

Alcaraz, Carlo; Chiquiar, Daniel; Salcedo, Alejandrina

**Working Paper**

## Informality and segmentation in the Mexican labor market

Working Papers, No. 2015-25

**Provided in Cooperation with:**

Bank of Mexico, Mexico City

*Suggested Citation:* Alcaraz, Carlo; Chiquiar, Daniel; Salcedo, Alejandrina (2015) : Informality and segmentation in the Mexican labor market, Working Papers, No. 2015-25, Banco de México, Ciudad de México

This Version is available at:

<https://hdl.handle.net/10419/129955>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

Banco de México  
Documentos de Investigación

Banco de México  
Working Papers

N° 2015-25

Informality and Segmentation in the Mexican Labor  
Market

Carlo Alcaraz  
Banco de México

Daniel Chiquiar  
Banco de México

Alejandrina Salcedo  
Banco de México

December 2015

La serie de Documentos de Investigación del Banco de México divulga resultados preliminares de trabajos de investigación económica realizados en el Banco de México con la finalidad de propiciar el intercambio y debate de ideas. El contenido de los Documentos de Investigación, así como las conclusiones que de ellos se derivan, son responsabilidad exclusiva de los autores y no reflejan necesariamente las del Banco de México.

The Working Papers series of Banco de México disseminates preliminary results of economic research conducted at Banco de México in order to promote the exchange and debate of ideas. The views and conclusions presented in the Working Papers are exclusively the responsibility of the authors and do not necessarily reflect those of Banco de México.

# Informality and Segmentation in the Mexican Labor Market\*

Carlo Alcaraz<sup>†</sup>  
Banco de México

Daniel Chiquiar<sup>‡</sup>  
Banco de México

Alejandrina Salcedo<sup>§</sup>  
Banco de México

**Abstract:** In developing countries, some workers have formal jobs while others are occupied in informal positions. One view regarding this duality suggests that sectors are segmented, which means that a worker in the informal sector identical to another in the formal sector cannot get a formal position due to entry barriers. A second view states that workers self-select into informal jobs. Previous research suggests that these two situations may coexist in the same labor market. In this paper we identify the proportion of informal workers who are in each situation for the case of Mexico. Using a simple model of self-selection with entry barriers into the formal sector, we estimate that between 10 and 20 percent of informal workers would prefer to have a formal job. While this result provides evidence of the presence of some segmentation in the Mexican labor market, it suggests that an important proportion of workers in the informal sector self-select into it.

**Keywords:** Informality, Segmentation, Mexico, Labor Market.

**JEL Classification:** J42, J46

**Resumen:** En países en desarrollo, algunos trabajadores tienen empleos formales y otros informales. Una visión respecto a esta dualidad sugiere que existe segmentación entre sectores, lo que significa que un trabajador informal idéntico a otro formal no puede obtener un trabajo formal debido a barreras a la entrada. Una segunda visión señala que los trabajadores se auto-seleccionan a la informalidad. Considerando que ambas circunstancias podrían coexistir, en este documento se identifica la proporción de trabajadores informales en cada situación para el caso de México. Utilizando un modelo de autoselección con barreras de entrada al sector formal, se estima que entre el 10 y el 20 por ciento de los informales preferirían tener un empleo formal. Si bien este resultado provee evidencia de la presencia de cierta segmentación en el mercado laboral mexicano, también sugiere que una importante proporción de trabajadores informales se autoselecciona al sector informal.

**Palabras Clave:** Informalidad, Segmentación, México, Mercado Laboral

---

\*The authors would like to thank seminar participants at the XVII Meeting of the Central Bank Researchers Network of the Americas in Montevideo (2012), Marco Gonzalez-Navarro, Alfonso Cebreros and an anonymous referee for very helpful comments, and María José Orraca for excellent research assistance.

<sup>†</sup> Dirección General de Investigación Económica. Email: carloalcaraz@banxico.org.mx.

<sup>‡</sup> Dirección General de Estabilidad Financiera. Email: dchiquiar@banxico.org.mx.

<sup>§</sup> Dirección General de Investigación Económica. Email: asalcedo@banxico.org.mx.

# 1 Introduction

In many countries an important proportion of workers have informal jobs, that is, they are not hired according to the labor regulation. Researchers have been interested in analyzing whether the formal and informal sectors are segmented or integrated (see Fields, 2009 for a literature review). Early studies on informal labor claim that labor markets in developing countries are segmented. In this case, the existence of entry barriers to the formal sector prevents workers from obtaining jobs in this sector, which means that an informal worker who would prefer to be formal cannot get a formal job even when he is identical to another worker employed in the formal sector (Lewis, 1972; Harris and Todaro, 1970; Rauch, 1991; Magnac, 1991). Given that entry barriers are the only reason preventing an otherwise identical informal worker from getting a job in the formal sector, these workers are considered involuntary informal workers. The entry barriers could be generated by the presence of strong unions, restrictive labor market regulations, or minimum wages above market clearing wage levels, among other factors.<sup>1</sup> More recent studies have proposed an alternative explanation for the existence of informal workers in developing countries. In this case, rather than a survival strategy, informal labor is seen as voluntary. That is, some workers self-select to informal jobs because, given their characteristics, it is in their best interest. For example, Maloney (1999) for the case of Mexico argues that there is no segmentation and that informality exists because some workers want to take advantage of the dynamic and unregulated informal labor market. However, the possibility that these two types of informal labor could coexist in the same market has also been proposed (Fields, 1990; Perry et al., 2007), and this is the topic of interest of this paper.

