



LUND UNIVERSITY

School of Economics and Management

Master in Economic Development and Growth

# THE EFFECTS OF SOCIAL PROTECTION PROGRAMS ON THE LABOUR MARKET: EVIDENCE FROM THE ESTABLISHMENT OF SEGURO POPULAR IN MEXICO (2002-2005)

Roos de Bruijn

[ro8518de-s@student.lu.se](mailto:ro8518de-s@student.lu.se)

*Abstract:* A high informality incidence, measured as the share of informal employment out of total employment, is a common characteristic of most developing countries' economies. In Mexico, where informal employment accounts for the majority of labour activity, this is argued to be a consequence of its unique social policy. The introduction of the social protection program for health in 2002, Seguro Popular, has been blamed to draw workers out of formality into informality by providing them with free health care, an alternative to paying for health through social security. By using a difference-in-difference method this thesis exploits the gradual phase-in of the program in Mexico's states to see whether Seguro Popular indeed had an effect on informality. It can be observed that overall informality increased over the time period studied but that this was not specifically the case for states which adopted the program. When segregating per sex, the effects seem to be more present for male than female workers, but overall this research finds no proof of a significant relationship between the introduction of Seguro Popular and the degree of informality among Mexico's states.

*Key words:* informal labour, social protection programs, Seguro Popular

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## Table of Contents

<b><u>ACKNOWLEDGEMENTS.....</u></b>	<b><u>2</u></b>
<b><u>LIST OF FIGURES.....</u></b>	<b><u>5</u></b>
<b><u>LIST OF TABLES.....</u></b>	<b><u>5</u></b>
<b><u>1. INTRODUCTION.....</u></b>	<b><u>6</u></b>
<b><u>2. LITERATURE REVIEW.....</u></b>	<b><u>8</u></b>
<b><u>2.1 INFORMALITY.....</u></b>	<b><u>8</u></b>
2.1.1 WHAT IS INFORMALITY? .....	8
2.1.2 INFORMALITY IN MEXICO .....	10
<b><u>2.2 SOCIAL POLICY .....</u></b>	<b><u>12</u></b>
2.2.1 SOCIAL SECURITY PROGRAMS .....	12
2.2.2 SOCIAL PROTECTION PROGRAMS .....	13
2.2.3 SEGURO POPULAR.....	17
<b><u>2.3 RESEARCH QUESTION AND HYPOTHESES .....</u></b>	<b><u>22</u></b>
<b><u>3. METHODS .....</u></b>	<b><u>24</u></b>
<b><u>3.1 DIFFERENCE-IN-DIFFERENCE MODEL .....</u></b>	<b><u>24</u></b>
<b><u>3.2 MODEL UNCERTAINTY .....</u></b>	<b><u>25</u></b>
<b><u>3.3 SAMPLE.....</u></b>	<b><u>27</u></b>
<b><u>4. DATA.....</u></b>	<b><u>29</u></b>
<b><u>4.1 DATA SOURCES.....</u></b>	<b><u>29</u></b>
<b><u>4.2 VARIABLES.....</u></b>	<b><u>31</u></b>
4.2.1 DEPENDENT VARIABLES.....	31
4.2.2 INDEPENDENT VARIABLES.....	34
<b><u>5. RESULTS .....</u></b>	<b><u>39</u></b>
<b><u>5.1 MAIN RESULTS .....</u></b>	<b><u>39</u></b>
<b><u>5.2 REGRESSIONS PER SEX .....</u></b>	<b><u>44</u></b>
<b><u>6. DISCUSSION .....</u></b>	<b><u>48</u></b>
<b><u>7. CONCLUSION.....</u></b>	<b><u>52</u></b>

**REFERENCES..... 54**

**APPENDIX..... 60**

## LIST OF FIGURES

Figure 1: Informal employment in Mexico, per sex for the period 2008-2013.....	<b>Error!</b>
<b>Bookmark not defined.</b>	
Figure 2: The division of Mexico's labour market according to social security status for the year 2012 .....	13
Figure 3: Introduction of Seguro Popular in the United Mexican states according to year of implementation.....	18
Figure 4: Seguro Popular Beneficiaries as a percentage of the total population for the period 2000-2013.....	19
Figure 5: National level of informality & IMSS enrolments, measured as percentage of totally employed population for the period 2000-2013.....	33
Figure 6: Population density in Mexico as a proxy for rurality based on population for the year 2000 .....	37
Figure 7: Mexico's states ranged from low to high degrees of informality for the year 2000.	60
Figure 8: Mexico's states ranged from low to high degrees of informality for the year 2013.	62
Figure 9: National labour force participation rates measured as a percentage of total population for the period 2000-2013 .....	62
Figure 10: National unemployment rates measures as a percentage of total labour force for the period 2000-2013.....	63

## LIST OF TABLES

Table 1: The difference-in-difference estimator explained.....	25
Table 2: T-test results for the two dependent variables informality & formality during $t=0$ , numbers represent p-values.....	39
Table 3: Difference in difference estimation results for informality, standard errors clustered by state.....	41
Table 4: Difference-in-difference estimation results for formality, standard errors clustered by state.....	42
Table 5: Difference-in-difference estimation results for informality for men, standard errors clustered by state.....	46
Table 6: Difference-in-difference estimation results for informality for women, standard errors clustered by state.....	47
Table 7: The states of Mexico grouped according to year of implementation of Seguro Popular.....	60
Table 7: Summary statistics for the variables consulted, totals and segregated by men and women.....	61

## 1. INTRODUCTION

In Mexico, the informal sector makes up more than half of the total labour force. Levy (2008), who made a thorough analysis of Mexico's labour market, found that informal employment accounts for 57 percent of all employment in 2007. The informality incidence, measured as the share of informality in total employment (OECD, 2015), is especially high among poor workers. Levy (2008) found that on average, only 7 percent of poor workers in Mexico work formally. He blames informality to be a deeply rooted problem for the country that will not just fade away following economic growth. It lowers productivity in both the formal and informal sector, thereby also lowering the returns to capital with negative implications for GDP growth. Also, Hanson (2010) argues that the high degree of informality is one of the main causes for Mexico's lacklustre growth. The existence of informal firms prohibits full competition and thus allows unproductive establishments to operate in a market in which they normally would not sustain. From the perspective of workers, the large informal sector drives down wages and decreases the chance to find a formal job. The low returns to labour market experience reduce the incentives to invest in education, which hinders the accumulation of human capital (Hanson, 2010).

