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Luis García
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DEPARTAMENTO DE
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econo@pucp.edu.pe
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jorge.rojas@pucp.edu.pe
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Effect of the Juntos social program on female labor supply in Peru

Luis García[1] and Erika Collantes[2]

Abstract

Over the last ten years, the Peruvian conditional transfer program, Juntos, has expanded significantly. The objective of this program is to promote school attendance, reduce child labor, and monitor the growth and development of children in impoverished areas. Although improvements in these indicators have been appreciated, there may be unforeseen impacts on the households receiving the transfers. In this study, we focus on the program's impact on the working hours of women in recipient households. According to the standard theory (Becker, 1965), transfers could reduce the labor supply by assuming leisure to be a normal good. According to theories of family economics, transfers to one member can affect the allocation of resources to all members of the household (Chiappori, 1992). The international empirical literature is inconclusive, pointing to non-existent, negative, and even positive effects (Alzúa, Cruces and Ripani, 2012; Gassman and Trindade, 2016). In the Peruvian case, the most similar study is that of Fernández and Saldarriaga (2014), who study the impact of the closeness of the program payment date on female labor supply, finding a negative effect during the week of payment. Our study goes further, in that: (i) we consider that transfers could result in a reallocation of resources within the household; (ii) we quantify the changes in working hours from one year to the next as a result of the program; (iii) in the light of structural econometric models, we control the main biases (unobservable heterogeneity, selection bias, and endogeneity), since it is not possible to apply an experimental design. Using the panel component of Peru's National Household Survey (Encuesta Nacional de Hogares del Perú), we find that the Juntos program reduces the paid work of women in beneficiary households by nine hours per week.

Keywords: Conditional transfer programs, Juntos program, unforeseen impacts, selection bias, unobservable heterogeneity.

JEL codes: C23, I38, J22

[1] Department of Economics, Pontificia Universidad Catolica del Peru (lgarcia@pucp.edu.pe)
[2] Department of Economics, Pontificia Universidad Catolica del Peru (erika.collantes@pucp.edu.pe)
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Resumen

En los últimos diez años, el Perú ha experimentado una importante expansión del programa de transferencias condicionadas Juntos. El objetivo de este programa es incentivar la asistencia escolar, reducir el trabajo infantil y seguir el crecimiento y desarrollo de los niños en zonas de pobreza. Se han observado mejoras en estos indicadores; sin embargo, pueden existir impactos no previstos en el hogar que recibe la transferencia. Este estudio se enfoca en el impacto sobre las horas de trabajo de las mujeres de hogares beneficiarios. Según la teoría estándar (Becker, 1965), las transferencias pueden reducir la oferta laboral asumiendo al ocio como un bien normal. Según las teorías de la economía familiar, las transferencias a un miembro pueden afectar la asignación de recursos de todos los miembros dentro del hogar (Chiappori, 1992). La literatura empírica internacional no es concluyente, mostrando efectos nulos, negativos o inclusive positivos (Alzúa, Cruces y Ripani, 2012; Gassman y Trindade, 2016). En el caso peruano, el estudio más cercano es el de Fernández y Saldarriaga (2014), quienes estudian el impacto de la proximidad de la fecha de pago del programa Juntos en la oferta laboral femenina, encontrando un efecto negativo. Nuestro estudio va más allá porque: (i) considera que las transferencias pueden ocasionar una reasignación de los recursos dentro del hogar; (ii) cuantifica los cambios en las horas de trabajo de un año a otro como consecuencia del programa; (iii) a la luz de modelos econométricos estructurales, controlamos los principales sesgos (heterogeneidad inobservable, sesgo de selección y endogeneidad), dado que no se puede aplicar un diseño experimental. Utilizando la Encuesta Nacionales de Hogares Panel del Perú de 2011-2013, encontramos que el programa Juntos reduce 9 horas semanales el trabajo remunerado de las mujeres de hogares beneficiarios.

Palabras Clave: Programas de transferencias condicionadas, programa Juntos, Impactos imprevistos, sesgo de selección, heterogeneidad inobservable.

Códigos JEL: C23, I38, J22

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Luis García and Erika Collantes

1. Introduction

In recent years, there has been a significant global expansion in social programs oriented towards the poorest. Peru has been running a conditional transfer program called Juntos since 2005, covering the population living in poverty. The objective of this program is to ensure that school-aged children attend school and undergo periodic health checks. The transfer is paid to mothers, conditional upon fulfillment of the stipulated program commitments.

There is a wealth of empirical literature to support the contention that conditional transfer programs have made a clear impact on school attendance, reducing child labor, and certain improvements in the field of health and nutrition (Fiszbein and Shady, 2009; Manley, Gitter and Slavchevska, 2013). However, the doubt remains about whether the design of such programs might have unforeseen impacts that could either increase and strengthen household welfare or harm it in some way. One such unforeseen impact is that on the labor supply of women from beneficiary households.

Standard economic theory predicts that a cash transfer to individuals will decrease their willingness to work, both in terms of labor participation and hours worked. Family economics extends the model to propose that transfers may cause a reallocation of resources, with the impact possibly depending on the bargaining power of individual household members. As such, we are interested in determining whether the Juntos program that has been massively implemented over the last decade has made any impact on the working hours of women from beneficiary households. The female population is important because of the well-known gender inequality of labor participation, whereby women participate less than men on the job market and the elasticity of the female labor supply tends to be greater than the male equivalent given their traditional role in the household (Kumar and Liang, 2016).

The international empirical literature on this subject is inconclusive, pointing to null, negative, and even positive effects (Alzúa, Cruces and Ripani, 2012; Gassman and Trindade, 2016). In the Peruvian case, the closest study to ours is that by Fernández and Saldarriaga (2014), who analyze the impact of closeness to the program payment date on the female labor supply and find a negative effect during the week of payment.

