


Notes: [1] Panel (b) includes cohabiting individuals as singles and panel (c) includes cohabiting individuals as couples. [2] Durango, Mexico, Michoacan, Nayarit, Puebla, Sinaloa, Tamaulipas, Yucatan, Morelos, Baja California and Guanajuato have been excluded from the analysis in (a)-(c) due to inconsistencies in the data related to spouses' educational attainment. **Mean at baseline:** 2.48 (conditional), -2.75 (unconditional only married), -2.04 (unconditional married and cohabiting).

Lastly, we investigate whether unilateral divorce reform has affected the types of matches formed in the marriage market as distinguished by the wife's work status at marriage. This is particularly relevant since we have found that the increase in the probability of divorce associated with unilateral divorce has been relatively larger among those marriages in which the wife was working at the time of marriage. Figure 3.14 shows that unilateral divorce reform has increased the fraction of marriages formed in which the wife is working at the time of marriage.

Besides the impact of unilateral divorce on the marriage market, we also document the extent to which the retreat from marriage documented in Section 3.3 can be attributed to the staggered liberalization of divorce in the country. Figures 3.15-3.17 show that among individuals in the 20-30 age group, UD reform has contributed significantly to the decline in the fraction of men and women in their first religious and legal marriage. For women, this is associated with a significant increase in the fraction of these women who are cohabiting. Among individuals in the 30-45 age group, unilateral divorce has also slightly contributed to

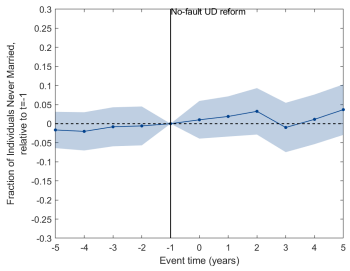
Figure 3.14: Wife's Labor Force Participation at the Time of Marriage



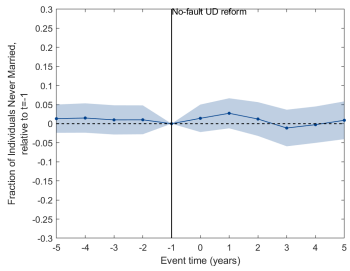
Notes: Mexico, Quintana Roo, Morelos, Nuevo Leon, San Luis Potosi, Sinaloa, Tamaulipas, Tlaxcala, and Michoacan have been excluded from the analysis due to inconsistencies in the data related to missing values and change in variables used to capture spouses' work status at the time of marriage made starting on 2010 generate artificial violations of the parallel trends assumption. Controls include spouses' age, education match, and the type of state defined by its default asset division regime. **Mean at baseline:** 0.41

the decrease in the fraction of individuals in this age group who are in their first marriage documented during the past two decades.

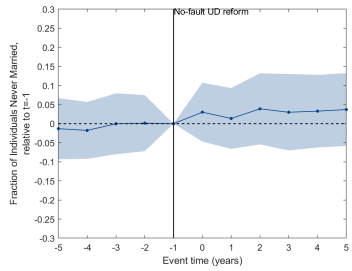
Figure 3.15: UD Reform and the Fraction of Individuals Never Married, By Age



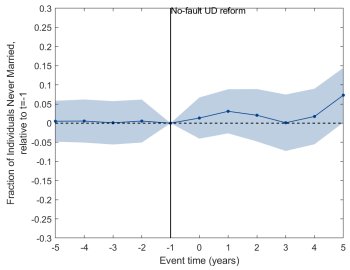
Women, Age 20-30



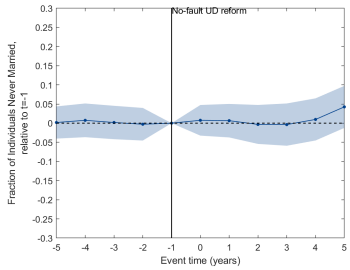
Women, Age 30-45



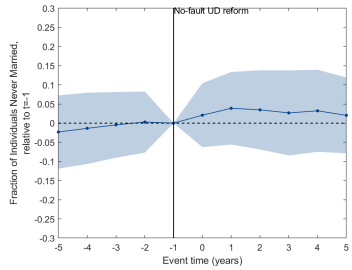
Women, Age 45-55



Men, Age 20-30

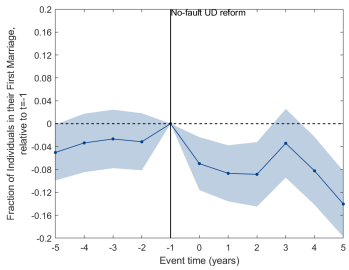


Men, Age 30-45

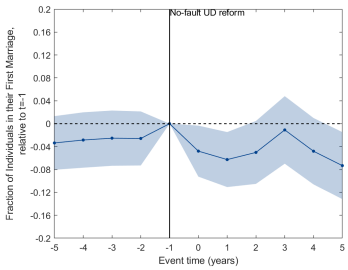


Men, Age 45-55

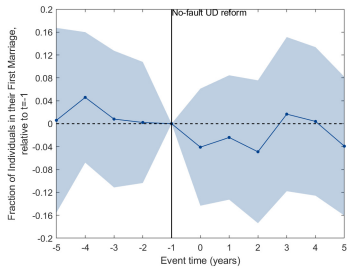
Figure 3.16: UD Reform and the Fraction of Individuals in a First Marriage, By Age



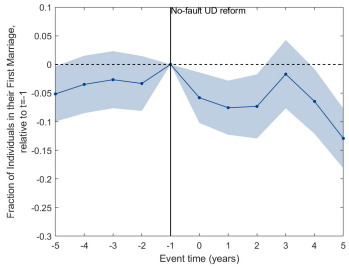
Women, Age 20-30



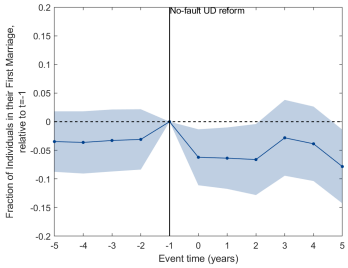
Women, Age 30-45



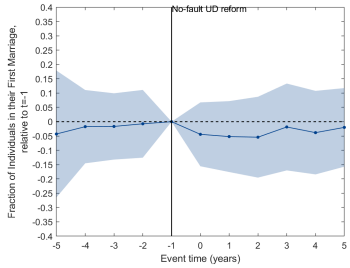
Women, Age 45-55



Men, Age 20-30

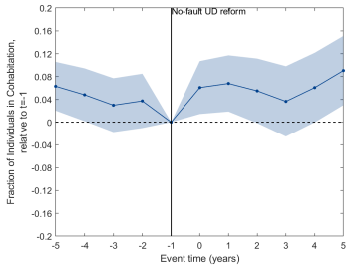


Men, Age 30-45

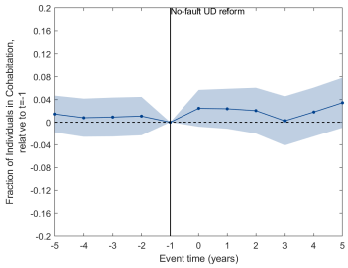


Men, Age 45-55

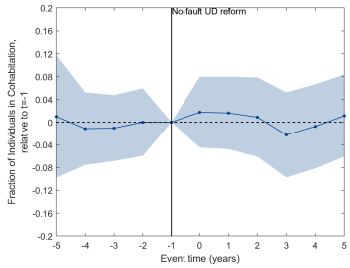
Figure 3.17: UD Reform and the Fraction of Individuals in Cohabitation, By Age



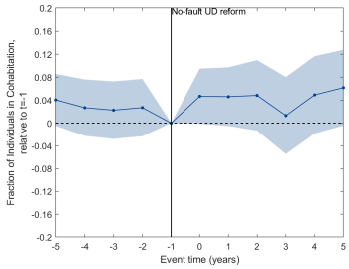
Women, Age 20-30



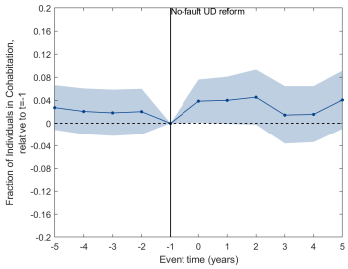
Women, Age 30-45



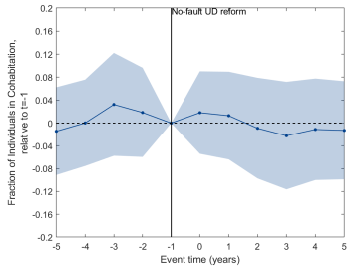
Women, Age 45-55



Men, Age 20-30



Men, Age 30-45



Men, Age 45-55

Overall, the results suggest that unilateral divorce reforms have had a significant positive impact on the incidence of divorce, with the increase being relatively higher among couples in which spouses chose community property as their matrimonial regime at the time of marriage, existing marriages, and marriages in which the wife was working at the time of marriage. Furthermore, we find evidence that unilateral divorce reform has increased assortativeness in education at the top among newlyweds, has increased the fraction of marriages in which the wife is working at the time of marriage, but has not significantly affected couples' choice of asset division regime at the time of marriage.

3.6 Conclusion

In this chapter, we provide novel evidence on the impact of unilateral divorce reforms on the incidence of divorce and investigate how such effect is heterogeneous by the characteristics of the spouses at the time of marriage, including their educational attainment, labor force participation, and choice of asset division regime at the time of marriage. We do this by combining unique panel data on the formation and dissolution of legal marriages registered in Mexico between 2002 and 2019 within an event study design that accounts for the heterogeneity in treatment timing generated by the staggered adoption of unilateral divorce reforms across states. Specifically, our results show that the staggered adoption of unilateral divorce reform significantly increased the probability of divorce for marriages with a tenure of 0-9 years. Furthermore, for marriages with tenure of 0-3 years, the impact is higher among existing marriages, those choosing community property at the time of marriage, and those in which the wife was working at the time of marriage.

We further provide evidence of the impact of unilateral divorce on marital sorting patterns in education, newlyweds' choice of asset division regime, and wives' labor force participation

at the time of marriage. Similarly, we present evidence of how these reforms have also contributed to the retreat from marriage documented in the country during the past two decades. Overall, we find that unilateral divorce has increased the degree of assortativeness in education among newlyweds, driven by an increase in the fraction of marriages in which both spouses have completed at least high school.

Our results contribute to the literature by adopting a comprehensive approach to documenting the impact of the liberalization of divorce on household formation and dissolution in the context of a developing country like Mexico and how this impact differs by the couple's characteristics at the time of marriage. Besides affecting marital formation and dissolution, we expect these reforms to also affect the behavior of intact couples, both married and cohabiting. The empirical results we present in this chapter provide motivating evidence for developing an equilibrium limited-commitment model of partnership formation, asset division regime choice, household behavior, and dissolution that could allow us to highlight the role and value of divorce laws and asset division regime choice. We leave these two considerations for future research.

Bibliography

Aguiar, Mark, and Erik Hurst. 2007. "Measuring trends in leisure: The allocation of time over five decades." *The Quarterly Journal of Economics*, 122(3): 969–1006.

Allen, Douglas W. 1992. "Marriage and divorce: Comment." *The American Economic Review*, 82(3): 679–685.

Angelucci, Manuela, and Orazio Attanasio. 2009. "Oportunidades: program effect on consumption, low participation, and methodological issues." *Economic Development and Cultural Change*, 57(3): 479–506.

Angelucci, Manuela, and Orazio Attanasio. 2013. "The demand for food of poor urban mexican households: Understanding policy impacts using structural models." *American Economic Journal: Economic Policy*, 146–178.

Angelucci, Manuela, Orazio Attanasio, and Jonathan Shaw. 2005. "The Effect of Oportunidades on the Level and Composition of Consumption in Urban Areas." *External Evaluation of the Impact of Oportunidades Porgram 2004: Education*, 105–152.

Apps, Patricia F, and Ray Rees. 1988. "Taxation and the Household." *Journal of Public Economics*, 35(3): 355–369.

Apps, Patricia F, and Ray Rees. 1996. "Labour supply, household production and intra-family welfare distribution." *Journal of Public Economics*, 60(2): 199–219.

Armand, Alex, Orazio Attanasio, Pedro Carneiro, and Valérie Lechene. 2020. "The effect of gender-targeted conditional cash transfers on household expenditures: Evidence from a randomized experiment." *The Economic Journal*, 130(631): 1875–1897.

Attanasio, Orazio, and Valerie Lechene. 2002. "Tests of the income pooling in household decisions." *Review of Economic Dynamics*, 5(4): 720–748.

Attanasio, Orazio, and Valérie Lechene. 2010. "Conditional cash transfers, women and the demand for food." IFS working papers.

Attanasio, Orazio, and Valérie Lechene. 2014. "Efficient responses to targeted cash transfers." *Journal of Political Economy*, 122(1): 178–222.

Attanasio, Orazio P, Costas Meghir, and Ana Santiago. 2012. "Education choices in Mexico: using a structural model and a randomized experiment to evaluate Progresa." *The Review of Economic Studies*, 79(1): 37–66.

Bayot, Denrick, and Alessandra Voena. 2015. "Prenuptial contracts, labor supply and household investments." *Unpublished manuscript, Department of Economics, University of Chicago, Illinois*.

Behrman, Jere, and Susan Parker. 2011. "The impact of the PROGRESA/Oportunidades conditional cash transfer program on health and related outcomes for the aging in Mexico."

Behrman, Jere R, Jorge Gallardo-Garcıa, Susan W Parker, Petra E Todd, and Viviana Vélez-Grajales. 2011. "Are Conditional Cash Transfers Effective in Urban Areas? Evidence from Mexico."

Behrman, Jere R, Jorge Gallardo-Garcia, Susan W Parker, Petra E Todd, and Viviana Vélez-Grajales. 2012. "Are conditional cash transfers effective in urban areas? Evidence from Mexico." *Education Economics*, 20(3): 233–259.

Behrman, Jere R, Piyali Sengupta, and Petra Todd. 2005. "Progressing through PROGRESA: An impact assessment of a school subsidy experiment in rural Mexico." *Economic development and cultural change*, 54(1): 237–275.

Bisin, Alberto, and Giulia Tura. 2019. "Marriage, Fertility, and Cultural Integration in Italy." National Bureau of Economic Research.

Blundell, Richard, and Monica Costa Dias. 2009. "Alternative approaches to evaluation in empirical microeconomics." *Journal of Human Resources*, 44(3): 565–640.

Blundell, Richard, Pierre-André Chiappori, and Costas Meghir. 2005. "Collective labor supply with children." *Journal of Political Economy*, 113(6): 1277–1306.

Blundell, Richard, Pierre-Andre Chiappori, Thierry Magnac, and Costas Meghir. 2007. "Collective labour supply: Heterogeneity and non-participation." *The Review of Economic Studies*, 74(2): 417–445.

Bobonis, Gustavo J. 2009. "Is the allocation of resources within the household efficient? New evidence from a randomized experiment." *Journal of political Economy*, 117(3): 453–503.

Browning, Martin, and Pierre-André Chiappori. 1998. "Efficient intra-household allocations: A general characterization and empirical tests." *Econometrica*, 1241–1278.

Browning, Martin, Pierre-André Chiappori, and Yoram Weiss. 2014. *Economics of the Family.* Cambridge University Press.

Callaway, Brantly, and Pedro HC Sant'Anna. 2020. "Difference-in-differences with multiple time periods." *Journal of Econometrics*.

Calvi, Rossella. 2020. "Why are older women missing in India? The age profile of bargaining power and poverty." *Journal of Political Economy*, 128(7): 2453–2501.

Cherchye, Laurens, Bram De Rock, and Frederic Vermeulen. 2012. "Married with children: A collective labor supply model with detailed time use and intrahousehold expenditure information." *American Economic Review*, 102(7): 3377–3405.

Cherchye, Laurens, Bram De Rock, Arthur Lewbel, and Frederic Vermeulen. 2015. "Sharing rule identification for general collective consumption models." *Econometrica*, 83(5): 2001–2041.

Cherchye, Laurens, Sam Cosaert, Bram De Rock, Pieter Jan Kerstens, and Frederic Vermeulen. 2018. "Individual welfare analysis for collective households." *Journal of Public Economics*, 166: 98–114.

Chiappori, P-A, and Ivar Ekeland. 2009. "The Microeconomics of Efficient Group Behavior: Identification 1." *Econometrica*, 77(3): 763–799.

Chiappori, Pierre-André, and Costas Meghir. 2015. "Intrahousehold inequality." In *Handbook of income distribution*. Vol. 2, 1369–1418. Elsevier.

Chiappori, Pierre-Andre, Bernard Fortin, and Guy Lacroix. 2002. "Marriage market, divorce legislation, and household labor supply." *Journal of political Economy*, 110(1): 37–72.

Chiappori, Pierre-André, Monica Costa Dias, and Costas Meghir. 2020. "Changes in assortative matching: Theory and evidence for the US." National Bureau of Economic Research.

Chiappori, Pierre-André, Murat Iyigun, and Yoram Weiss. 2015. "The becker–coase theorem reconsidered." *Journal of Demographic Economics*, 81(2): 157–177.

Choo, Eugene, and Aloysius Siow. 2006. "Who marries whom and why." *Journal of political Economy*, 114(1): 175–201.

Dávila Lárraga, Laura G. 2016. "How does Prospera work?: Best practices in the implementation of conditional cash transfer programs in Latin America and the Caribbean." *Inter-American Development Bank*.

Doss, Cheryl. 2013. "Intrahousehold bargaining and resource allocation in developing countries." *The World Bank Research Observer*, 28(1): 52–78.

Dubois, Pierre, Alain De Janvry, and Elisabeth Sadoulet. 2012. "Effects on school enrollment and performance of a conditional cash transfer program in Mexico." *Journal of Labor Economics*, 30(3): 555–589.

Duflo, Esther. 2003. "Grandmothers and granddaughters: old-age pensions and intrahousehold allocation in South Africa." *The World Bank Economic Review*, 17(1): 1–25.

Duflo, Esther. 2012. "Women empowerment and economic development." *Journal of Economic literature*, 50(4): 1051–79.

Duflo, Esther, and Christopher Udry. 2004. "Intrahousehold resource allocation in Cote d'Ivoire: Social norms, separate accounts and consumption choices." National Bureau of Economic Research.

Dunbar, Geoffrey R, Arthur Lewbel, and Krishna Pendakur. 2013. "Children's resources in collective households: identification, estimation, and an application to child poverty in Malawi." *American Economic Review*, 103(1): 438–71.

Flores, Andrea. 2021. "Conditional Cash Transfers and Intrahousehold Time Allocation: Evidence from Urban Mexico." *Available at SSRN 3937012*.

Friedberg, Leora. 1998. "Did unilateral divorce raise divorce rates? Evidence from panel data." *The American Economic Review*, 88(3): 608–627.

