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# Economic Cycle and Deceleration of Female Labor Force Participation in Latin America\*

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## Abstract

In this paper we analyze the role of economic growth in the recent deceleration of female labor force participation (LFP) in Latin America. We study the relationship between the business cycle and female LFP by estimating fixed effects models, using data from harmonized national household surveys of 18 countries in the period 1987-2014. We find that female LFP follows a countercyclical pattern, especially for vulnerable women, which may be explained by the added-worker effect. The sudden and fast increase in economic growth in the 2000s is then a likely relevant factor behind the deceleration in female LFP. We also provide evidence that the increase in social protection is another factor associated with the deceleration of female labor supply in the region.

JEL classification: J22, J16, N3

Keywords: economic cycle, female labor force participation, Latin America

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# 1. Introduction

Over more than fifty years, female labor force participation (LFP) has been increasing markedly and steadily in almost all regions of the world. Latin America has not been an exception: about 70 million women have been incorporated into the labor market during the second half of the 20th century, reflecting the increasingly important role of women in the region (Chioda, 2011). However, since the early 2000s, the growth of female LFP has slowed down significantly in most Latin American countries and it has even come to a halt in some of them. This change has occurred despite both a large increase in the level of schooling of women, which in some countries in the region has outweighed that of men, and a decline in fertility levels, two phenomena that should favor the increase in female labor supply (Gasparini and Marchionni, 2015; Beccaria *et al.*, 2015).

The recent slowdown in the growth rate of women's labor supply may affect their prospects for empowerment in society (World Bank, 2012), postpone the reduction of gender gaps in the labor market, and even undermine the goals of reducing poverty and income inequality in the region (Parada *et al.*, 2017). It could also imply a stagnation of the global labor supply, given the stability of male labor force participation (Beccaria *et al.*, 2015).

Gasparini and Marchionni (2015, 2017), after evaluating several alternative hypotheses, argue that the main factor capable of explaining the slowdown in female LFP is the unusual economic expansion that Latin America experienced in the 2000s. Better macroeconomic conditions can affect the entry of women into the labor market at least in two different ways, with effects in opposite directions. On the one hand, a better economic context can encourage women to enter the labor market, as they face enhanced labor conditions and higher wages (substitution effect). On the other hand, economic growth allows lower unemployment and higher earnings of male partners and the consolidation of social safety nets, factors that alleviate women's pressure to look for a job and negatively affect their LFP (income effect). This latter channel, a version of the typical added-worker effect, could be especially relevant for women in vulnerable households, since their labor supply is more elastic to income shocks, either coming from earned or unearned income, and their households were the most benefitted by the economic changes in the 2000s. The fact that this group experienced the greatest slowdown in labor force participation is suggestive of the relevance of the income effect.

In this paper we propose to deepen the analysis on the reasons that may be behind the recent reduction in the rate of growth of female LFP in Latin America. Our main objective is to analyze the role played by the strong economic expansion that the region experienced since the early 2000s, and hence the relevance of the added-worker effect. To this end, we estimate fixed effects models of female LFP based on a panel that follows groups of women defined according to their level of schooling and age in each Latin American country over the period 1987-2014. Unlike Gasparini and Marchionni (2015, 2017), our models incorporate a broad set of regressors, combining variables linked to the macroeconomic context (growth, cyclical and trend components of GDP) with others related to demographic and public policy changes, in particular levels of coverage of conditional cash transfer programs that allow us to evaluate the relevance of this factor in explaining the recent movements of female LFP beyond the economic cycle. Most of the data come from harmonized national household surveys that are

part of the SEDLAC database (CEDLAS and World Bank), although complementary sources are also used.

As the most important result, we find that whereas female LFP is positively associated to the trend component of GDP, it has a countercyclical behavior: large short term expansions of GDP are associated with a reduction in female labor supply. The evidence is consistent with an inverse added-worker effect, for which better economic conditions for primary workers cause a delay in secondary workers' entrance into the labor market. This relationship is stronger for married women (either in formal or consensual unions) that are secondary workers in the household, especially those with low educational attainment, living in rural areas, and in low income households.

We also provide evidence that the expansion in conditional cash transfer programs is another relevant factor associated to the deceleration in female labor supply in Latin America. In particular, we find that an increase in the coverage of such transfers is associated with a fall in female LFP. This result is consistent with the hypothesis that women decide to delay their entrance to the labor market due to higher unearned income and to the time required to comply with the conditionalities associated with these programs.

The rest of the paper is organized as follows. We begin in Section 2 by briefly reviewing the previous empirical literature about the determinants of female LFP in Latin America. Section 3 describes the data sources that are used in the study. In Section 4 we present preliminary evidence on the association between the economic cycle and the recent deceleration of female LFP in the region. Section 5 describes the empirical strategy which consists in estimating fixed effects models of female LFP using an unbalanced panel dataset of Latin American countries and groups of women defined for each country based on their age and level of schooling. Section 6 reports and discusses the results. In Section 7 we conclude with some final remarks.

## 2. Background

Gasparini and Marchionni (2015, 2017) extensively document the changes of women labor supply in the region over the period from 1992 to 2012, confirming a widespread and significant slowdown in its growth rate since the early 2000s. Even though they analyze the factors behind the deceleration, there is still little empirical evidence on its determinants.<sup>1</sup>

Female LFP is related to numerous factors. Busso and Romero Fonseca (2015) and Chioda (2011) present a broad conceptual framework, which divides the possible determinants of female LFP into two groups: those that depend on individual decisions and preferences, and those that are out of the individual's control. The first group includes the decisions associated with human capital investment (education) and to family formation (marriage, fertility, etc.). Among the second group of determinants there are the returns in the labor market (full-time and part-time wages, gender wage gaps, etc.), household technologies (availability of home

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<sup>1</sup> Beccaria *et al.* (2015) also present evidence of the deceleration in female LFP rate for the case of Argentina.

appliances, electricity and internet connection), health technologies (contraceptive methods), cultural factors (religion, gender discrimination), and public policies (taxes, conditional income transfers, children and elderly care services, maternity and parental leave).<sup>2</sup> The variables that we are most interested in are those related to macroeconomic conditions, which are part of the second group of factors and include the GDP growth and the economic cycle.

There is a set of papers that study the role of macroeconomic conditions through the estimation of the effect of recessions and economic crisis on the aggregate rate of female LFP. In particular, they try to evaluate the existence of the added-worker effect (AWE), and whether the AWE prevails over the discouraged worker effect. The concept was originally conceived by Woytinsky (1940) and later developed by Ashenfelter (1980), Heckman and Macurdy (1980), Lundberg (1985), Maloney (1987), and Borjas (2005). Under a simple static model, the AWE consists in the fact that secondary household workers, usually wives, enter the labor market after a transitory reduction in household income (*e.g.* because the household head is unemployed).<sup>3</sup> Thus, the AWE relies on a typical income effect that arises at the household level in the context of a unitary model that assumes that women are secondary workers and that leisure is a normal good. In the context of life cycle models, the AWE is expected to be negligible and focused on households that face liquidity constraints as long as the loss in income due to unemployment is small compared to the primary worker's lifetime earnings (Lundberg, 1985).

In addition to the income effect represented by the AWE, unfavorable economic perspectives in the labor market may eventually lead to a substitution effect known in the literature as the *discouraged worker effect*, which operates in the opposite direction. Therefore, if the latter is outweighed by the AWE, female labor force participation should exhibit a countercyclical behavior.

In practice, the strength of these effects depend on the relevance of other factors, such as the availability of alternative strategies to cope with negative income shocks (child labor, unemployment insurance, etc.) and the existence of imperfect credit markets together with liquidity constraints (Mankart and Oikonomou, 2016; Garcia-Perez and Rendon, 2016). Consequently, empirical studies for developed countries, such as the U.S. or the United Kingdom, find small added-worker effects (Gruber and Cullen, 1996; Stephens, 2002), and even other studies find no evidence of its existence (Layard et al., 1980; Maloney, 1991). Instead, in developing economies such as those of Latin America, the AWE may be larger because they usually lack extended unemployment insurance benefits, many households face

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<sup>2</sup> Busso and Romero Fonseca (2015) apply a meta-analysis of the determinants of women's labor supply and estimate bivariate models with country fixed effects to assess the role of each factor in explaining the evolution of female LFP in Latin America. Their results suggest that the positive long-term trend is driven primarily by the expansion of health and household technologies and by the gradual change in cultural factors. Furthermore, traditional factors such as the increasing female educational attainment and the decreasing fertility rates have also contributed to the long-term expansion of female participation in the labor force and vice versa. Other works reach similar conclusions using aggregate decompositions, such as Peña *et al.* (2013) for Colombia or Gasparini *et al.* (2015) for several countries in Latin America.

<sup>3</sup> In turn, the effect can be boosted if the increase in time away from the labor market of primary workers reduces the opportunity cost of carrying out market activities for secondary female workers, through the substitution of tasks within the household.

financial restrictions, and the role of women as secondary workers is reinforced by solid traditional family structures with a strong attachment to traditional gender roles, and low levels of women's skills and educational attainment. In addition, given the importance of the informal sector in the countries of the region, entry and exit barriers in the labor market are relatively low, which facilitates changes in female participation (Basu *et al.*, 2000; Maloney, 2004).

There are several empirical studies that analyze the validity of the AWE hypothesis in the region. For instance, Martinoty (2015) uses the collapse of the Argentina's convertibility regime as a natural experiment to evaluate the effect of husbands' labor situation changes in the decision of their wives' participation, finding evidence of a statistically significant AWE. Similar results are found by Cerrutti (2000) and Paz (2009) also for Argentina in the 1990s and 2000s, respectively, Fernandes and Felicio (2005) for Brazil, and Parker and Skoufias (2004) for Mexico. On the other hand, McKenzie (2003a) and MacKenzie (2003b) find no evidence on the presence of AWE when studying household strategies to compensate the negative shocks from the financial crises of 2002 in Argentina and 1995 in Mexico, respectively. The author argues in these articles that the entrance in the labor market was not an important mechanism to maintain households' welfare level due to the existence of a labor supply constraint.

There are also papers that use aggregate level data to study the cyclical behavior of female labor supply finding results in the other direction, *i.e.* that female LFP is procyclical, suggesting that the discouraged worker effect outweighs the AWE (Tachibanaki and Sakurai, 1991; Darby *et al.*, 1998; Lee and Parasnis, 2014).<sup>4</sup> Nevertheless, the studies that focus on developing countries yield more diverse results. For instance, Cox Edwards and Roberts (1994) analyze Latin American countries between 1965 and 1987 and find that the AWE is significant for low-income countries but not for richer countries like Chile or Argentina. In a more recent work, Bhalotra and Umaña-Aponte (2010) use individual data from 63 developing countries combined in a cross-country panel with aggregate variables such as GDP for the period 1986-2006. They find that the relationship between female labor and growth is negative on average for Latin America and Asia, but positive for Africa. The authors argue that the characteristics that magnify the countercyclical pattern include the low levels of education, the positive assortative mating among the less educated, rural residence, and high fertility, among other factors related to limited wealth. We improve the empirical strategy of these earlier studies by using better quality data (more Latin American countries, with longer and comparable time series), and by focusing directly on female labor force participation instead of the employment rate.

In this paper we deepen the analysis of the main hypothesis in Gasparini and Marchionni (2015, 2017): the deceleration of the growth rate of female labor supply could be a transitory circumstance related to the strong economic expansion experienced by the Latin American

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<sup>4</sup> Regarding this issue, there is a variety of recent literature, both theoretical and empirical, which tries to reconcile the differences between estimates of elasticities of female labor supply with respect to wages, based on micro data or aggregate data. For instance, Attanasio *et al.* (2015) estimate a life-cycle model to explain female labor supply in the United States, trying to bridge the discrepancies between micro and macro estimates. Among other results, they find that the aggregate elasticities of labor supply vary throughout the economic cycle, being stronger during recessions.



countries in the early 2000s. The better economic scenario, which resulted in an improved labor situation especially for the less skilled male workers, could have encouraged an inverse added-worker effect on their female partners. In other words, women, especially the most vulnerable, may have decided to postpone their entry into the labor market due to a lower pressure to search for a job. Using simple econometric estimations, Gasparini and Marchionni (2015, 2017) find that the LFP in Latin America has a countercyclical behavior and that this pattern is stronger for women with a low level of education.