Our study goes further than that of Fernández and Saldarriaga (2014), because: (i) we consider that transfers could result in a reallocation of resources within the household

including time spent working; (ii) we use the available data to quantify the changes in working hours from one year to the next as a result of the program; (iii) in the light of structural econometric models, we control the main biases (unobservable heterogeneity, selection bias, and endogeneity); this is because it is not possible to apply an experimental design, as the program's allocation was not random but targeted ad hoc at certain regions and geared towards populations living in poverty. Thus, we will quantify the causal effect by way of a structural econometric study, because of the lack of experimental data and because the structural model takes into account decisions within the households as well as causal relationships, unlike impact evaluation studies which do not usually feature such analysis (Gaarder et al., 2010).

In this study, we center on the impact on paid work of women. Remunerated work is known to mean working outside the house, and there are studies that propose that conditional transfer programs could be encouraging unpaid participation in family businesses or housework (Streuli, 2012; Escobal and Benites, 2012; Jones et al. 2007). Thus, it would be interesting to study the impact of these programs on remunerated work, given the implications of women leaving the job market.

Based on the theoretical literature, we hypothesize that the impact of the Juntos program on remunerated working hours is negative. The results of our study show that this impact has indeed been negative and significant, providing evidence of the income effect on remunerated working hours given an increase in unearned income, or in the monetary transfer. In this study we do not make a value judgement on whether the effects we find are good or bad in terms of welfare; we simply present the evidence we encounter.

The paper is organized as follows: In Section 2 we present a review of the theoretical and empirical literature on the subject. In Section 3 we set out the econometric methodology, in which we discuss the main economic problems we come up against and solve. In Section 4 we define the variables and present a brief analysis of the sample data. In Section 5 we show the main results. Finally, in Section 6 we conclude.

2. Theoretical framework

2.1. Theoretical literature

Economic literature abounds with studies on the impact of government transfers and social programs on the labor supply. In this section we break down the theoretical studies into those in which the decision to work is made on an individual basis (one-person households); and those in which a person's labor supply interacts with that of other members of the household (multi-person households).

2.1.1. The individual labor supply model

This concerns a basic neoclassical model of labor supply in a single period (see, for example, Blundell and McCurdy, 1999) in which an person decides between two goods, one a consumption good and the other leisure time, both of which provide individual welfare. This person faces two restrictions; one is time-related, where the total amount of time available is divided between leisure time and time spent in paid work. The other restriction is budget-related, and corresponds to the spending limit on the consumer good, which is financed through earned income (hours worked multiplied by wage earned) plus an unearned income. The microeconomic theory shows that an increase in unearned income will result in a reduction in the labor supply (Becker, 1965, p. 501). This model was extended by Gronau (1976), who considered domestic work to be an additional activity to leisure and work outside the house. Gronau's model proposes that given an increase in unearned income, there will be a reduction in hours worked due to the increase in leisure hours, without affecting domestic work. In the case of individuals who do not work (that is, those who only engage in domestic work and leisure), the aforementioned increase will entail an increase in leisure time at the expense of time spent on domestic work.

However, when it comes to welfare programs, as Moffitt (2002) points out, the outlook is a little more complex than the basic neoclassical model proposes. First, welfare programs can take a variety of forms, including conditional or unconditional monetary transfers, tax relief, and in-kind transfers. Second, these programs are usually applicable to lower-income population groups. That is, individuals are eligible for programs if they demonstrate that they meet the requirements for participation, which include having a low income (mean-tested programs). Moreover, if the earnings of these individuals increase over time, they may no longer be eligible to participate in these programs. This creates the possibility that individuals could make decisions to ensure program eligibility, at their convenience. An important fact that is not taken into account in the basic model is that many individuals who are eligible for programs may not wish to participate in them. According to Moffitt (2002), there are two possible rationalizations for this behavior. One is that there may be a certain degree of stigma attached to participating in the program, which could reduce individual utility. The other is that there are costs associated with taking part in these programs (time, effort, "hassle" costs, etc.), which could discourage individuals from participating.[1]

In this model, if the monetary transfer to the eligible group is increased, the labor supply could decrease, because: (a) there could be individuals who decide to work less to reduce their income in order to become eligible for the program; (b) some who are already on the program could reduce their working hours due to a pure income effect;

[1] In addition, there could be non-convexities in the budgetary restrictions, precisely in the area in which the person could change their eligibility status.

and (c) eligible individuals who did not previously wish to join the program could change their minds if any increase in the transfer exceeded the costs of being on the program (Moffitt, 2002, p.2417).

2.1.2. The family labor supply model

A number of studies have extended the standard one-person model of labor supply to reflect the fact that there may be more than one member of a household who is willing to supply working hours on the job market. The simplest way to approach the family economy is through a family utility-family budget model in which the function of household utility is a single entity, and depends on the aggregate consumption of all members and the number of hours worked by each. Moreover, this model assumes that the income generated through the work of household members goes into a common purse, used to fund family purchases. Any financial transfers to individual members would end up forming part of this common purse.

However, various studies have shown that this model is not suitable for the study of family decisions, whether theoretical or empirical (Chiappori, 1992; Quisumbing and Maluccio, 1999). For this reason, other models assume different and separate utility functions for the head of household and his or her spouse, with budgetary restrictions that are not necessarily common, and family decisions may be influenced by the individual with the most bargaining power in the household. This has given rise to a strand known as "collective" whose models contribute to an explanation of how the allocation of resources are determined within the household. Chiappori (1992) finds a sharing rule that is endogenously determined in the model, depending on the earnings of each individual and on non-labor income. This sharing rule determines how a transfer received can be distributed among the members of a household.

In the light of these models, a cash transfer disbursed to mothers would not necessarily have the same effect as in the case of the one-person model, since it is possible that a fraction of the amount transferred will end up in the hands of other household members. This fraction will depend on the bargaining power of the mother in the household. It is worth mentioning that the theoretical literature and the empirical evidence show that the cash transfers received by mothers can alter their empowerment (Haddad et al., 1997; Barrientos and DeJong, 2004).

2.2. International empirical evidence

In this section we present some international empirical evidence on the impact that welfare programs have on labor supply. Hoynes (1996), in a study on the United States, finds that the cash-transfer welfare program Aid to Families with Dependent Children-Unemployed Parent (AFDC-UP) has a negative effect on labor supply and other work incentives. For the same country, Krueger and Meyer (2002) evaluate the effects of the

social security program on labor supply. Specifically, they focus on workers' compensation insurance, and find that these programs tend to reduce employees' working hours.

