Individual Consumption in Collective Households: Identification Using Repeated Observations with an Application to PROGRESA

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Summary

Individual consumption is typically not observed for individuals living with others. Identification of individual resource shares from household expenditure data requires assumptions on preferences that are often difficult to justify. We show that individual resource shares can be identified from repeated observations under the intuitive assumption that individual preferences over a subset of goods are stable over time. Using this method to estimate the effect of PROGRESA on the intrahousehold distribution of household expenditure—and hence on individual consumption, we find unequal gains, with children's individual consumption increasing by 27.8%, fathers' consumption by 17.8%, and mothers' consumption by 5.8%.

Keywords: resource shares, collective household, PROGRESA

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1 Introduction

A key indicator of an individual's welfare is their level of consumption. For individuals who do not live alone, it is equal to the share of household expenditure that each individual consumes—their "resource share"—times household expenditure. While total household expenditure data are widely available, individual consumption is very costly to collect and hence typically not observed. With growing evidence of intrahousehold inequality in health outcomes (Anderson & Ray, 2010; Brown et al., 2019b; World Bank, 2011) and in consumption (Calvi, 2020; Dunbar et al., 2013) in poor countries, it is especially important to go beyond household-level indicators of wellbeing to improve the design of pro-poor policies.

Point identification of individual resource shares from *household* expenditure data is possible within the collective household framework due to Chiappori (1988) and Apps and Rees (1988) but requires assumptions on preferences that are often difficult to justify. The first approach to identify resource shares is to find suitable "distribution factors", i.e., variables assumed to influence the intrahousehold distribution of resources but not preferences (Chiappori & Ekeland, 2009; Dunbar et al., 2019). It is however difficult to find such valid distribution factors in practice—much like it is difficult to find suitable instrumental variables in treatment evaluation problems. The second approach assumes that different individuals or individuals observed in different cohabiting states have similar preferences over at least some goods (Browning et al., 2013; Dunbar et al., 2013).[1] The influential approach due to Dunbar et al. (2013) limits the assumption of similar interpersonal preferences to one private good by individual "type" (women, men, and children). In this approach, each individual type is assumed to have similar—i.e., same-shape—preferences over some private good irrespective of the number of children living in the household, or preferences over some private good are assumed to be similar across men, women, and children.[2]

When expenditure is only observed at one point in time, it may not be possible to identify

[1]Variants of Dunbar et al. (2013) have recently been proposed to address the partial lack of private goods (Penglase, forthcoming), or to obtain identification from assuming that interpersonal differences in preferences are the same across Engel curves for different private goods (Brown et al., 2019a).

[2]See Sokullu and Valente (2021) p.1 for further work on the identification of individual resource shares.

resource shares without relying on preference stability assumptions either between individuals or between different values of valid distribution factors. Repeated cross sectional- and panel data are however increasingly available through nationally representative household surveys as well as through the large body of experimental work carried out in developing countries, which routinely collects data prior to- and after a randomized experiment. A natural extension to Dunbar et al. (2013) is therefore to exploit the availability of additional data points over time—from either a panel or repeated cross-sections—and identify resource shares from the assumption that preferences are similar over short periods of time rather than between different categories of individuals. In this paper, we provide identification results for this alternative approach and apply this method to study the effect of the Mexican conditional cash transfer program PROGRESA on the resource shares of women, men, and children, and the resulting increases in their individual consumption.

Conditional cash transfer (CCT) programs are a popular social policy tool implemented in over 60 countries (Parker & Todd, 2017) which pay social transfers to (typically, women in) poor households conditional on some behaviors such as regular child school attendance and adherence to the recommended child immunization schedule. Evidence of their beneficial effects on children's educational and health outcomes abounds (for PROGRESA, see the excellent recent review by Parker & Todd, 2017). The evidence regarding the effect of these CCTs on intrahousehold allocation of resources, however, is mixed. Out of four recent field experiments in which the gender of the recipient of conditional or unconditional cash transfers was randomized (Akresh et al., 2012; Benhassine et al., 2015; Carneiro et al., 2020; Haushofer & Shapiro, 2016), only one finds an effect of the recipient's gender on outcomes related to expenditures on food, health, or education. Equally mixed results are found in studies estimating the effect of cash transfers targeted at women on self-reported measures of female bargaining power (De Brauw et al., 2014)—including in the particular case of PROGRESA (Adato et al., 2000)—and in studies estimating the effect of cash transfers on domestic violence (Angelucci, 2008; Bobonis et al., 2013; Haushofer & Shapiro, 2016; Hidrobo & Fernald, 2013).[3] Anthropological work in rural Mexico suggests that a CCT such as PROGRESA

[3]See Sokullu and Valente (2021) Sections A.2 and A.3 for a more detailed overview of the literature on the effect of CCTs (including PROGRESA) on measures of female empowerment other than individual resource shares.

may have a different effect on individual consumption compared to other sources of increases in women's relative income. The majority of women interviewed in Haenn (2018) indeed reports that the modern version of PROGRESA (Prospera) provides an excuse for men to share less income with their wives—which may not be compensated by the program's transfer. In addition, local program implementers are reported to pressurize women to spend the transfers on their children, leading Schmook et al. (2018) to conclude that "rather than enable children's social mobility through their mother's empowerment, the program does so *at the expense* of their mother's autonomy" (p.110, emphasis in original). Independently and in parallel to our work, Tommasi and Wolf (2016) and, more recently, Tommasi (2019) both identify the effect of PROGRESA on individual resource shares using Dunbar et al. (2013)'s approach, i.e. by assuming that the preferences of men, women, and children for clothing are similar and that these preferences are similar across different household sizes. Tommasi and Wolf (2016) conclude that PROGRESA tended to reduce women's resource shares, while Tommasi (2019) finds the reverse. All in all, there is no clear evidence that PROGRESA in particular, and CCTs directed at women in general, increase female empowerment, and whether this in turn affects the household's expenditure pattern in favor of women and/or children. We advance the literature by providing estimates of the overall effect of a cash transfer program on the individual consumption of women, men and children without relying on the assumption that different individuals have similar preferences.

We find that the CCT program, while increasing household expenditure by 16.4% on average in our sample, reduced significantly the share of household resources consumed by women, mostly to the benefit of their children. This suggests that the positive effects on child outcomes previously documented resulted not simply from the direct effect of meeting the conditionality requirements and the increase in total household expenditure but also from the redistribution of resources from mothers towards children within the household. Translating these findings in terms of individual consumption gains, we conclude that children benefited from a 27.8% increase in consumption, their fathers from a 17.8% increase, and their mothers from a 5.8% increase.

The model we use allows more than one interpretation for the Pareto weights given to each individual's utility function in the household utility function, and hence it does too for the effect of PROGRESA on resource shares. Under egoistic preferences—i.e., if we assume that individuals only care about their own utility, our results can be interpreted as evidence of a reduction in mothers' bargaining power. But in the more realistic case of caring preferences—such that individuals derive utility not only from their own utility but also from that of other household members, our results are consistent with unchanged or even increasing female bargaining power alongside reduced altruism of fathers towards mothers (as discussed in Section 6.2).

In the Mexican setting analyzed here, divorce is rare and women rely nearly exclusively on their husbands for income, so that the threat to cease cohabitation might not be very credible, as noted by Chiappori and Mazzocco (2017) to be the case in rural societies in many developing countries.[4] This and recent evidence from field experiments randomizing the gender of social transfers recipients in a range of poor countries suggests that social transfers targeting women may only have limited success in redistributing resources towards them.

The rest of the paper is organized as follows. In Section 2, we present the model, before turning to our identification approach in Section 3. In Section 4 we describe the PROGRESA program and dataset, discuss the suitability of the model and identification assumptions to our empirical context and provide details of the estimation. Section 5 presents our estimates. Section 6 compares our results with results obtained under the assumption that preferences are similar across different individuals and discusses the interpretation of our findings when altruism (of the "caring" type) is taken into account. Section 7 concludes.

2 The Model

We use the same collective household model as in Dunbar et al. (2013), which extends Browning et al. (2013) to include children. However, as we will see in Section 3, we depart from the identification strategy used in either paper. For ease of reference, Table 1 gives an overview of the

[4]Before PROGRESA, only 2.22% of adults age 21 to 59 in households eligible for the program were either divorced or separated, and PROGRESA only increased this by 0.32 ppt in two years (Bobonis, 2011). Only 4.2% to 5.1% (depending on survey wave) of mothers work, while between 96.8% and 98.6% of fathers work.

key similarities and differences between ours and Dunbar et al. (2013)'s identification approaches.

We consider households composed of an adult female, her male partner and s children. For now, we consider a single time period and omit time subscripts. We introduce the time dimension in Section 3. We refer to females f, males m and children c as three individual "types". There are K goods with market price vector $p = (p^1, .., p^K)'$. While $z_s = (z_s^1, .., z_s^K)'$ denotes the vector of quantities of goods purchased by a *household* of size s (i.e., comprising two adults and s children), the quantities of goods consumed by *individuals* of type $\ell = f, m, c$ are denoted by vector $x^\ell = (x_\ell^1, ..., x_\ell^K)'$.

A linear "consumption technology" à la Gorman (1976) transforms individual consumptions (x^f, x^m and x^c) into household expenditure (z_s), so that there exists a $K \times K$ matrix A_s such that $A_s(x^f + x^m + sx^c) = A_s x_s = z_s$. The sum of private consumptions can thus be larger than the quantity purchased by the household. For instance, the fuel purchased by the household can be partly used by individuals privately when traveling alone, and partly shared when individuals are traveling together.

As in Dunbar et al. (2013) and Bargain and Donni (2012), we assume that children have their own utility function. This enables us to estimate the resource share consumed by children and allows for the possibility that children have their own preferences.

Assuming that the household's allocation of goods reaches Pareto efficiency and that the household does not suffer from money illusion, the household solves the following problem:

$$\max_{x_f, x_m, x_c, z_s} \tilde{U}_s[U_f(x^f), U_m(x^m), U_c(x^c), p/y] \tag{1}$$

$$\text{such that} \quad z_s = A_s[x^f + x^m + sx^c] \quad \text{and} \quad y = z_s' p$$

where y is total household expenditure on non-durable goods and $U_\ell(x^\ell)$ for $\ell = f, m, c$, is the sub-utility of individual ℓ over non-durable goods in the current period. It captures the utility obtained by individual ℓ from consuming the bundle of goods x^ℓ when living in a household.

$U_c(x^c)$, the children's individual utility, can be interpreted either in the same way as $U_f(x^f)$ and $U_m(x^m)$, or it can be interpreted as the utility that the parents think the child has (Dunbar et al., 2013). And the "Pareto weight" associated with the child's utility function—defined as the derivative of $\tilde{U}_s$ with respect to $U_c(x^c)$—may be interpreted either as a measure of the child's bargaining power, or a measure of the weight which the parents put on the child's utility, or a combination of the two. We return to this point in Section 6.2.

Let $H_s^k(p,y)$ be the demand function for good k in a household with s children. We can write the household's demand functions as (Browning et al., 2013; Dunbar et al., 2013):

$$z_s^k = H_s^k(p,y) = A_s^k[h_{fs}^k(\eta_f y, A_s' p) + h_{ms}^k(\eta_m y, A_s' p) + s h_{cs}^k(\eta_c y/s, A_s' p)] \tag{2}$$

where $h_{\ell s}^k(.)$ denotes the demand for good k of an individual of type ℓ and η_ℓ is the resource share of person ℓ. For example, $h_{fs}^k(\eta_f y, A_s' p)$ denotes the demand an adult female in a household with s children would have chosen if she were to maximize her utility given the prices $A_s' p$ and income $\eta_f y$. Moreover, by definition, the resource shares sum up to 1:

$$\eta_f + \eta_m + \eta_c = 1 \tag{3}$$

Browning et al. (2013) show that there is a one-to-one correspondence between Pareto weights and resource shares in this model. Pareto weights, and hence resource shares, may, in general, depend on preference factors, prices, total expenditure, and distribution factors that affect demand *only* through their effect on the distribution of resources within the household (rather than through preferences or the budget constraint). For clarity, in this and the next sections we omit preference shifters and distribution factors, but the model can be extended to allow each utility function and resource shares to depend on covariates, which we allow to influence the parameters of the model in a very flexible way in our application.

We follow Lewbel and Pendakur (2008), Bargain and Donni (2012) and Dunbar et al. (2013) in assuming that the resource shares η_ℓ do not depend on total household expenditure—although they can depend on variables such as income that are correlated with total household expenditure (Dunbar et al., 2013). In order to test convincingly this assumption, it must not be required for identification. This is the case in Menon et al. (2012), Cherchye et al. (2015) and Bargain et al. (2019), where this assumption is tested empirically and supported by the data.

In the next section, we present our approach to identifying the resource shares η_ℓ, $\ell = f,m,c$ in this model.

3 Identification

3.1 The Identification Problem

While the household's demand function (Equation 2) is rather unyielding, Dunbar et al. (2013) suggest two assumptions which greatly simplify the identification problem: the assumption that the resource shares do not depend on total expenditure, and the assumption that, for each individual whose resource share is to be identified, there exists a private good which is known to the researcher to be consumed only by this individual—i.e., a private assignable good. Formally:

Assumption 1 *Equations (1), (2) and (3) hold at each time period $t = 1,..T, T \geq 3$ with resource shares $\eta_{\ell t}$ that depend on prices but not on total household expenditure.*

Assumption 2 *The demand functions include a private assignable child good, a private assignable female good and a private assignable male good denoted as x_c, x_f and x_m respectively.*

From Assumptions 1 and 2, it follows that the household's demand function for each $n = f,m$ private assignable good and time t, simplifies to:

$$z_t^n = h_{nt}(\eta_{nt}(p_t)y_t, A'p_t) \tag{4}$$

denoting $h_{\ell t}, \ell = f,m,c$ the demand of individual ℓ for the private good assignable to him or her. Similarly, the demand function for the child good is:

$$z_t^c = s_t h_{ct}(\eta_{ct}(p_t)y_t/s_t, A'p_t) \tag{5}$$

where $z_t^\ell, \ell = f,m,c$, s_t and y_t are observed in the data. Under some restrictions on the indirect utility function, the resource shares $\eta_{\ell t}(p_t)$, $\ell = f,m,c$ can then be identified from the Engel curves for the private assignable goods. For the sake of clarity, in Section 3.2 we explain our identification approach in the case of a specific (PIGLOG) functional form for the indirect utility function, which we use in our application. In Sokullu and Valente (2021) Section B, we give the conditions under which the resource shares can be identified nonparametrically (B.1), provide the formal proofs (B.2) and a fully-specified example (B.3), highlighting where our proofs depart from Dunbar et al. (2013).

Like in most of the literature, we use clothing and shoes as private assignable goods in our application. It is the only good for which we have separate expenditure data for male adults, female adults, and children.

3.2 Identification in the PIGLOG Case

In our application, and similar to Dunbar et al. (2013), we assume that consumers have Price-Independent Generalised Logarithmic (PIGLOG) preferences (as in, e.g., Deaton and Muellbauer (1980)'s popular Almost Ideal Demand System). In this simple case, we have the following indirect utility function:

$$V_{\ell t} = \psi_{\ell t}\left[\ln\left(\ln\left(\frac{y_t}{G_{\ell t}(p_t)}\right)\right) + F_{\ell t}(p_t), \tilde{p}_t\right] \tag{6}$$

where G is non-zero, differentiable and homogeneous of degree 1 and F is differentiable and homogeneous of degree zero and $\tilde{p}_t$ is the vector of prices at time t excluding the prices of the three private assignable goods.

Assumption 3 *("Similarity Over Time (SOT)" Assumption) Function F in Equation (6) satisfies $\partial F_{\ell t}(p_t)/\partial p_{\ell t} = \varphi_l(p_t) = \varphi_l(p_{t'}) \neq 0$ for $t \neq t'$. In words, its derivative with respect to the price of good x_ℓ may differ from one individual $\ell = f,m,c$ to the other, but it may not vary over time.*

Assumption 4 *Defining $\rho_{\ell t}$ as $\rho_{\ell t} = \varphi_{\ell t}(A' p_t)\eta_{\ell t}(p_t)$, matrix Λ defined below is nonsingular.*

$$\Lambda = \begin{pmatrix} 1 & 1 & 1 \\ \rho_{f2}/\rho_{f1} & \rho_{m2}/\rho_{m1} & \rho_{c2}/\rho_{c1} \\ \rho_{f3}/\rho_{f1} & \rho_{m3}/\rho_{m1} & \rho_{c3}/\rho_{c1} \end{pmatrix}$$

Assumption 5 $p_{\ell t} = p_\ell$ *for $t = 1,2,3$ and $\ell = f,m,c$.*

Lemma 1 *Under Assumptions 1, 2, 3, 4, 5, if consumers have PIGLOG preferences (as in Equation (6)) then the resource shares for the male adult (η_{mt}), the female adult (η_{ft}) and children (η_{ct}) are identified.*

Applying Roy's identity to Equation (6) (which, omitting $\psi_{\ell t}$'s arguments for conciseness, states that $h_{\ell t}(y_t, p_t) = \frac{-\partial\psi_{\ell t}}{\partial p_{\ell t}} / \frac{\partial\psi_{\ell t}}{\partial y_t}$), we obtain individual demand functions of the form:

$$h_{\ell t}(y_t, p_t) = y_t \delta_{\ell t}(p_t) - \varphi_{\ell t}(p_t) y_t ln(y_t) \tag{7}$$

where $\varphi_{\ell t}(p_t) = \partial F_{\ell t}(p_t)/\partial p_{\ell t}$ and $\delta_{\ell t}(p_t) = \frac{\partial G_{\ell t}(p_t)}{\partial p_{\ell t}} \frac{1}{G_{\ell t}(p_t)} + \varphi_{\ell t}(p_t) ln(G_{\ell t}(p_t))$.

