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Edwin van Gameren
El Colegio de México

Durfari Velandia Naranjo
Fundación Santa Fe de Bogotá

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The simultaneous decision of labor force participation, informal long-term care and childcare services in Mexico

Edwin van Gameren [a]

Durfari Velandia Naranjo [a,b]

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Abstract

Labor force participation and caregiving activities are competing for the scarce time of many people, especially for the generation in which care for aging parents comes together with care for (grand)children. In Mexico, a tradition of multigenerational families together with a limited availability of affordable (public or private) long-term and childcare facilities, imply a large dependence on informal care. We analyze which factors determine the women's decisions to participate in the labor market, to provide care to the elderly, and to provide care to the (grand)children, using data from the Mexican Health and Aging Study, a survey among people aged 50 and over, through the estimation of a three equation reduced form seemingly unrelated regression (SUR) model. The results suggest that care needs are the driving force behind the caregiving activities, much more than the economic situation. Traditional roles appear to be relevant, also in the labor force participation decision, in which women who had a close connection with the labor market during their earlier years are more likely to work. With simulations of demographic changes in Mexico, such as an aging population, we illustrate potential effects for future caregiving and participation rates.

Keywords: Labor force participation; Long-term care; Childcare; Informal care; Seemingly unrelated regression model
JEL-codes: J13, J14, J22, D13

a El Colegio de México, Centro de Estudios Económicos. Mexico City, Mexico.
b Fundación Santa Fe de Bogotá, Centro de Estudios e Investigación en Salud. Bogotá, Colombia.

Correspondence address: Camino al Ajusco 20, Pedregal de Santa Teresa, México, D.F., C.P. 10740, México. Tel.: +.52.55.54493000 ext. 4087. Email: egameren@colmex.mx, durfari@gmail.com.

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1 Introduction

Labor force participation and caregiving activities are competing for the scarce time of many people. In some age categories two different kinds of caregiving activities come together: on the one hand there is the care that must be given to aging parents who start to suffer from functional limitations, while on the other hand there are the own children who need attention (Rubin & White-Means, 2009). Although activities of a very different nature, both require time that cannot be spend in other ways, in particular on paid labor. In Mexico, public provision of childcare facilities is limited while subsidized long-term or elderly care services are almost non-existent; at the same time, privately paid services are too expensive to be a viable alternative for large sections of the population. Informally provided care within the family is therefore an important source for both elderly and childcare. Mexico is not unique in that sense, a similar situation exists in many other Latin-American countries and also in southern Europe (CISS, 2008; Pommer et al., 2007). A tradition of extended families in which several generations live together and share household chores further stimulates and facilitates that both care for the elderly and care for the children and/or grandchildren is arranged within the household. For the generation in the middle, sometimes addressed as the 'sandwich generation' (Miller, 1981), whether or not residing within the same household as the older and younger generation, a strong intra-familiar pressure to perform caring task may affect their opportunities to participate in the labor market and contribute to the household's living standards through an additional source of income. Given that, similar to many other OECD countries, also in Mexico and other Latin-American countries the phenomenon of population aging has started (Burniaux et al., 2004; Zúñiga Herrera, 2004; CISS, 2005), it is relevant to understand how caregiving activities and labor force participation interrelate and understand if expansion of services or support may be needed in the future.

In this paper we analyze which factors determine the decision to participate in the labor market, to provide care for the elderly, and to provide care for the (grand)children. We use data from the Mexican Health and Aging Study (MHAS), a survey among people aged 50 and over, including their (younger) partners, which contains information on the respondents' living situation, as well as information about their children and their parents. Specifically, the respondents answer questions about the financial and nonfinancial care they give to their (grand)children and to their parents. We estimate a three equation reduced form seemingly unrelated regression (SUR) model of the three decisions at hand.

The results suggest that care needs are the main force that determine the caregiving activities of women aged 45 to 70, much more than the households' economic situation. Traditional roles appear to be a relevant issue, also in the labor force participation decision. Here, women who had a close connection with the labor market in their younger years are more likely to work. With simulations of conceivable demographic changes in the Mexican society, such as an aging population due to increased life expectancy and reduced fertility rates, we illustrate potential effects for future caregiving and participation rates. A predictable increase in the need for long-term care due to more elderly parents can be compensated if health improvements are achieved, while a further compensation of caregiving needs results from reductions of the number of young children. The simulations suggest that the labor force participation rate is not very sensitive to these demographic changes, and does not grow a lot if less caregiving activities are required.

The following section discusses the literature regarding informal long-term caregiving and childcare in relation with labor force participation decisions. Section 3 presents the empirical framework to jointly analyze the three decisions, and introduces the data that are used. Section 4 presents the estimation results, while section 5 shows some simulation results that highlight the potential consequences of prospective demographic changes in the Mexican society. Section 6 concludes the paper.

2 Literature

In Mexico, traditionally, both long-term care and childcare are largely family-based. A private market for home care services, especially for domestic services, exists, but for more specialized (nursing) tasks and for residential care the market is small and costs are unaffordable for the large majority of the population, while publicly provided services are virtually absent. Childcare services are available through the social security system for formally employed people, while about half of the labor force which is employed informally in jobs without access to social security services can use the services provided by the social program *"Programa de Estancias Infantiles"* where they are available.[1] Therefore, in many cases, the care for both the elderly and the (grand)children have to be solved primarily within the family, and a united theoretical framework for the informal care for elderly and children is required.[2]

In the economics literature, theoretical models of the supply of informal long-term care in combination with labor force participation decisions of the potential caregivers are widely available, as well as models that describe the decisions of labor force participation and childcare usage, but models that jointly analyze the three decisions are scarce. The next subsection briefly reviews the theoretical models regarding informal long-term elderly care supply, followed by a review of theoretical issues with childcare demand. Section 2.3 discusses an integrated framework for the labor force participation in combination with childcare and elderly care decisions.

2.1 Models of informal long-term care supply

Basically, the models of supply of informal care describe a trade-off between work, leisure, and informal care, usually from the perspective of the caregiver. Taking into account that informal care is usually unpaid, the caregiver must directly derive utility from caregiving in order to be willing to provide care to her parents. Several motives can be distinguished, including altruism, duty, social norms, reciprocity, bequest, and setting an example for her children. Different motives give rise to different theoretical specifications, but in general the model will boil down to some mechanism where the caregiver derives utility from the care given to the care recipient.

Nocera & Zweifel (1996) model the utility of the caregiver as a function of her consumption services C, leisure L, and of the informal care Z that is given: $U=U(C, L, Z)$. The amount of consumption services is modeled to depend both on leisure time and on consumption goods X, $C=C(L, X)$, as in a household production function. The utility derived from informal

[1] The "*Programa de Estancias Infantiles*" has a national coverage of 34.6% of the target population identified as households without access to the social security system and whose income is below 1.5 minimum salaries, mothers or fathers alone with children aged between 1 and 4 years who (search for) work or study (SEDESOL, 2011; CONEVAL, 2011)

[2] We focus on care activities and do not analyze financial support given through monetary transfers.

caregiving depends on the time spent on informal care A, $Z=Z(A)$.[3] The caregiver maximizes her utility under the usual time and monetary budget constraints. Total time T can be spent on labor (H), leisure, or caregiving, $T=H+L+A$. The monetary budget equalizes income derived from paid work (at a wage rate w) and income from other sources M –which in particular includes a lump-sum payment for informal care– to the expenditures on consumption goods (where the price of consumption goods is normalized to one): $wH+M=X$. As in Chang & White-Means (1995), long-term care (LTC) bought in the market is considered as a component of the general consumption X; privately bought LTC is not modeled explicitly. The model does not include publicly provided or subsidized LTC, something that fits well to the Mexican situation.

It is essentially this model that is applied by Nizalova (2012),[4] with the main difference that she explicitly includes the utility of the care recipient in the model. Instead of the function $Z(A)$ as in Nocera & Zweifel (1996), where informal care depends only on the efficient use of the time spent on it, a function $Z(A,C_R)$ that includes the care recipients consumption is used, as well as an explicit possibility for monetary transfers from the caregiver to the care recipient.

Fevang et al. (2008) extend the model to a three period model, not only modeling the decisions at the time when the elderly is in need, but also in the period before (when the elderly is still healthy and informal caregiving is not necessary) and in the period after the death of the elderly in need. Two exogenous variables in particular are included in the model: the monetary cost (c) of the care, since the caregiver not only spends time but also money when giving care (travel costs, for instance), and an inheritance (M) that the caregiver will receive in the last period. With imperfect credit markets, or with uncertainty about the inheritance, the one period model as discussed earlier is sufficient to conclude that if monetary care costs and parental care utility are high enough, labor supply will increase in order to meet the expenses. However, with perfect credit markets and certainty about the inheritance size, the caregiver can take into account the future inheritance and essentially transfer a share of M from the last period to earlier ones. More relaxed budget constraints in earlier periods allow that the caregiver reduces labor supply in all periods and increases the time spent on caregiving in the period in which the elderly is in need. The model's predictions are tested using Norwegian administrative data in Fevang et al. (2012). The results indicate a reduction of labor supply in the years just prior to an elderly parent's death, especially for daughters, suggesting that future inheritance is taken into account. The observation that labor supply after the parent's death recovers incompletely also suggests that the inheritance increased liquidity.