It is governed by law that in Mexico, an employer registers all his employees with social security. As informal work happens mostly through domestic or self-employment, or illegally in case there is an employer involved, informal workers do not fall under the protection of social security. The governments' objective to provide social assistance to all workers and the low coverage of social security in the country, led to the introduction of social protection programs since the late 90s (Levy, 2008). This has led to the construction of the current social system in the country where formal, registered workers are enrolled with social security programs and those that enjoy an informal job or do not work at all can use the benefits of social protection programs. Affiliates of social security pay contributions as a percentage of their wage, which combined with contributions paid by their employer, entitles them to a bundle of social benefits. Social protection, as it is designed to limit the risks faced by the more vulnerable, is paid according to capacity, which makes it free for a large share of the beneficiaries. The biggest of these social protection programs was Seguro Popular, which was first introduced as a pilot in a few Mexican states in 2002 but soon achieved nation-wide implementation in 2005. The program, which literally means popular insurance, provides all those not entitled to social security, with health care. Participation is free and voluntarily, which

provides a large share of the population with an alternative option to paying for healthcare privately, which for most was unaffordable and thus left many without care. Although this was a good step towards the governments' objective to increase social insurance, Seguro Popular is often blamed to increase the informality incidence in Mexico. Due to the introduction of Seguro Popular, workers now have the option to work informally and obtain free health care or to work formally and pay for it. It will be explained later that the choice of workers in this case depends on their valuation of a certain program, but the introduction of social protection definitely makes informal work more appealing (Levy, 2008, World Bank, 2012).

By using state-level data and exploiting the phase-in approach according to which the Seguro Popular program was implemented across Mexico's states, this thesis will study whether this social protection program had any effects on the level of informality in Mexico. The time period of interest is from 2000 until 2003, so that a difference-in-difference method can be used to isolate the change in informality in states where Seguro Popular was launched in 2002 and 2003, from the change in informality in states where the program had not been launched at that time. The research question central to this study will therefore be the following:

*Did the introduction of social protection health program Seguro Popular have an effect on the degree of informality in Mexico's states?*

Section 2 of this thesis explains the definition and characteristics of informal labour in general and for Mexico specifically. After that, it introduces the system of social policy in Mexico and how this interacts with the labour market, to arrive at the introduction of Seguro Popular. Section 3 explains the difference-in-difference method used to conduct the analysis. The data section describes the data sources consulted and the main variables included in the analysis. In the results section the main findings following the regressions are shown and in Section 6 is discussed what can be taken away from the results and how this relates to other findings, followed by the limitations of this research. The conclusion will summarize the main findings from this thesis and give some suggestions for further research considering the relationship between Seguro Popular and informality.

## 2. LITERATURE REVIEW

### 2.1 INFORMALITY

#### 2.1.1 WHAT IS INFORMALITY?

The labour market can be divided in formally employed workers, informally employed workers and unemployed workers. However, informality here is a complex term. It involves both the firms and workers that are active in the informal sector, the underground, or shadow economy. Some argue that it encompasses all unregistered activities which would otherwise be taxed if reported to authorities (Schneider & Enste, 2002). Others define it as the sum of workers falling outside of the legal framework (ILO, 2018) or that fall outside of the protection of labour regulations and social security arrangements (Jonasson, 2011). Following Dougherty & Escobar (2013), informality comprises informal employment for formal firms, informal employment for informal firms, domestic work, self-employment and illegal activities.

A lack of investment capital and the need to stay undetected to authorities in order to escape the obligation to pay taxes or social security fees forces informal establishments to stay small. The International Labour Organization (ILO, 2018) reports that more than 90 percent of micro- and small enterprises worldwide operate within the informal economy. It also appears that these enterprises are significantly less productive than other firms, as in 91 percent of the cases their total factor productivity (TFP) is below that of the industry average (Pages, 2010). La Porta & Shleifer (2014) show that informal firms only add 20 percent of the value that formal firms add. This also interrelates with the fact that the informal sector is especially large in developing countries: Schneider & Enste (2002) estimated that for the period between 1988 and 2002, the informal sector comprised 15 percent of the workforce in developed countries, 21 to 30 percent in transition countries and between 35 and 44 percent in developing countries. La Porta & Shleifer (2014) find that informality is on average between 30 and 40 percent of total economic activity in poorer countries, and even higher when measured as a share of employment.

There are different explanations on the larger degree of informality in developing countries. De Soto (1989) argues that over-regulation and corruption inhibit the expansion of the formal sector. La Porta & Shleifer (2014) use the World Bank's Enterprise Surveys and find that lack of access to capital is a main obstacle, both in the form of credit and land. De Soto (1989) emphasised registration costs to be high barriers to be part of the formal economy, whereas La Porta & Shleifer (2014) state that informal firms stay informal for their whole lives and have no attempts to become formal. Forces of supply and demand within these separate sectors



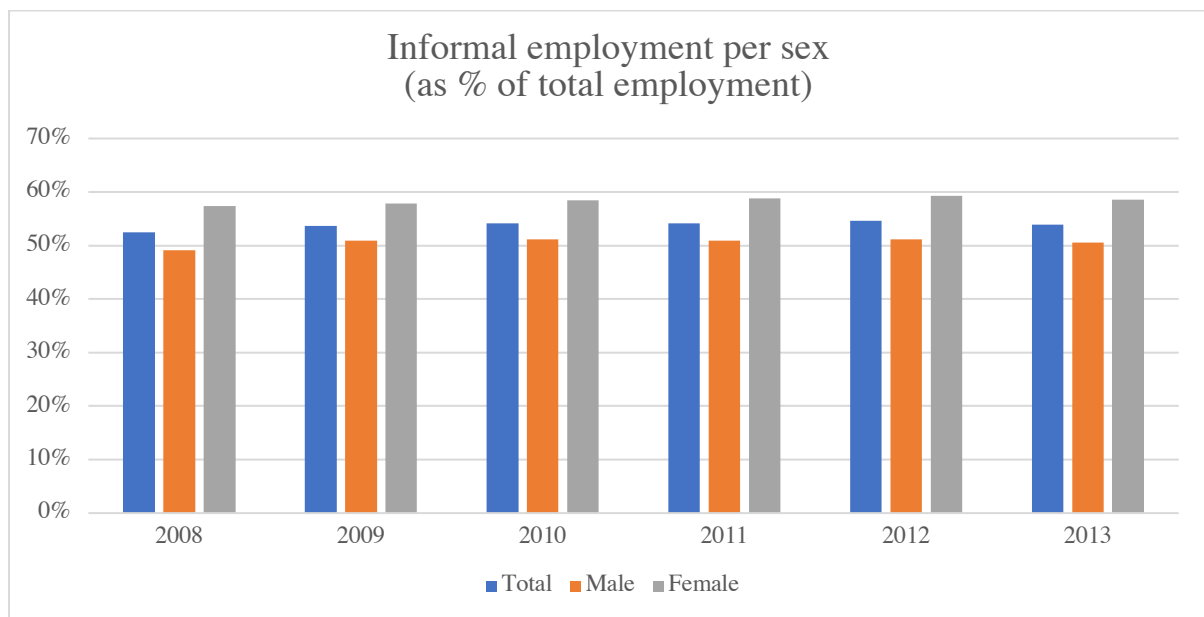
hinder the transition from one to the other. In poor countries with high inequality, which is typical for developing countries, the informal sector often delivers low quality but inexpensive goods to the poor community which cannot afford the better products from the formal sector. For an entrepreneur to start a modern or formal business, the fixed investment costs are often high. When a large share of the population is too poor to afford the products produced by this sector, the entrepreneur will not be able to make this investment and as a result modernity and formality will never grow (La Porta & Shleifer, 2014). The International Labour Organization (ILO, 2002) shows that developing countries, usually characterised by a fast-growing population and fast-expanding labour force, have a higher chance of having a large informal sector, as the informal labour often absorbs the excess workers that cannot find a job within the formal sector. As a consequence, in countries where informality is high, unemployment is often low. Baah-Boateng (2015) investigated unemployment in African countries and found that for many of them a statistical correlation exists between informality and unemployment, meaning that countries with low (high) unemployment have a high (low) degree of informality. The unemployment-informality trade-off for developing countries is recognized by more authors (Tümen, 2016, Meghir et al., 2011). Most people choose informal jobs with low wages and poor working conditions over being unemployed, explaining movements out of unemployment into informal employment (UNECA, 2011). However, the absorptive capacity of the informal sector can also lead to disguised unemployment, where according to statistics one is employed but there exists overemployment in his or her type of work. As a result, the marginal product of labour is low, or can be even negative (Barber, 1961). It can therefore not be concluded that informality is a solution to unemployment.