Garcia-Ramos, Aixa. 2017. "Divorce laws and intimate partner violence: Evidence from Mexico." *Unpublished Manuscript*.

Gayle, George-Levi, and Andrew Shephard. 2019. "Optimal taxation, marriage, home production, and family labor supply." *Econometrica*, 87(1): 291–326.

González, Libertad, and Tarja K Viitanen. 2009. "The effect of divorce laws on divorce rates in Europe." *European Economic Review*, 53(2): 127–138.

Goode, William J. 1993. "Latin America: a regional system of formal and informal divorce."

Goodman-Bacon, Andrew. 2021. "Difference-in-differences with variation in treatment timing." *Journal of Econometrics*.

Gruber, Jonathan. 2004. "Is making divorce easier bad for children? The long-run implications of unilateral divorce." *Journal of Labor Economics*, 22(4): 799–833.

Heckman, James, Hidehiko Ichimura, Jeffrey Smith, and Petra Todd. 1998. "Characterizing selection bias using experimental data." National bureau of economic research.

Heckman, James J, Hidehiko Ichimura, and Petra E Todd. 1997. "Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme." *The review of economic studies*, 64(4): 605–654.

Heckman, James J, Hidehiko Ichimura, and Petra Todd. 1998. "Matching as an econometric evaluation estimator." *The Review of Economic Studies*, 65(2): 261–294.

Hoehn-Velasco, Lauren, and Jacob Penglase. 2019. "The impact of no-fault unilateral divorce laws on divorce rates in mexico." *Economic Development and Cultural Change (forthcoming)*.

Hoehn-Velasco, Lauren, and Jacob Penglase. 2021. "Does unilateral divorce impact women's labor supply? Evidence from Mexico." *Journal of Economic Behavior & Organization*, 187: 315–347.

INEGI. 2009. "Uso del tiempo, una perspectiva estadistica de genero, 2009."

INEGI. 2010. "Conociendo la base de datos de la ENOE: Datos ajustados a proyecciones de poblacion 2010."

Lesthaeghe, Ron. 2014. "The second demographic transition: A concise overview of its development." *Proceedings of the National Academy of Sciences*, 111(51): 18112–18115.

Levy, Santiago. 2007. *Progress against poverty: sustaining Mexico's Progresa-Oportunidades program.* Brookings Institution Press.

Lew, Nellie, and Trinidad Beleche. 2008. "'Til Laws Do Us Part? The Impact of Changing Divorce Laws on Divorce Rates in Mexico." In *Technical Report*. Working paper. Recuperado el día 15 de enero de 2011 de:.

Lise, Jeremy, and Ken Yamada. 2019. "Household sharing and commitment: Evidence from panel data on individual expenditures and time use." *The Review of Economic Studies*, 86(5): 2184–2219.

Lise, Jeremy, Shannon Seitz, and Jeffrey Smith. 2004. "Equilibrium policy experiments and the evaluation of social programs." National Bureau of Economic Research.

Lundberg, Shelly J, Robert A Pollak, and Terence J Wales. 1997. "Do husbands and wives pool their resources? Evidence from the United Kingdom child benefit." *Journal of Human resources*, 463–480.

Méndez Sánchez, Allan Alberto. 2014. "El divorcio incausado en México." Master's diss. Universidad Iberoamericana Ciudad de México. Departamento Economía.

Newey, Whitney K, and Daniel McFadden. 1994. "Large sample estimation and hypothesis testing." *Handbook of econometrics*, 4: 2111–2245.

Ortega-Díaz, Araceli. 2020. "Marital Status and Poverty with Gender Bias." In *Advances in Women's Empowerment: Critical Insight from Asia, Africa and Latin America*. Emerald Publishing Limited.

Parker, Susan, and Emmanuel Skoufias. 2000. "The impact of PROGRESA on work, leisure and time allocation." *Washington, DC: International Food Policy Research Institute*.

Parker, Susan W, and Petra E Todd. 2017. "Conditional cash transfers: The case of Progresa/Oportunidades." *Journal of Economic Literature*, 55(3): 866–915.

Peters, H Elizabeth. 1986. "Marriage and divorce: Informational constraints and private contracting." *The American Economic Review*, 76(3): 437–454.

Peters, H Elizabeth. 1992. "Marriage and divorce: Reply." *The American Economic Review*, 82(3): 686–693.

Rangel, Marcos A. 2006. "Alimony rights and intrahousehold allocation of resources: evidence from Brazil." *The Economic Journal*, 116(513): 627–658.

Rosenbaum, Paul R, and Donald B Rubin. 1983. "The central role of the propensity score in observational studies for causal effects." *Biometrika*, 70(1): 41–55.

Rubio-Codina, Marta. 2010. "Intra-household time allocation in rural Mexico: Evidence from a randomized experiment." *Research in Labor Economics*, 31: 219–257.

Skoufias, Emmanuel. 2005. *PROGRESA and its impacts on the welfare of rural households in Mexico.* Vol. 139, Intl Food Policy Res Inst.

Skoufias, Emmanuel, and Vincenzo Di Maro. 2006. *Conditional cash transfers, adult work incentives, and poverty.* The World Bank.

Skoufias, Emmanuel, Susan W Parker, Jere R Behrman, and Carola Pessino. 2001. "Conditional cash transfers and their impact on child work and schooling: Evidence from the Progresa program in Mexico." *Economia*, 2(1): 45–96.

Sokullu, Senay, and Christine Valente. 2021. "Individual consumption in collective households: Identification using repeated observations with an application to progresa." *Journal of Applied Econometrics*.

Stampini, Marco, and Leopoldo Tornarolli. 2012. "The growth of conditional cash transfers in Latin America and the Caribbean: did they go too far?" IZA Policy Paper.

Stevenson, Betsey, and Justin Wolfers. 2007. "Marriage and divorce: Changes and their driving forces." *Journal of Economic perspectives*, 21(2): 27–52.

Sun, Liyang, and Sarah Abraham. 2020. "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects." *Journal of Econometrics*.

Todd, Petra E, and Kenneth I Wolpin. 2006. "Assessing the impact of a school subsidy program in Mexico: Using a social experiment to validate a dynamic behavioral model of child schooling and fertility." *American Economic Review*, 96(5): 1384–1417.

Tommasi, Denni. 2019. "Control of resources, bargaining power and the demand of food: evidence from PROGRESA." *Journal of Economic Behavior & Organization*, 161: 265–286.

Tommasi, Denni, and Alexander Wolf. 2016. "Overcoming weak identification in the estimation of household resource shares." *Unpublished Manuscript, ECARES*, 2.

Udry, Christopher. 1996. "Gender, agricultural production, and the theory of the household." *Journal of political Economy*, 104(5): 1010–1046.

Voena, Alessandra. 2015. "Yours, mine, and ours: Do divorce laws affect the intertemporal behavior of married couples?" *American Economic Review*, 105(8): 2295–2332.

Wolfers, Justin. 2006. "Did unilateral divorce laws raise divorce rates? A reconciliation and new results." *American Economic Review*, 96(5): 1802–1820.

Appendix A

Appendix to Chapter 1

A.1 Data Appendix

A.1.1 Sample Construction

For the construction of the subsample of two-parent households, this paper focuses on households in which there are no more than two adults in the households, namely the mother and the father, with any number of children younger than 25.[48] Identification of the parents used the variables pertaining individuals' relationship to head, marital status and a person's spouse, mother and father identifiers. By cross-checking each adults' spouse identifier, it is possible to double check that both adults are living maritally; while cross-checking the children's mother and father identifier helps ensure that the two adults in the household are indeed their parents. Observations in which there are inconsistencies for one wave regarding

[48]This age restriction is based on the ages specified in the 2002 ENCELURB questionnaire of the target respondents of the education component of the sociodemographic module. It also makes sense since at this point, individuals are expected to have completed at least their undergraduate studies, and no further significant investments in education are expected from the parents.

a person's relationship to head and spouse id were first checked with other waves.[49] From an original sample of 76,002 individual observations in 2002, this restriction further reduces the sample to 40,375 individual observations corresponding to 8,216 household observations. The further restriction of ensuring the stability of these household's structure across all waves combined with the restriction that the household's original 2002 poverty classification is non-missing further reduces the sample size to 5,023 households observed throughout 2002-2004, corresponding to 25,576 individual observations.[50] Furthermore, Table A.1 presents how the resulting sample is distributed across city blocks and poverty classification. As this

Table A.1: Distribution of Matched Two Parent Households according to their Poverty Classification across Intervention and Control City Blocks, 2002-2004

Poverty Classification	Control	Intervention
Poor (eligible)	1,299	1,989
Almost poor (almost eligible)	347	698
Non-poor (ineligible)	88	602
Total	1,734	3,289

paper focuses on the use of *Oportunidades* as a distribution factor, this paper focuses on the subsample of these households that are eligible to the program, or originally classified as poor in 2002. Therefore, the final subsample used in the analysis implemented in this paper consists of 3,288 poor households.

For the construction of the subsample of single parent households, this paper focuses on households in which there is only the mother and her children without any other adult

[49]There were some instances in which there were two people identified as the household head's spouse, but which in the other two waves only one of them was identified as the spouse and the other as a daughter or son.

[50]The poverty classification used in the empirical strategy is obtained from the 2002 wave *cla_soc* variable which was constructed at the baseline ENCELURB wave and is based on the more detailed mix of observational and self-reported information collected in this survey than the one provided in the *tamizaje*, or *screening* dataset constructed based on the self-reported responses provided by the households. In a way, the ENCELURB's *cla_soc* serves as a revised poverty classification to the one provided in the *tamizaje* data.

living in the household. The focus on single mothers stems from the gendered nature of the program's targeting which does not allow for the subsample of single fathers living with no other adult in the household to be too small for the analysis implemented in this paper. Furthermore, given the intended use of the single parent households' analysis as a way to obtain further information on a potential empowerment effect behind mothers' results in two parent households, this does not constitute a significant problem. The aforementioned restriction and the requirement of observing these single parents across the three waves of the evaluation survey reduces this subsample to 1,870 households. Table A.2 presents how the households in this subsample are distributed across city blocks and poverty classification.

Table A.2: Distribution of Matched Single Mother Households according to their Poverty Classification across Intervention and Control City Blocks, 2002-2004

Poverty Classification	Control	Intervention
Poor (eligible)	337	891
Almost poor (almost eligible)	89	267
Non-poor (ineligible)	23	263
Total	449	1,421

In order to be consistent with the restriction imposed in the two parent households subsample, this paper focuses on single mother households that are classified as poor, or eligible, by the program administration. This further reduces the subsample to 1,288 poor single mother households.

Geographic Distribution of Eligible Households

Both subsamples of poor households are disproportionately distributed across the poorest states which are located in the southern and eastern regions as can be seen in 1.1. This is consistent with the first stage of the program's targeting and with the subsequent selection

of households based on their poverty score. Table A.3 presents the geographic distribution of these households. Approximately 73% of poor two-parent households in intervention city blocks are located in southern and eastern states, while around 73% of poor households in control city blocks are located in central and eastern states. A similar pattern holds for single parent households.

Table A.3: Distribution of (Poor) Matched Households according to their Region across Intervention and Control Blocks, 2002-2004

	Two Parent Households		**Single Parent Households**	
Region	*Control*	*Intervention*	*Control*	*Intervention*
North	99	75	44	26
Central	627	346	142	144
East	316	655	77	347
West	17	108	11	51
South	240	805	63	323
Total	1,299	1,989	337	891

A.1.2 Variable Construction

Time Use

Following Aguiar and Hurst (2007) four main time use categories are analyzed in this paper. The major time-use groups mapped to the information provided in the ENCELURB. The main categories of time use of interest include the following

- Market Work: Primary job work hours and secondary job work hours
- Core Household Production: Food preparation, household care (doing laundry, dusting, ironing, doing dishes, vacuuming and maintenance), trash disposal and carrying water

- Procurement of goods and services: shopping for household items
- Child care

To highlight the importance of home production in the analysis of time allocation within households, this paper implements two definitions of leisure used in the literature. The first one, Leisure Definition 1 is constructed in the following way

$$L_1^i = \bar{T} - h_M^i \tag{A.1}$$

where $\bar{T}$ denotes the total weekly time endowment available to all individuals in the household, at 168 (24 hours per day). That is, Leisure Definition 1 is the component of total time endowment that is not spent in market work.

On the other hand, the level of disaggregation of the time use data provided in the ENCELURB permits the construction of a richer definition of leisure, called Leisure Definition 2, constructed in the following way

$$L_2^i = \bar{T} - h_M^i - h_D^i - h_K^i \tag{A.2}$$

where h_M^i refers to weekly market hours, h_D^i to weekly total home production hours (where total home production includes core household production activities and time spent on the procurement of goods and services for the household), and h_K^i to weekly child care hours.[51]

[51]The reference period used for inquiring about the time allocation across different categories is of a week. That is, the interviewer asks how many hours each individual household member typically devoted to each of the categories per week. A further consistency check consisted on making sure that the definition of core home production, and therefore, total home production remained homogeneous throughout the three waves. Beginning on 2003 and 2004, there were also weekly hours devoted to the care of elderly and sick people but this was not collected in the 2002 wave of the survey. Therefore, this was not included in the definition of home production as its inclusion would implicitly assign a 0 to the 2002 wave. This imposition does not suppose a major problem as a 98% of the final sample reports having devoted 0 hours to this activity.

That is, Leisure Definition 2 is the component of total time endowment that is not spent in a broader definition of work that takes time devoted to home production into account.

Transfer Receipt and Program Participation Indicator

The *Oportunidades* program provides administrative data on monetary transfers made to beneficiary households. Since these are made bi-monthly, there is information on the amount provided to the household throughout 2003, the year in which the newly-incorporated beneficiary households from the urban implementation must have started receiving the program's benefits. It is assumed that if a household is not part of this dataset, then it has never been a beneficiary for the period spanned by the file which covers up to 2012 when it was last updated. While a non-participant household can still appear in the data set. Thus, the *transfer* variable used to indicate the participation status of a particular household is based on whether or not there was a transfer made to that household in any of the six bimesters for 2003. To avoid any potential problems of inconsistencies with this data, this information is supplemented with the household's poverty classification provided in the ENCELURB by merging the two files on each household's identifier.

Then, the treatment indicator used in this paper's empirical analysis, d_i, is defined as

$$d_i = \begin{cases} 1 & \text{cla\_soc} = \text{poor} \ \ \& \ \text{transfer} = 1 \\ 0 & \text{cla\_soc} = \text{poor} \ \ \& \ \text{transfer} = 0 \end{cases}$$

It is worth noting that the socioeconomic dataset of 2002 contains a variable called *incorp* that captures the program incorporation status of each household as of 2002. However, Angelucci, Attanasio and Shaw (2005), suggest the use of this official administrative data on transfers made to participant households to construct an own indicator of program incorporation.

While there are some differences in the distribution of households across treatment and control groups under both definitions, these differences are not significant as the two variables provide the same treatment classification of a household approximately 97.5% of the times in the final estimation sample.

A.2 Appendix 2: Propensity Score Estimation

One of the estimators implemented in the paper's analysis involved a propensity score matching difference-in-differences strategy. As described in Section 1.4, the first step involves estimating a probit model of program participation. For two parent households, the marginal effects at the mean are presented in B.1.

For single parent households, a comparable set of covariates are used to estimate the model, yielding the marginal effects at the mean presented in Table B.2

Table A.4: Probit Estimates: Marginal Effects at the Mean

	$\Pr(D=1\|X)$	
HH Poverty Index	0.153*	(2.13)
(HH Poverty Index)^2	-0.0685***	(-3.99)
Household size	0.00521	(0.16)
Number of children, 0-5	0.0691	(1.94)
Number of children, 6-12	-0.0270	(-0.48)
Number of children, 13-15	-0.0210	(-0.38)
Number of children, 16-20	-0.0293	(-0.54)
(Number of children in school)^2	-0.0125**	(-2.72)
Number of children in school, 6-12	0.167***	(3.45)
Number of children in school, 13-15	0.200***	(3.70)
Number of children in school, 16-20	0.110	(1.58)
Female head	0.168	(1.93)
Number of rooms	-0.0661***	(-3.83)
Floors made of dirt	0.130***	(4.74)
Walls made of weak material	0.165***	(6.39)
Truck ownership	-0.328***	(-5.77)
Refrigerator ownership	-0.133***	(-4.63)
Gas stove ownership	-0.0204	(-0.36)
Has had loans	0.100***	(3.52)
Has a bank account	0.00250	(0.02)
Has had savings	0.0234	(0.40)
Death of a family member	0.0610	(1.78)
Job loss	0.0671*	(2.14)
Business loss	-0.303***	(-3.39)
Local incidence of poverty	0.0277***	(4.81)
(Local Incidence of Poverty)^2	-0.000181**	(-2.61)
Tortilla subsidy	0.252***	(5.88)
Milk subsidy	-0.0197	(-0.51)
Procampo	-0.0928	(-0.64)
Breakfast subsidy	-0.00789	(-0.21)
Employed in 2001, mother	-0.0386	(-1.03)
Employed in 2000, mother	0.124**	(2.79)
Employed in 1999, mother	-0.00249	(-0.06)
Employed in 2001, father	-0.0635	(-0.76)
Employed in 2000, father	-0.0564	(-0.65)
Employed in 1999, father	0.0310	(0.42)
Completed years of education, mother	-0.000987	(-0.15)
Completed years of education, father	-0.0144*	(-2.40)
Age, mother	-0.00605*	(-2.09)
Age, father	0.00374	(1.65)
N	2280	

t-statistics in parentheses

Table A.5: Probit Estimates: Marginal Effects at the Mean

	$\Pr(D=1\|X)$	
HH Poverty Index	-0.00175	(-0.01)
(HH Poverty Index)^2	-0.0173	(-0.59)
Household size	-0.0116	(-0.75)
Number of children, 0-5	0.0993**	(2.69)
Number of children, 6-12	0.0537	(1.48)
Number of children, 13-15	-0.0344	(-0.58)
Number of children, 16-20	0.0114	(0.26)
Wants more education for children	0.0768	(0.86)
(Number of children in school)^2	-0.000935	(-0.09)
Number of children in school, 6-12	0.0384	(0.67)
Number of children in school, 13-15	0.123	(1.56)
Number of children in school, 16-20	-0.118	(-1.32)
Number of rooms	-0.114**	(-3.23)
Floors made of dirt	0.140*	(2.56)
Walls made of weak material	0.126*	(2.41)
Refrigerator ownership	-0.0748	(-1.16)
Gas stove ownership	0.0320	(0.30)
Has had loans	0.0677	(1.15)
Has had savings	-0.106	(-0.90)
Death of a family member	0.0139	(0.21)
Job loss	0.0528	(0.79)
Employed in 2001, mother	0.0732	(0.95)
Employed in 2000, mother	0.0423	(0.53)
Employed in 1999, mother	0.000795	(0.01)
Local incidence of poverty	0.0258*	(2.26)
(Local Incidence of Poverty)^2	-0.000132	(-0.96)
Tortilla subsidy	0.301***	(5.33)
Milk subsidy	0.0367	(0.46)
Procampo	-0.279	(-0.74)
Breakfast subsidy	-0.0159	(-0.19)
Completed years of education, mother	-0.0263	(-1.87)
Age, mother	0.00103	(0.38)
N	609	

t-statistics in parentheses

Appendix B

Appendix to Chapter 2

B.1 Data Appendix

Given that the focus of this paper is on the urban component of the Oportunidades program, I obtain the data from the PROSPERA External Evaluation datasets provided by the program's administration. Particularly, I focus on the sociodemographic module of the Urban Evaluation Surveys (ENCELURB) to obtain information regarding household consumption, asset value, income and intra-household time allocation decisions for the period of time comprised by 2002-2004. This section provides a description of the ENCELURB and the relevant information exploited for the estimation of the different characterizations of the collective household model.