Gassmann and Trindade (2016) analyze the impact on labor supply of a monetary assistance program for the neediest in the Kyrgyz Republic. They find that the effect differs between heads of household and their spouses, the sign being negative for the former and unclear for the latter (primarily women). The impact on wives varies depending upon the region of the country and the quarter of the year in which the questionnaire was conducted.

Among the studies on conditional cash transfer programs, Alzúa, Cruces and Ripani (2012) investigate the effect of these social programs on incentives to work and the adult labor supply in three developing countries (Mexico, Nicaragua, and Honduras). To this end, they use a differences-in-differences technique since they have experimental data sets from those programs. The results show the effect of these social programs on the adult labor supply has been negative for the most part, but small and non-significant. However, in the case of the Mexican program Progresa, they find a small and positive impact on the number of hours worked by recipient mothers.

The literature on conditional cash transfers also includes that of Molyneux (2007) who, after studying Mexico's Progresa/Oportunidades, proposes that such programs, rather than empowering women, limit their traditional role as homemaker, childcarer, and administrator of household spending, while their male partners retain their role as breadwinner.

2.3. Description of the Juntos program

Before presenting the literature review on the Peruvian case, it is important to introduce the Juntos program. Since 2005, Peru has been part of the group of countries that has implemented conditional cash transfer programs to benefit children. The Juntos program consists fundamentally of the disbursement of a cash transfer (200 soles bimonthly, approximately 60 American dollars) to women with young children, conditional upon their attendance of school and on growth and development checks. The program began in the deprived region of Ayacucho, which was the cradle of the political violence that plagued Peru during the 1980s and part of the 1990s.

Then, throughout 2005, the program was rolled out in just five impoverished regions of the country. In the subsequent years it was extended to most of Peru, with coverage in 21 of its 26 political regions by 2017. Expansion has been gradual and the program does not cover these regions in their entirety, focusing primarily on deprived rural areas. Internally, in each region the program has reached the provinces and districts with the

highest levels of poverty and need. According to statistics from the third quarter of 2017, the program contains 742,094 registered households, of which 674,607 receive the transfer regularly. In these households, there are 1,599,582 beneficiary children.

A notable fact about this program is that no base line data was collected prior to implementation. Moreover, the initial selection of beneficiary districts was not based solely on poverty criteria, but also included those districts that were affected by the internal armed conflict. In subsequent years beneficiary selection was sequential, focusing primarily on the regions with the highest poverty levels in certain districts; within these districts, the Household Targeting System conducted a joint assessment with the local authorities to determine the recipient households.

This methodology meant that the information obtained from the program was far from being an experimental design. In the first place, the beneficiary selection was not random but determined by the authorities of the day, without a statistically comparable control group. Moreover, the participation of local authorities in the implementation and selection of beneficiaries introduced specific characteristics of each region (for example, preferences and acceptance of state policies by the population) to the selection process. Finally, the participation of each household in the program is voluntary, not compulsory. This fact creates a self-selection process which is based on subjective criteria (costs and benefits of taking part). All of these considerations suggest the existence of relevant information on individual participants that is not normally available to program evaluators. Therefore, given the nature of the data, measurement of the effect of Juntos requires statistical and econometric techniques that take into account the possible biases stemming from the program's design and the omitted variables.

2.4. Empirical evidence in Peru

In a qualitative study on the effects of the program in the Ayacucho region, Streuli (2012) finds similar results to those of Molyneux (2007) regarding the traditional rule of women, but she also points to evidence of empowerment of beneficiary women in terms of their self-esteem and social image. Moreover, she proposes that some beneficiary women could use the funds to undertake or bolster habitual agricultural activities. Moreover, because participating children spend more time at school, mothers reallocate their time to domestic activities.

In a qualitative analysis, Escobal and Benites (2012) use a differences-in-differences matching method to find that the Juntos program has had an impact on the allocation of time to child labor. According to their calculations, which draw on the "Young Lives" database, the number of minutes per day that children assign to remunerated activity is reduced slightly, while the minutes allotted to unpaid work increase. The authors infer from this that the program is fostering adult work (non-remunerative for the mothers)

in family businesses. Jones et al. (2007) reach similar conclusions about the increase in the workload of women in agricultural and domestic activities.

In another study, Fernández and Saldarriaga (2014) attempt to estimate the impact of Juntos on hours worked through the effect that closeness to the payment date might have. Using the differences between the Juntos payment dates and those of the interview for the National Household Survey (Encuesta Nacional de Hogares, ENAHO) within a single municipality, they find that the Juntos program reduces the number of hours worked by between six and ten hours during the week following the cash transfer date. The authors attribute this impact on hours worked to the time it takes to access the money from the transfer, the time allocated to spending it, and a possible income effect. This is likely to be a very short-term impact, as it only considers the week that immediately follows each payment date. This drop in working hours is greater for married women and for mothers with children below the age of five. Moreover, they do not find a significant effect on workforce participation in remunerated activities, nor on the labor supply of the husbands of married women.

Finally, Alencastre and Del Pozo (2017) estimate the impact of Juntos on labor participation. Using a linear and non-linear double differences model, they do not find statistically significant evidence of changes to labor participation in the years 2004 and 2014. In another study, Del Pozo and Guzmán (2010), employ quasi-experimental designs to find that Juntos is encouraging agricultural production activities in rural households, from which they infer that if might affect remunerated working hours.

3. Econometric methodology

We will assess the impact of the Juntos conditional transfer on the female labor supply through an econometric model that considers working hours as the endogenous variable, and has participation in the Juntos program as the main regressor. In addition, to control for the influence of other factors, the regression includes control variables.

As has been established in the literature on labor participation, econometric variables of this type can be subject to selection bias, and occurs in this case when the hours worked and wages are only observable for women who have opted to work. If this phenomenon were to materialize, the model could not be estimated using ordinary least squares (OLS), as this would present bias or inconsistency in the estimators, but using maximum likelihood estimation (MLE), following the model proposed by Heckman (1979).

