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A evolução da precariedade nos mercados de trabalho regionais no Brasil e no México: uma abordagem a partir da análise de componentes principais e de dados em painel

The evolution of precariousness in regional labor markets in Brazil and Mexico: an approach based on the analysis of main components and panel data

La evolución de la precariedad en los mercados laborales regionales en Brasil y México: un enfoque basado en el análisis de los principales componentes y datos de panel

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RESUMO

O objetivo deste artigo é avaliar como a precariedade nos mercados de trabalho regionais do Brasil e do México evoluiu entre 2012 e 2017 e quais foram os fatores que impactaram sua incidência. Para atingir este objetivo foi proposto um índice de precariedade do mercado de trabalho construído através da análise de componentes principais. Este índice foi utilizado para ver como a precariedade evoluiu nos mercados de trabalho regionais de ambos os países e também como uma variável dependente em um modelo de efeitos fixos *two-way*, usado para avaliar se as condições dos mercados de trabalho, suas estruturas e o sistema de regulação do trabalho influenciam o nível de precariedade. Os resultados para o índice mostram que a precariedade cresceu nos estados do México e caiu nos estados do Brasil no período, em geral. O principal motivo para este resultado pode ter sido a reforma trabalhista mexicana de 2012, uma vez que mesmo com as condições do mercado de trabalho mais desfavoráveis no Brasil, a manutenção de uma legislação trabalhista protetiva pode ter contido o avanço da precarização.

PALAVRAS-CHAVE: precariedade do mercado de trabalho; análise de componentes principais; efeitos-fixos *two-way*

ABSTRACT

This paper aims to evaluate how the labor precariousness evolved in Brazil and Mexico between 2012 and 2017 and what were the factors impacting its incidence. To accomplish this objective, we propose a labor precariousness index constructed through principal component analysis. The index was used to assess how labor precariousness evolved in both countries and as a dependent variable of a time-fixed effects model, used to assess whether labor market conditions, labor market structure and the system of labor regulation influences the level of precarity. The results for the index show that precariousness has risen in Mexico and decreased in Brazil and that the main reason may be the 2012 Mexican labor reform, given that even though Brazilian labor Market conditions were worse, the maintenance of a protective labor legislation may have counteracted the process of precarization.

KEYWORDS: Labor market precariousness. Principal component analysis. Time-fixed effects.

RESUMEN
El objetivo de este artículo es evaluar cómo evolucionaron los precarios mercados laborales regionales en Brasil y México entre 2012 y 2017 y qué factores influyeron en su incidencia. Para lograr este objetivo, se propuso un índice de precariedad del mercado laboral, basado en un análisis de los principales componentes. Este índice se utilizó para verificar cómo ha evolucionado la precariedad en los mercados laborales regionales de ambos países y también como variable dependiente en un modelo bidireccional de efectos fijos, utilizado para evaluar si las condiciones de los mercados laborales, sus estructuras y el sistema de regulación laboral influyen en el nivel de precariedad. Los resultados del índice muestran que la precariedad creció en los estados de México y disminuyó en los estados de Brasil en el período, en general. La razón principal de este resultado puede haber sido la reforma laboral mexicana de 2012, ya que incluso con las condiciones más desfavorables del mercado laboral en Brasil, el mantenimiento de la legislación laboral protectora puede haber contenido el avance de la precarización.

PALABRAS CLAVE: precariedad del mercado laboral; análisis de los principales componentes; efectos fijos bidireccionales.

INTRODUCTION

The dismantling of the “standard employment relationship” in Europe in the last quarter of the twentieth century drew attention to the topic of precarious labor growth in advanced countries. Yet, if one looks at the historical development of Latin American labor markets, one can see that precarious forms of labor have always been the standard, not the exception. For this reason, although it can be argued in favor of the existence of a general concept of precarious work, the process of precariousness, that is, the movement that inserts workers into precarious labor relations has different starting points in Latin America and Europe, and the process itself unfolds differently between these regions.

The purpose of this paper is to answer the following questions: what explains the incidence of precarious work in the labor markets and how these mechanisms impact the precariousness level in Brazil and Mexico between 2012 and 2017? Brazil and Mexico are the two largest economies in Latin America and, in the 2000s, followed opposite paths in terms of economic policy options. In 2012, Mexico undertook a labor reform in the spirit of regulating new forms of hiring, making hiring and firing more flexible and reducing labor costs. In this sense, the Mexican reform and how it impacted the

country's labor market during these years can be used as a predictor of the possible consequences of the 2017 Brazilian labor reform, as it had the same spirit as the Mexican one.

A labor market precariousness index has been proposed for two reasons. First, the fact that precariousness is not directly measured and is a multidimensional phenomenon makes it necessary to summarize the idea into one value. This objective is achieved through the principal component analysis (PCA), to reduce the set of variables that make up the concept of precarious labor market by a single value, which will be referred to as the "labor market precariousness index." The advantage of this approach is that it allows one to answer the issue of labor market precariousness in a multidimensional way, without having to define whether a worker is precarious in case they have at least one, some or all of the dimensions of precariousness. The second reason is its use in the two-way fixed effects model aiming to test the hypothesis of the mechanisms affecting the incidence of precarious work. The idea of this model is to analyze whether labor market conditions, its structure and changes in the labor regulation system impact precariousness in the country.

The article contains the following sections, in addition to this introduction. Section 1 reviews the factors behind the expansion of precarious work in Europe and why they are not fully adequate to understand the reality of Latin American labor markets. Rodgers' (1989) definition of precarious work was used and the main factors that led to the growth and incidence of precarious work in specific national contexts were reviewed, largely based on the study by Rubery (1989). Section 2 analyzed how these factors acted in the Brazilian and Mexican labor markets during the 2012-2017 period to build the assumptions about whether precariousness had increased or decreased in these countries. Section 3 provides a literature review of labor market precariousness indices, describes the construction of the index proposed in the article, and the methodology for the two-way fixed effects model. Then, the behavior of the index for the regional labor markets of both countries is shown and the hypotheses about which factors influence precariousness through the econometric model are tested. The paper is finished by means of conclusions.

1 PRECARIOUS LABOR: DEFINITION AND HYPOTHESES ON THE CAUSES

The concept of “precarious work” is commonly constructed as an opposition to the idea of “standard employment relationship.” The standard employment relationship (SER) – or, more broadly, the labor regulation system – emerged in the post-war period, as a response to workers' struggles for better living and working conditions and the political and economic transformations that have taken place in advanced countries, especially in Western Europe (CASTEL, 1998). The SER is characterized by a full-time and continuous employment relationship, where the employee used to have, throughout their career, only one employer who worked under their direct supervision, having access to a wide range of benefits and rights (VOSKO, 2010).

The set of labor regulations that defined the SER were developed under the protection of legislation or collective agreements and incorporated a degree of regularity and durability into employment relationships. These laws protected workers from socially unacceptable working practices and conditions, establishing rights and obligations and ensuring a core of social stability that endorsed economic growth (Rodgers 1989). The shaping of this social protection landscape ensured the availability of safe jobs with reasonable remuneration, which led to the stability of the advanced capitalist world in the mid-twentieth century (KALLEBERG; VALLAS, 2017).