The empirical LTC literature, including the empirical sections of the papers mentioned above, commonly estimates a reduced-form, linearized specification of the theoretical model. For example, Nizalova (2012) derives a system of three equations for her empirical specification, explaining the (annual) hours of informal care given to the elderly parents, the hours worked, and the (net) monetary transfers to the elderly. The reduced-form specification implies that LTC and labor force participation are explained by all exogenous variables, without a direct interaction between employment and LTC. It avoids the discussion regarding the order of the decisions to participate in the labor market and the caregiving decision; in general it is not a priori clear which decision comes first or what is the causal relation between the two decisions.[5]

[3] They permit that informal care negatively affects utility.

[4] She refers to Sloan et al. (2002) as her inspiration, however the latter do not analyze labor decisions.

[5] Several studies investigate the effect of caregiving on labor force participation, and often report negative effects (*e.g.* Ettner, 1996; Bolin et al., 2008) while others report the absence of an effect (*e.g.* Wolf & Soldo, 1994; Meng, 2012). Differences are generated, among other things, by differences in the amount of care that is given

Sometimes, an underlying behavioral model that includes both decisions is estimated by a selected sample. For example, Chang & White-Means (1995) estimate a two decision model where the first one is to decide whether to work or not, and the second is how many hours work; however their sample is selected conditional upon caregiving. So the sampled have already decided upon giving care when taking the decision to work, and the analysis essentially ignores the trade-off between the labor care decisions. Leigh (2010) analyzes the effect of LTC on labor force participation, and finds that using cross-sections a large negative is found but that this effect almost completely disappears with panel data. He explains this difference as caused by incomplete control for individual heterogeneity in the cross-section models, "the kinds of people who provide care tend to have low levels of labor force attachment even before or after they have provided that care".

2.2 Childcare demand models

The general framework for childcare demand models is set by the work of Connelly (1992) and Ribar (1995). In these, and in many of the later models and applications (*e.g.* Michalopoulos & Robins, 2002; Blau & Currie, 2004; Tekin, 2007), the focus is at the labor force participation decision of mothers with young children and their demand for formal (paid or subsidized) childcare services. Informal care, for example by the grandparents, is sometimes explicitly included as a specific class of care, while the mother's own time spent with the children is generally considered only implicitly.

In the model of Ribar (1995), a family with N children derives utility from the mother's leisure hours L, consumption of market goods C, and the average quality of care per child Q/N, $U=U(C, Q/N, L)$. The mother's total time T can be spent on labor (H), leisure, or on caregiving to the children (K), $T=H+L+K$. As in many other childcare models, the mother's caregiving time is considered a fixed fraction of leisure time. Apart from the mother's time, childcare can be received from market (paid, formal, F) and nonmarket (unpaid, informal, I) sources. The quality of care per child is described by a childcare production function, essentially a weighted average of the childcare times and their productivities α, $(Q/N)=\alpha_F(F/N)+\alpha_I(I/N)+\alpha_K(L/N)$. A monetary budget restriction determines that the income obtained from the mother's labor hours (at an hourly wage w) and from others sources (M), and the consumption goods and childcare bought on the respective markets, must be in equilibrium, $wH+M=C+pF+sI$, where p is the price of an hour of childcare while the price of consumption goods is normalized to one. A shadow price s for informal children, representing the value of the unpaid care provider's time in alternative activities, is required to rule out a solution with unlimited informal care.

In Connelly's model (1992), as in Ribar (1995), the mother's decision to participate in the formal labor market is the result of maximizing her utility, subject to a production function for child quality Q, and budget and time constraints. The main difference between these models lies in the fact that Connelly introduced the age structure of children in the child quality production function, as a strategy for including the presence of older siblings as potential caretakers in the household together with other adults. Connelly estimated first a two-stage model for expected expenditures on child care and then a probit model in which the number of young children and the labor supply participation are simultaneous decisions.

(Carmichael & Charles, 1998, 2003). Heitmueller (2007) emphasizes that accounting for the endogeneity of LTC in the explanation of labor force participation is essential. Carmichael et al. (2010) provide evidence that employment and earnings generate opportunity costs and have a negative impact on the willingness to supply informal elderly care.

In contrast with the models for the elderly care supply, the perspective of most childcare models is different. It is the optimizing mother who determines her labor supply and demand for grandparental childcare, hence it is not the informal caregiver who takes the decisions, as is the case in the elderly care models. To bring together the two categories of care and their respective streams in the literature, we need an approach that starts from the same perspective. The natural choice seems to be the perspective of the caregiver, as in the elderly care models, and focus on the supply of informal care both for LTC given to the elderly and for childcare given to the (grand)children.

Empirical work about childcare decisions often includes simultaneously the labor force participation for the complete sample, and the usage of external childcare (by professionals or informal caregivers) conditional upon working. Although the childcare decision is observed conditional upon being employed, the used econometric models generally take the simultaneity of the decisions into account. This construction is often enforced by the available data, in the sense that in many surveys childcare decisions are only asked from working mothers. In this paper we model the supply of informal childcare of women age over 45 to their (grand)children, while the childcare literature generally focuses at the demand or use of (formal or informal) childcare services by mothers who are confronted with the decision to work or to spend more time with their own children.

2.3 Integration of informal long-term and childcare decisions

One of the few models that combine childcare and elderly care, and explain the allocation of parental time between three activities, that is, labor market, child care, and elderly care, can be found in Giménez et al. (2008). Essentially they combine the two-generation models demonstrated above for elderly and childcare giving into a three-generation modeling framework where the middle generation decides how much care to give to the older generation (elderly care) and the younger generation (childcare). This framework constitutes the skeleton for our empirical analysis in the next section.

The middle generation (the parent) maximizes its utility, $U=U(C, Q, T, U_g)$, where utility is derived from consumption C, the child quality Q, the output of elderly care T, and the utility U_g of the grandparent as a reflection of the altruistic motive. Consumption is modeled as a function of labor income (e hours worked at an hourly wage w) and non-labor income y, $C=C(ew, y)$, a function that essentially describes the monetary budget restriction. The output of elderly care also depends on income, but also on the time t invested in elderly care, $T=T(t, ew, y)$. Similarly for child quality Q, which however is modeled as depending not only on the time spend on childcare (h) but also on the portion α of the time that the parent devotes to elderly care when the grandchild is present, $Q=Q(h, \alpha t, ew, y)$. In addition to the altruistic motive for elderly care through U_g, the portion α is introduced to allow a test of the 'demonstration effect', that is, the idea that parents want to give an example to their children in order that the children will care for the parents in the future. The model is closed with a time budget restriction, which is stated as a functional form (as done with the monetary budget), $h=h(m, t, e)$, where m indicates the parents' own available time. The applied model is an extension of Cox & Stark's (2005) model in which the authors attempt to identify the demonstration effect related to monetary intergenerational transfers but do not explicitly model the probability that the child will imitate the mother's elderly caregiving behavior.

Maximization with respect to the time spent on market labor (e) and elderly care (t) implicitly determines also the optimal time spent on childcare (h), all three as functions of the

wage (*w*), non-labor income (*y*), available time (*m*), and the shared care time factor (α). Being focused on this 'demonstration effect', Giménez et al. (2008) derive that α has a positive effect on the time spent on elderly care (*t*) and a negative effect on labor hours (*e*). The effect on (pure) childcare hours depends on the change in the marginal utilities of work and elderly care due to the changes in the hours after a change in α. If the increase in elderly care is larger than the decrease in labor hours, the increase in α will also increase childcare hours.

In the theoretical model they emphasize the role of setting an example for the children as a motive for LTC, a factor that is indeed shown in empirical implementations, although also a substitution effect is found: more young children in the household reduce the time spent on elderly care and market work (Giménez et al., 2010. 2012). Other motives such as altruism or the prevailing social norms and values, may be equally valid or more relevant than setting example per se, especially in a society like Mexico, where family ties are stronger and 'extended families' are more common than in (Northern-) Europe and the USA. The basic theoretical framework for giving LTC and childcare essentially boils down to the same set of equations as explained before regardless the motivation behind it.

The long term care models presented in section 2.1 are based on the altruism motive, while Cox & Stark (2005) base their analysis on the demonstration effect. Cox & Stark (2005) explore if empirical results, in effect, support the demonstration effect against tied transfers or altruism in monetary intergenerational transfers. The results are more in line with the demonstration effect than with altruism, providing evidence that women, who live longer and are more vulnerable compared to men, have more interest in cultivating familial bounds which eventually yield in the future than men. Moreover, they find that married women receive parental transfers even when their in-laws are rich, which contradicts the altruism (crowding out) hypothesis. Yet, the importance in differentiating motives lies in the policy implications, for instance when informal LTC is prompted to the demonstration effect, more accessibility or availability of formal LTC services will have a negligible substitution effect.

