Scarring effects of youth unemployment and informality Evidence from Brazil *

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Abstract

This paper studies the effects of youth unemployment and informality on adult labor market outcomes in Brazil. The main contribution of the analysis is to add a further dimension specific to developing and middle income countries -informality- to previous studies of unemployment scarring in advanced economies. We propose an econometric strategy based on cross-cohort differences in youth labor market experiences in order to identify the effects of interest. The findings indicate strong and significant scarring effects: cohorts exposed to higher levels of unemployment and informality in their youth fare systematically worse in the labor markets as adults. However, the persistence and wage penalty effects are mainly present in the early years of adulthood, and tend to dissipate with the passage of time. We also find that adverse effects are stronger for workers with lower levels of skill.

JEL Classification: J24, J31, J64, O17
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1 Introduction

A body of research on young individuals' performance in the labor market indicates that they tend to fare worse than adults in most outcomes. In particular, young workers in developed countries earn lower wages and face higher unemployment (Blanchflower and Freeman, 2000), and, in developing countries, they also have less access to formal jobs (Weller, 2007; Bassi and Galiani, 2009). These results are not unusual at the beginning of the labor market career when workers go through a search process that may result in high job turnover and spells of unemployment. However, these findings have generated substantial interest in determining whether these conditions have lasting effects into adulthood (usually referred to as 'scarring'), or whether they gradually fade away and only temporarily 'blemish' working lives (Ruhm, 1991).

Possible explanations for the scarring effect of past labor market experiences can be found in human capital theory (Becker, 1994). The depreciation of firm-specific human capital and the deterioration of general skills associated to a spell of unemployment can lead to lower future wages and lower chances of finding employment. Since productivity is not perfectly observable, those individuals with a history of unemployment may face a reduced probability of matching or a lower wage offer if the employer uses this information as signaling low productivity (Lockwood, 1991). Theories of job matching maintain that the unemployed may face an increased probability of return to the labor market in a lower paid position suffering a cost-of-job loss (Pissarides, 1994). Other explanations for the scarring effect are related to psychological discouragement or habituation effects (Clark et al., 2001).

Most of the scarring literature has focused on the consequences of youth unemployment on developed countries, finding that prolonged exposure to unemployment is associated with higher future unemployment and lower wages.[1] In Latin American countries the unfavorable conditions faced by young workers are not necessarily limited to unemployment. For instance, most young workers begin their labor market experience in informal jobs (Bassi and Galiani, 2009). These jobs have lower wages and are exempt from labor regulations and workplace benefits when compared to the formal sector (Maloney, 2004). Notably, while informality may be expected to be scarring based on these stylized facts, recent evidence has suggested that this sector may actually serve as some sort of informal job training. Therefore, early experiences in the informal sector need not harm an individual's career path in terms of employment prospects or wages (Bosch and Maloney, 2010; Cunningham

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[1]Section 2 reviews the literature on the relationship between youth labor market experiences and adult outcomes.

and Bustos, 2011).

In this context, the first aim of this study is to make a contribution to the literature on the role of early career labor market experiences on adult outcomes by analyzing how unemployment and informality during youth are related to adult unemployment, informality and hourly wages in Brazilian labor markets. This country provides an optimal framework of analysis of this phenomenon. Young workers in Brazil have persistently shown worse labor market outcomes than adult workers, with unemployment rates twice as large as national figures and informality rates of around half of the young working population (SEDLAC, 2012). Moreover, the length and size of Brazilian household surveys allow us to observe labor market experiences of young individuals and follow them many years later into adulthood.

The results provide empirical evidence on scarring from youth labor market experience related to an outcome -informality- that has not been studied thoroughly before. This lack of evidence mostly responds to the requirement of long-term panel data to measure scarring. However, this information is not widely available in Latin America. This study proposes a suitable alternative, since the analysis may be feasibly conducted using pseudo-panels which track birth cohorts. Thus, we use cross-cohort differences as the main source of variability for identification, in contrast to previous studies that rely on different individual labor market experiences within a single cohort.[2] In this way, the second objective of this study is to evaluate the scarring effects of youth labor market outcomes using an alternative estimation methodology based on pseudo-panels.

The main findings show that youth unemployment and informality do have effects on later adult labor market outcomes. The employment and wage penalty effects, however, are mainly present in the early years of adulthood and tend to disappear with the passage of time. These results are also different for adults of different skill levels. Those with lower skills experience higher wage losses and larger persistence effects.

The rest of this paper is organized as follows. The next section reviews the available literature on the relationship between youth labor market experiences and adult outcomes. Section 3 introduces the data while Section 4 and 5 describe the construction of the pseudo-panel and the estimation framework. Section 6 tests for evidence of an empirical relationship between youth unemployment and informality on several adult labor market outcomes. Section 7 concludes by drawing together the findings and discussing their potential policy implications.

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[2]Previous literature analyze scarring effects from early labor market experience using panel data. Some examples are Arulampalam (2000), Gregory and Jukes (2001), Fairlie and Kletzer (2003), Gregg and Tominey (2005), Mroz and Savage (2006).

2   Literature review

The school-to-work transition remains an important issue in developed and developing countries. This research suggests that early experiences in the labor market shape individuals' paths when they become full-time employed adults (Nordstrom, 2011). Most studies have focused on the effect of job stability (or 'churning'), unemployment, and more recently, the type of employment into which young workers are generally inserted -formal or informal- on adult outcomes such as wages and employment (or unemployment) prospects.

Job stability during the initial years of employment and its consequences have been studied by Holzer and LaLonde (1999), who find that increased tenure has a positive short-term effect on employment for young workers, since instability usually declines as workers grow older. They argue that churning amongst young workers is mostly due to the difficulty of finding a proper employment match in the first job. In fact, Neumark (2002) suggests that the earnings gain associated with one additional year of experience for young workers lies between 7-13% for men and 12-24% for women in the US, which may reveal that obtaining a good match instead of shopping around has its advantages.

Several studies have also focused on the consequences of unemployment on future unemployment and subsequent earnings at all ages, with mixed evidence.[3] For instance, Ruhm (1991) initially found no evidence of unemployment scarring using data from the Panel Study of Income Dynamics (PSID) for all workers. However, Jacobson et al. (1993) do find that displaced workers present evidence of scarring and that this effect is relatively stable across the age locus. However, since unemployment is higher during youth, several authors have questioned whether scars from joblessness in this period are more relevant.

This research has found significant evidence of a relationship between youth unemployment and future labor market outcomes. Gregory and Jukes (2001) make the distinction that unemployment by itself is not the most relevant cause of lower future earnings, but unemployment duration. In particular, they find that a one-year spell implies a wage penalty of 10 percentage points for British men, which is also found by Gregg (2001). Arulampalam (2000) looks at the effects of unemployment on re-employment wage using the British Household Panel Survey. He finds that an unemployed individual on returning to work will earn about 6% less in the first year and 14% less in the fourth year. Fairlie and Kletzer (2003) estimate the (annual) wage loss from exposure to unemployment for men and women using the National Longitudinal Survey of Youth and they show that it is 9% and 12.5%, respectively. Gregg and Tominey (2005) find that longer spells of unemployment in Britain have

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[3]See Arulampalam et al. (2001) for a review of unemployment scarring in developed countries.

a wage penalty of 9-21% up to twenty years later. Mroz and Savage (2006) show that early unemployment affects both future job displacement and earnings up to ten years after youth in the US. Using a multivariate duration model that controls for selection on observables and unobservables, Cockx and Picchio (2011) find that prolonging unemployment drastically decreases the chances of finding employment, but hardly affects the wage in subsequent employment among young individuals who are already long term unemployed in Belgium.

Nilsen and Reiso (2011) analyze the relationship between past unemployment and future labor market status (unemployed or out of the labor force) using a panel data of young workers from Norway. They use a nearest-neighbor propensity score matching method to balance their treatment and control groups and find that unemployment leaves young workers with long term scars that decrease over time. Burgess et al. (2003) examine whether aggregate unemployment at entry into the labor market impacts on later unemployment in Britain. Using a pseudo-panel approach they find evidence of adverse effects for the unskilled and small beneficial effects for more skilled individuals.

The scarring effects from youth are not limited to instability and unemployment. A series of recent studies have also begun to place attention on the effects of the first job held during youth. Mainly, this literature has focused on the effect of having an informal job on future employment prospects and wages. Young workers (mostly in developing countries), usually begin their labor market experience in informal jobs (Bassi and Galiani, 2009). In theory, expectations would lead to assume that an initial employment experience in the informal sector may perpetuate informality and hinder future earnings, since the probability of migration to the formal sector is generally low as are the wages paid in that sector (Gasparini and Tornarolli, 2009). However, the evidence remains inconclusive on this matter and has been identified as a key area for further research. Some of the studies in this direction include Bosch and Maloney (2010), who find that the informal sector provides young workers with training and experience for better jobs that they could not obtain right out of school. Cunningham and Bustos (2011) support this claim, arguing that young workers are only temporarily employed in the informal sector and then move on to formal jobs once the premiums placed on health benefits and job stability increase as they establish families. Moreover, they find that initiating the labor market experience in the informal sector does not necessarily imply that workers will remain in that sector, at least not permanently.

In summary, the previous literature suggests that early labor market experiences matter. However, there are still some topics to address. First, while there is predominant evidence of scarring for developed countries, evidence for developing countries and mainly Latin

America is less available. Youth experiences are particularly important in Latin America, since the population in this region is relatively young on average (Brea, 2003). Second, while informality may not be a significant concern in the US and OECD countries,[4] Latin America has experienced a large increase of the informal sector in the last decades (Gasparini and Tornarolli, 2009). Third, the potential effects of youth insertion into the labor market are even more interesting in the aftermath of the global recession, which some argue may have lasting consequences on those currently entering the labor market (Bell and Blanchflower, 2010).

3 Data and relevant definitions

3.1 Brazilian household surveys

The estimates in this paper are drawn from a large database of household surveys, the Socio-Economic Database for Latin America and the Caribbean-SEDLAC (CEDLAS and World Bank, 2012), compiled and homogenized by CEDLAS (Universidad Nacional de La Plata) and the World Bank's LAC poverty group (LCSPP).[5] These surveys have the advantage of being comparable between countries, since most of the variables are homogenized using the methodology in Gasparini (2012). For this study, we select a time series of household surveys from Brazil that include complete information on labor market variables such as informality, employment status and wages since the early 1980s.

