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The Part-Time Premium Enigma: An Assessment of the Chilean Case

Working part-time has been seen by some researchers, public policy advisers, and politicians as a way for women to find a balance between home and paid work (Gregory and Connolly 2008; Bardasi and Gornick 2008). However, there is no agreement on the optimal balance. Indeed, there are contrasting views on the subject. Those in favor suggest that in the absence of part-time jobs, female labor-force participation would be substantially lower (Sundström 1991; Dekker 2008). According to this belief, women, confronted with the choice between working full-time and not working at all, would opt for the latter. On the other hand, detractors in European countries assert that part-time jobs imply a waste of resources and of investments in human capital, since the many part-time working women who are highly educated generally make a downward occupational move when they switch from full-time to part-time work (Gregory and Connolly 2008; Manning and Petrongolo 2008).

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Furthermore, part-time jobs have adverse repercussions for the economic well-being of part-time working women, given that public social-welfare benefits, wage increases, and professional development might be scarce for these women (Leiva 2000; Warren 2008; Fernández-Kranz and others 2011; Fernández-Kranz and Rodríguez-Planas 2011). In addition, in member countries of the Organization for Economic Cooperation and Development (OECD), hourly earnings are lower (Manning and Petrongolo 2008) and employer-provided training less common (Gregory and Connolly 2008; Connolly and Gregory 2009) in part-time jobs than in full-time jobs. Furthermore, in those countries, though the hourly earnings gap between women and men in full-time work has been narrowing, the same is not the case for female part-time workers and males in full-time jobs (Manning and Petrongolo 2008). Part-time work among women after the birth of their first child is currently responsible for some of the pay gap between men and women (Kanji 2011).

Chile's rate of female labor-force participation is one of the lowest in Latin American countries (CEPAL/UN-ECLAC 2011), despite female educational attainment that is similar to or higher than that of other Latin American countries (Carrillo, Gandelman, and Robano 2013). To increase female labor-force participation, the Chilean government is promoting part-time (and home-based) work for women. Although part-time work is not as extensive as in other countries, the proportion of Chilean women working part-time has tripled in the past ten years, and part-time workers now represent more than 20 percent of the female workforce (National Socio-Economic Characterization Survey (Casen), 2009).

Contreras, Puentes, and Bravo (2005) show that in Chile, the female labor-force participation rate is positively correlated with education. It is not apparent why female labor-force participation is so low. Discrimination in the labor market or, more generally, the existent gender wage gap favorable to males (Ñopo 2012; Carrillo, Gandelman, and Robano 2013) might partially explain the low female participation rate, as might cultural factors. Contreras and Plaza (2010) find that women who have internalized *machista* values are less likely to participate in the labor market. Despite concerns of endogeneity owing to data limitations, Contreras and Plaza (2010) find a negative relationship between female labor-force participation and conservative values. Puentes and Ruiz-Tagle (2011), using the Voz de Mujer survey, analyze the same phenomenon while controlling for possible endogenous relationships.[1]

1. The Voz de Mujer survey was carried out by ComunidadMujer (www.comunidadmujer.cl/). The sampling method was randomized and probabilistic in each of the three stages (block, home, interviewee). Precision was estimated at approximately 2 percent, considering maximum variance and 95 percent confidence levels.

They find that cultural factors are not endogenously determined by a woman's labor-participation decision; on the contrary, it seems that whether women work has little effect on cultural factors in the short term. According to their study, values develop in early childhood rather than during a woman's working life.

Interestingly, the same 2002 survey that Contreras and Plaza (2010) used was reapplied by the Centro de Estudios Públicos and released in April 2012.[2] In both 2002 and 2012, 48 percent of interviewees stated that the most desirable choice for a woman with one child of preschool age was to work part-time, while her partner's employment was full-time (CEP 2012, p. 6).[3] These results suggest that Chilean society's preference toward part-time jobs for women was stable over the ten years between the 2002 and the 2012 surveys, reinforcing the importance of the present analysis.

Furthermore, in Chile, as in other developing countries (see López-Bóo, Madrigal, and Pagés [2010] for an analysis of Honduras), part-time work might be a response to a lack of full-time and formal jobs (salaried jobs with contracts and social benefits) available to them. Fifty-three percent of Chilean female part-time workers say that they want to work more hours (own calculation based on Casen 2009 data). This suggests that a significant proportion of female part-time workers are involuntarily working less than full-time. Reinforcing that idea, a study conducted by Rau (2010, page 53) concludes that part-time is a "precarious" work type for those involved.

Although Chilean men also work part-time, there are two important gender distinctions. First, the proportion of females working part-time is much higher than that of males, and the gap is widening. Second, in looking for part-time jobs women and men seem to have different motivations (women because of household chores and care activities; men to pay for their studies), at different points of their lifetime (women in adulthood, men in their youth), and with different duration (females tend to work permanently in part-time arrangements while males tend to work part-time only for short periods of time).

2. Both surveys, in 2002 and 2012, were carried out by the Centro de Estudios Públicos. The sampling method was randomized and probabilistic in each of the three stages (block, home, interviewee). Precision was approximately 3 percent, considering maximum variance and 95 percent confidence level.

3. In the 2002 survey, 42 percent of interviewees stated that women should not work, compared with 31 percent who gave that answer in 2012. Between survey waves a new answer option, both partners in a family working part-time, was added, attracting 9 percent of the responses.