In the 1970s, the SER began to fall apart (GLYNN, 2006). The causes of this process can be summarized in three sets of explanatory factors: i) financialization; ii) globalization and productive restructuring; iii) neoliberalism (STREECK, 2013). Financialization can be understood as the imposition of a speculative and short-term logic among economic agents – whether firms or families. The most prominent facet of this logic in firms is the emergence of the concept of shareholder value maximization (LAZONICK; O'SULLIVAN, 2000), which has diminished the value passed on to other agents who relate to firms, particularly workers. This gradually exposed the workforce to the risks of outsourcing and mass layoffs, as these strategies resulted in stock value growth (O'SULLIVAN, 2001; JACOBY, 2005). In other words, the durability of

employment relationships has been undermined by these strategies aimed at increasing shareholder value.

The processes of globalization and productive restructuring have increased the threat of joblessness for workers in three ways: the ability of advanced country firms to reallocate their production plants globally has posed a permanent threat for workers to move their jobs to other parts of the planet; the technological revolution made work highly replaceable and made it possible to redefine workers as independent contractors who could take risks previously taken by firms (KALLEBERG; VALLAS, 2017); and behind these two was the ideology of lean firms (Gordon, 1996), where reducing labor costs was indispensable for the firm to compete in this new scenario of intensified intercapitalist competition. Lastly, neoliberalism has emerged as the main political and economic ideology within power spaces and decision-making centers, advocating for a more market-oriented economy and more flexible labor markets. This culminated in a series of laws that sought to extend employer power over the allocation, use, and remuneration of the workforce through the regulation of flexible forms of work and the destruction of workers' organization protection (KALLEBERG; VALLAS, 2017), unbalancing the balance in favor of capital and over labor.

The "precariousness process" can be defined with this SER dismantling process that began in the last quarter of the twentieth century. This meant the growth of “nontypical” forms of work and, at the same time, the increased feeling of insecurity in the employment relationships felt by workers. The characteristics of this period of employment relationships are the low degree of certainty of continuity at work, since the risk of job loss is high; workers' lack of control over their own work, as the balance of power shifted favorably to the employer; reducing the extent to which workers are protected by law, collective organization or customs; falling wages and the rise of low-paying jobs, associating the working class with poverty and insecure social insertion (Rodgers 1989).

Thus, the panorama of post-war construction regulation in Western European countries and its subsequent erosion underlies the concept of precarious labor usually present in the literature. Nevertheless, the case of Latin American countries differs from

the situation of European countries. On one hand, European countries underwent a precarious process in the neoliberal period in the sense that they constituted a well-regulated labor market that has since been dismantled. On the other hand, Latin American countries did not completely constitute their social protection web (HAGGARD; KAUFMAN, 2008; CRUZ-MARTÍNEZ, 2014).

In other words, Latin American labor markets have always been "precarious" in some sense, conforming to some precarious structural characteristics such as low wages, lack of social protection and high informality. For this reason, it is important to analyze the adequacy of the process of precariousness as occurred in Europe in the contexts and social configurations of Latin American countries, where social protection and welfare did not become historical guarantees of state policies (VEJAR, 2017). The factors mentioned above also affected working conditions. Nonetheless, while in Europe they meant the dismantling of SER, in Latin America they meant the worsening of an already unstructured labor market characterized – among other things – by the prevalence of precarious work (VEJAR, 2014).

Thereby, a more general concept of precariousness was sought that could go beyond the idea of precariousness for workers who lost a set of rights and benefits in the context of SER to embrace multiple employment relationships with the characteristics proposed by Rodgers (1989), which could lead to insecurity and instability, regardless of the social and labor protection landscape, thus being adequate to understand precarious work in Latin America.

The growth and incidence of precarious work have not been homogeneous among countries, requiring recognition of the national specificity of the phenomenon (RUBERY; 1989; MEARDI, 2014). In this paper, we considered three main drivers of the process of constitution and precariousness in the labor market that should be "general", in that they are adequate both to understand the reality of the countries that constituted the SER and those that did not. The first is labor market conditions, mainly related to the labor supply relative to demand, with precariousness increasing in two situations. In a context of high labor supply and stagnant demand – due to economic or demographic conditions – growth and persistent unemployment would weaken the

bargaining power of job seekers, increasing employers' ability to provide precarious jobs. Another situation could be in a context of high demand for labor force with scarcity of labor supply in a low wage economy. In this case, workers would be able to hold multiple jobs to supplement their own income. In this situation, precariousness arises not only because secondary jobs are mostly more precarious, but also because long hours are also a feature of precariousness.

Labor market structure also plays an important role in determining the creation and incidence of precarious work. One can think – from the theory of labor market segmentation (FINE, 2002; FERNÁNDEZ-HUERGA, 2010) – in a labor market segmented in two sectors. The primary sector comprises capital-intensive, high-productivity, oligopolized firms that are capable of paying high wages and better working conditions, while in the secondary sector smaller, low-scale, labor-intensive firms offer less attractive and more insecure jobs, which are more subject to precariousness. However, precarious jobs are not confined to the secondary sector alone. The conformed domestic primary labor markets also create a hierarchical structure where firms maintain a protected core of high-skilled workers – mainly white-collar workers – while retaining a periphery of low-skilled factory floor workers that can be adapted to production needs, increasing insecurity among workers. Thus, this dual process of increasing polarization due to labor market segmentation and maintaining a reserve of low-skilled workers weakens workers' bargaining power and increases labor flexibility, which leads to precarious job creation (KALLEBERG, 2009; KALLEBERG, 2011; VALLAS; PRENER, 2012).

Last but not least, the last aspect to be considered is the institutional panorama of the labor market and how the labor regulation system is built. The regulatory system will shape the definition of precarious work and distinguish between precarious and non-precarious employment. Moreover, two aspects of the institutional landscape must be considered: the role of the state both as employer – providing precarious or non-precarious jobs – and as a legislator, impacting on the format of the regulatory system; and the role of workers' collective organization, as a means of balancing the balance

against the expansion of precarious labor in the struggle between capital and labor (Rodgers 1989).

In conclusion, Rodgers' (1989) definition of labor market precariousness dimensions will be used as the low certainty of the continuity of the employment relationship, lower worker control of their working conditions, wages and work rate, lack of social protection, generally expressed as lack of access to social security, and insufficient remuneration, relative to a historically and socially determined minimum amount able to ensure decent living conditions. This set of dimensions can be immediately extended to the concept of “precarious labor market”, which consists of a labor market with the prevalence of workers with combinations of these dimensions and in which workers entering this labor market are more likely to insert themselves precariously.

The following section analyzes how these three drivers were developed in Brazil and Mexico between 2012 and 2017. The objective is to formulate hypotheses about how precariousness must have evolved in these countries by analyzing the precarious drivers in this period.