Several authors have discussed the possible empirical implications of having a segmented or a non-segmented labor market (Portes, 1995; Fiess et al., 2010). In particular, they claim that under a segmented labor market one would expect low mobility between formal and informal jobs (or only informal to formal transitions) and countercyclical informal employment. For a non-segmented labor market, they expect high mobility between formal and informal jobs and procyclical informal employment. While some authors have argued that significant formal–informal wage differentials could also suggest segmentation (see Fields, 1980 for a literature review and Pratap and Quintin, 2006), evidence of wage differentials is not necessarily proof of segmentation since informal workers could be obtaining non-observed benefits, such as a greater flexibility in working hours, which could compensate them for these differentials (Maloney, 2004).

---

<sup>1</sup>Other explanations of barriers to the formal sector include: lack of formal jobs (Moser, 1978; PREALC, 1985) and the presence of an efficiency wage setting mechanism where formal firms (bigger and more complex than informal firms) have to pay higher wages in order to elicit effort from their workers (Bulow and Summers, 1986; Esfahani and Salehi-Isfahani, 1989).

In the case of Mexico, using the National Statistics Office (INEGI) definition, around 58 percent of workers are informal. This definition includes both wage earners that do not have access to social security and self employed workers that do not follow a formal accounting system. Some evidence associated with segmentation between the formal and informal sectors exists, such as the presence of a restrictive labor legislation (Heckman and Pagés, 2004; Botero et al., 2004) and countercyclical informal employment (Alcaraz, 2009; Gasparini and Tornaroli, 2009; Fiess et al., 2010). Some authors have argued that there is also evidence consistent with voluntary informal employment, such as high mobility between formal and informal employment (e.g. Levy, 2007) and procyclical informal employment (Maloney, 1998). Apart from methodological or data differences, these apparently contradictory results could be reflecting the fact that some workers in the informal sector are voluntary (self-selected) and others are involuntary (would prefer a formal job but cannot get one).

Even recognizing that the informal sector is composed of both voluntary and involuntary workers, estimating the relative prevalence of each type is not straightforward because being voluntarily or involuntarily employed in the informal sector is not observable. In particular, we can tell whether the worker is employed in the formal or in the informal sector, but we cannot observe whether an informal worker is employed voluntarily or involuntarily in such sector. In this paper we propose a simple empirical model of self-selection into the formal or informal sector, where we introduce a barrier to entry into the formal sector. This way we allow workers to self-select into the informal sector, but also consider that not all workers can have access to a formal job even if they wish to. In particular, the entry barrier into the formal sector is introduced as a probability that determines whether a worker obtains a formal job whenever he prefers a position in this sector. In the model, workers select their preferred sector according to their socioeconomic characteristics. The results from a maximum likelihood estimation indicate that between 10 and 20 percent of informal workers would prefer to have a formal job, and this proportion is statistically significant. Furthermore, the significance of the coefficient related to the barrier to entry into the formal sector provides evidence of the presence of segmentation in the Mexican labor market. However, the results also suggest an important proportion of workers self-selecting into the informal sector.

Among the papers that are closely related to this one, we should mention Duval and Smith (2011). These authors use the model of Dickens and Lang (1985) and modify it to allow for voluntary and involuntary informal workers and self-selection between sectors. They estimated the parameters of the model by maximum likelihood.<sup>2</sup> However, given that the purpose of their paper

---

<sup>2</sup>Dickens and Lang (1985; 1988) estimate models using maximum likelihood to identify two non-observed sectors in the labor market of the United States, and have become key papers for the literature on segmented labor markets.

is to estimate the effect of changes in social security services provided by the Mexican government, they do not estimate the proportion of involuntary informal workers. To our knowledge, the only other paper that tries to estimate the fraction of involuntary informal workers in an economy is Günther and Launov (2012), who apply their methodology to the case of Côte d’Ivoire. They assume that the labor market is composed of a formal sector which is homogeneous, and an informal sector that is heterogeneous and consists of two latent (unobservable) segments, each characterized by its own earnings equation. These authors find that 45 percent of the informal workers in that economy are involuntary. The model they develop is based on a finite mixture model to which they add sample selection into the labor market. However, conditional on labor force participation the finite mixture model does not account for self-selection into formality versus informality.<sup>3</sup> Our model takes into account barriers to formality and self-selection into informality, allowing us to directly estimate the fraction of the informal sector that is involuntary.

The rest of the paper proceeds as follows. In Section 2, we construct a model of self-selection into the formal or informal sector, where we also introduce an entry barrier into the formal sector. Section 3 develops the definition of informality and describes the data. Section 4 presents the empirical estimation of the model, and Section 5 concludes.

## 2 Model of Segmentation and Self-selection

In the model that we propose in this section there are two sectors in the labor market: formal and informal. We abstract from the decision to join the labor force, and workers only focus on the decision about which sector they want to work in. Workers first voluntarily decide to look for a job in the sector that will give them the highest utility based on their characteristics. Such characteristics include those that could directly affect their labor income (like education), but also those that affect the choice of sector and are not directly associated to their potential labor income (like household composition). The implicit assumption is that jobs in the formal sector are different from those in the informal sector. This could be due to flexibility in hours worked, the availability of social security benefits, or the preference to pay for such social security services (through a deduction from the worker’s wage).

We assume that once workers decide which sector they want to work in, they apply for a job in that sector. If they choose the informal sector, they immediately obtain the job they asked for. In

---

<sup>3</sup>According to the literature, self-selection into the formal or informal sector is a relevant source of endogeneity (Magnac, 1991; Duval and Smith, 2011; Pratap and Quintin, 2006).

contrast, we assume that there is a barrier to entry to the formal sector, so that if they choose this sector, there is a probability  $\delta$  that they are hired. With probability  $1-\delta$  they cannot get the job, and they are forced to take one in the informal sector (involuntary informal workers). We call voluntary informal workers those who self-selected into the informal sector given their characteristics.

