Women's Employment Status and Hours Employed in Urban Brazil: Does Husbands' Presence Matter?

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Abstract. The determinants of hours worked for employed women in developing countries is a little-studied topic. We compare the determinants of employment with the determinants of hours worked for prime-aged urban Brazilian women with and without husbands present. Given employment status, we find systematic differences for women in couple-headed and female-headed households. For the former, the same variables that affect employment do a good job of explaining hours worked. In contrast, our model generally fails to capture determinants of variation in hours worked for women who are sole heads of households. Sample selectivity functions in opposite directions for the two groups.

1. Introduction

The presence and labour force status of spouses are of critical importance for the well-being of individual adult men and women, their children, and the families to which they belong. In this paper we examine the employment status and hours worked of urban Brazilian women, conditional on the presence or absence of a male spouse or partner.

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While estimation of hours of employment for women in industrialized countries has been a central focus of modern labour economics, studies of women in developing countries have tended to focus on the determinants of employment or labour force participation, rather than on the number of hours worked by those who are employed.[1] We can think of a number of good reasons for this emphasis on participation: (1) empirically, a strong time trend toward greater participation of women in the labour market exists in many parts of the world, certainly in Latin America, so it is a behaviour of contemporary relevance; (2) researchers may trust employment data more than information on hours worked; (3) theoretically, women's employment in the labour market may be accompanied by a change in status or power in the household; and (4) in highly structured segments of the labour market, where hours are determined by the employer, participation may be the only real choice. However, there are equally compelling reasons why one might be interested in hours of employment. First, a substantial number of hours worked may change other family time allocations much more than a small number of hours worked. Second, excessive hours worked, especially at low wages, are an indicator of economic stress, particularly given women's 'second shift' in home and community work. Time is the fundamental resource for poor families with few other resources. In addition, determinants of hours worked may differ from determinants of participation due to institutional factors and fixed costs related to employment but unrelated to hours. Finally, analysis of the determinants of hours of employment allows us to estimate the elasticity of labour supply with respect to changes in the wage rate, which may be useful for predicting changes in labour supply brought about by changes in public policy. An exclusive focus on the determinants of women's labour force participation or employment precludes full consideration of these important dimensions of women's time allocation and well-being, and of the labour market more generally.

Throughout this paper we distinguish between women whose husbands (including unmarried partners) are present and those who do not have husbands present in the household and who are, therefore, sole heads of households. We argue that this distinction is theoretically relevant, although it also raises concerns (discussed below) related to the endogeneity of household structure and sample selection bias. The theoretical arguments linking the

presence of a husband and women's labour market activity take two forms (DeGraff and Bilsborrow, 1993). The first concerns household access to resources. Beyond their own income-generating capacity, husbands who are present represent increased full household income in ways which interact with many, if not most, other household- and individual-level determinants of women's employment and hours worked. That is, the presence of husbands is likely to indicate a completely different household resource set, such that marginal trade-offs are evaluated at a different point on the household utility function. With respect to time use, for example, the presence of a husband may create opportunities for specialization that do not exist in a household with a sole female head.

In addition, women who are sole heads of households are expected to face a very different set of choices and conditions in terms of access to social resources and support networks than do women with husbands present. In many cultures, women have primary responsibility for building and maintaining kin and community relations.[2] Networks incorporate kin of both spouses, neighbours of the family, and labour force contacts (such as employers and fellow employees) of family members. Kin and community networks provide additional resources in times of need, but the obligations attendant to such networks may also act as additional constraints. Women with young children are in a part of the lifecycle in which they are more likely to be net recipients than net donors of kin and/or community resources. While we are unable to observe such transfers, evidence in the headship literature suggests that access to kin and community resources differs systematically by husband's presence.[3] Splitting the sample by headship status allows us to draw some speculative conclusions about these unobservable influences.

The second theoretical link pertains to control over the allocation of resources within the household. Quisumbing *et al.* (1995) summarize evidence showing that what resources households have are allocated differently depending on the degree to which they are under the control of men and women. In particular, women tend to allocate a greater proportion of household resources to children's education and health than do men. Although we cannot capture power differentials in this analysis, women who are sole household heads are almost certainly not sharing decision-making authority to the extent that women with husbands present must be.

A substantial number of recent studies provide evidence of systematic differences between couple-headed and female-headed households across a variety of labour market and other household behaviours and conditions from a number of developing countries, including several in Latin America.[4] For Brazil, a recent paper by Barros *et al.* (1997) indicates substantial differences in measures of household well-being across headship status in urban areas, although it does not analyse associated differences in women's labour force activity. Moreover, exploratory analysis of our data showed a striking difference in the mean probability of employment between women in these two categories and a very strong positive effect of being a female head of household on hours of work. Thus, we expect that there are important interactive effects between headship status and other explanatory variables in the determination of employment and of hours of work that require splitting the sample in this way.

This paper compares the determinants of employment with the determinants of hours of employment for a large sample of prime-aged urban Brazilian women who are considered heads of households or spouses of heads of households.[5] We find that while many characteristics affect both decisions similarly, there are substantial differences between the two decisions. For example, the presence of potential care givers for young children in the family other than the mother affects the probability of employment but does not affect hours worked conditional on employment. In addition, we find important differences in the determinants of labour supply according to husband's presence, differences which suggest that while we know much about the determinants of the labour supply behaviour of women with husbands, our understanding of the labour supply of women who are sole household heads is relatively limited.

The remainder of the paper proceeds as follows. Section 2 provides information on the Brazilian setting and takes a descriptive look at employment probabilities and hours worked for urban Brazilian women. Section 3 discusses the theoretical model and econometric issues relevant to the estimation of labour supply models. Section 4 summarizes the results of our multivariate estimation of employment and hours, comparing estimated determinants of employment and of hours worked for subsamples of women with and without husbands present, and considering differences between the two subsamples in the determinants of labour supply. Section 5 concludes with a brief summary and agenda for further research.

2. Employment and hours worked by women in urban Brazil

The data used in this study come from the 1985 Pesquisas Nacional de Amostra de Domicílios (PNAD), which is an annual national household survey produced by the Brazilian census bureau, the Fundacão Instituto Brazileiro de Geografia e Estatística (IBGE). The PNAD provides information on labour force participation, hours worked, and earnings in conjunction with standard demographic characteristics. The samples are quite large, allowing us to include very detailed family composition information for over 38,000 households. Since we expect family composition to affect employment and hours worked, the large sample size of the PNAD represents one of the strengths of this data. In addition, the data is known to be of very high quality, from sampling design to enumeration to post-enumeration processing.

One drawback of the PNAD data is that it does not distinguish between couples who are formally married and those who are not. However, such distinctions are less clear in Brazil, where 'many women and men opt to form informal or consensual unions; [and those in] formal unions may be married by the church, the state, or both' (Greene and Rao, 1991; p. 3). Moreover, many couples in consensual unions refer to each other as 'husband' and 'wife' (Greene and Rao, 1991). Our analysis, therefore, includes women living with an unmarried male partner among those with husbands present.

Urban Brazil in 1985 provides an interesting context in which to analyse determinants of women's employment and hours worked. Rapid economic development and changing demographic patterns in the post World War II era have led to substantial changes in family life for Brazilians, especially for Brazilian women. On the labour demand side, increasing urbanization and industrialization imply increases in the opportunities for employment for Brazilian women. On the labour supply side, fertility has declined rapidly, which should also lead to increased employment and hours of employment. At the same time, the percentage of households that are 'extended', that is, that include relatives in addition to the nuclear family, has fallen. In 1960, 22.6 percent of households were 'extended', while in 1984, 14.1 percent were 'extended' (Goldani, 1989). All else constant, we expect this change should lead to a decrease in adult women's employment and perhaps hours if extended family members had been substituting for mothers' time in home production, particularly in child care responsibilities.