3 Empirical strategy

Modeling labor force participation conditional upon the care decision(s) or modeling care conditional upon work, as is not uncommon in the literature briefly revised in the previous section, hides the inherent simultaneity of the decisions. It is not a priori clear which decision comes first. Furthermore, as will be discussed more extensively in subsection 3.2, we observe labor force participation and caregiving activities for all sampled people. Hence, we do not suffer from non-observability of some decisions for a potentially endogenously selected fraction of the sample. Therefore, in the following subsection 3.1 we describe an empirical framework that simultaneously takes the three decisions into account.

3.1 Model set-up

Our desire to model three simultaneous decisions leaves us, in essence, with two options: a reduced-form specification, or a structural model. The latter explicitly models the effect of one decision on the other decisions, while the reduced form setup only considers exogenous variables as right-hand side (explanatory) variables. The structural form has the advantage that the interaction between the decisions is modeled precisely and allows for a causal interpretation of the estimated relations, but the functional form of the theoretical model and the identifying

variables are of ultimate importance for the validity of the model. If we limit our interest to the marginal effects of exogenous variables on the outcomes, we can suffice with a reduced-form model.

The theoretical model of the previous subsection gives rise to a reduced form seemingly unrelated regression (SUR) model of three equations, describing the hours worked in the labor market by the middle generation (parents), the hours of informal care given to the older generation (grandparents), and the hours of childcare given to the younger generation ((grand)children),

$$T_l = \gamma_l + X_j\beta_{jl} + \varepsilon_l ,$$
$$T_e = \gamma_e + X_j\beta_{je} + \varepsilon_e ,$$
$$T_h = \gamma_h + X_j\beta_{jh} + \varepsilon_h ,$$

where the dependent variables of the three variables are the numbers of hours spent on work (T_l), elderly care (T_e), and childcare (T_h). The vector X_j contains individual and household characteristics that determine the hours spent on the different activities. Given that it is a reduced form model, all exogenous variables enter in all three equations, while the endogenous variables (in particular, the hours) do not appear on the right-hand side. The three estimations can be estimated jointly while allowing for correlations between their error terms (Giménez et al., 2008, 2010).

Instead of looking at the hours, we will look at the binary decisions whether or not the respondent works (T_l'), gives care to her parents (T_e'), and gives care to her own children or grandchildren (T_h'), where, for $i=l, e, h$, each T_i'=1 if T_i>0 while T_i'=0 if T_i=0 (or under the standard assumption of latent variables, T_i<0). The three binary decisions gives rise to a trivariate seemingly unrelated (SUR) probit model.[6] Note that we do not analyze the (time spent on) other activities such as personal care, leisure, sleep, etc., hence the modeled activities do not necessarily have to bite each other, changes in their likelihood could compensated with changes in other activities.

3.2 Data

The data used in this paper are from the Mexican Health and Aging Study, MHAS (in Spanish: *Estudio Nacional sobre Salud y Envejecimiento en México, ENASEM*; Puig *et al.*, 2006; Wong *et al.*, 2007). MHAS is organized as a panel survey, where the baseline survey (held in 2001) is constructed as a nationally representative sample of the about 13 million Mexicans aged 50 and over. The questionnaire contains questions about socio-demographic status (including information on children living outside the household), health status, functional limitations, use of health services and other sources of support, current and previous labor status, sources of income and assets. Information on the health status consists of a self-evaluated, subjective, health assessment of the

[6] If we would want to explain labor and care hours, ideally we should account for corner solutions, that is, for the excess of zeros generated by people not working or caring. Note that Giménez et al. (2008, 2010) do do not account for the nonnegativity of the hours, and neither for a potential excess of zeros or for an upper limit on the number of hours. The more flexible way to address the excess of zeros would require the estimation of selection equations that model the decision to work or care, respectively, followed by a model for the numbers of hours spent on each activity. An intermediate option would be the estimation of a trivariate SUR Tobit model, a model that enforces that each explanatory variable has the same effect on the yes/no decision as on the hours decision. Nizalova (2012) applies a Tobit model for informal LTC hours but does not take into account the excess of zeros for labor hours nor for monetary transfers. The same issue would hold when explaining the (net) financial transfers between generations.

respondent's general health on a five-point scale (excellent, very good, good, fair, poor). In addition there is more objective information collected via a large set of questions regarding whether a doctor or other medical personnel has ever told the respondent that he or she suffered from specific health problems such as of hypertension, diabetes, cancer, respiratory problems, heart problems, stroke, arthritis, and many other diseases and symptoms. Furthermore, there is a battery of questions regarding problems with (instrumental) activities of daily living.

Both the heads of the selected households as well as their partners were interviewed, independent of their age, resulting in a total sample size (in 2001) of 15,186 individuals. In the follow-up survey of 2003, attempts where made to interview the same age-eligible persons and their partners, even if the household had moved or split. Some could not be traced or refused to participate (5.8% of the targeted households) while others died in the two years between the interview (3.8% of the interviewed individuals; in that case a next-of-kin was interviewed) (Wong & Espinosa, 2004). Information regarding labor, health, and education of resident and nonresident children is collected through a household roster.

In the analysis we focus on the women between 45 and 70 because this is the age where it is more likely that the respondent's parents or in-laws are still alive while the (grand)children may still be young enough to require supervision, and where labor force participation is still an issue.[7] Women are usually the most involved in caring activities. Different from Fevang (2008), we allow that the respondent's parents cohabit in the same household with the respondent and use dummy variables to capture the possible direct effect of this cohabitation condition on the caregiving and labor decisions.

Note that we do not make a selection of people who still have at least one parent alive, or have children or grandchildren. By presenting unconditional estimations, we create a possibility to perform simulations that consider higher survival rates of elder parents and lower fertility rates of younger generations. Estimations with samples conditional upon having living parents suggest that our construction captures well the relevant effects of other variables; only minor changes are encountered.

3.2.1 Dependent variables

As said above, we estimate three decisions that are taken simultaneously, that is, the decision whether or not to work, to give care to the parents, and to give care to her own children or grandchildren, by means of SUR-Probit regression model. The three dependent variables are derived from three survey questions.

Information on the labor status refers to the week before the interview, that contains a question regarding the work history, "Last week you …?", with six possible answers, of which the first two ("Worked", "Did not work, but you had a job") are recoded into a positive score for our employment indicator. For our analysis respondents who replied with one of the other four response categories ("Looked for work", "Were a student", "Dedicated self to household chores", and "Did not work") are considered as non-employed. In our sample, in the relevant age group, only 27.3% of the women work, while in the same age range 77.1% of the men work. These numbers compare rather well to information from other sources (Van Gameren, 2008; Juarez, 2010; Murrugarra, 2011). Basically all men work until they have the opportunity to retire

[7] The survey sampled people aged 50 and over, but do to the fact that not only the sampled respondent but also the partner was interviewed, and given that many men married a younger wife, we have a large number of women aged 45-50 that we decided to include in our analysis.

(if they can afford it), while for women the traditional dedication to household chores is still the predominant role model.

In addition to the technical reasons mentioned in the previous subsection for refraining from an analysis of the number of hours is that we do not have comparable information on the labor and caregiving hours. We have the information about hours worked per day for 2001, but we do not know how many days per week, while for caregiving activities, the respondent can choose to provide the information on the hours per day, week, month, or year. Another aspect that could be relevant is the rigidity of the labor market, specifically the (im)possibility to reduce the worked hours. In a flexible labor market the decision is between work more or less hours, in rigid market the more important decision could be whether to participate or not.[8] Especially among men the rigidity seems large, about 60% of the working men report between 8 and 10 labor hours. Women seem to have more flexibility, which could relate to the fact that women, even more than men, are employed informally (without obtaining access to social security through their own job), which generally gives more flexibility than formal employment.

The dependent variable for the long-term care giving activities derives from the survey question "In the last 2 years, did you (or your spouse) help your parents with basic personal activities such as dressing, eating or bathing because of a health problem? Exclude help with household chores, errands, and transportation", and specifically from the reply to the subsequent question, "Was this help for at least 1 hour a week, or about 100 hours in the last 2 years?", asked only in case of a positive reply to the previous one. Both questions are asked only if the respondent has at least one parent who is still alive. The formulation of the question does not allow the precise identification of the caregiver. Given that the questions are asked from both the sampled respondent as well as the spouse, we decided to combine the information into a variable that indicates that care is given to the own parent(s) and/or to the parent(s)-in-law. Furthermore, we assume that, if care is given, the female spouse is involved in the caregiving activities. Research in a variety of countries shows that a larger part of informal long-term care responsibilities is carried by women (Hammer & Neal, 2008; Spillman & Pezzin, 2000; Lilly et al., 2007, Giménez-Nadal et al., 2010), suggesting that our assumption is not very restrictive. Hence, a positive reply to the second question by at least one of the interviewed household members is coded as a positive value for our indicator for long-term care activities by the female respondent.[9]

Information on nonfinancial care given to the children and grandchildren is obtained through the survey question "In the last two years, have you (or your spouse) spent at least one hour a week, helping your children/their spouses/your grandchildren (or those of your spouse)?". A positive reply results in a positive value for our indicator for childcare activities by the respondent. In contrast with the literature that generally focuses purely at childcare activities to young children (aged 0-4 or 0-12), our survey asks for time spent helping (grand)children without specifying the activities. Hence, it can refer both to general household chores as well as to specific childcaring. Observing that the respondent can help her own child(ren) by taking care of the grandchildren, we decide to use the term childcare in the remainder of the paper.