Formally, we assume that for a person  $i$ , the unobserved utility of being a formal worker is given by

$$u_i^* = X_i\beta + \varepsilon_i, \quad \varepsilon_i \sim N(0, 1) \quad (1)$$

where  $X_i$  is a matrix of observable characteristics for individual  $i$  that determine the utility of being a formal worker. These include socio-demographic characteristics of the worker and his household. Whenever  $u_i^* > 0$ , the worker will prefer to work in the formal sector. Given that once the worker decides to work in the formal sector he is hired with probability  $\delta$ , a worker will have a job in the formal sector if  $u_i^* > 0$  and he is hired. Similarly, the worker will take a job in the informal sector if  $u_i^* \leq 0$ , but also if he wanted a job in the formal sector and did not get one, that is, if  $u_i^* > 0$  and he is not hired. This is summarized as follows:

$$\text{Worker's observed sector} = \begin{cases} \text{formal if } u^* > 0 \text{ and is hired} \\ \text{informal if } u^* > 0 \text{ and is not hired or } u^* \leq 0 \end{cases}$$

As can be noticed, this model is very close to the usual self-selection model, except that not all workers who would prefer a formal job can obtain one and are therefore displaced into the informal sector. We estimate the parameters of the model by maximum likelihood to determine the fraction of informal workers who would have preferred a formal job but could not obtain one. With this purpose, we first determine the probability of observing a worker in the formal or in the informal sector. These probabilities are given by:

$$p_i(\text{formal}) = P(u_i^* > 0 \text{ and is hired}) = \delta\Phi(X_i\beta) \quad (2)$$

$$\begin{aligned}
p_i(\text{informal}) &= P[(u_i^* > 0 \text{ and is not hired}) \text{ or } (u_i^* \leq 0)] \\
&= P(u_i^* > 0 \text{ and is not hired}) + P(u_i^* \leq 0) \\
&= (1 - \delta) \Phi(X_i \beta) + \Phi(-X_i \beta) \\
&= 1 - \delta \Phi(X_i \beta)
\end{aligned} \tag{3}$$

In the expressions above,  $\Phi$  represents the cumulative density of the normal distribution. Based on these probabilities, the likelihood function is defined in the following way:

$$L = \prod_{\text{formal}} \delta \Phi(X_i \beta) \cdot \prod_{\text{informal}} [1 - \delta \Phi(X_i \beta)] \tag{4}$$

It is important to note that  $\delta$  does not depend on the workers' preferences or characteristics, it depends only on the institutional framework of the economy. Once we obtain an estimate for  $\delta$  we can derive the proportion of informal workers who are employed involuntarily in that sector. Let  $F$  be the number of observed formal workers and  $f$  the proportion they represent among all workers. Additionally, let  $T$  be the total number of workers, and  $M$  the number of workers who prefer to be formal ( $u_i^* > 0$ ). Using the fact that  $F = \delta M$ , then,

$$\frac{\text{involuntary informal workers}}{\text{informal workers}} = \frac{(1 - \delta)M}{T - F} = \frac{(1 - \delta)\frac{1}{\delta}}{\frac{1}{f} - 1} \tag{5}$$

It is important to note that we allow workers to self-select into the formal or informal sectors and at the same time introduce a barrier to entry into the formal sector. Furthermore, we use workers' characteristics both directly and indirectly linked to wages to model self-selection. This way we try to capture that depending on their characteristics, workers can be attracted to diverse types of jobs. For example, workers, depending on their socioeconomics, may have different valuations for non-monetary benefits associated to some job and take that into account when self-selecting into the formal or informal sector. Indeed, apart from wages, non-monetary characteristics of the jobs are also important when workers decide about the job they want to seek (e.g. Maloney, 2004).

Some caveats of the model should be pointed out. In first place, we left aside the participation decision. For the empirical part, we focus only on male workers aged 23 to 60 whose participation is very high. Additionally, we do not allow for changes between sectors and we assume a one-time decision.



### 3 Informality in Mexico and Data Source

We estimate the parameters of the model presented in the previous section using employment information for Mexico. We use data from the Mexican employment survey, Encuesta Nacional de Ocupación y Empleo (ENOE), conducted by the Mexican statistics office, INEGI. This is a quarterly household survey at the national level designed to collect data on the employment situation of Mexicans in rural and urban areas.

The survey classifies workers according to whether they hold a formal or an informal job. The definition of informality follows the criteria proposed by the International Labour Organization (ILO 2003). Informal workers are assumed to be those who are not employed according to the labor regulations. More precisely, employees or wage earners are classified as informal if their job does not provide them with access to social security benefits.<sup>4</sup> Not having access to social security is regarded as an indicator that the worker is not hired following the labor regulation and therefore that is working informally. We should point out that informal workers can be working for a formal firm, that is, one that is legally registered in terms of tax obligations. All workers without payment, employees in the agricultural sector, and domestic workers without access to social security institutions are also considered informal. On the other hand, self-employed workers or employers are classified as informal if the businesses they run do not follow regulations in terms of registering their business to pay taxes. These businesses typically do not have a formal accounting method that allows for a separation between production activities and other activities of the owners (like regular household income or expenditures).

We consider that informality is an urban phenomenon, and as such for this document we focus on workers living in localities with 15,000 or more inhabitants. In Table 1, we present the percentage of urban workers classified as formal or informal by working condition (wage earner or self-employed/employer) with data for the fourth quarter of 2014.<sup>5</sup> The Table shows that among wage earners (which represent around 68 percent of all workers), 37.4 percent were classified as informal. On the other hand, for self-employed workers or employers (which represent 26 percent of all workers), we obtained that 81 percent are considered informal. Overall, around 46 percent of workers were informal in 2014-IV.<sup>6</sup>

---

<sup>4</sup>The employment survey labels wage earners as “Trabajadores subordinados y remunerados”. It is important to note that some workers may have access to health services in social security institutes through their spouses. This information is not used to classify the worker into formal or informal, because it is the provision of social security through the job of the worker that matters.