This paper overcomes some methodological limitations and at the same time deviates in several senses from the analysis in Gasparini and Marchionni (2015, 2017). For instance, their estimations are based on cross-country panel data for the period 1992-2012 and include as unique regressors the cyclical and trend components of GDP. Instead, in this paper we extend the period of analysis incorporating data from household surveys until 2014 and estimate multivariate models combining variables associated to the macroeconomic context (growth and its cycle) with others related to demographic changes and public policies. Among the regressors we include the coverage of conditional cash transfer programs, proxied by the proportion of beneficiaries in the population. This kind of information is not available in household surveys and requires the use of other data sources. In addition, we build a panel dataset disaggregating women into groups defined by education and age for each country, which significantly increases the cross-section variability. In this way, our models allow for a better identification of the partial correlations between labor force participation and each of its covariates, as we control for fixed effects by country, age and educational groups, and time, and other factors different from the economic cycle that may be associated with the decline in the growth of female labor supply.

### **3. Data sources**

Our analysis is mostly based on microdata from household surveys, which are part of the Socioeconomic Database for Latin America and the Caribbean (SEDLAC), a project jointly developed by CEDLAS of the National University of La Plata and the poverty group for the LAC region of the World Bank. Household surveys are not homogeneous among Latin American countries and in some cases not even for the same country over time. Given such heterogeneity, careful survey processing is necessary to ensure as much comparability as possible of estimates among countries and years. This is precisely one of the advantages of using the SEDLAC database, where microdata are harmonized using similar definitions of variables for each country/year and a consistent and documented protocol (see SEDLAC, 2014). In this paper, we use SEDLAC microdata of 18 countries (the 17 countries in continental Latin America and the Dominican Republic).<sup>5</sup> Table A1 in the Appendix describes the corresponding surveys and the years they cover.

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<sup>5</sup> Most of the household surveys included in the sample are representative at the national level. The exceptions are Uruguay before 2006 and Argentina, where surveys cover only the urban population, which, however, represents more than 85% of the total population.

Our econometric estimations are based on a non-balanced panel dataset of those 18 countries over the period 1987-2014. We also build a more disaggregated panel dataset that follows 9 groups of women defined according to their age and education for each one of the 18 countries. However, to compute the descriptive statistics that we show in Section 4, we use a smaller sample of only 15 countries for the shorter 1992-2014 period.<sup>6</sup> With this restricted sample we build a balanced panel using linear interpolations and extrapolations, for which we take information from the most proximate surveys. For countries with no surveys previous to a certain year we use constant extrapolations that extend the data point of the first available year all the way back until year 1992. A similar procedure is applied to complete the series until 2014 when necessary. Table A2 in the Appendix presents a schematic summary of the composition of both the non-balanced and balanced panels.

All statistics at the country or population-group level are computed using the corresponding sample weights. However, to describe the situation in the region we use unweighted averages across countries. Had we used population weights, we would have analyzed a phenomenon strongly affected by the more populated countries such as Brazil and Mexico, while almost ignoring the situation in other less populated nations.

The demographic, social and labor variables are obtained from the SEDLAC microdata. The rest of the variables, such as GDP per capita, the presence of certain laws, some institutional characteristics, or the coverage of social programs come from alternative sources (*e.g.* the World Development Indicators from the World Bank, or the CEPALSTAT). Table A3 describes the variables used throughout the study, their definitions and the corresponding sources.

An additional clarification before moving on to the next section: our analysis focuses on people between 25 and 54 years old. We believe this is the more adequate group to study the labor supply from a gender perspective. Labor behavior of younger individuals is more related to education decisions while the labor supply of older people mostly depends on the relevance and dynamics of the pension system.

## **4. The economic cycle and female labor force participation in Latin America**

The central phenomenon in which we concentrate on this study is the deceleration of female LFP in Latin America since the early 2000s, after a strong increase during the previous decade. In fact, female labor supply had strongly and persistently expanded since the 1960s in Latin America (Chioda, 2011). In this scenario, the 1990s appear as a decade where female LFP continued its long run increasing trend. In contrast, something must have changed afterwards, causing a halt in the rate of growth of female labor supply since the early 2000s. Figure 1 illustrates the evolution of the labor supply of women in Latin America for different groups of countries, showing that the deceleration phenomenon is clear regardless of the group chosen.

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<sup>6</sup> This group excludes Dominican Republic, Colombia and Guatemala, for which there are no comparable national household surveys previous to year 2000.

The descriptive analysis of this section focuses on the 15 Latin American countries for which we have comparable information over the period 1992-2014, thus leaving aside Colombia, Guatemala, and Dominican Republic.<sup>7</sup> While female labor force participation increases by 0.8 percentage points per year between 1992 and 2005, the rate of growth is only 0.3 percentage points per year between 2005 and 2014.<sup>8</sup> Even though the contrast between the growth rates in both periods is not representative of all Latin American countries, it is very clear in many of them and sufficiently widespread to be visible in the regional average.<sup>9</sup> In some cases there are even signs of stagnation (Figure A1 in the Appendix). Unlike women's, men's labor supply is much higher and more stable over time. Thus, the recent deceleration in the growth rate of female LFP delays the closing of the gender gap in labor participation.

Our evidence confirms that the deceleration documented in previous studies continues at least until 2014. Gasparini and Marchionni (2015, 2017) show that the deceleration is stronger for women that are in more vulnerable conditions, especially those with low education, living in rural areas, and who are married and with children. Vulnerable women usually have a weaker labor attachment, and thus they are more prone to enter and exit the labor market depending on the economic situation inside and outside their households (Michalopoulos et al., 1992; Kimmel, 1998; Eissa and Hoynes, 2004; Naz, 2004; Tamm, 2009). The fact that the deceleration since the early 2000s is especially intense among vulnerable women suggests that changes in the macroeconomic context could be playing an important role in the explanation of the changes in female LFP.

In fact, the contrast between the 1990s and the 2000s is also evident in terms of the macroeconomic conditions in Latin America. While the average GDP grows at an annual rate of 1.9% between 1990 and 1999, it grows 3.5% per year on average between 2000 and 2014, despite various severe economic crises.<sup>10</sup> In particular, the stronger economic expansion occurs during the last decade, *i.e.* between 2005 and 2014 with the exception of year 2009. In addition to the higher growth rates, the 2000s are characterized by more macroeconomic stability than previous decades.

Figure 2 shows that the strong increase in GDP per capita in the region over the 2000s occurs in coincidence with the deceleration of female LFP.<sup>11</sup> As discussed in Section 2, the effect of economic growth on women's labor supply could be either positive or negative depending on whether it is the substitution or the income effect that prevails. On the one hand, an improved macroeconomic context can encourage female LFP through a substitution effect, but on the

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<sup>7</sup> In the regression analysis of the following sections we are able to include all the 18 countries in an unbalanced panel that covers the period 1987-2014.

<sup>8</sup> The slowdown is also evident when grouping the countries by sub-region (South and Central America) or by their initial levels of female LFP.

<sup>9</sup> Argentina, Bolivia, Brazil, Chile, Costa Rica, Ecuador, Honduras, México, Panama, Paraguay and Venezuela experience a deceleration in the growth rate in female LFP since the decade of the 2000s

<sup>10</sup> The crises that globally affected the region in this period were the financial crisis with epicenter in Southeast Asia (1997), East Asia (1997) and Russia (1998). Some countries experienced specific crises, such as Mexico (1994-1995), Brazil (1998-1999), Argentina (2001), Uruguay (2002), and the Dominican Republic (2003). In 2008 there was a new global financial crisis that negatively affected more than half of Latin American countries.

<sup>11</sup> Figure A2 in the Appendix shows the GDP per capita series for each one of the countries under analysis.

other it can depress female labor supply because the better economic situation in the household alleviates the pressure on women to look for a job outside the house, allowing them to postpone their entry into the labor market.

The latter argument is a variant of the hypothesis of the added-worker effect (AWE), generally used to explain the increase in female LFP to deal with shocks in unemployment and with a decline in family income during economic recessions. Similarly, as labor conditions for the primary workers improve during a period of strong economic expansion, women could feel discouraged from participating in the labor market. The incentives for women do not necessarily imply an exit from the labor market, but a postponement of the decision to enter the market, for instance, to allocate more time to care for their children or the elderly at home. Also, the better economic conditions inside and outside the household can relieve the pressure on women to accept any kind of job, allowing them to wait until they find a job that fits their preferences.

Therefore, if the AWE outweighs the substitution effect, female LFP should exhibit a countercyclical behavior. In this sense, it is important to notice that the AWE should be much more relevant for women from more vulnerable households. In fact, poor women, with low educational attainment and with children are more likely to act as secondary workers, as they have a weaker attachment to the labor market and their labor decisions are more sensitive to the economic situation in their households (Michalopoulos et al., 1992; Kimmel, 1998; Eissa and Hoynes, 2004; Naz, 2004; Tamm, 2009). It is precisely these women who have benefitted most from the economic expansion in the 2000s, through improvements in the employment rate and earnings of men in their families.

Figure 3 illustrates this point by showing the evolution of some labor variables for prime-age men who, given the positive assortative mating phenomenon, are the ones likely married to prime-age women. The hourly wage ratio between men with high and low education shrinks substantially since the early 2000s. This fact suggests that in addition to the generalized increase in real wages, the improvement is higher in poor households compared to the non-poor. Also, there is a pronounced decline in the unemployment rate of unskilled men, which falls from 6.1% in 2002 to 3.7% in 2014, in contrast with a more stable behavior of the unemployment rate for the skilled men, which fluctuates around 4%. This way, Figure 3 highlights the existence of a potentially relevant added-worker effect especially for more vulnerable women married to low educated workers.

An additional factor that could explain the deceleration in female LFP is the income effect due to an increase in public transfers to families, especially the conditional cash transfer programs (CCTs), which have strongly expanded in Latin America since the early 2000s both in terms of number of beneficiaries and amounts transferred. Figure 4a shows that the coverage of CCTs in the region, measured as the percentage of the total population that are beneficiaries of these programs, grows from 2.7% to 18% between 2002 and 2010, and remains fairly stable over the following years. CCTs consist of transfers to poor families with children. The transfers are usually monetary and conditional on households investing in children's human capital (education, health, and nutrition). Currently, almost all the countries in Latin America have some kind of conditional cash transfer program, reaching a large fraction of the poor

population. For instance, according to Stampini and Tornarolli (2012) CCTs in Mexico, Brazil and Colombia cover around 50% of the poor, while coverage in Uruguay reaches 80%.<sup>12</sup>

The potential effects of CCTs on female LFP are ambiguous. On the one hand, there may be a negative effect operating through three different channels. For women who had the urgency to get a job due to the difficult economic situation in their homes, CCTs can provide the economic relief that allows them to delay their entrance to the labor market. Moreover, since women are typically the recipients of the cash transfer, they may perceive the subsidy as earned income in exchange for their efforts to ensure compliance with the conditionalities associated with the program, which reduces their available time to engage in market activities while encouraging the traditional division of gender roles within the household (Garganta *et al.*, 2015). Finally, the beneficiaries of CCTs can believe that in order to continue to be eligible for the program, they should work less to remain poor. All these three channels would involve a negative effect of CCTs on female LFP. On the other hand, CCTs can have positive effects on female LFP. If conditionalities require that children go to school, they may induce women to allocate more time to market activities as they do not need to use it for childcare anymore. This could also imply that children have less time to work, which could reduce household income and could increase the demand for earned income inside the family (Busso and Romero Fonseca, 2015).