The issue of informality becomes even more complex when considering the fact that the relationship between informal employment and formal- and unemployment is not mutually exclusive. Especially in poor or developing countries, informal workers have multiple jobs in order to provide themselves and their families with an income (Banerjee & Duflo, 2007). Often this is a combination of multiple informal jobs, but sometimes also of formal and informal jobs. As informal labour is not registered, people registered as unemployed could also work informally. The introduction of informality makes labour statuses within a country blurred and thus less accurate for devising policies.

### 2.1.2 INFORMALITY IN MEXICO

In Mexico, the informal sector comprises more than half of total employment. In figure 1, consulting the estimations on the size of Mexico's informal sector of the International Labour Organization, it can be observed that the informality incidence remained quite stable between 50 and 55 percent for the period between 2008 and 2013, and that informality was higher among female than male workers. In line with the informal-unemployment relationship introduced above, unemployment in Mexico is generally very low. Its rate has been around 4 percent of the total labour force for the last decade, only experiencing an increase of above 5 percent following the economic crisis (World Bank, 2018a).

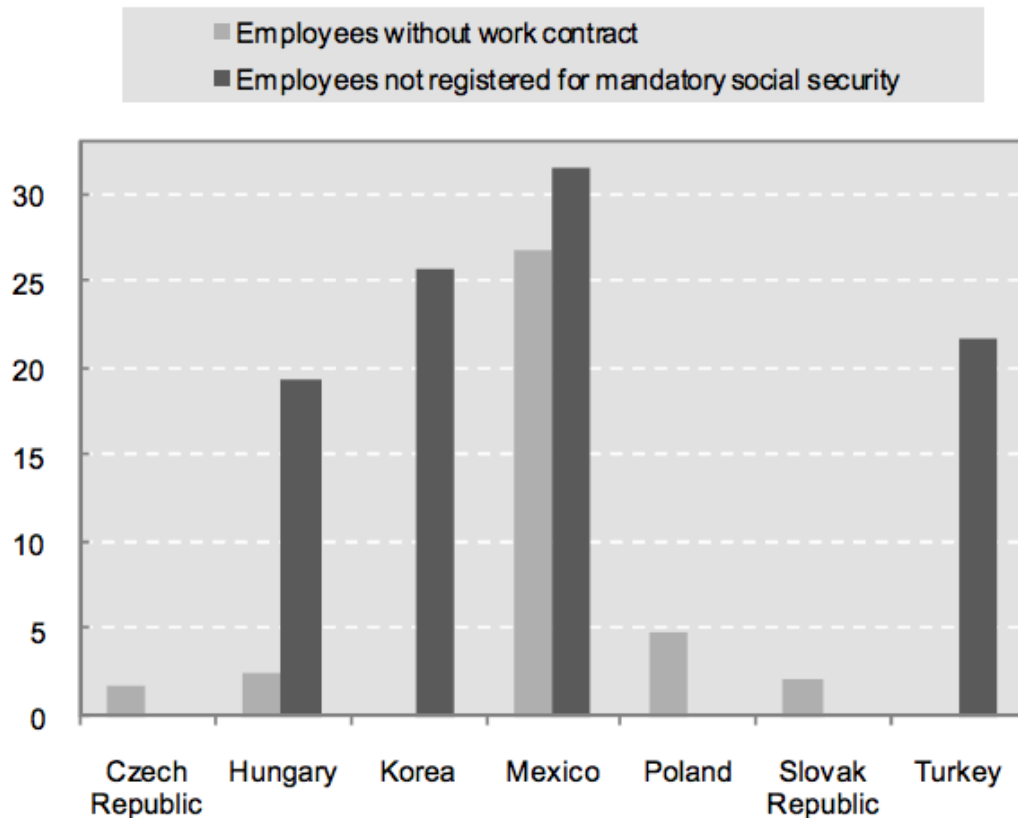
Figure 1: Informal employment in Mexico, per sex for the period 2008-2013



Source: Adapted from ILOSTAT (2018)

Comparing Mexico's labour market statistics to other developing countries, generally characterised by high informality, it can be observed that Mexico is quite an extreme case. Both the evasion of social security regulations, which makes a worker informal according to the definition of Jonasson (2011), and the number of employees working without a contract are higher for Mexico. The numbers are measured over the non-agricultural part of employment, which explains the difference with other estimates of informality in Mexico, as self-employment in agriculture is in general high and often included as a type of informal employment.

Figure 2: Informality in Mexico compared to other developing countries, as a % of non-agricultural employment.



Source: OECD (2008)

Levy (2008) found that the incidence of informality is especially high amongst poor households, where only seven percent of the workers is engaged in formal employment. As also seventy percent of the poor households live in rural areas, it could be implied that the informality incidence is highest in rural areas. Levy argues that Mexico's flexible labour market contributes to the high degree of informality in the country. As there are very low barriers to entry for both the formal and informal labour market, the mobility of workers is very high. It seems that most workers within the Mexican labour market experience different periods of formal and informal employment during their working life. Furthermore, Levy (2008) found that mobility is higher for low-wage workers.

Brandt (2011) explains that although mobility for workers is high, Mexico's economy can be characterised by high registration costs of firms that are operating formally or want to, strongly discouraging formalization. Short-term contracting of formal employees is possible by hiring temporary work agencies but establishing a permanent contract with an employee is costly and a lot of work.

Although the level of income taxes in Mexico is not extremely high, the other non-wage labour costs that pay for social security are explaining much of the evasion of formal labour (Brandt, 2011). Given that social contributions are regressive also strengthens the argument that mostly low-wage workers turn to informality. The author found that social health insurance in specific is argued by firms to be the biggest labour barrier to formalization, where its costs are higher than the Latin American average.