<sup>5</sup>We exclude from the analysis workers who declare to have a job without a monetary payment for their work. Around 6% of workers fall in this category.

<sup>6</sup>The 46% of informal workers reported in this section is computed considering the described restrictions to the

In order to provide a broader description of informality in Mexico, we first depict in Figure 1 the evolution of informality in the last ten years. It can be noted that the informality rate increased after the most recent economic crisis. Additionally, in Table 2, we show the prevalence of informality across different demographic groups of the population. As can be observed, 47.7 percent of employed women are informal, whereas 44.5 percent of men are. The Table also shows that some sectors have a high prevalence of informal workers, such as restaurants, various services and construction, as opposed to mining, manufactures and social services, where most workers are formal.

In Table 3 we compare the socio-demographic characteristics of informal vs formal workers. It can be observed that there does not seem to be an important difference on the mean age of informal and formal workers. However, on average, informal workers are less educated than formal workers. In this context, it is relevant to keep in mind that wage differentials between formal and informal workers may reflect endogenous decisions by workers relating the sector they prefer to work in (Alcaraz et al., 2008).

## 4 Empirical analysis

Having identified informal workers in the Mexican employment survey, we estimate the parameters of the model presented in Section 2 for a sample of male workers aged 23 to 60, declaring to receive a monetary payment for their job and living in localities of more than 15,000 inhabitants, in the last quarter of 2014.<sup>7</sup> As mentioned before, we restrict the sample to male workers to avoid possible selection problems due to participation. For the estimation of the model, we include variables that would directly affect the worker's labor income: age, geographic region, and schooling dummies. We also consider variables that are not directly related to labor income, but that could play a role in the choice of sector: marital status, being head of household, number of males in the household, number of household members, number of household members under 5 years of age, number of household members older than 60 years, and the average education of women in the household. Another variable that could affect the individual's decision of which sector to choose is whether a household member, other than himself, has access to social security institutions. If a

---

sample. This number differs from the 58% mentioned in the introduction that was computed without restricting the sample.

<sup>7</sup>For all exercises except a sensitivity analysis using different samples of workers (in particular the last panel in Table 6), we also drop workers who do not report labor income or report an income of zero and those with income in the top and bottom 1 percent of the labor income distribution.

worker has a formal job, he can extend social security benefits to his dependents (spouse, children, and parents living in the household). Therefore, if someone in the household already has access to these institutions, a worker could be more inclined to self-select into an informal job. However, this variable may be endogenous to the decision of which type of job to choose. We do not include an income variable because of the risk of facing endogeneity problems.

We present summary statistics of these variables in Table 4, comparing formal to informal workers from our selected sample. As can be noted, we do not find an important difference in average age between formal and informal workers, whereas formal workers have more years of schooling. The same is true for the average household education, as the women in formal households have, on average, 10.7 years of schooling, while they only have 8.8 years of schooling in informal households. Although on average formal workers are more likely to live in a household where another member has access to social security, it is important to highlight that only 43 percent of formal workers live in a household with this characteristic (25.6 percent for informal workers). Turning to household composition, the most salient finding is that informal households seem to be slightly larger.

We now turn to the estimation of the parameters of the model using a maximum likelihood methodology. The results are presented in Table 5. Each column refers to an estimation of the model that includes a different set of control variables ( $X_i$ ) that are assumed to affect the decision of whether to hold a formal or an informal job. At the bottom of the Table we report the estimated probability that the worker is hired in the formal sector if he decides to look for a formal job ( $\delta$ ), the probability that he is not hired if he chooses this sector ( $1-\delta$ ), and the last row presents the estimated proportion of informal workers who would have liked to hold a formal job, that is, the percentage of involuntary informal workers among informal workers.

In Column 1 we include only variables that would directly affect the worker's labor income. In Column 2 we add variables that could be directly related to the choice of sector and not directly linked to labor income. The results adding average education of women in the household are presented in Column 3. In Column 4 we show the results of the estimation considering the variable that indicates access to social security institutions from other members of the household, but excluding the average education of women in the household. Finally, in Column 5 we present the estimation with the full set of control variables. All estimations include regional dummies for the five main geographical regions of Mexico. As can be observed, the estimated probability of acquiring a formal job for those workers who would like to have one is around 90 percent. More importantly, the probability of not being able to obtain a job in the formal sector given that the worker applied for one ( $1-\delta$ ) is statistically different from zero in all specifications. This should be

interpreted as evidence of barriers to entry into the formal sector. In other words, we reject the null of inexistence of segmentation in the Mexican labor market. Additionally, to respond to the question of whether informal workers are voluntary or involuntary, we also report the estimated percentage of informal workers who would have liked to have a formal job. For the estimation in Column 3, which includes all socio-demographic variables and average education of women in the household, the percentage of involuntary informal workers is 11.8 percent, and it is statistically significant. Once we include the full set of variables, in Column 5, the percentage increases to 16.6 percent.<sup>8</sup>

Specific groups of workers may be relatively more restricted by labor market rigidities than others in terms of formal sector entry barriers. For example, salaried and full time workers may be more willing to have a formal job than other workers. On the other hand, self-employed workers and part time workers may be more willing to self-select into the informal sector in order to take advantage of its flexibility. We therefore estimate the model for different subsamples of workers. Table 6 reports the results of the same five specifications used above (that differ on the characteristics of the workers included as controls). The first panel presents, for comparison, the results of the full sample also reported in Table 5. The second panel reports the results using a sample restricted to wage-earners (i.e. not self-employed), and we do not find very different results from the baseline sample. However, we do find important differences in third and fourth panels, where we restrict the sample to workers who work for more than 30 and 35 hours a week, respectively. In this case, the proportion of involuntary informal workers rises to around 18 percent. This may be reflecting that part-time workers cannot find jobs in the formal sector that are as flexible as they require. Finally, the fifth panel shows the results in which we add to the main sample male workers who report not receiving a monetary payment for their job. In this case, the estimated proportion of involuntary informal workers is below the baseline estimates, probably reflecting that these persons may be working for their families and are therefore not looking a job in the formal sector.