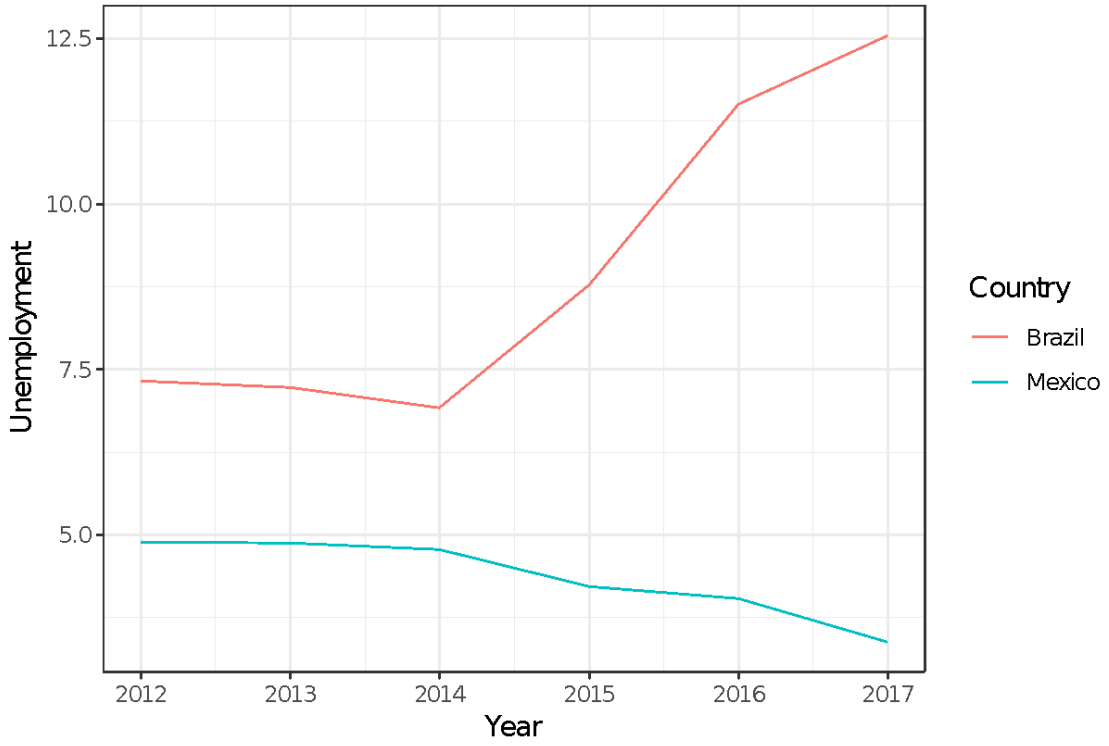
2 LABOR MARKET CONDITIONS AND THE LABOR REGULATION STRUCTURE AND SYSTEM IN BRAZIL AND MEXICO

Brazil and Mexico have taken different paths in terms of economic policy and their subsequent labor market outcomes. While Brazil has opted for more economic and social development-oriented policies, Mexico has adopted conservative economic policies. The consequences for these countries were falling unemployment and inequality in Brazil, with rising real wages, and the stagnation of Mexican labor market indicators (SALAS; SANTOS, 2011).

In the previous section, the theoretical framework shown affirms that both the conditions and the structure of the labor market, along with the labor regulation system, should be analyzed to understand how precariousness develops in a country. In this way,

this section will discuss how these drivers evolved in the countries along the period, to formulate hypotheses about how precariousness developed.

Between 2012 and 2017, Brazil and Mexico faced different labor market conditions, mainly due to differences in economic growth. Brazil experienced a decline



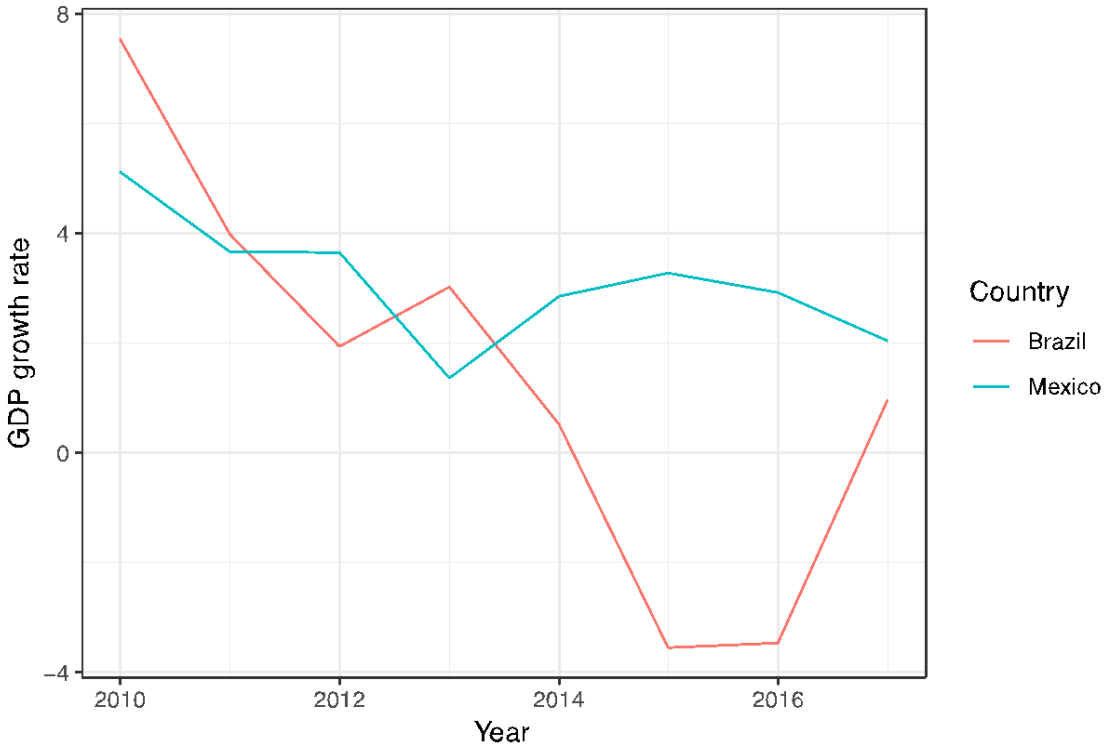
in its economic growth, facing two years of recession, while Mexico maintained its growth rate at around 3% per year (Chart 1).

Graph 1 – GDP growth rate: 2010-2017 (%)

Source: World Development Indicators (WDI)

These differences in growth rate have translated into different situations in terms of unemployment rate. The economic crisis has made the unemployment rate in

Brazil grow sharply, from around 7% in 2012 to 12.5% in 2017. In Mexico, on the other hand, unemployment remained at low levels, below 5%, and even falling to 3.3% in 2017 (Graph 2).



Graph 2 – Unemployment Rate: 2010-2017 (%)

Source: National Occupation and Employment Survey (ENOE) for Mexico and National Household Sample Survey (PNAD) for Brazil

Analysis based only on growth and unemployment rates may lead to misleading conclusions, implying that precariousness would find a more fertile soil to flourish in Brazil than in Mexico in the period under review. Nevertheless, the labor market structure and labor regulation system of both countries must be taken into account before further conclusions can be drawn.

For example, Mexico's low unemployment rates hide the fact that the absence of unemployment insurance induces individuals to constantly be looking for an occupation, especially on their own or in microenterprises (SALAS, 2002; GARCÍA; SALAS, 2007). For this reason, it is also important to analyze the structure of the labor market, especially in relation to firm size and self-employment.

Under the theory of labor market segmentation, the "secondary sector" would be one composed of microenterprises (with five or fewer employees) and self-employed workers. Although it cannot be assumed directly that all self-employed or micro-workers are precarious, the high incidence of workers in this situation is evidence for a growing precariousness of the labor market. This will be contrasted with salaried workers in large firms, which would constitute the “primary sector” of segmented labor markets.