Figure 4b shows the evolution of labor participation of women according on whether their households receive or not public transfers, which include CCTs and other not contributive pensions, either monetary or in kind, and exclude retirement pensions. While labor force participation rates are similar for the two groups of women over the 1990s, since the early 2000s a gap develops due to a decline in labor supply of women from beneficiary families. This fact is consistent with the hypothesis of the negative income effect discussed above. According to the meta-analysis carried out in Busso and Romero Fonseca (2015), CCTs generally have a negative effect on female LFP and hours worked, even though several studies for countries in the region find the effect to be not statistically significant.

We have argued that there are several factors that could explain the deceleration in female LFP in Latin America, and it seems that one of the most important is related to the economic cycle, even though the evidence presented so far is merely descriptive. The relationships described could be economically irrelevant or not statistically significant. Therefore, in the following sections we deepen into the analysis of the role of the economic cycle on women's labor participation decisions to assess the extent to which macroeconomic conditions can account for the recent slowdown in the rate of growth of women's labor supply in the region.

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<sup>12</sup> CCTs programs are not the only policy tool for poverty alleviation. For instance, non-contributory pensions have strongly expanded in the region during the 2000s, adding another source of non-labor income for the more vulnerable households.

## 5. Empirical strategy

In order to analyze the dynamics of women's LFP over the economic cycle, we use a set of econometric estimations based on panel data, which allows us to control for fixed country and year effects, along with other factors potentially associated to female labor supply. We start the analysis with a simple model of LFP based on an unbalanced panel of 18 Latin American countries over the period 1987-2014. We estimate the following models with fixed effects by country:

$$Y_{ct} = \alpha + \beta \ln(GDPpc)_{ct} + \eta_c + \epsilon_t + \mu_{ct} \quad (1)$$

$$Y_{ct} = \alpha + \beta_1 cycle_{ct} + \beta_2 trend_{ct} + \eta_c + \epsilon_t + \mu_{ct} \quad (2)$$

where the left-hand-side variable  $Y_{ct}$  is the LFP rate for women aged 25 to 54 for country  $c$  at year  $t$ . In model (1) we include in the right-hand side the logarithm of the real GDP per capita, while in model (2) we use its cyclical and trend components, estimated through the Hodrick-Prescott filter.<sup>13</sup> The country fixed effects  $\eta_c$  capture factors, both observable and unobservable, that vary among countries but that are fixed over time, avoiding potential sources of omitted variables bias.<sup>14</sup>

Besides time and country fixed effects, it is difficult to identify statistically significant relationships with other covariates of LFP given the small number of countries and the limited time variability that many social and economic indicators exhibit over time. To gain more sample variability we build a new panel with data at population-groups level, covering also the period 1987-2014. The groups are the result of combining three levels of educational attainment (low, medium and high) and three age ranges (25-34, 35-44, and 45-54). This latter panel then follows these nine groups of women in each of the 18 countries over time.

To assess the relevance of the added-worker effect we include the male unemployment rate of group  $g$  in country  $c$  of year  $t$  ( $um_{gct}$ ) as an additional explanatory variable. If the hypothesis of the inverse added-worker effect is valid, we expect that as we add this factor, the statistical significance of the estimated coefficient of the cyclical component of GDP per capita decreases. Also, in order to evaluate the relationship between the conditional cash transfer programs and the changes in female LFP, we include a variable of coverage of such programs,  $cct_{ct}$ . The basic model in equation (3) includes fixed effects by country and group ( $\eta_{gc}$ ):

$$Y_{gct} = \alpha + \beta_1 cycle_{ct} + \beta_2 trend_{ct} + \beta_3 um_{gct} + \beta_4 cct_{ct} + \varphi X_{ct} + \theta Q_{gct} + \eta_{gc} + \epsilon_t + \mu_{gct} \quad (3)$$

where  $X_{ct}$  are controls that vary among countries and through time, and  $Q_{gct}$  are explanatory variables that also vary among the groups  $g$ , such as education, fertility, marital status, age of

<sup>13</sup> We use a smoothing parameter of 100. See Hodrick and Prescott (1997).

<sup>14</sup> Our basic specification does not control for year fixed effects, but we perform some robustness checks where we do, finding that the main results hold. See the discussion at the end of section 6.2 and Table 5. Since GDP varies by country and by year, it is not possible to control for year fixed effects separately for each country.

children, average wage of women, gender wage gap, share of the service sector and rural population (see Tables A3 and A4 in the Appendix for definitions and descriptive statistics of the variables). The inclusion of these controls may contribute to reduce potential sources of estimation bias. Nevertheless, as far as they are highly correlated with GDP, its cycle or trend, we will be under the presence of high multicollinearity, which can prevent us from finding a significant relationship between female LFP and the business cycle.

We estimate models (1), (2) and (3) for women, men, and the gender ratio (men/women), in order to identify differences in the effect of the economic cycle by gender. The estimation results are presented and discussed in Section 6.

Endogeneity in the previous estimates is addressed by controlling for various potentially relevant factors, including the unobserved heterogeneity that varies among countries but is fixed in time. Nevertheless, this strategy may be insufficient since it does not deal with other sources of endogeneity, such as measurement error in the explanatory variables or the reverse causality between the economic cycle and female LFP. Thus, as an additional robustness exercise, we apply a strategy of identification of the causal effect of the cyclical component of GDP on female LFP based on instrumental variables. We propose to use some weather variables, such as annual temperature and precipitations average levels, as instruments for the cyclical component (Bruckner and Ciccone, 2011; Miguel *et al.*, 2004, who use the latter variable to instrument GDP). Bhalotra and Umaña-Aponte (2010) also use this strategy and find that the instruments are not weak, even though they fail to pass the over-identification tests with their data. The validity of the instruments is discussed in the next section. For the estimation, we use the method of Two Stages Least Squares (2SLS), considering the cyclical and trend components as endogenous variables.

## 6. Results

In this section we present and discuss the results from estimating the models of female LFP outlined in the previous section. We start with the simple models in equations (1) and (2), as in Gasparini and Marchionni (2017). Table 1 shows the OLS estimation results of country fixed effects models of labor force participation based on the unbalanced panel of 18 Latin American countries in the 1987-2014 period. The dependent variables are female LFP (columns 1 and 2), male LFP (columns 3 and 4), and also the gender ratio in LFP (men to women, in percentage, in columns 5 and 6). As explanatory variables we include the logarithm of real GDP per capita, and its cyclical and trend components.

The results in Table 1 suggest that changes in GDP are positively related to female LFP: a 10 percent increase in GDP per capita is associated with an increase in female LFP of 2.26 percentage points (pp.) on average. When decomposing GDP per capita, we find a statistically significant relationship both with the cyclical and the trend components, but with opposite signs. Whereas the trend component is associated with an increase in female LFP (2.56 pp.), the short-term movements are countercyclical: a 10 percent increase in the cyclical component of the GDP is associated with a reduction in female LFP of approximately 2.17 pp. This latter result is consistent with the hypothesis that the recent deceleration in women's

labor supply is driven by the unusual strong economic growth experienced by many Latin American countries during the 2000s.<sup>15</sup>

In contrast with the case of women, changes in GDP per capita or its cyclical and trend components are not associated with male labor supply, which shows very little variation over the period under study. As a consequence, the labor force participation gap between men and women is negatively correlated with the GDP trend, but positively correlated with the cyclical component.<sup>16</sup> In sum, the estimation results from models in equations (1) and (2) indicate that female LFP increases with economic development, reducing the gender gap in labor supply; however, short-term economic expansions are associated with a decline in the entry of women into the labor force, and thus with a widening of the gender gap.

## 6.1 Heterogeneities

In order to explore potential heterogeneities in the dynamics of female LFP we estimate models (1) and (2) for different population groups. In particular, we are interested in evaluating whether the relationship between LFP and the economic cycle varies with the socioeconomic vulnerability of the group. To this aim we estimate the LFP models by education, household size, per capita family income, marital status, area of residence, and family types. We also build a vulnerability index based on the principal components of these variables. According to this index, vulnerable people are those with a very low educational attainment, usually married, living in rural areas, with many small children, and with low incomes. Table 2 shows the estimation results of models (1) and (2) by educational group, and for the vulnerable and non-vulnerable population, defined as quintiles 1 and 5 of the vulnerability index, respectively.<sup>17</sup>

According to our results, the negative relationship between the cyclical component of GDP per capita and female LFP is stronger for the more vulnerable women (panel A of Table 2). For instance, while the coefficient associated with the cyclical component is negative but not statistically significant for non-vulnerable women (top quintile of the vulnerability index), the coefficient for the most vulnerable group is much larger in absolute value (-26) and highly significant. Similarly, the coefficient is -23.6 for the group of women with less than complete secondary schooling, and it halves (-11.3) for women with a degree from a tertiary institution. These results are consistent with our main hypothesis, *i.e.* that more vulnerable women are more likely to react to economic fluctuations than their less vulnerable counterparts, and thus

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<sup>15</sup> Our results are consistent with those of Bhalotra and Umaña-Aponte (2010), who find a countercyclical pattern of female LFP in Latin America and Asia.

<sup>16</sup> Using a similar regression framework we find that the employment rate is also positively related to the GDP per capita growth for women but not for men. The effect of the trend component is positive and particularly strong for women, while the cycle is especially strong for males. In addition, unemployment is negatively related to GDP, and the effects of both cyclical and trend component are negative and statistically significant for both genders. In turn, wages increase as GDP expands for both men and women. An increase in the trend component of GDP per capita is associated with reductions in the gender wage gap, while short-term expansions widen it. These results are available upon request.

<sup>17</sup> The results for other population groups are consistent with those presented in Table 2, and are available upon request.



the strong economic expansion in Latin America in the 2000s could have played a non-negligible role in the deceleration of female LFP, especially for the more vulnerable women.

In contrast, male labor supply does not seem to move in line with changes in GDP per capita: the coefficients of the LFP regressions are much smaller for men and non-statistically significant in most cases (panel B in Table 2). Accordingly, the labor force participation ratio between men and women is positively related to the cyclical component of GDP per capita and negatively related to the trend component, particularly for the more vulnerable/less educated groups.

## 6.2 Added-worker effect, CCTs, and associated factors

We now focus on the analysis of the channels behind the countercyclical pattern that characterizes women's labor supply, which may be partly explained by the added-worker effect, as discussed in previous sections. To further explore this hypothesis, we estimate the model in equation (3), which includes the male unemployment rate and the coverage of CCT programs as explanatory variables, besides the cyclical and trend components of GDP. We also control for other potential determinants or covariates of female LFP: factors that are jointly determined with the labor supply decisions (education, marriage, fertility), and factors that are likely exogenous to the individuals (gender income gap, cost of care services for children or the elderly, women's income, share of the services sector in GDP, rural population).<sup>18, 19</sup> To gain more sample variability we estimate model (3) based on a more disaggregated panel dataset, using as a unit of observation the population groups defined in terms of schooling and age for each country and year. Table 3 presents the estimation results of alternative specifications of model (3) with fixed effects by country-group.<sup>20</sup>

As a general result, we find that the sign and statistical significance of the coefficients associated with the cyclical and trend components of the GDP are robust across specifications, even though the absolute value decreases as we incorporate new regressors into the model. For instance, according to the basic model without controls (column 1 of Table 3) a 10-percent increase in the cyclical component of GDP per capita is associated with a fall in female LFP of 1.72 pp., while the estimated fall is 0.69 pp. when we include male unemployment, CCTs coverage and the full set of controls (column 8).

Our estimates suggest that both men's unemployment rate and CCTs coverage explain part of the countercyclical behavior of female LFP, but not its long-term behavior. Indeed, when the model includes any of these two variables, the coefficient associated with the cyclical component falls significantly, especially when using the full set of controls. The partial

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<sup>18</sup> It should be noted that including women's wages and a proxy of the importance of the services sector contributes to controlling for factors related to the labor demand, which in turn are correlated with the business cycle. Therefore, these controls would likely capture the fact that recessions or short-term economic expansions can generate compositional changes in the productive structure, thus affecting female LFP.

<sup>19</sup> The correlations of each of these additional controls with female LFP have the expected signs according to the empirical literature (see Busso and Romero Fonseca, 2015).