Brazil provide an optimal framework to study the role of early labor market experiences on adult outcomes in Latin America. The availability of an extended time series of household surveys allows us to construct birth-cohorts from youth into adulthood, covering a large part of adult working life. The Brazilian databases used in this study come from the Brazilian household survey called Pesquisa Nacional por Amostra de Domicílios (PNAD). The survey is carried out by the Instituto Brasilero de Geografía y Estadísticas (IBGE) on a yearly basis. The PNAD was first conducted in the state of Rio de Janeiro in 1967. It is now a national survey that covers urban and rural areas.[6] The survey was not carried out in 1970, 1980, 1991 and 2000 (census years) and 1994. Some rural areas from the North of the country were added in the sample frame since 2004. PNAD 2009 is the most recent survey from Brazil currently included in SEDLAC. The specific surveys used in the analysis span from 1981 to 2009. This framework, which comprises 25 years, provides the opportunity to

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[4]Labor informality has not been a topic of analysis in developed countries until recently. See Gunter (2010).

[5]See http://sedlac.econo.unlp.edu.ar/

[6]The exceptions are the rural areas of Rondonia, Acre, Amazonas, Roraima, Pará and Amapá.

assess both short and long term consequences of youth labor market experiences on adult outcomes.

3.2 Labor informality definition

Labor informality is a pervasive characteristic of labor markets in Latin America, and in Brazil in particular. Despite the usual debates about the size of the informal sector and its consequences, the term labor informality is ambiguous from a theoretical perspective and empirically difficult to implement. The literature distinguishes between two alternative definitions of this labor market phenomenon. On the one hand, the 'productive' definition focuses on the type of firm and employment while, on the other hand, the 'legalistic' definition is concerned with the compliance with labor market regulations, mainly labor protection (Gasparini and Tornarolli, 2009).

According to the International Labor Organization (1991), the 'productive' definition stands for those firms with low capital endowment, using primitive technologies and unskilled labor, and then with low productivity. Several measurement problems cause this informality perspective to be difficult to implement empirically: the level of capital is not usually reported in surveys, the notion of primate technology is difficult to define and the productivity level is not directly observable. In practice, this notion of informality is implemented using information about the type of employment, the type of firm and workers' skills.

Alternatively, the 'legalistic' definition classifies informal firms as those not complying with labor markets norms such as contracts, labor taxes and labor regulations. Then their workers have no rights to labor protection or social benefits linked to employment. The empirical limitation in this case has to do with the difficulties associated with the comparison of this concept across countries. Labor protection and social security include a large number of dimensions that differ across countries, depending on the design and extent of their systems,[7] and household surveys widely differ on the coverage of labor protection and social security issues. For instance, some surveys ask about social benefits and others do not. And even when surveys include questions about certain items, they could be too different to make a comparison across countries possible (Gasparini and Tornarolli, 2009).

The right to receive a pension when retired is the social security benefit more frequently asked in Latin American household surveys. As such, an informal worker is empirically de-

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[7]Labor protection dimensions include: contracts, severance payments, advanced notice, right to be unionized, vacations, workplace safety, and many more. Social security benefits include: pension, health insurance, and other insurances and benefits (Gasparini and Tornarolli, 2009).

fined as the person that does not have the right to receive a pension linked to his employment when retired.

As long as several measurement problems exist to empirically implement the 'productive' definition of labor informality, and provided that only the Brazilian case will be analyzed, this study will use the 'legalistic' perspective of informality. A worker will be classified as informal when he does not possess the right to receive a pension when retired.

Beyond the theoretical definition and the empirical implementation of the labor informality concept, there exists a controversial aspect of this phenomenon due to its association to lower wages and inferior labor conditions. Several studies have found that workers with similar observable characteristics earn lower wages when they are informal employees.[8] However, this negative relationship cannot be interpreted in causal terms and welfare comparisons drawn from these results may lead to misleading conclusions. An informal worker differs from a formal one in several dimensions and not just on the wage received. In a market with no distortions, workers would equate the utility obtained in each type of job, that is to say, the whole set of benefits and not just wages (Maloney, 2004). If wages were the same in formal and informal jobs, the informal one could be considered inferior because of the lost benefits. However, if some workers considered flexibility as an amenity, an informal job would be a superior option for them. Moreover, higher formal wages compensate formal workers for income taxes paid in order to support the provision of public goods from which informal workers cannot be excluded. For all these reasons, an informal job is not necessarily an inferior option. Labor market informality may thus entail exclusion from social insurance benefits and, on the other hand, a workers' escape decision (Perry et al., 2007).

3.3 Brazilian labor markets in the last three decades

In the last 30 years, Brazil has experienced several economic transformations such as monetary and fiscal reforms, deregulation of markets and a trade liberalization process. The labor force participation rate increased steadily along these macroeconomic changes (Menezes Filho and Scorzafave, 2009), but this movement into the labor market did not find a correspondence on the demand side. Since 1986, there was an almost uninterrupted increase in the Brazilian unemployment rate, from 3.3% in 1986 to 9.7% in 2003 while the GDP (at constant prices) grew without pause. The unemployment rate averaged 8% between 2004 and 2009. Economic transformations also impacted on job quality. Labor informality was and

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[8]Gasparini and Tornarolli (2009) for Latin American countries; Ulyssea (2006) in the case of Brazil; Marcouiller, Ruiz de Castilla and Woodruff (1997) for Peru and El Salvador.

remains a distinctive feature of Brazilian labor markets. The proportion of workers without pension rights has shown a counter-cyclical pattern along the analyzed period falling from 40% to near 30% (figure 1).

The evolution of unemployment by age groups shows that young people are affected the most, suffering from unemployment rates that are (at least) twice as large as national unemployment. The differential incidence of unemployment by age groups has widen with the passing of time from 5 to 10 percentage points between 1981 and 2009. Labor informality is also higher among young workers. While the fraction of workers without the right to receive a pension when retired was around 30%-40% along the period, it reaches 40%-50% for those under 25 years of age (figure 2).

Unemployment and informality also exhibit a negative relationship with the level of education. Menezes Filho and Scorzafave (2009) show a clear pattern between the years of education and the informality rate. Workers with up to three years of schooling have informality rates around 60% and this pattern has not changed much in the last thirty years. Another interesting aspect is that workers in intermediate and high education groups have experienced an increase in informality. The evolution of unemployment by educational levels shows that all groups experienced a rise in unemployment. However, there are some disparities in profiles with those in the intermediate educational group being the most affected (figure 3).

4 Cohort analysis

4.1 Constructing cohorts

The analysis of the relationship between past labor market experiences on adult labor market outcomes requires tracking individuals over time. Although the available data does not have a panel structure, we can track cohorts of individuals, with cohorts defined according to their year of birth, or more conveniently, by their age in 1981.

The use of a pseudo-panel provides some advantages over traditional panel data. First, in a long-term analysis longitudinal data has the common problem of sample attrition since it is difficult at best (and costly) to track individuals for long periods of time. Second, a pseudo-panel suffers less from problems related to measurement error (at least at the individual level) because it follows averages of individual observations; that feature also provides more stability for analyzing long-term outcomes, omitting biases due to transitory shocks and short-run movements. Finally, the wide availability of cross-sectional data allows to construct pseudo-panels covering substantially longer periods than what can be covered by

real panels. For instance, in most Latin American countries cross-sectional data are collected periodically, regularly twice a year or at least annually. However, using repeated cross-sections also has some limitations. On the one hand, pseudo-panels do not provide information on intra-cohort dynamics. On the other hand, since using this data implies estimating relationships at cohort level, this aggregation may be a potential source of bias. That would be the case if events like migration or death affected cohorts' sizes and composition (Antman and McKenzie, 2007). These factors are probably not at play in our analysis, as argued below.

The clustering of observations in cohorts depends on a trade-off between the number of cohorts and the number of observations in each cohort. If the number of cohorts is large, the estimations will suffer less from small sample problems. But if the number of observations per cohort is not large enough, the average characteristics in each cohort/year combination will be error-ridden measurements of the true cohort population values (McKenzie, 2004). The large size of Brazilian household surveys allows us to define birth cohorts at the most disaggregated level maximizing the number of cohorts and keeping a large number of observations in each cohort/year combination.

Table 1 defines the selected cohorts and describes their aging process throughout the analysis' timeframe. The first cohort is comprised of individuals born in 1966, who are aged 15 in the first available survey (1981). The second cohort contains individuals born in 1967 who are aged 15 in the second available survey. The following cohorts are defined in the same manner as more data become available. In the last period of observation (2009) we have individuals between 33 and 43 years old. As a result, the constructed pseudo-panel follows eleven birth cohorts over twenty five periods.[9]

We define youth as ages 15-24, and adulthood as 25 or older. Therefore, we can learn about the complete youth labor market experience for individuals in each birth cohort. Note that we could define additional birth cohorts using observations of those individuals born before 1966 or after 1976. However, we would not observe the complete youth labor market experience for those born before 1966[10] and the span of the observed adult working life would be very short for those born after 1976.

Table 2 presents the number of observations for a few typical of the cohort/year cells. The constructed pseudo-panel comprises a total of 876,044 individual observations that participated actively in the labor market (511,664 for men and 364,380 for women). These observations collapse into 231 synthetic observations for men and women, of which 139

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[9]We have missing household surveys for 1991, 1994 and 2000.

[10]Individuals born in 1965 had 15 in 1980 and our first available survey is the PNAD of 1981.

correspond to adulthood.

To avoid potential biases from individuals still in school, the sample does not include those who are still attending formal education and individuals with incomplete or invalid data on the variables of interest. Labor market outcomes of those individuals who are accumulating human capital are likely to be influenced by this investment decision. For instance, they may earn lower wages and have higher chances to be unemployed. Despite the fact that investment in human capital has been extended over time affecting the size of the selected cohorts (Cruces et al., 2012), we do not think this could impact on our results. The reasoning is that the investment in education is usually done during youth, and our econometric strategy models adult outcomes using the average youth labor market experience in each cohort as the explanatory variable of interest. Similarly, our pseudo-panel results would not be affected by events like migrations due to the disaggregated nature of the constructed birth cohorts. This would be a problem if the process of migration had an uneven distribution across ages and consequently across birth cohorts, but this is unlikely in this case.