Another econometric problem occurs when the error in the equation presents an unobserved heterogeneity component, such as individual tastes and presences related

to work, that is correlated to the decision to participate in the program. If this were to occur, estimation using the Heckman method would be biased and inconsistent. On the other hand, if a panel data is employed, the bias due to unobservable heterogeneity could be eliminated through a fixed effects approach, since the first difference or the *within groups* estimator would eliminate this component. However, the fixed effects model generally does not eliminate selection bias unless the conditional expectation of the error given participation on the labor market remains constant over time, which need not necessarily be the case.

A third econometric problem arises if the regressor of interest is endogenous, or if there are omitted variables that change over time, or this regressor has been measured with error. As a consequence, a correlation between the regressor and the idiosyncratic error is produced, which makes it necessary to use an alternative based on the instrumental variables method. Any other method could give rise to estimations with endogeneity bias. In the case of Juntos, this problem is likely to exist given that participation in the program is not random but voluntary and subject to the policy decisions of the program administrators and local authorities.

Fortunately, there are techniques that allow these biases to be controlled for. To go into these techniques in detail, we employ the following sample selection model with panel data,

$$y_{it}^{*} = x_{it}\beta + \alpha_i + \varepsilon_{it} \quad (1)$$

$$d_{it}^{*} = z_{it}\gamma + \eta_i + u_{it} \quad (2)$$

$$d_{it} = 1[z_{it}\gamma + \eta_i + u_{it} > 0] \quad (3)$$

$$y_{it} = d_{it} \cdot y_{it}^{*} \quad (4)$$

Equation (1) y_{it}^{*} represents the desired working hours of each individual i at the moment t and is a latent variable that is unobserved in the entire sample. In Equation (2), d_{it}^{*} is another continuous latent variable that determines the participation of an individual i in the labor market. This latter variable is unobservable, as there is only a dummy variable that takes the value of 1 for the individual i at the moment t if the right side of Equation (2) is positive and 0 if the opposite occurs (Equation [3]). Finally, Equation (4) shows that the observed hours worked y_{it} coincide with the desired hours if they are strictly positive, and equal to 0 otherwise. In equations (1) and (2), the unobserved heterogeneity error components are α_i and η_i, which do not vary over time, and capture elements specific to the individuals that do not usually change over time, such as tastes, preferences, habits, customs, etc. Meanwhile, the idiosyncratic errors ε_{it} and u_{it} behave like typical errors in linear regression models. Finally, the vectors x_{it} and z_{it} contain variables that determine the above-mentioned endogenous variables.

This is a model with sample selection if there is some kind of covariance between the idiosyncratic errors in equations (1) and (2) – that is, $Cov(\varepsilon_{it}, u_{it}) \neq 0$, and hence Equation (1) cannot be estimated using OLS. On the other hand, if the unobservable heterogeniety term α_i has a correlation with our main regressor included in the vector x_{it}, $Cov(\alpha_i, x_{it}) \neq 0$, then the OLS and Heckman estimations in Equation (1) will present bias. Finally, endogeneity bias will arise if $Cov(x_{it}, \varepsilon_{it}) \neq 0$.

Below we present the three estimators proposed in the literature to resolve these problems.

3.1. The Kyriazidou's estimator

It was developed in Kyriazidou (1997), and the objective of this estimator is to eliminate bias due to unobserved heterogeneity and selection bias in a single procedure. As mentioned, the differentiation procedures that eliminate the heterogeneity bias do not necessarily eliminate the sample selection bias. However, according to Kyriazidou's strategy, if one person participates in two consecutive periods, the magnitude of this selection effect is very similar in both periods if z_{it} does not change over time. Let λ_{it} be this effect[2]. Then, Equation (1) can be rewritten as

$$y_{it} = x_{it}\beta + \lambda_{it} + \alpha_i + v_{it} \qquad (1')$$

where $v_{it} \equiv \varepsilon_{it} - \lambda_{it}$, which has zero mean. The term λ_{it} in (1') is the equivalent of the term of correction introduced in the sample selection models (inverse Mills ratio), but it is not constant in time, so the first differences estimator does not eliminate it. Nevertheless, under an assumption called "conditional exchangeability" and assuming $z_{i1}\gamma = z_{i2}\gamma$ it will be the case that $\lambda_{i1} = \lambda_{i2}$. Then, the calculation of the first difference will also eliminate the effect of selection bias. In empirical terms, (a) it is most probable that γ will be unknown, and, (b) in general, $z_{i1}\gamma \neq z_{i2}\gamma$. To resolve (a), Kyriazidou's method estimates equations (2) and (3) using a conditional logit fixed effects model, obtaining $\hat{\gamma}$ and $z_{it}\hat{\gamma}$ for $t = 1, 2$. For (b), Kyriazidou assigns higher weights (kernel weights) to those observations for which $z_{it}\hat{\gamma} \cong z_{it-1}\hat{\gamma}$, and estimates equation (1') in first differences using weighted least squares for the case of $d_{it}d_{it-1} = 1$. When the panel has more than two periods, the differences between two contiguous periods or with more years of difference can be calculated. This will be the case of our estimator, since our 3-year-panel database is balanced. Let $\hat{\psi}_{in}$ be the estimated weight, then the expression of the estimator is

[2] Formally, $\lambda_{it} \equiv E[\varepsilon_{it}|d_{i1} = 1, d_{i2} = 1] = E[\varepsilon_{it}|u_{i1} > -z_{i1}\gamma - \eta_i, u_{i2} > -z_{i2}\gamma - \eta_i]$.

$$\hat{\beta} = \left[\sum_{i=1}^{n}\sum_{s<t}\hat{\psi}_{in}(x_{it}-x_{is})'(x_{it}-x_{is})d_{it}d_{is}\right]^{-1} \times \left[\sum_{i=1}^{n}\sum_{s<t}\hat{\psi}_{in}(x_{it}-x_{is})'(x_{it}-x_{is})d_{it}d_{is}\right]$$

Kyriazidou (1997) calculates the variance-covariance matrix, which differs from that obtained using ordinary least squares. One advantage of this method is that it does not require a specific distribution of the errors to be assumed, but its main defect is that it rests on the assumption of "conditional exchangeability," which implies homoscedasticity in the idiosyncratic error. This assumption has been criticized in the literature for being unrealistic (Dustmann and Rochina-Barrachina, 2006; Semykina and Wooldridge, 2010).