[8] In the analysis of the effect of wages on labor force participation, it is generally found that the extensive margin is more sensitive than the intensive margin (Evers et al., 2008; Arceo & Campos, 2010).

[9] The questions regarding LTC are asked only if at least one parent is alive, and thus caregiving to parents who passed away shortly before the interview is not recorded; as a consequence, we are likely to underestimate levels of care given in the past two years while at the same time we stay close to recent caregiving activities, given that individual LTC needs in general do not decrease over time.

Table 1 shows the number of observations available for the analysis, and the number of working and caregiving women in our sample. Childcare is much more widespread than LTC, with 47.9% and 7.8%, respectively, something that should not be considered as surprising given that the number of children and grandchildren of each respondent is potentially unlimited while there is a natural limit on the number of parents alive. Among working women, the caregiving activities are slightly higher when we talk about LTC 8.0% but a little lower when we look at childcare activities 43.3%. As a first impression, the respondent's support for the children seems to be in conflict with labor force participation, while work and LTC do not seem to bite each other. Of those who give LTC, 56.3% also give childcare. Obviously, the same 'care combiners' as a fraction of the childcare givers is much lower, 9.1%. Childcare among non-LTC providers as well as LTC among non-childcare givers is slightly lower, with 47.2% and 6.5% respectively, which provides indications that caregiving acitivities may complement each other.

Table 1 Dependent variables: employment, longterm care, and childcare, women, 2001

	working and non-financial assistance given to children								
help given	=== Not working ===			==== Working ====			====== Total ======		
to parents	No	Yes	total	No	Yes	total	No	Yes	total
No			92.3%			92.0%			92.2%
row-%	*50.9%*	*49.1%*	*100%*	*57.6%*	*42.4%*	*100%*	*52.8%*	*47.2%*	*100%*
column-%	*93.5%*	*91.2%*		*93.5%*	*89.9%*		*93.5%*	*90.9%*	
Yes			7.7%			8.0%			7.8%
row-%	*42.9%*	*57.1%*	*100%*	*45.7%*	*54.3%*	*100%*	*43.7%*	*56.3%*	*100%*
column-%	*6.5%*	*8.8%*		*6.5%*	*10.1%*		*6.5%*	*9.1%*	
Total	50.3%	49.7%	100%	56.7%	43.3%	100%	52.1%	47.9%	100%
#obs.			4322			1721			6043
			71.5%			28.5%			100%

3.2.2 Explanatory variables

As explanatory variables for the three decisions we include a block of variables that describe the health and living situation of the respondents' parents, another block of variables that account for the presence of children and grandchildren, and further we include a set of demographic and socio-economic characteristics of the respondents, as well as a group of variables that represent the work history. All variables are included in all three equations, as is common in a reduced-form framework, although obviously we should expect that the information regarding parents and (grand)children foremost has an effect on the LTC and childcare decisions, respectively. Given that we do not model a direct effect of one outcome variable on the other outcomes, as would be the case in a structural model, the inclusion of the main determinants of one decision also in the other equations together with the correlations between them should capture the cross-effects.

With regard to the information about the elderly generation, we include information on both the respondents' as well as the respondent's spouse's parents. In particular, we include whether the mother is still alive, whether she is in need of help (using the survey question "Because of a health problem does your mother need any help with basic personal needs like dressing, eating or bathing?"), and whether she can be left alone (based on the survey question "Can your mother be left alone for an hour or more?", recoded such that our variable indicates a more severe problem, i.e., that the mother cannot be left alone). The same questions are asked from the respondent with reference to the father, and from the spouse with respect to his father and mother. The information is taken together into variables that count the number of parents

and in-laws that match the respective conditions. As shown in table 2, the respondents have on average 0.78 living parents or in-laws (not shown is that 49.9% of the respondents have at least one living parent or in-law). The majority of them are in such good health that no help is needed; the average respondent has 0.178 parents/in-laws in need of care, while on average they have 0.098 parents/in-laws that cannot be left alone. For 84.4% of all respondents there are no parents/in-laws in need of help, and 91.3% of the respondents have no parents/in-laws who cannot be left alone. Further we include information about where the parents/in-laws live, in particular we include variables that count the number of parents/in-laws living with the respondent (on average, 0.039) and the number of parents/in-laws living alone or with their spouse (on average, 0.293); the reference category is formed by parents living with other children or relatives for at least a part of the year.[10]

Table 2 Explanatory variables, women, 2001

	mean	std.dev.		
parents				
#parents/inlaws alive	0.784	0.961	0	4
#parents/inlaws who need help	0.178	0.445	0	4
#parents/inlaws cannot be alone	0.098	0.335	0	3
#par./inlaws living with respondent	0.039	0.210	0	2
#par./inlaws living alone/spouse	0.293	0.675	0	4
(grand)children				
#nonresident grandchildren	7.898	8.622	0	67
nonresident grandchildren under 18	0.761	0.427	0	1
#(great)grandchild in household	0.622	1.201	0	13
#hh-members aged 0-4 years	0.226	0.557	0	5
#hh-members aged 5-11 years	0.330	0.719	0	8
#hh-members aged 12-17 years	0.396	0.721	0	5
socio-demographic background				
married/living together	0.688	0.463	0	1
#siblings alive	5.096	2.957	0	21
age	56.527	6.337	45	69
age squared (*100)	32.355	7.257	20.25	47.61
educ.: primary	0.544	0.498	0	1
educ.: secondary	0.065	0.247	0	1
educ.: technical/commercial	0.095	0.294	0	1
educ.: preparatory or higher	0.075	0.263	0	1
speaks indigenous language	0.068	0.252	0	1
locality size: 15000-100000 inhab.	0.148	0.355	0	1
locality size: 2500-15000 inhab.	0.086	0.281	0	1
locality size: less than 2500 inhab.	0.150	0.357	0	1
socio-economic background				
non-business assets (*$1mln)	0.329	0.583	-0.595	13.67426
househ. nonlabor income (*$1000)	3.765	97.611	-500	7500
spousal labor income (*$1000)	2.133	19.180	-250	1146.111
access to medical services	0.641	0.480	0	1
made pension deposits, 1-10 years	0.045	0.208	0	1
made pension deposits, 10-25 years	0.056	0.231	0	1
made pension deposits, >25 years	0.049	0.216	0	1
health status				
self-assessed health (0-4)	1.259	0.808	0	4
problem with ADL	0.063	0.243	0	1
problem with IADL	0.055	0.228	0	1
suffers a chronic disease	0.616	0.486	0	1
bad mental health status	0.495	0.500	0	1

[10] Information about the age and the levels of education did not add explanatory power and are not included in the final analysis.

The included information on the respondents' children and grandchildren, which is primarily expected to be of importance for the childcare decision but possibly also for the labor force participation and LTC decisions, mainly refers to the number of grandchildren and the household composition. In particular, we include the number of grandchildren or great-grandchildren that are living in the same household as the respondent, as well as specific indicators for the number of household members in the age ranges under 5, between 5 and 11, and between 12 and 17. Being aware that not all children or grandchildren share the household with the respondent but might live near enough to receive care and attention, we also include indicators of the number of grandchildren of the respondent's nonresident children, as well as an indicator if some of them are less than 18 years old.[11,12] In table 2 we see that the respondents have, on average, 8.0 nonresident grandchildren, and that 76.1% of the respondents have nonresident grandchildren aged under 18. The number of grandchildren and (other) children aged between 0 and 17 living in the same household as the respondent is much lower, less than 1, but given the proximity they might be influential in the decision-making process.

We use information about the occupational history of the respondent, in particular whether she actively contributed to some pension fund, as indicative for the connection with the labor market. On the one hand, past contributions imply a positive propensity to work in a formal job (given that most pension contributions are done through the social security system to which access is obtained through a formal job), while on the other hand prolonged periods of distributions create the opportunity to retire from the labor market with a retirement pension and spend more time on care activities. Table 2 shows that 4.5% of the respondents record less than ten years with contributions. In general, this duration is insufficient to claim a pension. About 5.6% report between 10 and 25 years of contributions, which qualifies for an incomplete pension. With more than 25 years of contributions, recorded for 4.9% of the respondents, retirement with the maximum pension is possible. The majority, thus, does not report any pension contributions, indicating the absence of a labor history in the formal sector. Access to the health care services provided by the social security can also be obtained through a formal job of the spouse or other family members. Table 2 shows that 64.1% reports access to these health care services. Given the much lower (formal) employment rates in our sample, for the majority of the observations this is through derived access rights. The social security institutes also provide childcare services, and, although access rights and actual opportunities differ, the same variable tells us something about the availability of formal childcare.