Brazil and Mexico share the characteristic of having a significant presence of self-employed workers and micro-enterprises. Approximately one in four workers in each country was self-employed in 2012. Yet, the proportion of self-employed workers in Brazil has grown by 2.6 pp since then, while the proportion of self-employed in Mexico has fallen slightly, although the number of workers in this condition has grown (Table 1). In this sense, self-employment has remained an important strategy for opposing unemployment in both Brazil and Mexico.

Similarly, both countries have always had a large proportion of their salaried employees employed in microenterprises. Almost 20% of Brazilian wage-earners and 25% of Mexicans were in firms with five or fewer employees between 2012 and 2017. The recent trend in microenterprise employment has followed a similar path to self-employment: while in the Brazilian labor market worker participation in microenterprises increased, this figure has been reduced in Mexico in proportionate

terms, even though the number of micro-employee salaried workers has grown in the country (Table 1).

Table 1 – Number and proportion of workers by labor market segment: 2012/2017

	2012			
	Brazil		Mexico	
	Count	Proportion	Count	Proportion
Wage-earners in large enterprises	47,370,760	56.85	19,860,280	47.83
Wage-earners in microenterprises	15,472,476	18.57	10,705,539	25.78
Autonomous workers	20,488,207	24.59	10,953,816	26.38
Total	83,331,443	100.00	41,519,635	100.00
	2017			
	Brazil		Mexico	
	Count	Proportion	Count	Proportion
Wage-earners in large enterprises	45,223,562	53.22	22,367,748	49.29
Wage-earners in microenterprises	16,640,849	19.58	11,598,910	25.56
Autonomous workers	23,105,400	27.19	11,412,437	25.15
Total	84,969,811	100.00	45,379,095	100.00

Source: National Occupation and Employment Survey (ENOE) for Mexico and National Household Sample Survey (PNAD) for Brazil

In conclusion, in Brazil, the economic downturn has led to rising unemployment, which has led workers to look for alternatives to self-employment and microenterprise unemployment. In the meantime, the stagnation of the Mexican economy has allowed little change in the country's labor market structure. However, it is necessary to further investigate the structure of the labor market to see the different conditions under which Brazilian and Mexican workers are inserted in the context of segmented labor markets. The distinction between “primary” and “secondary” sectors is used for analytical purposes. But while precariousness is indeed pervasive in the “secondary” sector, it is also present in the “primary” sector. For the sake of simplicity, three categories of workers are considered: self-employed and wage-earners in micro-enterprises representing those in the “secondary” sector, wage-earners workers in large enterprises representing the “primary” sector.

In general, among those in self-employment and micro-enterprises there is a prevalence of workers possessing at least one of the characteristics that defines precarious work as mentioned above. In other words, labor market structures with a high presence of self-employment and microenterprises are commonly more precarious labor markets. For this analysis, only three dimensions of precariousness were considered: lack of access to social security; nontypical working hours; and insufficient income. Despite demonstrating the highest degree of precariousness of self-employment and microenterprises, the analysis of the structure of the labor market alone is insufficient, due to the different composition of precarious workers in each country, requiring an overview of the work system regulation to fill the gaps.

In terms of access to social security, Brazil and Mexico face different realities. Most of the working population in Brazil has access to social security, while few Mexican workers have. Even so, the division between “primary” and “secondary” sectors shows that, in both countries, workers in the “secondary” market have less access to social security, which is the worst situation in Mexico (Table 2).

Table 2 – Proportion of workers by access to social security: 2012/2017

	2012			
	Brazil		Mexico	
	With access	Without access	With access	Without access
Wage-earners in large enterprises	88.56	11.44	75.07	24.93
Wage-earners in microenterprises	40.88	59.12	8.96	91.04
Autonomous workers	23.74	76.26	0.22	99.78
Total	63.77	36.23	38.16	61.84
	2017			
	Brazil		Mexico	
	With access	Without access	With access	Without access
Wage-earners in large enterprises	90.04	9.96	76.41	23.59
Wage-earners in microenterprises	44.03	55.97	7.95	92.05
Autonomous workers	30.29	69.71	0.13	99.87
Total	64.78	35.22	39.65	60.35

Source: National Occupation and Employment Survey (ENOE) for Mexico and National Household Sample Survey (PNAD) for Brazil

Similarly, Brazilian workers seem to be better off in terms of hours, with more people working on typical hours (between 40 and 48 hours per week). Wage-earning workers in Brazil use to work within the standard working hours, but the proportion of

those in large companies is higher. On the other hand, Autonomous workers often have nontypical hours. In the Mexican "secondary" sector, nontypical hours are quite present, with a significant proportion of micro-enterprise wage-earning workers working fewer than 40 and more than 48 hours per week (Table 3).

Table 3 – Proportion of workers by hours worked per week: 2012/2017

	2012			
	Brazil		Mexico	
	Nontypical	Typical	Nontypical	Typical
Wage-earners in large enterprises	30.36	69.64	47.08	52.92
Wage-earners in microenterprises	48.54	51.46	65.60	34.40
Autonomous workers	58.44	41.56	76.35	23.65
Total	40.64	59.36	59.63	40.37
	2017			
	Brazil		Mexico	
	Nontypical	Typical	Nontypical	Typical
Wage-earners in large enterprises	23.80	76.20	44.80	55.20
Wage-earners in microenterprises	41.78	58.22	65.43	34.57
Autonomous workers	54.36	45.64	75.36	24.64
Total	35.64	64.36	57.81	42.19

Source: National Occupation and Employment Survey (ENOE) for Mexico and National Household Sample Survey (PNAD) for Brazil

The situation is opposite in terms of income level. In Brazil, most of the population receives fewer than two minimum wages – with the situation being particularly negative for microenterprise workers – while in Mexico most workers receive more than twice the minimum wage, although the context is not favorable for microenterprise wage-earners and autonomous workers (Table 4).

Table 4 – Proportion of workers by salary level: 2012/2017

	2012			
	Brazil		Mexico	
	Fewer than 2 SM	More than 2 SM	Fewer than 2 SM	More than 2 SM
Wage-earners in large enterprises	63.60	36.40	29.02	70.98
Wage-earners in microenterprises	91.43	8.57	64.11	35.89
Autonomous workers	73.31	26.69	65.95	34.05
Total	71.14	28.86	48.14	51.86
	2017			
	Brasil		México	
	Fewer than 2 SM	More than 2 SM	Fewer than 2 SM	More than 2 SM
Wage-earners in large enterprises	63.17	36.83	35.14	64.86
Wage-earners in microenterprises	91.55	8.45	71.67	28.33
Autonomous workers	73.67	26.33	70.04	29.96
Total	71.58	28.42	53.71	46.29

Source: National Occupation and Employment Survey (ENOE) for Mexico and National Household Sample Survey (PNAD) for Brazil

Yet, two things need to be taken into consideration. First, Brazil has a minimum wage appreciation policy that has been responsible for the significant increase in its value over the past fifteen years. In Brazil, the minimum wage acts strongly as a "beacon", guiding the readjustment of other income and serving as a wage determination unit. Therefore, when analyzing the proportion of workers by wage level in terms of minimum wage, we note that most workers remain in the same wage range with reference to the minimum wage. Mexico, in turn, had stagnant minimum wages in the period. One thing to note is that in both countries self-employed and microenterprises are more likely to receive less than two minimum wages.