TABLE 1. The Part-Time Premium for Female Workers in Latin America[a]

Argentina	0.16 (0.02)***
Bolivia	0.55 (0.08)***
Brazil	0.25 (0.01)***
Costa Rica	0.35 (0.03)***
Chile	0.34 (0.01)***
Honduras	0.43 (0.02)***
Mexico	0.31 (0.02)***
Paraguay	0.28 (0.03)***
Peru	0.50 (0.08)***
Uruguay	0.22 (0.01)***
Venezuela	0.12 (0.03)***

Source: Authors' calculations based on household surveys circa 2005, Poverty and Social Indicator Monitoring (MECOVI) program.

a. Point estimates and their standard errors from OLS regressions for the coefficient on part-time work (less than thirty hours a week); dependent variable is log of hourly wage; independent variables are polynomials on education and experience.

***Significant at less than 1 percent.

A particularly notable feature of part-time work in Chile is that part-time workers earn higher hourly wages on average that those working full-time, seeming to suggest a part-time premium. Indeed, this pattern has been documented by Rau (2010) for the case of Chile and by López-Bóo, Madrigal, and Pagés (2010) for Honduras. However, this feature is also present in many Latin American countries. In this paper we use an ordinary least squares (OLS) analysis to present evidence of a part-time premium for females in several Latin American countries (see table 1).[4]

Our first contribution is to show that the positive correlation between part-time jobs and hourly earnings is present in several Latin American countries. Considering Chile as an example of this intriguing pattern, we undertake a more comprehensive analysis of the relationship between part-time jobs and hourly earnings. Our second contribution is to causally identify and unbiasedly estimate the link between the decision to work part-time and hourly earnings for the female population. Fulfilling this objective is not trivial, since the standard answer in the literature for a problem like this is to use instrumental variables. To our knowledge, there is no strong and credible instrument capable of isolating the effect of a part-time decision on hourly earnings from other correlated unobservable phenomena that also explain hourly earnings.

4. We also find through ordinary least squares (OLS) analysis a part-time premium for males, although in the remainder of this paper we focus on females since part-time work is growing fast in this group, already exceeding 20 percent of the total female labor force. In the case of male workers we do not observe such dynamism or relevance in terms of total employment. Although in absolute numbers about 5,000 males in our sample work part-time, this makes up only 9 percent of the total male labor force.

However, we overcome the problem of lack of a suitable instrument by using a set of estimation strategies that do not rely on the presence of an exclusion restriction for identification. We apply the recently developed technique of Klein and Vella (2009, 2010), identification through heteroskedasticity.

We find that, once unobservable characteristics are taken into account, the positive correlation disappears, and in its place we find a causal negative and significant effect on hourly earnings from working part-time. For the whole sample of females aged fifteen to fifty-nine, the estimated causal coefficient is not significant. For the subsample of dependent workers (wage earners), there is a negative causal effect of about 30 percent. For the subsample of formal workers, the negative causal effect is about 38 percent. Similar to what is documented for OECD countries, there is no positive relationship between part-time jobs and hourly earnings.

Our third contribution is to provide explanations for why the observed positive correlation between part-time work and hourly earnings disappears once we control for unobservable characteristics. Our first conjecture is that there is measurement error in the reporting of both hours and earnings (both owing to misreporting and true errors). In particular, we expect that part-time females in informal settings (for example, domestic employees) are not taking into account the transportation costs incurred by their need to be constantly moving from one employment place to another. This occurs especially among poor workers who are spatially segregated, living a long distance from where jobs are. Our second conjecture, which might be complementary to the first one, is that, following Rau (2010), the precarious features in the labor market combined with the low absolute levels of earnings implied make employers pay a higher hourly wage to make the job worthwhile. Another reason for the higher part-time hourly earnings might be that employers do not pay social contributions on those workers, which implies savings for the employer of about 20 percent.

Part-time might be a voluntary decision, but it need not be penalized by the market. Maybe less-able workers are choosing part-time employment, which might be one reason for the observed penalty.

Data and Description of Key Variables

The econometric analysis presented here is based on the main public household survey available in Chile: the CASEN (2009). This survey contains information from 75,512 Chilean women in the fifteen-to-fifty-nine age bracket. Of

TABLE 2. Chilean Female Population, Descriptive Statistics[a]

Employment status	*Females*
Inactive	43,815
Unemployed	4,533
Part-time	5,826
Full-time	21,338
Total	75,512
Unemployed as percent of total	0.14
LFPR (part time)	0.08
LFPR (full time)	0.28
LFPR	0.42

Source: Authors' calculations based on CASEN 2009.

a. Age bracket for females is fifteen to fifty-nine. Unemployment rate is calculated as the ratio of unemployed to unemployed plus all employed (either part-time or full-time).

LFPR = Labor force participation rate

these, 43,815 did not participate in the labor market, 4,533 were unemployed, 5,826 were employed in part-time jobs, and 21,338 were employed full-time (see table 2). Female labor-force participation was 42 percent, which was low by international standards (just for comparison: males' participation rate was 75 percent; own calculation based on CASEN 2009). It is worth noting that unemployment was more likely among women than men (14 percent versus 9 percent, respectively; own calculation based on CASEN 2009) and that the rate of employment for women was 36 percent. Also striking is the high percentage of females who declared they were out of the labor market (own calculation based on CASEN 2009).

We adopt the International Labour Organization convention of considering work part-time if the hours worked in a week are thirty or less.[5] In figure 1 we show the distribution of the hourly earnings for females conditional on working part- or full-time. The part-time distribution appears more concentrated to the right than the full-time distribution, evidencing the positive correlation between part-time and hourly earnings.

Table 3 presents descriptive statistics for the sample of 27,164 working females. The most striking factor is that hourly earnings are higher in part-time jobs than in full-time. Hourly earnings are constructed from the reported earnings in main occupation (which are paid monthly) adjusted by 4.2 weeks. We trim 1 percent of both tails to discard outliers.

5. As a robustness check, we have used the self-reported status of working part-time, an option that is available only for the subsample of dependent workers. Estimation results are similar in both definitions.