We include socio-demographic variables such as the age (as well as age squared to capture nonlinear effects), and whether the respondent is married or living in a consensual union with a partner. The respondents have on average 5.1 siblings alive. We include several indicators of the respondents' health status.[13] A general, subjective indicator is the self-assessed health,

[11] The survey asks, with respect to the respondent's nonresident children, "How many children does (name) have?" and "Are any of his/her children under age 18?", hence we can exactly determine the number of grandchildren but not exactly how many of them are younger than 18. We cannot rule out that some of these grandchildren live in the respondent's household instead of with their own parents.

[12] Information about the age structure of nonresident children and their labor force participation is not included in the analysis. More detailed information on the household composition is already captured by the information on where the parents/in-laws live. Information about gender, marital status, health, education, and labor activities is available only for household members and nonresident children (older than 12), hence not for all grandchildren.

[13] Van Gameren (2008, 2010) presents evidence for Mexico that health is not endogenous in the explanation of labor force participation. There is little evidence in the literature that health is affected by elderly care activities, the strongest effect being a (negative) one on mental health (Coe & Van Houtven, 2009; Schmitz & Stroka 2012). In

measured on a five-point scale (poor, fair, good, very good, resp. excellent health). Another variable indicates whether the respondent suffers a chronic disease,[14] while we also include a dummy variable that indicates a serious mental health problem. Furthermore, we include two indicators that report the respondent's limitations with adl and iadl.[15]

Also some socio-economic variables are used. The highest completed level of education by the respondent is included through a set of four dummy variables (with no formal education as a reference category). About 22.1% of the respondents have no education (our reference category), while 54.4% report primary education as the highest level. Secondary education (generally taken between ages 12 and 15) is the maximum for 6.5% of the respondents, while 9.5% report further professional or technical schooling and 7.5% have obtained preparatory tertiary education or higher (degree level).[16] The financial situation of the respondent's household is captured through the inclusion of the amount of (non-business) assets owned by the respondent and her spouse, the household's non-labor income, and the monthly labor income earned by the spouse.[17] Possession of non-business assets (total net value of real estate, investments, savings, stocks, shares and bonds, and private means of transport) says something about the resources available for obtaining private care services and the need for the respondent's labor force participation; spousal labor income does the same, where perhaps a larger effect on participation could be expected, because a working spouse also implies that he is not available for household chores. The respondents report an average amount of assets equal to 329,431 Mexican pesos, but the spread is huge, ranging from debts of 600,000 pesos to properties with a total value of 13.7 million pesos. The average spousal monthly labor income is about 2,133 Mexican pesos (about 1.5 times the formal minimum income), but also here the range is wide, from large negative incomes up to huge positive incomes. The latter also holds for the average non-labor income of 3,765 pesos, income that includes retirement and other pensions, transfers from government programs as well as children (remittances), and income from property or assets.

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our analysis we treat health as an exogenous explanatory variable, and address this issue in a robustness analysis.

[14] Chronic disease comprises hypertension, diabetes, cancer, a respiratory illness, heart disease, stroke, and arthritis.

[15] Activities of daily living (adl, personal care) such as eating, dressing and undressing, washing and bathing, using the toilet, and walking. Instrumental activities of daily living (iadl, domestic care) such as housekeeping and cleaning, laundering, telephoning, use of transportation, shopping, food preparation, and use of medicine.

[16] We decided against the construction of potential wages, which would have allowed the estimation of wage elasticities, as is common in the empirical childcare literature (see *e.g.* Connelly & Kimmel, 2003; Michalopoulos & Robins, 2002; Connelly, 1992; Borra, 2010). The method consists of the estimation of a Mincer wage equation on those for whom an earned wage is observed, followed by the prediction of potential wages for everyone in the sample. Subsequently, the predictions, or a combination of observed and predicted wages, would be included in the main model, under the assumption that people base their decision upon the thus constructed potential wages (Van Soest, 1995). Usually the identification is guarenteed through the inclusion of age and education in the wage equation but not in the main model. We prefer to include age, education, and some labor history identifiers, in the main model, allowing them to have an independent effect on the decisions, instead of assuming that their effects run exclusively through potential wages.

[17] Note that we ignore the spouse's labor force participation decision, as well as his caregiving decisions. Although this introduces a potential endogeneity problem if within the household the decisions are taken jointly by wife and husband. We consider this as a minor issue, given the observation that the large majority of men aged 50-65 work (Van Gameren, 2008). In this way we follow the (child)care literature, that generally considers the husband's labor decision exogenous. The earnings capacitiy of other household members is not included in the analysis; in a preliminary version we included the (log of the) total household consumption as an indicator of the available resources, but this did not add explanatory power.

Furthermore, we include the degree of urbanization, and whether the respondent is able to speak an indigenous language. 6.8% say that they have that ability. The majority lives in localities with 100,000 or more inhabitants (61.5%, reference category), and only 15.0% lives in localities with less than 2500 inhabitants (see table 2).

4 Results

The estimation results of the seemingly unrelated regression model outlined in section 3.1 for the joint decisions to provide care to elderly parents, to give care to the children or grandchildren, and whether or not to be active in the labor market, are given in table 3. For the reasons explained in section 3.2, we focus at the decisions made by Mexican women aged between 45 and 70.

The first column of table 3 shows that the driving force behind the decision to give care to the parents is the situation in which the parents encounter themselves. It was to be expected that having one or more parents or in-laws alive is a relevant factor (first line), but the subsequent lines indicate that the health status of the parents is of utmost importance. Parents for whom a need for help is reported or who cannot be left alone receive support much more often than parents for whom no health problems are reported. The parental health status thus has a strong effect on the activities of women. The household composition is also important; if the parents live in the same household as the respondent, it is much more likely that women take care of them than when the parents live with the respondent's siblings (the reference category), while parents who live alone or together with their spouse receive even less support. The international evidence also finds that living arrangements are important; when the caregiver and the elderly live together it is more probable that the caregiver quits her job in order to look after the elderly (Chang & White-Means, 1995).

If the respondent herself is married or living together with a spouse, less care is given to the parents. Apparently, for unmarried women it is easier to take up care activities with respect to the own parents, maybe because the siblings consider it a responsibility for their unmarried sisters. A small positive effect on caregiving is found if the respondent has more siblings.[18] Looking at the presence of siblings as a production factor of informal care supply, Nizalova (2012) and Chang & White-Means (1995) found that the more caregivers available the bigger and easier the substitution of elder care by work activities. A substitute-caregiver increases the probability of women to stay in the labour market (Chang & White-Means, 1995) and augments the informal care supply response to wage changes (Nizalova, 2012). Maybe the interaction of elderly care duties with migration decisions, as indicated by Antman (2012), may lead to the unavailability of siblings for caregiving and reduce substitution between the various siblings.

The socio-economic situation of the respondent is of minor relevance for the decision to give care to the parents. The parameter estimates for age and age squared suggest that the maximum burden of elderly care activities is found among women aged 54, and rapidly decreasing elderly care after that age; at higher ages it becomes unlikely that there are still living parents around. Only those who have made contributions to a pension fund for less than 10 years are significantly less likely to provide care, in comparison with those who never contributed (the reference category) and with those who contributed for a longer period. A longer period of

[18] This somewhat surprising siblings effect disappears if the parental living situation, with 'living with siblings' as the reference category, is excluded from the analysis.

contributions implies that already some pension can be claimed, while those with less than 10 years of contributions still have a chance to qualify for a pension if they contribute for some more years. Caregiving appears to be more common in small and medium-sized towns; maybe because in larger cities the family relations are weaker. The information about the respondent's children and grandchildren does not tell us anything about the care given to the parents, and neither does the respondent's health.

The second column of table 3 shows the factors that explain the respondent's support given to her children or grandchildren. As could be expected, a higher number of young household members increases the probability of childcare activities by the respondent. Children under age 5 have the strongest positive effect, more than older children. For children in primary school age (between 5 and 12), the positive effect is half the size of the effect for the pre-school aged children, while no significant effect is found for children aged over 12, given the positive effect of the number of (great)grandchildren in the household. Interesting is that the number of nonresident grandchildren has no direct effect on childcare activities, this in contrast with the number of (great)grandchildren in the household. However, if the respondent has nonresident grandchildren aged under 18, her childcare activities are significantly larger.