The effect of Mexico's social policy on informality is explained in more detail in the following section.

## 2.2 SOCIAL POLICY

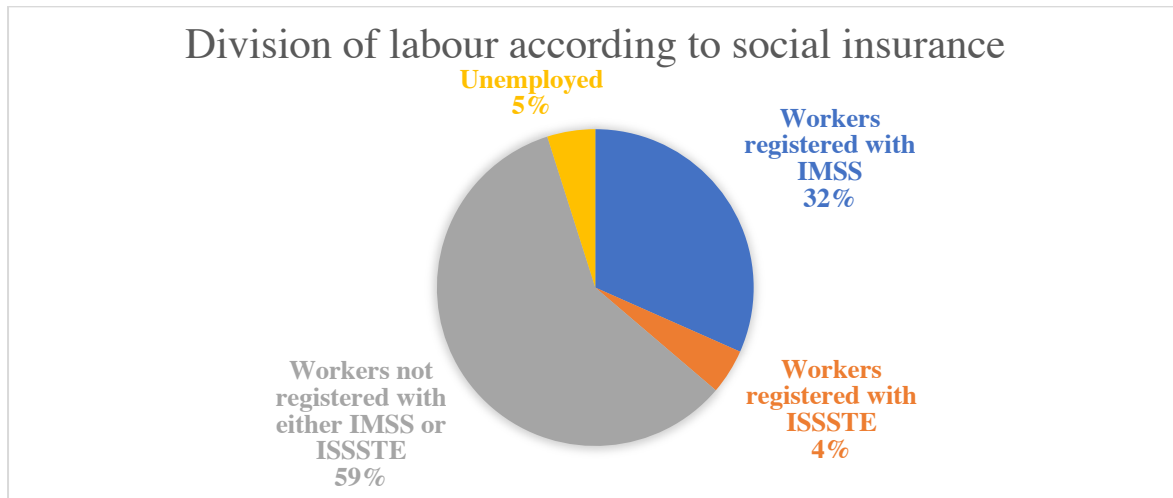
The following section discusses it's the main characteristics on Mexico's system of social policy and how it interacts with a workers' decision of working either formal or informal.

### 2.2.1 SOCIAL SECURITY PROGRAMS

The Mexican Social Security Law of 1943 made it obligatory for firms to provide salaried workers with social security. Both workers and firms are forced to contribute to social security payments, which are supplemented by a small contribution of government funds. In 2007, these contributions made up to 40.5 percent of total wages, of which 34.6 percent was paid by the employee and employer and the remaining 5.9 percent by the government (Levy, 2008). In return for these payments, workers receive a bundle of social benefits: health, life, work-risk and disability insurance, day-care for children, retirement pensions, housing loans, fire and severance pay, and sports and cultural facilities. The funds are managed by three agencies: the Instituto Mexicano del Seguro Social (IMSS) (Mexican Social Security Institute), the Instituto del Fondo Nacional de la Vivienda para los Trabajadores (Infonafit) (Institute of the National Fund for Workers' Housing) and Administradora de Fondos de Retiro (Afore) (Retirement Funds Administrator). The IMSS only regulates social security for workers employed with firms in the private sector with social security and does not cover workers in the public sector. The social security accounts for those workers are managed and regulated by the Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado (ISSSTE) (Institute for Social Security and Services for State Workers). However, the share of workers that fall under the jurisdiction of the ISSSTE is quite small (only 4.6 percent of the total labour force in 2012). Figure 2 displays the division of the Mexican labour market according to social security status. The grey area, which depicts the 'Workers not registered with either IMSS or ISSSTE' are thus

falling outside the jurisdictions of social security arrangements and can be regarded to work informal.

Figure 3: The division of Mexico's labour market according to social security status for the year 2012



Source: Adapted from CEFP (2013).

Despite the fact that the different social security funds are managed by separate institutions, a worker cannot choose which benefits to consume and thus pay for. As the Mexican government wants to ensure consumption of the goods it provides through social security, a formal worker is obliged to pay for all of them, whether they will be consumed or not (Levy, 2008).

### 2.2.2 SOCIAL PROTECTION PROGRAMS

The social security law only obliges firms to provide their employees with social security but does not state anything regarding other workers or those outside of the labour market. As a consequence, this part of the population was first left without any social safety net. But lately the Mexican government has recognized the obligation to provide social safety for all and has started to introduce several social protection policies. Social protection covers different benefits provided by different federal agencies and in Mexico they offer: healthcare, day care, basic life insurance, access to savings accounts and subsidies for housing (Levy, 2008). Most are means-based which means people pay according to ability. As social protection is highly subsidized by the government, the costs are generally low and free for the poorest people in society. Also, it is voluntary, in the sense that a participant can choose to enrol and which benefits to consume. The only requirement for participating in the social security program is that beneficiaries are not covered by social security. Doing so, it only excludes the formal workers from participating.

Mexico is now in a situation where social security is available solely for formal workers, and social protection for all others of the population. When considering workers, social policy is related to labour status: formal workers enjoy paid social security benefits, whereas informal workers enjoy cheap social protection benefits. Related to the high mobility of Mexican workers, they now have the opportunity to choose the option that is at that time most beneficial to them. Levy (2008) has studied the consequences social protection programs have on the workforce in Mexico. A simplified replication of this model is presented below, which assumes that workers are utility maximizing and that this is positively related to their wage.

1. Before the introduction of social protection programs, workers had two options:
  - working formally and receiving a wage  $w_f$ , paying social security payments  $ss_f$ , and receiving social security benefits  $sb_f$
  - working informally and receiving a wage  $w_i$
  
2. After the introduction of social protection programs, workers had two options:
  - working formally and receiving a wage  $w_f$ , paying social security payments  $ss_f$ , and receiving social security benefits  $sb_f$
  - working informally and receiving a wage  $w_i$  and receiving social protection benefits  $sb_i$

Where the subscript f indicates formality and the subscript i indicates informality.

Due to the fact that informal jobs are often low-skilled, not capital intensive and unproductive, it is reasonable to assume that  $w_f > w_i$ . Also, since social security programs include some benefits that are not included in social security programs such as a work-risk insurance, disability insurance and sports and cultural facilities, it is reasonable to assume that  $sb_f > sb_i$ . Furthermore  $ss_f/ss_b = 1$ , so that the social benefits in the formal sector cost the same as they are worth.

It can be seen that model 2, with the introduction of social protection programs, makes informal labour more appealing compared to model 1, as it increases the utility of informal workers as they receive more than without social protection. However, the fact that both wages and social benefits in the informal sector are lower than in the formal sector, still makes it less beneficial to work informally and thus formal employment is encouraged.