FIGURE 1. Hourly Earnings for Working Females, by Work Status

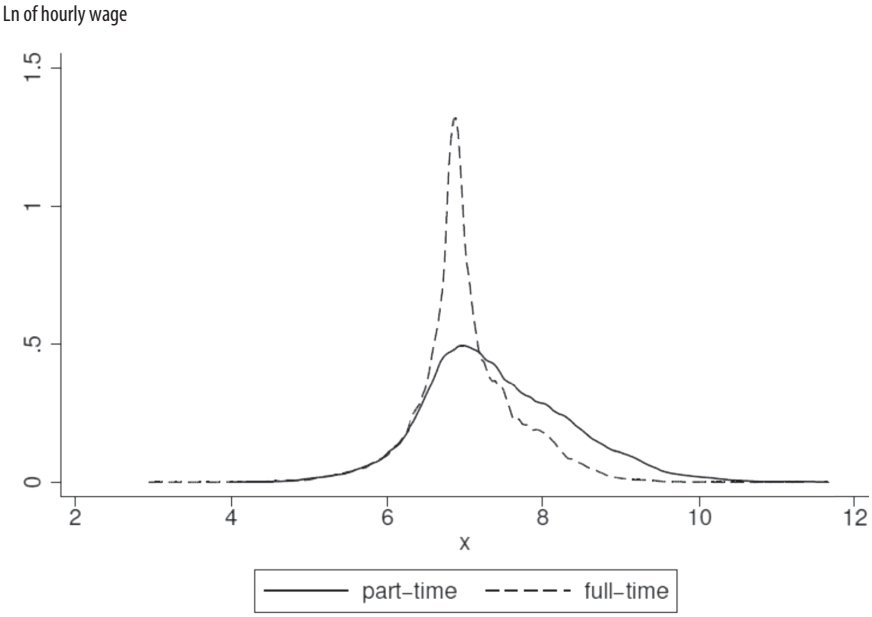

Table 3 includes a further description of demographic variables for working females. As we have already mentioned, Rau (2010) defines the position of part-time workers as precarious, and indeed, among the working females in our sample, those in part-time jobs were poorer, less educated, and older, which seems to confirm Rau's description.[6] Also, part-time working females were more likely to be married and more likely to have children five to fourteen years old in the household. This reflects the fact that partnered women are more likely to work part-time so they are free to do household chores and take care of their families. Owing to cultural factors, this option is not yet common for men. It is worth noting that part-time female workers had significantly lower levels of schooling; Manning and Petrongolo (2008) find the same in developed countries.

6. We acknowledge that age might not be the best proxy for experience in the case of females, because usually women take time away from the labor market during childbearing years. We could correct for the number of children a woman has, but because the number of children is endogenous to the labor-market decision, we have chosen to stick to age as a proxy (if an imperfect one) for experience.

TABLE 3. Chilean Female Working Population, Descriptive Statistics[a]

Variable	*Part-time*	*Full-time*	*Difference*
Hours worked	19.11	47.09	−27.98***
			(0.14)
Monthly earnings			
Pesos	172,436.11	276,880.34	−104444.23***
U.S. dollars (approx.)	211.00	341.00	(4,411.63)
Hourly earnings			
Pesos	2,879.00	1,432.71	1,446.29***
U.S. dollars (approx.)	3.50	1.76	(41.96)
Ln of hourly earnings	7.42	7.02	0.40***
			(0.01)
Urban	0.77	0.74	0.03***
			(0.01)
Poor	0.13	0.05	0.08***
			(0.00)
Years of schooling	10.32	11.21	−0.89***
			(0.05)
Age	38.88	37.86	1.02***
			(0.16)
Married or with partner	0.52	0.49	0.03***
			(0.01)
Presence of children aged five to fourteen years	0.73	0.65	0.07***
			(0.01)
Presence of children birth to four years	0.30	0.29	0.01
			(0.01)
N	5,826	21,338	

Source: Authors' calculations based on CASEN (2009).

a. Age bracket is fifteen to fifty-nine. Poverty line per capita was set at USD 63.134 for urban and USD 43.242 for rural households.

***Significant at less than 1 percent.

Informal work arrangements are common in the Chilean labor market, as in other Latin American countries. In this paper, informality is constructed by assigning a value of one whenever a worker is either self-employed or is a salaried employee who has no contract and, therefore, no social benefits. The proportion of informal workers was high in the sample, with more than 36 percent of workers classified as such. This phenomenon is cause for concern in the Chilean and other Latin American labor markets. In the case of the female part-time workers in our sample, informality exceeded 66 percent, while among those in full-time jobs less than 30 percent of employment was informal. As table 4 shows, on average, women in informal status work fewer hours a week, are more likely to live in rural settings, are more likely to be poor, have less schooling, and are older. Interestingly, informal female workers earn less per hour than formal workers.

TABLE 4. Chilean Female Working Population, Descriptive Statistics[a]

Variable	*Informal*	*Formal*	*Difference*
Hours	37.56	43.13	5.57***
			(0.18)
Earnings	210,073.28	280,224.77	70,151.49***
			(3,771.56)
Ln of hourly earnings	7.01	7.16	0.16***
			(0.01)
Urban	0.71	0.76	0.05***
			(0.01)
Poor	0.11	0.05	–0.06***
			(0.00)
Years of schooling	9.84	11.71	1.87***
			(0.04)
Age	39.66	37.16	–2.51***
			(0.14)
Married	0.52	0.48	–0.04***
			(0.01)
Children five to fourteen years	0.71	0.64	–0.06***
			(0.01)
Children birth to four years	0.29	0.30	0.01
			(0.01)
N	9,969	17,195	

Source: Authors' calculations based on CASEN 2009.

a. Age bracket is fifteen to fifty-nine. Poverty line per capita was set at USD 63.134 for urban and USD 43.242 for rural households. Informal work comprises self-employed workers and workers without contracts.