As in most of Latin America, there is a clear trend towards increased employment among women in Brazil (Psacharopoulos and Tzannatos, 1993). In the state of Sao Paulo, for example, the female employment rate rose from 30.9 percent in 1971 to 35.0 percent in 1979 and reached 40.4 percent in 1987 (Costa, 1990). Lam and Levison (1997, Figure 6) also show an increase in employment rates from 1976 to 1990 for women in each of four age groups, ranging from age 20 to 49. In our data, the percentage of urban Brazilian women aged 15–55 who are employed is 41.8 percent (see Table 1).[6]

There is substantial variation in urban Brazil in the number of hours worked by prime-aged women who are employed.[7] Table 1 shows the distribution in broad hours categories as well as mean hours employed for all women and for women with and without husbands present. Women with husbands present are much less likely to be employed (36.8 percent), compared to women without husbands present in the household (70.7 percent). Of those women who are employed, women with husbands work a slightly smaller mean number of hours. In addition, of those women who are currently employed with husbands present, 8.0 percent work fewer

Table 1. Distribution of hours worked for women aged 15–55, metropolitan Brazil 1985

Hours	All employed women	Employed women with husbands present	Employed women without husbands present
1–9	1.9	2.2	0.8
10–19	5.1	5.8	2.7
20–29	12.3	13.8	7.6
30–39	15.4	16.4	12.5
40–49	47.9	46.4	52.5
50–59	8.5	7.5	11.5
60–69	5.7	4.8	8.7
79–79	2.4	2.3	2.9
80+	0.8	0.8	0.8
% employed	41.8	36.8	70.7
Mean hours worked	36.8	35.7	40.2
S.D. hours	13.9	14.1	12.8
n	16,791	12,655	4,136

than 20 hours per week while 61.8 percent work 40 or more hours per week and 7.9 percent work 60 or more hours per week. The comparable numbers for women who are sole heads of households are 3.5 percent, 76.4 percent, and 12.4 percent. Figure 1 depicts a more detailed hours distribution for the two subsamples of employed women, which again illustrates the greater concentration of employed women without husbands present at the upper end of the hours of work distribution. Thus, not only are women household heads much more likely to be employed, they also work longer hours when employed. While the raw data exhibit some lumping on 30, 40, and 50 hours, there is no clear cutoff between full-time and part-time employment for either group.

Figure 2 expands our understanding of the hours of work distribution by examining how hours of employment differs by presence of young children, an important focus of our research. Women with children under the age of seven are less likely to be employed (36.9 percent versus 45.7 percent, on average) and, if employed, work slightly fewer hours than women without young children (35.0 hours versus 36.8 hours per week). This general pattern holds both for women with and without husbands present.

Figure 1. Hours of work for women with husbands present and without husbands present, metropolitan Brazil 1985

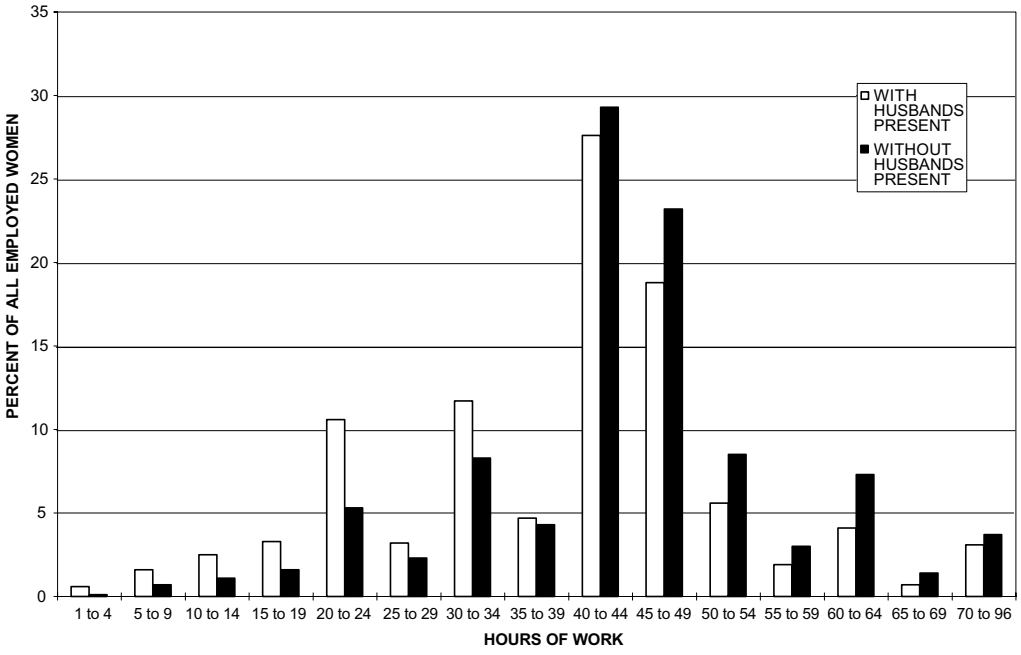
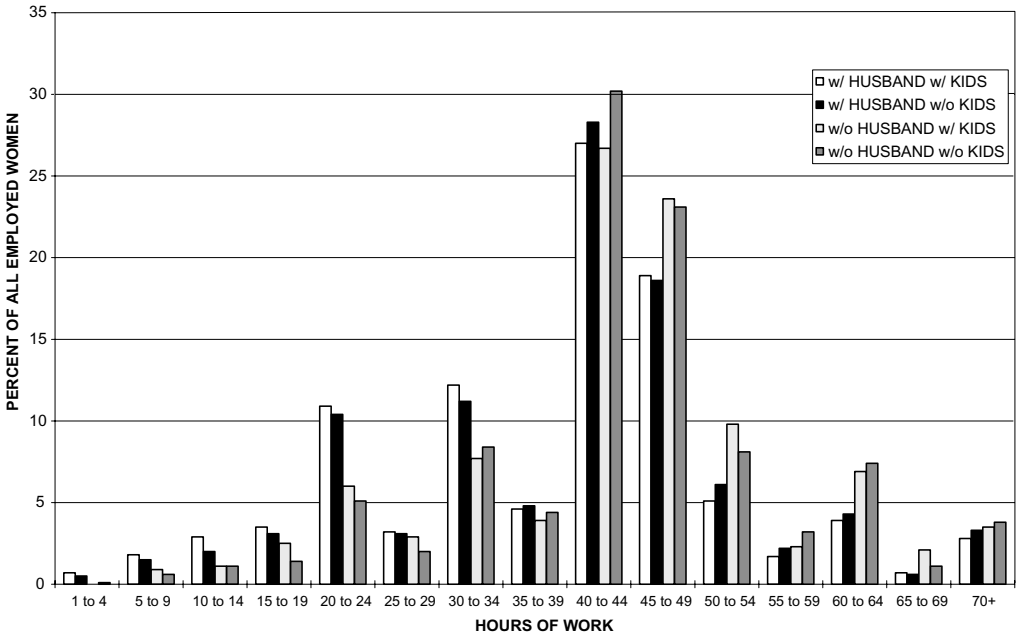


Figure 2. Hours of work for women with and without husbands present, by presence of children under the age of seven, metropolitan Brazil 1985



3. Issues in estimating labour supply

The theoretical foundation for our estimation of labour supply relies on a utility-maximizing framework (see Connelly *et al.* (1996a) for a more detailed description of the theoretical model). We model the female head/spouse's choice regarding employment and hours worked as a function of her market wage offer and other individual and household characteristics. Her labour supply decision is derived from a family utility function which includes family consumption and the well-being of children. Household composition is taken as given, as is the labour supply of adult men in the household; the labour supply of female household members and of male youth is considered endogenous.[8] Family utility is maximized subject to time constraints of all adult women and all youth in the household, both male and female, and subject to a household's resource constraint which includes non-labour income and labour income of all adult men. Given our assumptions about labour supply, the labour income of all females and of male youth is considered endogenous, while the labour income of adult men and non-labour income is considered exogenous.