However, Levy (2008) found that the utility from social benefits depends on the valuation of workers. He found that the assumption  $ss_f/ss_b = 1$  does not hold in Mexico. Instead,  $ss_f/ss_b < 1$ , which means that workers value social benefits in the formal sector (thus social security) at less than their costs. In this case, social security payments can be seen as an extra tax on labour equivalent to the difference between the costs and the valuation of the benefits to the worker ( $ss_f - sb_f > 0$ ). Whenever the wage differentials between formal and informal labour are smaller than this 'tax on formal labour', the introduction of social protection systems makes informal labour more appealing than formal labour. In this sense, the Mexican system does not meet its responsibility considering society: a good social system does not only deliver social assistance to insure the most vulnerable of the population, it should also link them to quality jobs and improve their productivity (World Bank, 2018b). The low valuation of social security is also observed by Brandt (2011), who explains that this reduces workers incentives to contribute.

In fact, the choice between working formally or informally is affected by many more indicators such as a workers' valuation of the fact that formal work is regulated through a contract and thus is a more secure type of labour, whether one has a family to take care of, one's level of education and the supply of both informal and formal jobs in the location where the worker lives (Campos-Vázquez & Knox, 2013). The explanations above are just to indicate the force of social programs in one's decision to work. As the aim of the model is to show how informal labour becomes more appealing in the case of social protection, only the option between formal and informal employment is included. Obviously, a worker can also be unemployed. Unemployment can take the form of voluntary unemployment, which constitutes a deliberate choice of a worker to not engage in employment, or involuntarily unemployment, where a worker gets fired. Formal workers that get fired receive fire and severance pay, which is included in their bundle of social benefits, equal to three months and twenty days for every year of (formal) employment (Levy, 2008). It is unclear whether those workers still receive social security benefits while being unemployed. If not, they become eligible to apply for social protection. Aside from that, Mexico has not developed any unemployment insurance or benefit scheme except some support in finding a new job (ILO Social Protection, 2015), and thus voluntary unemployed and the informal workers that get fired have not much more than to rely on other than social protection and their own resources.

The finding that workers in Mexico value formal social security at less than their costs, can be explained by a couple of reasons:

First of all, the obligation to pay for the whole bundle of social benefits while only consuming part of them, makes the relative price of the consumed benefits very high, as individuals also pay for services they do not use (Mason, 2007).

Second, inefficiency is a problem for many of the services provided by social security, which lower the values perceived by its users. Levy (2008) discusses problems related to the profitability of financial services such as mortgages and the retirement account such that the returns are very uncertain or observed to be higher in other investment options, lots of transaction and operating costs, low investment in health services, very limited spaces in day cares due to overcrowding and unobserved benefits from income taxes. Brandt (2011) explains that the inefficiency is mainly a result of a disintegrated system, providing social services for public, private and informal sector workers separately. Especially for health care, building towards one system would highly improve efficiency of its services and reduce disincentives to work formally caused by different funding regulations.

Third, the situation is aggravated for poor workers as they are discriminated in their use of social security, as the system works regressive. Furthermore, poor and/or rural regions in general have a lower IMSS coverage and thus workers in these areas have limited access to its services (Brandt, 2011). As social protection programs are focused on poor individuals or people not covered by social security, coverage by social protection infrastructure is on average higher in these regions and thus the choice to work informally becomes more attractive (Levy, 2008).

Lastly, a wide range of literature discusses the inefficiency or trust in the government that is a problem for some developing countries. Schneider & Enste (2002) estimated in their study on informality in developing countries, that a one-point increase on the regulation index led to a ten percent increase in informality amongst their sample of 84 countries. Here, I want to acknowledge that this may also play a role in a worker's willingness to work formally and pay income taxes and social security payments but discussing this issue in detail is outside of the scope of this research.



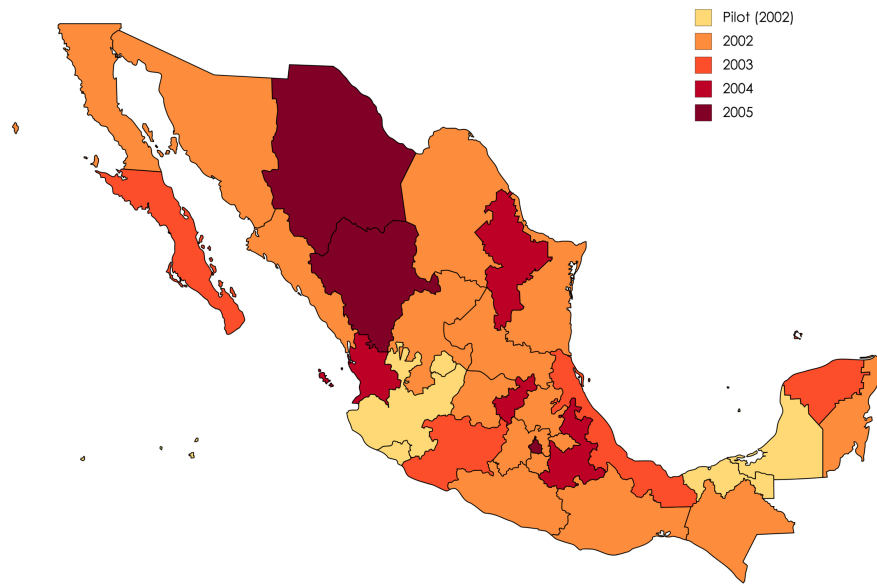
The discussion above shows that the introduction of social protection has increased the incentives to work in the informal sector compared to before. The disappointing performance of social security in the case of formal work, aggravates this relationship. Although the intentions to provide all workers with more security was good, the policy change has been blamed to harm the labour market and thereby worsening Mexico's welfare (Levy, 2008, Hanson, 2010). Related to this, I will discuss one of these programs specifically in the next section: the introduction of the Seguro Popular program.

### 2.2.3 SEGURO POPULAR

The largest social protection program in Mexico is the one that provides healthcare: Seguro Popular. The program was launched in 2002 by the Mexican government with the purpose to drastically increase health coverage in Mexico and reduce inequalities. It is provided to families and available to all Mexicans who are not protected by other public insurance programs: the informal workers and those out of the labour market (World Bank, 2012). Risk statuses are not considered in Seguro Popular, so that not only low-risk families will be selected for participation. It works such that uninsured Mexicans can become a member of Seguro Popular and receive a fixed sum of money to spend on health care in a certain account. The resources in this account can then only be spent on health care and are divided into two packages: one package of essential interventions and one of high-costs, specialized interventions (Frenk et al., 2009).

Figure 3 displays the map of Mexico, with its states coloured according to year of implementation. The program was launched as a pilot in five states, but due to great success the program was adopted by 16 other states in the same year, achieving nation-wide coverage within four years. A detailed scheme of the implementation can be found in table 7 in the appendix.