***Significant at less than 1 percent.

Informality is sometimes accepted by governments and international organizations because it favors those at the left tail of the wage distribution, who would otherwise be unable to earn enough to contribute through taxes to the social benefit system. It is thought that if formality were enforced, such workers would be excluded from the labor market. However, if informality permits those in the right tail of the wage distribution to extract extra rents from their work instead of contributing to the system, it would be accentuating wage differences and also might promote myopic behavior. The prevalence of those events would have adverse consequences, since inequality is known to be high in Chile and the pension system is one of individual capitalization.

Throughout the empirical exercise we control for geographic factors that aim to reflect costs of living. To do so we construct three variables: north, center, and south. These are binary variables that take a value of one whenever the person lives in this area. The base category for the analysis is the capital of the country (and its surroundings); one third of the population lives

in this region known as the Region Metropolitana. These regional dummies reflect the intrinsic characteristics of Chile, where the mining activities are mainly concentrated in the North (for males); the South's main activities are agriculture and forestry; and in the center agriculture, industry, and tourism are developed. We also include a binary variable for urban status.

In this paper, we deeply analyze the relationship between part-time work and hourly earnings. We document an interaction between part-time work and informality job status (described in the following section). A deep study of the determinants and effects of informality on female labor-force participation and hourly earnings falls outside the scope of this paper and deserves further research. Nevertheless, we attempt to expand and enlighten the understanding of such links that are specially relevant in Latin American labor markets.

Econometric Approach

Our econometric analysis begins with an OLS estimation of a mincerian equation in which the dependent variable is (log of) hourly earnings in the main occupation and which includes a binary variable indicating part-time work for the female sample of Chilean workers. We are interested in documenting the relationship between part-time work and hourly earnings. We consider first the sample of 27,687 working women, where Y is the log of hourly earnings, $\mathbf{X}$ is a vector of human capital characteristics (a set of binary variables for educational attainment: incomplete secondary, complete secondary, technical or university studies; age; and a set of regional dummies), part-time (PT) is a binary variable that takes the value of one when the hours worked in a week are less than or equal to thirty and takes the value of zero when the hours worked in a week are greater than thirty. In our analysis we compare the status of part-time work with that of full-time work, excluding women who are out of the labor market. Our equation of interest is thus

$$Y_i = \alpha + \beta PT_i + \mathbf{X}_i'\delta + \varepsilon_i.$$

We face a stylized problem: we want to estimate the effect of working part-time on hourly earnings, but the plausible endogeneity of the part-time–full-time decision renders the estimates from OLS invalid. Many unobserved factors might be causing the problem (different ability levels between full-time and part-time workers; discrimination; presence of segmented labor markets); the presence of reverse causality (the hourly earnings being the reason that workers choose to work part-time); or the existence of measure-

ment errors in the report of hours worked, owing to underestimation or overestimation or misreporting (overreporting) of women.[7] The standard solution to the endogeneity problem is to apply instrumental variables to causally estimate the effect from working part-time on hourly earnings. Thus the second step in our econometric analysis is to estimate a 2SLS model.

The challenge is thus to find a suitable instrument for the female decision to work part-time or full-time that is not correlated with hourly earnings. Manning and Petrongolo (2008) discuss some assumptions under which it might be reasonable to consider part-time status as an endogenous variable, but for lack of a suitable instrument they do not pursue the analysis. López-Bóo, Madrigal, and Pagés (2010) also state that they have been unable to find strong instruments for their analysis of part-time work in Honduras and acknowledge that by better accounting for the endogeneity of part-time work their findings might be reinforced.

Following what is conventional in the literature, we start our 2SLS analysis instrumenting the part-time decision with demographic characteristics (marital status, number of children from birth to four years and number of children from five to fourteen). We augment the specification to include also in the IV (instrumental variable) estimations both a binary variable indicating informal work and a selection correction term.[8] There seems to be a relationship between informality and female part-time work. This link, documented also by López-Bóo, Madrigal, and Pagés (2010) for Honduras, is explicitly analyzed here.

On the other hand, since we acknowledge that there may be selection in the female labor market (the working women in our sample might not be a random sample of the female population), following a variation of Heckman's (1979) procedure, we run a two-step estimation strategy wherein we first estimate the probability of working (called *LF,* either full-time or part-time) using human capital characteristics (X) and demographic variables (W) and then estimate the hourly earnings for the whole sample of females, using a transformation

7. In particular, regarding measurement errors, the estimates would be biased if such errors were correlated with some of the variables included in the hourly earnings equation. On the contrary, if those errors were independent of the explicative variables, then there would be no consequence.

8. Step-by-step estimations from baseline to the augmented IV equation are available upon request.

of the predicted probability of working as an additional explanatory variable (the inverse Mills ratio).[9]

The resultant model estimated with instrumental variables is

$$LF_i = \theta + X_i'\kappa + W_i'\tau + \mu_i$$
$$Y_i = \alpha + \beta_i PT_i + \gamma INF_i + \eta MILLS_i + X_i'\delta + \varepsilon_i,$$

where $\widehat{PT}_i$ is a prediction of the probability of working part-time (following Harvey's [1976] heteroskedastic probit model) and the exclusion restriction is given by the already listed demographic variables (marital status, number of children aged birth to four and number of children aged five to fourteen).[10]

On the other hand, as we document in detail in the following section, the 2SLS analysis is not robust. Indeed, though in this particular analysis it can be argued that there is no correlation between the projection of part-time work on the instruments and the hourly earnings error, the null hypothesis of weak instruments for the demographic variables (W) is not rejected. So there seems to be little correlation between the instrument and the index or, in other words, there seems to be no strong linear relationship among them.