3.2. The Rochina-Barrachina's estimator

Unlike the Kyriazidou's estimator, Rochina-Barrachina (1999) takes Equation (1) and use temporary differences to eliminate the unobserved heterogeneity component α_i, as in the case of fixed effect estimators. Let t and s be two different periods, and if the individual participates in the labor market in both (in which case, y_{it} and y_{is} will be observed), the differentiation will result in Equation

$$y_{it} - y_{is} = (x_{it} - x_{is})\beta + (\varepsilon_{it} - \varepsilon_{is}) \tag{5}$$

However, because of the sample selection problem, it will be the case that $E[\varepsilon_{it} - \varepsilon_{is}|x_i, z_i, d_{it} = 1, d_{is} = 1] \neq 0$ where x_i and z_i are the vectors of the exogenous variables in both periods. The strategy of Rochina-Barrachina is similar to that of Heckman in the case of the cross-sectional model, where the conditional expectation of $\varepsilon_{it} - \varepsilon_{is}$ is calculated under the assumption of joint normality of $\varepsilon_{it} - \varepsilon_{is}$ and the errors of the selection equation in periods t and s. Then, Equation (5) is written as

$$y_{it} - y_{is} = (x_{it} - x_{is})\beta + \ell_{ts}\lambda_{its} + \ell_{st}\lambda_{ist} + e_{its}. \tag{6}$$

In which the terms λ_{its} and λ_{ist} are the selection bias correction terms and are a function of the exogenous variables from Equation (2) in both periods and of the respective parameters.[3] The empirical strategy of Rochina-Barrachina involves estimating, in a first stage, the joint decision of labor participation in the periods t and s using a bivariate probit model, which takes the vectors z_{it} of all periods as regressors. These estimations are used to construct the estimations $\hat{\lambda}_{its}$ and $\hat{\lambda}_{ist}$, which are introduced in (6). Then, this equation is estimated using OLS, and in our case we estimate the standard deviations using the bootstrap technique. It is worth noting that this technique entails estimations taking the periods two-by-two. Using a T-period panel sample, $\binom{T}{2} = \frac{T!}{2!(T-2)!}$

[3] See Rochina-Barrachina (1999) for the exact formulas.

estimations are produced. In our case, we work with a three year panel so have three estimations that can be integrated into a single more efficient result by using a distance minimization procedure, with the variances-covariance matrix as a weighting matrix.

3.3. The estimator of Semykina and Wooldridge (2010)

The previous two estimators may not be suitable if the regressor of interest in x_{it} is correlated to the idiosyncratic error ε_{it}. As we explained earlier, if this occurs with the Juntos program, the estimators of Kyriazidou and Rochina-Barrachina would be biased and inconsistent. Semykina and Wooldridge (2010), extending the model of Woodridge (2005), propose an instrumental variables estimator to estimate this kind of model, in which there is unobserved heterogeneity correlated to the regressor of interest, selection bias, and endogeneity of the regressor of interest.

The Semykina and Wooldridge's model is in the spirit of Mundlak's (1978) correlated random effect model, which obtains the fixed-effect estimations of Equation (1), by adding time averages of a vector of variable z_{it}. This vector includes the exogenous regressors in the vector x_i, plus other valid instruments that are included in Equation (2) but not in (1). Then, Equation (1) is converted into

$$y_{it} = x_{it}\beta + \bar{z}_i\omega + E[v_{it1}|\bar{z}_i, d_{it}] + e_{it}$$

where $\alpha_i = \bar{z}_i\omega + c_i$, and $v_{it1} = c_i + \varepsilon_{it}$. Defining $v_{it2} = \eta_i + u_{it}$, under the typical assumption[4] that v_{it1} is a linear function of v_{it2} of the form $E[v_{it1}|v_{it2}] = \gamma v_{it2}$, it follows that $E[v_{it1}|\bar{z}_i, d_{it}] = \gamma E[v_{it2}|\bar{z}_i, d_{it}]$, in which $E[v_{it2}|\bar{z}_i, d_{it}] = \lambda_{it}$ is the equivalent of the inverse Mills ratio as a selection bias term of correction. Then, Semykina and Wooldridge estimate the model

$$y_{it} = x_{it}\beta + \bar{z}_i\omega + \gamma\lambda_{it} + e_{it} \quad (7)$$

using two-stage least squares for pooled data. In the first stage, λ_{it} is estimated through probit for each period. Then, $\hat{\lambda}_{it}$ is used in (7), which is estimated using as instrumental variables the valid instruments from Equation (2), $\bar{z}_i$ and $\hat{\lambda}_{it}$. The standard deviations are calculated using the bootstrap technique.

4. The data and the variables

We estimate the model primarily through the ENAHO panel for the years 2011-2013. This survey has nationwide coverage, including both urban and rural areas, and collects detailed information about household characteristics, members, and primary economic activities (job, education, healthcare, social programs, etc.). We selected the afore-

[4] This assumption is met when the joint distribution of errors is normal.

mentioned years because the Juntos panel was expanded considerably between 2011 and 2013, and these variations are captured in the survey.

Because we are interested in the labor behavior of women, we consider only those aged 14 or over. In the three years selected, it can be observed that some of these women can opt not to participate in the labor market during a given year. Some interesting patterns are discerned in this regard, in that the work engaged in by the women may involve dependent or independent activities; moreover, it is common in Peru for some women to dedicate time to unpaid work in family businesses.

Taking the above into account and discarding certain inconsistent data in the panel dataset,[5] the total sample from the 2011-2013 ENAHO Panel survey is 5,632 women observed over the three years. Under the methodologies of Kyriazidou and Rochina-Barrachina, the estimations are limited to the case of women working during at least two of the three periods, so the number of observations may decrease. In the case of the Semykina and Wooldridge estimator, those women in the sample who have worked at least one out of the three years are taken into account, so the size is somewhat larger.