The pseudo-panel averages observations by age of individuals for each year of data using the expansion factor in each survey, and then track the sample one year older in the next survey according to the aging process shown in table 1. In this way, we can follow cohort means between fifteen and twenty five years for each birth cohort of individuals.

4.2   Between-cohort identification

This data allows identifying whether the experiences of each cohort in their youth show evidence of lasting impact on adult labor market outcomes. To this end, we use between-cohort variation for identification in contrast to previous studies that rely on different individual labor market experiences within a single cohort.[11] This pseudo-panel approach deals with the typical unobserved heterogeneity problem using a different identification strategy. The nature of our constructed data set where age, time and birth-cohorts are simultaneously determined forces us to incorporate additional assumptions in order to identify the effects of interest.

The use of variation in labor market experiences at cohort level as the main source of variability relies on the assumption that employers can substitute between individuals of different ages at each point in time. Note that this assumption does not apply to a labor market that exclusively employs a single cohort like the youth labor market (Burgess et

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[11]Previous studies mainly use panel data relying on the labor market experience of a single cohort of individuals. See Section 2 for a literature review.

al., 2003). However, in this paper we define youth from 15 to 24 years old and the cohorts are defined as just 1-year band, allowing the substitution in this age range in the youth labor market. For instance, a firm that only hired young workers in 1990 could substitute individuals in the 15-24 age range generating variation at the cohort level.

Another important feature of the cohort analysis is the response of labor market outcomes to cohort size. For instance, smaller cohorts have incentives to increase their human capital investment because the returns will be higher. On the contrary, those belonging to a more populous generation are likely to find a depressant effect on earnings when entering the labor force (Ermisch, 1995). Given that our cohorts are defined at the most disaggregated level, we do not expect our findings to be explained by this cohort size effect. In fact, generational effects (if any) will be common to several of our birth-cohorts (Burgess et al., 2003).

The previous subsection pointed out that human capital accumulation has been extended over time affecting the size of the selected cohorts. However, the investment in education is usually done during youth. That means that the only effect on adult individuals -our population of interest- would be in their observable characteristics (level of education), not on the size of their cohort/year cells.

4.3 Methodological considerations

Our main objective is to estimate the effect of youth labor market outcomes on future outcomes for the same cohort when it reaches adulthood. The model we would like to estimate for adult individuals is the following

$$Y_{i,t} = X_{i,t}\beta + \delta Z_{i,0} + T_t + \eta_i + \varepsilon_{i,t} \tag{1}$$

where i indexes adult individuals and t indexes time periods. $Y_{i,t}$ is the adult labor market outcome of interest at time t; the vector $X_{i,t}$ contains observable characteristics, $Z_{i,0}$ is the labor market experience for individual i during his youth (at time 0), T_t accounts for time effects, η_i is the unobserved individual heterogeneity (e.g. the unobserved propensity to remain unemployed, unobserved individual valuation of social security benefits) and $\varepsilon_{i,t}$ is the idiosyncratic error term.

Taking cohort averages of equation (1) over the N_c individuals observed in cohort c at time t, the model becomes

$$Y_{c(t),t} = X_{c(t),t}\beta + \delta Z_{c(t),0} + T_t + \eta_c + \varepsilon_{c(t),t} \tag{2}$$

where $Y_{c(t),t}$ denotes the sample mean of Y over the individuals observed in cohort c at time t. Since different individuals are observed each time period with repeated cross-sections,

youth labor market outcomes of individuals in cohort c at time t are not observed ($Z_{c(t),0}$ in equation 2). This unobserved term is replaced with the sample mean over the individuals observed during their youth (at time 0) in each birth-cohort. Note that this averaging process comprises more than one period of time according to the construction of the pseudo-panel

$$Y_{c(t),t} = X_{c(t),t}\beta + \delta Z_{c(0),0} + T_t + \eta_c + \varepsilon_{c(t),t} + \lambda_{c(t),t} \tag{3}$$

where

$$\lambda_{c(t),t} = \delta[Z_{c(t),0} - Z_{c(0),0}]$$

As the number of individuals in each cohort becomes large, the term $\lambda_{c(t),t}$ converges to zero (McKenzie, 2004). McKenzie (2004) also shows that when the data generating process (1) contains individual fixed effects, one can instead include cohort fixed effects (η_c in equation 3) and estimate the coefficients in (3) consistently by OLS as the number of individuals per cohort gets large.

This empirical strategy needs a few qualifications. First, our explanatory variable of interest $Z_{c(0),0}$ (i.e. youth labor market outcome) is constant over time. As a result, we will not analyze labor market dynamics of adult individuals. Instead, our aim will be to estimate the effect of this past experience in the labor market on adult labor outcomes. Second, observed cohort means represent the true cohort population values with some measurement error. Deaton (1985) shows that if the total number of observations is large and the number of observations per cohort is large, then the OLS estimators from a pseudo-panel like (3) are consistent for the true parameters. Finally, the effect of youth unemployment on an adult outcome as hourly wages can only be identified for individuals who made the transition from unemployment to employment. In a panel data set this would lead to a sample selectivity problem (Heckman, 1979). Using a pseudo-panel we cannot observe transitions between different employment status, but at the same time we minimize sample selection issues. A selection occurs within each cohort/year cell where we compute the average hourly wages for employed individuals in this example. However, this is unlikely to affect estimation results given the size of our cohorts.

5   Empirical strategy

The pseudo-panel data previously described is used to estimate the effect of two youth labor market outcomes on diverse adult outcomes. The main challenge will be to disentangle the causal relationship from spurious effects generated by other sources such as time-invariant

unobserved characteristics. The main model for adult individuals is given by equation (3) described in previous section

$$Y_{c(t),t} = X_{c(t),t}\beta + \delta Z_{c(0),0} + T_t + \eta_c + \varepsilon_{c(t),t} \tag{4}$$

where $Y_{c(t),t}$ is the adult labor market outcome of interest at time t for cohort c. We estimate different models for three adult labor market outcomes: adult unemployment rate, adult informality rate and the logarithm of adult hourly wages (at constant prices). $Z_{c(0),0}$ captures the youth labor market experience faced by each birth cohort. We explore the effects of two youth labor market outcomes: youth unemployment rate and youth informality rate. T_t accounts for time effects, η_c is the cohort unobserved heterogeneity and $\varepsilon_{c(t),t}$ is the idiosyncratic error where

$$E(\varepsilon_{c(t),t}|X_{c(t),t}, Z_{c(0),0}, \eta_c) = 0 \qquad t = 1, ..., T \tag{5}$$

The vector $X_{c(t),t}$ contains the average of individual characteristics within each cohort/year cell. This vector includes the following set of variables that vary across both cohorts and time: mean years of education, proportion of individuals that are household heads, mean number of children under 15 at home, regional distribution of the population, sectoral composition of total employment, gross domestic product of the economy and proportion of population participating actively in the labor market.

The variables years of education, proportion of household heads and mean number of children at home are included to control for individual and household characteristics. We do not include the gender composition of each cohort/year cell because the estimations are obtained separately for men and women. The vector of explanatory variables also includes a set of age dummies. The regional distribution of population in each cohort/year cell is included to control for differences in regional labor markets' characteristics. The sectoral composition of total employment only varies across time and controls for labor demand shocks, e.g. changes in the productive structure of the economy. We consider five aggregate sectors: manufactures, trade, services, construction and other sectors. Labor supply shocks are considered by the fraction of population that participates actively in the labor market in each cohort/year combination. Finally, we also include the gross domestic product of the economy (at constant prices) in each year as an explanatory variable in order to control for aggregate shocks, such as economic crises. Figure 1 previously showed a correlation between the performance of Brazil in terms of aggregate product and the unemployment and informality rates.

In order to estimate the parameter of interest δ in equation (3) we face three econometric issues. First, the identification of the causal effect of youth labor market experiences on adult labor market outcomes is hard due to the cohort unobserved heterogeneity. We cannot be confident about the estimated parameters by an ordinary least squared (OLS) regression if we expect the youth labor market variable $Z_{c(0),0}$ to be correlated to the unobserved heterogeneity at the cohort level η_c.

Although the inclusion of birth cohorts fixed effects would allow us to control for characteristics that are time-constant within each cohort and may be correlated with the variable of interest $Z_{c(0),0}$, we have to consider that these variables have the same level of aggregation. Thus the robustness of fixed effects analysis comes at a price bringing us to the second issue: without further assumptions there is no way to distinguish the effect of the time-constant observable $Z_{c(0),0}$ from the time-constant unobservable η_c (Wooldridge, 2003).

Finally, the third problem is related to the nature of our constructed data set. Age, cohort and time are linearly dependent variables and the associated coefficients are not identified, even when one category is dropped from each set of dummies (Deaton and Paxson, 1994). McKenzie (2006) shows that the linear dependence of age, cohort and time effects requires normalization assumptions or the estimation of linear combinations of them, giving up the estimation of level effects. To deal with this last issue we assume that the business cycle impacts proportionally on all age/cohort cells. In particular, we redefine the dependent variable $Y_{c(t),t}$ as in Burgess et al. (2003) where $Y_{c(t),t}$ is normalized by the observed value of Y at date t. We rename this variable as $\tilde{Y}_{c(t),t}$, thus equation (3) becomes

$$\tilde{Y}_{c(t),t} = X_{c(t),t}\beta + Z_{c(0),0}\delta + \eta_c + \varepsilon_{c(t),t} \tag{6}$$

In light of this discussion, we propose two alternative estimation strategies. First, we define a composite error term $\nu_{c(t),t} = \eta_c + \varepsilon_{c(t),t}$, and estimate equation (6) by pooled OLS assuming

$$E(Z'_{c(0),0}\eta_c) = 0 \tag{7}$$

Even when (7) holds, the composite errors will be serially correlated due to the presence of the time-constant term η_c. Therefore, we make inference based on a robust variance matrix and robust test statistics clustering the standard error by cohorts. Note that this first empirical strategy deals with the second econometric issue defining a composite error term, while the first one is set aside at the price of making an additional assumption.