Klein and Vella Approach

We use a novel technique developed by Klein and Vella (2009, 2010) and Farré, Klein, and Vella (2010) that relies on the fact that, in the absence of instruments, the heterogeneity present in the data can be used as a valid

9. The inverse Mills ratio is defined as

$$MILLS_i = \frac{\phi(H_i)}{\Phi(H_i)},$$

where $H_i = \Phi^{-1}(P_i)$, $\phi(.)$ is the standard normal density function, $\Phi(.)$ the normal distribution function, and P_i is the estimated probability of participation for the ith female.

10. We have run several specifications (one that includes the informal dummy variable, another that considers the correction of selection biases through the use of the Mills ratio, another that uses both, and a fourth that includes only the human capital variables) for both OLS and IV analyses. Using both sets of analyses we reject the hypothesis of no selection in the female labor market. Nevertheless, for all of these regressions the point estimates of part-time work on the hourly earnings equation were positive and significant, both statistically and economically (given its magnitude, between 40 and 65 log points).

instrument to identify and unbiasedly estimate the causal effect of working part-time on hourly earnings.[11]

Consider the following triangular model:

$$Y_i = \alpha + X_i'\delta + \beta PT_i + \varepsilon_i \tag{1}$$

and

$$PT_i = I\left\{X_i'\pi + W_i'\phi + \nu_i > 0\right\}, \tag{2}$$

where, as described above, Y is (log of) hourly earnings; PT is the probability of working part-time (PT equals one if working part-time and zero if working full-time); and X is the set of exogenous human capital characteristics such that

$$E\left[\varepsilon_i \middle| X_i\right] = E\left[\nu_i \middle| X_i, W_i\right] = 0.$$

The endogeneity of PT arises whenever the error terms ε_i and v_i are correlated, as

$$E\left[\varepsilon_i, \nu_i \middle| X_i, W_i\right] = \rho,$$

where $\rho \neq 0$, which renders inconsistent the OLS estimate of β.

The same set of exogenous X variables appears in both outcome and treatment equations. We additionally include in the treatment equation the set of demographic variables W already used and explained (see 2SLS analysis above). Although the correlation between part-time and the demographic variables is low (both being weak instruments of the part-time decision), their introduction in the heteroskedastic nonlinear relationship and in the variance specification allows us to get consistent estimates. Thus we are able to adequately model the heteroskedasticity and thereby generate a valid instrument.

11. This technique was initially developed by Rigobón (2003) for continuous simultaneous equation models and was implemented for the continuous outcome–binary treatment case by Klein and Vella (2009). Recent implementations of the technique can be found in Rigobón (2003), Rigobón and Rodrik (2005), Farré, Klein, and Vella (2010), Schroeder (2010), Millimet and Tchernis (2012), Emran and Sun (2011), Emran and Shilpi (2012), Berg, Emran, and Shilpi (2013), Chowdhury and others (2013), Emran and Hou (2012), Mallick (2012) and Emran, Robano, and Smith (2014).

Rigobón (2003) and Klein and Vella (2009) note that if the errors in equation 2 are heteroskedastic, this will effectively induce an exclusion restriction, and it is thus possible to identify the model.

Although the model allows for the presence of heteroskedasticity in each equation, we follow Klein and Vella (2009) and model it only for the binary response equation:

$$\nu_i = S\left(X_i'\gamma + W_i'\zeta\right)\nu_i^*,$$

where $S(.)$ is an unknown function, γ and ζ are unknown parameter vectors, and v_i^* is a homoskedastic random disturbance independent of X_i and W_i but dependent on ε_i.[12] The probability of working part-time is thus

$$\Pr\left(PT = 1 \middle| X_i W_i\right) = \Pr\left(PT = 1 \middle| X_i'\pi + W_i'\phi; X_i'\gamma + W_i'\zeta\right)$$

$$\equiv P\left(\frac{X_i'\pi + W_i'\phi}{S\left(X_i'\gamma + W_i'\zeta\right)}\right),$$

where $P(.)$ is the distribution function for v^*. For the specification of the $S(.)$ we follow the parametric approach developed in Farré, Klein, and Vella (2010), Emran, Robano, and Smith (2014), and Millimet and Tchernis (2012), among others, which is based on Harvey's (1976) model of the heteroskedastic probit,

$$S\left(X_i, W_i\right) = e^{X_i'\gamma + W_i'\zeta}.$$

Regarding the interpretation of the error structure in the part-time–hourly earnings model, the heteroskedasticity of v might be explained by several variables. As mentioned earlier, human capital variables, regional dummies, and demographic characteristics are all good candidates to determine such heterogeneity in the sample variance. On the other hand, the correlation between ε_i and v_i can be attributed to unobserved ability, measurement errors, discrimination, or reverse causality. For instance, in our setup, as education is positively correlated with earnings, highly educated females might work part-time because they are well off, while other highly educated females might work full-time because of the high opportunity cost entailed in part-time work. Age is a proxy for experience; but some females might take different

12. If errors were homoskedastic, because the probability is nonlinear, it would still be possible to identify the model using data only from the tail. When errors are heteroskedastic, $S(.)$ is a nonconstant function, and it is possible to also exploit data from the region where $\Pr(PT = 1)$ is linear, and thus the predicted probability of working part-time becomes a valid instrument.

lengths of time off during childbearing. It seems reasonable, then, to view the approximation to experience through age as a variable affected by measurement errors (very likely correlated with some female characteristics). There might be different living expenses within the same region, generating both correlation among the errors and heteroskedasticity in the part-time equation. How the number of children affects a woman's decisions is not clear. For some females more children might mean working part-time to allow them to care for children at home, while for others more children might mean working full-time because they need the extra income. There are also measurement error problems both in hours and in reported earnings. It is highly likely that such problems generate both heteroskedasticity and correlation.