The ENCELURB data was gathered in three waves. The first wave captured baseline information and was gathered in the fall of 2002, once beneficiary households had been determined but prior to the provision of any benefits. The second wave captured the first follow up information, being gathered in the fall of 2003. The third wave captured the second

follow up information, being gathered during the fall of 2004. The data structure of the files provided for each of the waves is very similar across waves, with a few differences in the follow up files. There is some additional data collected in the follow up surveys that was not collected at baseline. On the other hand, there is some data that was collected at baseline but that was not collected in the following survey years. The following subsections describe how I build upon the data that is available across all waves of the ENCELURB to create the relevant variables used in the estimation of the model described in Section 2.4.

B.1.1 Consumption Variables

For the part of the model that deals with the consumption of private and public goods within the household, the goal is to exploit the detailed consumption data contained in the ENCELURB to construct the components of the following Hicksian composite good as described in Blundell, Chiappori and Meghir (2005)

$$C = \underbrace{q^A + q^B}_{=q} + Q$$

At the household level, the ENCELURB contains information on the expenditures incurred by the household on 38 food-related consumption items for which they use a one-week reference period (among these, I have the amount the household spent not only on vegetables and other forms of food to prepare meals at home, but also the amount of money spent by the household on meals outside of home). Furthermore, I also have information on the expenditures incurred by the household on personal hygiene items (for adults and for children, separately), home cleaning supplies, fuels, personal services, rent, and recreation and entertainment.

Given the detailed consumption data provided in these datasets, I construct a measure of Q and q for each household. For constructing Q, I focus on capturing two main types of consumption items: public expenditures on children and public expenditures on household goods and services. Among public expenditures on children, I include household expenditures on children clothing and footwear, school tuition and supplies, personal hygiene items for infants, and toys. Among public expenditures on household goods and services, I include household expenditures on home cleaning supplies, fuels, rent, home appliances, home furniture, home improvement expenses, and utensils and other home items.

On the other hand, to construct q, I use information on the household expenditures on food, meals outside of home, non-school related transportation costs, lighters and cigarettes, newspapers and magazines, candles, personal hygiene items, personal services, recreation and entertainment (movies, nightclubs among others), adult clothing and footwear, other expenses (jewelry, insurance, vacations and/or lotteries) and medical expenses (such as doctor appointments, lab tests, birth control).

A Note on Assignable Consumption: Information Both at the Household and Individual Level – Typically Used in the Literature to Recover the Sharing Rule

There are a few types of consumption that are assignable to particular types of household members or particular household members. However, data on some assignable goods is exclusive to 2004 but not available in the previous two waves. For all three waves, it is possible to distinguish expenditures on children's clothing and footwear from expenditures on adult's clothing and footwear. For the 2004 wave, there is a further distinction based on gender in terms of expenditures on clothing. This would allow for the use of clothing as an assignable good in the in an approach similar to the one implemented by Tommasi (2019) and Calvi (2020) do. Nonetheless, within the urban context I are focusing on, it is highly unlikely

that the availability of such information for prior years would aid my estimation approach in a significant way since these consumption categories do not constitute a significant share of the household's budget as together, these constitute less than 1% of households' expenditures.

B.1.2 Income Variables: Combining the ENCELURB and the Program's Administrative Data on Bi-Monthly Disbursements to Beneficiaries

For labor market earnings, I have information reported by the individual household members who worked in the market during the 12 months prior to the interview. The questionnaire captures information on the monetary value of the earnings of each market worker and then captures the periodicity with which the household member was paid, the weekly hours worked by the individual in that job and how many months and weeks that person worked during the past 12 months. This allows me to construct a wage based on the information captured in the questionnaire. However, besides the earnings, workers could have also earned a bonus that is typically paid every 6 months (known as the aguinaldo). The wage rate used in the model accounts for both the hourly/monthly/biweekly/yearly earnings reported for each individual household member but it also incorporates the aguinaldo reported, in case s/he reports having received one.

For non-labor income, I use information available in the ENCELURB related to individual savings and other forms of non-labor income reported at the level of the individual respondent including inheritances, alimony and lottery winnings. In addition to the individual savings information provided in the ENCELURB, it is possible to obtain an additional measure of assignable nonlabor income using the amount provided by *Oportunidades* to beneficiary households under the targeting of the program that places the transfer in the hands of

the household's female head. The program administration separately provides a dataset containing information on the transfers made to beneficiary households all the way to 2010. Given that I focus for the time period comprised by 2002 and 2004, I use information of transfers made to the household during the 4 quarters prior to the 4th quarter of the year of interview. This approach then attempts to use these quarters as retrospective information of the amount of money they have received from the program during the year prior to the time they are being interviewed which is the reference period the questionnaire of the ENCELURB captures for most income sources they ask about.

In addition to the types of non-labor income discussed so far, the sociodemographic module of the ENCELURB also contains highly detailed information on the asset ownership of the respondent. Besides asset ownership, the questionnaire also captures the estimated monetary value of the asset[52]. There are 16 assets that are accounted for in the questionnaire, including land, motor vehicles, electric appliances of numerous types (boiler, washer, dryer, radio, television, refrigerator, electric stove, among others) and animals for agricultural work. Since the model described in Section 2.2 is not set within an inter-temporal setting, I do not keep track of assets separately and use it as a component of the aggregate household non-labor income included in the budget constraint of the model.

B.1.3 Time Use Variables

In the individual datasets of the ENCELURB, it is possible to obtain a typical weekly measure of the amount of hours each individual household member spends on market work, leisure and home production. Moreover, it is possible to annualize these weekly measures by multiplying these hours by 52. Thus, following Aguiar and Hurst (2007), I define three major time-use

[52]The question that captures this information asks the following: "If you had to sell this item, how much money do you think you can ask for it?"

categories according to the information provided in the ENCELURB: market work, leisure and home production.

B.1.4 Bargaining Power Proxies

The sociodemographic module of the 2002 survey contains some questions related to the decision making structure of the surveyed households. There are five main questions that captures this information. The relevant variables encode the responses to the following questions

- Who decides when to take a sick child to the doctor?
- Who decides whether a child has to attend school even if the child does not want to go
- Who decides whether to make an expenditure related to children clothing and/or footwear.
- Who decides on important issues that affect all household members? (i.e. moving to a new house, changing jobs, among others)
- When there is additional income in the household, does the recipient of this extra income get to decide how to spend it?

Typically, the responses to this type of questions are used to construct indices of decision-making power that can be used to establish an empirical relationship between bargaining power and development policies. While this is not the focus of this paper, I use these to generate a set of initial guesses for the parameters of the Pareto weight within the structural estimation implemented in the paper.

B.1.5 Supplemental State-Level Data

I use data from the country's 2000 census to compute age-specific sex ratios at the state level. For this, I define 4 different age groups: 15-25, 26-35, 35-45, and 46 and older. I take the proportion of men and women in each age group at a particular state. Upon generating a data file containing these counts and proportions at the level of the state, I can then merge it with the ENCELURB files using the information available on the surveyed households' geographical location. Then, based on the age match of the couple in a two-parent household, I construct the sex ratio specific to that age match by dividing the proportion of women of the wife's age group in the state where the couple resides by the proportion of men of the husband's age group in that state.

B.2 Non-Parametric Identification

The non-parametric identification of the model is carried out in three main steps. The first step involves the identification of two-parent households' production function. The second step involves the identification of single-parent household. Lastly, the third step involves the identification of individual parental preferences and the Pareto weight exploiting the effect of *Oportunidades* on this distribution factor and production shifter and the fact that I observe the behavior of single-parent households. As will be highlighted throughout the analysis, even though this approach involves solving for the household's allocation by directly solving the social planner's problem, this approach follows a similar intuition to the identification approach used when working within the two-stage, decentralized characterization of the household's problem as in Chiappori and Ekeland (2009) and Cherchye, De Rock and Vermeulen (2012) as it relies on the use of an exclusive good (namely, leisure) and the variation generated by a

distribution factor and a production shifter. I first present a set of assumptions that facilitate the non-parametric identification of the model.

A1 Preferences are strongly separable on leisure, private consumption and the public domestic good so that these allow for an additively separable representation of the form

$$U^i(l^i, q^i, Q; \mathbf{X}^i) = u^{l,i}(l^i; \mathbf{X}^i) + u^{q,i}(q^i; \mathbf{X}^i) + u^{Q,i}(Q; \mathbf{X}^i)$$

This allows me to characterize each individual marginal utility as $\frac{\partial U^i(l^i,q^i,Q;\mathbf{X}^i)}{\partial l^i} = \frac{\partial u^{l,i}(l^i;\mathbf{X}^i)}{\partial l^i}$, $\frac{\partial U^i(l^i,q^i,Q;\mathbf{X}^i)}{\partial q^i} = \frac{\partial u^{q,i}(q^i;\mathbf{X}^i)}{\partial q^i}$ and $\frac{\partial U^i(l^i,q^i,Q;\mathbf{X}^i)}{\partial Q} = \frac{\partial u^{Q,i}(Q;\mathbf{X}^i)}{\partial Q}$.

A2 The Pareto weight is non-decreasing in z^A. That is, $\frac{\partial \lambda(w^A,w^B,y,\hat{z}^A)}{\partial z^A} \geq 0$.

A3 There exist some known $\hat{l}^A, \hat{l}^B$ and $\hat{z}^A$ such that $\frac{\partial U^A(\hat{l}^A,q^A,Q;\mathbf{X})}{\partial l^A} = \frac{\partial u^{l,A}(\hat{l}^A;\mathbf{X}^A)}{\partial l^A} = c_A$, $\frac{\partial U^B(\hat{l}^B,q^B,Q;\mathbf{X})}{\partial l^B} = \frac{\partial u^{l,B}(\hat{l}^B;\mathbf{X}^B)}{\partial l^B} = c_B$ and $\lambda(w^A, w^B, y, \hat{z}^A) = c$, where c_A, c_B and c are some known constants. Specifically, I assume that these normalizations are imposed at the lower boundaries of the domains of $\frac{\partial u^{l,A}(\hat{l}^A;\mathbf{X}^A)}{\partial l^A}$, $\frac{\partial u^{l,B}(\hat{l}^B;\mathbf{X}^B)}{\partial l^B}$ and $\lambda(w^A, w^B, y, \hat{z}^A)$.

A4 Married mothers are more productive at home than their single counterparts: $\frac{\partial F_Q^M(h_D^A,h_D^B,q^D;\mathbf{S})}{\partial h_D^A} > \frac{\partial F_Q^S(h_D^A,q^D;\mathbf{S})}{\partial h_D^A}$.

A5 The empirical relationship between z^A and l^A is positive. Similarly, the empirical relationship between s_j and l^A is positive. That is, I find empirical evidence suggesting that $\frac{\partial l^A}{\partial z^A} > 0$ and $\frac{\partial l^A}{\partial s_j} > 0$ in the data while fathers' time use is virtually unaffected by z^A and s_j.

A6 Shifts in the production shifter affect married and single mothers' productivity at home differently. That is, either $\frac{\partial}{\partial s_j}\left[\frac{\partial F_Q^M(h_D^A,h_D^B,q^D;\mathbf{S})}{\partial h_D^A}\right] \geq 0$ and $\frac{\partial}{\partial s_j}\left[\frac{\partial F_Q^S(h_D^A,q^D;\mathbf{S})}{\partial h_D^A}\right] \leq 0$ or vice versa.

B.2.1 Step 1: Identifying the Production Function of Two-Parent Households

Data availability on the amount of time each individual parent spends on home production and on the household's child-related expenditures allow for the identification of the household's production function despite Q being unobserved. This is a result that has been outlined in Blundell, Chiappori and Meghir (2005) and Chiappori and Ekeland (2009).[53]

From cost minimization, I can obtain a mapping between observed wages and the marginal rates of technical substitution of parental time and monetary investments on children. Following the notation from Blundell, Chiappori and Meghir (2005), productive efficiency yields the following conditions

$$\varphi_M^A(h_D^A, h_D^B, q^D; \mathbf{S}) = \frac{\partial F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})/\partial h_D^A}{\partial F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})/\partial q^D} = w^A$$
$$\varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S}) = \frac{\partial F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})/\partial h_D^B}{\partial F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})/\partial q^D} = w^B$$

From Blundell, Chiappori and Meghir (2005), these conditions are sufficient to identify φ_M^i for $i = (A, B)$ given the existence of a mapping between (w^A, w^B, y) and (h_D^A, h_D^B, q^D) generated by the reduced-form equations relating the observed inputs of production as functions of w^A, w^B and y (which are also observed in the data). However, this only recovers the φ_M^i's, but not the production function. Given this, Blundell, Chiappori and Meghir (2005) and Cherchye, De Rock and Vermeulen (2012) mention that at least one overidentifying condition

[53] Chiappori and Ekeland (2009) also emphasize that additional inputs can be introduced into the production function at no cost in terms of identification as long as these are observable. Thus, adding home production into the model does not constitute a significant challenge for identification as long as I have data on all inputs of production.

is needed to recover F_Q^M. In both papers, the recommendation is to impose an additional condition reflecting that these marginal rates of technical substitution stem from the same function. Such condition yields the following restriction that need to be satisfied by the marginal productivity of parental time and monetary investments in Q:

$$\frac{\partial \varphi_M^A(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial h_D^B} + \varphi_M^A(h_D^A, h_D^B, q^D) \frac{\partial \varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial q^D} = \frac{\partial \varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial h_D^A} + \varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S}) \frac{\partial \varphi_M^A(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial q^D} \tag{B.1}$$

The third condition presented in B.1 stems from the assumption that F_Q^M is $\mathcal{C}^2$ and exploiting the symmetry of its Hessian invoking Young's Theorem. To see this, consider the derivative of φ_M^A and φ_M^B with respect to each input of production. Furthermore, for the sake of keeping notation clean, let F_Q^M denote $F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})$ and φ_M^i denote $\varphi_M^i(h_D^A, h_D^B, q^D, \mathbf{S})$ for $i = (A, B)$.

Differentiating φ_M^A with respect to h_D^B and q^D yields

$$\frac{\partial \varphi_M^A}{\partial h_D^B} = \frac{\frac{\partial}{\partial h_D^B}\left[\frac{\partial F_Q^M}{\partial h_D^A}\right]}{\frac{\partial F_Q^M}{\partial q^D}} - \varphi_M^A \frac{\frac{\partial}{\partial h_D^B}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} \tag{B.2}$$

$$\frac{\partial \varphi_M^A}{\partial q^D} = \frac{\frac{\partial}{\partial q^D}\left[\frac{\partial F_Q^M}{\partial h_D^A}\right]}{\frac{\partial F_Q^M}{\partial q^D}} - \varphi_M^A \frac{\frac{\partial}{\partial q^D}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} \tag{B.3}$$

Similarly, differentiating φ_M^B with respect to h_D^A and q^D yields

$$\frac{\partial \varphi_M^B}{\partial h_D^A} = \frac{\frac{\partial}{\partial h_D^A}\left[\frac{\partial F_Q^M}{\partial h_D^B}\right]}{\frac{\partial F_Q^M}{\partial q^D}} - \varphi_M^B \frac{\frac{\partial}{\partial h_D^A}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} \tag{B.4}$$

$$\frac{\partial \varphi_M^B}{\partial q^D} = \frac{\frac{\partial}{\partial q^D}\left[\frac{\partial F_Q^M}{\partial h_D^B}\right]}{\frac{\partial F_Q^M}{\partial q^D}} - \varphi_M^B \frac{\frac{\partial}{\partial q^D}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} \tag{B.5}$$

Given the symmetry of the Hessian of F_Q^M, I know that $\frac{\frac{\partial}{\partial h_D^B}\left[\frac{\partial F_Q^M}{\partial h_D^A}\right]}{\frac{\partial F_Q^M}{\partial q^D}} = \frac{\frac{\partial}{\partial h_D^A}\left[\frac{\partial F_Q^M}{\partial h_D^B}\right]}{\frac{\partial F_Q^M}{\partial q^D}}$, which can be rewritten using B.2 and B.4 as

$$\frac{\partial \varphi_M^A}{\partial h_D^B} + \varphi_M^A \frac{\frac{\partial}{\partial h_D^B}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} = \frac{\partial \varphi_M^B}{\partial h_D^A} + \varphi_M^B \frac{\frac{\partial}{\partial h_D^A}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} \tag{B.6}$$

Furthermore, exploiting the fact that $\frac{\frac{\partial}{\partial h_D^i}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} = \frac{\frac{\partial}{\partial q^D}\left[\frac{\partial F_Q^M}{\partial h_D^i}\right]}{\frac{\partial F_Q^M}{\partial q^D}}$ for $i = (A, B)$, rearranging B.3 and B.5 and substituting the second term in both sides of B.6 yields

$$\frac{\partial \varphi_M^A}{\partial h_D^B} + \varphi_M^A \frac{\partial \varphi_M^B}{\partial q^D} + \varphi_M^A \varphi_M^B \frac{\frac{\partial}{\partial q^D}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}} = \frac{\partial \varphi_M^B}{\partial h_D^A} + \varphi_M^B \frac{\partial \varphi_M^A}{\partial q^D} + \varphi_M^B \varphi_M^A \frac{\frac{\partial}{\partial q^D}\left[\frac{\partial F_Q^M}{\partial q^D}\right]}{\frac{\partial F_Q^M}{\partial q^D}}$$

since the third term of each side is identical, the additional restriction that needs to be satisfied by the marginal rates of technical substitution of parental time for monetary investments is precisely the one presented in B.1

$$\frac{\partial \varphi_M^A}{\partial h_D^B} + \varphi_M^A \frac{\partial \varphi_M^B}{\partial q^D} = \frac{\partial \varphi_M^B}{\partial h_D^A} + \varphi_M^B \frac{\partial \varphi_M^A}{\partial q^D} \tag{B.7}$$