The endogenous variable of the main equation is hours engaged in a remunerated economic activity in the last seven days.[6] This variable assigns a value of 0 to those individuals who undertake unpaid work or do not participate in any economic activity.

The endogenous variable in the selection equation is a dummy variable that represents participation in the remunerated labor market, and takes a value of 1 if the individual presents a positive number of hours worked over the last seven days, and of 0 otherwise. Meanwhile, the regressor of interest is a dummy variable that indicates whether the household participated in the Juntos program at the time of the survey. In addition, some control variables are added to the model.

Some of the variables taken from the ENAHO survey and used in the model are:

- Household income: The annual income of the household in soles.
- Years of schooling: The years of education completed by the individual.
- Age: The age of the person in years.
- Number of children: The number of children below the age of six in the household.
- Married: A dummy variable that takes the value of 1 if the woman is married, and 0 otherwise.

[5] Fundamentally, these were consistencies in relation to age and sex.

[6] It should be noted that a sizable percentage of female workers in Peru engage in unremunerated economic activities. For example, according to our calculations using cross-sectional ENAHO data from 2011, of the total female participants in the survey that year who engaged in some type of economic activity, the main pursuit of 32.57% was unpaid family work. On the other hand, in that same year just 12% of men in the survey undertook unpaid work as their main activity.

- Chronic illness: Dummy variable that takes the value of 1 if the individual suffers some form of chronic illness, and of 0 if the individual does not suffer from any illness.
- Pregnancy: Dummy variable equal to 1 if the woman received pregnancy checks over the last 12 months, and of 0 otherwise.
- Illness of a member: Dummy variable equal to 1 if a household member experienced a serious illness or accident, and of 0 otherwise.
- Desertion by head of household: Dummy variable equal to 1 if the head of household deserted the household, and of 0 otherwise.
- Crime: Dummy variable equal to 1 if the household was victim to any form of crime (theft, assault, etc.), and to 0 otherwise.
- Natural disaster: Dummy variable equal to 1 if the household was victim to any form of natural disaster (drought, storm, plague, etc.), and to 0 otherwise.

Table 1 presents the descriptive statistics of the main endogenous variable, working hours in the primary paid activity. The table shows that an average of 17 hours per week were allotted to paid work for the three years from 2011 to 2013. This average also takes into account the zero hours of non-working women; if only working women are taken into account, the average number of hours per week increases to 36. This is because the sample is approximately halved when only working women are factored in, in comparison with the sample that includes both women who work and those who do not work. It is also noteworthy that in both samples there is variability between individuals and over time.

Table 1
Hours worked in main remunerated activity
(Average for 2011-2013)

Variable		Mean	Std. Dev.	Min	Max	Observations
Hours	*overall*	17.277	23.537	0	98	N = 16.896
	between		19.738	0	98	n = 5632
	within		12.823	-41.057	82.610	T3
Hours (if hours>0)	*overall*	35.953	21.940	1	98	N = 8119
	between		19.543	1	98	n = 3736
	within		11.143	-22.047	90.953	T-bar = 2.17318

Source: ENAHO PANEL 2011-2013
Compilation: authors.

Table 2 sets out the descriptive statistics of the other variables used in the estimations. As can be seen in the table, female labor participation in remunerated activities fluctuated around 48% in the years 2011-2013. It is also notable that just 11% of women participated in Juntos over the same period. Another striking result is that 49% of women in the sample report having or suffering from a chronic illness. Moreover, 45% of women were found to live in households with children below the age of six, while the

percentage of married women was just 33%. Also interesting is that 4% of women were pregnant at the time they were surveyed during one of the three sample years. It should be noted that 11% of those surveyed suffered some kind of natural disaster at some point over the period 2011-2013.

As a general comment regarding the standard deviations, it can be stated that all variables selected in the model contain intragroup, or within group, variability, based on what can be inferred from the standard deviation values (except for the case of the household desertion variable, which has a standard deviation of close to 0). This variability in time favors the use of fixed-effect techniques.

Table 2
Descriptive statistics of the other variables used in the estimations
(Average for 2011-2013)

Variable		Mean	Std. Dev.	Variable		Mean	Std. Dev.
Participation in remunerated activities	*overall*	0.481	0.500	Pregnancy	*overall*	0.041	0.198
	between		0.411		*between*		0.134
	within		0.284		*within*		0.146
Juntos program	*overall*	0.107	0.310	Criminal offense (theft, assault, etc.)	*overall*	0.032	0.177
	between		0.283		*between*		0.112
	within		0.126		*within*		0.138
Household income	*overall*	2494.4	2429.4	Serious illness or accident	*overall*	0.092	0.289
	between		2181.9		*between*		0.199
	within		1068.5		*within*		0,.16
Number of children < 6 years of age	*overall*	0.458	0.715	Desertion of head of household	*overall*	0.006	0.080
	between		0.641		*between*		0.059
	within		0.318		*within*		0.061
Chronic illness	*overall*	0.490	0.500	Natural disasters	*overall*	0.109	0.311
	between		0.399		*between*		0.227
	within		0.301		*within*		0.209
Married	*overall*	0.334	0.472	Proxy meanscore	*overall*	0.264	0.233
	between		0.459		*between*		0.224
	within		0.110		*within*		0.063

Source: ENAHO PANEL 2011-2013
Compilation: authors.

Of the afore-mentioned methods, that of Semykina and Wooldridge requires the use of instrumental variables, since the Juntos variable is considered as endogenous. As we know, these variables must meet the condition of being correlated with the endogenous regressor Juntos, but not correlated with the error of Equation (7). To this end, we selected the following variables as instruments:

- HDI: The human development index, as calculated by the United Nations Development Programme (UNDO) at district level. We use the HDI with a lag of one year – that is, for 2010, 2011, and 2012.[7]
- Percentage that completed secondary education: Percentage of the population that has completed secondary school in the district, in the year prior to the ENAHO survey. We also obtained this variable from the UNDP database, for the years 2010, 2011, and 2012.