Plugging into Equation (4), dividing by y_t, and multiplying by $p_{\ell t}$, the shares of total household expenditure spent on adult $n = f,m$'s and on children (c) private assignable good are given by:

$$\begin{aligned} \frac{z_{nt} p_{nt}}{y_t} &= p_{nt}\delta_{nt}(A'p_t)\eta_{nt}(p_t) - p_{nt}\varphi_{nt}(A'p_t)\eta_{nt}(p_t) ln(\eta_{nt}(p_t)) \\ &\quad - p_{nt}\varphi_{nt}(A'p_t)\eta_{nt}(p_t) ln(y_t) \end{aligned} \tag{8}$$

$$\begin{aligned} \frac{z_{ct} p_{ct}}{y_t} &= p_{ct}\delta_{ct}(A'p_t)\eta_{ct}(p_t) - p_{ct}\varphi_{ct}(A'p_t)\eta_{ct}(p_t) ln(\eta_{ct}(p_t)/s_t) \\ &\quad - p_{ct}\varphi_{ct}(A'p_t)\eta_{ct}(p_t) ln(y_t) \end{aligned} \tag{9}$$

With data for the private goods budget shares and total household expenditure, we can estimate the intercepts of the above Engel curves and their slopes with respect to $ln(y_t)$, the logarithm of total household expenditure. To pin down the resource shares $\eta_{\ell t}$, we then need to choose which potential sources of variation we can assume away. With three individuals $\ell = f,m,c$, three time periods, and no information on the prices of private goods $p_{\ell t}$, we have 12 equations (9 equations coming from the slopes of 9 Engel curves and 3 adding-up of individual resource shares constraints) in 18 unknowns (9 resource shares and 9 $p_{\ell t}\varphi_{\ell t}$).

The similarity restrictions proposed by Dunbar et al. (2013) to solve this identification problem correspond to imposing, *for the private assignable goods only*, either that: (i) $p_{\ell t}\varphi_{\ell t} = p_t\varphi_t \neq 0$ ("Similarity Across People" or SAP), which brings the number of unknowns down to 12, and/or (ii) $p_{\ell st}\varphi_{\ell st} = p_{\ell t}\varphi_{\ell t} \neq 0$ where s is the number of children ("Similarity Across Household Types" or SAT), which, if there are at least three family sizes, also allows identification (since, denoting S

the number of family size groupings, we have $12S$ equations and $9+9S$ unknowns).

Instead, in Assumption 3 we assume that preferences *for the private assignable goods only* are similar over time for a given individual type (women, men, children) and that there is a degree of price stability over the period of observation (one year in our application), as discussed in detail in Section 3.4. More precisely, in our application, we assume that $p_{\ell t}\varphi_{\ell t} = p_{\ell}\varphi_{\ell} \neq 0$ to identify the model, which results in 12 equations in 12 unknowns. Identification follows from taking the ratios of the derivatives of the Engel curves (Equations 8 and 9) with respect to $ln(y_t)$ and solving for the $\eta_{\ell t}$'s under Assumptions 3 to 5. Importantly, as in Dunbar et al. (2013), we only impose assumptions on the demand for one private assignable good per household member—therefore allowing preferences for any other good to vary over time. In Sokullu and Valente (2021) p.16, we illustrate graphically the intuition for our identification approach ($p_{\ell t}\varphi_{\ell t} = p_{\ell}\varphi_{\ell} \neq 0$) and for Dunbar et al. (2013)'s "Similar Across People" approach ($p_{\ell t}\varphi_{\ell t} = p_t\varphi_t \neq 0$).

From a mechanical point of view, our identifying assumptions are closely related to Dunbar et al. (2013)'s, but they have very different interpretations—and identification proofs differ, as detailed in Sokullu and Valente (2021) Section B.1. When assuming similar preferences between men, women, and children (SAP in Dunbar et al., 2013), one only makes an explicit assumption about current preferences without specifying how preferences may or not have changed over today's adults' life course to arrive at their current preferences. However there only seem to be two ways in which today's adults and children may have similar preferences for the private assignable good: either (i) today's adults started off, as children, with similar preferences to today's children and these preferences did not change as they aged over a very long period of time or (ii) the preferences of today's adults may have changed since they were children but these are now similar to their children's (due to, e.g., current external factors determining everyone's preferences). Either may well be true in some cases, but whether SAP is a reasonable assumption is in general questionable. Likewise, Dunbar et al. (2013)'s assumption that preferences are similar irrespective of the number of children in the household (SAT) requires, for the identification of resource shares, that individual types (women, men, children) in households with a different number of children have similar preferences for the private assignable good but different resource shares—which may or not be reasonable depending on the context.[5] Our approach thus adds a useful alternative to the applied researcher's "toolbox".

3.3 Interpretation with Panel Data vs. Repeated Cross-Sections

Our identification approach has two alternative interpretations depending on the type of data used. With repeated cross-sectional data, Assumption 3 means that preferences for the private assignable goods are similar between individuals of the same type (women, men, children) observed in different time periods. With panel data, Assumption 3 means instead that preferences for these goods are similar between time periods for the *same* individuals of a given type.

In the panel data case, our model formulation assumes that households maximize their utility (as per Equation (1)) in each period separately. This static model is best suited to contexts, such as the one in the empirical part of this paper, where the household's ability to transfer wealth from period to period is very limited, as discussed in Section 4.2. In different contexts, it may be preferable to use repeated cross-sectional data from a representative survey. In the presence of sample attrition, our approach can either be applied to the balanced panel or to the unbalanced sample. If applied to the balanced panel, our preference similarity assumption (Assumption 3) applies to the same individuals over time (as in our application). If applied to the unbalanced sample, to meet Assumption 3 any sample variation over time due to attrition has to leave preferences over the three private goods similar over time—i.e., be independent of $\varphi_{\ell t}$ for $\ell = f, m, c$.

If used with repeated cross-sections, Assumption 4 implies that a different cross-section of individuals of a given type (women, men, children) has similar preferences for the private assignable good but different resource shares. In our panel-data static model application, resource shares may vary over time as required by Assumption 4 due to changes in variables affecting resource shares, even if these changes are predictable. Resource shares could vary over time for the same house-

[5] In particular, SAT implies that the Lindahl price of shared goods—which decreases with the number of household members—only has a pure income effect on the demand for the private assignable goods (Dunbar et al., 2013). SAT is therefore more likely to hold when a smaller share of expenditure is spent on shared goods.

holds for a number of reasons that are compatible with our identification assumptions. Resource shares may vary over time within household due, for instance, to intrahousehold differences in discount factors (Adams et al., 2014), to unexpected changes in relative spousal income when spouses are not fully committed (Mazzocco, 2007), and with the age of household members—which is supported by Calvi (2020) and our own estimates (see Section 5.1). And while we assume that preferences for clothing do not vary between panel waves other than through intercept shifts, substantial variation in the nutritional needs of children and their cognitive ability to take part in household consumption decisions—and hence changes in resource shares—would seem likely even within a 12-month period. Indeed, Gidding et al. (2005) documents annual variation in children's caloric needs from birth to age 13 between 3.4% and 8% and Crawford et al. (2014) shows evidence of substantial cognitive gaps between children born less than 12 months apart.

3.4 Assumptions Regarding Price Variation

In order to identify the resource shares, we assume that $p_{\ell t}\varphi_{\ell t} = p_{\ell}\varphi_{\ell} \neq 0$. Here we make precise what this entails in terms of price stability. If *all* prices are constant over the study period, a sufficient condition for $\varphi_{\ell t} = \partial F_{\ell t}(p_t)/\partial p_{\ell t}$ to be constant over time is that the function $F_{\ell}(.)$ does not vary over the study period. But the assumption that $\partial F_{\ell t}(p_t)/\partial p_{\ell t}$ does not vary over time is also compatible with some price variation—e.g., as long as the prices that vary are those of goods whose prices solely affect demands for the private assignable goods through an income effect.[6] In the widely used Almost Ideal Demand System due to Deaton and Muellbauer (1980), $exp(F_{\ell t}(p_t))$ is a Cobb-Douglas price aggregator (Banks et al., 1997) so that $p_{\ell t}\varphi_{\ell t}$ is independent of prices altogether. In this case, our assumption that $p_{\ell t}\varphi_{\ell t}$ is constant over time is consistent with any price variation.

[6]For instance, using $\tilde{p}_t$ to denote the vector of prices at time t excluding the prices of the three private assignable goods and a subset r of goods, it could be that F_{ℓ} is the sum of two homogeneous of degree zero functions $F_{\ell}(p_{\ell t}, p_r, \tilde{p}_t) = f_{1\ell}(p_{\ell t}, p_r) + f_{2\ell}(\tilde{p}_t)$, where the derivative of the first function depends only on the price(s) of good(s) r (p_r), and the price of this/these good(s) is stable over time. In this case (used in our illustrative example in Sokullu & Valente, 2021, Section B.3), it is assumed that $\tilde{p}_t$ only affects demand for the private assignable goods through the individual's expenditure deflator $G_{\ell t}(p_t)$ and thus through an income effect. Or we could have price variation if the derivative of $F_{\ell}(.)$ depended on some price ratio which does not change over time. Either case is plausible in our application given that only about one year separates the first and last panel waves.

If we observed the prices of the private assignable goods $p_{\ell t}, \ell = f, m, c$, we could dispense with Assumption 5, plug in their values in $p_{\ell t}\varphi_{\ell t}$ and assume that only $\varphi_{\ell t}$ is constant over time. We do not observe the prices of the private assignable goods in our data, since the ENCEL surveys record the total spent on clothing and shoes separately for adult men, adult women, and children, but not the number of items purchased. In our application, we therefore need to assume that the prices of these goods are constant during the period covered by our data, which is plausible given that the three rounds of the panel dataset we use were collected only about six months apart.

In Sokullu and Valente (2021) Section B.3, we provide an example of a household maximization problem which meets all our assumptions, allows for some price variation (as per footnote 6), and results in the Engel curves we estimate.

4 Dataset and Estimation

4.1 Data

PROGRESA was initiated in 1997 and had several components: cash transfers targeted at mothers conditional on regular school- and, for younger children, health clinic attendance, as well as in-kind benefits such as nutritional supplements. Eligibility for the program was means-tested and determined at baseline. Among beneficiaries, the transfers amounted to a large share of household income (16.4% in our sample).

In the early stages, localities were randomized into the program. In order to obtain a causal estimate of the effect of PROGRESA on resource shares, we use the Encuesta de Evaluación de los Hogares (ENCEL) for the three waves during which PROGRESA is being implemented in the treated areas while the control areas are not yet treated, namely: October 1998, May 1999, and November 1999. Transfers to eligible households in treatment villages started in March/April of 1998, and eligible households in treatment areas were included in the program in November/December of 1999. There is no sign of household expenditure "catching up" in control areas relative to treatment areas as of the last survey wave used here—PROGRESA households have a total expenditure 10.5% (21.3%) higher in October 1998 (November 1999) compared to control households. Further tests for anticipation effects find no evidence of such effects (Section 4.2).

Although there are more survey waves than the ones we use, we are limited by data availability as the detailed expenditure data we require are only available from October 1998. We restrict the sample to a balanced panel of eligible households (based on the means-test applied in October 1997) in both treated and control areas, who have a male household head, for whom we have non-missing data for all the variables used in the analysis and whose expenditures data pass minimal validity tests.[7] Table 2 reports summary statistics for all the variables used in the analysis, by treated and control villages.

4.2 Suitability of the Model and Identification Assumptions to the PROGRESA Context

Our model is a collective household model. Attanasio and Lechene (2014) test the restrictions implied by a collective model of household consumption in the ENCEL data, and cannot reject efficiency of household decisions, while De Rock et al. (forthcoming) find that the results of a similar test depend on the time period analyzed. A weakness of both tests, however, is that they require the PROGRESA roll-out and another variable to be valid distribution factors.

The short time span covered by our three data waves (October 1998 to November 1999), and the limited ability of the households in our dataset to borrow and save fits our static model approach (see Section 3.3). Only 2.6% (5.4%) of the households in our dataset report that any of their members borrowed (saved) any money in the previous 6 months. In addition, Attanasio et al. (2012) find no evidence that households in control villages change their behavior before PROGRESA is rolled out to their villages, since their structural model does not fit the data better when they allow control households to anticipate the transfers. This could be due either to control households being liquidity constrained, or to them not being aware that they are about to become eligible for PROGRESA.

[7] More specifically, we drop 10 households who report no food consumption and 49 households with implausibly high values of any of: food expenditures, other 7-day recall, 1-month recall, or 6-month recall expenditures, or expenditures on women's, men's or children's clothing and shoes.

In Sokullu and Valente (2021) Section C, we present a reduced-form test where the possibility that households may not anticipate future transfers due to lack of information rather than due to liquidity constraints is unlikely. We exploit the fact that the educational component of PROGRESA only kicked in when children reached Grade 3, which should have been well-known by parents of school children. While imprecise, our estimates suggest that households in PROGRESA villages only consume expected grant income once they start receiving it. This provides further support for the hypothesis that a static model is a reasonable approximation to the household's maximization problem in our setting.

Our identification strategy accommodates the possibility of price variation as long as it is in line with the discussion in Section 3.4. For instance, PROGRESA may affect prices without restriction as long as any price change is constant between October 1998 and November 1999.[8] Our assumption that φ_ℓ is constant across the three waves is more likely to hold when prices are constant, as otherwise this assumption restricts the functional form of F (see Section 3.4). Food accounts for 79% of total household expenditure in our sample, and the ENCEL surveys we use collected detailed food price information. Based on the figures reported in Tables 2 and 3 in Attanasio et al. (2013), the Stone price index for food is largely unchanged between the first (October 1998) and last (November 1999) panel wave used in our analysis (1.942 to 1.946), suggesting low price variation during the study period.[9]

In Sokullu and Valente (2021) Section E, we further discuss the assumption we make, as others have before us, that resource shares do not vary with total household expenditure—although, as noted by Dunbar et al. (2013), they may vary with variables related to total expenditure such as income from PROGRESA or other sources—, the ways in which our identification approach allows the possibility that PROGRESA changed preferences, discuss our choice of private assignable goods, and provide examples of sources of variation in resource shares between panel waves.

[8]Cunha et al. (2019) test for price changes due to a different rural social transfers program in Mexico, which was delivered either as cash- or in kind transfers ("Programa de Apoyo Alimentario"). They find that the cash transfers had no significant effect on prices relative to the control group.

[9]In Sokullu and Valente (2021) Section B.3, we present a fully specified example of a household maximization problem which meets all our identification assumptions and allows a subset of prices, including food prices, to vary.

4.3 Estimation

The model presented in Section 3.2 results in the following system of estimating equations (obtained from Equations (3), (8), (9), and assuming $p_{\ell t}\varphi_{\ell t} = p_{\ell}\varphi_{\ell} \neq 0$ (Assumptions 3 and 5):

$$
\begin{aligned}
w_{ft} = & \quad \eta_{ft}(a_{ft} + b_f ln(\eta_{ft})) + b_f \eta_{ft} ln(y_t) + \varepsilon_{ft} \\
w_{mt} = & \quad \eta_{mt}(a_{mt} + b_m ln(\eta_{mt})) + b_m \eta_{mt} ln(y_t) + \varepsilon_{mt} \\
w_{ct} = & \quad (1 - \eta_{ft} - \eta_{mt})(a_{ct} + b_c(ln(1 - \eta_{ft} - \eta_{mt}) - ln(s_t))) \\
+ & \quad b_c(1 - \eta_{ft} - \eta_{mt}) ln(y_t) + \varepsilon_{ct}
\end{aligned}
\tag{10}
$$

for $t = 1,2,3$ and where $w_{\ell t}$ denotes the budget share of the private assignable good of individual $\ell = f,m,c$ at time t.[10] As in most of the collective household literature, the error term $\varepsilon_{\ell t}$ captures (multiplicative) measurement error (Browning et al., 2006). In the empirical application, each parameter $a_{\ell t}$, b_{ℓ} and $\eta_{\ell t}$ is modeled as a linear combination of 17 covariates (a constant, the number of children in the household, a PROGRESA village dummy, 6 state indicator variables, education of head and spouse, age of head and spouse in completed years, share of daughters among children, average child age, an indicator variable for whether the household's head is indigenous, and an indicator variable for whether the village was affected by a drought in the six months preceding the survey). Estimating the model given data on the covariates, $w_{\ell t}$ and y_t allows us to estimate one slope with respect to $\ln(y_t)$ per variable included in the model so that we have 9 equations in 9 unknowns for each of these variables.

The inclusion of this rich set of covariates (including household size) allows preferences and resource shares to vary flexibly across households. In addition, this flexible specification can also be thought of as controlling for variation in prices across space and over time to the extent that households with different characteristics (such as state of residence or whether recently hit by a drought) may be exposed to different relative prices.

[10]Estimating the model given data on $w_{\ell t}$ and y_t, we obtain estimates of slopes with respect to $\ln(y_t)$. For three waves, we thus obtain a system of 9 equations (one for each estimated slope) in 9 unknowns (6 resource shares η_{nt}, $n = f,m$ and 3 b_{ℓ}, $\ell = f,m,c$) under the identification assumption that b_{ℓ} is allowed to vary across individuals but not over time.