Figure 4: Introduction of Seguro Popular in the United Mexican states according to year of implementation



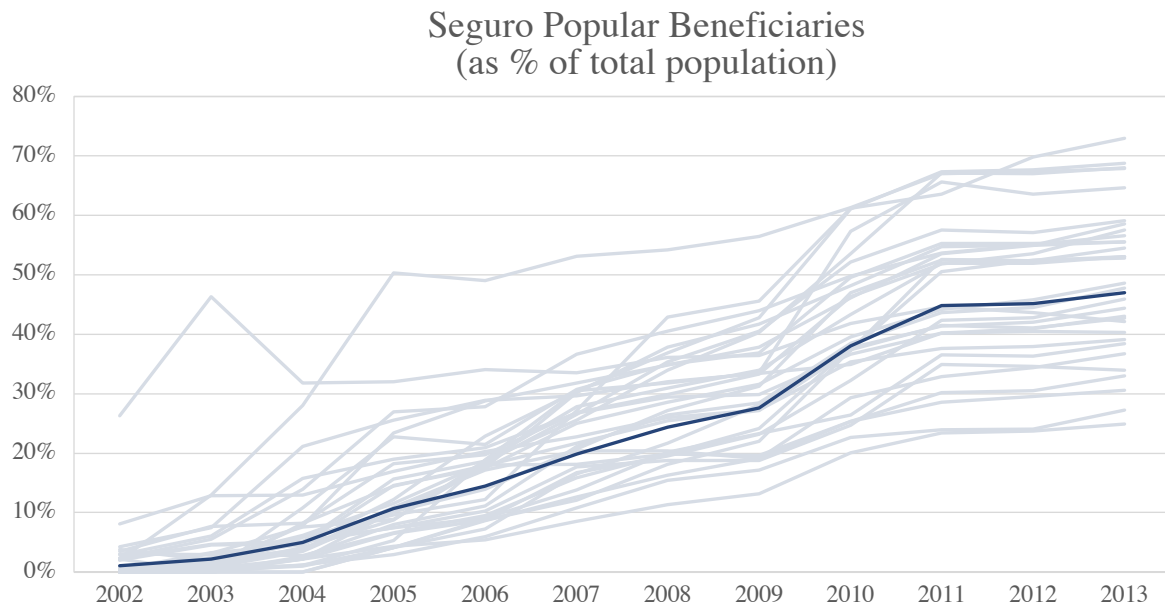
Created with mapchart.net ©

Source: Secretaría de Salud (n.d.)

Coverage increased rapidly, as after ten years after the launch of the program, 95 percent of the Mexicans without social security enjoyed a membership at Seguro Popular (World Bank, 2012). This is possibly a result of the design of the program nationally, where state funding is dependent on an annual fee based on the number of families affiliated. This can also be seen in Figure 5, which presents the share of Seguro Popular beneficiaries nationally. Although different per state, the dark-blue line measuring the national average, shows that within a time-span of ten years after nation-wide implementation, almost half of the population enjoyed health care through the program. For some states more than 60 percent of the population enjoyed health care through Seguro Popular. These findings show the relative importance of the program to Mexico's population.

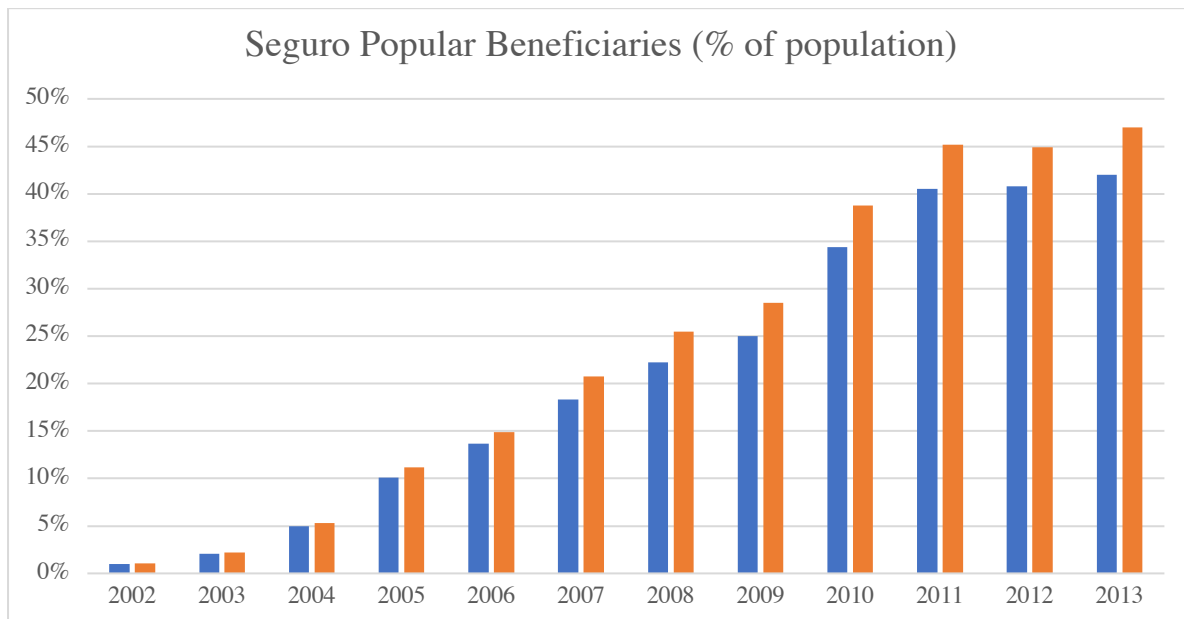
The same data shows that the program had more female than male beneficiaries throughout the whole period studied, presented in figure 6.

Figure 5: Seguro Popular Beneficiaries as a percentage of the total population for the period 2002-2013. Dark blue line represents average of all states (transparent lines).



Source: Author's own calculations based on Secretaría de Salud (2017) & CONAPO (2018).

Figure 6: Seguro Popular beneficiaries, men and women compared. National statistics measured as a percentage of population for the period 2002-2013.



Source: Author's own calculations based on Secretaría de Salud (2017) & CONAPO (2018)

The program is free of charge for participants and is completely funded by state resources. As the program allocates a fixed sum for health care expenses to every participant, the direct costs of the program increase linearly with the size of the program. Due to a higher demand for health services through the funding, the investment in facilities and infrastructure increased significantly, thereby improving the quality of and access to health care (Junco Machado, 2015). The introduction of Seguro Popular is therefore seen as the largest reform of the health

care system in Mexico. The World Health Organization (WHO) shows that in 2003, public funding was increased by one percent of GDP for seven years to cover the increase in health care expenditures to implement the program (Frenk et al., 2009). The same authors report that with the introduction of Seguro Popular, a much larger proportion of public resources is allocated to the population without social security: the budget of the Secretaría de Salud increased 72.5 percent between 2000 and 2006, whereas those of IMSS and ISSSTE increased with 35 and 45 percent respectively.

According to the WHO, of the beneficiaries that became insured through Seguro Popular, 96.9 percent of the families belonged to the two lowest deciles of the income distribution, 35.2 percent were families living in rural areas and just over 23 percent of the families were headed by women (Frenk et al., 2009). The study of the WHO states that apart from improving the health of the most vulnerable of the population, the program protects them financially by preventing them from catastrophic health expenditures in case of illness.