[7] Available at: http://www.pe.undp.org/

- Proxy meanscore: A continuous indicator that measures the household income and consumption, and it is calculated on a set of observable characteristics of the household and its members. This indicator is usually employed to determine whether a household is eligible for social support. We have calculated this indicator using the standard World Bank methodology (see World Bank [2007]).

The selection of these variables is justified because the program has been targeted from the outset to districts with high poverty levels, which is related to a low human development index, even if this relationship is not perfect (García, 2017). In our case, we use this index with a lag of one year, allowing that the selection of the districts may be related to the index from the previous year. In addition, we do not expect there to be a direct relationship between the previous year's HDI and the change in women's working hours from one year to the next. A similar argument applies to the second instrumental variable selected – the percentage of people in the district who have completed secondary education, as of the previous year. This is an indicator of the level of human development in the district, which could also be related to the selection of districts where the Juntos program was applied. Likewise, we do not expect this lagged structural indicator to be related to the changes in women's working hours from one year to the next. Finally, the method requires a third complementary instrumental variable, for which we have selected the "proxy mean score" variable. We also expect this variable to be related to the household's participation in the Juntos program, since the index seeks to identify potentially eligible households in a similar manner to the Household Targeting System. Table 3 shows the correlations between these instrumental variables and the Juntos variable. Although these correlations are high, in the estimation of the Semykina and Wooldridge method, statistical tests are performed to prove the validity of the estimates.[8]

Table 3
Correlations between instruments and the Juntos variables

HDI	Percentage with secondary education	Proxy meanscore
-0.4602	-0.3915	0.3729

Source: ENAHO PANEL 2011-2013
Compilation: authors.

5. Econometric results

[8] It is worth mentioning that the estimation of the "proxy meanscore" variable is not an excluded variable *per se*, so we do not consider it into the evaluation of the validity of the excluded variables. See Semykina and Wooldridge (2010), page 378 for an explanation of its function. The only variables taken into account are the HDI, percentage with higher education, and the respective averages in time.

As stated in the methodology section, we perform the estimation of the working hours model following the approaches of Kyriazidou (1997), Rochina-Barrachina (1999), and Semykina and Wooldridge (2010) for the Juntos program.

The estimations of the working hours model for Juntos using the standard "within groups" fixed-effects method, as well as the three above-mentioned methods, are set out in Table 4. The results show that the impact of Juntos on women's working hours in Peru is negative and significant for 2011-2013, which is consistent with the economic theories. Under the Kyriazidou and Rochina-Barrachina methods, Juntos reduces the remunerative activities of women over the age of 14 by an average of between three and four hours per week. However, the impact is greater under the method of Semykina and Wooldridge, which does take into account the problems of exogeneity associated with the Juntos variable. Under this method, it is estimates that Juntos reduces participation in remunerated activities by 9.4 hours per week, on average. It is possible that the Kyriazidou and Rochina-Barrachina methods are subject to an attenuation effect since they do not control the exogeneity of Juntos.

As stated in earlier sections, the international literature has also reported negative effects of cash transfers on hours worked (for example, Hoynes, 1996; Krueger and Meyer, 2002), and those results differ from the findings of Alzúa et al. (2012) regarding conditional transfers. If we take the estimation of an effect of 9.4 hours less hours worked as the most accurate, this impact is close to that found by Fernández and Saldarriaga (2014), calculated at between six and ten hours, although the impact of these authors is very short term. In our work, the calculation can be understood as a change from one year to the next, and thus implies readjustments in internal household resources, which would explain the slightly greater impact. On the other hand, this negative impact is consistent with that cited by other authors, such as Escobal and Benites (2012), who point out that in the case of children, remunerated work decreases in favor of more time spent on unremunerated activities. In our study, a decrease is also observed in the remunerated work of women. There is also consistency with the findings of the qualitative study by Streuli (2012), who demonstrates that the Juntos transfer is occasionally used to strengthen family businesses in which women perform unpaid work, but also notes that there may have been an increase in the time spent on non-laboral activities. Moreover, the effect identified is also consistent with the hypothesis that sending children to school results in a loss of unremunerated hours spend in the family business. These unpaid working hours would have to be covered by other household members, in this case by women, which would lead to a drop in their time spent in remunerated work. Our results are also consistent with the findings of Del Pozo and Guzmán (2010), who find that the Juntos program has a positive impact on household production, which could serve to reduce women's participation in paid work outside the house.

As to the other control variables, in the estimation it can be observed that the pregnancy variable presents a negative and significant sign under the Semykina-Wooldridge method, such that if a woman is pregnant, the number of hours worked per week reduces by four; this effect is reasonable. Curiously, under the Kyriazidou method, a positive sign is presented, which is counter-intuitive, and under Rochina-Barrachina the impact is non-significant. On the other hand, the estimations show that the variable for the number of children aged less than six presents a negative sign across all methods, but is only significant under the Kyriazidou and Semykina-Wooldridge approaches. It is notable that this effect is relatively small; remunerated work is reduced by one hour and a half for each additional small child in the household. Meanwhile, if a woman suffers from some form of chronic illness, her working hours will decrease slightly, although the effect proves to be significant only under the Kyriazidou method. Similarly, if a member of the household suffers from a serious illness, the number of working hours will decrease, but on this occasion the impact is only significant, to 10%, under the method of Semykina-Wooldridge. Moreover, if the head of household deserts the household, the average number of hours women spend working increases by almost nine, though this effect is only significant under the Kyriazidou method. Finally, there is a marked difference in the hours spent in paid activities among women who live in rural areas versus their urban counterparts.