---

<sup>8</sup>The variables included in the model generally show patterns that seem to be consistent with prior expectations. Older, more educated, married and head of household workers are more likely to be willing to be formal. It seems that the number of household members has a negative effect on the probability of being formal. This variable could be capturing the fact that poorer households tend to have more children. In Column 3, also as expected, higher mean education of women has a positive effect on the decision to be formal. However, not as intuitive is the result (Column 4) that access to social security by someone in the household has a positive effect on choosing a formal job, but this could be due to the possibility that social security access may be capturing some income effect or that family preferences for formality may be playing a role. Column 5 tries to control for the possible income effect by including education of women in the household, but although the magnitude of the effect decreases slightly, the direction of the results remains unchanged.

The percentage of involuntary informal workers may change with economic conditions, possibly increasing during an economic downturn. Figure 2 shows the evolution from 2005 to 2015 of the estimated fraction of involuntary informal workers using the specification in Column 5 of Table 5. Although the estimations are quite noisy, the graph shows a clear increase in the fraction of involuntary informal workers in the post-crisis period that began to decrease in the early 2013. The large confidence intervals do not allow us to give a precise conclusion about a possible change in the segmentation in the Mexican labor market in that period. However, while the estimated fraction of involuntary informal workers between 2007-I and 2009-IV was on average 12.8 percent, the fraction increased to an average of 16.8 percent between 2011-I and 2013-IV. It is important to have in mind that an increase of 4 percentage points is quite sizable, since the number of informal workers is very large.<sup>9</sup>

The results presented in this section point to a sizable fraction of informal workers who have self-selected into this type of job. This suggests that there are certain characteristics that the formal sector lacks to attract more workers. These could include more flexibility in hours worked or unbundled social security benefits. On the other hand, the results point at an important fraction of informal workers who could not access a formal job. This indicates that the Mexican labor market suffers from barriers to the creation of formal jobs, which could include high costs of hiring or firing workers.

---

<sup>9</sup>According to ENOE, in 2014-IV there were 11,316,527 urban workers in the informal sector.

## 5 Final Remarks

Informal labor is a widespread phenomenon among developing economies. Several studies have highlighted the importance of reducing informal work to increase long term productivity (Perry et al., 2007; Levy, 2007; Alcaraz et al., 2008, for example). In order to implement effective policies aimed at reducing informal labor, it is crucial to consider the heterogeneity of the informal labor market in each specific country. In this sense, if the labor market is characterized by entry barriers to the formal sector that derive in labor market segmentation, suitable policies to reduce informal labor could include modifying the regulation regarding labor unions and increasing labor market flexibility, in other words, eliminating regulations that hamper labor mobility. In contrast, if informal labor in a given country is voluntary and there are no entry barriers to the formal sector, other types of policies need to be implemented. In this case, reforms that reduce the relative cost of formality, such as decreasing labor taxes and social security contributions, could be more appropriate. If the two sources of informality coexist in an economy, a combination of both types of policies would be required to address the problem. Given the evidence provided in this paper that indicates that for the case of Mexico barriers to entry into the formal sector coexist with an important fraction of workers voluntarily self-selecting into the informal sector, in order to reduce informal labor in Mexico, a combination of policies should be implemented: measures to reduce entry barriers to the formal sector along with measures to increase the relative value of formal labor.

## References

- Alcaraz, C. (2009). Informal and formal labour flexibility in Mexico. *Revista Desarrollo y Sociedad*. Universidad de los Andes-CEDE.
- Alcaraz, C. and D. Chiquiar and M. Ramos Francia (2008). Diferenciales salariales intersectoriales y el cambio en la composición del empleo de la economía mexicana. Banco de México, Working Paper 2008-06.
- Botero, J., S. Djankov, R. L. P., and Lopez-De-Silanes, F. C. (2004). The regulation of labor. *The Quarterly Journal of Economics*, 119(4):1339–1382.
- Bulow, J. and Summers, L. (1986). A theory of dual labor markets with application to industrial policy, discrimination, and Keynesian unemployment. *Journal of Labor Economics*, 4(3):376–414. University of Chicago Press.
- Dickens, W. T. and Lang, K. (1985). A test of dual labor market theory. *American Economic Review*, 75:792–805.
- Dickens, W. T. and Lang, K. (1988). Labor market segmentation and the union wage premium. *The Review of Economics and Statistics*, 70(3):527–30. MIT Press.
- Duval, R. and Smith, R. (2011). Informality and Seguro Popular under segmented labor markets. CIDE, mimeo.
- Esfahani, H. and Salehi-Isfahani, D. (1989). Effort observability and worker productivity: Towards an explanation of economic dualism. *The Economic Journal*, 99(397):818–836.
- Fields, G. (1980). Poverty, inequality, and development. New York: Cambridge University Press.
- Fields, G. (1990). Labour market modeling and the urban informal sector: Theory and evidence. In D. Turnham, B. S. and Schwarz, A., editors, *The Informal Sector Revisited*. Development Centre of the Organization for Economic Co-Operation and Development, Paris.
- Fields, G. (2009). Segmented labor market models in developing countries. In Kincaid, H. and Ross, D., editors, *The Oxford handbook of philosophy of economics*. Oxford University Press.
- Fiess, N., Fugazza, M., and Maloney, W. (2010). Informal self-employment and macroeconomic fluctuations. *Journal of Development Economics*, 91(2):211–226.
- Gasparini, L. and Tornaroli, L. (2009). Labor informality in Latin America and the Caribbean: Patterns and trends from household survey microdata. *Revista Desarrollo y Sociedad*. Universidad de los Andes-CEDE.