An important point of this empirical strategy is the assumption of a constant (average) effect of youth labor market experiences over the entire adult life. This is a simplifying

assumption, since it is possible that while youth experiences may have no effect when considering an individual's entire adult life, they may temporarily affect labor market outcomes. Therefore, the setup needs to be expanded to include potential heterogeneities across the life cycle. A categorical variable was created to capture these potential adverse effects across adulthood. This variable has three categories which denote the passage of time: up to 5 years after youth (adult people between 25 and 29 years of age), between 5 and 10 years after youth (individuals between 30 and 34 years), and more than 10 years after youth (adult people of 35 years of age or older). In this way we obtain three groups of synthetic individuals including respectively 45, 49 and 45 observations out of the 139 adult observations in the constructed pseudo-panel. Indicator variables for each of these categories were interacted with the youth labor market experience variable ($Z_{c(0),0}$) to estimate equation (6) above. In this case we replace the set of age dummies with indicator variables of age groups. These results will provide an indication of the short and long term consequences of youth experiences on adult outcomes to determine whether youth unemployment and informality represent temporary penalties or if the effect is observed many years later.

The effect of youth labor market experiences could also be different for adult individuals of different skill levels. We carry out this analysis allowing the effect of the variable of interest to vary according to the years of education of adult individuals. We expect that any scarring effect will be less for individuals with higher skills.

The second strategy follows a two step estimation technique as in Burgess et al. (2003). In the first step we estimate (6) excluding the variable of interest $Z_{c(0),0}$ but allowing the presence of time-constant birth cohort effects η_c. The exclusion of the variable of interest allows us to control for the first and the second econometric issues estimating the following model

$$\tilde{Y}_{c(t),t} = X_{c(t),t}\beta + \eta_c + \varepsilon_{c(t),t} \tag{8}$$

In the second step we regress the estimated birth-cohort fixed effects on the variable of interest $Z_{c(0),0}$. The estimated birth-cohort effects capture the part of the variation on adult labor market outcomes that can be explained by time-constant factors. The estimation of φ in the second step (equation 9 below) isolates the part of that birth-cohort component that is correlated with youth labor market experiences

$$\hat{\eta}_c = Z_{c(0),0}\varphi + \vartheta_c \tag{9}$$

Because the dependent variable in this second step is estimated, we estimate equation (9) by the method of weighted least squares, using the inverse of the estimates of the variance

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of the birth-cohort fixed effects from the first step as weights.

It is worth noticing that the estimation strategy just described faces the unobserved heterogeneity problem by means of a two step estimation technique. This feature leads us to contrast these results with that obtained with the first estimation strategy, where we made the no correlation assumption (7). If we observe the same relationship between youth and adult labor market outcomes, this would be suggesting that cohort effects are not confounding factors affecting the direction of the results.

6 Results

6.1 Trends in youth labor market outcomes

Before moving on to the econometric results, we observe the evolution of the normalized labor market outcomes of interest for some selected cohorts against age groups, separately for men and women.[12]

Male normalized unemployment falls with age and stabilizes around the forties, following a truncated U-shaped pattern. This behavior is less marked for women. It is helpful to identify the point where normalized unemployment equals unity (the individual cohort unemployment rate is equal to the economy-wide average unemployment at this point). Young men experienced higher unemployment rates than total working age population regardless the time they entered the labor market. On the contrary, the unemployment rate is always lower than total unemployment for adult people. A different pattern appears for the group of women. While the female normalized unemployment rate decreases with age, it is always larger than total unemployment. This result reveals that the distribution of the normalized unemployment rate for women is higher than that of men. The normalized informality rate also displays an age-decreasing and truncated U-shaped pattern both for men and women. Men and women reach the national average rate around the 25-29 age range, but while men continue in an age-decreasing informality pattern, women stabilize near the national value as they age.

This first approximation shows the well known fact that young people fare worse than adults and this happens regardless of the time they entered the labor market. The following pages analyze the relationship between adult labor market outcomes and youth employment experiences.

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[12]In order to illustrate more clearly the patterns, we only include six cohorts in the figures: the first, the last and some of the middle cohorts. The averages are presented in tables 3 and 4 and the same information is plotted in figures 4 and 5.

6.2 Youth unemployment effects

We employ three alternative model specifications. The first one (column 1 in tables 5 to 10) controls for individual and household characteristics: dummies of age, years of education, average of individuals that are household heads, mean number of children under 15 at home and regional distribution of the population. Model 2 adds labor demand factors (sectoral composition of total employment and gross domestic product of the economy) while model 3 controls for labor supply shocks (proportion of the population that participates actively in the labor market).

Tables 5 and 6 present the estimated coefficient associated to the youth unemployment variable in model (6) for adult unemployment, adult informality and the logarithm of hourly wages as adults. The estimations show evidence of unemployment persistence for adult men, although the size of the effect is small. In particular, an additional percentage point in youth unemployment is associated to an increase in the adult unemployment rate that ranges between 0.6% and 0.9% of average unemployment.[13] We also find a positive impact on adult informality and a wage scarring effect that are statistically significant only for the first specification. These labor market outcomes for adult women are not affected by youth unemployment.

While illustrative, these results assume that youth unemployment has a constant effect during the entire adult life. Nevertheless, it may be that youth experiences in the labor market have either short or long term consequences, which may not be properly captured by averaging out across adulthood. Therefore, we obtain estimates allowing for the presence of heterogeneities across adult working lives. The second panel of tables 5 and 6 shows the results obtained when we include interaction effects between the explanatory variable of interest (youth unemployment) and indicator variables of age groups. We find that youth unemployment impacts on adult unemployment for men in the first ten years of adulthood. The estimated effect decreases from 0.9%-1.2% of average unemployment in the first five years of adulthood to 0.5%-0.6% in the next five years, and then disappears. The results for women only show an impact of 0.4% of average unemployment in the first five years of adulthood using the most conservative specification.

Conditional on being employed during adulthood, the effect of youth unemployment on adult informality ocurrs in the very short term for men. This effect ranges between 0.3%-0.7% of average informality in the first five years of adulthood and then fades away.

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[13]Since the explained variable is the normalized adult unemployment, we can interpret the coefficients as a proportion of the average unemployment rate.

Thus, just the very recent experience of youth unemployment can affect job's quality during adulthood.

The wage penalty identified when the model includes heterogeneities across adult working lives is only present in the first years of adulthood in the case of men. The estimated impact of an additional percentage point in the youth unemployment rate ranges between 0.6% and 1%. These result suggests a catch-up response that could be explained by the on-the-job training or a process of revelation of workers' productivity, as in Altonji and Pierret (2001), for those workers with a history of youth unemployment. This wage scarring effect is not present for women. On the contrary, we find a positive effect of youth unemployment on the log of adult normalized hourly wages for women between 30 and 34 years of age (result significant at the 10% level and small in magnitude). Figure 6 summarizes these heterogenous results across adulthood for men and women.

The bottom panels of tables 5 and 6 show the results obtained when we evaluate the presence of heterogeneous effects for adult (synthetic) individuals of different skill levels. These effects are captured by the interaction between the explanatory variable of interest (youth unemployment rate) and the years of education of adult workers. The results reveal that the unemployment persistence effect does not vary by skill level both for men and women. On the contrary, the wage loss and the effect on adult informality associated to youth unemployment is higher the lower the years of education for the group of men. For instance, the wage penalty for an adult with no education is of 6.4% in model 1, while it is of 0.8% for someone with complete primary education; the effect reverses when complete secondary education or higher is considered.

Finally, table 7 presents the estimations from the second econometric strategy. We find statistically significant results for all labor outcomes in the case of men. The direction of the effects coincide with previous estimations but the magnitud is larger. For instance, an additional percentage point in the youth unemployment rate leads to an increase in adult unemployment that ranges between 1.9%-2.4% of the average value. The effect on adult informality is between 1.3%-1.5% of average informality, while the wage penalty is of 2.3%-2.4%. As in the previous estimates, the effects of youth unemployment on women labor outcomes are not statistically different from zero.

Summing up, unemployment levels during youth impacts positively on adult unemployment and adult informality for the group of men. This effect fades away with the passing of time affecting adult men in the first ten and five years of adulthood, respectively. The analysis also uncovered a wage penalty at the beginning of adulthood, particularly for those

with lower skills. These results suggest that past episodes of unemployment, and particularly spells of unemployment during youth, reduce the chances of finding employment in the future. More importantly, this result is present regardless the level of education. Thus higher educational levels are not enough to compensate an unemployment episode in the past that might generate a human capital deterioration affecting employers' productivity perception. A possible explanation is that employers look for a candidate with certain level of education, and from the pool of potential employees that satisfy the skill threshold they will prefer a worker with no unemployment spells in the past. Conditional on being employed during adulthood, however, the wage penalty is lower for those with higher education. Once the obstacle in terms of finding employment is overcome, education acts as a signal of higher productivity. A similar pattern appears for the adult informality rate. Individuals with a past history of unemployment face higher chances of being an informal worker during adulthood, and this effect is lower for those with higher education levels. This last result reveals not only that education acts as signaling higher productivity, but also that labor informality is not a prefer option of workers.

6.3 Youth informality effects

The estimates of the effects of youth informality on adult labor market outcomes in tables 8 and 9 indicate similar patterns to those found for unemployment. Informality during youth shows significant persistence and implies substantial wage losses in adulthood.

An additional percentage point in youth informality generates an increase in adult informality of 0.5%-0.7% of average informality for men, and 0.5%-0.8% for women. When we allow the effect to differ across adult working lives we find a decreasing pattern for men. For instance, the rise in adult informality is of 0.4%-0.6% of average informality in the first five years of adulthood; 0.2%-0.3% when adult men are 30-35 years of age, and 0.1%-0.2% when they are 35-43 years old. This type of behavior does not appear for women. The impact for them is concentrated in the first years of adult working life and then disappears (figure 7).