In general, the data show that microenterprises and autonomous work are the loci of precarious work, but are not restricted to them, with large companies covering a significant share of workers with precarious characteristics. In this sense, one can perceive a connection between labor market conditions and their segmentation and, further, the evolution of precariousness. Unfavorable labor market conditions drive workers to seek alternatives to wage employment in large – often less precarious – companies and push them into more precarious types of microenterprises and autonomous work. Therefore, an important aspect to investigate when trying to assess the evolution of precariousness in Latin American countries concerns the conditions of labor markets and how they are structured. From this, it is possible to estimate at first the likelihood of a new worker entering a precarious position in the labor market or the transition of an employee to a more precarious job.

Until then, the structure and conditions of the labor market in Brazil have revealed a path of higher unemployment rate along with the growth of precarious alternatives to it, especially autonomous work and microenterprises. On the other hand, the Mexican economy was able to maintain low unemployment rates, but with a worsening occupational structure towards more precarious forms of insertion. This can be explained by the last factor that determines the incidence of precarious work, which

is the labor regulation system. In this context, Brazil and Mexico are similar in two aspects. In the case of the state as an actor, that is, employing workers precariously or not, public jobs in both countries are generally not precarious, although outsourcing in the public sector has grown in recent years. Equally, both countries have faced a decrease in labor organization and collective bargaining recently, as a result of falling union rates.

The most important aspect to stand out is the role of the state as a legislator. This is especially important in assessing the impacts of the 2012 Mexican labor reform and how it can serve to predict the consequences of the 2017 Brazilian labor reform. Both reforms tend to precarious work because their changes affect workers in all four dimensions. The main difference is that Mexico reformed in 2012, so that its effects are already appreciable in the country's labor market, while in Brazil the reform began in late 2017 and data are not yet able to capture its effects completely. The hypothesis that is worked in this article is that Brazil will follow the Mexican path once the effects of its reform begin to be felt.

Reforms in both countries – directly or indirectly – affect the four dimensions that constitute precarious work, as changes in legislation have the prerogative to act on specific points that make workers immediately precarious. In addition, the underlying objectives of this type of reform are to reduce labor costs, relax hiring and firing conditions and increase participation in atypical forms of contract.

Introduce yourself – based on Romero (2016) for Mexico and Teixeira et al. (2017) for Brazil – how these labor reforms opened the possibility for precarious growth by highlighting how they affect labor market precariousness dimensions.

In terms of certainty of continuity of work, both reforms reduce it by regulating fixed-term forms of contract, such as testing periods and initial training contract in the case of Mexico, and the intermittent contract in Brazil. With regard to control over work, the regulation of multitasking in Mexico, that is, the possibility for employers to assign employees complementary tasks over their original job description reduces their control over work, while in Brazil the worker may lose out control by making your journey more flexible.

The biggest threat to the protection of workers in the Brazilian labor reform comes from the reduced role of the Labor Justice and the prevalence of negotiated over the legislated. In Mexico, on the other hand, the attack on workers' ability to protect themselves comes from new criteria for defining strikes as illegal. Finally, in both cases, the idea of reforms is to reduce wage costs, but specifically in Mexico, the reduction of overdue pay and sick leave, along with the possibility of hourly pay, are the biggest threats to wage reduction directly, while in Brazil, unstable income should come from the increased importance of variable wages, such as productivity pay and individual wage bargaining, which should make room for wage reduction through negotiation, supplanting collective agreements.

Analyzes of the conditions and structures of both countries' labor markets, as well as recent changes in their labor laws, give clues as to how precarious labor markets may have evolved over the period. Two sets of hypotheses will be tested using the labor market precariousness index and the temporary fixed effects model proposed in the next section. The first set of hypotheses to be tested is whether these three factors - labor market conditions, their structure and labor legislation - influence the precariousness of a given labor market. The second set of assumptions is that from 2012 to 2017, the Brazilian labor market did not become more precarious because, although labor market conditions and structure have worsened, labor legislation has been able to protect workers from precariousness. The effects of the 2012 Mexican labor reform, on the other hand, have already been manifesting in the country's labor market, making the working population precarious.

3 EMPIRICAL ANALYSIS

3.1 Literature Review

The literature regarding indices for measuring precariousness can be divided into two approaches. The first approach is that of simple sum. In this methodological current, the researcher first defines the variables that are part of the concept of precariousness.

Following this, they set thresholds for considering individuals as precarious and assigns new values to them (the value of 1 if the individual has the precarious characteristic, and 0 otherwise). Then, they generally fall into two extreme values for the index, where the individual is considered precarious if at least one or all of the characteristics are present simultaneously. This can be achieved either by summing the values, so the index ranges from 0 – no precarious characteristics – ak, where k is the number of precariousness dimensions considered, or by multiplying the values, which generates a binary index (1, if precarious, 0, otherwise).

The rationale for this approach is that it is not possible to satisfactorily weigh the importance of each dimension of precariousness. In other words, all variables must be equally important in explaining precariousness. Moreover, any form of weighting would be arbitrary. Comparative studies between indices constructed with simple or weighted sums did not find any significant differences in the way to measure precariousness in the same labor market (MORA, 2012), which would be a favorable argument for the adoption of the most parsimonious indicator.

Gallo (2003) proposes an "index" in its simplest form, that is, considering as precarious a worker who does not have access to social security and/or an employee on a fixed-term contract. With this binary indicator, the author was able to adjust a logistic regression to assess how socio-demographic and economic-productive factors affect precariousness in the Mar del Plata region of Argentina Campos (2010) separated precariousness into three dimensions – fixed-term contract, insufficient income and absence of protection – to construct a state-level index for Mexico between 1995 and 2010 that consisted of the sum of the proportion of workers with precarious characteristics in each state and their results showed that precariousness decreased across the Mexican states between 1996 and 2008 and grew in the 2009-2010 biennium, with the precariousness being higher in the less developed states of the south of the country.

Using a set theory approach, Olsthoorn (2014) proposes two integrated indicators for specific aspects of precarious employment: one for income insecurity (using wages, supplementary income and unemployment insurance as variables) and

another one for employment insecurity (using fixed-term contract and duration of unemployment as variables). His approach consists first of setting thresholds for each of the variables. Workers are deemed precarious with respect to income in case they are below the threshold for each of the characteristics, and the same is valid for precariousness with respect to employment. It then integrates both indicators to build a labor precariousness index for the Dutch labor market and tests its hypothesis by using probit templates.

Lastly, García-Pérez et al. (2017) propose a new methodology for measuring precarious employment using data from Spain between 2006 and 2010 with a multidimensional approach. They used precariousness as low wages, fixed-term contracts, and part-time work. They first set a threshold for each dimension, assigning 1 if the individual has the precarious characteristic, and 0 otherwise. Then they sum the values to construct a second threshold in two ways, that is, the individual will be precarious if they contain all the characteristics (index equal to three) or contain at least one of them (index equal to one). The rationale for this approach is that it allows measuring both the incidence – that is, how many precarious jobs there are – and the intensity – the average number of precarious dimensions – per group.

The second stream of literature deals with indices developed through a type of weighted sum. Similarly, the researcher must, at first, define the variables that make up the precariousness index. After that, they must set the weights. This can be done in two ways: it can be defined by some parameter already calculated – as the inverse of the population not containing that specific precarious characteristic, as in Mora (2012); or through factor analysis. In factor analysis, the factor weight of each variable with respect to some of the factors is used as weight. The assumption is that one or more factors represent precariousness as a latent variable and, therefore, factor weights can be seen as the correlation of that dimension with precariousness, thus allowing a less arbitrary and meaningful weighting.