The presence of young children in the household also imposes a constraint on the model because we assume young children must be cared for at all times. As a result, the family makes decisions not only about each adult woman's labour supply, and all teenagers' labour supply, but also about the care of young children. One of the outcomes of this theoretical model is that the woman's options are influenced by the availability of alternative sources of child care. Based on our assumptions, all teenagers, all adult women, and any unemployed adult men are considered potential child care providers. The presence of individuals who may take on income earning roles, household production roles, and child care roles is thus a crucial determinant of women's labour market behaviour, both participation and hours worked.

We expect the factors affecting women's labour supply to differ in fundamental ways depending upon the presence of a husband, for the theoretical arguments discussed above. Constructing subsamples which distinguish between women with and without husbands present in the household, however, raises concerns related to the endogeneity of household structure and sample selection bias. Methodological difficulties can arise if (1) women simultaneously determine whether or not they live with a male partner and their labour force status and hours worked, and/or (2) unobservables differ across women in ways that are correlated with husband's presence. This is the case if women with male partners present are systematically different from women with no male partner present in the household, in ways which affect women's employment status and hours worked but are not captured by observables. We are unable to address either concern here, due to a lack of identifier variables with which to estimate a husband-present equation. Nor are we persuaded that these are serious problems: while some women in our sample have undoubtedly chosen not to 'marry,' many other women in Brazil who are sole heads of households are widowed or abandoned. Although there may be unobservables that are systematically related to widowhood or abandonment, there is likely to be a large random component to these outcomes.

Moreover, as we argue elsewhere, the theoretical simultaneity of household structure (in this case, husbands' presence) and women's labour force activity arises through a recursive *stochastic* dynamic programming problem. Even if women make joint decisions about labour supply and 'marriage' at one point in time, the endogeneity of husbands' presence to their labour supply in the future may be muted. Random events, uncertainty, and rapidly changing

economic structures — especially in developing countries — make the distribution of a household's economic state at some future time extremely diffuse. The number of widely differing possible outcomes increases exponentially as the elapsed time between the decisions widens. This has the effect of both reducing the value of joint decision making and of introducing exogenous factors which may overwhelm the effects of persistent sources of endogeneity and dampen the effects of time-dependent sources of endogeneity (Connelly *et al.*, 1999).

In the empirical specification of the women's labour supply function we assume that the function for each subsample — women with husbands present and women without husbands present — can be approximated as a continuous latent variable in a linear form.

$$H_{ij}^{*} = \beta_j' X_{ij} + \varepsilon_{ij} \qquad [1]$$

where H^* is defined as the woman's desired number of hours employed, X_j is a set of explanatory variables for each subsample, $j = 1$ or 2, and ε_{ij} is a stochastic term which is assumed to follow a normal distribution with mean zero and standard deviation σ_j. Because a substantial proportion of observed hours are zero, we differentiate between desired hours, H^*, and actual hours, H, and recognize that ordinary least squares is not an appropriate estimation strategy. Focusing on the nonzero observations, $H > 0$, we can write equation [1] as:

$$H = 0 \quad \text{if} \quad H^* \leqslant 0; \qquad H = H^* \quad \text{if} \quad H^* > 0, \qquad \text{and}$$

$$\begin{aligned} E(H_{ij} \mid H_{ij} > 0) &= E(H_{ij}^{*} \mid H_{ij}^{*} > 0) \\ &= \beta_j' X_{ij} + E(\varepsilon_{ij} \mid \varepsilon_{ij} > -\beta_{j'} X_{ij}) \\ &= \beta_j' X_{ij} + \sigma_j \frac{\phi[(\beta_{j'}/\sigma_j) X_{ij}]}{\Phi[(\beta_{j'}/\sigma_j) X_{ij}]} \end{aligned} \qquad [2]$$

where ϕ is the probability density function and Φ is the cumulative density function of the standard normal distribution. This equation can be estimated with a two-stage procedure as outlined in Maddala (1983), or using maximum likelihood estimation. The maximum likelihood estimation is usually referred to as a Tobit.

Mroz (1987) and Zabel (1993) both argue that the Tobit estimation of hours worked is a highly restrictive model. The

model implied by equation [2] is one in which the decision to participate in employment and the choice over the number of hours worked are, in fact, the same decision. In this model, employment is simply being in the state of $H > 0$. While, of course, the employment decision and the hours worked decision are closely linked, there is reason to believe that the association is not strong enough to warrant the restrictions that the Tobit places on the coefficients. For example, labour demand-side restrictions, such as minimum hours of work expectations on the part of employers, would cause the hours of work decision to differ from the employment decision. Moffit (1982) finds that 83 percent of the American men in his sample were constrained by the minimum hours requirement. Zabel (1993) finds that 66 percent of his sample of married women in the USA were constrained by minimum hours and that the average minimum hours constraint was at approximately 28 hours per week.

Positive costs of employment can also cause the employment decision to differ from the hours decision. Jacoby (1993) notes, in his study of family labour supply in the Peruvian Sierra, that transactions costs related to employment may dissuade the supply of a small number of hours to the labour market. Cogan (1981) estimates a model of labour supply of white, married women in the USA that includes a fixed cost of employment and finds that including such costs helps to explain why relatively few people work just a few hours a week. Cogan's results show a discontinuity in the hours equation at about 24 hours a week. Zabel's estimates are remarkably similar to Cogan's. Finally, non-wage compensation such as benefits can create thresholds in the hours of work distribution. Some desirable benefits come with employment at any number of hours. Others may be withheld until a minimum number of hours criterion has been met. This practice would also drive a wedge between the employment decision and the decision on hours worked.

Since both the cost of employment argument and the minimum hours argument imply that the hours of work decision should be modelled separately from the employment decision, we model hours of employment using a generalized Tobit specification characterized by:

$$H_{ij} = \beta_j' X_{ij} + \sigma_j \rho_j \frac{\phi(\alpha_j' Z_{ij})}{\Phi(\alpha_j' Z_{ij})} + \upsilon_{ij} \qquad [3]$$

for those women who are currently employed, where Z are the determinants of participation in employment and ρ_j is the correlation between ε_{ij} and the stochastic component of the participation equation.[9] For employed women, v_{ij} has the desirable properties of a mean of zero and is independent from the explanatory variables. The $\phi(\_)/\Phi(\_)$ term is referred to as the Inverse Mills Ratio.

This model does not directly identify the cause of the difference between participation in employment and the hours worked decision, but simply allows all coefficients to differ across the two. The standard Tobit estimation can be characterized as the restriction that α_j is proportional to β_j in equation [3]. Both Mroz and Zabel test these restrictions against the unrestricted generalized Tobit and both studies reject the restrictiveness of the Tobit model for married women's labour supply in the United States.[10]

Although the results from Mroz and Zabel are quite strong in favour of the generalized Tobit, we did not simply assume that these results would carry over to Brazil. There are several reasons why we might expect the standard Tobit to be appropriate in the Brazilian case. There should be fewer institutional constraints in Brazil (and in any developing country labour market) because of the substantial informal sector. Fewer institutional constraints suggest that the hours choice and employment choice could well be one decision. Also, costs of employment (Cogan's main focus) may be lower in Brazil than in a more industrialized country. For example, while a lack of transportation infrastructure would lead to higher monetary costs of transportation to work in many developing countries, this is not likely to be the case in urban Brazil, where public transportation is well-developed. In addition, there may be relatively lower child care costs. Levison (1990) and Connelly *et al.* (1996b) find that a substantial amount of child care is provided by family members, mainly daughters and other female relatives, which leads to lower fixed costs of employment and perhaps to a greater willingness to work a small number of hours. All these factors argue in favour of the standard Tobit specification in Brazil. On the other hand, a job in the formal sector in Brazil is an important employment goal since formal sector employment confers a sizeable package of welfare benefits including social security and health care for the family. Because such benefits are not contingent upon the hours of work, the employment decision and the hours of work decision may in fact be distinct. Long commutes to work, common in Brazilian cities, could also lead to a

disjunction in the determinants of employment and hours worked by creating a large fixed time cost of employment.