<sup>20</sup> The tables with the coefficients for all the variables in the regressions are available upon request.

correlation between male unemployment and female LFP is always positive and statistically significant. When men's unemployment rate increases 1 pp., women's labor supply rises between 0.12 and 0.21 pp. on average, depending of the specification chosen. This result is consistent with the added-worker effect and could explain part of the negative association between female LFP and the business cycle. On the other hand, in the models that include CCTs coverage we find that expansions in social protection are associated with reductions in female LFP, although the relationship is statistically significant only in specifications that include the full set of controls. For instance, the coefficient of -5.6 in columns 4 and 8 of Table 3 implies that an increase in CCTs coverage of 17.5 pp. (the average increase in the region since year 2000) is associated with a decline in female LFP of almost 1 pp. on average. This result is consistent with the hypothesis that the extra family income implied by the expansion of CCTs in the region can decelerate the entry of women into the labor market.

Table 4 shows the results of estimating model (3) with the labor force participation ratio between men and women as the dependent variable. Cyclical expansions are associated with a widening of the gender gap: a 10 percentage increase in GDP per capita is associated with an increase in the gender gap that ranges between 2pp. and 5 pp. across specifications except for the one in column 8 in which the effect is not statistically significant and it is mainly captured by the variability of the male unemployment rate and the coverage of CCTs. Increases in male unemployment are associated with reductions in the LFP gender ratio, a piece of evidence that supports the validity of the AWE hypothesis. Specifically, a 1 pp. increase in the male unemployment rate is associated to a reduction of the gender gap that ranges between 0.64 and 0.93 pp., depending on the specification. Again, CCTs coverage is statistically significant only in specifications that include the full set of controls, where a 10 pp. increase is related to a widening of the gender ratio in labor supply of about 3.4 pp.

Table 5 reports a range of specifications of models and different estimation methods as robustness checks. For instance, we use pooled cross-sectional OLS, first-difference estimator, the Arellano and Bond (1991) GMM estimator for a dynamic model, and random-effect estimator. We also estimate model (3) adding year fixed effects to the country-group fixed effect. We add controls for educational group trends, and additional variables that refer to cultural or legal factors, although in these cases the number of observations falls. We also restrict the sample to countries with available data for more than 10 and 20 years. In all cases the main results of the paper hold: the countercyclical behavior of female LFP seems a robust result.

### **6.3 Instrumental variables estimates**

In this last section we perform an additional robustness exercise to assess the credibility of the previous results. By all means, all the models estimated so far potentially suffer from endogeneity bias. Even though we control for unobservable fixed heterogeneity across countries and population groups, it is likely that other sources of endogeneity remain, such as measurement error in the components of GDP, or inverse causality between female LFP and the economic cycle. On the one hand, measurement error in the cyclical component of GDP per capita would lead to attenuation bias in our previous fixed-effect estimates, and the bias

would be larger the larger the variance of the measurement error. On the other hand, under certain assumptions the reciprocal relationship between the business cycle and female LFP could also bias our OLS estimates towards zero. This would be the case if, for instance, female LFP positively affected economic growth (Tsani *et al.*, 2013; Elborgh-Woytek *et al.*, 2013).

To assess the relevance of these potential problems, in this section we use instrumental variables and estimate model (3) through Two Stages Least Squares (2SLS). In order to instrument the cyclical and trend components of the GDP we use weather variables, such as the annual temperature and precipitation average levels.<sup>21</sup> For these instruments to be valid they have to fulfill with the condition of relevance (*i.e.* they have to affect economic growth) and with the exclusion restriction (*i.e.* they have to affect female LFP only through the economic growth). The first stage in equation (4) allows us to test the first condition.

$$cycle_{ct} = \gamma + \delta Z_{ct} + \phi X_{ct} + \theta Q_{gct} + \eta_c + \epsilon_t + \mu_{ct} \quad (4)$$

where  $Z_{ct}$  is the vector of additional instruments, *i.e.* the cyclical and trend components of the annual temperature and precipitation average levels.<sup>22</sup> We also instrument the trend component using a similar equation with  $trend_{ct}$  as the endogenous variable. The bottom panel in Table 6 shows the estimation results of the first stage. The economic cycle is negatively associated with the instruments related to temperature levels and positively associated to those related to precipitations, and even though the coefficients are small, they are statistically significant.<sup>23, 24</sup>

Concerning the exclusion restriction, although it seems very likely, nothing guarantees that weather variables influence female LFP exclusively through the business cycle. In fact, some studies find a relationship between weather variables and the labor supply (Graff Zivin and Neidell, 2014; Connolly, 2008; Niemelä *et al.*, 2002). However, they generally find effects on hours of work or labor productivity based on micro level data. The fact that there are no

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<sup>21</sup> The weather variables that we use are those used in Burke *et al.* (2015) to evaluate the nonlinear effect of temperature and precipitations on economic growth. That is, they estimate the first-stage regression which provides information on the income effects of weather variation.

<sup>22</sup> We use average annual weather variables measured in levels: degrees Celsius for temperature and meters for precipitation. Then, we apply the Hodrick-Prescott filter to obtain the cyclical and trend component of these series, using a smoothing parameter equal to 100. The original variables are obtained from Burke *et al.* (2015), whose source for the data is the University of Delaware reconstruction assembled by Matsuura and Willmot (2012), which contains 0.5 degree gridded monthly average temperature and total precipitation data for all land areas over the period 1900-2010, as interpolated from station data. Burke *et al.* (2015) aggregate the 0.5 degree grid cell estimates to the country-year level, weighting by population density in the year 2000.

<sup>23</sup> The F-statistics to test the joint significance of the parameters associated with the additional instruments generally exceed the threshold of 10, as suggested by Angrist and Pischke (2009), in the specifications that include all control variables.

<sup>24</sup> The intuition behind these relationships comes from the fact that higher temperatures (especially during drought seasons) harm both the level and growth of the product, since they may negatively affect the agricultural sector, which is very important in most Latin American countries (Hsiang, 2010). On the other hand, precipitations should positively affect the product, particularly in economies that depend on the agricultural sector, that do not have extended irrigation systems, and that are close to the Equator (Miguel and Satyanath, 2011). There is also evidence from first-stage estimates on the effects of climate on product growth (Miguel *et al.*, 2004; Brückner and Ciccone, 2011). Burke and Leigh (2010) find that temperature is a stronger predictor of income than precipitation.

studies that analyze effects on the extensive margin of labor supply may be due to the fact that it is difficult to think that climatic variables directly affect the decision to participate in the labor market, and therefore in the aggregate labor participation rate. Indeed, when we test the validity of the instruments and/or the correct specification of the model through over-identification tests, we do not reject the null hypothesis that the instruments are not correlated with the error term in the specifications that include all control variables.

Table 6 shows that in all specifications, independently of whether we consider the cycle or the trend as endogenous variables, and despite the instruments we use, the estimated coefficient for the cyclical component of GDP per capita continues to be negative and statistically significant, but larger than the fixed effects estimates from subsection 6.2. This suggests that, if the instruments were valid, our previous results suffer from attenuation bias, so they could be interpreted as a lower bound of the true effect of the economic cycle on female LFP.

This strategy is included in the study just as a robustness exercise, especially because there may be a lack of consensus about the validity of the instruments. Even though the instruments are not statistically weak, the economic arguments on which this relationship is based may be not sufficiently convincing.

## 7. Concluding remarks

The main goal of this study is to analyze the role of the economic growth in the deceleration in female LFP that has taken place in Latin America since the early 2000s. In order to do so, we evaluate the relationship between the economic cycle and female LFP using econometric estimations of fixed-effect models. We find that female LFP is positively related to the trend component of GDP per capita –long-term effect– and negatively related to the cyclical component –mostly related to short-term shocks. This latter link is stronger for vulnerable women, with low educational attainment, married, with children, in rural areas, and in low-income households, *i.e.* the group for which the deceleration of labor force participation in the booming years of the 2000s was more noticeable. We provide evidence that suggest that an inverse added-worker effect could have been in play. We also provide evidence that the coverage of CCTs programs is a relevant factor associated with the deceleration in female labor supply.

The implications of the deceleration in female LFP in terms of wellbeing are not very clear. This transformation may be due to the fact that within a more favorable economic context, women are no longer forced to get out of the labor market and take precarious low-quality jobs, which do not fit to their preferences. In this sense, the deceleration could be a natural optimal answer from the women that choose to allocate their time to activities outside the market, like children and elderly care. Nevertheless, as suggested by Gasparini and Marchionni (2017), staying out of the labor market during some time could imply the loss of productivity, making them less likely to work in the future, independently of the macroeconomic conditions. Furthermore, it could mean a strengthening of the traditional gender roles in the household, affecting negatively the perspectives of women to participate in the labor force in the long term. This pessimistic view is particularly relevant in the current context, where some Latin

American economies are facing economic instability that threatens their perspectives of growth.

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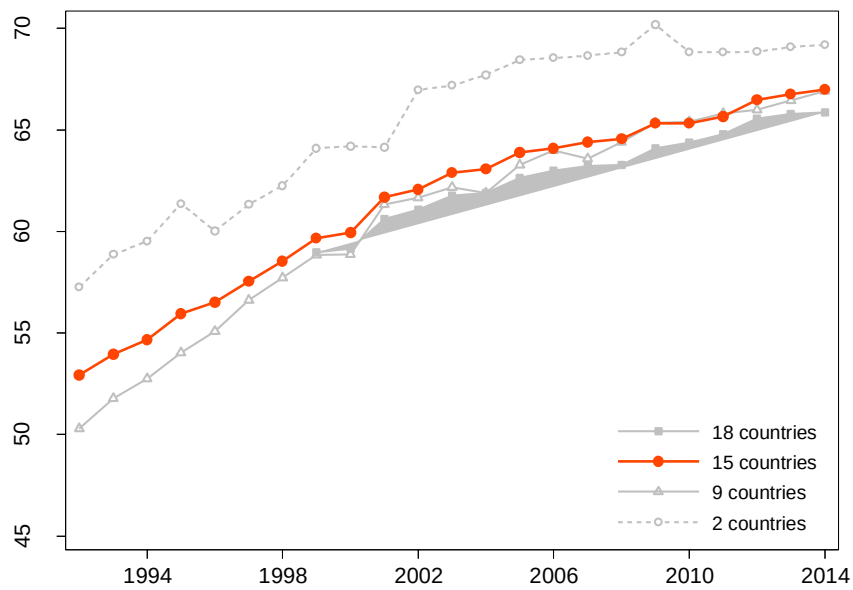
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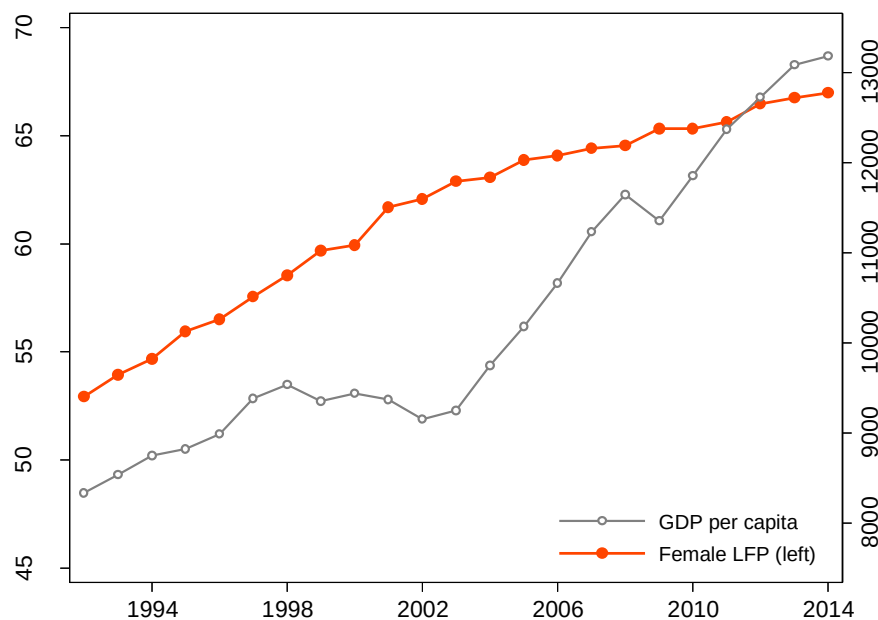
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**Figure 1: Female labor force participation in Latin America**