One issue in the estimation of Engel curves is the question of endogeneity of the total expenditures, y_t. In order to account for this, we instrument it with the log of average laborer's daily wage at the village level as in Attanasio and Lechene (2014) and estimate the system using Hansen (1982)'s Generalized Method of Moments.[11] As shown in Attanasio and Lechene (2014), average laborer's wages in the village is a valid instrument under the assumption that consumption and leisure are separable in the household's utility function. This assumption is implicit in the maximization problem presented in Section 2, since the household utility function does not depend on hours worked, as in Browning et al. (2013), Dunbar et al. (2013), and Attanasio and Lechene (2014).

We report standard errors allowing for arbitrary correlation of the error terms within household as well as, in the case of the coefficient associated with the PROGRESA indicator, standard errors allowing for arbitrary correlation within village, since PROGRESA was randomly allocated or not to the whole village.

5 Results

5.1 Effect of Covariates on Resource Shares

In Table 3, we present our main regression estimates. We first report estimates of the constant coefficient in the linear combinations which compose the resource shares in our estimating equations. The coefficients associated with the constant correspond to the average resource shares for adult females, adult males, and children for the reference household, defined as a household in a control village with all other covariates set at the sample mean (for continuous variables) or mode (for categorical variables). We then show estimates of how these shares vary with the number of children in the family, and estimates of the effect of PROGRESA. In control areas, the average

[11] To be more precise, we use the moment condition $E[\varepsilon|Z] = 0$, where $\varepsilon = (\varepsilon_{ft}, \varepsilon_{mt}, \varepsilon_{ct})'$ for $t = 1,2,3$ and Z is the vector of instruments which contains the exogenous variables in our model and the instrument, average laborer's wages in the village, for $t = 1,2,3$. In order to improve efficiency, we use optimal instruments. Optimal instruments are given by the derivatives of the moment conditions with respect to the parameters up to a scale factor. Following Dunbar et al. (2013), we compute the derivatives using nonlinear seemingly unrelated regression (NLSUR) estimates and then use them in the GMM estimation.

resource share of mothers in the reference household varies between 32.4% to 41.3% of the household expenditure over the three waves of the survey, and is, on average, somewhat larger than that of the father, which varies over time between 27.4% and 41.3%. Average children's shares vary between 24% and 40.2% of total household expenditure, and increase by between 2.9 and 4.9%-point per additional child. Given the non-negligible amount of variation over time, it appears to be empirically important to measure resource shares at different points in time to obtain a fuller picture of intrahousehold resource allocation.

We find that, in the first and last periods, PROGRESA decreased women's shares by 3.8 to 6.9ppt, while children's shares increased by about 3.6 to 4.7ppt due to PROGRESA. These effects on mothers' shares are statistically significant even when allowing for arbitrary correlation in the error terms within village (to reflect the fact that PROGRESA was randomly allocated at the village level), while the effect on children's shares becomes statistically insignificant when standard errors are clustered at the village level. The point estimates on the effect of PROGRESA on men's shares are positive but small in all time periods (between 0.2 and 2.2ppt) and statistically insignificant. The estimated effect of PROGRESA on resource shares during the second time period are all statistically insignificant. F-tests of pairwise equality of (PROGRESA) treatment effects between survey waves lead to the rejection (at the 5% significance level) of the null of equal effects on women's shares in all three pairwise comparisons, and in two out of three pairwise comparisons for children's shares. One possible explanation for these results is that the effect of PROGRESA on resource shares has a seasonal component, but note that we allow the intercept of the resource shares ($\eta_{\ell t}$, $\ell = f, m, c$) to vary by panel wave and thus capture seasonal changes in resource shares that are independent of PROGRESA.

There is clear evidence that PROGRESA reduced mothers' resource shares to the benefit of the other members of the household and the relative magnitude of estimated effects for men and children suggests that the reduction benefited children more than adult men, although F-test results are inconclusive regarding whether children specifically benefited from the reduction in their mothers' shares.[12] Of course, PROGRESA may increase mothers' consumption despite a decrease in their expenditure *share*, and indeed we find that it did (see Section 5.3).

As reported in Table A-3 (Sokullu & Valente, 2021), we also find that older individuals have lower resource shares to the benefit of their spouses, while none of the adults' age influences much children's shares. These findings echo those of Calvi (2020), who finds that adult women's consumption shares decrease with age in India. And similar to both Dunbar et al. (2013) and Calvi (2020), as the proportion of daughters among children increases, mothers' shares tend to increase. Although none of the coefficients associated with the effect of daughters' share on *children*'s shares is individually statistically significant, children's shares tend to decrease when more of the children are daughters. This may stem from a degree of son preference, so that women (have to) give up some of their consumption to the benefit of their sons and/or from sons having more bargaining power than daughters. Children's mean age increases the children's share mostly to the detriment of fathers. We also find that men's shares increase with their level of education, but the other effects of socioeconomic characteristics (parental education and indigenous household head) are inconclusive.

5.2 Robustness Checks

As explained in Section 3.2, we identify the resource shares off the slopes of the Engel curves with respect to the logarithm of total expenditures. It is therefore important to ensure that all these slopes are non-zero. It is the case here. Recall that each b_ℓ, $\ell = f, m, c$ slope in the estimated system of equations (10) is a linear combination of 16 demeaned/demoded variables plus a constant. We find that all 3 coefficients associated with the constant term in each one of these three slopes (one for each type of individual) are statistically significant with p-values below 0.01.

It should be expected from a complex nonlinear model such as the one we estimate that the objective function may exhibit local minima, and results obtained at different local minima may

[12] The test statistic for the null of no joint effect of PROGRESA on women's shares across the three time periods is 13.15 with standard errors clustered at the village level (79.06 with standard errors clustered at the household level), that for children is 2.03 (12.23) and that for men is 0.72 (4.35), for a $\chi^2(3)$ critical value of 7.82 for a 5% significance level.

differ. We therefore carried out extensive checks using 600 different starting values for the parameters of the model and report here the results for which the optimization led to the lowest function value, as in Cherchye et al. (2012) and Dunbar et al. (2019). Reassuringly, although estimates vary across local minima, the general pattern is qualitatively similar across the board (for full details see Sokullu & Valente, 2021, Section D).

5.3 Average Resource Shares and Individual Consumption

We now use our estimates to compute average resource shares across households in treated and control villages, as well as individual poverty rates which take into account the potential unequal distribution of expenditure between household members.

Over the three time periods, the average resource share of women is 3 percentage points (ppt) lower in PROGRESA villages, while children's resources shares go up by 3 ppt (from 29% to 32%). Men's resources shares are unchanged at 34 ppt in both treated and control villages. Reassuringly, out of 24,471 resource share estimates (one for each of three time periods, for three types of individuals in each of 2,719 households), only 6 shares are negative, and none is larger than one, although we do not restrict individual shares to fit a particular range of values in the estimation. With a maximum of 0.75 for any single individual in any given period, the range of the estimated resource shares also appears reasonable.

As a point of international comparison, existing estimates of women's resource shares vary from substantially lower than men in Malawi and India (Calvi, 2020; Dunbar et al., 2013) to somewhat smaller than men in the US (Cherchye et al., 2015; Voena, 2015) and in the UK (Lise & Seitz, 2011), slightly larger for women in Cote d'Ivoire (Bargain et al., 2014), and substantially larger than men's in France and in Canada (Bargain & Donni, 2012; Browning et al., 2013).[13] Importantly, the ENCEL consumption data excludes leisure, as in most related work. It is therefore possible that women, while consuming a slightly larger share of non-durable and semi-durable

[13] More specifically, the range of estimates for women's (men's) shares is 16.6% (43.7%) (for reference households with 3 children under the "Similar Across Types" specification in Dunbar et al., 2013) to 73.4% (26.6%) (for childless couples in Model (c) in Bargain et al., 2014).

household expenditure more than compensate through work—predominantly domestic work given that less than 5% of women in our sample have a job.

Using ENCEL data as in the present paper, but for a different sample, and relying on Dunbar et al. (2013)'s identification assumptions, Tommasi (2019, Table 5, Panel A) estimates that women (men) consume 31% (36%) of household expenditure with PROGRESA compared to 29% (40%) without. Table 5 summarizes similarities and differences between Tommasi (2019)'s analysis and ours. While our results may diverge for reasons other than identification strategy—e.g., due to sample differences—, in Section 6.1 we report estimates differing only from our main analysis in that they use Dunbar et al. (2013)'s identification assumptions and find that this goes some way towards explaining the differences between Tommasi (2019)'s and our conclusions.

Finally, estimates of individual consumption obtained by multiplying individual resource shares by total household expenditure show that, on average, consumption gains in PROGRESA villages are distributed unequally between women, men, and children (see Table A-4 in Sokullu & Valente, 2021). Children benefit most from PROGRESA (by a 27.8% increase), followed by men (17.8%), and then women (5.8%).[14] Unsurprisingly, in this sample of households who qualified as poor enough to be eligible for PROGRESA, poverty rates are high, and the increases in total expenditure achieved by PROGRESA lower poverty rates, but most beneficiaries remain below the poverty line (Sokullu & Valente, 2021, Section F).

6 Discussion

In this section, we first compare estimates of the effect of PROGRESA on individual resource shares obtained when using our identification strategy and when identification relies instead on interpersonal similarity of preferences—holding everything else constant including the sample and variables used in the analysis. We then discuss the interpretation of our results under the realistic

[14] Although PROGRESA households have, on average, an additional 0.16 child enrolled in school, our results are not simply driven by increases in school-related expenditure. The approximate cost of schooling an extra child, including school fees, uniforms, school supplies and other school contributions—even assuming that each enrolled child requires as many as 6 uniforms per year—the total annual cost of schooling an extra 0.16 child is only 72 pesos per year, or 8% of the estimated increase in child consumption.

assumption that parents are altruistic towards their children and towards each other.

6.1 Comparison with Assuming Similar Preferences Between Individuals

Table A-6 in Sokullu and Valente (2021) presents the results obtained when estimating, for each panel wave, a system of three Engel curves (one for each household member) similar to System (10), but where the slopes are assumed to be the same for men, women and children ($b_f = b_m = b_c$) (Dunbar et al. (2013)'s "SAP" assumption) and do not depend on the number of children (Dunbar et al. (2013)'s "SAT" assumption) instead of being assumed constant over time ("SOT"). None of the PROGRESA coefficients obtained with this alternative approach are statistically significant. They are generally of the same sign as our main estimates (Table 3) but are quite a bit smaller in magnitude than ours. These findings go some way towards explaining the difference between our results and Tommasi (2019)'s (see Table 5) to the extent that, when applying SAT & SAP instead of SOT to an otherwise similar sample and model to the one we estimate in Section 5, women do not appear to have significantly lower resource shares in PROGRESA villages. They also account for the difference between our findings and Tommasi and Wolf (2016)'s, who apply SAT & SAP to the first two waves of data included in our analysis and find, as in Table A-6, that PROGRESA has little effect on individual adult resource shares but that, if anything, it decreases women's shares.

The results in Table A-6 show that the estimated effects of PROGRESA on resource shares obtained with SAT & SAP are substantially smaller in magnitude than those obtained with SOT. Next we test whether the overall difference in estimates based on different preference similarity assumptions is statistically significant. We run Hall and Pelletier (2011)'s GMM version of the Vuong test, which assumes that the true model is unknown and tests the null hypothesis that competing models are asymptotically equivalent against the alternative that one of the models is closer to the true data generating process (Vuong, 1989). We find that our model using SOT fits the data better —i.e., has a lower minimand— than each of SAT, SAP, and combined (SAT & SAP) models, but the estimates are too imprecise to reject the null hypothesis with p-values between 0.38 and

0.74.[15]

Finally, we run Wald tests to see whether, assuming that preferences are similar over time, we can reject SAT and/or SAP. We cannot reject SAT—i.e., we cannot reject that the three coefficients associated with the number of children in the three b_ℓ slopes are all equal to zero. But we reject the null that all the coefficients associated with each of the covariates entering b_ℓ are the same for men, women, and children, and thus reject SAP.

6.2 Interpretation in the Context of Caring Preferences

The formulation in maximization problem (1) allows caring preferences such that individuals derive utility from the utility of other household members. Pareto weights may thus depend not just on bargaining power but also (or only) on how much other household members value the individual's utility. To fix ideas, consider the simple case of caring preferences (analogous to Browning et al. (2006)'s two-person household example) such that the total utility of adult $n = f, m$ can be expressed as:

$$W_n = U_n(x^n) + \tau_n^{-n} U_{-n}(x^{-n}) + \tau_n^c U_c(x^c) \tag{11}$$

where $\tau_n^{-n} \in (0,1)$ captures the response of adult n's utility to an increase in the utility of the other adult (denoted $-n$), $\tau_n^c \in (0,1)$ captures the response of adult n's utility to an increase in the utility of children—i.e., how "caring" parents are towards their children. In this example, children are assumed to have no bargaining power and the Pareto weight attached to their utility function comes only from the caring preferences of their parents towards them. Defining μ as the woman's bargaining power, the household's total utility function $\tilde{U}_s$ (omitting $\tilde{U}_s$'s arguments for brevity) is:

$$\begin{aligned} \tilde{U}_s &= \mu W_f(x^f) + (1-\mu) W_m(x^m) \\ &= (\mu + (1-\mu)\tau_m^f) U_f(x^f) + ((1-\mu) + \mu \tau_f^m) U_m(x^m) + (\mu \tau_f^c + (1-\mu)\tau_m^c) U_c(x^c) \end{aligned} \tag{12}$$

The woman's bargaining power μ may increase due to PROGRESA while her resource share decreases if fathers care sufficiently less about mothers' utility due to PROGRESA. Men may plausibly become less altruistic towards women now that PROGRESA pays out large transfers

[15] Our conclusions are unchanged if using instead the test statistic proposed by Schennach and Wilhelm (2017).

to them, as suggested by Schmook et al. (2018) and by evidence that being the recipient of cash transfers increases some forms of intimate partner violence (Angelucci, 2008; Bobonis et al., 2013; Hidrobo & Fernald, 2013). The increase in children's resource shares may stem from an increase in women's (men's) bargaining power combined with mothers (fathers) being more caring towards their children than men (women), and/or from an increase in the weight put by parents on the wellbeing of children. Given the pressure said to be exerted by local implementers for recipients to spend PROGRESA transfers on their children (Schmook et al., 2018), it seems especially likely that the weight *mothers* put on children's utility should increase with PROGRESA.

7 Conclusion

Estimating individual consumption based on the typically available household-level expenditure data requires assumptions on preferences that are often difficult to justify. Previous literature has achieved point-identification of individual resource shares of adult men, women, and children by assuming that different individuals have similar preferences, or by assuming that some variables (distribution factors) affect the distribution of resources within the household but do not influence preferences. We allow preferences to vary between different types of individuals and do not rely on the existence of valid distribution factors. Instead, we propose a new assumption on preferences which is intuitively appealing—restricting the way preferences vary over time within individual types, and which exploits increasingly available repeated cross-sectional and panel data.

Applying our method to estimate the effect of PROGRESA, we find that, on average, the CCT benefited all individuals in eligible households, but that children benefited from the largest increase in consumption (27.8%), followed by their fathers (17.8%) and, to a much lesser extent, their mothers (5.8%), thus suggesting that part of the beneficial effects of PROGRESA on child outcomes is a result of the redistribution of household resources towards children. This and recent evidence from field experiments randomizing the gender of social transfers recipients in a range of poor countries suggests that social transfers targeting women may only have limited success in redistributing resources towards them.

References

Adams, A., Cherchye, L., De Rock, B., & Verriest, E. (2014). Consume now or later? time inconsistency, collective choice, and revealed preference. *American Economic Review*, *104*(12), 4147–83.

Adato, M., De la Briere, B., Mindek, D., & Quisumbing, A. (2000). The impact of progresa on women's status and intrahousehold relations. *Final Report, International Food Policy Research Institute, Washington DC*.

Akresh, R., De Walque, D., & Kazianga, H. (2012). Alternative cash transfer delivery mechanisms: Impacts on routine preventative health clinic visits in burkina faso. *NBER Working Paper No. 17785*.

Anderson, S., & Ray, D. (2010). Missing women: Age and disease. *The Review of Economic Studies*, *77*(4), 1262–1300.

Angelucci, M. (2008). Love on the rocks: Domestic violence and alcohol abuse in rural mexico. *The BE Journal of Economic Analysis & Policy*, *8*(1), 43.

Apps, P. F., & Rees, R. (1988). Taxation and the household. *Journal of Public Economics*, *35*(3), 355–369.

Attanasio, O. P., & Lechene, V. (2014). Efficient responses to targeted cash transfers. *Journal of Political Economy*, *122*(1), 178–222.

Attanasio, O. P., Meghir, C., & Santiago, A. (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.

Attanasio, O., Di Maro, V., Lechene, V., & Phillips, D. (2013). Welfare consequences of food prices increases: Evidence from rural mexico. *Journal of Development Economics*, *104*, 136–151.

Banks, J., Blundell, R., & Lewbel, A. (1997). Quadratic engel curves and consumer demand. *Review of Economics and Statistics*, *79*(4), 527–539.

Bargain, O., & Donni, O. (2012). Expenditure on children: A rothbarth-type method consistent with scale economies and parents' bargaining. *European Economic Review*, *56*(4), 792–813.