- Günther, I. and Launov, A. (2012). Informal employment in developing countries: Opportunity or last resort? *Journal of Development Economics*, 97(1):88–98.
- Harris, J. and Todaro, M. (1970). Migration, unemployment, and development: A two sector analysis. *American Economic Review*, 40:126–142.
- Heckman, J. and Pagés (2004). Law and employment: Lessons from Latin America and the Caribbean. NBER.
- International Labor Organization (2003). Final report of the 17th international conference of labour statisticians. Geneva: International Labor Organization.
- Levy, S. (2007). ¿Pueden los programas sociales disminuir la productividad y el crecimiento económico? Una hipótesis para México. *El Trimestre Económico*, 74(3):491–540.
- Lewis, W. (1972). Reflections on unlimited labor. In DiMarco, L., editor, *International Economics and Development: Essays in Honor of Raul Prebisch*, pages 75–96. New York: Academic Press.
- Magnac, T. (1991). Segmented or competitive labor markets. *Econometrica*, 59(1):165–87. Econometric Society.
- Maloney, W. F. (1998). Are LDC labor markets dualistic? The World Bank.
- Maloney, W. F. (1999). Does informality imply segmentation in urban labor markets? Evidence from sectorial transitions in Mexico. *World Bank Economic Review*, 13:275–302.
- Maloney, W. F. (2004). Informality revisited. *World Development*, pages 1159–1178.
- Moser, C. (1978). Informal sector or petty commodity production: dualism or dependence in urban development? *World Development*, 6(9-10):1041–1064.
- Perry, G., Maloney, W., Arias, O., P., F., Mason, A., and J., S.-C. (2007). Informality: Exit and exclusion. World Bank Publications.
- Portes, A. (1995). *En torno a la informalidad: ensayos sobre teoría y medición de la economía no regulada*. México DF: Editorial Porrúa.
- Pratap, S. and Quintin, E. (2006). Are labor markets segmented in developing countries? A semiparametric approach. *European Economic Review*, 50(7):1817–1841. Elsevier.
- Programa Regional de Empleo para America Latina (1985). Más allá la crisis. Santiago de Chile: International Labor Office.
- Rauch, J. (1991). Modelling the informal sector formally. *Journal of Development Economics*, 35(1):33–47.



Table 1  
 Informality by working condition

	<b>Informality rate</b>	<b>Formality rate</b>	<b>Total</b>
<b>Wage earners</b> (68% of all workers)	37.4%	62.6%	100%
<b>Self-employed workers or employers</b> (26% of all workers)	81.1%	18.9%	100%
<b>Total</b>	45.8%	54.2%	100%

Source: ENOE, INEGI, fourth quarter of 2014. The sample is restricted to urban workers who live in localities with 15,000 or more inhabitants and declare receiving a monetary payment for their job. See Section 3 for the definition of informality.

Table 2  
Informality by gender, age, sector of activity and working hours among urban workers

	Percentage informal	Percentage formal	Total
<b>Gender</b>			
Male	44.5%	55.5%	100%
Female	47.7%	52.3%	100%
<b>Age group</b>			
16-22	58.0%	42.0%	100%
23-35	39.9%	60.1%	100%
36-50	43.0%	57.0%	100%
51 and older	52.7%	47.3%	100%
<b>Sector of activity</b>			
Primary activities	68.4%	31.6%	100%
Mining	4.9%	95.1%	100%
Manufacturing	27.9%	72.1%	100%
Construction	71.7%	28.3%	100%
Trade	52.5%	47.5%	100%
Restaurants and accomodation	62.9%	37.1%	100%
Transport and communications	51.0%	49.0%	100%
Professional and financial services	29.8%	70.2%	100%
Social services	16.4%	83.6%	100%
Various services	79.6%	20.4%	100%
Government and international organizations	12.5%	87.5%	100%
<b>Hours worked</b>			
Less than 30 hours per week	78.5%	21.5%	100%
30 or more hours per week	39.3%	60.7%	100%
35 or more hours per week	38.4%	61.6%	100%

Source: ENOE, INEGI, fourth quarter of 2014. The sample is restricted to urban workers who live in localities with 15,000 or more inhabitants and declare receiving a monetary payment for their job. See Section 3 for the definition of informality.

Table 3  
 Characteristics of urban workers

<b>Variables</b>	<b>Informal workers</b>	<b>Formal workers</b>	<b>All workers</b>
<b>Male (%)</b>	58.6%	61.7%	60.3%
<b>Mean age (years)</b>	39.9	38.7	39.3
<b>(s.d.)</b>	(14.7)	(12.3)	(13.4)
<b>Years of schooling (distribution)</b>			
No schooling	3.7%	0.6%	2.0%
Between 1 and 3	6.0%	1.4%	3.5%
Between 4 and 6	22.4%	9.0%	15.1%
Between 7 and 9	32.5%	23.9%	27.8%
Between 10 and 12	22.5%	28.1%	25.5%
13 or more	12.9%	37.1%	26.0%
<b>Married (%)</b>	59.1%	63.3%	61.4%

Source: ENOE, INEGI, fourth quarter of 2014. The sample is restricted to urban workers who live in localities with 15,000 or more inhabitants and declare receiving a monetary payment for their job. See Section 3 for the definition of informality.