Building a bridge between the two streams of literature, Mora (2012) analyzes some of the main methodological problems arising from the attempt to build a multidimensional precariousness index. Using Mexico's National Occupation and

Employment Survey for the second quarter of 2008, the author compares the results of three strategies for building a precariousness index. After defining the variables that are part of the index and the respective threshold, the author proposes three indices: one consisting of the arithmetic mean of the variables, another one using the inverse of the proportion of the working population that does not have the precarious characteristic as weight, and finally, a factorial analysis, with the factor weights being used as weights in constructing the index. The results for the indices were similar, which led the author to choose the simplest one (the arithmetic mean).

Similarly, Oliveira (2006) applies factor analysis to construct an index based on the factorial weight of each of the dimensions considered – all related to the degree of job security – in relation to the first statistical factor obtained to study the development of precarious employment among Mexican workers in the year 2000.

3.2 Methodology

The main objectives of this paper are to evaluate how labor market precariousness evolved in Brazil and Mexico between 2012 and 2017 and to test whether labor market conditions, its structure and labor law affect precariousness. The paper proposes a labor market precariousness index to provide a way to measure the incidence of precarious labor in aggregate terms, that is, how precarious a specific section of the labor market is. In this case, data will be considered at the state level (SALAS, 2014). The index will be constructed through principal component analysis (PCA). The PCA is a statistical technique that distributes the variation of a multivariate data set between components, allowing the explanation of the variability of the observed data through a small number of linear combinations (JOLLIFFE, 2011).

The problem is that “labor market precariousness” cannot be measured directly. Indeed, precariousness is a “very elusive, difficult to capture in survey questionnaires” concept (KIERSZTYN, 2017). Thus, it is assumed as a latent (unobservable) factor underlying a set of variables. In other words, the existence of an unobserved variable

named “labor market precariousness” is assumed, which consists of the explanatory variable of a series of observed indicators. (KOLENIKOV *et al.*, 2004).

These observed indicators, taken simultaneously, make up the definition of labor market precariousness. They need to meet two criteria to be considered in the composition: i) they need to be theoretically related to the latent variable; ii) they need to be highly correlated with each other. Then, it is necessary to evaluate the sample adequacy measure for the factor analysis for each variable in the model and for the complete model through the Kaiser-Meyer-Olkin (KMO) test. The KMO test returns values between 0 and 1, where values close to 1 indicate a more appropriate set of variables for factor analysis. (HAIR *et al.*, 2016).

After defining the *k* variables that will compose the index, compute the aggregate index at the state level. The index will be derived by using the PCA. By using these *k* variables, a vector of size *k* will be defined for each state of each country in period t = 1, where each coordinate is the proportion of the working population that contains the k^{th} characteristic previously defined, centered to zero mean and to variance equal to one. Then compute the correlation matrix A_k between the variables under analysis:

$$A_k = \begin{bmatrix} 1 & \rho_{12} & \dots & \rho_{1k} \\ \rho_{21} & 1 & \dots & \rho_{2k} \\ \vdots & \vdots & \ddots & \vdots \\ \rho_{k1} & \rho_{k2} & \dots & 1 \end{bmatrix}$$

All the elements of the main diagonal are equal to one – because the correlation of a variable with itself is equal to one – and the elements outside the main diagonal are the correlations between the variables. And by solving $det\ det\ (A_k - \lambda I) = 0$, I is the dimension identity matrix k – where the eigenvalues of λ can be found.

The index will be built through the eigenvector scalar product a_1' associated with the highest eigenvalue of the correlation matrix (that is, the one that captures most of the data variance), and the variable vector ***x***. This procedure provides *k* major components, with the first capturing as much of the variance proportion as possible of the studied variables, the second capturing most of the remaining variance and so on. Since the eigenvectors are orthogonal to each other, the main components are uncorrelated.

It is assumed that the first factor obtained, namely the first major component, expresses the precariousness of the labor market. For the procedure to be robust, all variables need to be positively correlated with the first major component, that is, they need to be positively correlated with "labor market precariousness." In PCA, the eigenvector elements correspond to the correlations between each variable with the corresponding component to which that eigenvector belongs (HAIR et al., 2006). For this reason, the eigenvector coordinates will be used as weights to construct the index, so for each state *i* in the period *t,* the index will be defined as:

$$PRE_{it} = a'_{1k}x_{kit} = a_{11}x_{1it} + a_{12}x_{2it} + \cdots + a_{1k}x_{kit} = \sum_{j=1}^{k} a_{1j}x_{jit}$$

In this sense, it is ensured that the variables that are most correlated with the first major component – which synthesizes the "precariousness of the labor market" – gives more weight to the final index. With this approach, it is possible to evaluate the importance of each variable to explain the degree of precariousness in each country through its correlation with the precariousness of the labor market.

To make comparisons between several periods, the first eigenvector (corresponding to the highest eigenvalue) estimated for period t = 1 is used and the process is repeated for the following years. The idea is to make the index comparable over time to some base year to check whether precariousness has dropped or grown since then. Thus, it is assumed that the correlation between indicators and labor market precariousness has not changed significantly over time.

Following what has been written in Section 2, three hypotheses will be tested regarding the mechanisms that generate precariousness: i) worse labor market conditions, summed up in higher unemployment, lead to greater precariousness; ii) a labor market structure with a larger presence of workers in microenterprises increases the precariousness level; iii) since the 2012 labor reform in Mexico, precariousness has risen in the country's regional labor markets, in contrast to Brazil, where the maintenance of protective labor legislation has kept the precariousness stable.

To test these hypotheses, a two-way fixed effects template has been estimated in order to control the unobserved characteristics of states and time periods of the labor

market precariousness index. The template can be described, for each state *i* in period *t*, as:

$$PRE_{it} = \alpha_t + \sum_{j=1}^{k} \beta_j X_{jit} + c_i + \epsilon_{it}$$

The α_t corresponds to the fixed time effects, X_{jit} are the variables that explain the variability of the labor market precariousness index, c_i controls by the time-invariant specific characteristics of states, and ϵ_{it} is a white noise. The unemployment rate and the proportion of workers employed in microenterprises were used to evaluate hypotheses i) and ii), respectively, while the analysis of α_t was useful to assess hypothesis iii).

3.3 Data

The databases used to calculate the index were the National Occupation and Employment Survey (*Encuesta Nacional de Ocupación y Empleo*, ENOE) for Mexico and the National Household Sample Survey (PNAD) for Brazil. Both are quarterly surveys, but their data were used to reconstruct the bases as annuals. Thus, for the Mexican base, data were used for the first quarter, which consists of expanded research. For the Brazilian case, we used the first interviews of each household in each year, thus considering data from all quarters because of the data collection format.

Both databases contain information about individuals and households and can be broken down by state. They also contain information about demographic and occupational characteristics. Table 5 shows the elements that make up the definition of precarious work and the corresponding variables in the Brazilian and Mexican databases.