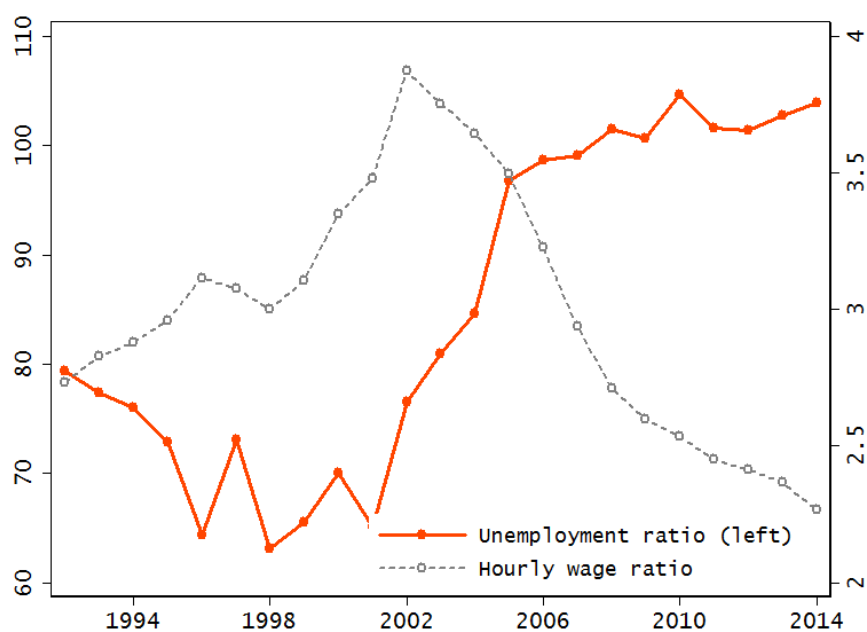
Source: own calculations based on microdata from national household surveys. Note: women aged 25-54. Unweighted means of Latin American countries. The series of 2 countries includes Argentina and Brazil. The series of 9 countries adds to the previous Bolivia, Chile, Costa Rica, Honduras, Mexico, Uruguay and Venezuela. The series of 15 countries adds to the previous Ecuador, El Salvador, Nicaragua, Panama and Paraguay. The series of 18 countries includes the previous 15 countries plus Colombia, Guatemala and the Dominican Republic.

**Figure 2: Female labor force participation and economic growth**



Source: own calculations based on microdata from national household surveys, GDP per capita (in PPP-adjusted constant US\$) from WDI. Notes: women aged 25-54. Unweighted means of 15 Latin American countries.

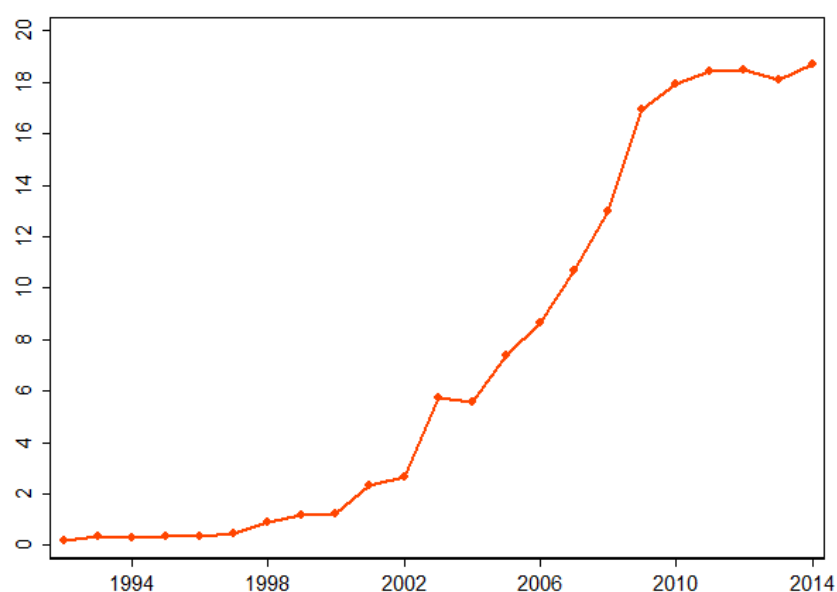
**Figure 3:** Unemployment and hourly wage ratios between men with high and low education. Men aged 25-54.



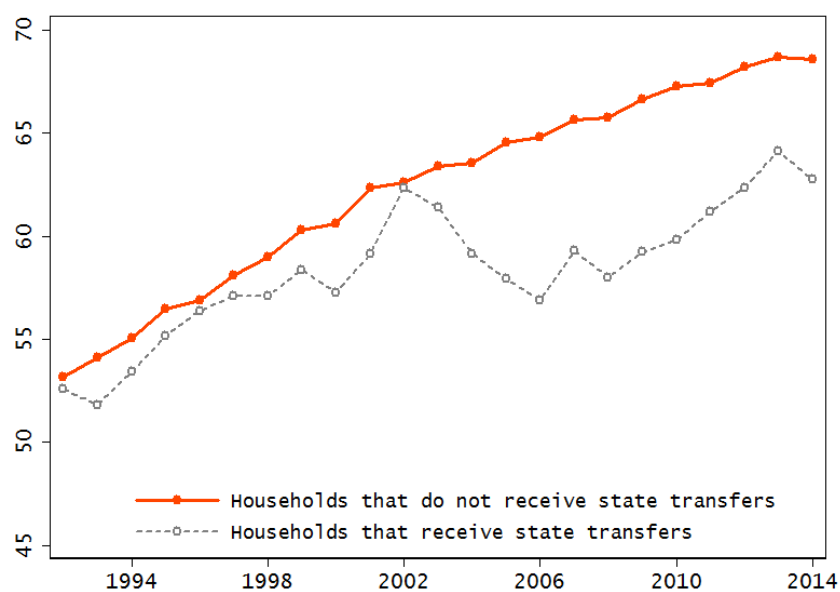
Source: own calculations based on microdata from national household surveys. Note: the ratios are defined as high education / low education, where low education=less than secondary complete, high education=tertiary complete. Unweighted means of 15 Latin American countries.

**Figure 4:** Evolution of state transfers in Latin America

(a) Average coverage of CCTs in Latin America (beneficiaries as percentage of total population)



(b) Female labor force participation and public transfers



Source: figure (a) own calculations based on non-contributory social protection programs database, Social Development Division, ECLAC; figure (b) own calculations based on microdata from national household surveys. Note: figure (a) shows unweighted means of 17 Latin American countries: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru and Uruguay. Figure (b) refers to women aged 25-54, unweighted means, monetary and non-monetary public transfers. Unweighted means of 15 Latin American countries.

**Table 1:** Models of labor force participation. Latin American countries, panel 1987-2014. Adults aged 25-54

|                    | Women             |                     | Men             |                 | Ratio men/women     |                     |
|--------------------|-------------------|---------------------|-----------------|-----------------|---------------------|---------------------|
|                    | (1)               | (2)                 | (3)             | (4)             | (5)                 | (6)                 |
| Log GDP per capita | 22.6***<br>(8.08) |                     | -1.1<br>(-1.24) |                 | -73.0***<br>(-5.06) |                     |
| Cyclical component |                   | -21.7***<br>(-3.59) |                 | 2.3<br>(1.46)   |                     | 61.9***<br>(3.81)   |
| Trend component    |                   | 25.6***<br>(8.96)   |                 | -1.3<br>(-1.41) |                     | -82.2***<br>(-5.54) |
| NxT                | 304               | 304                 | 304             | 304             | 304                 | 304                 |
| N                  | 18                | 18                  | 18              | 18              | 18                  | 18                  |
| R-squared          | 0.56              | 0.66                | 0.04            | 0.06            | 0.49                | 0.57                |

Notes: Fixed effects (by country) OLS regressions. Unbalanced panel of 18 countries. Dependent variable: in columns 1 and 2 (3 and 4) is female (male) labor force participation as percentage of women (men) aged 25-54; in columns 5 and 6 is the LFP ratio (men/women) expressed in percentage. Log GDP per capita is the logarithm of real gross domestic product per capita. Cyclical and trend components of GDP are obtained by applying the Hodrick-Prescott filter to the log of GDP per capita. For detailed data definitions and sources, see Table A3 in the Appendix. Robust t statistics clustered by country in parentheses. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

**Table 2:** Models of labor force participation by educational attainment and vulnerability. Latin American countries, panel 1987-2014. Adults aged 25-54

**A. Women**

|                    | Low education |          | Medium education |         | High education |          | Vulnerable |          | Non-vulnerable |         |
|--------------------|---------------|----------|------------------|---------|----------------|----------|------------|----------|----------------|---------|
|                    | (1)           | (2)      | (3)              | (4)     | (5)            | (6)      | (7)        | (8)      | (9)            | (10)    |
| Log GDP per capita | 19.2***       |          | 8.5**            |         | 8.7***         |          | 25.6***    |          | 12.0***        |         |
|                    | (7.18)        |          | (2.51)           |         | (3.21)         |          | (7.62)     |          | (4.03)         |         |
| Cyclical component |               | -23.6*** |                  | -16.9** |                | -11.3*** |            | -26.0*** |                | -9.0    |
|                    |               | (-3.32)  |                  | (-2.31) |                | (-3.43)  |            | (-3.26)  |                | (-1.48) |
| Trend component    |               | 22.1***  |                  | 10.3*** |                | 10.1***  |            | 29.1***  |                | 13.5*** |
|                    |               | (8.40)   |                  | (2.93)  |                | (3.42)   |            | (8.77)   |                | (4.30)  |
| NxT                | 304           | 304      | 304              | 304     | 304            | 304      | 304        | 304      | 304            | 304     |
| N                  | 18            | 18       | 18               | 18      | 18             | 18       | 18         | 18       | 18             | 18      |
| R-squared          | 0.45          | 0.56     | 0.15             | 0.22    | 0.21           | 0.26     | 0.44       | 0.52     | 0.21           | 0.24    |

**B. Men**

|                    | Low education |         | Medium education |         | High education |        | Vulnerable |        | Non-vulnerable |         |
|--------------------|---------------|---------|------------------|---------|----------------|--------|------------|--------|----------------|---------|
|                    | (1)           | (2)     | (3)              | (4)     | (5)            | (6)    | (7)        | (8)    | (9)            | (10)    |
| Log GDP per capita | -2.0*         |         | -0.1             |         | 0.2            |        | 1.1        |        | -1.4           |         |
|                    | (-1.91)       |         | (-0.08)          |         | (0.16)         |        | (0.99)     |        | (-1.42)        |         |
| Cyclical component |               | 2.1     |                  | 2.1     |                | 1.8    |            | 0.1    |                | 6.0*    |
|                    |               | (1.43)  |                  | (0.67)  |                | (1.20) |            | (0.05) |                | (2.03)  |
| Trend component    |               | -2.3*   |                  | -0.2    |                | 0.1    |            | 1.1    |                | -1.9*   |
|                    |               | (-2.05) |                  | (-0.22) |                | (0.07) |            | (0.97) |                | (-1.77) |
| NxT                | 304           | 304     | 304              | 304     | 304            | 304    | 304        | 304    | 304            | 304     |
| N                  | 18            | 18      | 18               | 18      | 18             | 18     | 18         | 18     | 18             | 18      |
| R-squared          | 0.10          | 0.12    | 0.00             | 0.01    | 0.00           | 0.00   | 0.03       | 0.03   | 0.02           | 0.04    |