Since the standard Tobit model is a special case of the generalized Tobit, we estimate both models for each subsample, using the two-step estimator, and perform the log-likelihood test. The null hypothesis is that the standard Tobit restrictions hold. Both the log-likelihood tests are rejected: the less restrictive generalized Tobit is a better fit for urban Brazilian women than the standard Tobit model. Thus, while there is more variation in the number of hours worked by women in urban Brazil than in the USA, there still appear to be institutional constraints, fixed costs of employment, fixed availability of employment benefits and/or other factors that drive a wedge between the decision to be employed and the decision regarding the number of hours to work. The results presented in the following sections are, therefore, those from the generalized Tobit specification using the two-step estimator (see note 10); we compare the employment equation to the hours worked equation for insights as to what may be driving the difference.

4. Comparing the determinants of employment and hours worked

Appendix Tables 1 and 2 present the unweighted means and standard deviations of all variables used in our analysis by subsample and for each model estimated. Although there are many variables, they fall into six basic categories: (1) characteristics of the woman (age, education and the natural logarithm of her estimated wage);[11] (2) measures representing current income and permanent wealth including 'family income' ('family income' is the natural logarithm of current 'exogenous' per capita annual family income which is defined as labour income of men aged 20 or older and non-labour income of the household), 'family benefits' (whether there is a male family member in a formal-sector job that provides benefits for family members),[12] and the presence in the house of a water filter, private indoor toilet, and connection to a sewer system; (3) characteristics of the husband, if present (a dummy variable indicating whether unemployed and another indicating whether self-employed); (4) the number of children at various ages who require care, differentiated between own children and the children of relatives; (5) the presence of potential alternative care givers, including own children aged 7 or older,

female relatives aged 7 or older, male relatives aged 7–19, and unemployed men over 19 years of age; and (6) a set of metropolitan region dummy variables.

Table 2 compares the marginal effects of this vector of observable characteristics on the decision to be employed and on the hours of employment decision for women with husbands present, while Table 3 does the same for women who are sole heads of households. Since the units of analysis are different for the probability of employment and the number of hours employed per week, we do not directly compare the magnitudes of the derivatives. We instead comment on the signs and significance of the estimated effects. We also compare the hours equations across subsamples based on husband's presence; here magnitudes of the derivatives are relevant.[13]

Women with husbands present

The results of the employment equation for a joint sample of prime-aged women with and without husbands present were discussed in detail in Connelly *et al*. (1996a), and are reproduced

Table 2. Women with husbands present, metropolitan Brazil 1985

	Employment model		**Hours model**	
	Partial	***t*-statistic**	**Coefficient**	***t*-statistic**
Constant	−6.716**	35.711	14.984	1.121
Predicted ln wage	1.199**	33.021	4.094*	2.015
Age	−0.019**	14.397	−0.186**	4.780
Education	−0.150**	19.425	−0.760**	2.759
Water filter	−0.078**	4.280	−0.995**	2.904
Private indoor toilet	−0.106**	4.070	0.350	0.712
Sewer system	−0.009	0.470	−0.286	0.916
Family income	−0.192**	23.226	−1.254**	3.665
Family benefits	−0.082**	3.980	−0.330	0.841
Husband unemployed	−0.200**	6.746	−0.197	0.310
Husband self-employed	−0.021	1.094	1.157**	3.644
Number of children aged:				
0–1	−0.383**	21.490	−2.936**	3.936
2–4	−0.165**	12.677	−2.137**	5.883
5–6	−0.136**	8.620	−1.732**	4.888
Number of relatives aged:				
0–4	0.037	0.399	0.647	0.397
5–6	−0.421**	2.962	1.822	0.603

Table 2. *Continued*

	Employment model		Hours model	
	Partial	***t*-statistic**	**Coefficient**	***t*-statistic**
Number of daughters aged:				
7–9	−0.052**	2.884	−1.298**	4.135
10–14	0.025	1.690	−0.052	0.209
15–19	0.011	0.673	0.513	1.783
20–24	−0.085**	3.418	−1.132*	2.400
Number of female relatives aged:				
7–9	0.351*	2.301	2.023	0.844
10–14	0.197*	2.572	1.709	1.349
15–19	0.194**	3.350	3.226**	3.314
20–24	0.187**	2.724	3.040**	2.807
Number of adult women aged:				
25–54	−0.050	1.367	0.657	0.987
55–64	0.074	0.977	1.458	1.216
65 and older	0.104*	2.191	1.039	1.330
Number of sons aged:				
7–9	−0.091**	5.145	−1.063**	3.133
10–14	−0.016	1.148	−0.724**	2.992
15–19	−0.032*	2.000	0.183	0.657
Number of male relatives aged:				
7–9	0.052	0.316	0.690	0.239
10–14	−0.099	0.880	−0.564	0.276
15–19	0.014	0.190	−1.621	1.308
Number of unemployed men aged:				
20–64	−0.142**	3.802	−2.796**	3.809
65 and older	−0.145	1.372	−2.210	1.183
Inverse Mills Ratio	—	—	6.187**	2.283
n	33,108		12,594	
Log likelihood	−19,969.7		−50,983.2	

*Significant at 5% level, **Significant at 1% level.

Notes: For all tables, the following notes and definitions apply. Metropolitan area results are excluded but available from authors upon request. The metropolitan areas used are as follows: São Paulo, Rio de Janeiro, Curitíba, Porto Alegre, Fortaleza, Recife, Salvador, Belém, Brasília, and Belo Horizonte (the omitted category). 'Family income' is defined as household income minus the earnings of all female household members and earnings of male household members under 20 years of age. It is converted to a per capita measure and is in minimum salary units. It is then converted to the natural logarithmic scale. At the time of the PNAD-1985 survey, one minimum salary was 333,120 Cruzeiros, or US$44.57 at the official exchange rate. It is possible for the resulting variable to be negative because per capita income in minimum salary units can be less than one. 'Family benefits' is set equal to one if any male member of the household holds a formal sector job which provides benefits for family members, and is set to zero otherwise. 'Husband unemployed' equals one if husband is present and is unemployed or employed less than 20 hours per week, and equals zero otherwise. 'Husband self-employed' equals one if husband is present and is self-employed or an employer, and equals zero otherwise.

Table 3. Women without husbands present, metropolitan Brazil 1985

	Employment model		Hours model	
	Partial	***t*-statistic**	**Coefficient**	***t*-statistic**
Constant	−10.686**	8.230	64.757**	5.082
Predicted ln wage	1.593**	8.067	−1.817	0.956
Age	−0.024**	7.334	−0.073	1.935
Education	−0.175**	5.181	−0.177	0.549
Water filter	0.011	0.234	0.224	0.460
Private indoor toilet	0.008	0.136	−0.172	0.288
Sewer system	0.012	0.236	−0.809	1.555
Family income	−0.409**	30.841	0.116	0.432
Family benefits	0.521**	9.053	1.275	1.571
Number of children aged:				
0–1	−0.238**	0.043	0.261	0.324
2–4	−0.142**	2.675	−0.550	1.043
5–6	−0.051	0.877	−0.613	1.053
Number of relatives aged:				
0–4	−0.038	0.365	0.574	0.445
5–6	0.025	0.146	−0.799	0.405
Number of daughters aged:				
7–9	−0.094	1.495	−0.390	0.618
10–14	0.053	1.208	0.982*	2.207
15–19	−0.086*	2.094	0.226	0.483
20–24	−0.155**	2.935	0.662	1.042
Number of female relatives aged:				
7–9	−0.104	0.419	3.715	1.097
10–14	0.053	1.208	−1.455	0.805
15–19	−0.086*	2.094	−0.270	0.263
20–24	−0.155**	2.935	−0.083	0.090
Number of adult women aged:				
25–54	−0.213**	4.069	0.703	1.217
55–64	0.162	1.043	0.834	0.643
65 and older	0.200*	2.156	0.654	0.682
Number of sons aged:				
7–9	−0.056	0.901	−1.169	1.877
10–14	−0.012	0.295	0.065	0.149
15–19	−0.095**	2.576	0.093	0.221
Number of male relatives aged:				
7–9	−0.134	0.629	1.105	0.406
10–14	−0.036	0.155	−1.863	0.757
15–19	−0.187	1.170	1.856	1.452
Number of unemployed men aged:				
20–64	0.057	0.736	−2.687**	3.159
65 and older	−0.021	0.091	2.110	0.762
Inverse Mills Ratio	−8.196**	4.860		
n	5,779		4,112	
Log likelihood	−2,533.532		−16,303.3	