As discussed in previous paragraphs, it is reasonably assumed that the decision to work part-time is correlated with unobservables that affect earnings. The Klein-Vella technique (KV) solves this endogeneity problem. However, endogeneity may not be the sole problem we face. We have assessed the possibility of selection into the female labor market. As we did in the OLS and 2SLS analyses, we introduce a proper Mills ratio—and also the informality binary variable—in our KV augmented earnings equation.

Results

In this section, we discuss the results of our econometric analysis. We apply the recently developed technique "identification through heteroskedasticity." First, to build intuition, we show the results from the ordinary least squares (OLS) and instrumental variables estimations. Then, we causally identify and unbiasedly estimate the link between the decision to work part-time and hourly earnings for females already explained.

Baseline OLS Estimation

The usual Mincer equation (column 1 in table 5) for the whole sample of working females shows positive and significant effects of education (recall that primary education is the base category) and experience. As we stated, we use dummies to control for geographical effects.

The last control variable is urban, which is significant and positive, as expected. The coefficients for educational attainment, experience, and the regional dummies are robust to the five specifications (except in the case of urban status, where the point estimate increases from 4 percent to 8 percent).

TABLE 5. Estimation Results for the Whole Sample[a]

Variable	*OLS* (1)	*IV* (2)	*KV-IV* (3)	*KV-IV* (4)	*KV-IV* (5)
Part-time	0.42	0.62	–0.04	–0.07	–0.08
	(0.01)***	(0.35)**	(0.12)	(0.16)	(0.16)
Incomplete secondary	0.12	0.13	0.10	0.10	0.11
	(0.01)***	(0.02)***	(0.01)***	(0.01)***	(0.01)***
Complete secondary	0.30	0.34	0.26	0.26	0.31
	(0.01)***	(0.02)***	(0.02)***	(0.01)***	(0.01)***
Technical or university	0.95	1.04	0.87	0.88	1.00
	(0.01)***	(0.03)***	(0.02)***	(0.02)***	(0.02)***
Age	0.01	0.01	0.01	0.01	0.01
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
North	–0.07	–0.07	–0.07	–0.07	–0.07
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
Center	–0.16	–0.17	–0.17	–0.17	–0.17
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
South	–0.17	–0.19	–0.16	–0.16	–0.18
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
Urban	0.04	0.04	0.06	0.07	0.08
	(0.01)***	(0.02)***	(0.01)***	(0.01)***	(0.01)***
Informal status		–0.15		0.04	0.04
		(0.10)*		(0.04)	(0.04)
Inverse Mills ratio		0.54			0.56
		(0.06)***			(0.07)***
Constant	6.54	6.15	6.65	6.64	6.21
	(0.02)***	(0.06)***	(0.03)***	(0.03)***	(0.06)***
R^2	0.28	0.27	0.20	0.19	0.19
N	26,687.00	26,687.00	26,687.00	26,687.00	26,687.00
F	1,035.75	722.06	791.27	704.32	646.18
Underid		18.75	145.23	103.13	103.05
Underid-pval		0.00	0.00	0.00	0.00
APchi-Weakid-RK		3.75	145.97	103.49	103.40
Hansen-J		59.50	0.00	0.00	0.00
J-pval		0.00			
Endog					
Endog-pval		0.63	0.00	0.00	0.00

a. The whole sample is Chilean women age fifteen to fifty-nine. Estimates from regressions at mean levels. Column 1 presents OLS estimation results. Column 2 uses as instruments number of children (birth to four years and five to fourteen years) present at home and marital status. Columns 3 to 5 use the Klein and Vella (2009) identification through heteroskedasticity technique. Column 4 is a binary variable for informal employment status to column 3. Column 5 adds a selection correction term to column 4. Dependent variable is log of hourly earnings from labor income. Authors' calculations based on CASEN (2009).

**Significant at less than 5 percent.

***Significant at less than 1 percent.

Column 1 also includes a binary variable that takes a value of one whenever the worker works less than thirty hours a week. In this case, we find a positive and significant premium of 52 percent (0.42 log points in the table). A similar result is documented in López-Bóo, Madrigal, and Pagés (2010) for Honduras and in Rau (2010) for Chile. This is the opposite of what is found in OECD countries, where one of the concerns is that beyond lack of prospects, greater informality, and lower future pensions, part-time workers earn less per hour (that is, there is a penalty rather than a premium).

Instrumental Variables with Selection Correction

Column 2 of table 5 presents the point estimates from the augmented 2SLS estimation (described in equations 1 and 2). We ran a comprehensive set of regressions, constructed by gradually including regressors one by one. However, since there are no dramatic changes and the results always show a premium, for the sake of space we include only the baseline OLS (column 1) and the augmented 2SLS (column 2) before moving to the set of regressions that follow Klein and Vella's (2009) work.

There is evidence of a selection bias, as demonstrated by the positive and significant coefficient on the inverse Mills ratio. We were not able to reject the null hypothesis that the instrumental variables (the set of demographics in this case) are weak instruments. The informal status binary variable is negative and significant (close to 15 percent).

Owing to the differences in the specification of column 2 with respect to column 1, the part-time coefficient changes from 52 to 86 percent (0.42 to 0.62 log points in the table).[13]

Endogeneity in the Part-Time–Full-Time Work Decision

We estimate the causal effect of working part-time on hourly earnings. Strikingly, once we account for the endogeneity in the decision to work part-time using the Klein and Vella (2009) technique, the impact on hourly wages is not positive and significant anymore. It should be stressed that the positive correlation that we detected in all the regressions (many different specifications) that did not control for endogeneity completely disappears once we

13. In the case of this study, the variables that are usually assumed as a disincentive to female labor-force participation are significant and have the expected sign. Education and experience are positive, and the demographic variables related to care duties are negative. Being divorced or separated seems to be the only category that shows a positive effect on a woman's labor decision relative to the single group.

consider it. Furthermore, such positive correlation becomes a nonsignificant penalty. Results are presented in columns 3, 4, and 5 of table 5. We begin with baseline KV-IV estimation, comparable to that of column 1, that shows a 4 percent nonsignificant penalty. The penalty increases to 7 percent when the informal binary variable is included and to 8 percent when beyond informality status, a selection correction term is considered (Mills ratio).