Instead, Barros (2008) finds that although limiting out-of-pocket expenditures on health care, the program had no effect on the health of beneficiaries and blames this on the low quality of public healthcare. Furthermore, he shows that the program was redistributive in nature: most of the increased expenditures on health care resulting from Seguro Popular were funded by raising taxes on formal labour. Barros blames that it ‘transferred money to informal sector households conditional on sickness’ (2008, pp. 3).

In line with the model explaining the possible effects of social protection programs on the Mexican labour market on page twelve of this thesis, a concern arose that the introduction of Seguro Popular might increase incentives to engage in informal employment. The opportunity to receive free health care instead of paying for it through social security, plus the fact that only working informally (or not working at all) makes one eligible for the program, can result in a shift out of formal employment into informal employment. This effect is aggravated by the high degree of worker mobility on Mexico’s labour market (Barros, 2008).

Using consumption-expenditure household data, Barros (2008) finds no significant shift in employment into formality as an effect of Seguro Popular: his results even indicate an opposite shift out of informality. Campos-Vazquez & Knox (2013) also do not find any correlation between the introduction of the program and workers’ decision to work formally when using

employment surveys. They blame this on the low enrolments with the program during the first years of the program, which they studied. Other authors have addressed the same issue from a different perspective by studying whether the program induced a change in social security enrolments and found significant results. Aterido et al. (2011), studying a longer period while the program was in place (2000-2009), found that the probability of a household being enrolled with IMSS decreased with 0.4 percentage points due to the introduction of Seguro Popular, and that it decreased with 0.6 percentage points for individuals. Bosch & Campos-Vázquez (2010), who also studied the program effects over a longer time, using IMSS enrolment data in municipalities between 2001 and 2008, found a negative impact on the incentive to work formally. From an employers' perspective, affiliation with IMSS decreased with 0.8 percent in municipalities where more than ten people were enrolled with Seguro Popular, after three years this was 3.8 percent.

Most studies that studied urban regions specifically, found no effects of Seguro Popular on affiliation with the formal sector. However, Perez-Estrada (2011) showed that the introduction of the program made male workers in urban areas 1.05 percentage points less likely to have a formal job compared to states where the program had not been introduced. Bosch & Campos-Vázquez (2010) used a difference-in-difference method separating municipalities which had not introduced the program from those that did, ranged from low until high levels of enrolment. They found a reduction in IMSS registrations as a result of Seguro Popular for both urban and rural areas, which was 0.3 percent for urban workers and somewhat higher for rural workers: 0.6 percent. The same authors found that effects were more pronounced for women than for men, as enrolment with IMSS decreased with 6.4 percent for female workers and with 4.9 percent for male workers, although specifically focused on workers under 30 and working in small firms with no more than five employees. It was also found that the affiliation with social security decreased more for spouses than for household heads (Aterido et al., 2011) when estimating the effect on individuals, thus also indicating a higher effect for women when assuming that men are often the main breadwinner and head of the household in Mexico's society.

Some studies have considered the direction of movements on the labour market as a consequence of the introduction of Seguro Popular, testing whether the program resulted in moves out of formality or into informality. Duval & Smith (2011) found that around the time

of introduction of Seguro Popular (between 2002 and 2004), there was a general decrease in the probability of applying for a formal job of 0.28 percent. This effect became more severe when Seguro Popular was active for longer and had received more coverage: between 2005 and 2009 this probability was 5.7 percent lower. Focusing on rural areas specifically, this effect was even more intense, with a decrease of 0.57 percent between 2002 and 2004 and one of 11.6 percent between 2005 and 2009. Aterido et al. (2011) also focused on movements between different sectors and found an increased flow from formal into informal salaried employment (0.5 percentage points) and into self-employment (0.5 percentage points) following the introduction of Seguro Popular. Flows into formality decreased by 3.1 percentage points coming from informal salaried employment and with 1.3 percentage points for self-employment. Azuara and Marinescu (2011), also performing a difference-in-difference estimation but on the municipality level, find no effect on the population in general but do when they zoom in on workers with low levels of education. They conclude that only few workers will choose their employment based on the health benefits provided.

### 2.3 Research question and hypotheses

The findings by Levy (2008) on the introduction of social protection programs in combination with the inefficiency of social security in their effect on the labour market poses questions on the efficiency of introducing these kinds of programs in Mexico. By providing social benefits for those workers that do not have a formal job, social protection programs make informal labour more appealing in theory. The fact that much informal labour in Mexico is voluntary due to social security evasion, indicating discontent with the formal system, may aggravate the effects social protection programs can have. Research on the largest of this kind, health program Seguro Popular, shows that although achieving its main goal of providing health care to the most vulnerable part of the population, it has brought some negative side effects regarding informality. However, as most empirical research that has found a positive correlation between the introduction of Seguro Popular and informality focused only on a small subset of the population, the effects on informality on Mexico's labour force as a whole are still unclear. This has brought me to the following question guiding the topic of my research:

*Did the introduction of social protection health program Seguro Popular have an effect on the degree of informality in Mexico's states?*

Following many other authors studying Seguro Popular, I have exploited the natural experiment that presented itself due to the varying phase-in period of Seguro Popular over states by using a difference-in-difference analysis to study its effects on informality. Related to the small but positive effect of the program on informality in former studies and the design of the method I am using, I arrived at the following expectation regarding its introduction in Mexico:

*H1: Informality increased more for states where Seguro Popular was introduced at the time of measurement than for those where it had not been implemented.*

Conform the methods used by other authors and the higher reliability of data, I will also study the effects of Seguro Popular from another other perspective: by estimating the size of the formal sector. As formality and informality are each other's opposites, the opposite effect of the introduction of the Seguro Popular program is expected when considering formality.

*H2: Formality decreased more for states where Seguro Popular was introduced at the time of measurement than for those where it had not been implemented.*

This research is novel in that it aims to estimate the effects of the introduction of Seguro Popular for the labour force as whole. Therefore, macro data aggregated on state-level was consulted, which matches the phase-in method of the program. Also, the use of macro data can tell us more on the actual behaviour of the population following the introduction of Seguro Popular, rather than their own interpretation of the influence of such a program using macro-data. By estimating the total effects of the policy on its states, this research aims to provide an insight on the net effects that Seguro Popular has induced.

In the section that follows, I will first explain how the difference-in-difference method works and how I have designed the framework for this thesis specifically. After that, the data that is used to perform the analysis will be discussed regarding its sources, construction and limitations.

### 3. METHODS

#### 3.1 DIFFERENCE-IN-DIFFERENCE MODEL

In order to generate insights on the effects of Mexico's policy change regarding social protection on the degree of informality in the country, I use a difference-in-difference approach to estimate the effects of Seguro Popular across states. As the Seguro Popular program was phased in over a time span of four years, this provides an opportunity to analyse the effects in the shape of a natural experiment. The difference-in-difference approach divides the subjects of study in two groups: a treatment group that received the new program, and a control group, which did not experience this change. The groups are observed over two periods, where in the first phase both groups are in the same condition (no treatment), while in later periods only the treatment group receives treatment and the control group does not. The objective of the difference-in-difference method is to measure the difference in the variable of interest once treatment was put in place.