With this last condition obtained from the assumptions made on the household's production function, I obtain the following system of equations

$$\varphi_M^A(h_D^A, h_D^B, q^D; \mathbf{S}) - w^A = 0 \tag{B.8}$$

$$\varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S}) - w^B = 0 \tag{B.9}$$

$$\frac{\partial \varphi_M^A(h_D^A, h_D^B, q^D)}{\partial h_D^B} + \varphi_M^A(h_D^A, h_D^B, q^D; \mathbf{S}) \frac{\partial \varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial q^D} - \frac{\partial \varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial h_D^A} - \varphi_M^B(h_D^A, h_D^B, q^D; \mathbf{S}) \frac{\partial \varphi_M^A(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial q^D} = 0 \tag{B.10}$$

This allows me to recover each individual marginal productivity separately allowing for the identification of F_Q^M up to a strictly monotone (and therefore invertible) transformation. Formally, the solution to the system of equations described above can be integrated to recover $\bar{F}_Q^M(h_D^A, h_D^B, q^D; \mathbf{S}) = G_M[F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})]$ so that $F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S}) = G_M^{-1}[\bar{F}_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})]$. Within a parametric approach, G_M^{-1} is pinned down by the functional form imposed on F_Q^M.[54]

B.2.2 Step 2: Identifying the Production Function of Single-Parent Households

Letting the gender of a single parent be denoted by g, similar to the case of two-parent households, productive efficiency allows me to define the following rate of technical substitution

[54]While it has already been established in the literature that observing all inputs of production is sufficient to recover the household's production technology, allows me to pinpoint the main drivers of the identification of two-parent households' production technology. Since I am able to use each parent's wage as the price for parental time and q^D is part of a Hicksian composite good with price normalized to unity, I observe the responses of h_D^A, h_D^B and q^D to these prices. More importantly, I exploit the fact that the marginal rates of technical substitution are equal to the ratio of their prices and the continuous differentiability of the production function to obtain the restriction needed to separately identify each of the marginal productivities.

of time for monetary investments in the production of the public good

$$\varphi_S^g = \frac{\partial F_Q^{S,g}(h_D^g, q^D; \mathbf{S})/\partial h_D^g}{\partial F_Q^{S.g}(h_D^g, q^d; \mathbf{S})/\partial q^D} = w^g$$

which, given that I have data on both single parents' monetary and time investments on Q can be identified by applying a similar result to the one for used two-parent households, relying on the invertibility of the following Jacobian of reduced-form equations

$$D_{(w^A,Y)}(h_D^g, q^D) = \begin{pmatrix} \frac{\partial h_D^g}{\partial w^g} & \frac{\partial h_D^g}{\partial y} \\ \frac{\partial q^D}{\partial w^g} & \frac{\partial q^D}{\partial y} \end{pmatrix} \tag{B.11}$$

While this recovers φ_S^g, I am still falling short of one condition that could allow me to identify each marginal productivity separately. While in the case of two-parent households, this additional condition could be obtained from exploiting the continuous differentiability of the production function to ensure that the marginal rates of technical substitution of both parents' home time for monetary investments on the domestic good corresponded to the same production function F_Q^M, this is not feasible in the case of a single-parent household since there are only two inputs of production, and therefore only one marginal rate of technical substitution that can be used. It is in here where I can use (1) the role of the number of children in the household attending school, s_j, as a production shifter, (2) the relationship between the conditional factor demands for h_D^A and q^D with s_j, and (3) the variation induced by the *Oportunidades* cash transfer program on children's school attendance to generate an additional condition in terms of both marginal productivities that can help me separately identify each of them. For this, I can differentiate φ_S^g with respect to s_j taking into consideration the reduced-form relationship between h_D^g and s_j and between q^D and s_j:

$$\frac{\partial h_D^g}{\partial s_j}\frac{\partial}{\partial h_D^g}\left[\frac{\partial F_Q^{S,g}}{\partial h_D^g}\right] + \frac{\partial}{\partial s_j}\left[\frac{\partial F_Q^{S,g}}{\partial h_D^g}\right] - w^g\left(\frac{\partial q^D}{\partial s_j}\frac{\partial}{\partial q_D}\left[\frac{\partial F_Q^{S,g}}{\partial q^D}\right] + \frac{\partial}{\partial s_j}\left[\frac{\partial F_Q^{S,g}}{\partial q^D}\right]\right) = 0 \tag{B.12}$$

where $\frac{\partial h_D^g}{\partial s_j}$ and $\frac{\partial q^D}{s_j}$ is observed in the data, and therefore, known to the researcher. Similar to the case of two-parent households, B.11 and B.12 generate a 2×2 system of equations that allows me to recover the marginal productivity of single parents' time and monetary investments in the production of Q. This allows me to identify the production function $F_Q^{S,g}$ up to a strictly monotone transformation, $G_{s,g}$ such that $F_Q^{S,g}(h_D^g, q^D; \mathbf{S}) = G_{S,g}^{-1}[\bar{F}^{S,g}(h_D^g, q^D; \mathbf{S})]$.

B.2.3 Step 3: Identification of Preference Parameters and Pareto Weight

At this point, I can then take $\frac{\partial F_Q^M}{\partial h_D^A}$, $\frac{\partial F_Q^M}{\partial h_D^B}$, $\frac{\partial F_Q^M}{\partial q^D}$, $\frac{\partial F_Q^{S,A}}{\partial h_D^A}$, $\frac{\partial F_Q^{S,B}}{\partial h_D^B}$, $\frac{\partial F_Q^{S,A}}{\partial q^D}$, and $\frac{F_Q^{S,B}}{\partial q^D}$.

The following notation is adopted hereafter.

Unknowns

For the household's decision making structure, the only unknown is $\lambda(\mathbf{z})$. For individual preferences, let $\Gamma_l^i(l^i, q^i, Q, \mathbf{X}^i) = \frac{\partial U^i(l^i, q^i, Q; \mathbf{X}^i)}{\partial l^i}$, $\Gamma_Q^i(l^i, q^i, Q, \mathbf{X}^i) = \frac{\partial U^i(l^i, q^i, Q; \mathbf{X}^i)}{\partial Q}$ and $\Gamma_q^i(l^i, q^i, Q, \mathbf{X}^i) = \frac{\partial U^i(l^i, q^i, Q; \mathbf{X}^i)}{\partial q^i}$ for $i = (A, B)$. Furthermore, given that preferences are strongly separable as described in A1, I have that $\Gamma_l^i(l^i, \mathbf{X}^i) = \frac{\partial u^{l,i}(l^i; \mathbf{X}^i)}{\partial l^i}$, $\Gamma_Q^i(Q, \mathbf{X}^i) = \frac{\partial u^{Q,i}(Q; \mathbf{X}^i)}{\partial Q}$ and $\Gamma_q^i(q^i, \mathbf{X}^i) = \frac{\partial u^{q,i}(q^i; \mathbf{X}^i)}{\partial q^i}$ for $i = (A, B)$.

Known (from the data and recovered in Step 1)

Recovered in Step 1:

For two-parent households

$$\phi_M^A = \phi_M^A(h_D^A, h_D^B, q^D; \mathbf{S}) = \frac{\partial F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial h_D^A} \tag{B.13}$$

$$\phi_M^B = \phi_M^B(h_D^A, h_D^B, q^D; \mathbf{S}) = \frac{\partial F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial h_D^B} \tag{B.14}$$

$$\phi_M^D = \phi_M^D(h_D^A, h_D^B, q^D; \mathbf{S}) = \frac{\partial F_Q^M(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial q^D} \tag{B.15}$$

For single-parent households

$$\phi_S^A = \phi_S^A(h_D^A, q^D; \mathbf{S}) = \frac{\partial F_Q^{S,A}(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial h_D^A} \tag{B.16}$$

$$\phi_S^B = \phi_S^B(h_D^B, q^D; \mathbf{S}) = \frac{\partial F_Q^{S,B}(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial h_D^B} \tag{B.17}$$

$$\phi_S^{D,A} = \phi_S^{D,A}(h_D^A, q^D; \mathbf{S}) = \frac{\partial F_Q^{S,A}(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial q^D} \tag{B.18}$$

$$\phi_S^{D,B} = \phi_S^{D,B}(h_D^B, q^D; \mathbf{S}) = \frac{\partial F_Q^{S,B}(h_D^A, h_D^B, q^D; \mathbf{S})}{\partial q^D} \tag{B.19}$$

Data only

$$\Delta_{z^A}^l(d, A) = \frac{\partial l^A}{\partial z^A} \tag{B.20}$$

$$\Delta_{z^A}^l(d, B) = \frac{\partial l^B}{\partial z^A} \tag{B.21}$$

$$\Delta_{s_j}^l(d, A) = \frac{\partial l^A}{\partial s_j} = \frac{\Delta_{z^A}^l(d, A)}{\Delta_{z^A}^{s_j}(d)} \tag{B.22}$$

$$\Delta_{s_j}^l(d, B) = \frac{\partial l^B}{\partial s_j} = \frac{\Delta_{z^A}^l(d, B)}{\Delta_{z^A}^{s_j}(d)} \tag{B.23}$$

$$\Delta_{z^A}^{h^D}(d, A) = \frac{\partial h_D^A}{\partial z^A} \tag{B.24}$$

$$\Delta_{z^A}^{h^D}(d, B) = \frac{\partial h_D^B}{\partial z^A} \tag{B.25}$$

$$\Delta^{h^D}_{s_j}(d,A) = \frac{\partial h^A_D}{\partial s_j} = \frac{\Delta^{h^D}_{z^A}(d,A)}{\Delta^{s_j}_{z^A}(d)} \tag{B.26}$$

$$\Delta^{h^D}_{s_j}(d,B) = \frac{\partial h^B_D}{\partial s_j} = \frac{\Delta^{h^D}_{z^A}(d,B)}{\Delta^{s_j}_{z^A}(d)} \tag{B.27}$$

$$\Delta^{q^D}_{z^A}(d) = \frac{\partial q^D}{\partial z^A} \tag{B.28}$$

$$\Delta^{q^D}_{s_j}(d) = \frac{\partial q^D}{\partial s_j} = \frac{\Delta^{q^D}_{z^A}(d)}{\Delta^{s_j}_{z^A}(d)} \tag{B.29}$$

$$\Delta^{q}_{z^A}(d) = \frac{\partial q}{\partial z^A} \tag{B.30}$$

$$\Delta^{q}_{s_j}(d) = \frac{\partial q}{\partial s_j} = \frac{\Delta^{q}_{z^A}(d)}{\Delta^{s_j}_{z^A}(d)} \tag{B.31}$$

Combination of data and components recovered in Steps 1 and 2

$$\Delta^{\phi}_{z^A}(d,A) = \frac{\partial \phi^A}{\partial z^A} = \frac{\partial \phi^A}{\partial h^A_D}\Delta^{h^D}_{z^A}(d,A) + \frac{\partial \phi^A}{\partial h^B_D}\Delta^{h^D}_{z^A}(d,B) + \frac{\partial \phi^A}{\partial q^D}\Delta^{q^D}_{z^A}(d) \tag{B.32}$$

$$\Delta^{\phi}_{s_j}(d,A) = \frac{\partial \phi^A}{\partial s_j} = \frac{\partial \phi^A}{\partial h^A_D}\Delta^{h^D}_{s_j}(d,A) + \frac{\partial \phi^A}{\partial h^B_D}\Delta^{h^D}_{s_j}(d,B) + \frac{\partial \phi^A}{\partial q^D}\Delta^{q^D}_{s_j}(d) \tag{B.33}$$

$$\Delta^{\phi}_{z^A}(d,B) = \frac{\partial \phi^B}{\partial z^A} = \frac{\partial \phi^B}{\partial h^A_D}\Delta^{h^D}_{z^A}(d,A) + \frac{\partial \phi^B}{\partial h^B_D}\Delta^{h^D}_{z^A}(d,B) + \frac{\partial \phi^B}{\partial q^D}\Delta^{q^D}_{z^A}(d) \tag{B.34}$$

$$\Delta^{\phi}_{s_j}(d,B) = \frac{\partial \phi^B}{\partial s_j} = \frac{\partial \phi^B}{\partial h^A_D}\Delta^{h^D}_{s_j}(d,A) + \frac{\partial \phi^B}{\partial h^B_D}\Delta^{h^D}_{s_j}(d,B) + \frac{\partial \phi^B}{\partial q^D}\Delta^{q^D}_{s_j}(d) \tag{B.35}$$

$$\Delta^{\phi^D}_{z^A}(d) = \frac{\partial \phi^B}{\partial z^A} = \frac{\partial \phi^D}{\partial h^A_D}\Delta^{h^D}_{z^A}(d,A) + \frac{\partial \phi^D}{\partial h^B_D}\Delta^{h^D}_{z^A}(d,B) + \frac{\partial \phi^D}{\partial q^D}\Delta^{q^D}_{z^A}(d) \tag{B.36}$$

$$\Delta^{\phi^D}_{s_j}(d) = \frac{\partial \phi^D}{\partial s_j} = \frac{\partial \phi^B}{\partial h^A_D}\Delta^{h^D}_{s_j}(d,A) + \frac{\partial \phi^D}{\partial h^B_D}\Delta^{h^D}_{s_j}(d,B) + \frac{\partial \phi^D}{\partial q^D}\Delta^{q^D}_{s_j}(d) \tag{B.37}$$

$$\Delta^{Q}_{z^A}(d) = \frac{\partial Q}{\partial z^A} = \phi^A\Delta^{h^D}_{z^A}(d,A) + \phi^B\Delta^{h^D}_{z^A}(d,B) + \phi^D\Delta^{q^D}_{z^A}(d) \tag{B.38}$$

$$\Delta^{Q}_{s_j}(d) = \frac{\partial Q}{\partial s_j} = \phi^A\Delta^{h^D}_{s_j}(d,A) + \phi^B\Delta^{h^D}_{s_j}(d,B) + \phi^D\Delta^{q^D}_{s_j}(d) \tag{B.39}$$

I start by focusing on the first order conditions relating parents' marginal utility for public consumption and their marginal utility for leisure. For single mothers and fathers, respectively,

I have that

$$\frac{\partial F_Q^{S,A}}{\partial h_D^A}\frac{\partial U^A}{\partial Q} = \frac{\partial U^A}{\partial l^A}$$
$$\frac{\partial F_Q^{S,B}}{\partial h_D^B}\frac{\partial U^B}{\partial Q} = \frac{\partial U^B}{\partial l^B}$$

Substituting $\frac{\partial U^A}{\partial Q}$ into the two-parent households' marginal utility for public consumption, yielding

$$\frac{\partial F_Q^M}{\partial h_D^A}\left[\lambda(\mathbf{z})\frac{\partial U^A/\partial l^A}{\partial F_Q^{S,A}/\partial h_D^A} + (1-\lambda(\mathbf{z}))\frac{\partial U^B/\partial l^B}{\partial F_Q^{S,B}/\partial h_D^B}\right] = \lambda(\mathbf{z})\frac{\partial U^A}{\partial l^A} \tag{B.40}$$

Differentiating this with respect to s_j and z^A could yield 2 additional restrictions to the two-parent households first order condition relating both parents' marginal utilities for leisure

$$\frac{\lambda(\mathbf{z})}{1-\lambda(\mathbf{z})}\frac{\partial U^A/\partial l^A}{\partial U^B/\partial l^B} = \frac{w^A}{w^B}$$

Thus, I have the following 3×3 system of equations that can be used to recover parents' marginal utility for leisure and the Pareto weight

$$\frac{\lambda(\mathbf{z})}{1-\lambda(\mathbf{z})}\frac{\Gamma_l^A}{\Gamma_l^B} - \frac{w^A}{w^B} = 0 \tag{B.41}$$

$$(1-\lambda(\mathbf{z}))\left(\frac{\phi_S^B\Delta_{s_j}^l(d,B)\frac{\partial\Gamma_l^B}{\partial l^B} - \Gamma_l^B\Delta_{s_j}^{\phi_S}(d,B)}{(\phi_S^B)^2}\right)$$
$$-\lambda(\mathbf{z})\left(\frac{\phi_M^A\Delta_{s_j}^l(d,A)\frac{\partial\Gamma_l^A}{\partial l^A} - \Gamma_l^A\Delta_{s_j}^{\phi_M}(d,A)}{(\phi_M^A)^2} - \frac{\phi_S^A\Delta_{s_j}^l(d,A)\frac{\partial\Gamma_l^A}{\partial l^A} - \Gamma_l^A\Delta_{s_j}^{\phi_S}(d,A)}{(\phi_S^A)^2}\right) = 0 \tag{B.42}$$

$$-\frac{\partial\lambda(\mathbf{z})}{\partial z}\frac{\Gamma_l^B}{\phi_S^B} + \frac{(1-\lambda(\mathbf{z}))}{\phi_S^B}\Delta_{z^A}^l(d,B)\frac{\partial\Gamma_l^B}{\partial l^B} - \frac{\phi_M^A\left(\frac{\partial\lambda(\mathbf{z})}{\partial z^A}\Gamma_l^A + \lambda(\mathbf{z})\Delta_{z^A}^l(d,A)\frac{\Gamma_l^A}{\partial l^A}\right) - \Gamma_l^A\lambda(\mathbf{z})\Delta_{z^A}^{\phi_M}(d,A)}{(\phi_M^A)^2}$$
$$+\frac{1}{\phi_S^A}\left(\frac{\partial\lambda(\mathbf{z})}{\partial z^A}\Gamma_l^A + \lambda(\mathbf{z})\Delta_{z^A}^l(d,A)\frac{\Gamma_l^A}{\partial l^A}\right) = 0 \tag{B.43}$$

The first equation corresponds to the relationship between the marginal rate of substitution of spouses' leisure within two-parent households. The second equation is obtained by differentiating B.40 with respect to s_j. Finally, the third one is obtained by differentiating B.40 with respect to z^A. Note that I can exploit the variation of the program on h_D^A through z^A only for mothers in two-parent households since only in this type of household structure I have that the conditional factor demand for h_D^A, h_D^B and q^D are functions of z^A.