Since the Klein and Vella (2009) technique relies on the presence of heteroskedasticity, we test it using the likelihood-ratio test for the null hypothesis of homoskedasticity, which is convincingly rejected in all the estimation samples (all females aged fifteen to fifty-nine, salaried workers and formal workers). The *p* value is always 0.00. In the appendix, we present in table A1 the probit selection estimation for part-time status for the whole sample of females. Point estimates are presented in column 1, and the variables providing heteroskedasticity are in column 2. Technical education and age imply significantly low dispersion levels. The urban and north geographical variables as well as the number of children contribute positively and significantly to the dispersion levels.

We consider now two subsamples of females: those who are dependent (salaried workers), of whom we observe earnings for 18,439 females, and those who work in a formal setting (about 17,056 earnings observations). We present estimation results for them in tables 6 and 7.

When comparing the whole sample (table 5) and the subsample (table 6) of salaried employees, we observe that the magnitude and significance of the coefficients change. From detecting a nonsignificant penalty of less than 10 percent, we move to finding a significant penalty that, depending on the specification, is always larger than 25 percent (the 0,25 log points in the table is approximately a penalty of 22 percent).

In the same way, we detect a significant penalty for the subsample of formal workers (table 7) that is always larger than 15 percent. Although for the whole sample of working women the estimated penalty is nonsignificant, for the subsample of salaried workers and the subsample of formal workers it is clearly significant, both statistically and economically.

Conclusion

We have made three contributions in this paper. We document the positive correlation between part-time work and hourly earnings in Latin America. Using Chile as an example, we analyze the causal effect from working part-time

TABLE 6. Estimation Results for Salaried Employees[a]

	OLS (1)	*IV* (2)	*KV-IV* (3)	*KV-IV* (4)	*KV-IV* (5)
Part-time	0.32	0.84	−0.36	−0.25	−0.48
	(0.01)***	(0.56)	(0.12)***	(0.14)*	(0.16)***
Incomplete secondary	0.10	0.09	0.09	0.09	0.10
	(0.01)***	(0.01)***	(0.02)***	(0.02)***	(0.02)***
Complete secondary	0.30	0.32	0.27	0.26	0.31
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
Technical or university	0.95	1.03	0.91	0.89	1.03
	(0.01)***	(0.02)***	(0.01)***	(0.01)***	(0.02)***
Age	0.01	0.01	0.01	0.01	0.01
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
North	−0.07	−0.10	−0.06	−0.06	−0.07
	(0.01)***	(0.02)***	(0.01)***	(0.01)***	(0.01)***
Center	−0.15	−0.16	−0.14	−0.14	−0.15
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
South	−0.14	−0.17	−0.12	−0.12	−0.14
	(0.01)***	(0.02)***	(0.01)***	(0.01)***	(0.01)***
Urban	0.03	0.01	0.05	0.05	0.07
	(0.01)***	(0.03)	(0.01)***	(0.01)***	(0.01)***
Informal status		−0.33		−0.13	−0.09
		(0.11)***		(0.03)***	(0.03)***
Inverse Mills ratio		0.54			0.68
		(0.09)***			(0.07)***
Constant	6.53	6.17	6.66	6.70	6.21
	(0.02)***	(0.06)***	(0.03)***	(0.03)***	(0.06)***
R^2	0.35	0.31	0.20	0.25	0.16
N	18,439.00	18,439.00	18,439.00	18,439.00	18,439.00
F	901.82	801.96	816.55	811.61	659.97
Underid		7.35	163.68	121.03	115.58
Underid-pval		0.20	0.00	0.00	0.00
APchi-Weakid-RK		1.47	165.06	121.75	116.23
Hansen-J		31.34	0.00	0.00	0.00
J-pval		0.00			
Endog					
Endog-pval		0.38	0.00	0.00	0.00

Source: Authors' calculations based on CASEN (2009).

a. Estimates from regressions at mean levels for the subsample of dependent workers. Column 1 presents OLS estimation results. Column 2 uses as instruments number of children (birth to four years and five to fourteen years) present at home and marital status. Columns 3 to 5 use the Klein and Vella (2009) identification through heteroskedasticity technique. Column 4 is a binary variable for informal employment status to column 3. Column 5 adds a selection correction term to column 4. Dependent variable is log of hourly earnings from labor income.

***Significant at less than 1 percent.

**Significant at less than 5 percent.

*Significant at less than 10 percent.