Table 5 – Elements comprising the definition of precarious work

Precariousness dimension	Description	Variable

Certainty degree of work continuity	Workers with a short-term horizon are more likely to lose their jobs	Temporary contract; no portfolio for Brazil; unwritten contract for Mexico
Control over work	Control over working conditions, wages or work pace	Journey of fewer than 40 or more than 48 hours per week
Social protection	Protection of workers by law or collective organization	Lack of access to social security
Income level	Low-wage jobs may be associated with poverty and unsafe social inclusion	Hourly wage lower than two minimum wages

Source: prepared by the author, based on Rodgers (1989)

The first variable has to do with the uncertainty of continuing to work. In the literature, it is common to use temporary contracts for this variable. In this article, a different definition will be used. For both countries, workers with temporary contracts will be considered as those with the greatest uncertainty about continuing in employment. However, workers without a formal contract in Brazil and without written contracts in Mexico will be added to the definition, as these two mechanisms guarantee a degree of security of continuity in employment in these countries because they mean higher dismissal costs for employers. .

The second variable – hours worked per week – attempts to approximate workers' ability to have control over their work. Workers are considered to have a precarious trait if they work fewer than 40 or more than 48 hours per week, as they deviate from the regular workday. The third variable deals with the absence of social

protection. Lack of access to social security is considered a precarious feature, since this means that a worker will not be able to fully obtain welfare benefits such as access to health and retirement (depending on the country). Finally, the fourth variable corresponds to insufficient income and is considered as precarious workers who receive an hourly wage lower than twice the minimum hourly wage in the country.

For the fixed effects model, the variables used were: the unemployment rate, measured as the proportion of unemployed people in the state labor force, to capture labor market conditions, and the proportion of employees in microenterprises (with fewer than five employees) as an approximation of the labor market structure. Further, the fixed time effects allowed us to see how the average level of precariousness evolved over time, which was important in answering the question whether the 2012 Mexican labor reform affected the level of precariousness in the country's regional labor markets, in contrast to Brazil, which maintained its labor legislation.

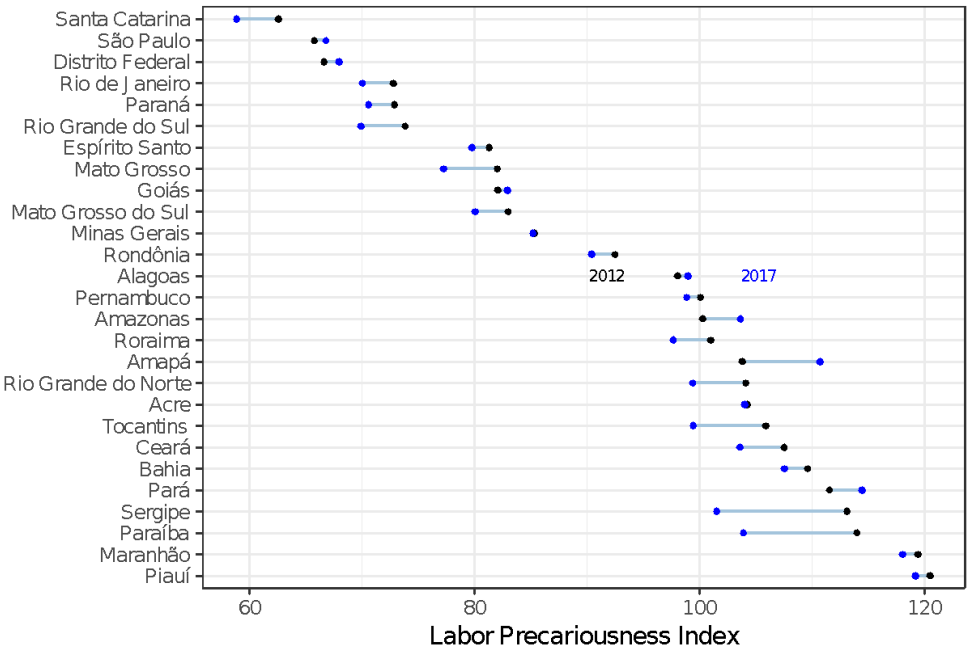
3.4 Results

The idea is to analyze how precariousness evolved in Brazil and Mexico between 2012 and 2017 at the regional level. The index allows comparison within countries between time periods, but not a direct comparison between the countries. Therefore, the analysis is restricted to comparing how precariousness has evolved, namely whether it has grown or decreased within states in each country.

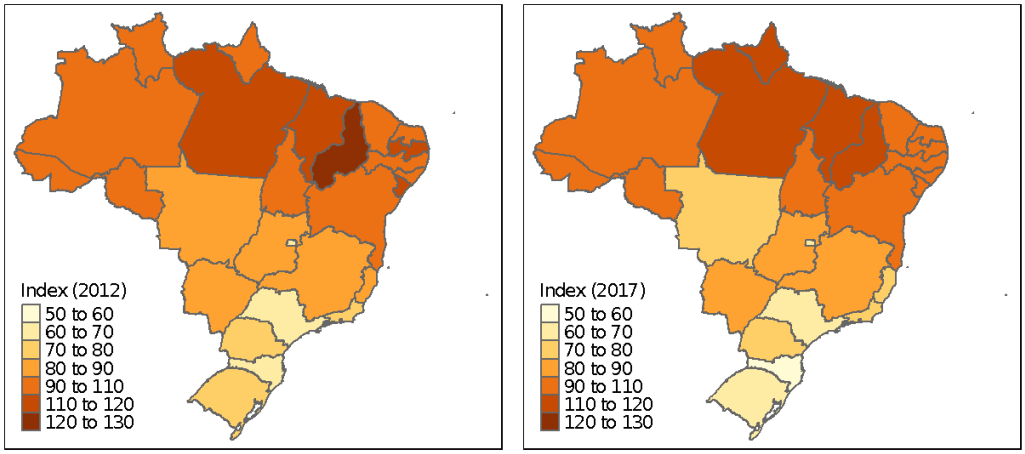
The results show a division between the less developed states of Northern and Northeastern Brazil – with their highest precariousness indices – in contrast to the more developed states of the South, Southeast, and Midwest, with lower precariousness indices (Figure 1). Most Brazilian states experienced a drop in the index, especially those in the north of the country (Figure 2).

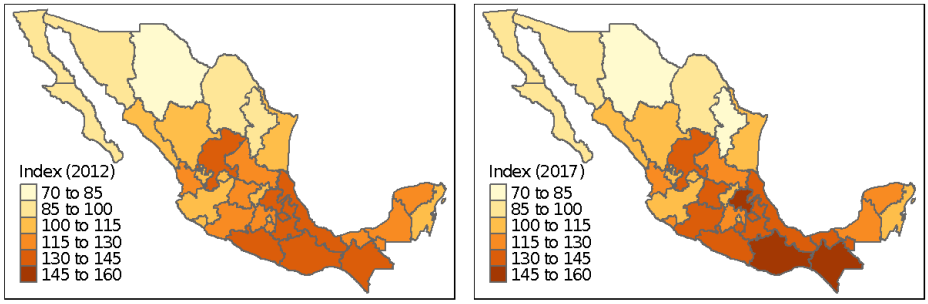
Figure 1 – Labor market precariousness index by state – Brazil: 2012-2017

Figure 2 – Labor market precariousness index by state – Brail: 2012-2017



The situation is different for the Mexican states. In a context analogous to the Brazilian case, the historically less developed states – in this case, the southern ones – have a higher precariousness index, while the more developed northern states





bordering the United States, have significantly lower rates (Figure 3). Additionally, nearly all Mexican states had growth in precariousness indices (Figure 4).