**C. Ratio men/women**

|                    | Low education |           | Medium education |         | High education |          | Vulnerable |           | Non-vulnerable |          |
|--------------------|---------------|-----------|------------------|---------|----------------|----------|------------|-----------|----------------|----------|
|                    | (1)           | (2)       | (3)              | (4)     | (5)            | (6)      | (7)        | (8)       | (9)            | (10)     |
| Log GDP per capita | -95.5***      |           | -20.6**          |         | -12.1***       |          | -192.8***  |           | -18.8***       |          |
|                    | (-4.61)       |           | (-2.43)          |         | (-3.59)        |          | (-4.01)    |           | (-3.98)        |          |
| Cyclical component |               | 88.3***   |                  | 40.5*** |                | 17.8***  |            | 147.7***  |                | 21.5**   |
|                    |               | (3.40)    |                  | (3.21)  |                | (4.16)   |            | (3.04)    |                | (2.63)   |
| Trend component    |               | -108.0*** |                  | -24.7** |                | -14.2*** |            | -216.0*** |                | -21.5*** |
|                    |               | (-5.04)   |                  | (-2.80) |                | (-3.96)  |            | (-4.37)   |                | (-4.46)  |
| NxT                | 304           | 304       | 304              | 304     | 304            | 304      | 304        | 304       | 304            | 304      |
| N                  | 18            | 18        | 18               | 18      | 18             | 18       | 18         | 18        | 18             | 18       |
| R-squared          | 0.44          | 0.52      | 0.19             | 0.26    | 0.24           | 0.31     | 0.40       | 0.46      | 0.16           | 0.20     |

Notes: Fixed effects (by country) OLS regressions. Unbalanced panel of 18 countries. Dependent variable: in panel A (B) is female (male) labor force participation as percentage of women (men) aged 25-54; in panel C is the LFP ratio (men/women) expressed in percentage. Columns show estimations of the models dividing individuals by different levels of educational attainment and quintiles of a vulnerability index. Low education=less than secondary complete; medium education=secondary complete or tertiary incomplete; high education=tertiary complete. Vulnerable = individuals who are in quintile 1 of a vulnerability index based on the principal components of level of educational attainment, marital status and number of children in the household. Log GDP per capita is the logarithm of real gross domestic product per capita. Cyclical and trend components of GDP are obtained by applying the Hodrick-Prescott filter to the log of real GDP per capita. For detailed data definitions and sources, see Table A3 in the Appendix. Robust t statistics clustered by country in parentheses. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

**Table 3:** Models of female labor force participation. Latin American countries, panel of education and age groups, 1987-2014. Women aged 25-54

|                     | (1)                 | (2)                 | (3)                 | (4)                 | (5)                 | (6)                 | (7)                | (8)                |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|--------------------|
| Cyclical component  | -17.2***<br>(-6.63) | -15.0***<br>(-5.63) | -13.1***<br>(-5.13) | -10.3***<br>(-3.83) | -12.9***<br>(-4.58) | -11.3***<br>(-3.97) | -9.5***<br>(-3.46) | -6.9**<br>(-2.46)  |
| Trend component     | 15.5***<br>(11.79)  | 5.7***<br>(3.26)    | 15.8***<br>(8.66)   | 8.7***<br>(5.17)    | 15.5***<br>(11.35)  | 6.9***<br>(4.02)    | 15.4***<br>(8.49)  | 9.6***<br>(5.96)   |
| CCTs coverage       |                     |                     | 1.3<br>(0.55)       | -5.6***<br>(-2.94)  |                     |                     | 1.5<br>(0.69)      | -5.6***<br>(-2.86) |
| Male unemployment   |                     |                     |                     |                     | 21.4***<br>(2.63)   | 15.4**<br>(2.27)    | 18.6**<br>(2.27)   | 12.2**<br>(2.08)   |
| Additional controls | No                  | Yes                 | No                  | Yes                 | No                  | Yes                 | No                 | Yes                |
| NxT                 | 2,736               | 2,537               | 2,511               | 2,321               | 2,669               | 2,476               | 2,445              | 2,261              |
| N                   | 162                 | 162                 | 153                 | 153                 | 162                 | 162                 | 153                | 153                |
| R-squared           | 0.27                | 0.35                | 0.29                | 0.36                | 0.28                | 0.34                | 0.30               | 0.36               |

Notes: Fixed effects (by country, educational and age groups) OLS regressions. Unbalanced panel of 9 groups in 18 countries. Dependent variable: female labor force participation as percentage of women aged 25-54. Log GDP per capita is the logarithm of real gross domestic product per capita. Cyclical and trend components of GDP are obtained by applying the Hodrick-Prescott filter to the log of real GDP per capita. CCTs program coverage as share of population who are beneficiaries. Male unemployment as the share of active adults in each group. Additional controls: average years of education, average number of children, share of married women, share of women in charge of old person, average age of children in household, female hourly wage, hourly wage ratio (men/women), service sector value added as share of GDP, rural population as share of total population. For detailed data definitions and sources, see Table A3 in the Appendix. Robust t statistics clustered by country and group in parentheses. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

**Table 4:** Models of relative labor force participation (male/female). Latin American countries, panel of education and age groups, 1987-2014. Adults aged 25-54

|                     | (1)                 | (2)               | (3)                 | (4)                 | (5)                 | (6)                 | (7)                 | (8)                 |
|---------------------|---------------------|-------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Cyclical component  | 49.8***<br>(6.24)   | 33.6***<br>(3.89) | 41.8***<br>(5.11)   | 21.4**<br>(2.29)    | 32.8***<br>(3.86)   | 20.6**<br>(2.26)    | 27.0***<br>(3.22)   | 8.9<br>(0.90)       |
| Trend component     | -53.2***<br>(-7.59) | -11.7<br>(-1.19)  | -58.5***<br>(-5.76) | -24.7***<br>(-2.70) | -56.2***<br>(-7.27) | -15.6<br>(-1.63)    | -61.2***<br>(-5.64) | -28.0***<br>(-3.14) |
| CCTs coverage       |                     |                   | 9.9<br>(0.85)       | 32.9***<br>(3.12)   |                     |                     | 10.0<br>(0.84)      | 34.0***<br>(3.17)   |
| Male unemployment   |                     |                   |                     |                     | -93.7***<br>(-2.86) | -69.4***<br>(-3.11) | -88.8***<br>(-2.66) | -64.2***<br>(-3.12) |
| Additional controls | No                  | Yes               | No                  | Yes                 | No                  | Yes                 | No                  | Yes                 |
| NxT                 | 2,736               | 2,537             | 2,511               | 2,321               | 2,669               | 2,476               | 2,445               | 2,261               |
| N                   | 162                 | 162               | 153                 | 153                 | 162                 | 162                 | 153                 | 153                 |
| R-squared           | 0.25                | 0.40              | 0.26                | 0.42                | 0.26                | 0.41                | 0.27                | 0.43                |

Notes: Fixed effects (by country, educational and age groups) OLS regressions. Unbalanced panel of 9 groups in 18 countries. Dependent variable: labor force participation ratio (men/women) expressed in percentage. Robust t statistics clustered by country and group in parentheses. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%. See notes to Table 3 for more specifications about the regressions.



**Table 5:** Models of female labor force participation. Latin American countries, panel of education and age groups, 1987-2014. Adults aged 25-54

|                                                                     | Dependent variable  |                    |                       |                     | NxT   |
|---------------------------------------------------------------------|---------------------|--------------------|-----------------------|---------------------|-------|
|                                                                     | Female LFP (%)      |                    | LFP ratio (men/women) |                     |       |
|                                                                     | Cyclical comp.      | Trend comp.        | Cyclical comp.        | Trend comp.         |       |
| (1) Base model                                                      | -17.2***<br>(-6.63) | 15.5***<br>(11.79) | 49.8***<br>(6.24)     | -53.2***<br>(-7.59) | 2,736 |
| (2) Pooled OLS                                                      | -14.1***<br>(-2.78) | -0.6<br>(-1.27)    | 35.3**<br>(2.36)      | 2.0<br>(1.63)       | 2,736 |
| (3) Differences                                                     | -8.4***<br>(-2.74)  | -2.6<br>(-0.72)    | 19.7**<br>(2.55)      | 12.4<br>(0.99)      | 2,052 |
| (4) Dynamic panel model /1                                          | -6.1***<br>(-2.61)  | 0.0<br>(0.20)      | 24.9***<br>(4.97)     | -0.0<br>(-0.15)     | 1,773 |
| (5) Std. error clustered by country                                 | -17.2***<br>(-3.29) | 15.5***<br>(5.59)  | 49.8***<br>(3.59)     | -53.2***<br>(-5.01) | 2,736 |
| (6) Random Effects                                                  | -13.4***<br>(-5.14) | 6.1***<br>(9.70)   | 33.0***<br>(4.28)     | -11.8***<br>(-6.97) | 2,736 |
| (7) Year fixed effects                                              | -14.0***<br>(-4.08) | 8.2***<br>(2.78)   | 39.2***<br>(3.54)     | -32.5**<br>(-2.15)  | 2,736 |
| (8) Year fixed effects + interaction<br>year and educational groups | -14.0***<br>(-4.17) | 8.2***<br>(3.19)   | 39.2***<br>(3.90)     | -32.5***<br>(-3.24) | 2,736 |
| (9) Additional controls 1                                           | -15.0***<br>(-5.63) | 5.7***<br>(3.26)   | 33.6***<br>(3.89)     | -11.7<br>(-1.19)    | 2,537 |
| (10) Additional controls 2                                          | -13.9***<br>(-3.60) | 12.8***<br>(3.67)  | 27.7***<br>(2.88)     | -9.6<br>(-1.05)     | 936   |
| (11) Only country >20 periods                                       | -17.5***<br>(-6.05) | 19.2***<br>(9.27)  | 55.7***<br>(5.22)     | -64.9***<br>(-5.35) | 1,224 |
| (12) Only country >10 periods                                       | -17.7***<br>(-6.78) | 15.9***<br>(11.88) | 50.7***<br>(6.28)     | -54.2***<br>(-7.60) | 2,646 |

Notes: (1) Base model specification is the same presented in column 1 of table 3 for female LFP and table 4 for the LFP ratio (men/women). (2) Pooled cross-sectional OLS regression with t statistics clustered by country and group in parentheses. (3) First-difference estimator with t statistics clustered by country and group in parentheses. (4) Arellano and Bond (1991) GMM estimator with robust standard errors; we instrument for cycle component using a double lag. (5) Base model specification with t statistics clustered only by country in parenthesis. (6) Random-effect estimator with robust t statistics in parentheses. (7) Base model adding year fixed effects with t statistics clustered by country and group in parentheses. (8) Specification (7) + interactions between education groups and year dummies. (9) Base model specification with control variables; these results are the same presented in column 2 of table 3 for female LFP and table 4 for the LFP ratio. (10) Specification (9) + additional controls such as percentage of married women using modern contraceptive methods, an indicator of legal abortion, percentage of women with a washing machine, percentage of non-practicing catholic and an index of labor market regulations. (11) Base model specification restricting the sample to countries with available data for 20 years or more. (12) Base model specification restricting the sample to countries with available data for 10 years or more. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%.