Table 4  
 Characteristics of urban male workers in the selected sample

Variables	Mean values		
	Informal workers	Formal workers	All workers
<b>Age (years)</b>	39.9 (10.4)	39.0 (10.2)	39.4 (10.3)
<b>Years of schooling (distribution)</b>			
No schooling	2.7%	0.5%	1.5%
Between 1 and 3	5.1%	1.5%	3.0%
Between 4 and 6	23.5%	10.6%	16.1%
Between 7 and 9	35.1%	28.6%	31.4%
Between 10 and 12	21.4%	27.8%	25.1%
13 or more	12.3%	31.1%	23.0%
<b>Married (%)</b>	73.0%	76.3%	74.9%
<b>Head of household (%)</b>	67.4%	70.8%	69.3%
<b>Number of males in hh</b>	2.3 (1.2)	2.2 (1.1)	2.3 (1.2)
<b>Number of members in hh</b>	4.4 (2.0)	4.2 (1.7)	4.3 (1.9)
<b>Number of members in hh younger than 5</b>	0.4 (0.7)	0.4 (0.7)	0.4 (0.7)
<b>Number of members in hh older than 60</b>	0.3 (0.6)	0.2 (0.5)	0.2 (0.5)
<b>Access to social security (%)</b>	25.6%	43.1%	35.6%
<b>Average education of females in hh</b>	8.8 (3.7)	10.7 (3.7)	9.9 (3.8)
<b>Number of observations</b>	19,402	28,667	48,069

Source: ENOE, INEGI, fourth quarter of 2014. Standard deviation in parenthesis. The sample is restricted to male urban workers aged 23 to 60, who live in localities of 15,000 or more inhabitants and declare receiving a monetary payment for their job. The sample excludes workers who do not report income, those that report an income of zero, and the top and bottom 1 percent of the labor income distribution. See Section 3 for the definition of informality. The dummy variable “Access to social security institutions” indicates if the individual lives in a household where at least one member, other than himself, has access to social security institutions as labor benefit.

Table 5

## Maximum Likelihood Estimation Results

Model of self-selection into the formal (vs. informal) sector with an entry barrier

Variables	(1)	(2)	(3)	(4)	(5)
Age	0.0257*** (0.00636)	-0.00326 (0.00597)	-0.00490 (0.00662)	0.0104* (0.00610)	0.00517 (0.00697)
Age squared	-0.000279*** (7.83e-05)	-2.40e-06 (7.21e-05)	3.43e-05 (7.93e-05)	-0.000191*** (7.39e-05)	-0.000118 (8.37e-05)
<b>Years of schooling (dummies)</b>					
Between 1 and 3	0.295*** (0.0682)	0.267*** (0.0665)	0.235*** (0.0718)	0.261*** (0.0678)	0.243*** (0.0738)
Between 4 and 6	0.536*** (0.0599)	0.493*** (0.0585)	0.439*** (0.0633)	0.465*** (0.0594)	0.442*** (0.0650)
Between 7 and 9	0.992*** (0.0612)	0.914*** (0.0592)	0.808*** (0.0636)	0.874*** (0.0593)	0.822*** (0.0650)
Between 10 and 12	1.421*** (0.0688)	1.307*** (0.0647)	1.129*** (0.0681)	1.261*** (0.0624)	1.170*** (0.0685)
13 or more	1.967*** (0.0997)	1.780*** (0.0826)	1.456*** (0.0805)	1.723*** (0.0720)	1.542*** (0.0776)
Married		0.250*** (0.0223)	0.131*** (0.0267)	0.271*** (0.0227)	0.199*** (0.0287)
Head of household		0.176*** (0.0219)	0.181*** (0.0240)	0.259*** (0.0227)	0.260*** (0.0256)
Number of males in hh		-0.0130 (0.00951)	-0.00452 (0.00973)	-0.0189* (0.00986)	-0.0113 (0.0104)
Number of members in hh		0.00425 (0.00674)	-0.0118 (0.00725)	-0.0308*** (0.00709)	-0.0394*** (0.00788)
Number of members in hh younger than 5		-0.0401*** (0.0122)	-0.0229* (0.0125)	-0.00418 (0.0126)	0.00260 (0.0134)
Number of members in hh older than 60		-0.0417*** (0.0153)	-0.0202 (0.0176)	0.00371 (0.0158)	0.0108 (0.0188)
Average education of females in hh			0.0337*** (0.00273)		0.0224*** (0.00270)
Access to social security				0.523*** (0.0232)	0.470*** (0.0242)
Constant	-1.685*** (0.141)	-1.213*** (0.132)	-1.286*** (0.144)	-1.493*** (0.136)	-1.470*** (0.152)
Region dummy	✓	✓	✓	✓	✓
Observations	48,069	48,069	41,320	48,069	41,320
$\delta$	0.866*** (0.016)	0.914*** (0.017)	0.929*** (0.018)	0.903*** (0.011)	0.903*** (0.012)
1- $\delta$	0.134*** (0.016)	0.086*** (0.017)	0.071*** (0.018)	0.097*** (0.011)	0.097*** (0.012)
Involuntary informal workers/ Informal workers	22.77%*** (3.14%)	13.93%*** (3.01%)	11.79%*** (3.28%)	15.90%*** (2.04%)	16.57%*** (2.26%)