Bargain, O., Donni, O., & Kwenda, P. (2014). Intrahousehold distribution and poverty: Evidence from cote d'ivoire. *Journal of Development Economics*, *107*, 262–276.

Bargain, O., Lacroix, G., & Tiberti, L. (2019). Intra-household allocation and individual poverty: An assessment of collective models using direct evidence on sharing. *Mimeo*.

Benhassine, N., Devoto, F., Duflo, E., Dupas, P., & Pouliquen, V. (2015). Turning a shove into a nudge? a "labeled cash transfer" for education. *American Economic Journal: Economic Policy*, *7*(3), 86–125.

Bobonis, G. J. (2011). The impact of conditional cash transfers on marriage and divorce. *Economic Development and Cultural Change*, *59*(2), 281–312.

Bobonis, G. J., González-Brenes, M., & Castro, R. (2013). Public transfers and domestic violence: The roles of private information and spousal control. *American Economic Journal: Economic Policy*, 179–205.

Brown, C., Calvi, R., & Penglase, J. (2019a). Sharing the pie: Undernutrition, intra-household allocation, and poverty.

Brown, C., Ravallion, M., & van de Walle, D. (2019b). Most of africa's nutritionally deprived women and children are not found in poor households. *Review of Economics and Statistics*, *101*(4), 631–644.

Browning, M., Chiappori, P.-A., & Lechene, V. (2006). Collective and unitary models: A clarification. *Review of Economics of the Household*, *4*(1), 5–14.

Browning, M., Chiappori, P.-A., & Lewbel, A. (2013). Estimating Consumption Economies of Scale, Adult Equivalence Scales, and Household Bargaining Power. *Review of Economic Studies*, *80*(4), 1267–1303.

Calvi, R. (2020). Why are older women missing in india? the age profile of bargaining power and poverty. *Journal of Political Economy*, *128*(7), 2453–2501.

Carneiro, P., Lechene, V., Attanasio, O., & Armand, A. (2020). The effect of gender-targeted conditional cash transfers on household expenditures: Evidence from a randomized experiment. *The Economic Journal*.

Cherchye, L., De Rock, B., Lewbel, A., & Vermeulen, F. (2015). Sharing rule identification for general collective consumption models. *Econometrica*, *83*(5), 2001–2041.

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

Chiappori, P.-A., & Ekeland, I. (2009). The microeconomics of efficient group behavior: Identification. *Econometrica*, *77*(3), 763–799.

Chiappori, P.-A. (1988). Rational household labor supply. *Econometrica*, 63–90.

Chiappori, P.-A., & Mazzocco, M. (2017). Static and intertemporal household decisions. *Journal of Economic Literature*, *55*(3), 985–1045.

Crawford, C., Dearden, L., & Greaves, E. (2014). The drivers of month-of-birth differences in children's cognitive and non-cognitive skills. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *177*(4), 829–860.

Cunha, J. M., De Giorgi, G., & Jayachandran, S. (2019). The price effects of cash versus in-kind transfers. *The Review of Economic Studies*, *86*(1), 240–281.

De Brauw, A., Gilligan, D. O., Hoddinott, J., & Roy, S. (2014). The impact of bolsa famılia on women's decision-making power. *World Development*, *59*, 487–504.

De Rock, B., Potoms, T., & Tommasi, D. (forthcoming). *Household responses to cash transfers*.

Deaton, A., & Muellbauer, J. (1980). An almost ideal demand system. *The American Economic Review*, *70*(3), 312–326.

Dunbar, G. R., Lewbel, A., & Pendakur, K. (2013). Children's resources in collective households: Identification, estimation, and an application to child poverty in malawi. *American Economic Review*, *103*(1), 438–71.

Dunbar, G. R., Lewbel, A., & Pendakur, K. (2019). Identification of random resource shares in collective households without preference similarity restrictions. *Journal of Business & Economic Statistics*, *0*(0), 1–20. https://doi.org/10.1080/07350015.2019.1665532

Gidding, S. S., Dennison, B. A., Birch, L. L., Daniels, S. R., Gilman, M. W., Lichtenstein, A. H., Rattay, K. T., Steinberger, J., Stettler, N., & Van Horn, L. (2005). Dietary recommendations for children and adolescents: A guide for practitioners: Consensus statement from the american heart association. *Circulation*, *112*(13), 2061–2075.

Gorman, W. M. (1976). Tricks with utility functions. *Essays in Economic Analysis*, 211–243.

Haenn, N. (2018).

Hall, A. R., & Pelletier, D. (2011). Nonnested testing in models estimated via generalized method of moments. *Econometric Theory*, 443–456.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica*, 1029–1054.

Haushofer, J., & Shapiro, J. (2016). The short-term impact of unconditional cash transfers to the poor: Evidence from kenya. *The Quarterly Journal of Economics*, *131*(4), 1973–2042.

Hidrobo, M., & Fernald, L. (2013). Cash transfers and domestic violence. *Journal of Health Economics*, *32*(1), 304–319.

Lewbel, A., & Pendakur, K. (2008). Estimation of collective household models with engel curves. *Journal of Econometrics*, *147*(2), 350–358.

Lise, J., & Seitz, S. (2011). Consumption inequality and intra-household allocations. *The Review of Economic Studies*, *78*(1), 328–355.

Mazzocco, M. (2007). Household intertemporal behaviour: A collective characterization and a test of commitment. *The Review of Economic Studies*, *74*(3), 857–895.

Menon, M., Pendakur, K., & Perali, F. (2012). On the expenditure-dependence of children's resource shares. *Economics Letters*, *117*(3), 739–742.

Parker, S. W., & Todd, P. E. (2017). Conditional cash transfers: The case of progresa/oportunidades. *Journal of Economic Literature*, *55*(3), 866–915.

Penglase, J. (forthcoming). Consumption inequality among children: Evidence from child fostering in malawi. *The Economic Journal*.

Schennach, S. M., & Wilhelm, D. (2017). A simple parametric model selection test. *Journal of the American Statistical Association*, *112*(520), 1663–1674.

Schmook, B., Haenn, N., & Radel, C. (2018). Empowering women? conditional cash transfers in mexico (M. E. Balen & M. Fotta, Eds.). In M. E. Balen & M. Fotta (Eds.), *Money from the government in latin america: Conditional cash transfer programs and rural lives, 1st edition*. Routledge.

Sokullu, S., & Valente, C. (2021). Supplementary Appendix to "Individual Consumption in Collective Households: Identification Using Repeated Observations with an Application to PROGRESA".

Tommasi, D. (2019). Control of resources, bargaining power and the demand of food: Evidence from progresa. *Journal of Economic Behavior & Organization*, *161*, 265–286.

Tommasi, D., & Wolf, A. (2016). Overcoming weak identification in the estimation of household resource shares.

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

Vuong, Q. H. (1989). Likelihood ratio tests for model selection and non-nested hypotheses. *Econometrica: Journal of the Econometric Society*, 307–333.

World Bank. (2011). *World development report 2012: Gender equality and development*. World Bank Publications.

Table 1: Comparison with Dunbar et al. (2013)

Reference	Dunbar et al. (2013)		Present article	
A.Identification Method	Similar Across People (SAP)	Similar Across Types (SAT)	Similar Over Time (SOT)	
Requires Distribution Factor	No	No	No	
Restricts Preferences for Goods Other than PAG	No	No	No	
Allows for Caring Preferences	Yes	Yes	Yes	
Assumes that Preferences for PAG are similar between:	Men, Women and Children	Men for any N_c Women for any N_c Children for any N_c	Men in any X-section Women in any X-section Children in any X-section	Same men in any wave Same women in any wave Same children in any wave
Data Required	X-section	X-section	Repeated X-section	Panel
B.Application to PROGRESA	Tommasi and Wolf (2016) Tommasi (2019) Section 6.1	Tommasi and Wolf (2016) Tommasi (2019) Section 6.1		Section 5 Section 5 Section 5

PAG stands for "Private Assignable Good". N_c stands for "number of children in the household". "X-section" stands for "cross-section". Caring preferences are a form of altruism such that individuals derive utility from other individuals' utility (see Section 6.2).

Table 2: Summary Statistics

	Control Areas		PROGRESA Areas	
	mean	sd	mean	sd
Time Invariant Variables				
State:				
Guerrero	0.07		0.09	
Hidalgo	0.11		0.18	
Michoacán	0.12		0.13	
Puebla	0.17		0.18	
Querétaro	0.04		0.03	
San Luis Potosi	0.14		0.14	
Veracruz	0.36		0.25	
Father's Education	1.23	0.867	1.34	0.848
Mother's Education	1.20	0.884	1.23	0.868
PROGRESA village	0.00		1.00	
Indigenous Household Head	0.41		0.40	
Time Varying Variables				
Number of Children	3.32	1.481	3.45	1.530
Father's age	33.76	8.302	33.58	7.567
Mother's age	29.47	6.459	29.81	6.687
Daughters' ratio	0.50	0.321	0.48	0.308
Mean Child Age	6.14	2.817	6.12	2.729
Village Suffered Drought	0.65		0.64	
Mean Laborer Daily Wages	30.37	8.301	30.19	8.183
Total HH Expenditure	10752.82	5753.337	12515.67	6773.843
Share Female Cloth. & Shoes	0.01		0.01	
Share Male Cloth. & Shoes	0.01		0.01	
Share Children Cloth. & Shoes	0.02		0.03	
No. of Households	1022		1697	

Source: Encuestas de Evaluación de los Hogares (ENCEL) October 1998, May 1999 and November 1999. Education variables take values 0 for no schooling, 1 for less than completed primary schooling, 2 for completed primary schooling, and 3 for anything above. Age is measured in completed years. All monetary values are expressed in Pesos.

Table 3: Resource Shares in Reference Household, Effect of Household Size and Effect of PROGRESA

	Mothers		Fathers		Children	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Std Err.	Coefficient	Std Err.	Coefficient	Std Err.
October 1998						
Constant	0.413	0.004	0.347	0.005	0.240	0.009
Additional child	-0.012	0.008	-0.017	0.007	0.029	0.015
PROGRESA	-0.038	0.009	0.002	0.009	0.036	0.017
		(0.021)		(0.022)		(0.043)
May 1999						
Constant	0.324	0.008	0.274	0.0123	0.402	0.018
Additional child	-0.013	0.010	-0.020	0.010	0.033	0.019
PROGRESA	0.027	0.013	0.003	0.013	-0.030	0.026
		(0.032)		(0.032)		(0.064)
November 1999						
Constant	0.342	0.004	0.413	0.006	0.246	0.009
Additional child	-0.022	0.016	-0.027	0.015	0.049	0.031
PROGRESA	-0.069	0.010	0.022	0.011	0.047	0.020
		(0.024)		(0.027)		(0.050)

Source: Encuestas de Evaluación de los Hogares (ENCEL) October 1998, May 1999 and November 1999. Sample size: 2719 households. System 10 estimated by the Generalized Method of Moments using the log of average laborer's daily wage at the village level as an instrument for total expenditure, and controlling nonlinearly for a constant, the number of children, a PROGRESA village dummy, 6 state indicator variables, education of head and spouse, age of head and spouse, an indicator for whether the head of the household is indigenous, share of daughters among children, average child age, and an indicator variable for whether the village was affected by a drought in the six months preceding the survey. Standard errors allowing for arbitrary correlation of the error terms within village are reported in parenthesis. The other standard errors in Columns (2), (4) and (6) allow for arbitrary correlation of the error terms within household. The constant can be interpreted as the resource share for a household in control villages in the largest state (Veracruz) with all other characteristics set to their average (for continuous variables) or modal value (for binary variables).

Table 4: Estimated Resource Shares

	(1) Control Areas				(2) PROGRESA Areas			
	mean	sd	min	max	mean	sd	min	max
October 1998								
Women	0.45	0.050	0.22	0.61	0.40	0.050	0.21	0.59
Men	0.36	0.072	0.15	0.55	0.36	0.074	0.13	0.58
Children	0.20	0.087	-0.01	0.45	0.24	0.088	0.00	0.50
May 1999								
Women	0.33	0.089	0.09	0.65	0.35	0.086	-0.00	0.75
Men	0.30	0.072	-0.00	0.55	0.31	0.066	0.04	0.50
Children	0.37	0.116	0.05	0.65	0.34	0.111	0.02	0.71
November 1999								
Women	0.35	0.053	0.18	0.51	0.27	0.052	0.04	0.46
Men	0.35	0.102	0.08	0.62	0.36	0.102	0.05	0.63
Children	0.30	0.116	0.01	0.67	0.36	0.118	0.05	0.91
Average over Time								
Women	0.37	0.048	0.16	0.55	0.34	0.046	0.14	0.51
Men	0.34	0.072	0.10	0.54	0.34	0.070	0.11	0.56
Children	0.29	0.099	0.03	0.56	0.32	0.097	0.05	0.75
One Child	0.097	0.044	0.02	0.40	0.104	0.052	0.04	0.50
N	1022				1697			

Source: Encuestas de Evaluación de los Hogares (ENCEL) October 1998, May 1999 and November 1999. Predicted resource shares based on estimates from system 10 estimated by the Generalized Method of Moments using the log of average laborer's daily wage at the village level as an instrument for total expenditure, and controlling nonlinearly for a constant, the number of children, a PROGRESA village dummy, 6 state indicator variables, education of head and spouse, age of head and spouse, an indicator for whether the head of the household is indigenous, share of daughters among children, average child age, and an indicator variable for whether the village was affected by a drought in the six months preceding the survey.

Table 5: Comparison with Tommasi (2019)

	Present Article	Tommasi (2019)
PAG	Clothing and Footwear	
Demand	PIGLOG	
Data Source	ENCEL	
Sample	balanced panel	pooled data
	October'98, May'99, Nov'99	October'98, May'99, Nov'99, Nov'00
	No restriction on number of children up to 15 years old.	Households with 1 to 3 children only. Households with children older than 12 are excluded.
Identification	SOT	SAP & SAT
Estimation	Set of covariates largely similar despite small differences	
	GMM (total household expenditure assumed endogenous)	NLSUR
Results	PROGRESA decreases the resource share of mothers while increasing that of children. No effect on fathers' resource shares.	PROGRESA increases mothers' and children's resource shares whilst decreasing the fathers' share.
Poverty	PROGRESA reduces poverty for mothers, fathers and children.	PROGRESA reduces poverty only for mothers and children.
What else?	New identification results (Section 3)	Also estimates: (i) the reduced-form effect of PROGRESA on answers to the question "Who should decide how to spend any extra income of the wife?" and "Who decides how much is spent on food?" in the May 1999 wave and (ii) the effect of a larger maternal- than paternal resource share on the household's food budget share using PROGRESA as an instrument.

"PAG" stands for "private assignable good". "SOT" stands for "similar over Time", "SAP" for "Similar across People" and "SAT" for "similar across (household) types".

Appendices

For Online Publication

A Further Related Literature

A.1 Further Resource Shares Literature

For conciseness, in the main text we cover literature providing point estimates of individual resource shares using typical household expenditure data, which is closest to our work. Here we mention other related work.

While total household expenditure data is widely available, individual consumption is very costly to collect and hence typically not observed. There are however a few exceptions, namely Menon et al. (2012), Cherchye et al. (2012), Lise and Yamada (2019), Mercier and Verwimp (2017), and Bargain et al. (2019).

Cherchye et al. (2015) and Cherchye et al. (2017) only make minimal assumptions on preferences, but their revealed preferences method allows the identification of bounds on individual resource shares rather than point identification.

In other related work, Lise and Seitz (2011) assume that utility functions have a particular functional form and point-identify the resource shares of adults in households without children off the adults' labor supply function and the assumption that adults with equal earnings have equal resource shares.

A.2 Effect of CCTs on the Intrahousehold Distribution of Resources

As mentioned in the main text, the evidence regarding the effect of CCTs on intrahousehold allocation of resources is mixed. Here we report further detail on related literature.

Changes in expenditure patterns caused by cash transfer programs targeted at women can often be indirectly rationalized by a change in intrahousehold bargaining in their favor (Angelucci &

Attanasio, 2013; Attanasio et al., 2012; Attanasio & Lechene, 2010; Rubalcava et al., 2009; Schady & Rosero, 2008). But contrary to observational studies which have found that an increase in the share of household income controlled by the mother or grandmother leads to higher investments in child health (e.g: Duflo, 2003; Thomas, 1990), recent field experiments in which the gender of the recipient of conditional or unconditional cash transfers was randomized find mixed evidence of the effect of the recipient's gender on outcomes related to expenditures on food, health, or education (Akresh et al., 2012; Benhassine et al., 2015; Carneiro et al., 2020; Haushofer & Shapiro, 2016). Out of these four recent field experiments in which the gender of the recipient of conditional or unconditional cash transfers was randomized, three studies set in Africa do not find any effect of the recipient's gender on outcomes related to expenditures on food, health, or education (Akresh et al., 2012; Benhassine et al., 2015; Haushofer & Shapiro, 2016), while Carneiro et al. (2020) find that, in Macedonia, food expenditure shares increase by 6.8% when the recipient is female.[16]

Equally mixed results are found in studies estimating the effect of cash transfers targeted at women on self-reported measures of female bargaining power (Adato et al., 2000; De Brauw et al., 2014),[17] and in studies estimating the effect of cash transfers on domestic violence (Angelucci, 2008; Bobonis et al., 2013; Haushofer & Shapiro, 2016; Hidrobo & Fernald, 2013).