We also identify an heterogenous response by skill level. An additional percentage point in youth informality is associated to an increase in the adult informality rate of 3.1%-3.7% of average informality for someone with no education. This effect is of 0.3%-0.9% for an individual with complete primary education and is negative for someone with complete secondary school or higher. A similar pattern appears for women, with a larger effect the lower the years of education. These results may reflect the effect of informal work as a pathway to obtain experience and training in different jobs for those with higher skills,

which may enhance an individual's chances to acquire a formal job as he ages. Therefore, the evidence does seem to fall in line with the results from Bosch and Maloney (2010) and Cunningham and Bustos (2011) but only for individuals with high education levels.

Youth informality also impacts on adult unemployment. A cohort's past levels of informality reduces the probability of finding employment during adulthood for men.[14] Most importantly, the effect is larger than the youth unemployment penalty and ranges between 1.1% and 1.3% of average unemployment. Employers may interpret an employment history with informality spells as a worse signal of labor market performance than an experience of youth unemployment. This effect decreases with the passing of time, both for men and women, and is larger for those with higher educational levels. This can be interpreted as follows. If an employer searches for a low skill worker, spells of informal employment may not constitute an informative signal for hiring decisions. However, for high skill workers, informal employment during youth may signal work experience (or on-the-job training) of bad quality.

The effect of youth informality on adult normalized hourly wages is negative. The penalty is between 1%-1.2% for each percentage point increase in the youth informality rate for men, and 0.8%-1.1% for women. These wage losses fade away with the passing of time. For instance, the wage loss for men ranges between 0.8%-1% in the first five years of adulthood, gets reduced to 0.6%-0.7% when they are 30-35 years of age, and the effect is between 0.4%-0.5% when they are 35-43.

Finally, the wage scarring effect also shows a differential pattern according to the skill level of adult men. The wage loss is around 2.4%-3% for someone with no education, 0.9%-1.1% for those with complete primary education, and the effect reverses for those with higher educational level.

The results from the second econometric strategy, where we proceed in two steps allowing for the presense of birth-cohort fixed effects in the first step, yield the same conclusions (table 10). The estimated effects have the same direction than those from the first estimation technique, although the magnitudes are larger. For instance, the persistence effect for men ranges between 0.8%-0.9% of average informality and the wage penalty is of 1.3%-1.4%.

The level of human capital seems to be crucial for the persistence of the youth informality status on adult working life. Previous studies have shown that the informal sector may serve as a training ground for young workers to gain skills and experience in order to get a formal job in the future. Our results reveal that this pattern only fits the labor market experience

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[14]This effect is statistically significant for women only in the first specification.

of workers with higher levels of education. Thus, the relevance of 'formal' human capital accumulation through the educational system in order to move from the informal to the formal sector seems to be greater than the experience and training obtained in an informal job during youth (proxied by a cohort's level of youth informality). A similar reasoning applies to the wage prospects of adult people that worked informally during youth. Past work experiences in the informal sector may be perceived as a signal of low productivity generating wage penalties for adult workers. These signals, however, can be offset with 'formal' education. Workers with higher education are then in a better position to improve their labor market prospects and move up the job quality ladder. The lower incidence of informality on adult workers with higher acquired skills indicates that labor informality may not be a preferred option after all.

7 Conclusions

This paper studied the role of early career labor market experiences on adult outcomes by analyzing how unemployment and informality during youth are related to adult unemployment, informality and hourly wages in Brazilian labor markets. We used an extended time series of household surveys spanning from the early 1980s to late 2000s. Through an analysis of cohorts, we evaluated the scarring effects of youth labor market outcomes using an alternative estimation methodology based on pseudo-panels. These estimates provided empirical evidence on scarring from youth labor market experiences, adding a further dimension specific to developing and middle income countries -informality- to the copiously documented scarring effects of unemployment in advanced economies.

In light of the econometric issues generally associated to the estimation of this type of relationships, and those that arise using a pseudo-panel design, we proposed two alternative empirical strategies relying on cross-cohort differences as the main source of variability. The main findings indicated that youth unemployment and informality do have effects on adult labor market outcomes both for men and women, and these results were robust to both estimation strategies. Results suggested that past episodes of unemployment, and particularly spells of unemployment during youth, reduce the chances of finding employment in the future. More importantly, this result is present regardless the level of education. Thus higher educational levels are not enough to compensate an unemployment episode in the past that might generate a human capital deterioration affecting employers' productivity perception. But conditional on being employed during adulthood, the wage penalty is lower for those with higher education. Thus once the obstacle in terms of finding employment is

overcome, education acts as signaling higher productivity.

The level of human capital showed up as a crucial factor for the persistence of the youth informality status on adult working life. Previous studies have shown that the informal sector may serve as a training ground for young workers to gain skills and experience in order to get a formal job in the future. Our results revealed that this pattern only fits to the labor market experience of workers with higher levels of education. Thus, the relevance of 'formal' human capital accumulation through the educational system in order to move from the informal to the formal sector seems to be greater than the experience and training obtained in an informal job during youth. A similar reasoning applies to the wage prospects of adult people that worked informally during youth. A past experience in the informal sector is perceived as a signal of low productivity generating wage penalties for adult workers. But these signals can be offset with 'formal' education.

These results are particularly relevant for policy making in developing countries' labor markets. The detrimental effects of informality add a further layer of complexity: active labor market policies for the young should not only aim at promoting employment per se, but preferably formal employment. Our findings challenge the view that an informal job still provides training and experience for better jobs that may not be obtained right out of school. In this sense, measures such as the introduction of lower minimum wage levels for youth could, for instance, translate into lower levels of social security contributions or payroll taxes for young workers. This would create a further incentive for employers to register young workers. The importance of measures along these lines is emphasized by the results on informality dependence, which only holds for workers with lower levels of qualifications. Training programs may also pave the way to formality specially if they provide a certification of the acquired skill that acts as a mechanism to signal the labor market. This is especially relevant since the evidence for Latin America indicates that youth training programs have little overall employment effects but tend to have a stronger impact on formal employment (Card et al., 2011; Attanasio et al., 2011). Other policy interventions are also compatible with the results obtained in this study. For instance, Brazil has recently implemented the 'lei do aprendiz´ (apprentice's act), an active labor market program that provides monetary incentives for firms to hire workers aged 14 to 23. The purpose of the program is to enhance the quality of young worker's first labor market experiences. In light of the evidence presented here, these policies can have substantial and longlasting payoffs in the medium and longer run.

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9 Figures

Figure 1
Macroeconomic and labor market variables
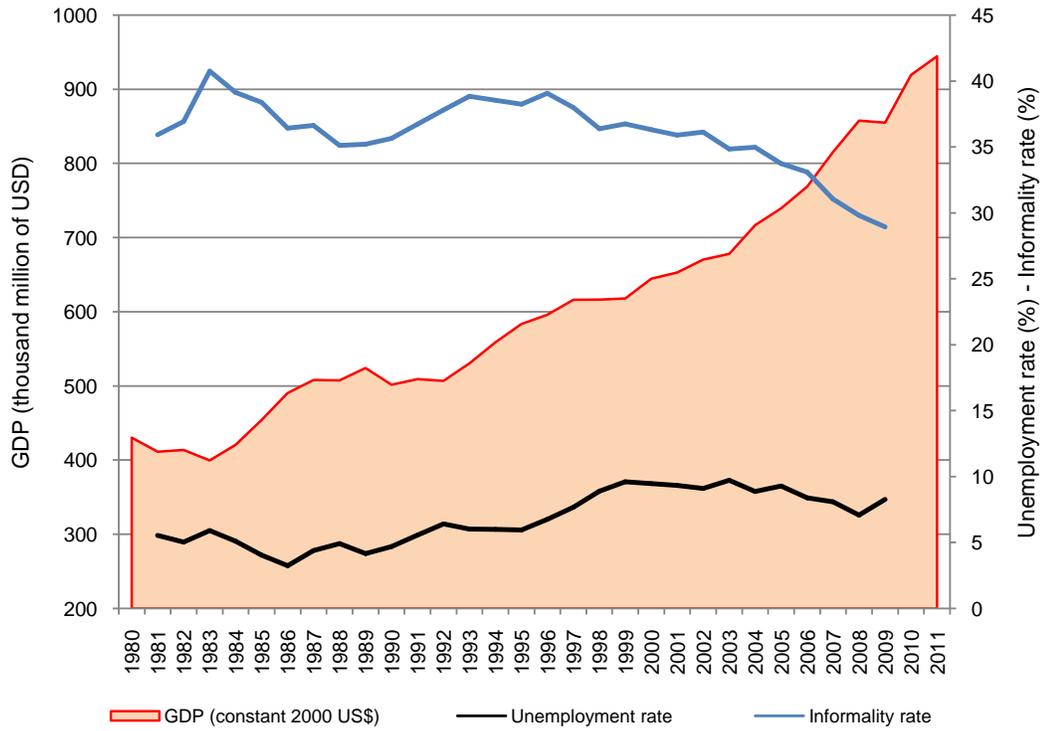
Source: Own elaboration based on WDI (2012) and SEDLAC (CEDLAS and the World Bank, 2012).

Figure 2
Youth in Brazilian labor markets
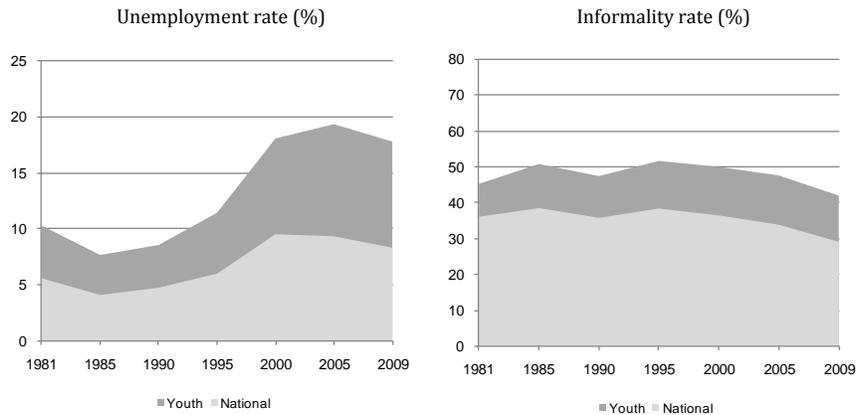
Source: Own elaboration based on SEDLAC (CEDLAS and the World Bank, 2012).