Table 4
Estimation of impact of Juntos program on hours worked in remunerated activities
(Panel 2011-2013)

Variable	Fixed effects conditioned to d=1		Kyriazidou (1997)		Rochina-Barrachina (1999)		Semykina – Wooldridge (2010)	
Juntos	-3.798	**	-3.846	***	-3.076	*	-9.471	**
	(1.819)		(1.009)		(1.773)		(4.108)	
Family income	$38.27x10^{-5}$	**	$173.63x10^{-5}$	***	$43.42x10^{-5}$		$85.34x10^{-5}$	***
	($18.15x10^{-5}$)		($29.43x10^{-5}$)		($40.06x10^{-5}$)		($29.29x10^{-5}$)	
# Children < 6 years of age	-0.488		-1.157	**	-0.800		-1.595	*
	(0.671)		(0.586)		(1.050)		(0.842)	
Chronic illness	-0.795		-1.008	***	-1.222		-0.813	
	(0.639)		(0.404)		(0.993)		(0.826)	
Marital status	1.495		-0.913		3.188		1.433	
	(1.736)		(2.535)		(2.048)		(2.531)	
Pregnancy	-2.488		9.666	***	-0.209		-4.630	**
	(1.798)		(3.096)		(2.249)		(2.165)	
Desertion	1.293		8.874	***	3.550		3.478	
	(2.793)		(2.720)		(2.666)		(3.528)	
Crime victimhood	0.952		0.490		1.113		0.035	
	(1.392)		(0.844)		(1.401)		(1.738)	
Serious illness of household member	-0.603		-0.852		-0.792		-1.999	*
	(0.952)		(0.584)		(1.124)		(1.206)	
Natural disaster	-0.704		-0.175		-0.999		-0.998	
	(1.112)		(0.585)		(1.239)		(1.249)	
Rural=1, Urban=0	-16.660	*	-19.636	***	-14.444	***	-17.447	**
	(9.675)		(3.234)		(5.267)		(7.937)	

Robust standard errors in parentheses. ***=sig. at 1%, **=sig. at 5%, *=sig. at 10%.
Note 1: Rochina-Barrachina and Semykina-Wooldridge estimations use bootstrap standard errors.
Note 2: The selection bias terms of correction in the Rochina-Barrachina and Semykina-Wooldridge regression do not prove to be significant (not shown in the table).
Compilation: authors.

It is worth noting the results of the validity of the instruments. For this, we have opted for the well-known F-test for the strength of the instruments, the Sargan test for overidentifying restrictions, and the Hausman test for the pertinence of using the instrumental variables method based on evaluation of the endogeneity of the Juntos regressor. These tests only apply to the regression with instrumental variables under Semykina and Wooldridge's method. Table 5 shows the validity test for the instruments. As can be seen the chosen instruments meet the required conditions. As to the strength of the instruments, the F statistic applied to the excluded instruments is equal to 116.1, exceeding the known "golden rule" that sets the minimum threshold at ten units. According to the Sargan test for overidentifying restrictions, the null hypothesis is not

rejected, so it is correct to exclude the afore-mentioned instruments from the regression. Finally, the Wu-Hausman test of endogeneity in the Juntos variable indicates that the null hypothesis of non-endogeneity is rejected for this variable; thus, the estimation by instrumental variables is preferred to an estimation using ordinary least squares.

Table 5
Assessment of instrument validity

Edogeneity		Instrument weakness		Restrictions on identifiers	
H_0: Exogenous regressors		H_0: Weak instruments		H_0: Instruments correctly excluded from the main equation	
Wu-Hausman	4.351	Strength of excluded variables	116.141	Sargan	2.587
P-value	0.037	P-value	0.000	P-value	0.460

Compilation: authors.

Finally, we evaluate the interaction of the program's impact with some of the regressors. To this end, we have performed separate estimations for each population subgroup. We present these results in Table 6. First, we see clearly that there is a considerable difference in the program's impact depending on women's marital status. Thus, for the group of married women, Juntos has no appreciable significant effect on remunerated working hours, while for unmarried women, if a member of their household is a Juntos beneficiary, this will reduce their engagement in paid work by 15 hours per week. Another striking result is the difference found according to the age of the women. For women below the age of 40, the Juntos program reduces their working time by almost 18 hours per week, while there is practically no effect for those over the age of 40. This result suggests that younger women are more sensitive in their labor participation, perhaps because they are involved in other alternative activities, or because they have less economic responsibilities within the household. As to the other variables in Table 6, there are practically no differences in subpopulations, or the estimations are not entirely reliable since the instruments do not achieve validity in these subpopulations.

Table 6
Impact of Juntos on hours worked per week, by population groups

	Juntos coefficient	P-value
Unmarried	-15.451	0.002
Married	3.308	0.684
Without children < 6 years	-7.746	0.180[+]
With children < 6 years	-10.637	0.078
Age <40	-16.630	0,003
Age > 40	-0.834	0.896
No chronic illness	-10.085	0.053
Chronic illness	-9.436	0.218
Rural	-6.179	0.060[+]
Urban	-17.770	0.250

[+] Instruments do not prove valid

6. Conclusions

In this study we investigated the impact of the Juntos program on the number of hours that women in Peru spend in remunerated work. Economic theory holds that this effect should be negative due to the income effect that cash transfers bring about. Because the Juntos program does not yield experimental data and the quasi-experimental techniques do not control all biases, it is necessary to employ a structural econometric model that controls for unobserved heterogeneity biases, selection bias, and regressor endogeneity. We used techniques developed specifically to control for these biases, such as those of Kyriazidou (1997), Rochina-Barrachina (1999), and Semykina and Wooldridge (2010).

Our results for Peru show that the impact of the Juntos conditional cash transfer program on hours spent in remunerated activities has been negative and significant, evidencing the income effect on working hours in the case of a cash transfer.

We found an average estimated impact of 9.4 hours per week less remunerated work for those women whose households are recipients on the Juntos program. These results are close to those found for the very short term by Fernández and Saldarriaga (2014), and to other authors who present negative results. However, the effect found in this paper is not a short-term effect, but interpreted as an annual change. Our results are in keeping with the theories on intra-household resource allocation. Moreover, we find

significant differences in impact based on women's marital status and age, with the impact greater in the case of young and of unmarried women.

The results leads us to assert that the Juntos program should not be seen purely as a program to benefit children, but one that also has implications for other household members, principally on women, given the reallocation of time and other household resources. Whether the program is expanded or continued, these collateral effects should be kept in mind, and the results should also be considered alongside other studies that have evaluated unforeseen or indirect effects of the program for an overall evaluation of its positive and negative aspects.

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