A.3 Possible Effects of PROGRESA on Individual Resource Shares

In the main text we explain that, while PROGRESA transfers are targeted at women, the broader societal and PROGRESA-specific context may limit women's ability to benefit in terms of intrahousehold bargaining power and individual consumption. Here we discuss more fully the relevant literature and expand on potential channels for a program such as PROGRESA to impact resource shares in theory.

[16]Out of these four studies, only two estimate the effect of the gender of the recipient on food expenditure (Carneiro et al., 2020; Haushofer & Shapiro, 2016). Haushofer and Shapiro (2016) report a minimum detectable effect size for this outcome of 20% of the control group mean, and therefore lack power to detect an effect of the magnitude found by Carneiro et al. (2020).

[17]Departing from self-reported measures of female empowerment, Almås et al. (2018) find that, when women are the randomly assigned recipient of a CCT in Macedonia, they are less willing to sacrifice total household payoffs from a lab experiment to increase their own payoffs, which can be rationalized within a collective household framework as evidence of increased female bargaining power following the receipt of the CCT.

PROGRESA may have an effect on the intrahousehold distribution of resources through several mechanisms. First, it may increase the bargaining position of women in the household through an increase in their relative income, an improvement in their "threat point" or income outside marriage, as well as, possibly, through compulsory attendance at monthly health and nutrition information sessions also aimed at empowering women. Divorce or separation is however extremely rare in the population of interest (at baseline in 1997, only 2.22% of adults age 21 to 59 in households eligible for PROGRESA were either divorced or separated),[18] and the consumption of women in our study sample is almost exclusively the result of transfers from their husbands or partners, since only 4.2% to 5.1% (depending on survey wave) of mothers work, while between 96.8% and 98.6% of fathers work. These figures suggest that the threat to cease cohabitation might not be very credible—as noted by Chiappori and Mazzocco (2017) to be the case in rural societies in many developing countries—and that, in most households, husbands have the option to reallocate the value of PROGRESA transfers to their own consumption by reducing transfers to their wives. The extent to which women may use PROGRESA transfers as a bargaining chip is therefore not obvious in this context. In recent anthropological work in rural Mexico interviewing spouses separately among 222 couples, 40% of men and 57% of women report that the modern version of PROGRESA (Prospera) provides an excuse for men to share less income with their wives (Schmook et al., 2018). In addition, men may resent the fact that their partners receive cash transfers, and may become less altruistic towards them. Previous work has indeed found evidence that, although conditional and unconditional cash transfers directed at women tend to reduce domestic violence towards them (Ramos, 2016), these transfers can increase some forms of violence on average, and physical violence towards some women. In the case of Mexico's Oportunidades (the expanded version of PROGRESA), Bobonis et al. (2013) find that the program decreased physical violence but increased emotional violence, while Angelucci (2008) reports no change in aggressive behavior on average but an increase for some women.

A number of studies have estimated the effect of cash transfers targeted at women on self-

[18] Bobonis (2011) estimates that the effect of PROGRESA on marital dissolutions was modest in the short run (an increase by 0.32 ppt in two years).

reported measures of female bargaining power, with mixed findings (De Brauw et al., 2014). In the case of PROGRESA, Adato et al. (2000) find that the CCT program had no durable effect on women's self-reported role in household expenditure decisions, despite some influence on *attitudes* towards women's autonomy in spending their own income. More specifically, Adato et al. (2000) find that, when asked: "When the woman has some extra income, do you think that...she should decide how to spend it?/she should give it to her husband?/they should decide together how to spend it?", PROGRESA beneficiaries are more likely to answer that the woman should decide and less likely to answer that she should give the money to her husband, in May 1999 (after just over one year of implementation). In October 1998, after six months of implementation, PROGRESA beneficiaries are instead *less* likely to answer that the wife alone should decide. Turning now to the woman's self-reported role in decisions regarding expenditure on durable goods, house repairs, child clothing, and food, estimates are mixed in the October 1998 wave, and in May 1999 the only statistically significant coefficient indicates a *lower* probability of the wife alone making decisions about food expenditures in PROGRESA villages relative to the chance of a joint couple decision (see Table 15 in Adato et al., 2000).

Self-reported measures of control over household expenditure decisions may however not be very informative. In the panel of households we use in our analysis, the correlation coefficient between a binary indicator for whether the wife (the husband) is "in charge of household expenditure" and its 6-month lag is 0.040 (0.066). If answers to these questions were reasonable proxies for female bargaining power, then one would expect a degree of persistence, which does not appear to be the case here.[19]

If mother and father care differently about the utility of their children, then a change in the bargaining power of one of the parents may also result in changes in children's resource shares. Either or both parents may also increase the weight they put on the child's utility through a labeling effect

[19]We find similarly low correlations (ranging from 0.013 to 0.074) when considering correlations (i) between answers in every possible pair of time periods, (ii) between answering that the woman has either all or shared control over household expenditure, and (iii) between answers to "Who takes the important decisions that affect the members of the household?". For a thorough discussion of the quality of self-reported measures of women's intrahousehold bargaining power, see Donald et al. (2017).

of PROGRESA's transfers (Benhassine et al., 2015; Kooreman, 2000), or through pressure from local program implementers to spend the transfers on children (Schmook et al., 2018). Finally, another channel through which individual resource shares within the household may be affected by an educational CCT such as PROGRESA is by lending children more say in household expenditures through an increase in the share of household income that is attached to their actions. PROGRESA education transfers are conditional on 85% attendance. In addition, one of the PROGRESA rules was that the child becomes ineligible if they repeat a class twice, and therefore it is indirectly conditional on performance at school. Even without assuming that the children have any bargaining power, parents may want to put more weight on the children's wellbeing simply because a CCT introduces a financial return to their ability to attend—and, to a lesser extent, perform reasonably well at school.

B Identification in the General Case and Graphical Intuition

In Section 3.2, we discussed identification for a commonly used functional form for the indirect utility function. In this appendix section, we present our nonparametric identification results (Sections B.1 and B.2), provide an example model which satisfies our identification assumptions (Section B.3), and a graphical illustration of our identification approach in the PIGLOG case (Section B.4).

B.1 Assumptions and Identification Theorem (Theorem 2)

Assumption 6 *Equations (1), (2) and (3) hold at each time period* $t = 1,..T, T \geq 3$ *with resource shares* $\eta_{\ell t}$ *that depend on prices but not on total household expenditure.*

Assumption 7 *The demand functions include a private assignable child good, a private assignable female good and a private assignable male good denoted as* x_c, x_f *and* x_m *respectively.*

Assumption 8 *For* $\ell \in \{f,m,c\}$ *and* $t = 1,...,T, T \geq 3$, *the indirect utility function of person* ℓ *is* *given by:*

$$V_{\ell t} = \psi_{\ell t}\left[\nu_\ell\left(\frac{y_t}{G_{\ell t}(p_t)}\right) + F_{\ell t}(p_t), \tilde{p}_t\right] \tag{13}$$

where

- $\tilde{p}_t$ *denotes the vector of prices at time* t *excluding the prices of the three private assignable goods,* x_c, x_f *and* x_m.

- $G_{\ell t}$ *is nonzero, differentiable and homogenous of degree 1.*

- ν_ℓ *is differentiable and strictly increasing.*

- $F_{\ell t}(p_t)$ *is differentiable, homogenous of degree zero and satisfies* $\partial F_{\ell t}(p_t)/\partial p_{\ell t} = \varphi_l(p_t) = \varphi_l(p_{t'}) \neq 0$ *for* $t \neq t'$. *In words, its derivative with respect to the price of good* x_ℓ *may differ from one individual* $\ell = f, m, c$ *to the other, but it may not vary over time.*

Except for the absence of restrictions on the similarity of $\nu_\ell(.)$ and $\varphi_\ell(.)$ across individuals, this indirect utility function is similar to that used by Dunbar et al. (2013) for expenditure levels below a certain threshold. Since, in both their case and ours, identification comes from households with expenditure levels below this threshold, for simplicity we do not add an unrestricted portion of the indirect utility function for higher expenditure levels. Given that all the households in our sample are eligible for PROGRESA and thus poor, in our application our indirect utility function is consistent with any utility function for higher levels of expenditure than those observed in our data. We do not impose any restrictions on preferences for goods other than the three private assignable goods required (clothing and footwear in our application).

Instead of restricting demand functions for private assignable goods to be similar across types of individuals (male, female, and children) and/or households with a different number of children, we rely on the stability of individual preferences over short periods of time and thus assume that demand functions for assignable goods are similar over time for the same individual type (women, men, and children) in Assumption 8. We are able to do so by using repeated observations. In our case, the key assumptions are that the function $\nu_\ell(.)$ and the value of the derivative of the function

$F_{\ell t}(p_t)$ with respect to the price of ℓ's private assignable good can vary across individuals but do not vary over time.

Using Roy's identity, we can write the demand function for good ℓ at time t as:

$$h_{\ell t}(y_t, p_t) = y_t \frac{\partial G_{\ell t}(p_t)}{\partial p_{\ell t}} \frac{1}{G_{\ell t}(p_t)} - \frac{\varphi_l(p_t)}{\nu'_\ell(y_t/G_{\ell t}(p_t))} \frac{G_{\ell t}(p_t)}{y_t} y_t$$

$$h_{\ell t}(y_t, p_t) = y_t \delta_{\ell t} + g_\ell \left(\frac{y_t}{G_{\ell t}(p_t)}, p_t \right) y_t \tag{14}$$

where

$$\delta_{\ell t} = \frac{\partial G_{\ell t}(p_t)}{\partial p_{\ell t}} \frac{1}{G_{\ell t}(p_t)}$$

and

$$g_\ell \left(\frac{y_t}{G_{\ell t}(p_t)}, p_t \right) = \frac{\varphi_\ell(p_t)}{\nu'_\ell(y_t/G_{\ell t}(p_t))} \frac{G_{\ell t}(p_t)}{y_t}$$

Substituting into Equation (2), it follows that the household demand for good $n = f, m$ at time t is given by:

$$H_{nt}(y_t, p_t) = \delta_{nt}(A' p_t) \eta_{nt}(p_t) y_t + g_n \left(\frac{\eta_{nt}(p_t) y_t}{G_{nt}(p_t)}, A' p_t \right) \eta_{nt}(p_t) y_t \tag{15}$$

And the household demand for good c is given by:

$$H_{ct}(y_t, p_t) = \delta_{ct}(A' p_t) \eta_{ct}(p_t) y_t + g_c \left(\frac{\eta_{ct}(p_t) y_t}{s_t G_{ct}(p_t)}, A' p_t \right) \eta_{ct}(p_t) y_t \tag{16}$$

Having thus defined function $g_\ell(.,.)$ for $\ell = f, m, c$, we can state our final assumptions.

Assumption 9 *$g_\ell(.,.)$ is $r \geq 2$ times differentiable with respect to its first argument. Denote $g_{\ell 1}^{(r)}(.,.)$ the rth derivative of $g_{\ell 1}(.,.)$ with respect to its first argument and let $\tilde{G}_{\ell t}(p_t) = 1\{\ell = f, m\} G_{\ell t}(p_t) + 1\{\ell = c\} s_t G_{\ell t}(p_t)$.*

- *Case 1: $g_\ell(.,.)$ is polynomial in $ln(y)$ such that:*

$$g_\ell \left(\frac{\eta_{\ell t}(p_t) y_t}{\tilde{G}_{\ell t}(p_t)}, A' p_t \right) = \sum_{i=0}^{I} \left(\frac{ln(\eta_{\ell t}(p_t))}{\tilde{G}_{\ell t}(p_t)} + ln(y_t) \right)^i k_{\ell i}$$

- *Case 2: $\lim_{X \to 0} X^\zeta g_{\ell 1}^{(r)}(X,.)/g_{\ell 1}^{(r-1)}(X,.) < \infty$ and the rth derivative of $g_{\ell 1}(X,.)$ is a constant.*

As in Dunbar et al. (2013)'s "Similar Across People" (SAP) identification proof, Assumption 9 imposes a degree of nonlinearity on $g_\ell(.,.)$ which allows us to identify the resource shares ($\eta_{\ell t}$'s). Popular demand systems such as the Almost Ideal Demand System and Quadratic Almost Ideal Demand System fall within *Case 1*, while *Case 2* is more general and encompasses *Case 1*. In *Case 2*, we depart from Dunbar et al. (2013)'s proof in that we rely on the rth derivative of $g_\ell(.,.)$ being constant, and hence we allow $g_\ell(.,.)$ to be $r \geq 2$ differentiable.

Assumption 10 *Consider the two cases given in Assumption 9. Assume that $t = 1,2,3$ and define $\rho_{\ell t}$ as follows:*

- *Under Case 1:* $\rho_{\ell t} = \frac{\partial^I \tilde{H}_{\ell t}(y_t, p_t)}{\partial(ln(y_t))^I} = I! k_{\ell I} \eta_{\ell t}$ *where* $\tilde{H}_{\ell t} = H_{\ell t}/y_t$.
- *Under Case 2:* $\rho_{\ell t} = g_{\ell 1}^{(r)}\left(\frac{y_t}{\lambda_\ell}, A' p_t\right) \frac{\eta_{\ell t}(p_t)}{\lambda_\ell^r}$ *for* $\lambda_\ell \neq 0$.

Then matrix Λ defined below is nonsingular.

$$\Lambda = \begin{pmatrix} 1 & 1 & 1 \\ \rho_{f2}/\rho_{f1} & \rho_{m2}/\rho_{m1} & \rho_{c2}/\rho_{c1} \\ \rho_{f3}/\rho_{f1} & \rho_{m3}/\rho_{m1} & \rho_{c3}/\rho_{c1} \end{pmatrix}$$

Assumption 10—which departs from Dunbar et al. (2013)'s SAP proof—is needed to guarantee that there is a unique solution to the system of equations used for identification. Given data on total household expenditures and the quantities of each private assignable good demanded by the household, under Assumptions 6 to 10 we can identify the resource shares for adult males, females, and children. Theorem 2 below states our result formally. The proof is presented in Appendix B.2.

Theorem 2 *Under Assumptions 6 to 10, the resource shares for adult male (η_{mt}), adult female (η_{ft}) and children (η_{ct}) are identified.*

B.2 Proof of Theorem 2

Recall that, under Assumptions 6, 7 and 8, the household demand for good $n = f, m$ at time t is given by:

$$H_{nt}(y_t, p_t) = \delta_{nt}(A' p_t)\eta_{nt}(p_t)y_t + g_n\left(\frac{\eta_{nt}(p_t)y_t}{G_{nt}(p_t)}, A' p_t\right)\eta_{nt}(p_t)y_t \tag{17}$$

And the household demand for good c is given by:

$$H_{ct}(y_t, p_t) = \delta_{ct}(A'p_t)\eta_{ct}(p_t)y_t + g_c\left(\frac{\eta_{ct}(p_t)y_t}{s_t G_{ct}(p_t)}, A'p_t\right)\eta_{ct}(p_t)y_t \tag{18}$$

Let us define $\tilde{H}_{\ell t} = H_{\ell t}/y_t$:

$$\tilde{H}_{nt}(y_t, p_t) = \delta_{nt}\eta_{nt}(p_t) + g_n\left(\frac{\eta_{\ell t}(p_t)y_t}{G_{nt}(p_t)}, A'p_t\right)\eta_{nt}(p_t)$$

and

$$\tilde{H}_{ct}(y_t, p_t) = \delta_{ct}(A'p_t)\eta_{ct}(p_t) + g_c\left(\frac{\eta_{ct}(p_t)y_t}{s_t G_{ct}(p_t)}, A'p_t\right)\eta_{ct}(p_t)$$

Given data on total household expenditures and quantities of private assignable goods demanded by the household, below we show that the resource shares $\eta_{\ell t}$, $\ell = f, m, c$ are identified under either of the two cases set out in Assumption 9.

Case 1:

Assume that $g_\ell(.,.)$ is a polynomial in $ln(y)$ such that:

$$g_\ell\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}, A'p_t\right) = \sum_{i=0}^{I}\left(\frac{ln(\eta_{\ell t}(p_t))}{\tilde{G}_{\ell t}(p_t)} + ln(y_t)\right)^i k_{\ell i}$$

Define $\rho_{\ell t}$ as:

$$\rho_{\ell t} = \frac{\partial^I \tilde{H}_{\ell t}(y_t, p_t)}{\partial(ln(y_t))^I} = I!k_{\ell I}\eta_{\ell t}$$

Then for $t \neq t'$, we can write:

$$\frac{\rho_{\ell 1}}{\rho_{\ell 2}} = \frac{\eta_{\ell 1}}{\eta_{\ell 2}} \Rightarrow \eta_{\ell 2} = \frac{\rho_{\ell 2}\eta_{\ell 1}}{\rho_{\ell 1}}$$

$$\frac{\rho_{\ell 1}}{\rho_{\ell 3}} = \frac{\eta_{\ell 1}}{\eta_{\ell 3}} \Rightarrow \eta_{\ell 3} = \frac{\rho_{\ell 3}\eta_{\ell 1}}{\rho_{\ell 1}}$$

for $\ell = m, k, c$.

Given that the resource shares add up to one in each period, we can write:

$$\begin{pmatrix} 1 & 1 & 1 \\ \rho_{f2}/\rho_{f1} & \rho_{m2}/\rho_{m1} & \rho_{c2}/\rho_{c1} \\ \rho_{f3}/\rho_{f1} & \rho_{m3}/\rho_{m1} & \rho_{c3}/\rho_{c1} \end{pmatrix} \begin{pmatrix} \eta_{f1} \\ \eta_{m1} \\ \eta_{c1} \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$$

Under Assumption 10, we can invert the matrix Λ and recover the resource shares.