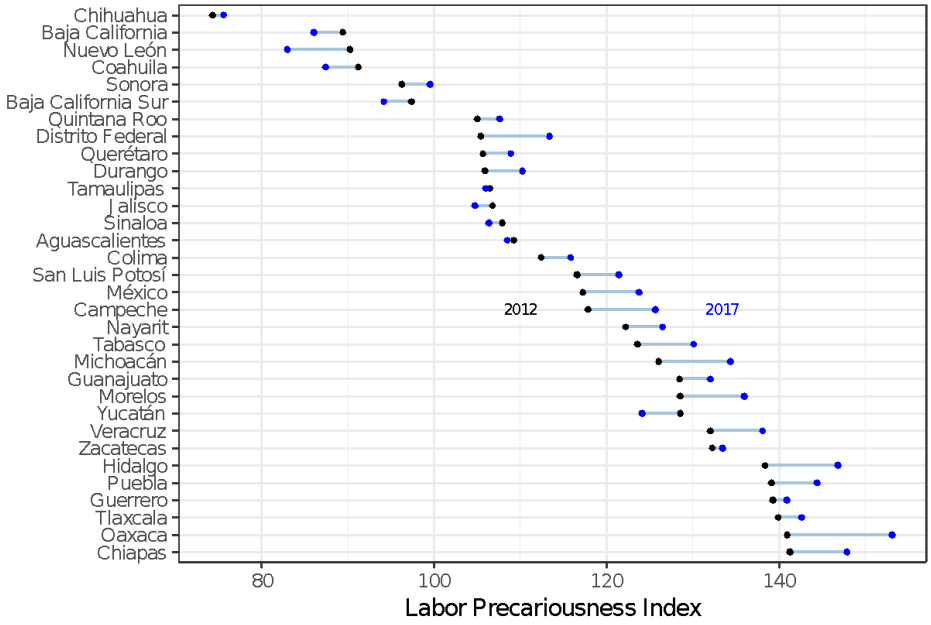


Figure 3 – Labor market precariousness index by state – Mexico: 2012-2017

Figure 4 – Labor market precariousness index by state – Mexico: 2012-2017

Thus, it is possible to see that precariousness fell slightly in the Brazilian states, despite the negative economic conditions, while in Mexico it seems to have grown soon after the approval of the 2012 labor reform. The following econometric model may provide some evidence for the hypotheses. (i) the rise in the state unemployment rate – understood as worsening labor market conditions – would lead to increased precariousness; ii) the growth in the proportion of microenterprise workers favors the increase in the precariousness index; and iii) despite a stable economic performance, the 2012 Mexican labor reform had significant impacts on the precariousness index of the country's regional labor markets, and this can be contrasted with the better results of Brazilian regional labor markets, even though Brazil has experienced worse labor market conditions.

Table 6 – Two-way fixed effects template results

	Dependent variable:	
	Labor precariousness index	
	Brazil	Mexico
Unemployment rate	0.560***	0.183
	(0.199)	(0.257)
Firm size	0.566***	0.785***
	(0.105)	(0.098)
2013	−2.248***	0.482
	(0.557)	(0.497)
2014	−4.423***	1.423***
	(0.569)	(0.510)
2015	−5.961***	2.311***
	(0.624)	(0.517)
2016	−9.565***	3.447***
	(1.027)	(0.540)
2017	−7.963***	4.479***
	(1.231)	(0.596)
Observations	162	192
R^2	0.544	0.476
Adjusted R^2	0.427	0.346
F Statistic	21.827*** (df = 7; 128)	19.878*** (df = 7; 153)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 6 shows the results for two-way fixed effects models for both Brazil and Mexico. Regarding hypothesis i), the expected result would be that states with higher unemployment rates would have higher levels of precariousness, all the more constant. The result was that this relationship is positive and significant for Brazil, that is, the

addition of 1 pp in the state unemployment rate increases the expected value of the precariousness index by 0.56 units, in line with the idea that worse labor market conditions would lead to increased precariousness. However, this statement is not true for the Mexican case, where the coefficient for the unemployment rate is not significant. This may be due to the fact that the absence of unemployment insurance forces workers to look for any type of occupation – usually autonomous work or microenterprises – which would mean that the unemployment rate does not reflect Mexican labor market conditions well.

Regarding hypothesis ii), in both countries the increase in the proportion of workers in microenterprises would lead to an expected increase in the precariousness index of the labor market. The effect is greater in Mexico, which would be an evidence in favor of the idea that a greater search for jobs in microenterprises in times of crisis for the Mexican case tends to make workers in this country more precarious. In general, this result favors the idea that microenterprises are one of the main precarious workplaces in these countries, although not restricted to these places.

Finally, as a way of capturing the impact of the 2012 Mexican labor reform on precariousness – hypothesis iii) – the template reveals that while in Brazil the average precariousness index is lower for every year compared to 2012, in Mexico the opposite can be noticed (except 2013), that is, precariousness (as measured in this article) has grown since the implementation of the reforms in 2012. Although the analysis developed here cannot be fully conclusive regarding the impact of the Mexican labor reform on precariousness, this result coupled with the fact that Brazil was able to sustain a fall in the labor market precariousness index, even in the face of lower labor market conditions, is an evidence of the importance of the Mexican reform in explaining the variability of precariousness in your regional labor markets.

CONCLUSIONS

Studying the precariousness of the labor market in Latin America should not have the same starting point as in Europe. In other words, while in Europe it is common to

study the dismantling of the standard employment relationship as the starting point of the precariousness process, Latin American labor markets have been populated by precarious workers since their inception. The number of workers with precarious characteristics has always been higher in Latin America, so the process in the region is not new.

In this paper, the concept proposed by Rodgers (1989) was used, which defined as “precarious” the type of work with a high risk of short-term dismissal, low control by the employee, lack of social protection and insufficient income. These dimensions were approximated, respectively, by the following items: having a temporary contract, without formal or unwritten work, working fewer than 40 or more than 48 hours per week, lack of access to social security, and hourly income lower than two minimum wages.

From these variables, the creation of a labor market precariousness index through the statistical technique of principal component analysis (PCA) has been proposed. The use of this technique was important, as it relates to the multidimensional characteristic of the labor market precariousness phenomenon. The first major component resulting from PCA was considered the approximation to "labor market precariousness" and the correlation between variables and this factor was used as weights in constructing the index.

The goal was twofold. First, we sought to see how precariousness evolved in the regional labor markets of Brazil and Mexico between 2012 and 2017. The results showed that precariousness declined in the Brazilian states, while it grew in the Mexican states. In addition, we tried to test the hypothesis of which mechanisms influenced the incidence of precarious work in both countries. The hypotheses were: i) labor market conditions, summarized in the unemployment rate, influence the incidence of precariousness; ii) the structure of the labor market, especially the proportion of microenterprise workers, affects the degree of precariousness; iii) the 2012 Mexican labor reform negatively affected this country's regional labor markets, causing precariousness to grow in the Mexican states, but not in Brazil, where protective labor legislation remained.

To achieve this goal a two-way fixed effects model has been proposed. Unemployment has been found to explain the incidence of precariousness in Brazilian states, but not in Mexicans. On the other hand, states with the largest presence of workers in microenterprises tend to be more precarious in both countries. Finally, the results show that, since 2012, precariousness has increased in the states of Mexico, which would be an evidence for the negative impact that labor reform has had on the country's regional labor markets. This result may serve as a warning to raise concerns about the potential for precariousness in regional labor markets in Brazil, as the 2017 labor reform contains many similarities – especially in terms of objectives – with the Mexican one.

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