The normalizations described in A3 allow me to characterize B.41-B.43 as a non-linear system of equations of the form $\mathbf{F}(\Gamma_l^A, \Gamma_l^B, \lambda) = \mathbf{0}$. Formally, I describe these normalizations in the following way

$$\frac{\partial \Gamma_l^A}{\partial l^A} \approx f_\Gamma^A = \frac{\Gamma_l^A - c_A}{l^A - \hat{l}^A} \tag{B.44}$$

$$\frac{\partial \Gamma_l^B}{\partial l^B} \approx f_\Gamma^B = \frac{\Gamma_l^B - c_B}{l^B - \hat{l}^B} \tag{B.45}$$

$$\frac{\partial \lambda(\mathbf{z})}{\partial z^A} \approx f_\lambda = \frac{\lambda - c}{z^A - \hat{z}^A} \tag{B.46}$$

Thus, I define $\mathbf{F}(\Gamma_l^A, \Gamma_l^B, \lambda) = \mathbf{0}$ so that

$$F1 = \frac{\lambda(\mathbf{z})}{1-\lambda(\mathbf{z})}\frac{\Gamma_l^A}{\Gamma_l^B} - \frac{w^A}{w^B} = 0 \tag{B.47}$$

$$F2 = (1-\lambda(\mathbf{z}))\left(\frac{\phi_S^B \Delta_{s_j}^l(d,B) f_\Gamma^B - \Gamma_l^B \Delta_{s_j}^{\phi_S}(d,B)}{(\phi_S^B)^2}\right)$$
$$-\lambda(\mathbf{z})\left(\frac{\phi_M^A \Delta_{s_j}^l(d,A) f_\Gamma^A - \Gamma_l^A \Delta_{s_j}^{\phi_M}(d,A)}{(\phi_M^A)^2} - \frac{\phi_S^A \Delta_{s_j}^l(d,A) f_\Gamma^A - \Gamma_l^A \Delta_{s_j}^{\phi_S}(d,A)}{(\phi_S^A)^2}\right) = 0 \tag{B.48}$$

$$F3 = -\frac{\partial \lambda(\mathbf{z})}{\partial z}\frac{\Gamma_l^B}{\phi_S^B} + \frac{(1-\lambda(\mathbf{z}))}{\phi_S^B}\Delta_{z^A}^l(d,B) f_\Gamma^B - \frac{\phi_M^A\left(\frac{\partial \lambda(\mathbf{z})}{\partial z^A}\Gamma_l^A + \lambda(\mathbf{z})\Delta_{z^A}^l(d,A) f_\Gamma^A\right) - \Gamma_l^A \lambda(\mathbf{z}) \Delta_{z^A}^{\phi_M}(d,A)}{(\phi_M^A)^2}$$
$$+\frac{1}{\phi_S^A}\left(\frac{\partial \lambda(\mathbf{z})}{\partial z^A}\Gamma_l^A + \lambda(\mathbf{z})\Delta_{z^A}^l(d,A) f_\Gamma^A\right) = 0 \tag{B.49}$$

Invoking the Inverse Function Theorem, a solution to $\mathbf{F}(\Gamma_l^A, \Gamma_l^B, \lambda) = \mathbf{0}$ exists if I can show that $\mathbf{DF}(\Gamma_l^A, \Gamma_l^B, \lambda)$ is invertible. That is, I need to show that $det(\mathbf{DF}(\Gamma_l^A, \Gamma_l^B, \lambda)) \neq 0$.

To keep notation clean, let

$$C1 = \frac{1}{\phi_S^A} - \frac{1}{\phi_M^A}$$
$$C2 = \frac{\Delta_{s_j}^{\phi_M}(d, A)}{(\phi_M^A)^2} - \frac{\Delta_{s_j}^{\phi_S}(d, A)}{(\phi_S^A)^2}$$

where $C1, C2 > 0$, by assumptions A4 and A6, respectively.

Note that I can sign the following by the assumption that $\lambda \in (0, 1)$ and that $U^A(l^A, q^A, Q; \mathbf{X}^A)$ and $U^B(l^B, q^B, Q; \mathbf{X}^A)$ are increasing on (l^i, q^i, Q) for both A and B, implying that $\Gamma_l^A, \Gamma_l^B > 0$:

$$\frac{\partial F_1}{\partial \lambda} = \frac{\Gamma_l^A}{(1-\lambda)^2 \Gamma_l^B} > 0$$
$$\frac{\partial F_1}{\partial \Gamma_l^A} = \frac{\lambda}{(1-\lambda)\Gamma_l^B} > 0$$
$$\frac{\partial F_1}{\partial \Gamma_l^B} = -\frac{\lambda \Gamma_l^A}{(1-\lambda)(\Gamma_l^B)^2} < 0$$

Moreover, given that in assumption A3, the normalization imposed relative to the lower boundary of l^A and l^B and that U^i is assumed to be concave, I know then that $f_\Gamma^i < 0$ for $i = (A, B)$. Furthermore, assuming that λ is non-decreasing on z^A, it follows that $f_\lambda >= 0$.

To simplify the derivation of $det(\mathbf{DF}(\Gamma_l^A, \Gamma_l^B, \lambda))$ that could allow me to sign it, I consider the particular case I have in our empirical application. Recall that in Section 1.3 I showed that participation in the program leaves fathers' time allocation unaffected. Similarly, I find that mothers' leisure increases with program participation. Thus, suppose that $\Delta_{s_j}^l(d, B) = \Delta_{z^A}^l(d, B) = 0$, $\Delta_{s_j}^l(d, A) \geq 0$ and $\Delta_{z^A}^l(d, A) \geq 0$. That is, fathers' leisure is unresponsive to changes in z^A and s_j while mothers' leisure in two-parent households is

positively related with changes in z^A and s_j associated with participation in a program like *Oportunidades*.[55] Then, I describe $det(\mathbf{DF}(\Gamma_l^A, \Gamma_l^B, \lambda))$ and sign it in the following way

$$
\begin{aligned}
det(\mathbf{DF}(\Gamma_l^A, \Gamma_l^B, \lambda)) = & -\frac{\Gamma_l^A}{(1-\lambda)^2\Gamma_l^B}\frac{\lambda f_\lambda C1 \Delta_{s_j}^l(d,A)}{\phi_S^B(l^A - \hat{l}^A)} + f_\Gamma^A \frac{\lambda}{(1-\lambda)\Gamma_l^B}\frac{\Delta_{s_j}^l(d,A)C1}{\phi_S^B} \\
& - \frac{\Gamma_l^A}{(1-\lambda)^2}\frac{\lambda f_\lambda C2}{\phi_S^B} - \frac{\lambda}{(1-\lambda)\Gamma_l^B}\frac{\Gamma_l^A C2}{\phi_S^B} \\
& - \frac{\lambda}{1-\lambda}\frac{\Gamma_l^A}{(\Gamma_l^B)^2}\Bigg[\underbrace{\left(-C1\Delta_{s_j}^l(d,A)f_\Gamma^A + \Gamma_l^A C2\right)\left(C1\left(f_\lambda + \frac{\lambda\Delta_{z^A}^l(d,A)}{l^A - \hat{l}^A}\right) + \frac{\lambda\Delta_{z^A}^{\phi_M}(d,A)}{(\phi_M^A)^2}\right)}_{+} \\
& - \Bigg(\underbrace{\frac{1}{z^A - \hat{z}^A}\left(-\frac{\Gamma_l^B}{\phi_S^B} + \Gamma_l^A C1\right) + f_\Gamma^A \Delta_{z^A}^l(d,A)C1}_{-}\Bigg)\Bigg(\underbrace{C1\frac{\lambda\Delta_{s_j}^l(d,A)}{l^A - \hat{l}^A} + \lambda C2}_{+}\Bigg)\Bigg]
\end{aligned}
$$

Given the signs of Γ_l^A, Γ_l^B, f_Γ^A, f_Γ^B, and f_λ, this is **negative**. Thus, a solution to the system of equations generated by B.41-B.43 exists.

Given the solution obtained for $(\Gamma_l^A, \Gamma_l^B, \lambda)$, I proceed to recover $\Gamma_Q^A, \Gamma_Q^B, \Gamma_q^A, \Gamma_q^B$. I start by focusing on parents' marginal rate of substitution of leisure for private consumption implied by the optimality condition relating leisure and private consumption. This allows me to recover Γ_q^i using $\frac{\Gamma_l^i}{\Gamma_q^i} = w^i$ as Γ_l^i is known at this stage and I observe w^i in the data. I then combine the marginal rates of substitution of leisure for public consumption for parents in both types of households to derive the following

$$
\begin{aligned}
\Gamma_Q^A &= \frac{1}{\lambda(\mathbf{z})}\left(\lambda(\mathbf{z})\frac{\Gamma_l^A}{\phi_M^A} - (1-\lambda(\mathbf{z}))\frac{\Gamma_l^B}{\phi_S^B}\right) \\
\Gamma_Q^B &= \frac{1}{1-\lambda(\mathbf{z})}\left((1-\lambda(\mathbf{z}))\frac{\Gamma_l^B}{\phi_M^B} - \lambda(\mathbf{z})\frac{\Gamma_l^A}{\phi_S^A}\right)
\end{aligned}
$$

[55] The positive relationship between program participation and changes in s_j is established by the evidence I find that program participation increases the number of children attending school as shown in Section 2.4.4. The subsequent impact on parents' time allocation within two-parent households is derived as described in Step 1 in Section 2.4.3.

Since Γ_l^i, λ, ϕ_S^i and ϕ_M^i (for $i = A, B$) are known at this stage, the identification of Γ_Q^i follows. Thus, the marginal utilities of both mothers and fathers and the Pareto weight are recoverable.

B.3 Parametric Identification

This section describes the parametric identification of the model from which the estimation strategy described in Section 2.4.3 is derived.

Proposition C1 (Parametric Identification of Two-Parent Households' Production Technology).
Let (h_D^A, h_D^B, q^D) be observed functions of $(w^A, w^B, y, \boldsymbol{S}, \boldsymbol{z})$ for two-parent households. If for at least one production shifter $s_j \in \boldsymbol{S}$, $\exists s_j^*$ such that $\psi(\boldsymbol{S}^*) = 1/2$, the substitution parameter γ is identified. Once γ is identified, the relative productivity of the spouses can be recovered from the home time ratios observed in the data, $\frac{h_D^A}{h_D^B}$. With γ and $\psi(\boldsymbol{S})$ identified, the output share of parental time, ρ, is identified upon observing at least one of the home time to monetary investment ratios, $\frac{h_D^i}{q^D}$, for $i = (A, B)$.

Proof: Identification of the home production parameters stems from the optimality conditions related to productive efficiency described in 2.19-2.21. However, even though there are three equations containing three unknowns, the three equations alone do not allow me to explicitly solve for each parameter in terms of observables unless I impose a normalization. Since the sample of households in the application here considered has any positive number of children, I let s_j be the number of children that attend school. Since, for now, the only observable included in the estimation of $\psi(\mathbf{S})$ is this s_j, a useful normalization to consider involves

focusing on the sub-sample with no children for whom, using 2.19, I can let $\psi(\mathbf{S}) = 1/2$ to recover γ. Taking γ as known, I can recover $\psi(\mathbf{S})$ using 2.19 on the sub-sample of households with at least one child attending school. Once I have γ and $\psi(\mathbf{S})$, I can use either 2.20 or 2.21 to recover ρ. Thus, I find that either of these two conditions can also serve as an overidentifying restriction in this case.

Proposition C2 (Parametric Identification of Single-Parent Households' Production Technology).
Let (h_D^i, q^D) be observed functions of $(w^i, y^i, \boldsymbol{S})$ for $i = (A, B)$. If for at least one production shifter $s_j \in \boldsymbol{S}$, $\exists s_j^*$ such that $\phi(\boldsymbol{S}^*) = 1/2$, the substitution parameter β is identified. Once β^i is identified, the relative productivity of parental time, $\phi^i(\boldsymbol{S})$, can be recovered from single parents' home time to monetary investment ratios observed in the data, $\frac{h_D^i}{q^D}$.

Proof: Identification of single-parent households' production technology is derived from the optimality condition related to productive efficiency and described in 2.16. Note that in this case I face a similar problem in the identification of β and $\phi(\mathbf{S})$ as when focusing on the production technology of two-parent households. This involves the lack of a condition I can use to begin solving for each individual production function parameter. Again, since the production shifter of interest involves the number of children enrolled in school, I can then impose a similar normalization to the one used for two-parent households such that for parents with no children enrolled in school ($s_j = 0$), $\phi(\mathbf{S}) = 1/2$. Thus, from these households, I can recover β. Once I recover β, I can then estimate $\phi(\mathbf{S})$ taking β as given over the sample of households in which there are children attending school ($s_j > 0$).

Proposition C3 (Parametric Identification of Individual Preferences).

Let (l^i, q^i) *be observed functions of* $(w^i, y^i, \boldsymbol{S})$ *for* $i = (A, B)$. *With* $\phi^A(\boldsymbol{S})$ *and* β^A *identified, mothers' marginal rate of substitution of leisure for private consumption is identified by observing mothers' wages and leisure to private consumption ratios following 2.16. Upon the identification of the marginal rate of substitution, preference for leisure,* $\alpha_1^A(\boldsymbol{X})$*, and for private consumption,* $\alpha_2^A(\boldsymbol{X})$*, are separately identified by observing single mothers' leisure to home production hours ratio following 2.17 and their private consumption to monetary investments in the production of the public good following 2.18. A symmetric result holds for the identification of single fathers' preferences for leisure and private market consumption. Assuming that preferences are invariant to marital status, the identification of the individual preferences within two-parent households follows.*

Proof: Once the production function for the sample of single-parent households has been identified, I can then take β^i and $\phi^i(\mathbf{S})$ as known in 2.17 and 2.18. These two conditions yield two expressions for $\alpha_1^i(\mathbf{X})$ and for $\alpha_2^i(\mathbf{X})$ for both men and women. This follows from using 2.16 to write down either $\alpha_1^i(\mathbf{X})$ in terms of $\alpha_2^i(\mathbf{X})$, or vice versa, and using this in 2.17 or 2.18 to solve the system of equations, yielding

$$\alpha_1^i(\mathbf{X}) = \left(1 - \frac{1}{w^i l^i}[(\phi^i(\mathbf{S})(h_D^A)^{\beta^i} + (1-\phi^i(\mathbf{S}))(q^D)^{\beta^i})(q^D)^{1-\beta^i} + q^i]\right)^{-1}$$
$$\alpha_2^i(\mathbf{X}) = \left(1 - \frac{w^i}{q^i}[(\phi^i(\mathbf{S})(h_D^A)^{\beta^i} + (1-\phi^i(\mathbf{S}))(q^D)^{\beta^i})(h_D^A)^{1-\beta^i} + l^i]\right)^{-1}$$

Proposition C4 (Parametric Identification of the Pareto Weight).

Let (l^A, l^B, q) *be observed functions of* $(w^A, w^B, y, \boldsymbol{S}, \boldsymbol{z})$ *for two-parent households. With individual preferences identified, identification of the Pareto weight,* $\lambda(\boldsymbol{z})$ *follows from the relationship between the spouses' relative bargaining power, observed leisure and wage ratios*

and distribution factors as described in the third optimality condition presented in 2.22.

Proof: Once the parents' individual preferences for leisure have been identified, I can take these as known in the first order conditions of two-parent households, from which I can recover $\lambda(\mathbf{z})$ without needing a normalization since it can come directly from the third condition presented in 2.22 upon substitution of α_1^i $(i = A, B)$. This yields the following relationship between the Pareto weight and what is known at this stage

$$\lambda(\mathbf{z}) = \frac{w^A l^A \alpha_1^B(\mathbf{X})}{w^A l^A \alpha_1^B(\mathbf{X}) + w^B l^B \alpha_1^A(\mathbf{X})}$$

Corollary C4.1 (Overidentification of the Pareto Weight).
With individual preferences and two-parent households' production technology identified, there exist two sets of overidentifying conditions for the Pareto weight. The first set relates the household's public consumption optimality conditions and the second set relates the restrictions derived using the experimental variation of Oportunidades on household behavior.

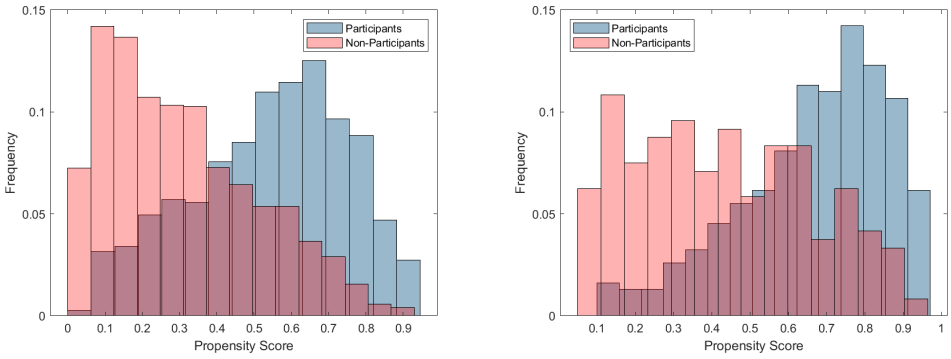
Proof: While the identification of the Pareto weight is guaranteed by the relationship described in the third optimality condition presented in 2.22, the conditions related to the household's marginal utility for public consumption and for leisure and the spouses' marginal productivity at home described in 2.23 and 2.24 yield two additional conditions to identify the Pareto weight since both parental preferences and two-parent households' production technology is known at this stage. Furthermore, the conditions related to the experimental variation of *Oportunidades* on household behavior described in 2.28-2.32 yield another set of overidentifying restrictions relating the Pareto weight, individual preferences and the production technology parameters.

B.4 Supplemental Tables and Figures

B.4.1 Propensity Score Estimation and Distribution

The first step of the MDID estimator described in Section 1.3 involves estimating a probit model of program participation. For two-parent households, I present the marginal effects at the mean in B.1. For single parent households, a comparable set of covariates are used to estimate the model, yielding the marginal effects at the mean presented in Table B.2. The distributions of the predicted propensity scores are presented B.1.