Case 2:

Let us denote $\tilde{h}_{\ell t}^{(r)} = \partial^r \tilde{H}_{\ell t}/\partial y_t^r$, then:

$$\tilde{h}_{\ell t}^{(r)}(y_t, p_t) = g_{\ell 1}^{(r)}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}, A'p_t\right)\frac{\eta_{\ell t}^{r+1}(p_t)}{\tilde{G}_{\ell t}^r(p_t)}$$

Define $\lambda_\ell = \lim_{\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)} \to 0}\left(\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}\right)^\zeta g_{\ell 1}^{(r)}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)},.\right)/g_{\ell 1}^{(r-1)}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)},.\right)\right)^{1/1-\zeta}$, $\zeta \neq 1$

and

$$\kappa_{\ell t}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}\right) = \left(X_t^\zeta \frac{\tilde{h}_{\ell t}^{(r)}(X_t,.)}{\tilde{h}_{\ell t}^{(r-1)}(X_t)}\bigg|_{X_t = \frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}}\right)^{1/1-\zeta}$$

$$\kappa_{\ell t}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}\right) = \frac{\eta_{\ell t}(p_t)}{\tilde{G}_{\ell t}(p_t)}\left(\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}\right)^\zeta \frac{g_{\ell 1}^{(r)}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}, A'p_t\right)}{g_{\ell 1}^{(r-1)}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}, A'p_t\right)}\right)^{1/1-\zeta}$$

Then the following holds:

$$\lim_{\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}\right)\to 0} \kappa_{\ell t}\left(\frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)}\right) = \frac{\eta_{\ell t}(p_t)}{\tilde{G}_{\ell t}(p_t)}\lambda_\ell \quad \Rightarrow \quad \kappa_{\ell t}(0) = \frac{\eta_{\ell t}(p_t)}{\tilde{G}_{\ell t}(p_t)}\lambda_\ell$$

Now let us define $\rho_{\ell t} = \partial \tilde{h}_{\ell t}^{(r)}(X_t, p_t)/(\kappa_{\ell t}(0))^r \Big|_{X_t = \frac{\eta_{\ell t}(p_t)y_t}{\tilde{G}_{\ell t}(p_t)\kappa_{\ell t}(0)}}$, then:

$$\rho_{\ell t} = g_{\ell 1}^{(r)}\left(\frac{y_t}{\lambda_\ell}, A'p_t\right)\frac{\eta_{\ell t}(p_t)}{\lambda_\ell^r}$$

Assuming that $g_{\ell 1}^{(r)}$ is constant over time (Assumption 9), we have $g_{\ell 1}^{(r)}\left(\frac{y_t}{\lambda_\ell}, A'p_t\right) = g_{\ell 1}^{(r)}\left(\frac{y_{t'}}{\lambda_\ell}, A'p_t\right)$, for $t \neq t'$. Given data on the quantities of the private assignable goods demanded by households and total household expenditures, ρ_{ft}, ρ_{mt} and ρ_{ct} are identified for $t = 1, ..., T, T \geq 3$, thus we can solve for $\eta_{\ell t}$, $\ell = f, m, c$.

Using the definition of ρ and the fact that $g_{\ell 1}^{(r)}\left(\frac{y_t}{\lambda_\ell}, A'p_t\right) = g_{\ell 1}^{(r)}\left(\frac{y_{t'}}{\lambda_\ell}, A'p_t\right)$, for $t \neq t'$, we can write:

$$\frac{\rho_{\ell 1}}{\rho_{\ell 2}} = \frac{\eta_{\ell 1}}{\eta_{\ell 2}} \Rightarrow \eta_{\ell 2} = \frac{\rho_{\ell 2}\eta_{\ell 1}}{\rho_{\ell 1}}$$

$$\frac{\rho_{\ell 1}}{\rho_{\ell 3}} = \frac{\eta_{\ell 1}}{\eta_{\ell 3}} \Rightarrow \eta_{\ell 3} = \frac{\rho_{\ell 3}\eta_{\ell 1}}{\rho_{\ell 1}}$$

for $\ell = m, k, c$. Identification follows again from the use of Assumption 10.

B.3 Example

In this subsection, we provide an example of a maximization problem meeting our assumptions in order to fix ideas. We build upon the fully specified model presented in Dunbar et al. (2013)'s Appendix A.4, adopting the same functional forms except for function $F_{\ell t}(p_t)$. More precisely, let the indirect utility function be:

$$V_{\ell t}(p_t, y_t) = \exp\left[\ln\left(\ln\left(\frac{y_t}{G_{\ell t}(p_t)}\right)\right) + \frac{p_{\ell t}}{\prod_{k_1=1}^{K_1}(\tilde{p}_{1k_1})^{(a_{1k_1\ell})}} + \frac{\tilde{p}_{21t}}{\prod_{k_2=2}^{K_2}(\tilde{p}_{2k_2t})^{(a_{2k_2\ell t})}}\right] \tag{19}$$

where the prices of goods other than the three private assignable goods ℓ are split into two sets: $\mathcal{P}_1$ and $\mathcal{P}_2$. $\mathcal{P}_1$ refers to goods indexed by $k_1 = 1$ to K_1 whose price is stable during the period under study (and which needs to be non-empty but can include only one good). $\mathcal{P}_2$ refers to goods indexed by $k_2 = 1$ to K_2 whose price varies freely. This functional form satisfies the assumption that, for $\ell = f,m,c$, $\partial F_{\ell t}(p_t)/\partial p_{\ell t} = \varphi_\ell(p_t) = \varphi_\ell(p_{t'})$ for $t \neq t'$. In addition, to satisfy Assumption 8, we assume that $\varphi_\ell(p_t) \neq 0$ and that $\sum_{k_1=1}^{K_1} a_{1k_1\ell} = 1 = \sum_{k_2=2}^{K_2} a_{2k_2\ell t}$ (to ensure homogeneity of degree 0). Here we have chosen a functional form in which the prices of some goods ($\mathcal{P}_2$) only affect the demand for the private assignable goods through the individual's expenditure deflator $G_{\ell t}(p_t)$ and thus through an income effect. Our identification strategy does not require this to be the case, but this choice allows us to illustrate how our assumptions can accommodate variation in prices and in some private assignable good preference parameters during the period under study.

Taking the log of Equation (19), we obtain:

$$lnV_{\ell t}(p_t, y_t) = \ln\left(\ln\left(\frac{y_t}{G_{\ell t}(p_t)}\right)\right) + exp\left[\ln p_{\ell t} - \sum_{k_1=1}^{K_1} a_{1k_1\ell} \ln \tilde{p}_{1k_1}\right] + exp\left[\ln \tilde{p}_{21t} - \sum_{k_2=2}^{K_2} a_{2k_2\ell t} \ln \tilde{p}_{2k_2t}\right] \tag{20}$$

$$= \ln\left(\ln\left(\frac{y_t}{G_{\ell t}(p_t)}\right)\right) + \frac{exp(\ln p_{\ell t})}{exp\left[\sum_{k_1=1}^{K_1} a_{1k_1\ell} \ln \tilde{p}_{1k_1}\right]} + \frac{exp(\ln \tilde{p}_{21t})}{exp\left[\sum_{k_2=2}^{K_2} a_{2k_2\ell t} \ln \tilde{p}_{2k_2t}\right]}$$

And taking the exponential of Equation (20), we can write:

$$V_{\ell t}(p_t, y_t) = \ln\left(\frac{y_t}{G_{\ell t}(p_t)}\right) \times \exp(p_{\ell t} e^{(-a'_{1\ell} \ln \tilde{P}_1)}) \times \exp(\tilde{p}_{21t} e^{(-a'_{2\ell t} \ln \tilde{P}_{2t})}) \tag{21}$$

where $\tilde{P}_{2t}$ is the vector of prices $\{\tilde{p}_{2k_2t}\}_{k_2=2}^{K_2}$, $\tilde{P}_1$ is the vector of prices $\{\tilde{p}_{1k_1}\}_{k_1=1}^{K_1}$, $a_{1\ell}$ is the vector $\{a_{1k_1\ell}\}_{k_1=1}^{K_1}$ and $a_{2\ell t}$ is the vector $\{a_{2k_2\ell t}\}_{k_2=2}^{K_2}$. Turning now to the maximization problem, we follow Dunbar et al. (2013) in adopting the following general Bergson-Samuelson social welfare function, where Pareto weight functions are denoted $\omega_\ell(p)$, $\ell = f,m,c$ and $\rho_\ell(p)$, $\ell = f,m,c$ are utility transfer or externality functions.[20]

$$\begin{aligned}\tilde{U}[U_f(x^f), U_m(x^m), U_c(x^c), p/y] &= \omega_f(p)[U_f(x^f) + \rho_f(p)] + \omega_m(p)[U_m(x^m) + \rho_m(p)] \\ &\quad + \omega_c(p)[U_c(x^c) + \rho_c(p)]\end{aligned} \tag{22}$$

Assuming that the extent to which a good is shared does not depend on the consumption of other goods, all the off-diagonal elements of matrix A are equal to zero. Denoting A_k the kth

[20] To simplify notation, we omit the household size index s throughout this example.

element along the diagonal of A, and plugging in Equation (22) into the household's maximization problem of Section 2, for a given time period, the household's problem is:

$$\max_{x_f, x_m, x_c, z} \omega(p) + \omega_f(p) U_f(x^f) + \omega_m(p) U_m(x^m) + \omega_c(p) U_c(x^c) \tag{23}$$

$$\text{such that} \quad z_k = A_k[x^{fk} + x^{mk} + s x^{ck}] \quad \text{and} \quad y = z' p$$

where $\omega(p) = \omega_f(p)\rho_f(p) + \omega_m(p)\rho_m(p) + \omega_c(p)\rho_c(p)$.

Problem (23) can be solved by first maximizing the household's indirect utility function with respect to resource shares evaluated at the optimal level of expenditures, and then obtain the optimal level of expenditures by maximizing, for each member ℓ, their individual utility $U(x_\ell)$ subject to their individual budget constraint $\sum_k A_k p_k x^{\ell k} = \eta_\ell y$.

The first step is thus:

$$\max_{\eta_f, \eta_m, \eta_c, z} \omega(p) + \omega_f(p) V_f(A' p, \eta_f y_t) + \omega_m(p) V_m(A' p, \eta_m y_t) + \omega_c(p) V_c(A' p, \eta_c y_t) \tag{24}$$

$$\text{such that} \quad \eta_f + \eta_m + \eta_c = 1$$

Which, given our chosen functional forms, can be rewritten:

$$\max_{\eta_f, \eta_m, \eta_c, z} \omega(p) + \tilde{\omega}_f(p) \ln \frac{\eta_f y}{G_f(A' p)} + \tilde{\omega}_m(p) \ln \frac{\eta_m y}{G_m(A' p)} + \tilde{\omega}_c(p) \ln \frac{\eta_c y}{G_c(A' p)} \tag{25}$$

$$\text{such that} \quad \eta_f + \eta_m + \eta_c = 1$$

where $\tilde{\omega}_\ell(p) = \omega_\ell(p) \exp(A_\ell p_{\ell t} e^{(-a'_{1\ell} \ln \tilde{A}'_1 \tilde{P}_1)}) \times \exp(A_1 \tilde{p}_{21t} e^{(-a'_{2\ell t} \ln \tilde{A}'_{2t} \tilde{P}_{2t})})$

The first order conditions for this maximization problem are:

$$\frac{\tilde{\omega}_f(p)}{\eta_f} = \frac{\tilde{\omega}_m(p)}{\eta_m} = \frac{\tilde{\omega}_c(p)}{\eta_c} \tag{26}$$

And thus the solution to the problem is:

$$\eta_\ell(p) = \frac{\tilde{\omega}_\ell(p)}{\tilde{\omega}_f(p) + \tilde{\omega}_m(p) + \tilde{\omega}_c(p)} \quad \text{for} \quad \ell = f, m, c \tag{27}$$

Note that the optimal resource shares do not depend on y, as per Assumption 6. In addition, Equation (27) can be used to illustrate the different ways in which $\eta_\ell(p)$ can vary from one time period to the next, as required by the assumption that matrix Λ defined in Assumption 10 be nonsingular. The $\tilde{\omega}_\ell(p)$, and thus the resource shares could indeed change over time due to any of the following: a change in the Pareto weight functions, a change in the transfer or externality functions, a change in any price associated with the subset of goods $k_2 = 1$ to K_2, and/or a change in preference parameters $a_{2\ell t}$ associated with these goods. All of these changes may occur over time without violating our assumptions. Assuming that food prices enter function $F_\ell(p_t)$ through $\frac{\tilde{p}_{21t}}{\prod_{k_2=2}^{K_2}(\tilde{p}_{2k_2})^{(a_{2k_2\ell t})}}$, then a likely source of time variation in the $\eta_\ell(p)$ would be one driven by increases in the children's caloric needs and thus a change in a_{2k_2ct}.

The second step of the maximization problem is for individuals to maximize their individual utility subject to their shadow budget constraint. Plugging into Equation (21) the shadow income and shadow prices faced by individual ℓ, and applying Roy's identity to obtain the individual's demand functions:

$$\begin{aligned} h^k_{\ell t}(\eta_{\ell t}y_t, A'p_t) &= (\eta_{\ell t}y_t) \times \frac{1}{G_{\ell t}}\frac{\partial G_{\ell t}(p_t)}{\partial A_k p_{kt}} \\ &\quad -(\eta_{\ell t}y_t)\frac{\ln(\eta_{\ell t}y_t)}{G_{\ell t}}\left[\frac{\frac{\partial \exp(F_{\ell 1}(A_\ell p_\ell, \tilde{A}'_1\tilde{P}_1))\exp(F_{\ell 2t}(\tilde{A}'_{2t}\tilde{P}_{2t}))}{\partial A_k p_{kt}}}{\exp(F_{\ell 1}(A_\ell p_\ell, \tilde{A}'_1\tilde{P}_1))\exp(F_{\ell 2t}(\tilde{A}'_{2t}\tilde{P}_{2t}))}\right] \end{aligned} \tag{28}$$

Where $F_{\ell 1}(A_\ell p_\ell, \tilde{A}'_1\tilde{P}_1) = A_\ell p_{\ell t}e^{(-a'_{1\ell}\ln(\tilde{A}'_1\tilde{P}_1))}$, $F_{\ell 2t}(\tilde{A}'_{2t}\tilde{P}_{2t}) = \tilde{A}_{1t}\tilde{p}_{21t}e^{(-a'_{2\ell t}\ln(\tilde{A}'_{2t}\tilde{P}_{2t}))}$, and $\tilde{A}_1$ and $\tilde{A}_{2t}$ denote the vectors of the diagonal elements of A corresponding to the goods whose prices enter vectors $\tilde{P}_1$ and $\tilde{P}_{2t}$, respectively.