Figure 3
Labor market variables by educational level

Unemployment rate (%)   Informality rate (%)
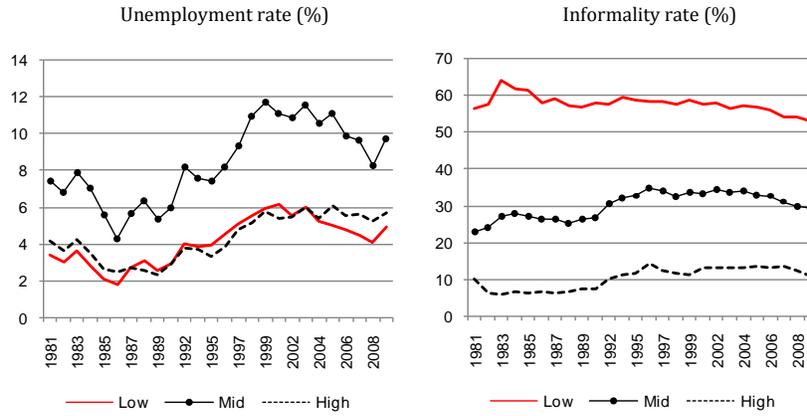
Source: Own elaboration based on SEDLAC (CEDLAS and the World Bank, 2012).
Low educational level: up to 3 years of education; Mid educational level: between 4 and 11 years of education; High educational level: 12 years of education or more.

Figure 4
Birth-cohort normalized unemployment rate

Men   Women
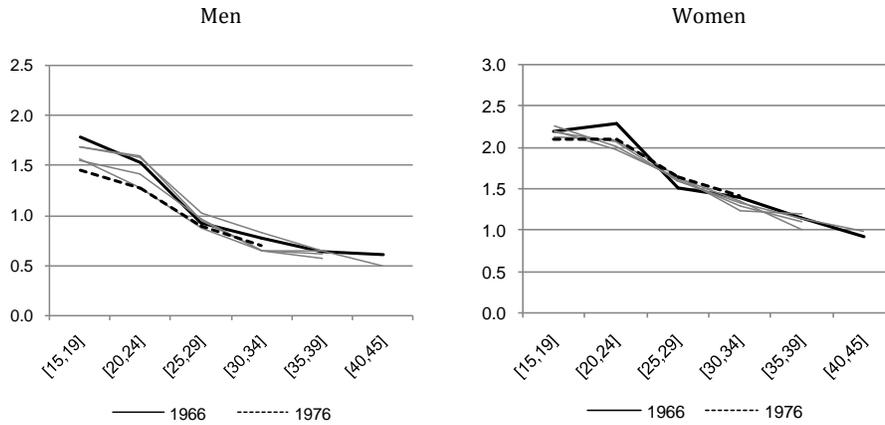
Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).

Figure 5
Birth-cohort normalized informality rate

Men

Women
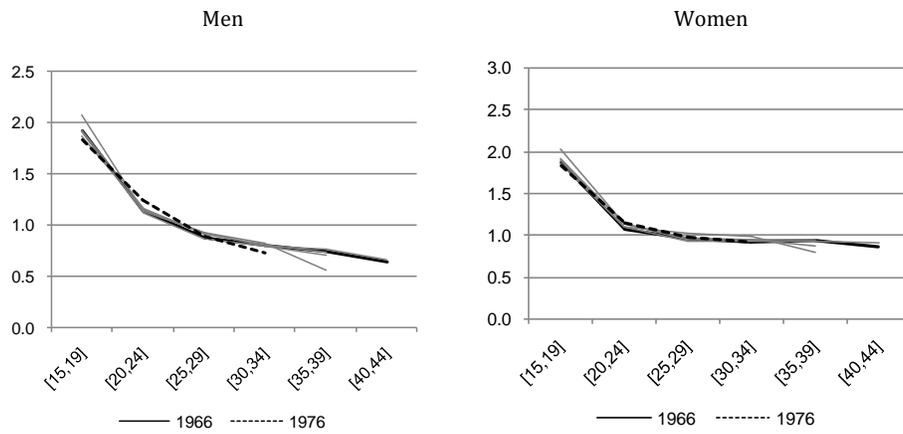
Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).

Figure 6
Scarring effects of youth unemployment
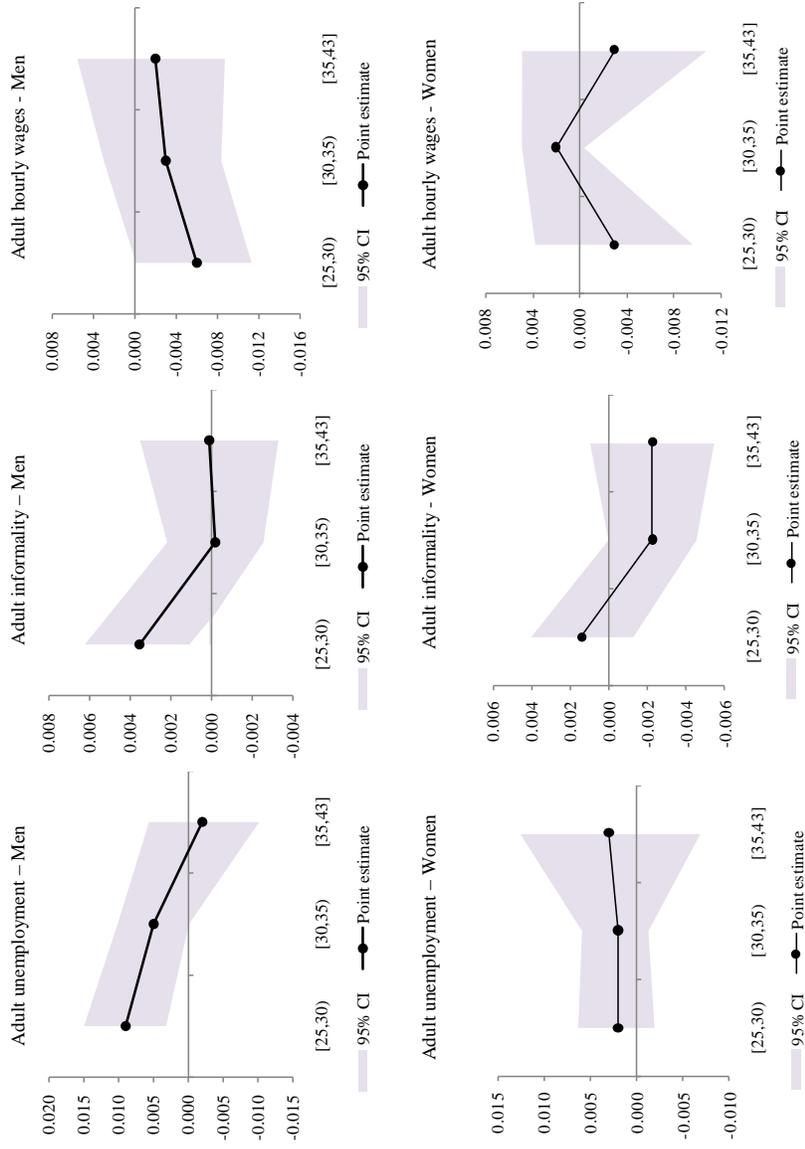
Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Estimations by pooled OLS from equation (6) and model specification 3.

Figure 7
Scarring effects of youth informality
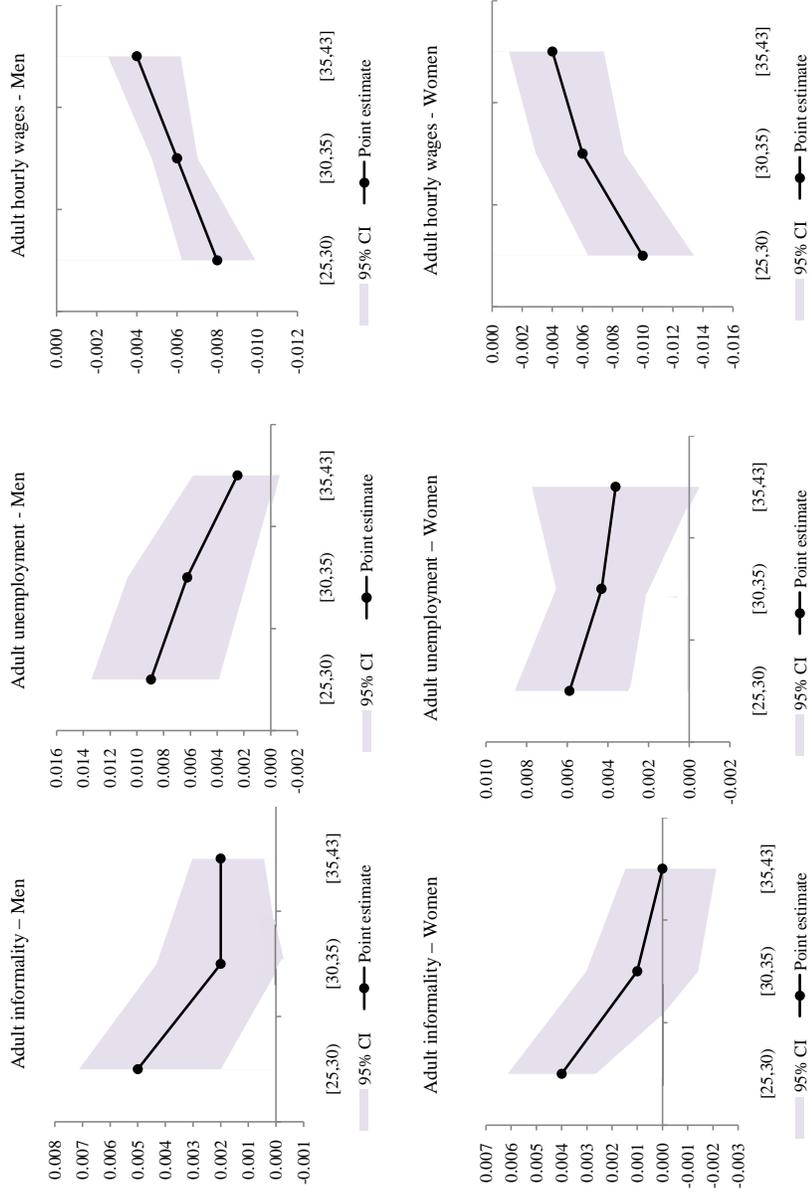
Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Estimations by pooled OLS from equation (6) and model specification 3.