Figure B.1: Propensity Score Distribution by Type of Household



Two-Parent Single-Parent

Table B.1: Probit Estimates: Marginal Effects at the Mean

	$\Pr(D=1\|X)$	
HH Poverty Index	0.375*	(0.16)
(HH Poverty Index)^2	-0.129***	(0.04)
Household size	0.0617	(0.06)
Number of children, 0-5	0.0453	(0.07)
Number of children, 6-12	-0.106	(0.11)
Number of children, 13-15	-0.0999	(0.10)
Number of children, 16-20	-0.231*	(0.11)
(Number of children in school)^2	-0.0188	(0.01)
Number of children in school, 6-12	0.256*	(0.10)
Number of children in school, 13-15	0.236*	(0.11)
Number of children in school, 16-20	0.369**	(0.14)
Female head	0.243**	(0.09)
Wants children to get more education	0.0194	(0.18)
Number of rooms	-0.0602	(0.04)
Floors made of dirt	0.160**	(0.05)
Walls made of weak material	0.208***	(0.05)
Gas stove ownership	-0.125	(0.11)
Refrigerator ownership	-0.0203	(0.06)
Has had loans	0.105*	(0.05)
Has had savings	0.0765	(0.10)
Local incidence of poverty	0.0311**	(0.01)
(Local incidence of poverty)^2	-0.000216	(0.00)
Tortilla subsidy	0.269***	(0.07)
Milk subsidy	-0.0885	(0.08)
Breakfast subsidy	-0.0590	(0.07)
Employed in 2001, mother	-0.0797	(0.06)
Employed in 2000, mother	0.0410	(0.07)
Employed in 1999, mother	0.0654	(0.06)
Employed in 2001, father	0.0702	(0.18)
Employed in 2000, father	-0.171	(0.18)
Employed in 1999, father	-0.0794	(0.16)
Completed years of education, mother	-0.0150	(0.01)
Completed years of education, father	-0.0309*	(0.01)
Age, mother	-0.00978	(0.01)
Age, father	0.00663	(0.00)
N	629	

Standard errors in parentheses

Table B.2: Probit Estimates: Marginal Effects at the Mean

	$\Pr(D=1\|X)$	
HH Poverty Index	0.0500	(0.15)
(HH Poverty Index)^2	-0.0376	(0.04)
Household size	-0.0773	(0.05)
Number of children, 0-5	0.205**	(0.06)
Number of children, 6-12	0.0893	(0.08)
Number of children, 13-15	0.0520	(0.09)
Number of children, 16-20	0.0724	(0.08)
(Number of children in school)^2	-0.00265	(0.01)
Number of children in school, 6-12	0.107	(0.07)
Number of children in school, 13-15	0.0974	(0.09)
Number of children in school, 16-20	0.0352	(0.11)
Wants children to get more education	0.0519	(0.12)
Number of rooms	-0.169***	(0.04)
Floors made of dirt	0.153**	(0.06)
Walls made of weak material	0.137*	(0.05)
Refrigerator ownership	-0.00573	(0.07)
Gas stove ownership	-0.208	(0.12)
Has had loans	0.0918	(0.06)
Has had savings	0.0460	(0.12)
Local incidence of poverty	0.0571***	(0.01)
(Local incidence of poverty)^2	-0.000524***	(0.00)
Tortilla subsidy	0.271***	(0.07)
Milk subsidy	0.0595	(0.09)
Breakfast subsidy	-0.00791	(0.08)
Employed in 2001	0.0712	(0.08)
Employed in 2000	0.0181	(0.08)
Employed in 1999	-0.0363	(0.06)
Age	0.00800*	(0.00)
Completed years of education	-0.0202	(0.01)
N	650	

Standard errors in parentheses

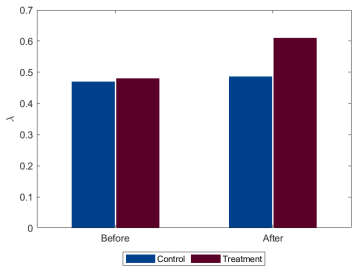
Table B.3: Overall Impact of *Oportunidades* on Two-Parent Beneficiary Households in which Mothers do not Work

	Leisure, Mother	Home Prod., Mother	Leisure, Father	Home Prod., Father	Market Work, Father	Public Exp.
MDID	241.275**	-241.275**	-131.267	9.637	119.655	648.493***
	(119.868)	(119.868)	(115.502)	(28.186)	(113.741)	(118.961)
Mean	3,149.81	2,674.19	3,324.76	174.15	2,325.09	4,729.65
N	1187	1187	1188	1188	1188	1188

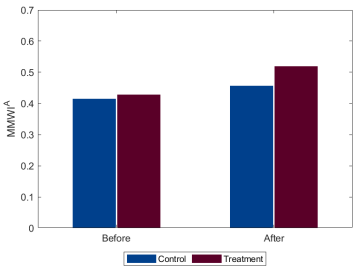
[1] Monetary values reported in 2002 MXN pesos. 1USD = 10.43 MXN pesos. [2] All measures are annualized.
[3] Bootstrapped standard errors (100 repetitions).

B.4.2 Graphs: Bargaining Power and Individual Welfare Measures

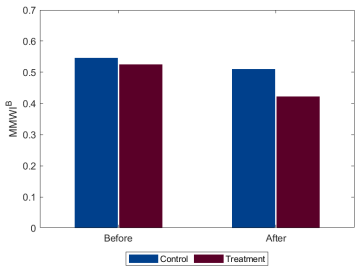
Figure B.2: Overall Impact of *Oportunidades* on Intrahousehold Bargaining Power and Individual Welfare



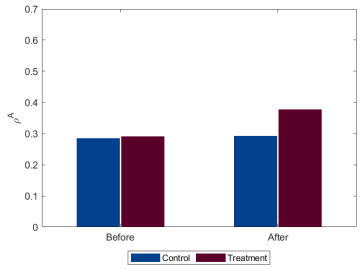
Pareto Weight



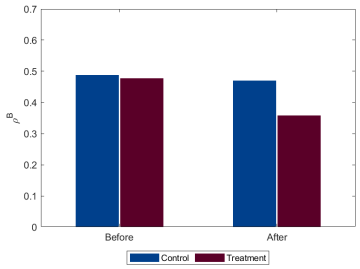
MMWI, Wife



MMWI, Husband



Sharing Rule, Wife



Sharing Rule, Husband

B.5 Inclusion of Non-Poor Households in Estimation

Table B.4 presents the summary statistics obtained from the updated sample. Comparing this with Table 2.1, I can observe that the inclusion of poor households has lead to an increase of more than 400 two-parent households, 500 single-mother households and 100 single-father households. I can also corroborate that overall, average and median expenditures, income and earnings is relatively higher within this updated sample than within the sample used so far which is consistent with the inclusion of relatively richer households of working parents. Similarly, the gender specialization patterns observed within eligible households remain when expanding the sample to include their non-poor counterparts with women spending significantly more yearly hours, on average, in housework relative to men and significantly less time working in the market relative to men. Furthermore, among two-parent and single-mother households, more than 60% of the sample is poor/eligible while this is 53% among single-father households.

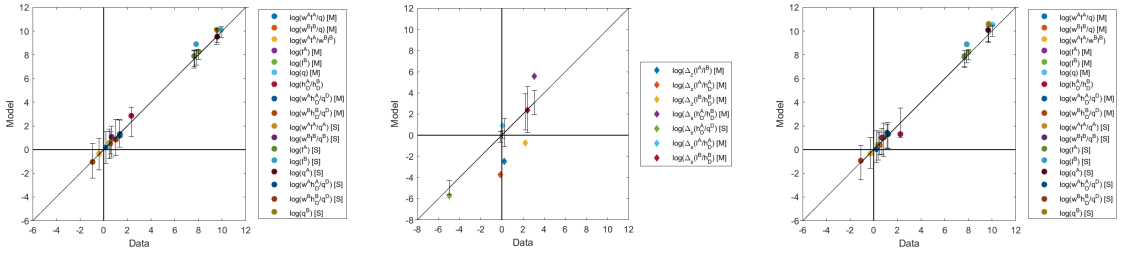
B.5.1 Model Fit by Specifications Used

I use the same set of moment conditions used in Section 2.4.3. More specifically, I define the theoretical moments described in 2.16-2.25 for both poor and non-poor households, but define the experimental moments described in 2.28-2.32 only for poor, eligible households. Figure B.3 - Figure B.6 present the model fit checks implemented for each of the four specifications considered. For the experimental moments, there is a further distinction between those that are untargeted in each specification (represented by diamonds) and those that were targeted (represented by squares) in each of the specifications considered.

Table B.4: Descriptive Statistics, Eligible and Non-Eligible Households

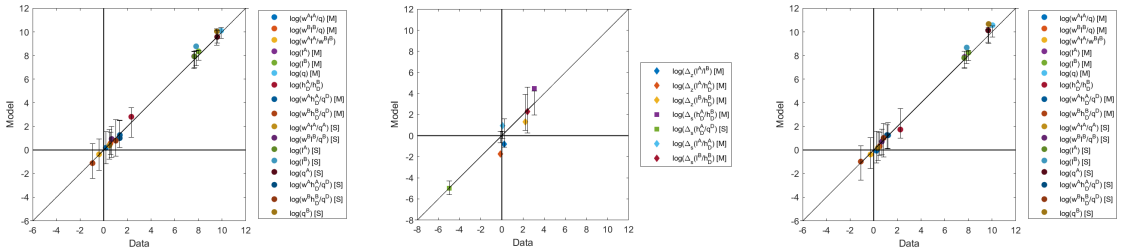
	Two Parent			*Single Mother*			*Single Father*		
	Obs	**Mean**	**Median**	**Obs**	**Mean**	**Median**	**Obs**	**Mean**	**Median**
Household Characteristics:									
Household Size	1,071	4.88	5.00	1,354	3.61	3.00	240	1.89	1.00
Number of children	1,071	2.77	3.00	1,354	2.41	2.00	240	1.82	1.00
Mean Age of Children in Household	1,063	9.05	9.00	1,232	10.80	11.00	97	13.02	13.50
Poor/Eligible	1,071	0.62	1.00	1,354	0.63	1.00	240	0.53	1.00
Household Consumption:									
Public Expenditures, Yearly	1,071	7,943.18	6,750.21	1,354	5,808.47	5,018.80	240	3,707.31	2,960.97
Private Consumption	1,071	23,591.29	21,716.15	1,354	17,119.69	15,392.14	240	18,755.47	16,108.00
Food Expenditures	1,071	18,280.31	16,900.00	1,354	13,785.61	12,610.00	240	11,132.55	9,672.00
Income									
Total Household Nonlabor Income	1,071	8,470.64	4,950.00	1,354	7,298.07	3,472.04	240	4,607.19	1,822.36
Wife's Share	1,071	0.32	0.10	0	.	.	0	.	.
Total Household Earnings	1,071	41,556.10	37,303.84	1,354	17,201.25	14,921.53	240	26,645.05	24,869.22
Parental Characteristics:									
Age, Mother	1,071	33.80	33.00	1,354	39.33	38.00	0	.	.
Age, Father	1,071	37.24	36.00	0	.	.	240	47.05	46.00
Years of Education, Mother	1,071	6.68	6.00	1,354	5.83	6.00	0	.	.
Years of Education, Father	1,071	7.24	6.00	0	.	.	240	5.82	6.00
Market Work Hours, Mother	1,071	1,124.91	780.00	1,354	1,564.70	1,560.00	0	.	.
Market Work Hours, Father	1,071	2,249.71	2,496.00	0	.	.	240	2,165.12	2,496.00
Child Care Hours, Mother	1,071	522.31	364.00	1,354	315.44	52.00	0	.	.
Child Care Hours, Father	1,071	130.56	0.00	0	.	.	240	47.99	0.00
Home Production Hours, Mother	1,071	1,669.97	1,638.00	1,354	1,421.45	1,352.00	0	.	.
Home Production Hours, Father	1,071	220.48	130.00	0	.	.	240	723.02	676.00
Real Wage, Mother	1,071	18.54	10.79	1,354	14.97	9.58	0	.	.
Real Wage, Father	1,071	15.38	11.65	0	.	.	240	15.78	11.34

Figure B.3: Model Fit Specification 1



Poor Households' Theoretical Moments | Poor Households' Theoretical Moments | Non-Poor Households' Theoretical Moments

Figure B.4: Model Fit Specification 2



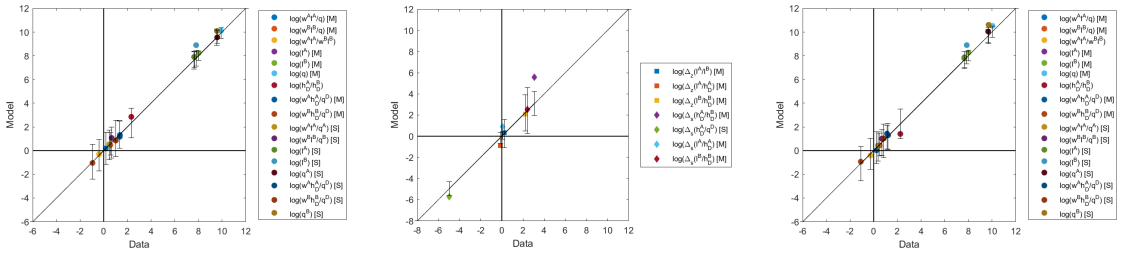
Poor Households' Theoretical Moments | Poor Households' Experimental Moments | Non-Poor Households' Theoretical Moments

As discussed in the results presented in Section 2.4.3, all specifications seem to be fitting the theoretical moments relatively well. The only theoretical moments that seem to be off are the ones related to single-father households for both poor and non-poor. However, this might be expected given that these households represent a relatively small share of the estimation sample so that most of the estimation related to fathers' preferences might be driven by the sample of married fathers for which I have information from a larger number of households. Overall, the model seems to be over-predicting single fathers' leisure hours and private market consumption.

The model hits the experimental moments related to the effect of *Oportunidades* on the leisure-to-home time ratios of both fathers and mothers through the effect on the production shifter (number of children attending school) despite the fact that these remain untargeted in all of the specifications. However, specifications 1 and 2 fail to fit the experimental moments related to the effect of *Oportunidades* on the spouses' leisure ratio, and their individual leisure-to-home time ratios through the program's effect on the distribution factor z^A (i.e. the mothers' share of non-labor income). Both specifications 3 and 4 target these remaining experimental moments, improving the model fit of these moments even though the model seems to be slightly under-predicting the effect of the program on mothers' leisure-to-home time ratio through its effect on z^A. Nonetheless, this constitutes a better fit than the one

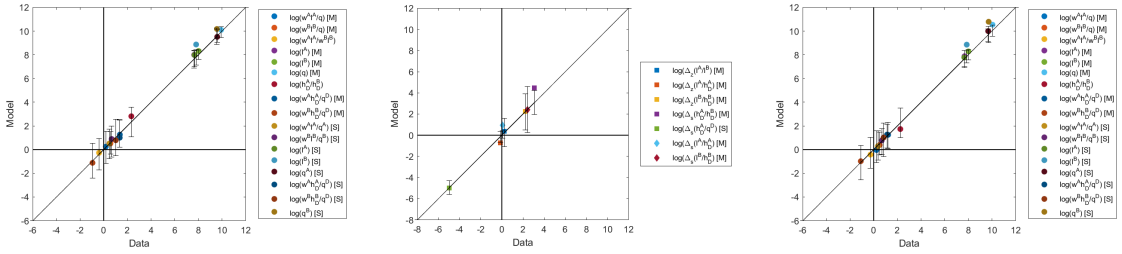
yielded by specifications 1 and 2. As observed in the estimation of the model over the smaller sample of poor households discussed in Section 2.4.3, a significant difference in the results obtained from specifications that leave these moments untargeted and these that target them is that I obtain a coefficient for z^A in the Pareto weight that is higher in the specifications in which these moments are targeted.

Figure B.5: Model Fit Specification 3



Poor Households' Theoretical Moments | Poor Households' Experimental Moments | Non-Poor Households' Theoretical Moments

Figure B.6: Model Fit Specification 4



Poor Households' Theoretical Moments | Poor Households' Experimental Moments | Non-Poor Households' Theoretical Moments

Regarding the moments related to the program's impact on the domestic input ratios through the effect on the production shifter for both two-parent and single-parent households, I can see that specifications that target the experimental moment for single-parent households fit this

moment better. On the other hand, the model fit of this experimental moment improves once I target it in estimation, but it is still left slightly over-predicted by the estimates obtained for specifications 2 and 4. Simultaneously, these specifications seem to fit the theoretical moment related to spouses' home time ratios among non-poor households relatively better.

Overall, I find that the specifications that target the experimental moments related to the impact of *Oportunidades* on spouses' time use ratios through its effect on the distribution factor do a relatively better job at fitting the data than the specifications that leave these moments untargeted. In order to exploit the use of the exogenous variation of the program in both steps of the GMM estimator implemented, I choose the fourth specification to carry out the identification of poor mothers within non-poor households and the evaluation of the program's impact on intrahousehold bargaining and individual welfare.

B.5.2 Results

Table B.5 presents the estimates and computed standard errors obtained for specifications 1-4 using an optimal weight matrix. Given the slight difference between the results obtained from the estimation of the model on the sub-sample poor households and those obtained from the estimation of the model on the larger sample including non-poor households now, the interpretation of the results in Table B.5 is similar to the one discussed in Section 2.4.3. The key point of departure between the estimates presented in Table 2.5 can be found in the estimate obtained for the coefficient related to the production shifter for two-parent households as its magnitude increased upon the inclusion of non-poor households in the estimation of the model.