The household level demand for good k is then obtain from Equation (2), which, assuming that all the off-diagonal elements of matrix A are equal to zero as we do in this particular example, can be written:

$$z^k_t = H^k_t(p_t, y_t) = A_k[h^k_{ft}(\eta_{ft}y_t, A'p_t) + h^k_{mt}(\eta_{mt}y_t, A'p_t) + sh^k_{ct}(\eta_{ct}y_t/s, A'p_t)] \tag{29}$$

In the case of private assignable goods, z^k_t simplifies to $h^k_{nt}(\eta_{nt}y_t, A'p_t)$ for $n = f, m$ and to $sh^k_{ct}(\eta_{ct}y_t, A'p_t)$ for the children's private assignable good. In addition, for private assignable goods,

$$\frac{\partial \exp(F_{\ell 1}(A_\ell p_\ell, \tilde{A}_1'\tilde{P}_1))\exp(F_{\ell 2t}(\tilde{A}_{2t}'\tilde{P}_{2t}))}{\partial A_k p_{kt}} = \frac{\partial \exp(F_{\ell 1}(A_\ell p_\ell, \tilde{A}_1'\tilde{P}_1))}{\partial p_\ell}\exp(F_{\ell 2t}(\tilde{A}_{2t}'\tilde{P}_{2t})) \tag{30}$$
$$= \exp(F_{\ell 1}(A_\ell p_\ell, \tilde{A}_1'\tilde{P}_1))\exp(F_{\ell 2t}(\tilde{A}_{2t}'\tilde{P}_{2t}))e^{-a_{\ell 1}'\ln(\tilde{A}_1'\tilde{P}_1)}$$

And substituting the above expression into Equation (28), multiplying by $p_{\ell t}$, and dividing by y_t, we obtain Engel curves of the form presented in Equations (8) and (9). Recalling that our choice of functional form in this example is such that, for the three private assignable goods ($\ell = f,m,c$), $\partial F_{\ell t}(p_t)/\partial p_{\ell t} = \varphi_\ell(p_t) = \varphi_\ell(p_{t'})$ for $t \neq t'$, we obtain the following Engel curves for $n = f,m$ and for the children's private assignable good c:

$$\frac{z_{nt}p_{nt}}{y_t} = p_{nt}\delta_{nt}(A'p_t)\eta_{nt}(p_t) - p_{nt}\varphi_n(A'p_t)\eta_{nt}(p_t)\ln(\eta_{nt}(p_t))$$
$$-p_{nt}\varphi_n(A'p_t)\eta_{nt}(p_t)\ln(y_t) \tag{31}$$

and

$$\frac{z_{ct}p_{ct}}{y_t} = p_{ct}\delta_{ct}(A'p_t)\eta_{ct}(p_t) - p_{ct}\varphi_c(A'p_t)\eta_{ct}(p_t)\ln(\eta_{ct}(p_t)/s_t)$$
$$-p_{ct}\varphi_c(A'p_t)\eta_{ct}(p_t)\ln(y_t) \tag{32}$$

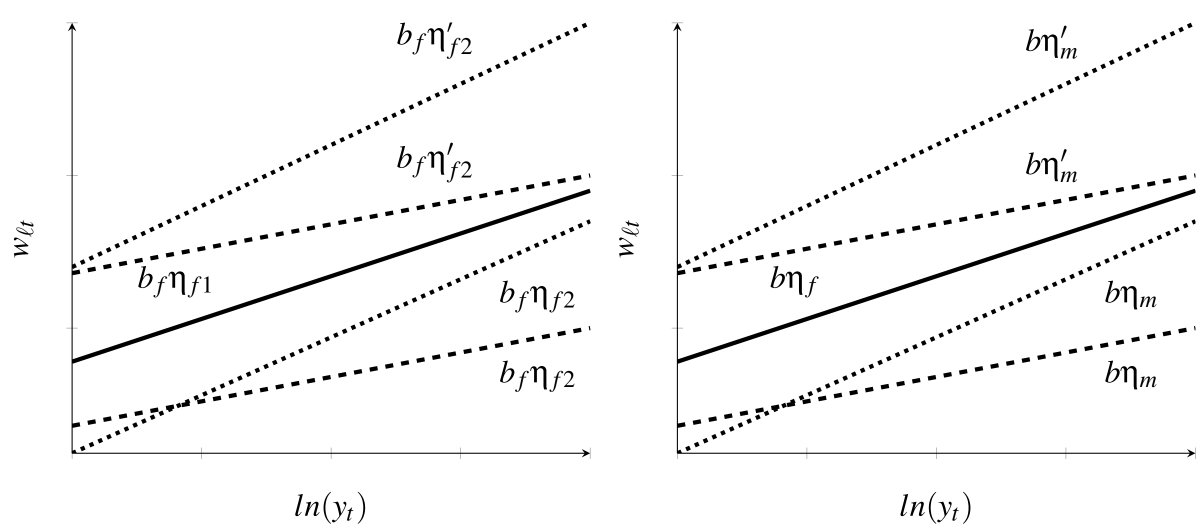
where $\varphi_\ell(A'p_t)$ is time-invariant and the slope of the Engel curve with respect to $\eta_{\ell t}\ln(y_t)$, $p_{\ell t}\varphi_\ell(A'p_t)$, is equal to minus the price elasticity of $\exp(F_{\ell 1}(A_\ell p_\ell, \tilde{A}_1'\tilde{P}_1))\exp(F_{\ell 2t}(\tilde{A}_{2t}'\tilde{P}_{2t}))$ with respect to the price of private assignable good ℓ.

For all the other goods, the expressions are more involved but are also linear in $\ln(y_t)$ and can be written:

$$\frac{z_t p_{kt}}{y_t} = A_k p_{kt}\left[\delta_{ft}^k(A'p_t)\eta_{ft}(p_t) + \delta_{mt}^k(A'p_t)\eta_{mt}(p_t) + s_t\delta_{ct}^k(A'p_t)\eta_{ct}(p_t)\right]$$
$$-A_k p_{kt}\left[\varphi_{ft}(A'p_t)\eta_{ft}(p_t)\ln(\eta_{ft}(p_t)) + \varphi_{mt}(A'p_t)\eta_{mt}(p_t)\ln(\eta_{mt}(p_t))\right.$$
$$\left. + s_t\varphi_{ct}(A'p_t)\eta_{ct}(p_t)\ln(\eta_{ct}(p_t))\right]$$
$$-A_k p_{kt}\left[\varphi_{ft}(A'p_t)\eta_{ft}(p_t) + \varphi_{mt}(A'p_t)\eta_{mt}(p_t) + s_t\varphi_{ct}(A'p_t)\eta_{ct}(p_t)\right]\ln(y_t)$$

B.4 Intuition Behind the Identification Strategy

The figure below illustrates the intuition behind our identification strategy in the PIGLOG case used in our application. On the y-axis, we plot the budget shares associated with private assignable goods—i.e., the share of total household expenditure spent on each of these goods, while the x-axis represents the logarithm of total household expenditure ($ln(y_t)$). Panel (a) shows (in solid line) a hypothetical Engel curve for female clothing in the first wave with respect to $ln(y_t)$ which has slope $b_f\eta_{f1}$, as well as several possible Engel curves in the second time period (with slopes $b_f\eta(')_{f2}$). To avoid cluttering the figure, the Engel curves are labelled simply by their slopes with respect to $ln(y_t)$. Under our assumption that b_f is constant over time, a flatter slope in period 2 than period 1 indicates that the women's resource share is smaller in period 2 than 1. This is the case for both dashed Engel curves, irrespective of whether their intercept is above ($b_f\eta'_{f2}$) or below ($b_f\eta_{f2}$) period 1's intercept—in other words, we do not make any assumptions on how demands for the private assignable goods shift up or down independently of $ln(y_t)$, only on the stability of the slope b_f over time. Conversely, a steeper slope in period 2 than period 1 indicates that the women's resource share is larger in period 2 than 1. This is the case for both dotted Engel curves, irrespective of whether their intercept is above ($b_f\eta'_{f2}$) or below ($b_f\eta_{f2}$) period 1's intercept.



(a) Similar Over Time **(b)** Similar Across People

Panel (b) illustrates the alternative approach used by Dunbar et al. (2013)'s "Similar Across People" identification strategy. In this case, only one period of data is needed, but b is assumed to be the same for female adults, male adults and children. In this case, if the slope of the Engel curve for the men's private assignable good is steeper (flatter) than the women's, then the men's resource share (η_m) is estimated to be larger (smaller) than the women's (η_f). Similar to Panel (a), what matters for identification is the slope of the Engel curve, not the intercept.

C Reduced-Form Test of Anticipation Effects

Here we provide a reduced-form test where the possibility that households may not anticipate future transfers due to lack of information rather than due to liquidity constraints is unlikely.

At the time of the first wave of the dataset used in our analysis, PROGRESA had been rolled out for about six months in treated villages. Households who meet the means test (i.e., those "eligible") and living in treated villages are thus likely to know by then that, from Grade 3 of primary school onwards, the program pays out transfers conditional on regular school attendance. Until Grade 2 of primary school, however, eligible households are only entitled to a cash transfer of 100 pesos per month per household conditional on attending scheduled visits to health centers (Skoufias et al., 2001, p.49).

Households whose eldest child is in Grade 2 or below should therefore only consume up to 1200 pesos more per year unless they are able to increase their current consumption in response to the expected increase in income from the educational grants starting in Grade 3. In order to test if this is the case, we created a "net household consumption" variable equal to total annual household consumption in control villages and to total annual household consumption minus the basic annual 1200 peso transfer in treated villages. We then restricted the sample of households used in the main analysis to those whose eldest child is age 6 and above but is in Grade 2 or below, and thus whose parents should expect to receive educational transfers within a couple of years' time, resulting in a sample of 505 households. Regressing our "net household consumption" variable on household characteristics and a treatment indicator, the coefficient associated with PROGRESA villages is (a statistically insignificant) -157 pesos (Table A-1 Column (1)), suggesting that households consumed nearly all the 1200 pesos cash transfer they were already eligible for, but no more.

Finally, we carried out a difference-in-differences analysis to obtain the difference between treated and control households in the difference in net household consumption between households whose eldest child is in Grade 3 and above and households whose eldest child is in Grade 2 or below and found a (statistically insignificant) difference-in-differences of 391 pesos (Table A-1 Column (2)). While imprecise, these estimates suggest that households in PROGRESA villages only consume expected grant income once they start receiving this income. This provides further support for the hypothesis that, in our setting, a static model is a reasonable approximation to the household's maximization problem.

D Robustness

It should be expected from a complex nonlinear model such as the one we estimate that the objective function may exhibit local minima, and results obtained at different local minima may differ. We therefore carried out extensive checks using 600 different starting values for the parameters of the model and report here the results for which the optimization led to the lowest function value, as in Cherchye et al. (2012) and Dunbar et al. (2019).

More specifically, we first defined sets of possible starting values for each parameter entering the resource shares of each individual and all other parameters to be estimated (i.e., each parameter entering the $\eta_{\ell t}$, $\alpha_{\ell t}$ and b_{ℓ}, $\ell = f, m, c$ and $t = 1, 2, 3$ in estimation system (10)). We then drew 600 random combinations of starting values from these pre-defined sets, estimated the model for each of these random combinations, and selected the set of results with the lowest local minimum. Table A-5 in Appendix G reports the sets of possible values from which we drew the starting values for each parameter. Except for the number of children, for which we chose ranges of starting values consistent with decreasing parental resources shares as the number of children increases, and for adult education, for which we chose ranges of starting values consistent with bargaining power increasing with the level of education, we were agnostic as to the direction in which each variable would influence the intercepts, slopes, and resource shares appearing in the system. In particular, we did not restrict the starting values for the effect of PROGRESA on resource shares to be of any particular sign.

E Further Discussion of the Suitability of the Model and Identification Assumptions to the PROGRESA Context

Another assumption we make, as others have before us, is that resource shares do not vary with total household expenditure, although, as noted by Dunbar et al. (2013), they may vary with variables related to total expenditure such as income from PROGRESA or other sources. In Section 2, we report evidence supportive of this assumption outside Mexico. Turning now to our sample, given that it is restricted to households who met a means-tested eligibility test at baseline (and were therefore eligible for PROGRESA in treated villages), there is less variation in total household expenditure than across the general population, which makes this assumption more realistic. Households in PROGRESA villages experienced substantial increases in income as a result of the program, and we allow resource shares (and all the Engel curve intercepts and slopes) to vary with PROGRESA.

Our identification approach allows the possibility that PROGRESA changed preferences. What we require is that preferences for clothing and footwear, if affected by PROGRESA, be affected in the same way between the October 1998 and November 1999 waves—recalling that these are three 'post-treatment' waves in the sense that PROGRESA villages are treated in all three periods and that the remaining villages act as control villages throughout this period. We do not restrict in any way preferences for other goods and thus do not restrict how PROGRESA may impact on preferences for these goods.

In our application, we use clothing and footwear as private assignable good since, like in many other datasets, it is the only good for which we observe the recipient of the expenditure (female adult, male adult or children). There might be a concern about the semi-durable nature of this good, which we address here. It is difficult to interpret correlations between expenditure in different time periods as genuine dynamic effects since a number of omitted factors may lead to these correlations—just like correlations between expenditure on different goods in the same time period should not be taken as evidence of complementarities in consumption. For completeness, we nonetheless report estimates of these correlations and compare them with correlations observed for a nondurable good—namely food—to assess whether the semi-durability of our private assignable goods leads to a different correlational pattern. We find that it does not. The first three columns of Table A-2 report estimates obtained when regressing the ratio of total household expenditure (or "budget share") spent on each private assignable good on its 6-months lag, while Column (4) reports similar estimates for the household's food budget share. Estimates associated with lagged budget shares are all positive and comparatively small in magnitude, equaling 0.14 for food and varying between 0.03 (male) and 0.08 (children) for the private assignable goods.[21] As another point of reference, the correlation between current male and female clothing and footwear budget shares is much larger, with estimated coefficients between 0.46 (Column (1)) and 0.73 (Column (2)). If we estimate the models in the first three columns of Table A-2 without controlling for the contemporaneous budget shares for the private assignable goods of the other household members to increase comparability with the food budget shares specification, the correlations between current- and lagged private assignable good budget shares are 0.06 (male adult), 0.08 (female adult) and 0.09 (children).[22]

Finally, for identification we require variation in the resource shares between panel waves to ensure point identification (i.e., we require the non-singularity of matrix Λ (Assumption 4)). Such variation may come, for instance, from children having more say in consumption decisions over time as their cognitive ability increases or from changes in children's nutritional needs, as discussed in Section 3.2. The American Heart Association nutritional guidelines imply an average

[21]If instead we estimate the correlation between past and present budget shares *deviations* from the three-period household average using household fixed effects estimation, we obtain negative correlations of similar magnitudes for the private assignable goods and for food (with estimated coefficients ranging from -0.60 to -0.48 for private assignable goods and equal to -0.52 for food), but we do not report these estimates as fixed-effects models with lagged dependent variables are not consistent in short panels such as ours (full results are available on request).

[22]Full results available on request.

annual increase in caloric needs between 3 and 8% between the ages of 1 and 18, varying by gender and—non-linearly—by age (Gidding et al., 2005). It therefore seems reasonable to assume that resource shares increase (non-linearly) with a child's age and do so between panel waves six months apart. We estimate, in each panel wave, how resource shares vary cross-sectionally with the average age of children in the household, and find that children's resource shares increase by between 1 and 2 ppt for an additional average year of age. See also Appendix B.3 for a fully specified example meeting all our model assumptions and in which the changing nutritional needs of children and nothing else alter resource shares over time.

F Poverty Analysis

Unsurprisingly, in this sample of households who qualified as poor enough to be eligible for PROGRESA, poverty rates are high, and the increases in total expenditure achieved by PROGRESA lower poverty rates, but most beneficiaries remain below the poverty line. We use as poverty line the poverty line defined by the Mexican Secretariat of Social Development as the individual expenditure that is necessary to maintain a healthy caloric intake, and which is equivalent to about US$1.6.[23] Assuming that (i) children's needs correspond to 50% of those of an adult, and (ii) resources are distributed proportionally to needs in the household yields a poverty rate estimate of 93% in control villages and 89% in PROGRESA villages (Table A-4 in Appendix G). But when we instead use our estimates of the distribution of resources within the household, the poverty rate of women falls to 77% (in control villages) and 73% (in treated villages), the poverty rate of men falls from 85% in control villages to 74% in treatment villages, while the child poverty rate is higher but also decreasing in treatment villages—from 97% in control villages to 93% in treatment villages. Although children experience the largest percentage increase in expenditure thanks to PROGRESA, there are more children in poorer households and their consumption is still very low, so that the effect on poverty rates is much less impressive.

Caution should prevail when interpreting these poverty rates, as they depend on the ratio used to

[23] Comité técnico para la medición de la pobreza (2002) suggests a poverty line of 15.4 pesos per person per day in rural areas in 2000. This corresponds to about US$1.6 at the December 1999 exchange rate.

compare children's to adult needs. As illustrated in the bottom panel of Table A-4 in Appendix G, children's poverty rates decline when it is assumed that they only need 40% of an adult's consumption. In addition, although the model allows for the consumption of goods to be shared within the household, we do not estimate the extent of economies of scale, which is likely to vary according to household size. In particular, we use the same adult-equivalent poverty threshold irrespective of household size. Given that there are more children in larger households, if taken into account in our poverty rate calculations, economies of scale would tend to benefit children disproportionately.

G Appendix Tables and Figures

Table A-1: Test of Anticipation Effects

	(1) Annual HH Expenditure Net of Food Subsidy	(2) Annual HH Expenditure Net of Food Subsidy
PROGRESA village	-156.85	-322.20
	(537.100)	(512.603)
PROGRESA$\times$ Child eligible for Grade$\geq$3		390.55
		(582.723)
Child eligible for Grade$\geq$3		-1372.35
		(823.922)
Observations	505	2000
R-Squared	0.123	0.112

Standard errors clustered at the village level reported in parentheses. The dependent variable is equal to total household expenditure minus 1200 Pesos per year if in a PROGRESA village (reflecting PROGRESA's food subsidy of 1200 Pesos per year). "Child eligible for Grade$\geq$3" is a binary variable equal to one if the child has *completed* Grade 2 of primary schooling or more, and zero otherwise. For children currently enrolled in school, this implies that they are enrolled in Grade 3. For the few children who are not currently enrolled in school, this implies that, were they to enroll, they would do so in Grade 3. Both regressions include a constant, controls for the number of kids enrolled in school, the number of household assets owned in October 2017, age fixed effects, state fixed effects, age and education level of household head, age and education level of head's spouse, number of children in the household, share of girls among children, average age of the children in the household, whether the head is indigenous, and whether the household reports experiencing a drought in the previous 6 months. Column (1) includes only children aged 6-15 who are not yet in Grade 3 or above, Column (2) includes all children aged 6-15 and above irrespective of grade. Source: Authors' calculations using ENCEL October 1998.

Table A-2: Intertemporal and Interpersonal Budget Shares Correlations

Budget Share Dependent Variable:	(1) Female Clothing and Footwear	(2) Male Clothing and Footwear	(3) Child Clothing and Footwear	(4) Food
Lagged Female C&F Budget Share	0.05			
	(0.014)			
Children C&F Budget Share	0.05	0.05		
	(0.005)	(0.007)		
Male C&F Budget Share	0.46		0.29	
	(0.019)		(0.044)	
Lagged Male C&F Budget Share		0.03		
		(0.012)		
Female C&F Budget Share		0.73	0.53	
		(0.038)	(0.052)	
Lagged Children C&F Budget Share			0.08	
			(0.018)	
Lagged Food Budget Share				0.14
				(0.015)
Observations[a]	5438	5438	5438	5438
No. of Clusters	2719	2719	2719	2719
R-Squared	0.435	0.423	0.205	0.139

[a]With three time periods and a regressor lagged one period, each of the 2,719 households is observed twice (May 1999 and November 1999). Budget shares are defined as the share of total household expenditure spent on the relevant good. Ordinary Least Squares regressions also including a constant and controls for panel wave fixed effects, contemporaneous and lagged log of total household expenditure, number of children in the household, PROGRESA village, age of household head and spouse, average child age, share of girls among children, education level of head and spouse, indigenous head, drought in the past 6 months and state fixed effects. Standard errors clustered at the household level in parentheses.