Apart from the obvious relevance of young (grand)children, it is interesting to see that also the presence in the household of elderly in need for care has a positive effect on childcare activities. Something similar is found by Giménez et al. (2010), who conclude that more time is devoted to both care activities when children are present while caring for the elderly. Giménez et al. (2010) found no evidence of joint production in Spain, they do not find that more time is devoted to work when caring for children and elderly at the same time. We do not dismiss that it is possible that 'economies of scale' are at hand in Mexico, in the sense that the grandchildren are around and kept an eye on while care is given to the elderly, but also a demonstration effect as suggested by Giménez et al. (2010, 2012) cannot be discarded. If the elderly cannot be left alone, such economies of scale appear to be less feasible, as reflected by the significantly negative parameter estimate. The negative effect on the respondent's childcare activities of the number of parents/in-laws in the same household reflects another kind of scale benefits: the co-resident elderly can take care of the younger household member, enabling the respondent to spend her time on other activities. However, we do not find an increased probability of work activities (our data do not permit the analysis of hours spent on the diverse activities).

The socio-demographic and economic background of the respondent is slightly more important for childcare decisions than it is for the elderly care decision. With regard to the age pattern, the parameter estimates indicate maximum childcare activities at the age of 51. This may reflect the fact that older respondents have fewer young children around that need care, but it could also indicate the onset of a deterioration of their own health. The relevance of the respondent's own health is also suggested by the indicators of problems with (instrumental) activities of daily living. Adl-problems restrict labor activities outside the household but increase childcare probability. On the other hand, when the respondent suffers iadl-problems, which is usually the area where dysfunction and reduction of independence due to aging starts, also a reduction of childcare activities is found. Childcare activities appear to be more common in cities with more than 100,000 inhabitants, an effect that contrasts with the elderly care activities. Maybe in large cities there are fewer substitution opportunities for within-family childcare, due to the costs of external care or because of less confidence in third-party caregiving.[19] Access to

[19] We have no direct information on the costs or quality, often found to be relevant (Blau & Currie, 2004), of other

the health care services provided by the social security has a positive effect on within-family childcare activities. Although the same social security institutes also provide childcare services, and therefore a reduction of informal childcare could be expected, it is important to note that, in contrast with health care rights, the right to use childcare centers from the social security system cannot be acquired through formally employed relatives but only from own labor. In the childcare literature (Blau & Currie, 2004) it is common to find that mothers with higher potential wages work more and spend less time with their children. Under the presumption that higher education comes with higher potential wages, our results appear to contradict the general finding regarding childcare, but we have to consider that we are not (only) looking at mothers' time with their own children but (mainly) at the time grandmothers spend with grandchildren. Moreover, education is not the only indicator of earnings capacity.

The third column of table 3 presents the respondent's labor force participation decision. Here, the economic situation has a stronger impact. In particular, the existence of access to health care services and of previous pension contributions is relevant. If access to the health care services offered by the social security system is available, possibly acquired through working family members, this reduces the likelihood that the respondent is active in the labor market. If, however, in the past the respondent has made contributions for a retirement pension, it is more likely that she is still actively working. Note that the past contributions tell us something about the labor experience of the respondent; contributions not only indicate a history with formal employment, but also more generally that she has not been dedicated to household chores all her life. In general, it suggests a strong connection with the labor market, and therefore of earnings capacity, in addition to the achieved level of education, a measure that is not found to be strongly significant in our analysis. Chang & White-Means (1995) found non-wage income as a significant variable affecting negatively the decision of working for caregivers, but we find no evidence that the spousal labor income, the nonlabor income, or the household's wealth have an effect on the respondent's labor force participation decision. Traditional roles seem to be more important, as is suggested also by the finding that married respondents work less often, probably because they dedicate their time to household chores. We find that women who report better health are more likely to be active in the labor market, while especially those with adl or iadl problems are less likely to work.[20]

childcare options available to the mothers or respondents in our survey.

[20] In a model without the subjective self-assessed health, the educational levels become more important in the labor force participation equation, suggesting that the health status tells us something about the respondent's earnings capacity (commonly measured by education). The role of the other health indicators in the participation decision becomes slightly stronger (although mental health loses its counterintuitive significant positive effect). The same is found when the respondents' health information is completely eliminated from the model; its potential endogeneity does not seem to bias the other parameters. When only mental health, perhaps the health indicator that is most suspect for endogeneity (Schmitz & Stroka, 2012), is left out of the analysis, all the results reported in table are maintained with only very minor changes. The counterintuitive positive effect of mental health problems on labor force participation may have to do with this endogeneity.

Table 3 Joint long-term care, childcare, and labor force participation decision, women, 2001

	[1] LTC		[2] childcare		[3] employment	
parents						
#parents/inlaws alive	0.257 ***	(0.040)	0.014	(0.028)	-0.033	(0.030)
#parents/inlaws who need help	0.903 ***	(0.061)	0.111 **	(0.046)	0.019	(0.047)
#parents/inlaws cannot be alone	0.257 ***	(0.072)	-0.134 **	(0.057)	-0.070	(0.060)
#par./inlaws living with respondent	0.809 ***	(0.093)	-0.147 *	(0.080)	0.052	(0.084)
#par./inlaws living alone/spouse	-0.138 ***	(0.050)	-0.039	(0.033)	0.009	(0.035)
(grand)children						
#nonresident. grandchildren	-0.006	(0.005)	-0.001	(0.003)	0.006 **	(0.003)
nonresident grandchildren under 18	0.021	(0.074)	0.518 ***	(0.046)	-0.064	(0.048)
#(great)grandchild in household	-0.052	(0.050)	0.124 ***	(0.030)	0.042	(0.031)
#hh-members aged 0-4 years	0.006	(0.079)	0.201 ***	(0.046)	-0.101 **	(0.047)
#hh-members aged 5-11 years	0.016	(0.060)	0.102 ***	(0.037)	-0.070 *	(0.038)
#hh-members aged 12-17 years	0.044	(0.044)	-0.025	(0.027)	0.020	(0.028)
socio-demographic background						
married/living together	-0.155 **	(0.072)	0.007	(0.040)	-0.456 ***	(0.043)
#siblings alive	0.023 **	(0.010)	0.011 *	(0.006)	-0.002	(0.006)
age	0.225 **	(0.089)	0.100 **	(0.049)	0.082	(0.054)
age squared (*100)	-0.210 ***	(0.079)	-0.099 **	(0.042)	-0.109 **	(0.047)
educ.: primary	0.089	(0.082)	0.093 **	(0.045)	-0.085 *	(0.048)
educ.: secondary	0.169	(0.135)	0.107	(0.079)	0.114	(0.083)
educ.: technical/commercial	0.347 ***	(0.120)	0.166 **	(0.073)	-0.042	(0.079)
educ.: preparatory or higher	0.089	(0.155)	0.325 ***	(0.087)	0.161 *	(0.091)
speaks indigenous language	-0.179	(0.126)	-0.011	(0.069)	0.058	(0.073)
locality size: 15000-100000 inhab.	0.186 **	(0.080)	-0.074	(0.048)	0.060	(0.052)
locality size: 2500-15000 inhab.	0.247 **	(0.102)	-0.257 ***	(0.063)	0.003	(0.068)
locality size:less than <2500 inhab.	0.192 **	(0.094)	-0.263 ***	(0.054)	-0.075	(0.059)
socio-economic background						
non-business assets (*$1mln)	0.009	(0.050)	-0.034	(0.029)	-0.049	(0.036)
househ. nonlabor income (*$1000)	-0.000	(0.000)	0.002	(0.001)	-0.005	(0.003)
spousal labor income (*$1000)	0.000	(0.001)	0.000	(0.001)	0.000	(0.001)
access to medical services	0.105	(0.066)	0.196 ***	(0.039)	-0.108 ***	(0.042)
made pension deposits, 1-10 years	-0.341 **	(0.151)	-0.103	(0.083)	0.500 ***	(0.083)
made pension deposits, 10-25 years	-0.025	(0.120)	-0.097	(0.076)	0.878 ***	(0.079)
made pension deposits, >25 years	0.038	(0.142)	-0.040	(0.085)	0.494 ***	(0.088)
health status						
self-assessed health (0-4)	-0.041	(0.041)	0.015	(0.024)	0.093 ***	(0.026)
problem with ADL	-0.086	(0.146)	0.244 ***	(0.079)	-0.162 *	(0.090)
problem with IADL	0.005	(0.158)	-0.203 **	(0.086)	-0.287 ***	(0.100)
suffers a chronic disease	0.127 **	(0.064)	0.076 **	(0.037)	-0.041	(0.039)
bad mental health status	0.022	(0.061)	0.066 *	(0.036)	0.065 *	(0.038)
Constant	-8.323 ***	(2.512)	-3.351 **	(1.400)	-1.435	(1.526)
ρ_{12}	0.148 ***	(0.036)				
ρ_{13}	-0.010	(0.039)				
ρ_{23}	-0.095 ***	(0.023)				
Wald χ^2 test [a]	782.0 ***	p=0.000	495.2 ***	p=0.000	597.7 ***	p=0.000
number of observations	6043					
Loglikelihood	-8294.0					

[a] Wald-tests that all parameters equal zero (except the constant); in each equation a $\chi^2(35)$ distribution applies.
Robust standard errors; * p<0.10, ** p<0.05, *** p<0.01

The bottom lines of table 3 present the estimates of the ρ's, the correlations between the unexplained parts of the decisions. The estimates show that, after we have taken into account a variety of observable characteristics, the interaction between the three decisions through other unobserved factors remains important. In particular, ρ_{12} is significantly positive, suggesting that there are unobserved factors that increase both types of caregiving. A preference for caregiving by the women in our sample, but also traditional role models or habits may be at hand. Also Giménez et al. (2010, 2012) found a positively related effect of childcare and elderly care, when children are present while taking care of elderly there is a boost effect on the total time devoted

to caring. Likewise, ρ_{23} is negative, indicating that there are unmeasured factors that affect childcare and labor force participation in opposite ways. The relevance of unmeasured factors in the relation between elderly care and employment appears to be absent, ρ_{13} is small and insignificant. Childcare activities and labor force participation seem to bite each other in ways that we cannot capture with the observed variables, while on the other hand for LTC vs. labor no additional unobserved factors appear to have relevance.