*Significant at 5% level, **Significant at 1% level.
See Table 2 for notes.

here in Appendix Table 4. That paper did not consider differences by husband's presence nor did it analyse hours of employment. Our results in Table 2 regarding the participation in employment by women with husbands present are similar to those results for all prime-aged women; this is to be expected since the 'husbands' sample includes 85 percent of the full sample.[14] In terms of the woman's own characteristics, the woman's predicted wage is a positive predictor of employment, while older age is correlated with lower levels of participation. Education also is negatively related to participation once we have controlled for the wage. Given the wage, the remaining variation in education may proxy the value of time in home production, characteristics of the structure of labour demand and how it differs by education, and/or wealth, which is only partially controlled for by our other variables. As predicted by theory, income and wealth proxies are negative predictors of women's employment: the effects of 'family income' and the presence of a water filter or a toilet on employment are negative and significant. Also, the presence of at least one adult male in the family with a formal sector job ('family benefits') decreases the probability of participation in employment, as expected.

The number of own young children aged 0–6 and the number of young relatives aged 5 and 6 in the household have the expected negative effect on employment of urban Brazilian women with husbands present, while the number of 0–4 year old children of relatives does not affect the probability of employment. Among own children, younger children are a larger deterrent than older children. Sons and daughters aged 7–9 also have a negative effect on employment, indicating that they are care needers rather than care givers.

As predicted by our theoretical model, we find significant effects of the presence of other household members on the employment of women with husbands present. Table 2 shows positive effects of female relatives aged 7–24 and any women aged 65 and older on the employment probabilities of the women in our sample. These young female relatives and older women seem to be providing child care or other home production for the household, allowing the spouse of the household head to allocate her time to the labour market. Interestingly, adolescent daughters do not have the same expected positive effect on employment probabilities, indicating that our disaggregated approach illuminates the different time use strategies for own children versus child relatives. While young

relatives and older women in the household increase the probability of employment, daughters aged 20–24 and sons aged 15–19 have a significant negative effect on employment. These family members may be providing earned income for the family, allowing the mothers in our sample to remain engaged in home production. Although unemployed or underemployed men aged 20–64 also have a negative effect on the woman's participation in employment, we believe the reason may be very different; we speculate that either such men have disabilities and require care, or that we are observing household-specific heterogeneity regarding inclinations or ability to work.

Results from the hours of employment equation for women with husbands present are shown in the last two columns of Table 2. For this subsample, many of the determinants of employment have similar effects upon hours worked conditional on employment, in terms of signs and significance. This is true for the woman's predicted wage, age, and years of education, for 'family income,' and for many of the family structure variables. In particular, young children substantially reduce the number of hours worked for married women. Again, 7–9 year old children appear to be care needers as opposed to care givers since the magnitude of the coefficients is similar to those for the younger children. Sons aged 10–14 also have a negative effect on hours worked.

The most interesting differences between the first and third columns are in the effects of 'family benefits' and of self-employed husbands on employment and hours worked. As predicted, having a male in a job with benefits reduces the probability of women's employment. In contrast, given employment, 'family benefits' does not affect women's hours worked. Thus, as expected, the lack of formal benefits provided by the men in the family creates an incentive for women to seek employment in order to obtain these benefits, but the number of hours worked is independent of this motivation. Conversely, 'husband self-employed,' which is used as a proxy for the presence of a family business, does not affect the probability of employment but does positively affect hours worked. Having a family business may lower the transactions costs associated with expanding the number of hours worked.

Other variables that differ between the employment and the hours employed models in terms of sign or significance are private indoor toilet, number of relatives aged 5–6, number of relatives aged 10–14, number of adult women aged 65 and older, and number of sons aged 15–19. These variables are all significant

predictors of employment but not of hours. The effect of private indoor toilet on employment is likely to be a wealth effect that is not important once the employment decision has been made. The remaining variables reflect the demographic composition of the household. Considered as a group, these results suggest that the employment decision is more influenced by the substitutability across household members than is the hours worked decision. The one exception is that the presence of sons aged 10–14 does not significantly affect the probability of employment but does negatively affect the number of hours. Anecdotal evidence suggests that mothers of boys of this age are often concerned about their sons getting into trouble if left unattended for a substantial portion of the day.

Having estimated the hours model we are now able to calculate wage elasticities. For Brazilian women with husbands present, the estimated wage elasticity for hours worked per week is 0.11, conditional on employment. In a review of empirical studies of labour supply, Killingsworth (1983) finds that in models comparable to ours, the estimated wage elasticity for married women in the USA ranges from 0.6 to 1.1. Mroz (1987) also reviews a number of studies of married women's labour supply in the USA. In his analysis he eliminates those studies that do not pass a set of specification tests. This exercise yields a range of 0.12–0.45 for the wage elasticity of annual hours worked. Thus, our estimate is smaller than those discussed by Killingsworth, and is at the bottom of the range of those discussed by Mroz. The only study we have found that uses a generalized Tobit specification for a developing country is Malathy (1989, 1991). Estimating a model of yearly hours worked for married women in Madras, India, Malathy derives a wage elasticity of −0.12.

Sole heads of households: women without husbands present

Table 1 showed a substantial difference in the percentage of women employed by headship status. Even controlling for all other factors, the results from the joint model reported in Appendix Table 4 indicate that women who are sole heads of households have a much higher probability of participating in employment, compared to women with husbands present. Table 3 indicates that when the sample is limited to sole heads of households, fewer of the independent variables have a significant influence on employment, compared to women with husbands present. Predicted wage, age,

and education still have the expected effects, as does 'family income.' In contrast, the presence of at least one adult male with a formal sector job ('family benefits') increases the probability of participation in employment. We had expected a negative effect (and found it for women with husbands present) given that families strive to get at least one member into a formal sector job to improve access to health insurance and other benefits; instead, for this subsample, this variable may be an indicator of access to better jobs via kin or community networks. Only 15 percent of women without husbands present are in households in which an adult male has a formal sector job, whereas 78 percent of women with husbands present are in households covered by formal sector benefits.

Many of the household composition variables which affect the employment of women with husbands present do not affect women who are sole heads of households. Among the young children variables, 0–4 year olds still have a negative effect on the probability of employment but 5–6 and 7–9 year olds do not. Female relatives and unemployed adult men also have no discernable effect on this subsample's employment. Daughters aged 15–24 now decrease the likelihood of employment, as do adult women aged 25–54 and sons aged 15–19. However, adult women aged 65 and older continue to have a positive effect on employment of women who are sole heads.

One interpretation of the different effects of the household composition variables on the two subsamples stems from considering whose employment is most valuable in the labour market. If the husband is present, his employment will generally be the most highly compensated in the family, given the gender-based occupational and wage inequality documented by Barros *et al.* (1997). If there is no husband present, it is likely to be the woman head of household — or her more-educated grown-up son and/or daughter — who has the greatest earning power.[15] If an adult daughter or son can earn higher wages, then they may be more likely to substitute for their mother in the labour market. Relatives in the household may be disadvantaged in some way which affects their wage rates. For example, they may be migrants from rural areas or (in the south and southeast) from northeastern cities, where average education levels are lower; they might also have fewer contacts or other relevant information about the local labour market. Thus, the presence of 15–19 year old daughters (or sons) reduces the probability of employment for women without

husbands present while female relatives neither increase nor decrease the probability of employment.