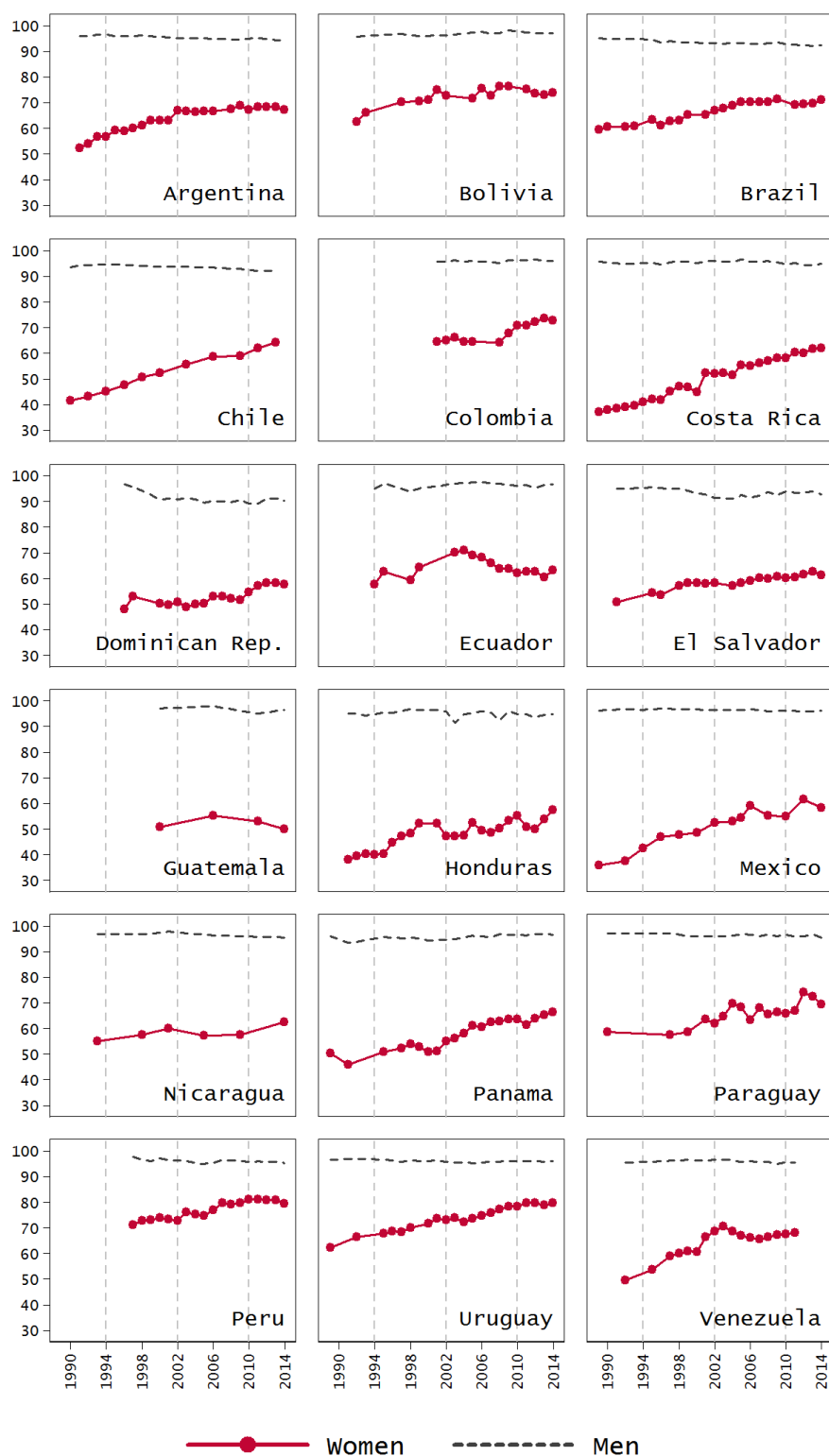
**Table 6:** Models of female labor force participation. Fixed effects OLS and instrumental variables 2SLS. Latin American countries, panel of education and age groups, 1987-2010. Women aged 25-54

|                                                                 | OLS                 |                     | 2SLS                          |                      |                      |                      |                                          |                      |                      |                      |
|-----------------------------------------------------------------|---------------------|---------------------|-------------------------------|----------------------|----------------------|----------------------|------------------------------------------|----------------------|----------------------|----------------------|
|                                                                 | (1)                 | (2)                 | Cyclical component endogenous |                      |                      |                      | Cyclical and trend components endogenous |                      |                      |                      |
|                                                                 |                     |                     | (3)                           | (4)                  | (5)                  | (6)                  | (7)                                      | (8)                  | (9)                  | (10)                 |
| <i>Second stage</i>                                             |                     |                     |                               |                      |                      |                      |                                          |                      |                      |                      |
| Instruments used                                                |                     |                     | temp                          |                      | temp + precip        |                      | temp                                     |                      | temp + precip        |                      |
| Cyclical component                                              | -16.4***<br>(-6.19) | -14.5***<br>(-5.30) | -243.7**<br>(-2.16)           | -86.5***<br>(-3.61)  | -309.7***<br>(-2.67) | -91.2***<br>(-3.71)  | -222.3**<br>(-1.97)                      | -85.3**<br>(-2.32)   | -302.9***<br>(-2.71) | -111.7***<br>(-3.94) |
| Trend component                                                 | 18.1***<br>(10.52)  | 7.0***<br>(3.11)    | 20.1***<br>(10.26)            | 13.5***<br>(4.32)    | 20.6***<br>(10.66)   | 13.9***<br>(4.36)    | 23.9***<br>(3.70)                        | 14.2<br>(0.69)       | 16.6***<br>(2.91)    | -2.6<br>(-0.31)      |
| <i>First stage for the cyclical component of GDP per capita</i> |                     |                     |                               |                      |                      |                      |                                          |                      |                      |                      |
| Temperature - cycle                                             |                     |                     | -0.005**<br>(-1.98)           | -0.012***<br>(-3.57) | -0.005*<br>(-1.80)   | -0.012***<br>(-3.36) | -0.006**<br>(-2.08)                      | -0.012***<br>(-3.64) | -0.005*<br>(-1.89)   | -0.012***<br>(-3.45) |
| Temperature - trend                                             |                     |                     | -0.007<br>(-1.24)             | -0.031***<br>(-3.84) | -0.006<br>(-0.98)    | -0.030***<br>(-3.45) | -0.004<br>(-0.74)                        | -0.023***<br>(-2.87) | -0.003<br>(-0.54)    | -0.017**<br>(-1.97)  |
| Precipitations - cycle                                          |                     |                     |                               |                      | 0.003<br>(0.62)      | -0.000<br>(-0.06)    |                                          |                      | 0.003<br>(0.55)      | -0.000<br>(-0.08)    |
| Precipitations - trend                                          |                     |                     |                               |                      | 0.008<br>(0.92)      | 0.005<br>(0.48)      |                                          |                      | 0.012<br>(1.34)      | 0.027***<br>(2.62)   |
| F test                                                          |                     |                     | 2.77                          | 16.05                | 2.20                 | 9.37                 | 2.55                                     | 4.51                 | 2.19                 | 10.67                |
| Overid. test (p-value)                                          |                     |                     | 0.56                          | 0.97                 | 0.44                 | 0.05                 |                                          |                      | 0.40                 | 0.56                 |
| Additional controls                                             | No                  | Yes                 | No                            | Yes                  | No                   | Yes                  | No                                       | Yes                  | No                   | Yes                  |
| NxT                                                             | 2,196               | 2,015               | 2,196                         | 2,006                | 2,196                | 2,006                | 2,196                                    | 2,006                | 2,196                | 2,006                |
| N                                                               | 162                 | 162                 | 162                           | 153                  | 162                  | 153                  | 162                                      | 153                  | 162                  | 153                  |

Notes: Fixed effects (by country, educational and age groups) OLS regressions in columns 1 and 2. Fixed effects (by country, educational and age groups) 2SLS regressions in columns 3 to 10. Unbalanced panel of 9 groups in 18 countries. We restrict the sample to period 1987-2010 for reasons of availability of weather variables. Dependent variable: female labor force participation as percentage of females aged 25-54. Instrument variables: temp=average annual temperature level (degrees Celsius); precip=average annual precipitations level (meters). Over-identification test refers to the Hansen J statistic, where the joint null hypothesis is that the instruments are valid. Robust t statistics clustered by country and group in parentheses. \*significant at 10%; \*\*significant at 5%; \*\*\*significant at 1%. See notes to Table 3 for more specifications about the regressions. The results of first-stage regressions of trend component are available upon request.

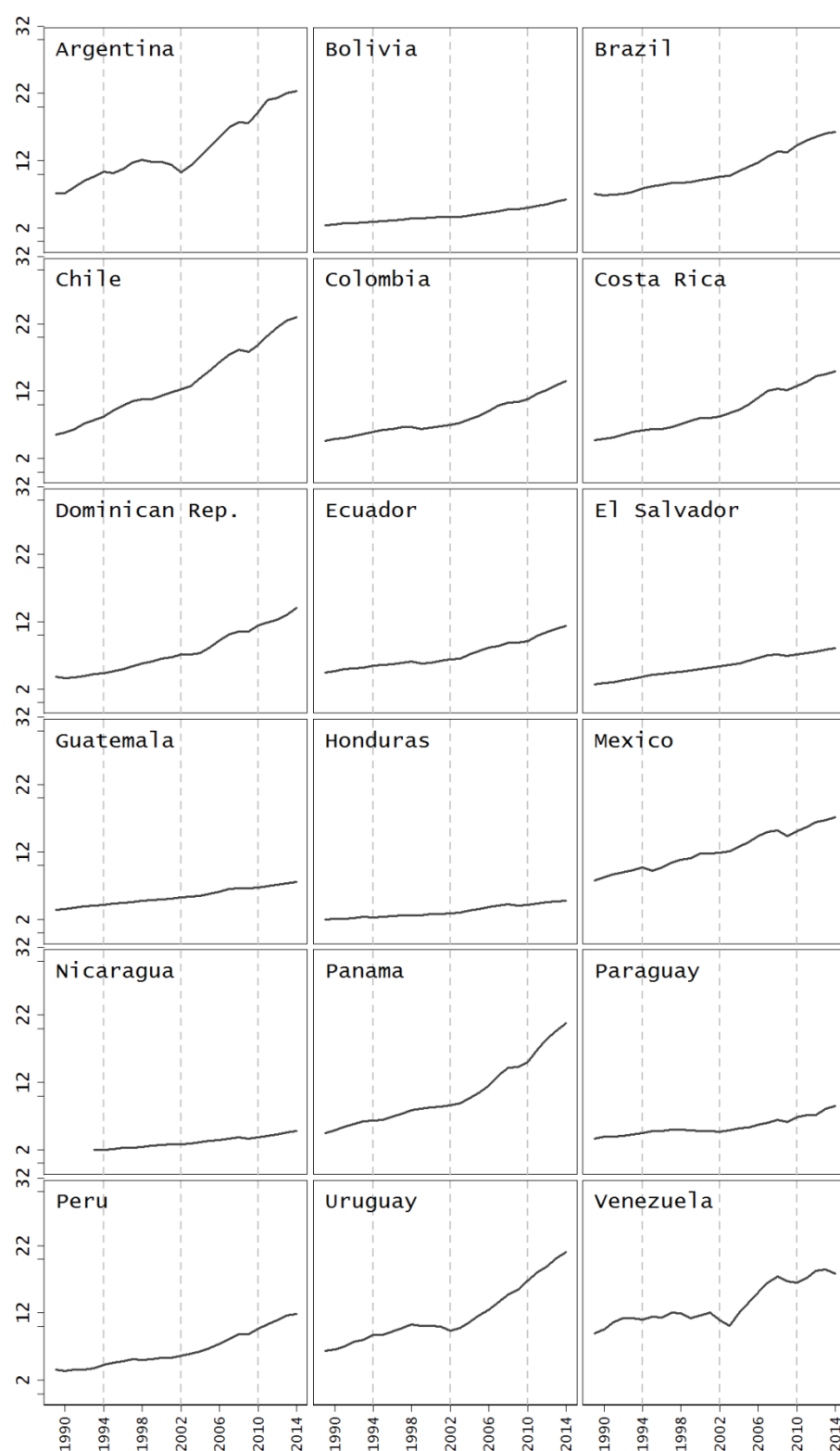
## Appendix

**Figure A1:** Female and male labor force participation. Latin American countries.



Source: own calculations based on microdata from national household surveys. Note: adults aged 25-54.

**Figure A2: GDP per capita. Latin American countries**



Source: own calculations based on data from WDI Database. Note: GDP per capita in thousands of PPP-adjusted 2011 US\$.