Table B.5: Structural Estimation Results, Model with Home Production

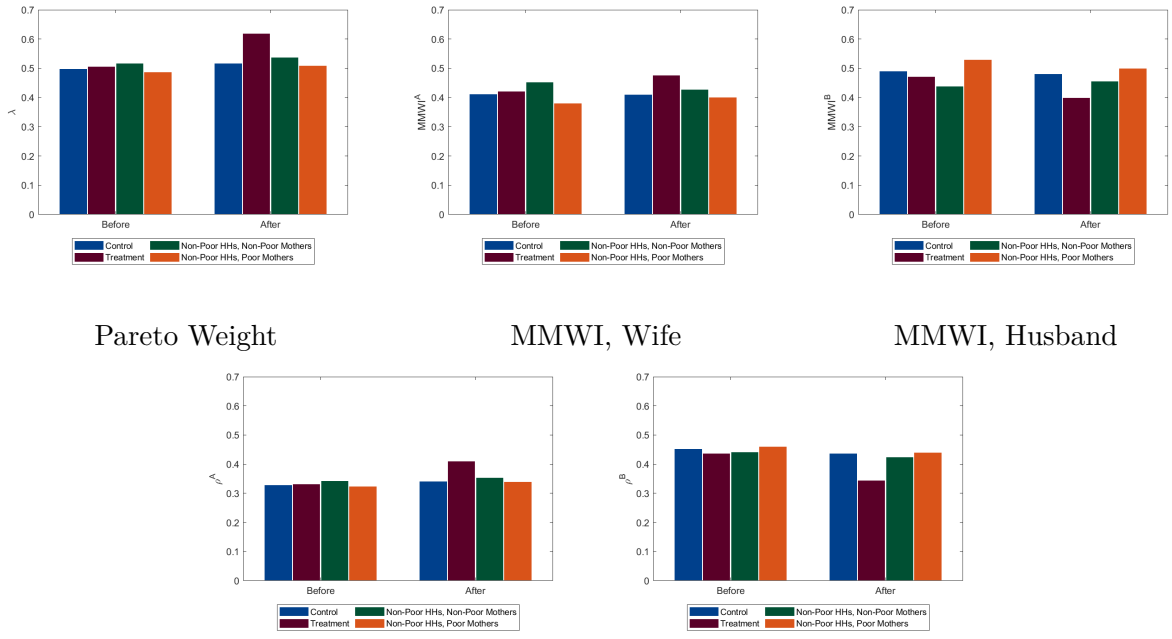
	(1)		(2)		(3)		(4)	
	Estimate	**SE**	**Estimate**	**SE**	**Estimate**	**SE**	**Estimate**	**SE**
Home Production Parameters, Two-Parent HHs:								
γ	0.9106	0.0003	0.8468	0.0151	0.9106	0.0003	0.8468	0.0151
ρ	0.8114	7.0477E-05	0.8028	0.0014	0.8114	7.0477E-05	0.8028	0.0014
ψ_2 $[n_s]$	0.1158	8.7694E-06	0.2033	0.0026	0.1158	8.7694E-06	0.2033	0.0026
Sample mean $\psi(\mathbf{S})$ =	0.5449		0.5775		0.5449		0.5775	
Home Production Parameters, Single-Mother HHs:								
β	-1.1820	0.0019	-1.0750	0.0007	-1.1820	0.0019	-1.0750	0.0007
ϕ_2 $[n_s]$	-0.0322	0.0012	-0.0647	8.8636E-05	-0.0322	0.0012	-0.0647	8.8636E-05
Sample mean $\phi(\mathbf{S})$ =	0.4874		0.4748		0.4874		0.4748	
Home Production Parameters, Single-Father HHs:								
β	-0.6173	0.0030	-0.6564	0.0004	-0.6173	0.0030	-0.6564	0.0004
ϕ_2 $[n_s]$	-0.0363	0.0006	-0.2254	0.0005	-0.0363	0.0006	-0.2254	0.0005
Sample mean $\phi(\mathbf{S})$ =	0.4858		0.4146		0.4858		0.4146	
Wife's Preference for Leisure Parameters:								
$\alpha^A_{1,1}$ [Constant]	-0.0685	0.0093	-0.2083	0.0022	0.0521	0.0275	0.1031	0.0008
$\alpha^A_{1,2}$ [Age]	0.0113	0.3312	0.0101	0.0833	0.0090	0.9405	0.0003	0.0297
$\alpha^A_{1,3}$ [Education]	-0.0032	0.0593	-0.0004	0.0139	-0.0132	0.1833	-0.0045	0.0054
$\alpha^A_{1,4}$ [Number of Children]	-0.0651	0.0246	0.0048	0.0058	-0.0537	0.0756	0.0582	0.0022
Sample mean $\alpha^A_1(\mathbf{X})$ =	0.4082		0.3926		0.4095		0.4189	
Wife's Preference for Private Consumption Parameters:								
$\alpha^A_{2,1}$ [Constant]	-3.1301	0.0080	-3.0044	0.0028	-1.7549	0.0092	-1.7784	0.0007
$\alpha^A_{2,2}$ [Age]	0.0666	0.3001	0.0682	0.1034	0.0401	0.3222	0.0419	0.0258
$\alpha^A_{2,3}$ [Education]	0.0301	0.0484	0.0259	0.0169	-0.0035	0.0618	-0.0016	0.0042
$\alpha^A_{2,4}$ [Number of Children]	0.0136	0.0204	0.0247	0.0072	-0.0416	0.0257	-0.0267	0.0018
Sample mean $\alpha^A_2(\mathbf{X})$ =	0.2385		0.2718		0.2392		0.2516	
Husband's Preference for Leisure Parameters:								
$\alpha^B_{1,1}$ [Constant]	3.1902	0.0058	2.7511	0.0005	3.7946	0.0095	3.3035	4.60071E-05
$\alpha^B_{1,2}$ [Age]	-0.0029	0.2248	-0.0023	0.0194	-0.0012	0.3542	-0.0021	0.0012
$\alpha^B_{1,3}$ [Education]	-0.0639	0.0406	-0.1099	0.0031	-0.0437	0.0703	-0.0850	0.0005
$\alpha^B_{1,4}$ [Number of Children]	-0.1009	0.0128	0.2820	0.0009	-0.3210	0.0235	-0.2199	0.0002
Sample mean $\alpha^B_1(\mathbf{X})$ =	0.7486		0.7731		0.8063		0.7193	
Husband's Preference for Private Consumption Parameters:								
$\alpha^B_{2,1}$ [Constant]	1.1138	0.0016	1.0266	0.0002	1.3616	0.0027	1.6368	0.0001
$\alpha^B_{2,2}$ [Age]	0.0014	0.0635	0.0021	0.0081	-0.0021	0.1177	-0.0021	0.0045
$\alpha^B_{2,3}$ [Education]	0.0204	0.0166	0.0541	0.0014	0.0187	0.0224	0.0247	0.0011
$\alpha^B_{2,4}$ [Number of Children]	-0.1485	0.0060	-0.2915	3.40227E-05	-0.2347	0.0137	-0.4324	0.0004
Sample mean $\alpha^B_2(\mathbf{X})$ =	0.1814		0.1655		0.1319		0.1860	
Pareto Weight Parameters:								
λ_0 [Constant]	0.6827	0.0065	0.5060	0.0012	0.8787	0.0776	1.1154	0.0014
λ_1 $[w^A/w^B]$	0.0539	0.0106	-0.0534	0.0020	0.0450	0.1209	0.0450	0.0022
λ_2 [y]	-0.0072	0.0533	0.0089	0.0100	0.0042	0.6980	0.0053	0.0127
λ_3 $[z^A]$	0.0980	0.0015	0.2080	0.0003	0.7120	0.0886	0.7406	0.0016
λ_4 [Sex ratio]	-0.5856	0.0058	-0.3613	0.0011	-1.0207	0.0700	-1.3695	0.0013
Sample mean $\lambda(\mathbf{z})$ =	0.5419		0.5499		0.5414		0.5219	
Additional Restriction, Step 2A	No		Yes		No		Yes	
Additional Restriction, Step 2B	No		No		Yes		Yes	

Notes: The normalization imposed for $\psi(\mathbf{S})$, $\phi^A(\mathbf{S})$ and $\phi^B(\mathbf{S})$, render $\psi^A_1 = \psi^B_1 = 0$, and $\phi_1 = 0$ for both mothers and fathers.

B.5.3 Program Evaluation

As before, I use the fourth specification to evaluate the impact of the program on the intrahousehold allocation of bargaining power and individual welfare. Before assessing the impact of the program, I first check what the distribution of bargaining power and the different money metric individual welfare measures is at the program's baseline and followup years for four different groups of households: treatment (poor households that receive the transfer), control (poor households that did not receive the transfer), non-poor (ineligible households) with a non-poor mother (as identified using the individual poverty analysis implemented in the section above) and non-poor (ineligible households) with a non-poor mother as identified in the previous section. Figure B.7 presents these data checks.

Figure B.7: Overall Impact of *Oportunidades* on Intrahousehold Bargaining Power and Individual Welfare



Pareto Weight | MMWI, Wife | MMWI, Husband

Sharing Rule, Wife | Sharing Rule, Husband

Throughout the formal evaluation of the program, I consider two alternative control groups used in the analysis. The first control group used is the same as the one used so far, consisting only of poor households that did not to participate in the program. The relevant results are presented in both level and percentage terms in Tables B.6 and B.7, respectively. The results indicate that participation in the program increased poor beneficiary mothers' bargaining power by almost 21.4% relative to poor non-participant mothers. This is consistent with an 18.18% and 22.52% increase in their MMWI and sharing rule, respectively. Furthermore, I find that participation in *Oportunidades* increased domestic production by approximately 17% relative to their non-participant poor counterparts.

Table B.6: Overall Impact of *Oportunidades* on Beneficiary Households

	Pareto Weight	MMWI, A	MMWI, B	ρ^A	ρ^B	Q	θ_Q, A	θ_Q, B
MDID	0.119***	0.083***	-0.096***	0.083***	-0.105***	379.865**	1.221	-2.356**
	(0.005)	(0.013)	(0.015)	(0.004)	(0.006)	(162.427)	(2.530)	(0.956)
N	478	478	478	478	478	478	478	478

[1] As in the model, A denotes the mother and B denotes the father.

Table B.7: Overall Impact of *Oportunidades* on Beneficiary Households, Percentage Change

	Pareto Weight	MMWI, A	MMWI, B	ρ^A	ρ^B	Q	θ_Q, A	θ_Q, B
MDID	21.387***	18.182***	-22.235***	22.524***	-27.077***	17.196**	3.049	-44.375***
	(0.935)	(3.044)	(3.651)	(1.233)	(1.579)	(7.858)	(12.305)	(12.004)
N	478	478	478	478	478	478	478	478

[1] As in the model, A denotes the mother and B denotes the father.

An alternative control group considered consists of both poor households that did not participate in the program and those deemed as non-poor by the program administration. The relevant results are presented in both level and percentage terms in Tables B.8 and B.9, respectively. The results show that while the Pareto weight and individual welfare results are robust (though slightly lower in magnitude) to the inclusion of all non-poor households in the

control group, the lack of an impact in the domestic production of Q constitutes one of the main departures with the results obtained so far only among poor households. This might be reflective of the inclusion of non-poor households in the control group that can afford to secure higher levels of inputs of production.

Table B.8: Overall Impact of *Oportunidades* on Beneficiary Households – Including Non-Poor Households in the Control Group

	Pareto Weight	MMWI, A	MMWI, B	ρ^A	ρ^B	Q	θ_Q, A	θ_Q, B
MDID	0.118***	0.075***	-0.085***	0.084***	-0.098***	54.623	-2.298	-4.064***
	(0.005)	(0.013)	(0.014)	(0.003)	(0.005)	(138.670)	(2.620)	(1.212)
N	713	713	713	713	713	713	713	713

[1] As in the model, A denotes the mother and B denotes the father.

Table B.9: Overall Impact of *Oportunidades* on Beneficiary Households, Percentage Change – Including Non-Poor Households in the Control Group

	Pareto Weight	MMWI, A	MMWI, B	ρ^A	ρ^B	Q	θ_Q, A	θ_Q, B
MDID	21.177***	17.518***	-18.887***	22.782***	-25.664***	2.584	-7.479	-62.618***
	(0.907)	(2.844)	(3.689)	(0.969)	(1.286)	(6.132)	(9.022)	(9.156)
N	713	713	713	713	713	713	713	713

[1] As in the model, A denotes the mother and B denotes the father.

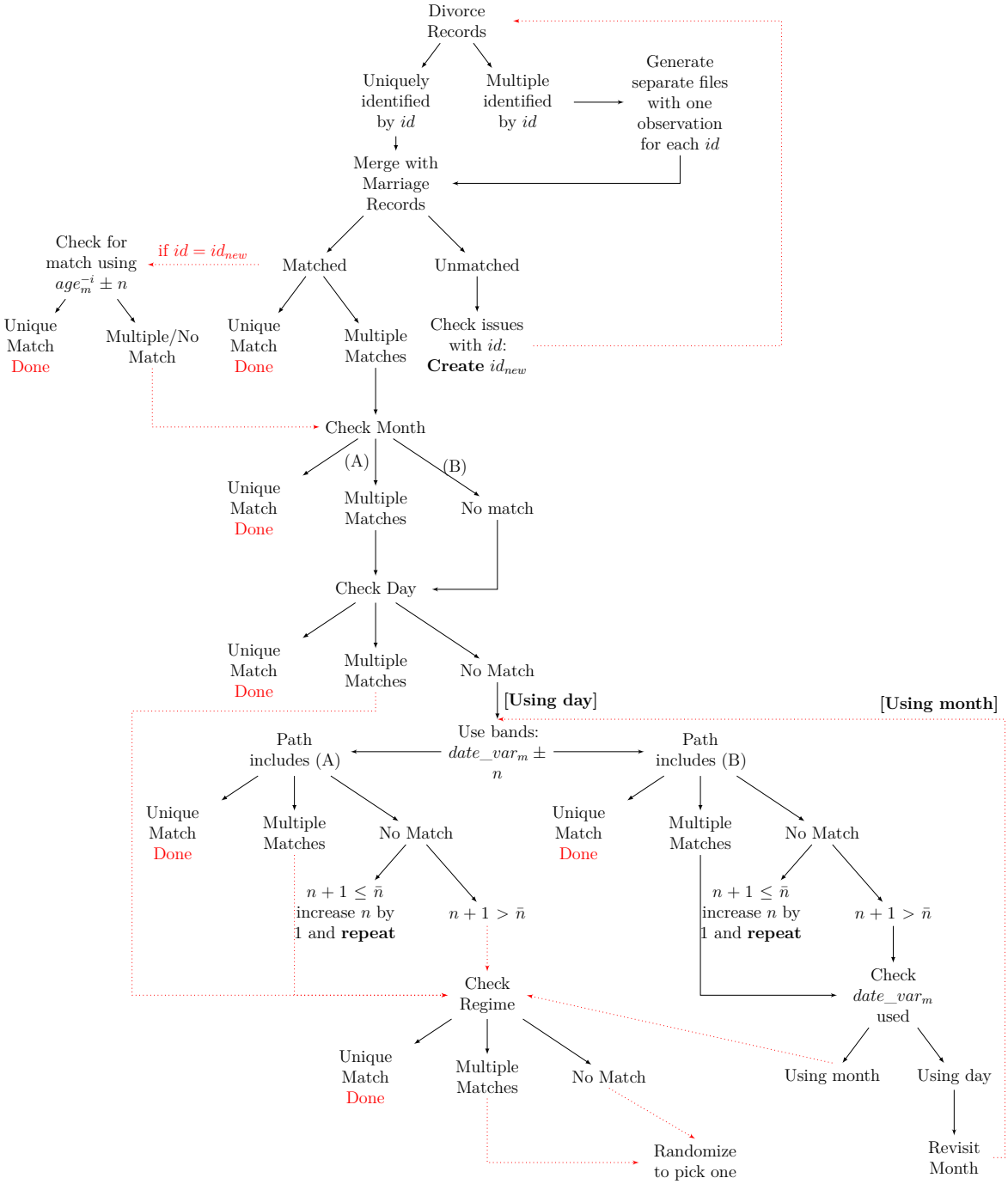
Appendix C

Appendix to Chapter 3

C.1 Data Appendix: Matching Algorithm

In this section, we describe the algorithm implemented for the matching of the administrative data files in further detail. We begin by using what we describe as the most restrictive identifier to generate as many unique matches as possible. We then detail how we adjust this identifier to allow for differences in ages and dates between the two data files.

Figure C.1: Divorce-Marriage Matching Algorithm



Additional notes on other steps implemented in the matching process based on issues faced:

- For the divorces that are not uniquely identified by id,
    1. Flag each observation by its "duplicate number". That is, for each id, the first observation with this id is assigned $dup\_num = 1$, the second observation with this same id will get $dup\_num = 2$ and so on.
    2. We create a distinct data file containing one duplicate divorce per id. This requires having one file for the $dup\_num = 1$ of each id, another one for the $dup\_num = 2$ and so on.
    3. In each of these separate files id is unique and can be merged with the marriage records in the same way as the observations that were originally uniquely identified by id.
- For the use of bands (i.e. intervals allowing for some discrepancies in the date and/or age variables in both data sets):
    1. $date\_var_m$ denotes the marriage date variable (either the month or day of marriage) for which the use of bands is going to be applied. There are two options: $date\_var_m = day_m$ or $date\_var_m = month_m$
    2. Before choosing a particular value for $\bar{n}$, first check how bad the matches on day and/or month of marriage are overall.
- In order to check for regime in the divorce dataset, we focus on the variable that captures which spouse is ruled in favor of in terms of custody and the division of assets. In the absence of children younger than 18, if we observe only one of the spouses being ruled in favor of, we can infer a mixed asset division regime being chosen at the time of marriage.

- Checking for issues with id for the uniquely identified divorces that were not matched with any marriage at all involves:
  - In the marriage dataset, we checked for missing values in the age of the spouses since there are none for geographical location and year–one issue that we can rule out at this point is missing information about the spouses' age at marriage (since these divorces are uniquely identified by id, this means that we do have some information from this variable). What we cannot rule out, however, is whether or not the age was misreported, thereby causing a discrepancy between the divorce record and its potential match in the marriage data set.
  - Upon closer inspection of these records, we realized that the issue with most of these unmatched divorces is that these can be matched to some marriage if we drop one of the spouses' age from id–these might signal a potential misreporting of age at marriage (highly likely from the divorce dataset). To address this issue, we can generate id_{new} aforementioned and then check for matches using the omitted spouse's age, age_m^{-i}, while allowing for some discrepancy with his/her reported age in any of the datasets by allowing it to be off by n.
- Checking for issues with the divorces for which the original id is missing.
  - This required us to generate an alternative (less unique) identifier based only on the three geographic variables and the year of marriage. This is mainly because what was causing the problem with the original id was the age of the spouses at the time of marriage.

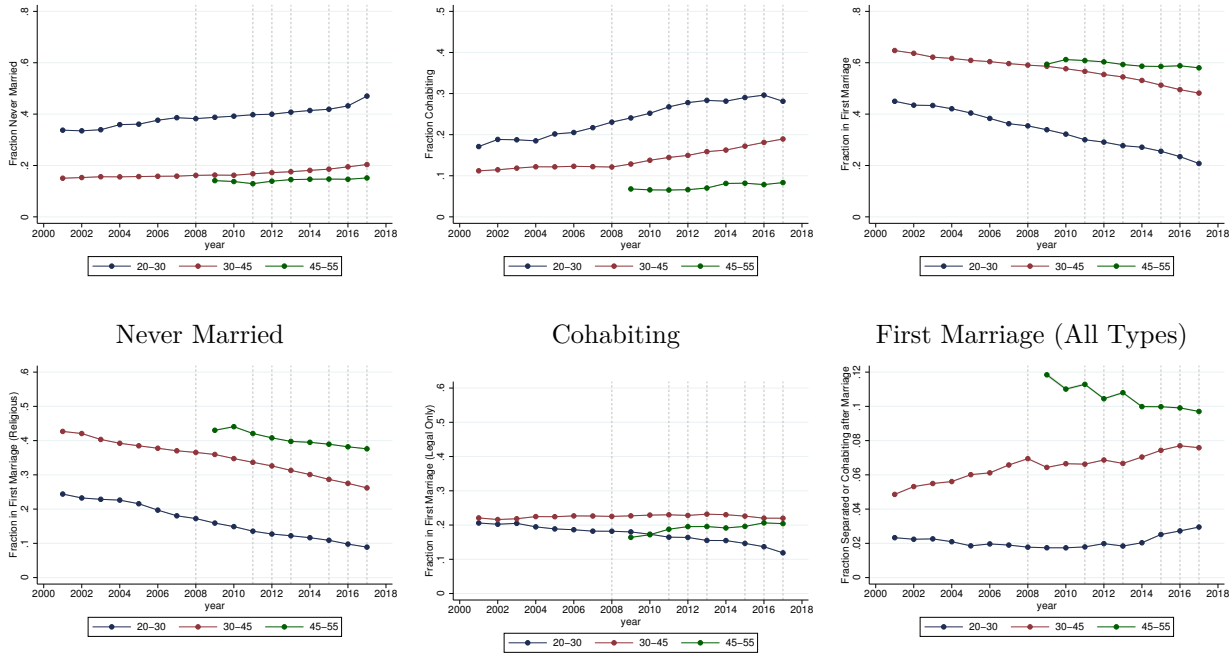
Table C.1: Distribution of Divorces in Original and in Matched Dataset across the Reported Year of Marriage

Year of Marriage	# of div in original data set	# of div in matched data set
2002	62,098	54,035
2003	57,979	53,947
2004	57,493	53,687
2005	55,829	52,392
2006	53,499	50,289
2007	51,978	48,803
2008	49,308	46,370
2009	43,309	40,967
2010	40,590	38,546
2011	38,111	36,407
2012	34,610	33,161
2013	29,082	27,742
2014	22,586	21,416
2015	15,684	15,078
2016	9,960	9,537
2017	4,628	4,272
2018	966	781

Notes: Rows in yellow correspond to years in which the matrimonial regime choice is observed.