Turning now to the hours of employment equation for women without husbands present, we again find that a number of variables that are significant determinants of employment are not significant determinants of hours worked. Of special interest is the estimated effect of the predicted wage. For sole heads of households, the woman's wage is not a significant determinant of her hours worked, though it is a significant predictor of her employment. This means the elasticity of hours worked with respect to wages is essentially zero for women who are sole heads of households. Mroz and Zabel both find that the wage elasticity falls substantially when they switch from the standard Tobit estimation to the generalized Tobit. In our estimation of the standard Tobit (not shown), the coefficient on the wage variable was also much larger and the wage was a positive, significant predictor of hours worked, even for this subsample. But Table 3 indicates that for women who are sole household heads, the wage influences hours indirectly, through its effect on employment, not directly, conditional on employment. Once employed, it seems to be the case that income and substitution effects of changes in the wage tend to counteract one another for this subsample. For families struggling to meet minimum thresholds of income, low wages translate into the need for more hours worked.

Years of schooling is also not a significant predictor of hours worked for this subsample. Based on our previous work on the use of child care in Brazil, we had hypothesized that women with higher education were more likely to work in the formal rather than the informal labour market and thus to face greater institutional constraints in terms of number and flexibility of hours.[16] Furthermore, there may also be a standard substitution response toward home production among many better educated women with young children. Since most formal preschool opportunities in urban Brazil are only for 4 hours per day or less (Levison, 1990), better educated women in the labour force may choose, if possible, to work fewer hours in order to facilitate preschool enrolment of their children. While these forces appear to be at work for women with husbands present, this interpretation does not hold for women who are sole household heads. If women with less education are more likely to work in the informal sector, they are more able to work either a very large number of hours or a very small number of hours. Among sole

household heads, this flexibility may result in fewer hours worked among the less educated because of their many other responsibilities. Furthermore, the negative effect of increasing education on hours is less likely to arise for this subsample simply because these women's labour income constitutes the majority of total income.

The results regarding the presence of young children in need of care also indicate interesting differences across the two dimensions of labour supply for this subsample. There is no measurable effect of own young children on hours employed, although, as reported above, the presence of 0–4-year-olds does have a negative effect on the probability of employment. The results reported in Table 3 indicate that once women who are sole household heads are in the labour force, the ages of young children do not influence the hours decision.

Another interesting set of comparisons pertains to the potential alternative care givers. The pattern of results for the employment model suggests that certain household members act to facilitate the employment of female household heads by taking on child care and other home production roles, while other members of the household decrease the likelihood of the mother's labour force participation, perhaps because of their own employment. This evidence of intrahousehold substitutability largely disappears when considering the hours worked decision, with the exception of a positive effect of daughters aged 10–14. That this age group increases mother's hours of employment provides evidence that daughters in households without a husband present may be asked to contribute more hours to household duties and at younger ages. We do not observe this positive effect for any of the sons or daughters categories for women with husbands present. Each of the other relevant household composition coefficients that is significant in the employment model for women without husbands present is not significant in the hours worked model. This is not to say that intrahousehold substitution is not taking place in households with a sole female head, but rather that such substitution does not influence the mother's choice over hours of work once she has made the decision to be in the labour force. Recall that for women with husbands present, several of the household composition variables are significant in the hours equation, suggesting that there exists some degree of substitutability across household members that influences the woman's decision regarding hours of employment.

Comparing women with and without husbands present

Finally, consider some overall comparisons of the results of the hours worked model, conditional upon employment status, for the subsample of women with husbands present to those for women who are sole heads of households. Substantial differences exist between these two groups of women: as discussed above, many of the coefficients that are significant determinants of hours worked for the subsample of women with husbands present are not significant for the subsample of women without husbands present. Indeed, what is most striking about the hours equation for sole female heads is the absence of significance of the vast majority of variables. This is in spite of the fact that this subsample contains more than 4,100 employed women and that there is considerable variation in the dependent variable and among the explanatory variables. The observable characteristics we have included are very poor predictors of hours of employment for female household heads, and/or — as suggested by Barros *et al.* (1997) — this subset of women is so heterogeneous (in ways not captured by the model) that modelling its labour market behaviour without characterizing the nature of female headship in more detail is not very useful. In fact, the only observable variables that have significant effects on hours worked (at a 5 percent significance level or better) are the number of daughters aged 10–14, who increase women's hours of work, and the number of unemployed men aged 20–64, who decrease women's hours of work. The former is likely due to substitution in home production, whereas the latter may result from dependent care needs of a disabled male adult.

In addition to these two significant observable effects, the other significant coefficient in the hours equation for sole heads of households is that for the Inverse Mills Ratio, the sample selection term.[17] In the full sample, the coefficient for this term is not significant (see Appendix Table 4). However, for the two subsamples, the selection terms have significant effects, but of the opposite sign. Among women with husbands present, the positive effect of the selection term indicates that the unobservables which increase participation in employment also increase hours worked once employed. Unobservables of this type may include motivation, ambition, or ability. In contrast, for women who are sole household heads — and whose observed characteristics lead to greater hours worked — the unobservables that increase participation in employment lead to decreased hours

worked, once employed. An example of an unobservable factor which would produce this result might be the lack of kin-based networks and community connections which would facilitate child care and various other home production activities. These relationships are likely to be based, at least in part, on the husband's affiliations and may thus be weaker for women who are sole household heads. It is precisely the lack of such networks that increases the likelihood for female heads to enter the labour market but also may necessitate that they work fewer hours in order to attend to their many other responsibilities. These factors must be outweighing motivation, ambition and ability which should have the same positive effect on women who are sole heads of household as they have on women with husbands present.

Barros *et al*. (1997) emphasize the heterogeneity of female heads of households in Brazil, and our subsample of women without husbands present overlaps (definitionally) to a large degree with their sample of female heads. We suspect that our inability to control for more of this heterogeneity has greatly limited the model's explanatory power for labour force hours by sole female heads. Ideally, we would like to control for a number of factors which the headship literature has found to be important. For example, in Ecuador, how women came to be female heads — by widowhood, divorce, or single motherhood — seems to affect their community resources (DeGraff and Bilsborrow, 1993). Wealth is another important dimension which is poorly captured by the PNAD data, and the household income variable contains very little information when there is no income from a husband, since we do not include women's income because of endogeneity. Whether women are migrants, and whether they have family members nearby, are other dimensions of potential relevance for capturing this heterogeneity.

In general, neither hours model has much explanatory power for the number of hours worked. This is consistent with the US literature on male hours worked; Pencavel (1996; p. 25), for example, writes that 'the inability of empirical studies of working hours to remove anything more than a relatively small fraction of the observed variation in a large sample is striking.' We had expected that this stylized fact might not hold for urban Brazilian women, given the importance of the informal sector and the resulting diminution of the influence of formal labour market institutions, such as a standard 40-hour work week, on hours worked. In fact, the statement does fit our results. As in any micro data set, we observe substantial differences in human behaviour

without having adequate measures of the sources of this variation. Although social scientists can explain variation in aggregate hours worked fairly well, we have less success with individual behaviour.[18]

5. Conclusion

The determinants of hours worked for employed women is a little-studied topic in labour market analysis of developing countries. We find a large variance in hours worked by urban Brazilian women. Almost 20 percent of women work fewer than 30 hours per week, while another 20 percent work 50 or more hours per week. Hours differ substantially by education level, by the presence of husbands and by the presence of young children. From our multivariate analysis, we get a resounding yes in response to the question 'Does husbands' presence matter?' For the subsample of women with husbands present, the same variables that affect employment are also mostly significant predictors of hours worked, given employment status. In contrast, our model generally fails to capture determinants of variation in hours worked for women who are sole heads of households.

In this analysis we have shown that substantial differences exist between the determinants of employment status and the determinants of hours worked, conditional on employment, for prime-aged women in urban Brazil. These determinants also vary substantially depending on whether a husband is present in the woman's household. Results for women who are sole heads of households are especially interesting: factors such as her predicted wage, her years of schooling, the number and ages of her preschool-aged children, and the presence of potential alternative care givers significantly affect the employment decision but not hours worked, given employment status.