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10 Tables

Table 1: Cohorts definition and aging pattern

Year of birth	Age in 1981	Age in 1985	Age in 1990	Age in 1995	Age in 2000	Age in 2005	Age in 2009
1966	15	19	24	29	34	39	43
1967		18	23	28	33	38	42
1968		17	22	27	32	37	41
1969		16	21	26	31	36	40
1970		15	20	25	30	35	39
1971			19	24	29	34	38
1972			18	23	28	33	37
1973			17	22	27	32	36
1974			16	21	26	31	35
1975			15	20	25	30	34
1976				19	24	29	33

Source: SEDLAC (CEDLAS and the World Bank, 2012).

Table 2: Number of observations

Men

Year of birth	1981	1985	1989	1993	1997	2001	2005	2009	Total
1966	1,666	3,546	2,259	2,327	2,320	2,455	2,394	2,379	35,629
1967		3,114	2,155	2,123	2,366	2,322	2,351	2,319	37,440
1968		2,614	2,069	2,312	2,307	2,426	2,505	2,227	39,212
1969		2,137	2,018	2,180	2,287	2,417	2,436	2,436	40,836
1970		1,829	1,965	2,356	2,381	2,454	2,581	2,546	43,029
1971			1,765	2,104	2,242	2,460	2,467	2,362	43,855
1972			1,499	1,945	2,355	2,365	2,640	2,435	49,364
1973			1,249	2,001	2,231	2,479	2,613	2,381	50,529
1974			935	1,813	2,272	2,464	2,468	2,502	54,339
1975				1,645	2,156	2,475	2,789	2,573	55,795
1976				1,326	2,076	2,499	2,664	2,564	61,636

Women

Year of birth	1981	1985	1989	1993	1997	2001	2005	2009	Total
1966	1,058	1,898	1,296	1,557	1,725	1,841	2,026	1,968	26,090
1967		1,728	1,187	1,512	1,787	1,793	2,045	1,918	27,162
1968		1,454	1,181	1,488	1,613	1,813	2,071	1,877	28,316
1969		1,311	1,090	1,456	1,578	1,826	2,027	2,206	29,352
1970		1,039	964	1,465	1,690	1,814	2,065	2,019	31,072
1971			859	1,339	1,512	1,841	1,942	1,968	31,326
1972			748	1,294	1,679	1,776	2,111	2,043	34,414
1973			652	1,159	1,560	1,791	2,049	2,048	36,118
1974			512	1,000	1,566	1,728	1,957	2,089	38,068
1975				915	1,439	1,804	2,158	2,099	39,511
1976				715	1,351	1,769	2,180	2,130	42,951

Total

Year of birth	1981	1985	1989	1993	1997	2001	2005	2009	Total
1966	2,724	5,444	3,555	3,884	4,045	4,296	4,420	4,347	61,719
1967		4,842	3,342	3,635	4,153	4,115	4,396	4,237	64,602
1968		4,068	3,250	3,800	3,920	4,239	4,576	4,104	67,528
1969		3,448	3,108	3,636	3,865	4,243	4,463	4,642	70,188
1970		2,868	2,929	3,821	4,071	4,268	4,646	4,565	74,101
1971			2,624	3,443	3,754	4,301	4,409	4,330	75,181
1972			2,247	3,239	4,034	4,141	4,751	4,478	83,778
1973			1,901	3,160	3,791	4,270	4,662	4,429	86,647
1974			1,447	2,813	3,838	4,192	4,425	4,591	92,407
1975				2,560	3,595	4,279	4,947	4,672	95,306
1976				2,041	3,427	4,268	4,844	4,694	104,587

Source: SEDLAC (CEDLAS and the World Bank, 2012).

Table 3: Birth-cohort unemployment rate
By age groups

	Not normalized						Normalized					
	[15,19]	[20,24]	[25,29]	[30,34]	[35,39]	[40,45]	[15,19]	[20,24]	[25,29]	[30,34]	[35,39]	[40,45]
Men												
1966	8.59	5.75	4.55	4.73	4.54	3.56	1.78	1.53	0.92	0.76	0.64	0.60
1968	7.27	7.00	5.22	5.84	4.33	2.80	1.68	1.58	1.02	0.83	0.65	0.48
1970	6.64	7.93	5.81	4.74	3.58		1.69	1.59	0.94	0.64	0.57	
1972	6.71	7.72	6.76	4.79	3.73		1.55	1.42	0.96	0.64	0.61	
1974	7.78	7.99	6.75	4.29	4.24		1.56	1.28	0.88	0.64	0.65	
1976	8.37	9.15	6.86	4.52			1.46	1.26	0.89	0.69		
Women												
1966	10.34	9.02	8.34	9.81	8.99	6.27	2.20	2.28	1.51	1.39	1.16	0.92
1968	8.96	9.54	9.45	10.76	8.75	6.54	2.19	2.07	1.60	1.33	1.13	0.99
1970	8.82	10.93	11.28	10.19	7.77		2.26	2.02	1.63	1.29	1.09	
1972	9.30	12.41	13.12	10.02	8.09		2.13	2.09	1.66	1.24	1.19	
1974	11.30	13.48	13.81	9.98	7.42		2.20	1.97	1.63	1.36	1.01	
1976	12.12	16.42	13.72	10.04			2.10	2.10	1.65	1.42		

Source: SEDLAC (CEDLAS and the World Bank, 2012).

Table 4: Birth-cohort informality rate
By age groups

	Not normalized						Normalized					
	[15,19]	[20,24]	[25,29]	[30,34]	[35,39]	[40,45]	[15,19]	[20,24]	[25,29]	[30,34]	[35,39]	[40,45]
Men												
1966	71.56	37.92	32.26	29.42	25.66	25.96	1.92	1.13	0.88	0.81	0.75	0.64
1968	71.92	37.47	32.06	28.03	25.66	30.94	1.91	1.12	0.87	0.79	0.76	0.66
1970	68.43	41.07	33.39	28.53	27.50		1.93	1.16	0.92	0.82	0.73	
1972	70.20	42.29	32.98	26.74	28.61		2.07	1.14	0.92	0.79	0.70	
1974	67.11	42.23	32.15	26.31	39.34		1.87	1.15	0.92	0.83	0.56	
1976	69.44	45.57	30.62	27.53			1.83	1.25	0.90	0.73		
Women												
1966	69.28	36.17	34.61	33.24	32.19	31.52	1.87	1.07	0.95	0.91	0.93	0.86
1968	70.56	36.92	34.53	32.46	30.06	37.57	1.89	1.10	0.93	0.92	0.93	0.92
1970	67.50	40.52	35.56	32.52	33.86		1.91	1.15	0.98	0.95	0.96	
1972	68.64	42.61	34.25	31.62	32.88		2.03	1.15	0.96	0.94	0.87	
1974	65.95	40.82	35.64	31.17	43.01		1.85	1.11	1.03	0.98	0.80	
1976	69.56	41.90	33.83	33.30			1.84	1.15	0.98	0.91		

Source: SEDLAC (CEDLAS and the World Bank, 2012).

Table 5: Youth unemployment effects – Men
Pooled OLS estimations

Mean effects

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment	0.009 [0.004]**	0.006 [0.003]*	0.006 [0.003]*	0.004 [0.002]*	0.000 [0.001]	0.000 [0.001]	-0.008 [0.004]*	-0.003 [0.003]	-0.003 [0.003]
Observations	139	139	139	139	139	139	139	139	139
R^2	0.66	0.70	0.70	0.6	0.74	0.74	0.71	0.81	0.82

Heterogenous effects by age

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment									
Aged [25,30)	0.012 [0.002]***	0.009 [0.003]***	0.009 [0.003]***	0.007 [0.002]***	0.003 [0.001]**	0.004 [0.001]**	-0.010 [0.003]***	-0.006 [0.002]**	-0.006 [0.003]**
Aged [30,35)	0.006 [0.002]**	0.005 [0.002]**	0.005 [0.002]*	0.001 [0.001]	0.000 [0.001]	0.000 [0.001]	-0.005 [0.003]	-0.003 [0.002]	-0.003 [0.003]
Aged [35,43]	-0.001 [0.003]	-0.002 [0.003]	-0.002 [0.004]	0.001 [0.002]	-0.001 [0.001]	0.000 [0.002]	-0.004 [0.003]	-0.002 [0.003]	-0.002 [0.003]
Observations	139	139	139	139	139	139	139	139	139
R^2	0.66	0.69	0.69	0.64	0.74	0.74	0.70	0.79	0.79

Heterogenous effects by years of education

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment	0.028 [0.019]	-0.012 [0.015]	-0.012 [0.015]	0.071 [0.016]***	0.049 [0.013]***	0.050 [0.013]***	-0.064 [0.022]**	-0.028 [0.015]*	-0.029 [0.015]*
Youth unemployment * years of educ	-0.003 [0.003]	0.002 [0.002]	0.002 [0.002]	-0.009 [0.002]***	-0.007 [0.002]***	-0.007 [0.002]***	0.008 [0.003]**	0.003 [0.002]	0.003 [0.002]
Observations	139	139	139	139	139	139	139	139	139
R^2	0.66	0.70	0.70	0.74	0.79	0.80	0.76	0.82	0.82

Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Robust standard errors, clustered by cohorts in parentheses.
Estimations are weighted by the square root of the number of observations in each cohort.
Model 1 controls for years of education, average of individuals that are household heads, mean number of children under 15 at home, dummies of age and regional distribution of the population. Model 2 adds the sectoral composition of total employment and gross domestic product of the economy. Model 3 adds the proportion of the population that participates actively in the labor market.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Youth unemployment effects – Women
Pooled OLS estimations

Mean effects

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment	0.002 [0.002]	0.002 [0.002]	0.001 [0.002]	-0.001 [0.001]	-0.001 [0.001]	-0.001 [0.001]	0.000 [0.001]	-0.001 [0.001]	0.000 [0.001]
Observations	139	139	139	139	139	139	139	139	139
R^2	0.82	0.85	0.85	0.35	0.55	0.55	0.58	0.70	0.71