Table A-3: Effect of Demographic Characteristics on Resource Shares

	Mothers		Fathers		Children	
	Est.	Std Err.	Est.	Std Err.	Est.	Std Err.
October 1998						
Father's Age	0.0002	0.0029	-0.0003	0.0026	0.0002	0.0016
Mother's Age	-0.0052	0.0041	0.0015	0.0036	0.0038	0.0020
Share Daughters	0.0030	0.0100	0.0245	0.0099	-0.0275	0.0199
Children's Age	0.0009	0.0091	-0.0123	0.0079	0.0114	0.0062
Father's Ed.	-0.0117	0.0055	0.0102	0.0055	0.0016	0.0109
Mother's Ed.	-0.0262	0.0057	0.0406	0.0056	-0.0144	0.0108
Indigenous	0.0004	0.0085	0.0168	0.0086	-0.0172	0.0170
May 1999						
Father's Age	0.0080	0.0023	-0.0069	0.0022	-0.0011	0.0022
Mother's Age	-0.0083	0.0036	0.0039	0.0026	0.0044	0.0034
Share Daughters	0.0291	0.0142	-0.0411	0.0142	0.0119	0.0283
Children's Age	-0.0154	0.0106	-0.0043	0.0086	0.0197	0.0096
Father's Ed.	-0.0224	0.0087	0.0078	0.0090	0.0146	0.0171
Mother's Ed.	0.0196	0.0086	0.0006	0.0087	-0.0202	0.0170
Indigenous	0.0130	0.0123	0.0318	0.0123	-0.0448	0.0245
November 1999						
Father's Age	0.0037	0.0023	-0.0045	0.0025	0.0008	0.0021
Mother's Age	-0.0035	0.0033	0.0012	0.0034	0.0023	0.0027
Share Daughters	0.0335	0.0137	-0.0009	0.0138	-0.0326	0.0275
Children's Age	0.0060	0.0067	-0.0156	0.0079	0.0096	0.0066
Father's Ed.	0.0198	0.0070	0.0323	0.0064	-0.0521	0.0129
Mother's Ed.	-0.0199	0.0066	-0.0172	0.0065	0.0371	0.0128
Indigenous	0.0279	0.0104	-0.0226	0.0106	-0.0053	0.0207

Source: Encuestas de Evaluación de los Hogares (ENCEL) October 1998, May 1999 and November 1999. Sample size: 2719 households. System 10 estimated by the Generalized Method of Moments using the log of average laborer's daily wage at the village level as an instrument for total expenditure, and controlling nonlinearly for a constant, the number of children, a PROGRESA village dummy, 6 state indicator variables, education of head and spouse, age of head and spouse, an indicator for whether the head of the household is indigenous, share of daughters among children, average child age, and an indicator variable for whether the village was affected by a drought in the six months preceding the survey. Standard errors allowing for arbitrary correlation of the error terms within household.

Table A-4: Individual Expenditures and Poverty Rates

	(1) Control Villages	(2) PROGRESA Villages
Woman's Expenditure	3963.83	4193.97
Man's Expenditure	3552.96	4186.72
Children's Expenditure	3236.03	4134.97
Child's Expenditure	1034.73	1296.03
Poverty Rates Assuming Children Needs Equivalent to 0.5 Adult		
Equal Shares	0.93	0.89
Women	0.77	0.73
Men	0.85	0.74
Children	0.97	0.93
Poverty Rates Assuming Children Needs Equivalent to 0.4 Adult		
Equal Shares	0.90	0.84
Women	0.77	0.73
Men	0.85	0.74
Children	0.93	0.88
N	1022	1697

Source: Encuestas de Evaluación de los Hogares (ENCEL) October 1998, May 1999 and November 1999. Predicted individual expenditure obtained from multiplying total household expenditure by the individual's predicted resource share based on estimates from system 10. System 10 was estimated by the Generalized Method of Moments using the log of average laborer's daily wage at the village level as an instrument for total expenditure, and controlling nonlinearly for a constant, the number of children, a PROGRESA village dummy, 6 state indicator variables, education of head and spouse, age of head and spouse, an indicator for whether the head of the household is indigenous, share of daughters among children, average child age, and an indicator variable for whether the village was affected by a drought in the six months preceding the survey.

Table A-5: Intervals for Starting Values

	η_f	η_m	α $(\alpha_f, \alpha_m, \alpha_c)$	β $(\beta_f, \beta_m, \beta_c)$
Constant	$[0.3, 0.4]$	$[0.3, 0.4]$	$[-0.005, 0.005]$	$[-0.05, 0.05]$
Additional Child	$[-0.05, 0]$	$[-0.05, 0]$	$[-0.005, 0]^*$	$[-0.05, 0.05]$
PROGRESA	$[-0.05, 0.05]$	$[-0.05, 0.05]$	$[-0.005, 0.005]$	$[-0.05, 0.05]$
Father's education	$[-0.05, 0]$	$[0, 0.05]$	$[-0.005, 0.005]$	$[-0.05, 0.05]$
Mother's education	$[0, 0.05]$	$[-0.05, 0]$	$[-0.005, 0.005]$	$[-0.05, 0.05]$
Father's age	$[-0.005, 0.005]$	$[-0.005, 0.005]$	$[-0.0005, 0.0005]$	$[-0.005, 0.005]$
Mother's age	$[-0.005, 0.005]$	$[-0.005, 0.005]$	$[-0.0005, 0.0005]$	$[-0.005, 0.005]$
Proportion Daughters	$[-0.05, 0.05]$	$[-0.05, 0.05]$	$[-0.005, 0.005]$	$[-0.05, 0.05]$
Children's Mean Age	$[-0.005, 0.005]$	$[-0.005, 0.005]$	$[-0.0005, 0.0005]$	$[-0.005, 0.005]$
Indigenous head	$[-0.05, 0.05]$	$[-0.05, 0.05]$	$[-0.005, 0.005]$	$[-0.05, 0.05]$
Drought	$[-0.05, 0.05]$	$[-0.05, 0.05]$	$[-0.005, 0]$	$[-0.05, 0.05]$
State Indicators**	$[-0.05, 0.05]$	$[-0.05, 0.05]$	$[-0.005, 0.005]$	$[-0.05, 0.05]$

*For α_c we set the interval to $[0, 0.005]$. **We use the same interval for all state indicator variables. We use 0.05 as absolute value for the bounds in the case of categorical variables and 0.005 in the case of more continuous variables.

Table A-6: Effect of PROGRESA on Resource Shares Assuming Stability of Preferences Across Individuals

	Mothers		Fathers		Children	
	(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient	Std Err.	Coefficient	Std Err.	Coefficient	Std Err.
October 1998						
PROGRESA	-0.0248	0.0153	-0.0033	0.0165	0.0282	0.0318
		(0.0376)		(0.0406)		(0.0781)
May 1999						
PROGRESA	0.0113	0.0146	0.0190	0.0170	-0.0304	0.0257
		(0.0358)		(0.0417)		(0.0630)
November 1999						
PROGRESA	-0.0093	0.0126	-0.0107	0.0157	0.0200	0.0254
		(0.0322)		(0.0520)		(0.0745)

Source: Encuestas de Evaluación de los Hogares (ENCEL) October 1998, May 1999 and November 1999. Sample size: 2719 households. Standard errors allowing for arbitrary correlation of the error terms within village are reported in parenthesis. The other standard errors in Columns (2), (4) and (6) allow for arbitrary correlation of the error terms within household. Contrary to the other results tables, here we do not assume that preferences are stable over time. Instead, we assume that preferences for the private assignable goods are similar across individual types (woman, man, children) and similar across household sizes, as in Dunbar et al. (2013), and estimate the model separately for each panel wave.

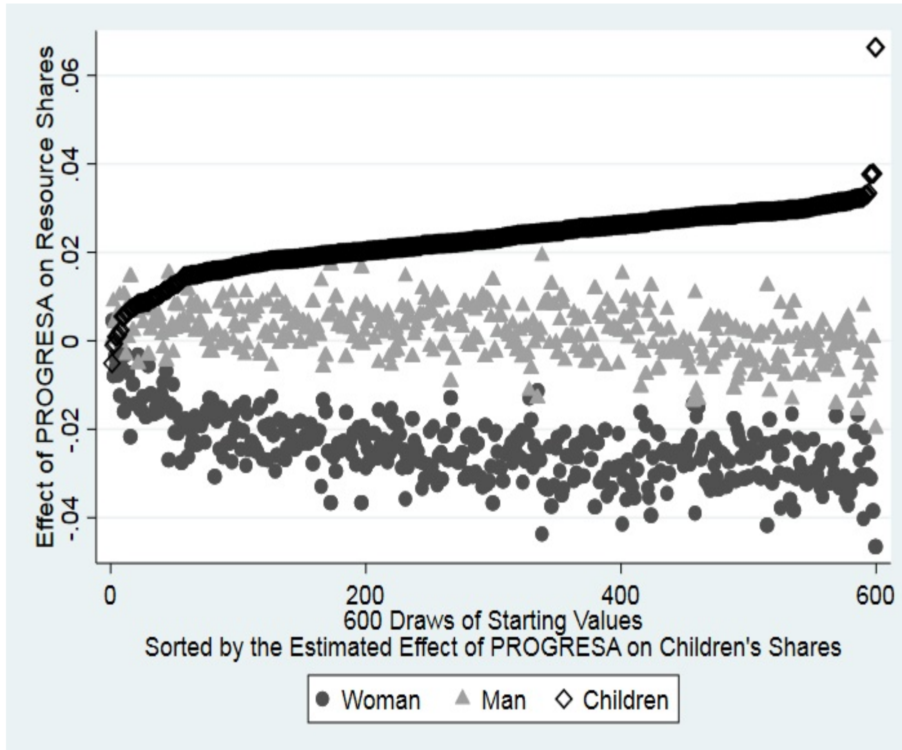


Figure 1:

Note: For each of the 600 randomly drawn set of starting values from the ranges presented in Table A-5, we take the average, across the three survey waves, of: the coefficient associated with PROGRESA villages in the resource shares of the woman ($\eta_f^{treated}$), the coefficient associated with PROGRESA villages in the resource shares of the man ($\eta_m^{treated}$), and the coefficient associated with PROGRESA villages in the resource shares of their children ($\eta_k^{treated}$). We then sort the 600 sets of results according to the value of $\eta_k^{treated}$ and plot $\eta_f^{treated}$, $\eta_m^{treated}$, and $\eta_k^{treated}$ for each draw thus ordered.

References

Adato, M., De la Briere, B., Mindek, D., & Quisumbing, A. (2000). The impact of progresa on women's status and intrahousehold relations. *Final Report, International Food Policy Research Institute, Washington DC*.

Akresh, R., De Walque, D., & Kazianga, H. (2012). Alternative cash transfer delivery mechanisms: Impacts on routine preventative health clinic visits in burkina faso. *NBER Working Paper No. 17785*.

Almås, I., Armand, A., Attanasio, O., & Carneiro, P. (2018). Measuring and changing control: Women's empowerment and targeted transfers. *The Economic Journal*, *128*(612), F609–F639.

Angelucci, M. (2008). Love on the rocks: Domestic violence and alcohol abuse in rural mexico. *The BE Journal of Economic Analysis & Policy*, *8*(1), 43.

Angelucci, M., & Attanasio, O. (2013). The demand for food of poor urban mexican households: Understanding policy impacts using structural models. *American Economic Journal: Economic Policy*, *5*(1), 146–205.

Attanasio, O., Battistin, E., & Mesnard, A. (2012). Food and cash transfers: Evidence from colombia. *The Economic Journal*, *122*(559), 92–124. https://doi.org/10.1111/j.1468-0297.2011.02473.x

Attanasio, O., & Lechene, V. (2010). Conditional cash transfers, women and the demand for food. *IFS working paper W10/17*.

Bargain, O., Lacroix, G., & Tiberti, L. (2019). Intra-household allocation and individual poverty: An assessment of collective models using direct evidence on sharing. *Mimeo*.

Benhassine, N., Devoto, F., Duflo, E., Dupas, P., & Pouliquen, V. (2015). Turning a shove into a nudge? a "labeled cash transfer" for education. *American Economic Journal: Economic Policy*, *7*(3), 86–125.

Bobonis, G. J. (2011). The impact of conditional cash transfers on marriage and divorce. *Economic Development and Cultural Change*, *59*(2), 281–312.

Bobonis, G. J., González-Brenes, M., & Castro, R. (2013). Public transfers and domestic violence: The roles of private information and spousal control. *American Economic Journal: Economic Policy*, 179–205.

Carneiro, P., Lechene, V., Attanasio, O., & Armand, A. (2020). The effect of gender-targeted conditional cash transfers on household expenditures: Evidence from a randomized experiment. *The Economic Journal*.

Cherchye, L., De Rock, B., Lewbel, A., & Vermeulen, F. (2015). Sharing rule identification for general collective consumption models. *Econometrica*, *83*(5), 2001–2041.

Cherchye, L., De Rock, B., & Vermeulen, F. (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, L., Demuynck, T., De Rock, B., & Vermeulen, F. (2017). Consumption when the marriage is stable. *American Economic Review*, *107*(6), 1507–34.

Chiappori, P.-A., & Mazzocco, M. (2017). Static and intertemporal household decisions. *Journal of Economic Literature*, *55*(3), 985–1045.

Comité técnico para la medición de la pobreza. (2002). Medición de la pobreza: Variantes metodológicas y estimación preliminar. *México, Secretarıa de Desarrollo Social, julio (Serie: Documentos de Investigación, núm. 1)*.

De Brauw, A., Gilligan, D. O., Hoddinott, J., & Roy, S. (2014). The impact of bolsa famılia on women's decision-making power. *World Development*, *59*, 487–504.

Donald, A., Koolwal, G., Annan, J., Falb, K., & Goldstein, M. (2017). Measuring women's agency. *Policy Research Working Paper no. 8148*.

Duflo, E. (2003). Grandmothers and granddaughters: Old-age pensions and intrahousehold allocation in south africa. *The World Bank Economic Review*, *17*(1), 1–25.

Dunbar, G. R., Lewbel, A., & Pendakur, K. (2013). Children's resources in collective households: Identification, estimation, and an application to child poverty in malawi. *American Economic Review*, *103*(1), 438–71.

Dunbar, G. R., Lewbel, A., & Pendakur, K. (2019). Identification of random resource shares in collective households without preference similarity restrictions. *Journal of Business & Economic Statistics*, *0*(0), 1–20. https://doi.org/10.1080/07350015.2019.1665532

Gidding, S. S., Dennison, B. A., Birch, L. L., Daniels, S. R., Gilman, M. W., Lichtenstein, A. H., Rattay, K. T., Steinberger, J., Stettler, N., & Van Horn, L. (2005).

Dietary recommendations for children and adolescents: A guide for practitioners: Consensus statement from the american heart association. *Circulation*, *112*(13), 2061–2075.

Haushofer, J., & Shapiro, J. (2016). The short-term impact of unconditional cash transfers to the poor: Evidence from kenya. *The Quarterly Journal of Economics*, *131*(4), 1973–2042.

Hidrobo, M., & Fernald, L. (2013). Cash transfers and domestic violence. *Journal of Health Economics*, *32*(1), 304–319.

Kooreman, P. (2000). The labeling effect of a child benefit system. *American Economic Review*, *90*(3), 571–583.

Lise, J., & Seitz, S. (2011). Consumption inequality and intra-household allocations. *The Review of Economic Studies*, *78*(1), 328–355.

Lise, J., & Yamada, K. (2019). *The Review of Economic Studies*, *86*(5), 2184–2219.

Menon, M., Pendakur, K., & Perali, F. (2012). On the expenditure-dependence of children's resource shares. *Economics Letters*, *117*(3), 739–742.

Mercier, M., & Verwimp, P. (2017). Are we counting all the poor?: Accounting for the intra-household allocation of consumption in burundi. *Journal of Demographic Economics*, *83*(3), 307–327.

Ramos, A. (2016). Household decision making with violence: Implications for conditional cash transfer programs.

Rubalcava, L., Teruel, G., & Thomas, D. (2009). Investments, time preferences, and public transfers paid to women. *Economic Development and Cultural Change*, *57*(3), 507–538.

Schady, N., & Rosero, J. (2008). Are Cash Transfers Made to Women Spent Like Other Sources of Income? *Economics Letters*, *101*(3), 246–248. https://ideas.repec.org/a/eee/ecolet/v101y2008i3p246-248.html

Schmook, B., Haenn, N., & Radel, C. (2018). Empowering women? conditional cash transfers in mexico (M. E. Balen & M. Fotta, Eds.). In M. E. Balen & M. Fotta (Eds.), *Money from the government in latin america: Conditional cash transfer programs and rural lives, 1st edition*. Routledge.

Skoufias, E., Parker, S. W., Behrman, J. R., & Pessino, C. (2001). Conditional cash transfers and their impact on child work and schooling: Evidence from the progresa program in mexico. *Economia*, *2*(1), 45–96.

Thomas, D. (1990). Intra-household resource allocation: An inferential approach. *Journal of Human Resources*, 635–664.