It is worth emphasizing again that sample selectivity functions in opposite directions for the two subsamples. Unobservables for women with spouses present operate in the same positive direction for both employment status and hours worked. For women who are sole heads, however, the unobservables which increase the likelihood of employment tend to decrease hours worked, once employed. That is, although employed women without husbands present tend to work longer hours than those with husbands present, unobservables keep their paid work hours from being even higher. Again, this suggests quite different dynamics at work in the

determinants of hours of employment for women who are sole heads, dynamics which we have not fully captured in our model.

For policy purposes, we argue that researchers need to continue to explore differences between women with husbands present and women who are sole heads of household, and need to move from studies of participation in employment to studies of hours worked. Time is the primary resource of poor households, and hours of employment are how poor people gain the resources which sustain life. Women who are sole heads of households compensate for a lack of other resources by working more hours in the labour force. Although we agree with Barros *et al.* (1997) that the best way to increase the well-being of poor female-headed households would be to reduce gender-specific occupational and wage inequality, in the short-run we may also need to figure out which poor households can be effectively targeted for resource transfers. Doing so will require a better understanding of the options and constraints on the time of sole female heads of households.

Notes

[1] See Schultz (1990) for a comprehensive synthesis of female labour force participation studies from around the world. Also see Psacharopoulos and Tzannatos (1993) which reports on women's labour force participation studies in ten countries in Latin America. Connelly *et al.* (1996a) looks at women's employment in Brazil. Other papers that examine women's labour force participation in Brazil include Arends-Kuenning (1997), Costa (1990), Duryea (1994), and Lam and Duryea (1997). Studies which examine women's hours of employment in family-based market work and/or paid employment in developing countries include Alderman and Chishti (1991), Floro (1991), Jacoby (1993), Khandker (1988), King and Evenson (1983), Malathy (1989, 1991), Mueller (1984) and Popkin (1983). See Killingsworth (1983), Mroz (1987), and the references therein for studies of women's hours of employment in industrialized countries.

[2] di Leonardo (1992) refers to this as 'kinwork.' She found that 'often, the very existence of kin contact ... depended on the presence of an adult woman in the household' (p. 248) and notes that 'kinwork, then, is like housework and child care: men in the aggregate do not do it' (p. 249).

[3] See DeGraff and Bilsborrow (1993), and references therein.

[4] See, for example, Barros *et al.*, (1997), Buvinic and Gupta (1997), DeGraff and Bilsborrow (1993), DeVos (1992), DeVos and Richter (1988), Handa (1996), Kossoudji and Mueller (1983), Lloyd and Brandon (1991), Merrick and Schmink (1983), and Rosenhouse (1988).

[5] Women who are not heads of households or spouses of heads of households are excluded since we do not know how many children they have, which is an important explanatory variable. We also exclude the small percentage of households which

include multiple families, for whom it is unclear which members are acting jointly. Furthermore, we are unable to determine whether women whom we consider sole heads of households actually have female partners present.

[6] Table 1 and both figures are based on weighted data in order to be representative of the population; the weights adjust for differential sampling by metropolitan area. Unweighted data are used in model estimation.

[7] Hours of employment data are based on all jobs in the week prior to the survey.

[8] In other work (Connelly *et al.*, 1999), we address the potential endogeneity of recent fertility within this model and using this data. We conclude that the assumption of exogeneity is reasonable in this case.

[9] The generalized Tobit procedure assumes an employment participation function, $I^* = \alpha_j' Z_{ij} + \eta_{ij}$, with I^* defined as the latent variable underlying participation. $I = 0$, i.e. non-participation, if $I^* \leqslant 0$. In the case of employment, $I = 1$ if $I^* > 0$. The stochastic component η_{ij} is assumed to follow a standard normal distribution. For the purpose of identification of equation (3), the functional form of $\phi(\alpha' Z_i)$ could theoretically be the sole 'identifier'. However, as is common in the labour supply literature, we also use higher order and interactive terms involving age and education as 'identifiers,' that is, variables that are included in Z and not in X.

[10] Mroz estimates equation (3) using a two-stage procedure very similar to the two-step procedure used to estimate women's wages. The error term υ_i is assumed to be distributed normally thus allowing the labour force participation model to be estimated using a probit function. The Inverse Mills Ratio, $\phi(\alpha' Z_i)/\Phi(\alpha' Z_i)$, is estimated from the coefficients of the labour force participation probit, $\hat{\alpha}$. Then hours worked, conditional on being employed, is estimated using OLS with the sample restricted to those women who are currently employed. The predicted inverse Mills ratio, $\phi(\hat{\alpha}' Z_i)/\Phi(\hat{\alpha}' Z_i)$, is included as one of the variables on the right hand side of the hours equation. Alternatively, Zabel assumes that ε_i and υ_i are jointly normally distributed. He uses a full information maximum likelihood estimation strategy to jointly estimate the two coefficient vectors, α and β. He compares these results to the two-stage procedure used by Mroz and obtains very similar results. Given the similarity of results, the slightly less restrictive nature of the two-step procedure, our large sample, and the computational ease of the two-step procedure, we have estimated our generalized Tobit using the two-step approach.

[11] Results for the wage equations are presented in Appendix Table 3. The wage variable for all employed women was derived from total monthly labour income for the past month, divided by 4.33 weeks per month, divided by total hours worked in the past week.

[12] Again, the variable is defined by men's employment because that is assumed exogenous to women's employment and child care decisions.

[13] Note that, contrary to the discussion of equation (3), the variables in the employment model and the hours model are identical. This seeming inconsistency arises because the employment models presented in Tables 2 and 3 are not those used to construct the lambda terms included in the hours models to control for selection into employment. The employment models in Tables 2 and 3 are structural, whereas those used to construct the lambda terms are reduced form. The difference between them is that the reduced form employment models do not include the predicted log wage, but do include the 'identifier' variables discussed earlier in the context of equation (3). See note 9.

[14] Partial derivatives are calculated using predicted values for each woman and then averaging over all cases.

[15] Average years of completed schooling has been rising for both women and men in Brazil for decades. Lam and Duryea (1997) find mean schooling levels of 2.66 and 3.05 years, respectively, for women and men from the 1925–27 birth cohort, and they show that each three-year birth cohort that follows has higher mean schooling than the cohort born just before it. Women's mean schooling has surpassed that of men since the 1958–60 birth cohort was educated, with average levels of education rising to 6.35 and 5.99 years, respectively, for women and men in the 1961–63 cohort.

[16] While we do have information on women's industry of employment and occupation, industry and occupation have been shown to be poor predictors of formal or informal employment in urban Brazil (Telles, 1988).

[17] The sample selection correction terms (Inverse Mills Ratios) are derived from the reduced form estimation of participation in employment which excludes the estimated wage and includes higher order and interactive age and education variables.

[18] We thank Tom Mroz for a conversation on this point.

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Appendix

Table A1. Means and standard deviations for estimation sample of women with husbands present, metropolitan Brazil 1985

	Employment model		Hours model	
	Mean	**S.D.**	**Mean**	**S.D.**
Participation in employment	0.382	0.486	—	—
Hours of employment	—	—	38.387	14.191
Predicted ln wage	7.059	0.920	7.341	1.060
Age	34.505	9.458	34.745	8.512
Education	6.059	4.242	7.117	4.814
Water filter	0.608	0.488	0.613	0.487
Private indoor toilet	0.900	0.300	0.904	0.295
Sewer system	0.417	0.493	0.432	0.495
Family income	−0.105	1.218	−0.089	1.308
Family benefits	0.762	0.426	0.753	0.432
Husband unemployed	0.101	0.301	0.091	0.288
Husband self-employed	0.230	0.421	0.256	0.437
Number of children aged:				
0–1	0.240	0.466	0.179	0.407
2–4	0.407	0.616	0.373	0.587
5–6	0.261	0.485	0.251	0.478
Number of relatives aged:				
0–4	0.006	0.082	0.005	0.080
5–6	0.003	0.059	0.002	0.044
Number of daughters aged:				
7–9	0.171	0.416	0.180	0.425
10–14	0.234	0.525	0.260	0.547
15–19	0.171	0.467	0.178	0.474
20–24	0.080	1.320	0.068	0.299
Number of female relatives aged:				
7–9	0.002	0.047	0.003	0.054
10–14	0.009	0.095	0.011	0.103
15–19	0.015	0.125	0.018	0.137
20–24	0.010	0.105	0.013	0.120
Number of adult women aged:				
25–54	0.039	0.214	0.032	0.192
55–64	0.009	0.095	0.011	0.104
65 and older	0.023	0.153	0.027	0.164
Number of sons aged:				
7–9	0.175	0.424	0.177	0.424
10–14	0.246	0.541	0.265	0.554
15–19	0.189	0.495	0.191	0.495
Number of male relatives aged:				
7–9	0.002	0.044	0.002	0.045
10–14	0.004	0.067	0.003	0.061
15–19	0.009	0.100	0.009	0.101
Number of unemployed men aged:				
20–64	0.038	0.210	0.031	0.185
65 and older	0.005	0.070	0.005	0.067
n	33,108		12,594	

See Table 2 for notes.