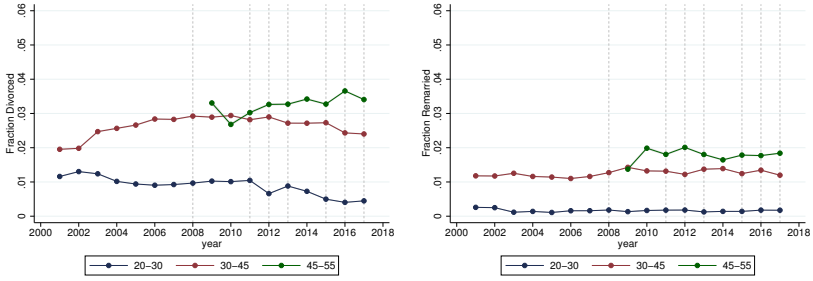
C.2 Supplemental Graphs

Figure C.2: Trends in Women's Marital Status (2000-2017), by Age Groups



Never Married | Cohabiting | First Marriage (All Types)

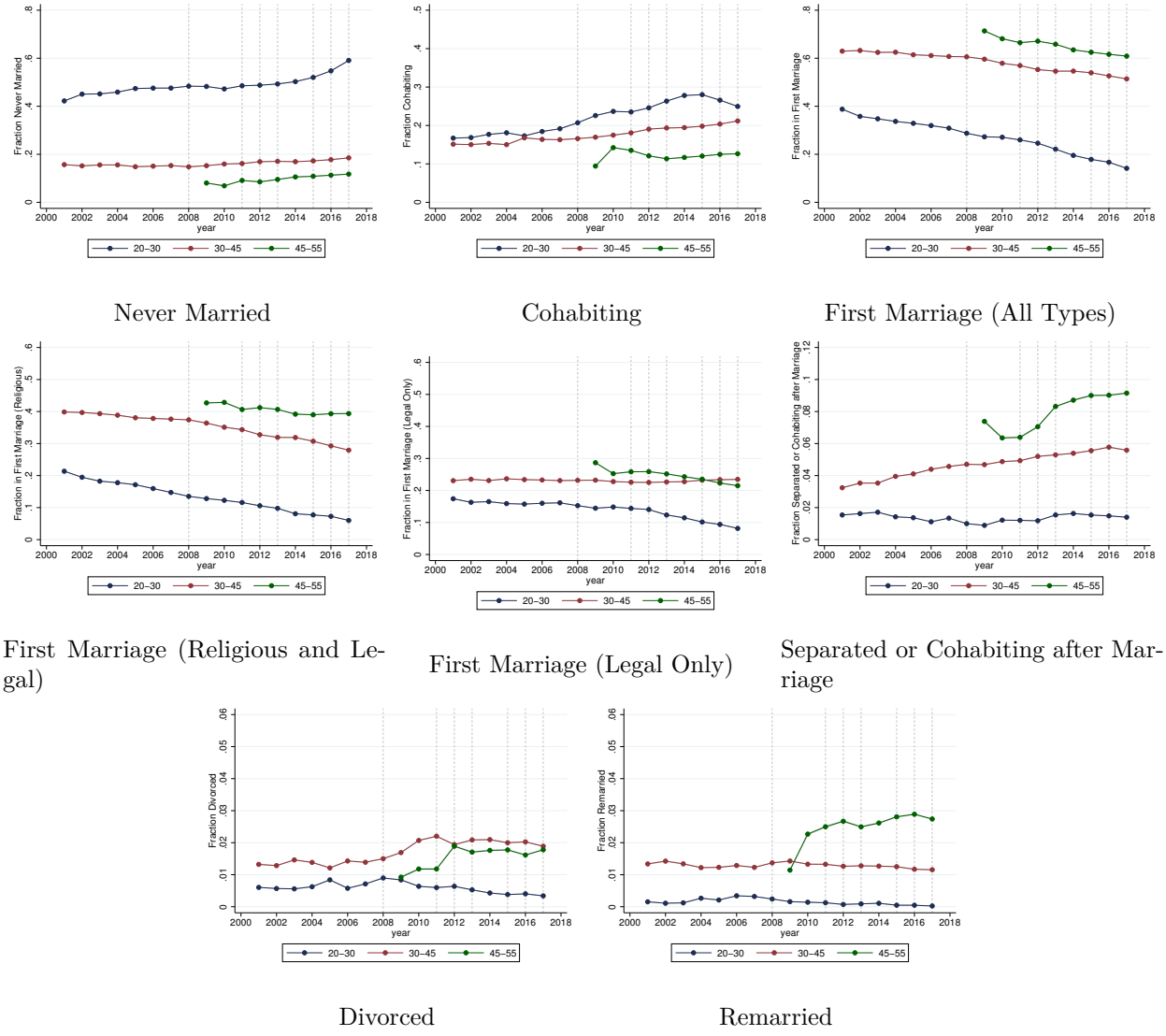
First Marriage (Religious and Legal) | First Marriage (Legal Only) | Separated or Cohabiting after Marriage



Divorced | Remarried

Notes: [1] Dotted lines correspond to UD reform years. [2] For the group of individuals older than 45, trends begin until 2008 since only household members aged 20-55 in 2017 were interviewed for the retrospective module of the 2017 ENH (thus, the earliest year in which the eldest interviewee could be included in this age group would be 2008). However, 2008 is omitted for this age group since it only consists of 70 observations.

Figure C.3: Trends in Men's Marital Status (2000-2017), by Age Groups



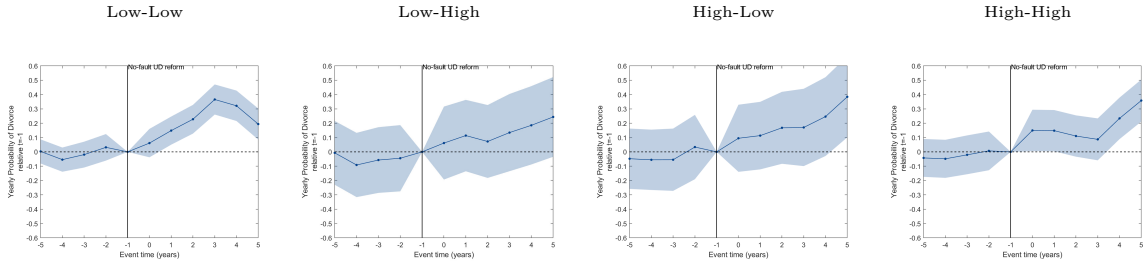
Never Married | Cohabiting | First Marriage (All Types)

First Marriage (Religious and Legal) | First Marriage (Legal Only) | Separated or Cohabiting after Marriage

Divorced | Remarried

Notes: [1] Dotted lines correspond to UD reform years. [2] For the group of individuals older than 45, trends begin until 2008 since only household members aged 20-55 in 2017 were interviewed for the retrospective module of the 2017 ENH (thus, the earliest year in which the eldest interviewee could be included in this age group would be 2008). However, 2008 is omitted for this age group since it only consists of 70 observations.

Figure C.4: Dynamic Impact of UD on the Probability of Divorce, 0-3 Years of Marriage by Education Match



Notes: Queretaro, Quintana Roo, Tabasco and Yucatan have been excluded from the analysis due to inconsistencies in the quality of these states' marriage and divorce records for some years between 2003 and 2018. **Mean at baseline:** 0.48 (L-L), 0.68 (L-H), 0.65 (H-L) 0.85

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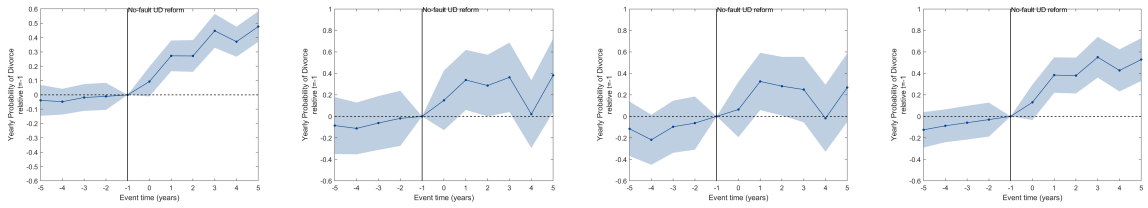
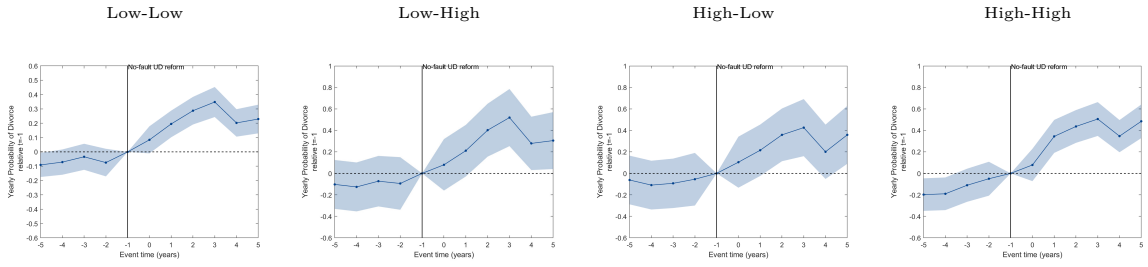
Figure C.5: Dynamic Impact of UD on the Probability of Divorce, 4-6 Years of Marriage by Education Match



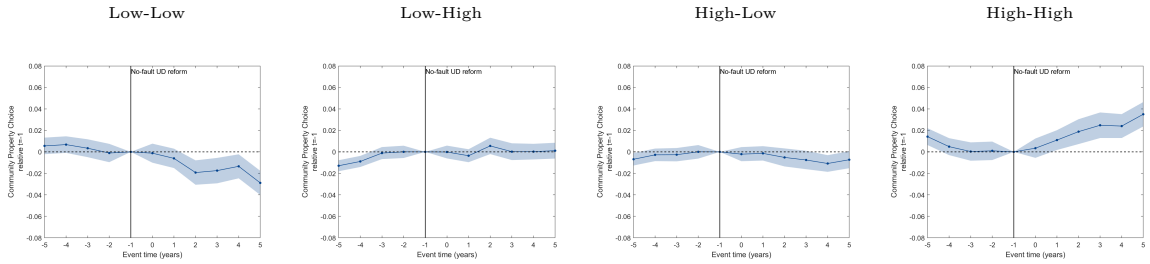
Notes: Queretaro, Quintana Roo, Tabasco and Yucatan have been excluded from the analysis due to inconsistencies in the quality of these states' marriage and divorce records for some years between 2003 and 2018. **Mean at baseline:** 0.63 (L-L), 0.75 (L-H), 0.86 (H-L), 1.10 (H-H).

Figure C.6: Dynamic Impact of UD on the Probability of Divorce, 7-9 Years of Marriage by Education Match



Notes: Queretaro, Quintana Roo, Tabasco and Yucatan have been excluded from the analysis due to inconsistencies in the quality of these states' marriage and divorce records for some years between 2003 and 2018. **Mean at baseline:** 0.68 (L-L), 0.87 (L-H), 0.89 (H-L), 1.45 (H-H).

Figure C.7: Dynamic Impact of UD on Marital Sorting (Education)



Notes: Durango, Mexico, Michoacan, Nayarit, Puebla, Sinaloa, Tamaulipas, Yucatan, Morelos, Baja California and Guanajuato have been excluded from the analysis due to inconsistencies in the data related to missing values for the couple's choice of asset division regime during the first years in which this information became available. Controls include spouses' age, education match, wife's work status at the time of marriage and the type of state defined by its default asset division regime. **Mean at baseline:** 0.45 (L-L), 0.10 (L-H), 0.10 (H-L), 0.35 (H-H).

C.3 Stylized Conceptual Framework

Throughout this section, we informally explore the conditions under which the implications of the Becker-Coase theorem might fail to hold. In particular, we focus on understanding how these conditions depend on the characteristics of the Mexican context presented in the previous section, focusing on the role of property division regimes, or matrimonial regimes, and changes in divorce legislation that ease the cost of divorce. Throughout this discussion, we go through the simple example presented in Chiappori, Iyigun and Weiss (2015). Specifically, we consider an economy in which individuals live for two periods. Each agent has preferences over goods and marital status. We assume that there exists two types of goods: a private good, q^i whose price is normalized to unity and a good that is consumed jointly among married individuals, Q whose price is denoted by P. Thus, preferences of each individual can be represented in the following way, depending on their marital status

$$v^i(q^i, Q) = \begin{cases} u^i(q^i, Q) & \text{if single} \\ u^i(q^i, Q) + \theta^i & \text{if married} \end{cases}$$

for $i = \{A, B\}$, where A denotes a woman and B denotes a man. Thus, for married individuals, this notation is consistent with the notation adopted in the previous two chapters, where A denotes the wife and B denotes the husband.

In this case, we allow for θ^i to denote the quality of the match realized in individual i's marriage. Thus, θ^i captures the non-pecuniary benefits individual i derives from marriage. The realization of this match quality is assumed to only affect a couple's choice to remain married or divorce in the second period. Specifically, we assume that this match quality is unobserved at the time of marriage, when spouses choose the consumption levels of both types of goods, and thus, does not affect the consumption allocations within marriage. We further assume that these allocations are Pareto efficient but make no specific assumption regarding the mechanism under which such outcome is reached.

Further consider a simple case in which preferences follow a generalized quasi-linear (GQL) form such that $u^i(q^i, Q) = q^i Q$. Then,

$$v^i(q^i, Q) = \begin{cases} q^i Q & \text{if single} \\ q^i Q + \theta^i & \text{if married} \end{cases}$$

Consumption allocations in marriage: Given the preferences described above, at an interior solution, the optimal allocations are a function of (i) total household income $y = y^A + y^B$, and (ii) prices, P. For the public good, at an interior solution, the optimal level of Q is described by

$$Q = \frac{y}{2P}$$

Furthermore, the spouses' aggregate consumption of the private good q satisfies the following

$$q = q^A + q^B = \frac{y}{2}$$

Thus, at an interior solution, spouse i's utility is described by

$$v^i(q^i, Q) = q^i \left(\frac{y}{2P}\right) + \theta^i$$

In this case, the Pareto frontier is

$$\begin{aligned} v^A(q^A, Q) + v^B(q^B, Q) &= (q^A + q^B)\left(\frac{y}{2P}\right) + \theta^A + \theta^B \\ &= \frac{y^2}{4P} + \theta^A + \theta^B \end{aligned}$$

so that we can check that the slope of the Pareto frontier of the married couple is $\frac{dv^A(q^A,Q)}{dv^B(q^B,Q)} = -1$.

Consumption allocations in divorce: For now, suppose that the public good that is jointly consumed in marriage becomes (purely) privately consumed in the case of divorce. Furthermore, let $D^i(y^A, y^B; \Omega)$ capture the way in which the ex-spouses' aggregate income is divided upon divorce by denoting the share of income obtained by ex-spouse i at the time of divorce. In this case, we let Ω denote the state of the legislation governing divorce in the couple's state of residence. Let β denote the share of income the wife receives upon divorce so that $D^A(y^A, y^B; \Omega) = \beta$ and $D^B(y^A, y^B; \Omega) = 1 - \beta$. In this case, each ex-spouse solves the following problem

$$\max_{q^i, Q} (D^i(y^A, y^B; \Omega)y - PQ)Q$$

Then, at an interior solution, we have that the consumption allocations for ex-spouse i are described in the following way

$$Q = \frac{D^i(y^A, y^B; \Omega)y}{2P}; \quad q^i = D^i(y^A, y^B; \Omega)y - P\left(\frac{D^i(y^A, y^B; \Omega)y}{2P}\right) = \frac{D^i(y^A, y^B; \Omega)y}{2}$$

Thus, his/her utility in case of divorce is the following

$$v^i(q^i, Q) = \left(\frac{D^i(y^A, y^B; \Omega)y}{2P}\right)\left(\frac{D^i(y^A, y^B; \Omega)y}{2}\right) = \frac{(D^i(y^A, y^B; \Omega)y)^2}{4P}$$

Then, the Pareto frontier is decreasing and concave, and can be described in the following way upon divorce

$$v^A(q^A, Q) = \frac{\left(y - 2\sqrt{Pv^B(q^B, Q)}\right)^2}{4P}$$

Thus, it is possible to have cases in which the Pareto frontiers in marriage and divorce intersect, thus invalidating the implications of the Becker-Coase theorem. Specifically, Chiappori, Iyigun and Weiss (2015) argue that through the following channels, changes in divorce legislation that allows spouses to divorce unilaterally can ultimately lead to changes in the incidence of divorce:

- Match quality shocks that are realized at the individual level such that it is possible to have scenarios in which $\theta^A > 0 > \theta^B$ or $\theta^B > 0 > \theta^A$.
- Disparities in the allocation of income (wealth) upon divorce. That is, changes in β.

We now focus on a modified version of Counter-example 1 presented in Chiappori, Iyigun and Weiss (2015) as we reverse the gender of the spouse who would decide to divorce under a unilateral regime and whose spouse would veto the divorce under a mutual consent regime.

In an economy in which women tend to accumulate less wealth throughout the marriage, we can expect β in a marriage formed under a separation of property regime to be significantly lower than in one formed under a community property regime (where $\beta = 1/2$ by definition). In this case, we would expect that among couples in which $\theta^B > 0 > \theta^A$, the increase in the incidence of divorce would be larger among couples in which β is relatively large. That is, among such couples who chose a community property regime at the time of marriage or in couples formed under a separation of property regime in which the wife has been able to accumulate enough wealth for herself. In such an economy in which β in a separation of property regime tends to be lower than 1/2, we would expect the increase in the incidence of divorce to be, on average, larger among couples formed under a community property regime than among couples formed in a separation of property regime. In these cases, the husband's ability to compensate his wife to "bribe" her to stay in the marriage is relatively more limited.