One interpretation of the results is that the decisions to give care are primarily governed by needs factors, where traditional roles and expectations, as well as the household composition, are probably the most important underlying (but due to inherent measurement problems incompletely observed) driving forces. Economic factors are of a lesser importance, especially in the care decisions, so in this case it is not so clear that expansion of the provision of affordable LTC in the formal market could widely replace informal caregiving, since informal care provision is apparently for a large part an embedded habit.

4.1 Robustness checks

As a first robustness check we ran the analysis separately for respondents living with resp. without a partner. In the sample of respondents married or otherwise living together with a partner (4158 observations), the main difference with the results in table 3 is that the education effect for childcare activities is stronger, while for LTC the age pattern is more pronounced. In the labor force participation equation, the relevance of the labor history increases, while the access to medical services becomes less important, both suggesting that the (female) respondent's own labor opportunities are more important in couples. In general, the health effects become somewhat weaker. In the sample of single respondents (1885 observations), the needs effect on LTC is strengthened; especially the importance of having parents alive becomes much stronger, its size is about tripled. Such a shift is not found for childcare needs. For childcare activities, the age pattern becomes more pronounced, while the relevance of the age pattern for LTC disappears. In all equations, the little age effects found in the full sample, almost completely disappear for single respondents. The only large (and significant) education effect is a reduction of LTC activities for those with preparatory or higher education. In contrast, a larger amount of non-business assets obtains a larger and significant positive effect on LTC. In the labor force participation equation, the relevance of the labor history slightly decreases, while the access to medical services becomes more important. In contrast with the married women, the respondent's own labor opportunities seem to be less important for single women. Health status loses significance in LTC and participation, while stronger and larger effects are found in the childcare equation.

Caregiving responsibilities may also differ between age groups, as demonstrated by the age patterns estimated in table 3, for example because older women are traditionally less inclined to work and neither have parents that are alive. As a robustness check we ran the analysis separately for the younger women in our sample, aged 45-55, and for the older women, aged 55-70. The most important difference in the younger group (2564 observations) is that grandchildren have a stronger effect on the employment decision than is the case in table 3, while the presence of needy elderly parents or inlaws loses its significance as determinants of the childcare activities. On the other hand, the impact of being married becomes significantly positive in the childcare decision; its effects on the other decision becomes stronger. Siblings and the respondent's age lose relevance, while education seems even less important in the group of respondents aged between 45 and 55 than it was already in the full sample. The effect of the

socio-economic situation remains similar to the results in table 3, although a closer connection to the labor market in the past (more than 10 years of pension deposits) appears to have stronger positive impact on current labor force participation. Fewer health indicators maintain a significant effect, however the impact of adl and mental health on childcare and the effects of self-assessed health and iadl on participation become stronger than in the full sample. In the group aged 55-70 (3479 observations), the importance of parents in need of care becomes more important in the LTC and childcare decisions, while in this group also a negative effect on participation is found if parents cannot be left alone. In constrast, the significant effects of grandchildren on participaton found in the full sample are not observed in the older age group of respondents. Being married has a negative impact on childcare activities in this age group, contrasting the positive effect in the younger group and the insignificant result in the full sample. Also in this age group, siblings and age lose relevance, something that happens also with the locality size in the LTC decision (but not for childcare). In contrast with the younger age group, the impact of more than 10 years of pension deposits in the participation decision is less important –although still strongly significant– while the households' nonlabor income has a significantly negative effect on the respondent's labor force participation. As in the younger sample, few health effects show significance, and those that are significant are less strong than before.

A third robustness check is performed by separating the sample in urban areas with more than 100,000 inhabitants (3718 observations) and semi-urban and rural areas (2325 observations). Availabilty of extra-household services may be even more limited in rural areas than in large cities, while also the attitudes towards extra-household care may be more negative. However, migration from rural areas to the larger cities or to the USA may affect within-household care solutions. The results regarding elderly care needs are rather similar for urban and rural areas, with the exception of the care that is given when parents/inlaws live alone or with their spouse: the negative impact reported in table 3 is found (and magnified) only in urban areas, while in rural areas no effect is found. Apparently, in large cities, elderly living alone receive less care, which could be due to different attitudes but also due to larger distances and therefore fewer visits. Another difference is that the interaction between childcare giving and elderly in need of care is not found in urban areas. In rural areas the general effect on childcare activities of grandchildren in the household is larger than in urban areas, while the specific effects of children in young age groups are larger in urban areas. Altogether, this suggests that in large cities care is given only when necessary but that in rural areas a more general 'caring' attitude seems to exist. The (nearly) irrelevance of the respondent's health on caregiving activities could confirm this attitude. The impact of being married on LTC appears only in rural areas, while the effect of siblings is found only in urban areas. The negative impact of a marriage on labor force participation is much stronger in rural areas, which may reflect more traditional roles. Signifcant age effects are not found for the rural areas. In the subsamples we find significantly negative impacts of non-business assets (in urban areas) and of the household's nonlabor income (in rural areas) on labor force participation, although spousal labor income increases participation in rural areas. The absence of income and wealth affects in Table 3 is thus somewhat mitigated when we focus on urban and rural areas; differences in the labor market structure may be behind the different impacts.

Overall, the findings in the subsamples separated by household composition (married or single), by the age of the respondent, resp. by the degree of urbanization, are consistent with the findings reported in table 3 for the full sample.

5 Simulations

In order to give a clearer idea of the implications of the estimation results presented in the previous section, in this section we present simulations in which we compare the caregiving and labor decisions of typical persons and household situations, generating predictions based on the estimation results in table 3. The selected simulations reflect demographic trends that are observed in Mexico, and indicate how the caregiving and participation decisions at the individual level could change due to these trends. The results of the simulations are shown in table 4, varying one or more (individual) characteristic(s) at a time (by fixing it at a specific value) while using the observed values for all other characteristics to predict the three outcomes (using the estimates in table 3) for each respondent and calculate the average probabilities.

Also in Mexico, a trend of population aging has been initiated (Zúñiga Herrera, 2004). Population aging is reflected by a larger share of older people in the population and therefore a higher average age. Table 4 (panel A) shows that older people are less likely to give LTC or childcare, and are less likely to work. A higher average age also comes with relatively larger numbers of the 'eldest elderly' (over 80 years), whose children will have aged too and will less often have the characteristics or capacities to provide care for their elder parents, and in fact are more likely to be in need of care themselves.

Panel B of table 4 shows that with more parents alive but in such conditions that they need help and cannot be left alone, the probability of LTC activities increases from zero to one,[21] without effects for childcare activities, but at a (far from complete) trade-off with labor force participation. The reduction in labor force participation rates may seem minor in comparison with the increase of caregiving activities, but we should not forget that female participation in Mexico is already rather low (compared with other OECD and Latin-American countries (Arceo & Campos, 2010; Van Gameren, 2010), and that with an aging population, the share of working-age people will reduce. In that situation, the participation rate should increase to maintain the same production levels, something that is not observed in our simulations. Panel C shows that having more parents alive, also under the assumption that they are not in need of care, increases the probability that LTC is given, although not so dramatically as when care needs are reported. In an aging population, it becomes more likely that people aged between 45 and 70 years have living parents. However, as long as the parents are in good health and do not need care, the negative effects on the labor force participation are not very pronounced. The results suggest that it is important that the process of an aging population is accompanied by health improvements. Hence, what is required is a growth in the number of years in good health, more than a longer life expectancy on itself.

A counterforce for the increasing LTC needs due to a larger share of elder people is formed by a prospective reduction of the number of young people. Table 4 (panel D) shows the implications of fewer and older grandchildren in the respondent's household. Obviously, the stronger effects are found for the childcare activities; both the reduction of the number of grandchildren and the older age of the grandchildren imply a strong reduction of childcare. This appears to give rise to very minor increases in LTC activities, and to a somewhat more substantial growth of the labor force participation rates.