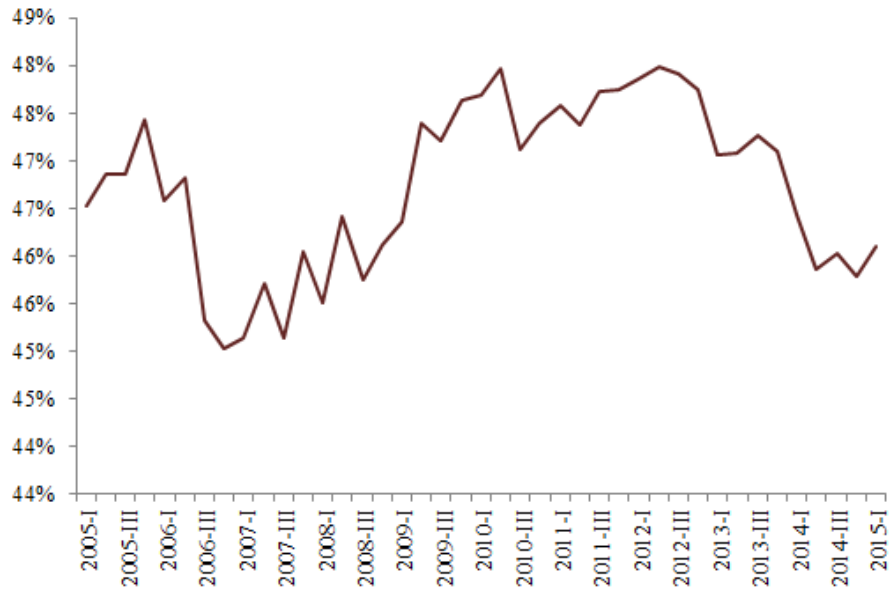
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors in parenthesis. Source: ENOE, INEGI, fourth quarter of 2014. The sample is restricted to male urban workers aged 23 to 60, who live in localities of 15,000 or more inhabitants and declare receiving a monetary payment for their job. The sample excludes workers who do not report income, those that report an income of zero, and the top and bottom 1 percent of the labor income distribution. See Section 3 for the definition of informality. The dummy variable "Access to social security institutions" indicates if the individual lives in a household where at least one member, other than himself, has access to social security institutions as labor benefit. The coefficients represent the effect of each variable in the individual's preference for the formal sector.  $\delta$  is the probability of obtaining a formal job for a worker who prefers a job in the formal sector.

Table 6  
Estimated Percentage of Involuntary Informal Workers

	(1)	(2)	(3)	(4)	(5)
<b>Whole sample</b>					
Involuntary informal workers / Informal workers	22.77%*** (3.14%)	13.93%*** (3.01%)	11.79%*** (3.28%)	15.90%*** (2.04%)	16.57%*** (2.26%)
<b>Wage earners</b>					
Involuntary informal workers / Informal workers	17.99%*** (3.11%)	13.10%*** (2.85%)	12.10%*** (3.11%)	16.61%*** (2.04%)	17.47%*** (2.27%)
<b>Individuals who work 30 or more hours per week</b>					
Involuntary informal workers / Informal workers	24.88%*** (2.65%)	18.92%*** (2.62%)	16.86%*** (2.78%)	17.30%*** (2.02%)	18.36%*** (2.16%)
<b>Individuals who work 35 or more hours per week</b>					
Involuntary informal workers / Informal workers	25.48%*** (2.62%)	20.44%*** (2.56%)	18.51%*** (2.72%)	18.27%*** (2.02%)	19.47%*** (2.14%)
<b>Whole sample plus male workers who report being workers without monetary payment</b>					
Involuntary informal workers / Informal workers	21.06%*** (3.36%)	11.64%*** (3.13%)	8.94%*** (3.42%)	14.48%*** (2.03%)	14.98%*** (2.24%)

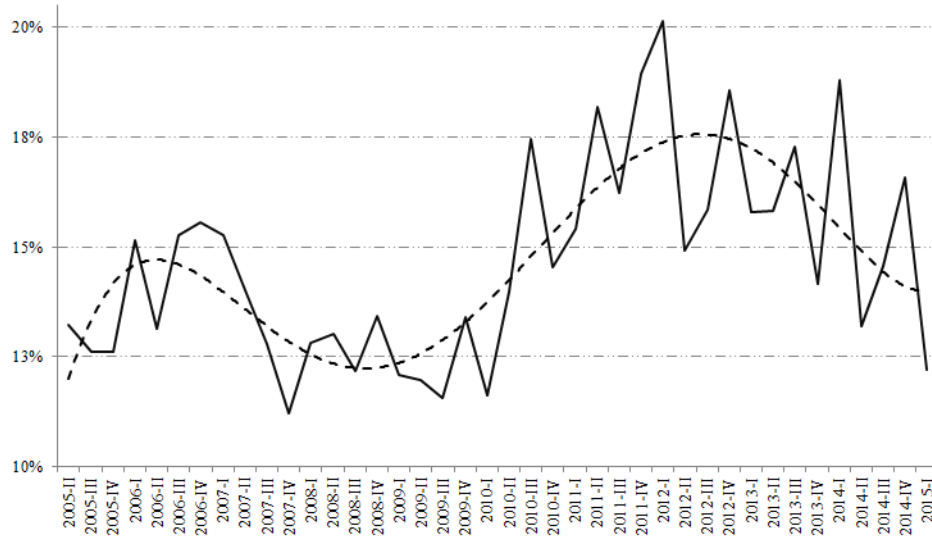
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors in parenthesis. Source: ENOE, INEGI, fourth quarter of 2014. The columns in this Table correspond to the specifications shown in Table 5. The sample is restricted to male urban workers aged 23 to 60, who live in localities of 15,000 or more inhabitants and declare receiving a monetary payment for their job (except for the last panel where we include those that specifically reported not receiving monetary income). In all cases the sample excludes workers who, although they declare receiving a monetary payment for their job, do not report income or report an income of zero, and the top and bottom 1 percent of the labor income distribution. See Section 3 for the definition of informality.

Figure 1  
Urban Informality Rate



Source: ENOE, INEGI, 2005-2015. The sample is restricted to urban workers who live in localities of 15,000 or more inhabitants and declare receiving a monetary payment for their job. See Section 3 for the definition of informality.

Figure 2  
 Estimated Fraction of Involuntary Informal Workers



Source: ENOE, INEGI, 2005-2015. The sample for each period is restricted to male urban workers aged 23 to 60, who live in localities of 15,000 or more inhabitants and declare receiving a monetary payment for their job. The sample for each period excludes workers who do not report income, those that report an income of zero, and the top and bottom 1 percent of the labor income distribution. The graph shows the evolution of the estimated fraction of involuntary informal workers to informal workers that corresponds to the estimation of column 5 in 5 for each period. See Section 3 for the definition of informality.