Table A2. Means and standard deviation for estimation sample of women without husbands present, metropolitcan Brazil 1985

	Employment model		Hours model	
	Mean	**S.D.**	**Mean**	**S.Dev**
Participation in employment	0.715	0.451	—	—
Hours of employment	—	—	43.069	13.215
Predicted ln wage	7.994	0.828	8.089	0.868
Age	39.831	9.542	38.426	9.104
Education	5.959	4.683	6.503	4.878
Water filter	0.549	0.498	0.540	0.499
Private indoor toilet	0.840	0.367	0.828	0.378
Sewer system	0.447	0.497	0.451	0.498
Family income	−2.153	2.091	−2.722	1.985
Family benefits	0.143	0.350	0.116	0.320
Number of children aged:				
0–1	0.068	0.266	0.070	0.266
2–4	0.147	0.405	0.153	0.411
5–6	0.128	0.358	0.134	0.362
Number of relatives aged:				
0–4	0.027	0.185	0.021	0.164
5–6	0.013	0.117	0.011	0.106
Number of daughters aged:				
7–9	0.101	0.326	0.103	0.331
10–14	0.198	0.478	0.204	0.486
15–19	0.197	0.479	0.178	0.458
20–24	0.114	0.362	0.092	0.331
Number of female relatives aged:				
7–9	0.005	0.073	0.004	0.060
10–14	0.012	0.113	0.012	0.114
15–19	0.032	0.195	0.035	0.200
20–24	0.042	0.223	0.045	0.225
Number of adult women aged:				
25–54	0.133	0.392	0.119	0.368
55–64	0.020	0.145	0.023	0.157
65 and older	0.047	0.216	0.048	0.220
Number of sons aged:				
7–9	0.103	0.330	0.107	0.335
10–14	0.203	0.489	0.202	0.488
15–19	0.233	0.539	0.210	0.517
Number of male relatives aged:				
7–9	0.007	0.090	0.005	0.076
10–14	0.008	0.087	0.007	0.084
15–19	0.022	0.160	0.022	0.161
Number of unemployed men aged:				
20–64	0.056	0.250	0.052	0.241
65 and older	0.006	0.082	0.005	0.073
n	5,779		4,112	

See Table 2 for notes.

Table A3. Determinants of the natural log of women's wage, metropolitan Brazil 1985

	Women with husbands present		Women without husbands present		Combined sample	
	Coefficient	***t*-statistic**	**Coefficient**	***t*-statistic**	**Coefficient**	***t*-statistic**
Constant	3.469**	21.603	6.054**	27.840	5.525**	48.594
Age	0.133**	18.856	0.050**	4.710	0.064**	11.776
Age-squared	−0.002**	17.663	−0.001**	4.585	−0.001**	10.361
Education	0.078**	9.470	0.065**	4.597	0.084**	11.864
Education-squared	0.008**	22.033	0.004**	8.140	0.005**	16.400
Age*Education	0.000	1.126	0.001**	4.164	0.001**	4.562
São Paulo	0.350**	13.851	0.388**	8.979	0.352**	15.917
Rio de Janeiro	0.007	0.279	0.046	1.061	0.004	0.188
Curitíba	0.221**	7.339	0.161**	3.033	0.167**	6.325
Porto Alegre	0.317**	12.108	0.157**	3.461	0.187**	8.292
Fortaleza	−0.048	1.561	−0.038	0.716	−0.118**	4.446
Recife	−0.374**	12.625	−0.321**	6.426	−0.372**	14.415
Salvador	−0.032	1.064	0.138**	2.917	0.005	0.198
Belém	0.077*	2.414	0.017	0.319	0.031	1.121
Brasília	0.459**	14.350	0.285**	5.640	0.366**	13.378
Husband self-employed	0.115**	7.352	—	—	0.008	0.560
Inverse Mills Ratio	0.929**	23.993	0.178**	4.420	0.233**	12.702
n	12,077		4,084		16,161	
R^2	60.41		59.25		58.95	

* Significant at 5% level, ** Significant at 1% level.

Table A4. Determinants of the probability of employment and hours worked for the combined sample (women with and without husbands present), metropolitan Brazil 1985

	Employment model		Hours model	
	Partial	***t*-statistic**	**Coefficient**	***t*-statistic**
Constant	−4.483**	34.696	54.941**	6.152
Predicted ln wage	0.718**	34.018	−1.232	0.906
Age	−0.011**	22.417	−0.104**	3.826
Education	−0.095**	24.800	−0.109	0.512
Water filter	−0.020**	3.630	−0.421	1.571
Private indoor toilet	−0.026**	3.239	0.438	1.188
Sewer system	0.000	0.037	−0.399	1.489
Family income	−0.086**	38.348	−0.577**	4.224
Family benefits	−0.002	0.371	0.506	1.587
Two-parent family	−0.138**	14.903	−3.001**	6.465
Husband unemployed	−0.072**	7.469	0.857	1.732
Husband self-employed	0.043**	7.022	1.268**	4.116
Number of children aged:				
0–1	−0.130**	22.844	−1.019**	2.823
2–4	−0.058**	13.903	−1.302**	5.894
5–6	−0.045**	8.974	−1.086**	4.327
Number of relatives aged:				
0–4	−0.000	0.018	0.333	0.321
5–6	−0.088*	2.514	0.389	0.231
Number of daughters aged:				
7–9	−0.020**	3.420	−1.005**	3.701
10–14	0.009*	2.015	0.069	0.323
15–19	−0.000	0.043	0.327	1.342
20–24	−0.035**	4.668	−0.383	1.039
Number of female relatives aged:				
7–9	0.067	1.579	0.897	0.466
10–14	0.051*	2.177	−0.017	0.017
15–19	0.047**	2.755	1.151	1.654
20–24	0.020	1.061	0.557	0.796
Number of adult women aged:				
25–54	−0.034**	3.492	0.422	0.958
55–64	0.027	1.208	1.244	1.400
65 and older	0.032*	2.308	0.826	1.378
Number of sons aged:				
7–9	−0.031**	5.419	−0.775**	2.830
10–14	−0.006	1.342	−0.543**	2.586
15–19	−0.014*	2.777	0.227	0.985
Number of male relatives aged:				
7–9	−0.009	0.203	0.981	0.486
10–14	−0.028	0.847	−1.049	0.662
15–19	−0.013	0.592	−0.399	0.441

Table A4. *Continued*

	Employment model		Hours model	
	Partial	***t*-statistic**	**Coefficient**	***t*-statistic**
Number of unemployed men aged:				
20–64	−0.040**	3.616	−2.190	4.032
65 and older	−0.050	1.555	−0.597	0.386
Inverse Mills Ratio	—	—	−0.973	1.008
n	38,887		16,706	
Log likelihood	−22,713.7		−67,363.86	

*Significant at 5% level, **Significant at 1% level.
See Table 2 for notes.