TABLE 7. Estimation Results for Chilean Workers in Formal Status

	OLS (1)	*IV* (2)	*KV-IV* (3)	*KV-IV* (4)
Part-time	0.39	–0.74	–0.17	–0.40
	(0.02)***	(0.90)	(0.18)	(0.20)**
Incomplete secondary	0.09	0.09	0.09	0.09
	(0.01)***	(0.02)***	(0.02)***	(0.02)***
Complete secondary	0.28	0.32	0.27	0.32
	(0.01)***	(0.02)***	(0.01)***	(0.01)***
Technical or university	0.93	1.07	0.91	1.07
	(0.01)***	(0.03)***	(0.01)***	(0.02)***
Age	0.01	0.01	0.01	0.01
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
North	–0.06	–0.04	–0.05	–0.05
	(0.01)***	(0.03)	(0.01)***	(0.02)***
Center	–0.15	–0.13	–0.14	–0.14
	(0.01)***	(0.02)***	(0.01)***	(0.01)***
South	–0.13	–0.13	–0.12	–0.14
	(0.01)***	(0.02)***	(0.01)***	(0.01)***
Urban	0.01	0.06	0.03	0.05
	(0.01)	(0.03)**	(0.01)***	(0.01)***
Inverse Mills ratio		0.72		0.69
		(0.12)***		(0.08)***
Constant	6.60	6.19	6.67	6.17
	(0.02)***	(0.08)***	(0.03)***	(0.06)***
R^2	0.36	0.02	0.27	0.20
N	17,056.00	17,056.00	17,056.00	17,056.00
F	879.85	554.95	823.23	678.05
Underid		4.59	82.35	78.61
Underid-pval		0.47	0.00	0.00
APchi-Weakid-RK		0.92	82.71	78.92
Hansen-J		19.60	0.00	0.00
J-pval		0.00		
Endog				
Endog-pval		0.12	0.00	0.00

Source: Authors' calculations based on CASEN 2009.

a. Estimates from regressions at mean levels. Column 1 presents OLS estimation results. Column 2 uses as instruments number of children (birth to four years and five to fourteen years) present at home and marital status. Columns 3 and 4 use the Klein and Vella (2009) identification through heteroskedasticity technique. Column 4 adds a selection correction term to column 3. Dependent variable is log of hourly earnings from labor income.

***Significant at less than 1 percent.

**Significant at less than 5 percent.

on hourly earnings. And we provide explanations behind the change in sign (from positive correlation to negative causality).

The positive correlation between part-time work and hourly earnings has already been documented for Honduras and Chile. We provide evidence that it is also present in several Latin American countries.

Using a novel econometric technique that does not rely on the presence of an exclusion restriction for identification, we have causally estimated the effects on hourly earnings of working part-time, which are negative and significant for a subsample of female workers (those in a dependency relation or in formal settings). The estimated penalty is economically important in magnitude, as it is of about 30 percent.

We suggest that the reason for the sign change is the presence of heterogeneity, which summarizes in a point estimate (the OLS) many different situations, encompassing multiple effects (measurement errors, precarious features). Once those situations are considered and the heterogeneity taken into account, there is a negative causal effect from working part-time on hourly earnings.

This paper has key policy implications for countries that see part-time work as a way to increase female labor-force participation and for those with higher levels of women's participation in labor market that see part-time work as an opportunity for women (and their families) to find a balance between home and paid work. In particular, given that in other respects (prospects, training, public social benefits, turnover, and so on) part-time work is already considered precarious, the possibility that beyond its negative features it could also mean a penalty for women should be a reason to be concerned, and even more in a scenario where such work is being promoted. Moreover, part-time work and informality seem to be related. Women seem to be penalized when they accede to a salaried and/or to formal part-time job. On the other hand, neither a penalty nor a premium is detected when they work in nonsalaried or in informal situations.

Since this paper enlightens our understanding of female part-time features in a developing country, its main results should be considered. Part-time employment is positively related with informality, and whenever women achieve a part-time position with contract and social benefits they are penalized.

Some features of part-time work are not considered here but are left for future research. First, it would be important to address the reasons behind the part-time penalty that salaried workers and formal female workers face. Second, the analysis considers whether this penalty has different impacts on

vulnerable or more favored workers. When examined along the income distribution, a number of possible patterns may be observed: it may be that for poor workers the part-time penalty is greater than for those at the right tail, or that the opposite pattern is observed, or that a flat penalty is observed along the entire distribution. Nevertheless, the first possibility seems to be the most likely, given that among workers toward the right tail there are professionals and technicians who are likely to have the strongest bargaining power and may elect for self-employment and part-time work in an informal framework to avoid having to make social security contributions.

Third, for women, working in part-time jobs might be a stepping-stone between not working at all and working full-time when their children attend school. In such a scenario, the unfavorable effects of working part-time for a period (effects that are themselves a reason for concern) would be moderate since these would only occur during a transitional stage and would be preferred over the alternative option of not working at all. If this is the case, then through part-time jobs women may acquire experience (or at least avoid depreciation of their human capital) during a life phase in which they are balancing home and some sort of paid work. However, part-time work might not be a transitional stage, and it is likely that the alternative for part-time work is not actually nonwork but rather full-time work. If that is the case, then the adverse results presented in this paper (penalty in formality versus nonpenalty but informality) should be seriously considered, since women might become trapped for long periods in a bad equilibrium.

TABLE A1. Probit Estimation for the Part-Time Equation[a]

	Point/se	*Insigma*^{2}
Incomplete secondary	−0.04	0.02
	(0.03)	(0.11)
Complete secondary	−0.09	−0.04
	(0.05)*	(0.11)
Technical or university	−0.13	−0.19
	(0.05)**	(0.11)*
Age	0.01	−0.03
	(0.00)***	(0.00)***
North	−0.07	0.20
	(0.04)*	(0.09)**
Center	−0.02	0.07
	(0.03)	(0.07)
South	0.02	0.03
	(0.02)	(0.06)
Urban	−0.04	0.34
	(0.02)**	(0.06)***
Number of children 5–14	0.01	0.06
	(0.01)	(0.03)*
Number of children birth to four years	−0.04	0.13
	(0.02)*	(0.06)**
Married	0.01	0.04
	(0.02)	(0.06)
Separated	0.02	0.03
	(0.03)	(0.10)
Widowed	0.05	−0.25
	(0.04)	(0.16)
Constant	−0.72	
	(0.08)***	
N		26,687
Likelihood–ratio test		98.59
p value		0.00

Source: Authors' calculations based on CASEN 2009.

a. The whole sample of females aged fifteen to fifty-nine is considered.

***Significant at less than 1 percent.

**Significant at less than 5 percent.

*Significant at less than 10 percent.

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