[21] The combination of the means of the other variables lead to LTC caregiving predicted slightly above zero in the case of zero parents alive; in our joint model estimation we do not explicitly force it down to zero.

Table 4 Probabilites of LTC, childcare, and employment

	Pr[LTC]	Pr[CC]	Pr[LFP]
Panel A: Age			
45	0.067	0.493	0.406
50	0.080	0.505	0.368
55	0.083	0.498	0.314
60	0.074	0.474	0.247
65	0.058	0.432	0.176
70	0.038	0.373	0.111
Panel B: Number of parents alive (in need of care, cannot be left alone)			
0	0.020	0.472	0.294
1	0.234	0.469	0.269
2	0.735	0.465	0.245
3	0.977	0.462	0.222
4	1.000	0.459	0.200
Panel C: Number of parents alive (in good health without care needs)			
0	0.020	0.472	0.294
1	0.035	0.477	0.284
2	0.058	0.482	0.274
3	0.091	0.487	0.265
4	0.137	0.492	0.255
Panel D: Number and age of grandchildren in household			
3 grandch., <5 yr.	0.063	0.771	0.237
3 grandch., 5-11 yr.	0.066	0.677	0.264
3 grandch., 12-17 yr.	0.074	0.538	0.348
1 grandch., <5 yr.	0.071	0.548	0.271
1 grandch., 5-11 yr.	0.072	0.510	0.280
1 grandch., 12-17 yr.	0.075	0.462	0.308
Panel E: More and healthier parents, fewer and older grandchildren			
A[a]	0.197	0.763	0.222
B[a]	0.315	0.514	0.293
C[a]	0.090	0.471	0.287
Panel F: As in panel E but for different formal labor histories			
A[a], never contrib. (informal)	0.201	0.767	0.190
B[a], never contrib. (informal)	0.320	0.518	0.258
A[a], 10-25yr with contr. (formal)	0.194	0.737	0.479
B[a], 10-25yr with contr. (formal)	0.312	0.481	0.569

a Scenario A: One parent alive, in need of care and cannot be left alone, three grandchildren aged under 5 in the household. Scenario B: Three parents alive, of which only one with care needs while all can be left alone, one grandchild aged 12-17 in the household. Scenario C: Same as scenario B, except that none of the parents have care needs.

The simulations in panel E of table 4 suggest that the increased LTC needs due to more parents alive (as indicated by panels B and C) is not necessarily offset completely by expected health improvements of the parents and by smaller numbers of young grandchildren (a full compensation is found only if none of the parents need care). The smaller number of grandchildren and their older age drastically reduce the probability that women aged 45-70 are expected to be active in childcare activities. However, the increase in the labor force participation rate does not match the reduction of caregiving activities, especially not in the scenario with more living parents when all of them are in good health without care needs, suggesting that care and work activities do not unambiguously compete for time among middle-aged Mexican women. Other reasons such as traditions and attitudes regarding work may be expected to be important, similar to what has been found for external childcare usage and labor force participation in the Netherlands (Van Gameren & Ooms, 2009; Van Gameren, 2012).

Even though the concurrent economic factors of wealth and spousal income appear not to be relevant, the formal labor history as indicated by the pension deposits was found to be important. Panel F shows scenario E separately for women who have been more attached to labor market in early years (last two lines, between 10 and 25 years of contributions) and for

those who have not been attached to the formal labor market (first two lines, never made pension deposits). Women with a strong connection to the formal labor market are much more likely to continue their participation in the labor market than the women who have not worked formally before. The labor market history on itself does not affect the incentives for caregiving, the probabilities of childcare and elderly care reported in panel E remain rather similar when calculated separately for the labor market connection, but in combination with the other demographic trends, the observed changes in the labor force participation of Mexican women, nowadays participation among young women is much higher than for the generation in our data, will have important consequences for the availability of caregivers that may go beyond what we can highlight with our analysis.

Note that we do no impose restrictions on the feasibility of the simulated outcomes; it is a partial result under the assumption that there are no changes in the behavioral reactions, in the household's environment, and in other circumstances. Hence, the results are purely indicative of what could happen if there are no other changes. In particular, feasibility will depend on the drastically changing shares of the various age categories in the population; a lower individual propensity of women aged 45-70 to provide LTC might not be tenable if the number of elderly with care needs increases faster than the number of women aged 45-70.

6 Conclusions

In this paper we have analyzed the interaction between labor force participation, care responsibilities with respect to the parents (known as elderly or long-term care), and supportive activities given to the (grand)children for Mexican women aged among 45 to 70 years. Although labor force participation and caregiving activities compete for the scarce time of many people, especially for the generation in which care for aging parents comes together with care for (grand)children, from our theoretical review we learned that there is only a small literature that combines the analysis of those decisions. On the one hand, there exists a rich literature regarding childcare and labor force participation, generally focused at the costs of and subsidies for formal childcare services, aimed at the analysis of the labor force participation decision of women with young children. On the other hand, an increasingly rich literature is found that analyzes the role that informal care responsibilities towards the elderly parents play for middle-aged women. These two streams show little overlap, although there are some publications that combine the three decisions emphasizing the role of setting an example for the children as a motive to give long-term care. Other motives such as altruism or the prevailing social norms and values may be equally valid or more relevant than setting an example per se, especially in a society like Mexico, where a tradition of extended families in which several generations live together in combination with limited availability of affordable (public or private) long-term and childcare facilities, implies a large dependence on informal elderly and childcare.

We have estimated a reduced form seemingly unrelated regression (SUR) model of the three binary decisions at hand, using data from the first wave of the Mexican Health and Aging Study. We do not impose, and neither intend to analyze, the causal structure, given that we have no legitimate idea about the order in which labor and care decisions are taken.

The results suggest that care needs are the driving force behind the caregiving activities, much more than the economic situation. Having parents or in-laws alive strongly increases the probability that long-term care is given, with a small effect on childcare activities but no impact

on labor force participation. The existence of young grandchildren raises the probability that the respondent performs childcare activities, while it slightly reduces the probability of labor market activities. Hence, care needs have a strong effect on the care activity that it requires, but also some effect on other activities. Traditional roles that prescribe that the women provide care when necessary appear to be relevant. For the elderly care this seems to hold especially in smaller communities, while supporting the children with childcare activities is found more in larger communities. Tradition is also reflected in the labor force participation decision: married women have a much lower probability to participate than unmarried women. The economic situation mainly enters in the participation decision, for which we find that women who had a close connection with the formal labor market earlier in their life are more likely to work. The formal labor market connection however has no effect on caregiving, giving rise to a potential double burden of care and work for those women. The relevance of the earnings capacity is not evident when we consider the educational levels, but may be linked to the health status. Women who report better health (fewer health problems) are more likely to be active in the labor market, while they are less likely to perform care activities, in particular childcare. Hence, despite the strong role of care needs, there are several characteristics that point toward the interdependence between the three decisions at hand. Apart from the observable characteristics, we find indications that there are other (unobserved) characteristics that increase both caregiving activities, and that have opposing effects on long-term care and participation.

With simulations of demographic changes in Mexico, reflecting the aging population, we illustrate potential effects for future caregiving and participation rates. Although the Mexican society is still rather young compared to many (Southern) European countries, the onset of an aging population is observable, with reductions of both the fertility and the mortality rate. A scenario with more parents alive, but in better health than the elderly in our sample, in combination with fewer but older grandchildren, is likely to reduce individual long-term care and childcare needs but lead to only a small increase of labor force participation rates. Increased participation rates can be expected if future generations of women have a stronger connection to the (formal) labor market.

Informal care provision is apparently largely needs-driven while socio-economic factors have limited impact. Hence, an expansion of the affordable (public) provision of elderly care and/or childcare may have relatively small consequences on caregiving and work decisions and therefore on the burden involved. Nevertheless, we have to be aware that for the scenarios we assume the absence of behavioral changes of the generation in the middle, something that is unlikely in the longer run. Drastically changing shares of the age groups in the population, in particular a faster increase in the number of older elderly in need of care than in the number of women available for caregiving activities, combined with increases in the labor force participation rates of younger women, may imply that the current informal care activities are not tenable and that behavioral changes are unavoidable. That the expansion of public support may lead to the reduction of private or informal support has been show in various countries. Mexico is not likely to be different; results by Juarez (2009) indicate that the expansion of public pension transfers nearly fully crowded out private financial support given to the elderly. Additionally, the availability and accessibility of more services for elderly and children may have an effect on the quality of life and the well-being of those caregivers who feel burdened by their care tasks, especially for those who combine the care with paid work or feel forced to consider the take-up of both care and work. Traditions, attitudes, and opinions with respect to caregiving may change and more room for and need of external (public or private) services could be the consequence.

For that to be successful, not only the affordability but also the quality and safety of the services must be guaranteed.

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