**Table A1: National household surveys used in this study**

| Country        | Survey name                                                  | Acronym | Surveys used                                                                |
|----------------|--------------------------------------------------------------|---------|-----------------------------------------------------------------------------|
| Argentina      | Encuesta Permanente de Hogares Puntual                       | EPH     | 1992-2003                                                                   |
|                | Encuesta Permanente de Hogares Continua                      | EPH-C   | 2003-2014                                                                   |
| Bolivia        | Encuesta Integrada de Hogares                                | EIH     | 1992, 1993                                                                  |
|                | Encuesta Nacional de Empleo                                  | ENE     | 1997                                                                        |
|                | Encuesta Continua de Hogares                                 | ECH     | 1999, 2000                                                                  |
|                | Encuesta de Hogares                                          | EH      | 2001, 2002, 2005, 2007-2009, 2011-2013                                      |
|                |                                                              |         |                                                                             |
| Brazil         | Pesquisa Nacional por Amostra de Domicilios                  | PNAD    | 1988-1993, 1995-1999, 2001-2009, 2011-2014                                  |
| Chile          | Encuesta de Caracterización Socioeconómica Nacional          | CASEN   | 1987, 1990, 1992, 1994, 1996, 1998, 2000, 2003, 2006, 2009, 2011, 2013      |
| Colombia       | Encuesta Continua de Hogares                                 | ECH     | 2001-2005                                                                   |
|                | Gran Encuesta Integrada de Hogares                           | GEIH    | 2008-2014                                                                   |
| Costa Rica     | Encuesta de Hogares de Propósitos Múltiples                  | EHPM    | 1989-2009                                                                   |
|                | Encuesta nacional de hogares                                 | ENAH    | 2010, 2012-2014                                                             |
| Dominican Rep. | Encuesta Nacional de Fuerza de Trabajo                       | ENFT    | 2000-2014                                                                   |
| Ecuador        | Encuesta de Condiciones de Vida                              | ECV     | 1994, 1995, 1998, 1999,                                                     |
|                | Encuesta Nacional de Empleo, Desempleo y Subempleo           | ENEMDU  | 2003-2014                                                                   |
| El Salvador    | Encuesta de Hogares de Propósitos Múltiples                  | EHPM    | 1991, 1995, 1996, 1998-2014                                                 |
| Guatemala      | Encuesta Nacional sobre Condiciones de Vida                  | ENCOVI  | 2000, 2006, 2011                                                            |
| Honduras       | Encuesta Permanente de Hogares de Propósitos Múltiples       | EPHPM   | 1991-1999, 2001-2013                                                        |
| Mexico         | Encuesta Nacional de Ingresos y Gastos de los Hogares        | ENIGH   | 1989, 1992, 1994, 1996, 1998, 2000, 2002, 2004-2006, 2008, 2010, 2012, 2014 |
| Nicaragua      | Encuesta Nacional de Hogares sobre Medición de Nivel de Vida | EMNV    | 1993, 1998, 2001, 2005, 2009                                                |
| Panama         | Encuesta de Hogares, Mano de Obra                            | EMO     | 1989, 1991                                                                  |
|                | Encuesta de Hogares                                          | EH      | 1995, 1997-2012                                                             |
| Paraguay       | Encuesta de Hogares (Mano de Obra)                           | EH      | 1990                                                                        |
|                | Encuesta Integrada de Hogares                                | EIH     | 1997, 2001                                                                  |
|                | Encuesta Permanente de Hogares                               | EPH     | 1999, 2002-2014                                                             |
| Peru           | Encuesta Nacional de Hogares                                 | ENAH    | 1997-2014                                                                   |
| Uruguay        | Encuesta Continua de Hogares                                 | ECH     | 1989, 1992, 1995-1998, 2000-2014                                            |
| Venezuela      | Encuesta de Hogares Por Muestreo                             | EHM     | 1989, 1992, 1995, 1997-2011                                                 |

Source: own elaboration.

**Table A2: Composition of the panel datasets used in this study**

|      | arg | bol | bra | chl | col | cri | dom | ecu | slv | gtm | hnd | mex | nic | pan | pry | per | ury | ven |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1987 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1988 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1989 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1990 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1991 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 1992 |     |     |     |     |     |     |     | x   | ~   |     |     |     | x   | ~   | ~   | x   |     |     |
| 1993 |     |     |     | ~   |     |     |     | x   | ~   |     |     | ~   |     | ~   | ~   | x   | ~   | ~   |
| 1994 |     | ~   | ~   | ~   |     |     |     |     | ~   |     |     | ~   | ~   | ~   | ~   | x   | ~   | ~   |
| 1995 |     | ~   | ~   | ~   |     |     |     |     | ~   |     |     | ~   | ~   | ~   | ~   | x   | ~   | ~   |
| 1996 |     | ~   | ~   | ~   |     |     |     | ~   | ~   |     |     | ~   | ~   | ~   | ~   | x   | ~   | ~   |
| 1997 |     |     |     | ~   |     |     |     | ~   | ~   |     |     | ~   | ~   | ~   | ~   |     |     |     |
| 1998 |     | ~   |     | ~   |     |     |     | ~   | ~   |     |     | ~   | ~   | ~   | ~   |     |     |     |
| 1999 |     |     |     | ~   |     |     |     | ~   | ~   |     |     | ~   | ~   | ~   | ~   |     | ~   |     |
| 2000 |     |     | ~   | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2001 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2002 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2003 |     | ~   |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2004 |     | ~   |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2005 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2006 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2007 | ~   |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2008 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2009 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2010 |     | ~   | ~   | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2011 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     |     |
| 2012 |     |     |     | ~   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     | x   |
| 2013 |     |     |     |     |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     | x   |
| 2014 |     |     |     | x   |     |     |     | ~   | ~   |     | ~   | ~   | ~   | ~   | ~   |     |     | x   |

Notes: The shaded cells correspond to the available surveys, which constitute the unbalanced panel that we use in the econometric estimates. The cells marked with the ~ and x signs are interpolated and extrapolated data, respectively, used to compute the descriptive statistics for the Latin American average in section 4. Note that the Latin American average excludes Colombia, Dominican Republic and Guatemala.

**Table A3: Description and sources of variables used in this study**

| Variable                                    | Description                                                                              | Source                                                                                             |
|---------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Female labor force participation            | female labor force participation as percentage of women aged 25-54                       | National household surveys                                                                         |
| Male labor force participation              | Male labor force participation as percentage of men aged 25-54                           | National household surveys                                                                         |
| Labor force participation ratio (men/women) | LFP ratio (men/women) expressed in percentage                                            | National household surveys                                                                         |
| Log GDP per capita                          | Real gross domestic product per capita (log)                                             | WDI Database, World Bank                                                                           |
| CCTs coverage                               | Share of total population who are beneficiaries of conditional income transfer programs. | CCTs beneficiaries: own elaboration based on data from ECLAC. Population: WDI Database, World Bank |
| Male unemployment                           | Unemployment rate as percentage of men aged 25-54                                        | National household surveys                                                                         |
| Years of education                          | Average of years of education (log)                                                      | National household surveys                                                                         |
| Number of children                          | Average number of children (log)                                                         | National household surveys                                                                         |
| Married women                               | Share of married women aged 25-54                                                        | National household surveys                                                                         |
| Women in charge of old person               | Share of women who are in charge of old persons (>70 years old)                          | National household surveys                                                                         |
| Age of children                             | Average age of children in household                                                     | National household surveys                                                                         |
| Hourly wage gap (men/women)                 | Gender ratio of average hourly labor income of the main job, PPP adjusted. (men/women)   | National household surveys                                                                         |
| Female hourly wage                          | Hourly labor income of the main job of women, PPP adjusted                               | National household surveys                                                                         |
| Service sector (value added)                | Value added of service sector (share of GDP)                                             | WDI Database, World Bank                                                                           |
| Rural population                            | Rural population as share of total population                                            | WDI Database, World Bank                                                                           |
| Temperature                                 | Average annual temperature (C°)                                                          | Burke <i>et al.</i> (2015)                                                                         |
| Precipitations                              | Average annual precipitations (m)                                                        | Burke <i>et al.</i> (2015)                                                                         |

**Table A4: Mean of main variables**

|                | LFP   |      | Employment |      | Unemployment |     | GDP<br>(log) | Cyclical<br>comp. | Trend<br>comp. | CCTs<br>coverage | Service sector<br>(value added) | Rural<br>pop. |
|----------------|-------|------|------------|------|--------------|-----|--------------|-------------------|----------------|------------------|---------------------------------|---------------|
|                | Women | Men  | Women      | Men  | Women        | Men |              |                   |                |                  |                                 |               |
| Argentina      | 67.1  | 94.1 | 62.7       | 89.6 | 6.6          | 4.8 | 16.0         | -0.039            | 9.9            | 27.4             | 62.9                            | 8.4           |
| Bolivia        | 73.8  | 97.0 | 71.0       | 94.9 | 3.7          | 2.2 | 4.8          | 0.015             | 8.7            | 26.8             | 50.2                            | 31.9          |
| Brazil         | 71.2  | 92.4 | 66.4       | 89.0 | 6.8          | 3.7 | 12.4         | 0.003             | 9.6            | 26.5             | 70.8                            | 14.6          |
| Chile          | 64.3  | 92.3 | 60.2       | 87.6 | 6.3          | 5.1 | 16.4         | 0.029             | 10.0           | 4.1              | 61.7                            | 10.8          |
| Colombia       | 72.9  | 96.1 | 66.2       | 91.1 | 9.2          | 5.2 | 9.5          | 0.008             | 9.4            | 10.1             | 58.0                            | 23.8          |
| Costa Rica     | 62.2  | 94.9 | 56.9       | 89.6 | 8.4          | 5.6 | 11.0         | -0.010            | 9.6            | 3.6              | 69.4                            | 24.1          |
| Dominican Rep. | 57.8  | 90.3 | 55.1       | 88.4 | 4.6          | 2.1 | 8.7          | 0.001             | 9.4            | 23.4             | 66.9                            | 21.9          |
| Ecuador        | 63.3  | 96.7 | 60.8       | 94.5 | 4.0          | 2.3 | 8.5          | 0.018             | 9.3            | 17.4             | 51.8                            | 36.5          |
| El Salvador    | 61.3  | 92.8 | 59.8       | 89.3 | 2.5          | 3.8 | 6.7          | -0.004            | 9.0            | 2.8              | 61.9                            | 33.7          |
| Guatemala      | 50.1  | 96.5 | 49.4       | 95.3 | 1.4          | 1.3 | 6.2          | 0.002             | 8.9            | 24.7             | 59.6                            | 48.9          |
| Honduras       | 57.6  | 94.8 | 54.1       | 91.3 | 6.0          | 3.7 | 3.9          | -0.007            | 8.5            | 44.2             | 59.8                            | 45.9          |
| Mexico         | 58.5  | 96.2 | 57.0       | 91.8 | 2.5          | 4.5 | 14.7         | 0.009             | 9.7            | 22.5             | 62.2                            | 21.0          |
| Nicaragua      | 62.7  | 95.5 | 59.3       | 91.7 | 5.4          | 4.0 | 3.6          | 0.011             | 8.4            | 2.6              | 54.2                            | 41.5          |
| Panama         | 66.4  | 96.6 | 63.3       | 94.2 | 4.6          | 2.5 | 12.6         | 0.006             | 9.9            | 3.3              | 69.6                            | 33.7          |
| Paraguay       | 69.5  | 95.4 | 65.6       | 92.4 | 5.6          | 3.1 | 6.6          | 0.033             | 9.0            | 8.4              | 50.6                            | 40.6          |
| Peru           | 79.4  | 95.3 | 77.6       | 93.7 | 2.2          | 1.6 | 7.8          | -0.009            | 9.4            | 10.5             | 57.6                            | 21.7          |
| Uruguay        | 79.6  | 96.0 | 74.5       | 93.0 | 6.4          | 3.1 | 14.0         | 0.007             | 9.9            | 7.9              | 64.2                            | 4.8           |
| Venezuela      | 68.0  | 95.4 | 63.0       | 90.0 | 7.4          | 5.7 | 15.6         | -0.003            | 9.7            |                  | 42.1                            | 11.2          |
| Latin America  | 65.9  | 94.9 | 62.4       | 91.5 | 5.2          | 3.6 | 9.9          | 0.004             | 9.4            | 15.6             | 59.6                            | 26.4          |

Notes: The table shows averages over the period available for each country, Labor force participation and employment as percentage of adults aged 25-54. Unemployment as percentage of active adults aged 25-54. Real gross domestic product in logs. CCTs program coverage as percentage of population who are beneficiaries. Service sector value added and rural population as percentage of total population.