Heterogenous effects by age

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment									
Aged [25,30]	0.004 [0.002]*	0.003 [0.002]	0.002 [0.002]	0.002 [0.002]	0.002 [0.001]	0.001 [0.001]	-0.005 [0.004]	-0.004 [0.003]	-0.003 [0.003]
Aged [30,35]	0.001 [0.002]	0.002 [0.001]	0.002 [0.002]	-0.003 [0.001]***	-0.002 [0.001]*	-0.002 [0.001]	0.004 [0.002]*	0.002 [0.001]*	0.002 [0.001]*
Aged [35,43]	0.003 [0.004]	0.003 [0.005]	0.003 [0.004]	-0.003 [0.002]*	-0.002 [0.001]	-0.002 [0.001]	-0.002 [0.003]	-0.003 [0.003]	-0.003 [0.004]
Observations	139	139	139	139	139	139	139	139	139
R^2	0.75	0.79	0.8	0.34	0.52	0.52	0.49	0.64	0.65

Heterogenous effects by years of education

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment	-0.004 [0.023]	-0.015 [0.021]	-0.013 [0.021]	0.031 [0.022]	0.020 [0.017]	0.020 [0.017]	-0.030 [0.022]	-0.013 [0.015]	-0.014 [0.015]
Youth unemployment * years of educ	0.001 [0.003]	0.002 [0.002]	0.002 [0.002]	-0.004 [0.003]	-0.003 [0.002]	-0.003 [0.002]	0.004 [0.003]	0.002 [0.002]	0.002 [0.002]
Observations	139	139	139	139	139	139	139	139	139
R^2	0.82	0.85	0.86	0.38	0.56	0.56	0.59	0.71	0.71

Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Robust standard errors, clustered by cohorts in parentheses.
Estimations are weighted by the square root of the number of observations in each cohort.
Model 1 controls for years of education, average of individuals that are household heads, mean number of children under 15 at home, dummies of age and regional distribution of the population. Model 2 adds the sectoral composition of total employment and gross domestic product of the economy. Model 3 adds the proportion of the population that participates actively in the labor market.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Youth unemployment effects

Two step estimation strategy - Second step

Men

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment	0.019 [0.003]***	0.024 [0.005]***	0.024 [0.005]***	0.015 [0.003]***	0.013 [0.003]***	0.014 [0.003]***	-0.023 [0.004]***	-0.024 [0.005]***	-0.024 [0.005]***
Observations	10	10	10	10	10	10	10	10	10
R^2	0.80	0.72	0.72	0.78	0.71	0.72	0.78	0.72	0.73

Women

	Adult unemployment			Adult informality			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth unemployment	0.010 [0.008]	0.005 [0.008]	0.003 [0.007]	0.012 [0.009]	0.007 [0.007]	0.007 [0.009]	-0.019 [0.014]	-0.013 [0.012]	-0.012 [0.015]
Observations	10	10	10	10	10	10	10	10	10
R^2	0.15	0.06	0.03	0.17	0.10	0.07	0.20	0.12	0.08

Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Robust standard errors in parentheses.
WLS estimation using the inverse of the estimates of the variance of the birth-cohort fixed effects from the first step as weights.
Model 1 controls for years of education, average of individuals that are household heads, mean number of children under 15 at home, dummies of age and regional distribution of the population. Model 2 adds the sectoral composition of total employment and gross domestic product of the economy. Model 3 adds the proportion of the population that participates actively in the labor market.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Youth informality effects - Men
Pooled OLS estimations

Mean effects

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality	0.007 [0.001]***	0.005 [0.002]*	0.005 [0.002]**	0.011 [0.002]***	0.013 [0.003]***	0.013 [0.003]***	-0.012 [0.001]***	-0.010 [0.002]***	-0.010 [0.002]***
Observations	139	139	139	139	139	139	139	139	139
R^2	0.71	0.76	0.77	0.72	0.74	0.75	0.86	0.87	0.87

Heterogenous effects by age

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality									
Aged [25,30)	0.006 [0.001]***	0.004 [0.001]***	0.005 [0.001]***	0.009 [0.001]***	0.009 [0.002]***	0.009 [0.002]***	-0.010 [0.001]***	-0.008 [0.001]***	-0.008 [0.001]***
Aged [30,35)	0.003	0.002 [0.001]	0.002 [0.001]*	0.006 [0.001]***	0.006 [0.002]***	0.006 [0.002]**	-0.007 [0.001]***	-0.006 [0.001]***	-0.006 [0.001]***
Aged [35,43]	0.002 [0.001]**	0.001 [0.000]**	0.002 [0.001]**	0.002 [0.001]**	0.002 [0.001]*	0.002 [0.001]	-0.005 [0.001]***	-0.004 [0.001]***	-0.004 [0.001]***
Observations	139	139	139	139	139	139	139	139	139
R^2	0.74	0.77	0.77	0.71	0.71	0.71	0.83	0.85	0.85

Heterogenous effects by years of education

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality	0.037 [0.004]***	0.032 [0.004]***	0.031 [0.004]***	0.003 [0.006]	-0.002 [0.009]	-0.002 [0.009]	-0.030 [0.006]***	-0.025 [0.007]***	-0.024 [0.007]***
Youth informality * years of educ	-0.004 [0.001]***	-0.004 [0.000]***	-0.004 [0.000]***	0.001 [0.001]	0.002 [0.001]*	0.002 [0.001]*	0.003 [0.001]**	0.002 [0.001]*	0.002 [0.001]*
Observations	139	139	139	139	139	139	139	139	139
R^2	0.81	0.82	0.83	0.72	0.75	0.75	0.86	0.87	0.87

Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Robust standard errors, clustered by cohorts in parentheses.
Estimations are weighted by the square root of the number of observations in each cohort.
Model 1 controls for years of education, average of individuals that are household heads, mean number of children under 15 at home, dummies of age and regional distribution of the population. Model 2 adds the sectoral composition of total employment and gross domestic product of the economy. Model 3 adds the proportion of the population that participates actively in the labor market.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Youth informality effects - Women
Pooled OLS estimations

Mean effects

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality	0.008 [0.002]***	0.005 [0.002]**	0.006 [0.002]**	0.006 [0.002]**	0.004 [0.003]	0.002 [0.002]	-0.011 [0.003]***	-0.008 [0.002]**	-0.008 [0.003]**
Observations	139	139	139	139	139	139	139	139	139
R^2	0.53	0.59	0.60	0.84	0.85	0.86	0.71	0.74	0.74

Heterogenous effects by age

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality									
Aged [25,30)	0.005 [0.001]***	0.004 [0.001]***	0.004 [0.001]***	0.007 [0.001]***	0.007 [0.001]***	0.006 [0.001]***	-0.011 [0.001]***	-0.010 [0.002]***	-0.010 [0.002]***
Aged [30,35)	0.002 [0.001]	0.001 [0.001]	0.001 [0.001]	0.005 [0.001]***	0.005 [0.001]***	0.004 [0.001]***	-0.007 [0.001]***	-0.006 [0.001]***	-0.006 [0.001]***
Aged [35,43]	0.000 [0.001]	0.000 [0.001]	0.000 [0.001]	0.004 [0.002]**	0.004 [0.002]*	0.004 [0.002]*	-0.005 [0.001]***	-0.004 [0.001]**	-0.004 [0.001]**
Observations	139	139	139	139	139	139	139	139	139
R^2	0.52	0.58	0.58	0.81	0.81	0.82	0.73	0.75	0.75

Heterogenous effects by years of education

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality	0.026 [0.006]***	0.020 [0.005]***	0.020 [0.005]***	-0.003 [0.006]	-0.010 [0.006]	-0.010 [0.006]	-0.025 [0.009]**	-0.017 [0.009]*	-0.017 [0.009]*
Youth informality * years of educ	-0.003 [0.001]***	-0.002 [0.001]***	-0.002 [0.001]***	0.001 [0.001]	0.002 [0.001]**	0.002 [0.001]**	0.002 [0.001]	0.001 [0.001]	0.001 [0.001]
Observations	139	139	139	139	139	139	139	139	139
R^2	0.58	0.63	0.63	0.84	0.86	0.86	0.72	0.74	0.74

Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Robust standard errors, clustered by cohorts in parentheses.
Estimations are weighted by the square root of the number of observations in each cohort.
Model 1 controls for years of education, average of individuals that are household heads, mean number of children under 15 at home, dummies of age and regional distribution of the population. Model 2 adds the sectoral composition of total employment and gross domestic product of the economy. Model 3 adds the proportion of the population that participates actively in the labor market.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 10: Youth informality effects

Two step estimation strategy - Second step

Men

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality	0.009 [0.001]***	0.008 [0.000]***	0.008 [0.000]***	0.011 [0.001]***	0.014 [0.001]***	0.014 [0.001]***	-0.013 [0.001]***	-0.014 [0.001]***	-0.014 [0.001]***
Observations	10	10	10	10	10	10	10	10	10
R^2	0.97	0.98	0.98	0.97	0.97	0.97	0.99	0.99	0.99

Women

	Adult informality			Adult unemployment			Adult hourly wages		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Youth informality	0.010 [0.000]***	0.007 [0.000]***	0.009 [0.000]***	0.009 [0.001]***	0.007 [0.001]***	0.007 [0.001]***	-0.015 [0.001]***	-0.013 [0.001]***	-0.015 [0.001]***
Observations	10	10	10	10	10	10	10	10	10
R^2	0.99	0.98	0.99	0.96	0.93	0.93	0.98	0.98	0.98

Source: Own estimations based on SEDLAC (CEDLAS and the World Bank, 2012).
Robust standard errors in parentheses.
WLS estimation using the inverse of the variance of the estimates of the birth-cohort fixed effects from the first step as weights.
Model 1 controls for years of education, average of individuals that are household heads, mean number of children under 15 at home, dummies of age and regional distribution of the population. Model 2 adds the sectoral composition of total employment and gross domestic product of the economy. Model 3 adds the proportion of the population that participates actively in the labor market.
* significant at 10%; ** significant at 5%; *** significant at 1%.