The variable of interest in this study is the degree of informality, while the variable of variation is Seguro Popular. Thus, I would analyse the difference in the degree of informality, before and after the introduction of Seguro Popular, between states where it was and where it was not introduced over the time span studied. The model under study in this case looks as follows:

*Equation 1: Model equation informality*

$$infor_{it} = \beta_0 + \beta_1 time_t + \beta_2 SP_i + \beta_3 did_{it} + \beta_n c_{it} + u_{it}, t = 0,1.$$

Where *infor* represents the degree of informality per state in time *t*, *time<sub>t</sub>* a dummy variable which takes the value of one when *t*=1 and zero otherwise, a dummy variable *SP<sub>i</sub>* which takes the value one when state *i* participates in Seguro Popular in time *t* and thus was treated and zero if it was not, an interaction term between the dummy variables for time and program *did<sub>it</sub>*, a set of control variables *c<sub>it</sub>*, and *u<sub>it</sub>*: an error term for each year per state.

For the regressions, a clustered approach will be used, clustering the standard errors per state in order to control for state fixed effects.



The same regression will be performed using a dependent variable measuring formality, to see whether the opposite term of informality would also behave the opposite to a variation in social policy. Again, standard errors are clustered per state:

*Equation 2: Model equation formality*

$$for_{it} = \beta_0 + \beta_1 time_t + \beta_2 SP_i + \beta_3 did_{it} + \beta_n c_{it} + u_{it}, t = 0,1.$$

Table 1 shows how the two dummies ‘time’ and ‘program’ were constructed and what the interaction between them, thus the difference-in-difference estimator “did”, looks like.

*Table 1: The difference-in-difference estimator explained*

<b>Dummies</b>	2000, 2001 (t=0)	2002, 2003 (t=1)
<i>Control group (program = 0)</i>	No treatment (0)	No treatment (0)
<i>Treatment group (program = 1)</i>	No treatment (0)	Treatment (1)

It can be observed that the value of the difference-in-difference estimator only obtains a value for the treatment group in the second period. The value of the coefficient therefore displays the effects felt in this group on the dependent variable and these changes could thus be linked to the Seguro Popular program. If regressing the difference-in-difference estimator on the degree of informality obtains a significant result, it can be concluded that there is a statistically significant effect of the introduction of Seguro Popular on informality in Mexico’s states.

### 3.2 MODEL UNCERTAINTY

There are a few imperfections in the use of this model to study the effects of Seguro Popular in Mexico, which are discussed below.

#### ENDOGENEITY

The model design of this thesis faces a few issues that consider endogeneity.

First of all is the issue of omitted variable bias. As explained in section 2.1, informality is a complex issue, which is strongly rooted in Mexico’s labour market and characterizing for developing countries. As it is not possible to predict the labour movements within a country with just a few variables, it is likely that the dependent variables in my model are correlated

with many other variables that are not incorporated. As a result, the ability to predict the behaviour of informality or formality with the variables included in this difference-in-difference model are probably be limited. This translates in a large error term per state and year  $u_{it}$  and a low r-squared presenting the amount of variation that is explained. Furthermore, it could thus be that the change in informality induced by the difference-in-difference estimator seems to be caused by the introduction of Seguro Popular as it is specific for states where this program was introduced, but it could as well have been caused by another unobserved variable that coincidentally also affected those states that introduced Seguro Popular. I have tried to explain as much variation in the dependent variable as possible by including the control variables of which I found in the literature to have an effect on informality. Those can be found under section 4.2.2 of the data section. Furthermore, the use of panel data and clustering the standard errors per state, limits the variation in informality caused by time-invariant heterogeneity, thereby controlling for state fixed effects.

Second, there is the problem that the variable of variation (Seguro Popular) and the variable of interest (informality) are correlated with each other. As the Seguro Popular policy was designed to provide social safety for those not falling under social security laws, and informality can be defined as those workers outside of social security protection, both can be explained by the same observable. It would be ideal to introduce an instrumental variable in the model which would have an effect on Seguro Popular but not on informality. However, as social policy in Mexico is dependent on labour status (working formally or not), I have not been able to find this variable.

Related to this problem, it could have been the case that the order of introduction of Seguro Popular was biased. In this case Seguro Popular could have been introduced earlier in states where informality was high and this would highly overestimate the effects of Seguro Popular on informality for the treatment group compared to the control group, as informality would have already been higher there to start with. In order to test for this issue related to endogeneity, I performed a t-test on the periods before introduction of the program to see whether informality and formality in the control and treatment group states were similar. The results of this test can be found under section 5 “Results”.

## SEGURO POPULAR DUMMY

A flaw of the model above is that it is designed to check whether informality increases as a result of the introduction of Seguro Popular through a dummy, which takes the value of one in the situation where Seguro Popular was active in that specific state. As a result, in the model it seems as if all Seguro Popular beneficiaries were informal workers. In fact, not only informal workers but anyone not currently enrolled in social security can register with Seguro Popular. This means that it is available for the whole population except for formal workers, thus also for unemployed and those that are not part of the labour force. It can thus not be assumed that all Seguro Popular beneficiaries are informal workers, as some of them might be willing to work formally (the unemployed) or not able to work at all (not in the labour force). In this sense, it would be better to include a dummy incorporating the share of Seguro Popular beneficiaries that were informal workers instead of including a dummy which takes the value of one when the program was active. As there was no data available that described the labour status of all of the beneficiaries, I did not find a way to solve this problem.

However, as far as was found in the literature the program does not work by exclusion or a maximum number of beneficiaries in a certain year or area. This would mean that the introduction of the program still provides the same opportunity to workers, namely the option to pay for health care through social security or receiving it for free with Seguro Popular. As this opportunity is seen as the driving force behind the effect Seguro Popular can have on informality, the fact that the program is available would already be enough to measure its effects on the labour market.

### 3.3 SAMPLE

The data analysis was executed using a sample of 31 states over a period of 4 years, as only the years from 2000 until 2003 could be used for the difference-in-difference estimation, thus running the regressions using 124 observations. Of the 31 states, 26 were treated and 5 were used as controls.

Mexico has 32 states, but the observations for the federal district were dropped from the analysis. As there were variables for which this state did not contain any observations, it could not be used for the regressions. In 2016, the district was renamed Ciudad de México and gained the status of an independent state, thereby becoming the 32<sup>nd</sup> state of the United Mexican States (The Guardian, 2016). Before that time, the federal district was only a region within the state

of Mexico consisting. As the recognition of this region changed over time and the fact that it contains only the capital of the country, it has a different institutional framework and data behaved odd.

## 4. DATA

This section discusses the data sources consulted and assess the variables constructed using that data. The data is described by showing the distribution of the main variables and trends on the Mexican labour market. Furthermore, an assessment is made about the quality of the data and shortly elaborated on other data that would be preferable to include but which was unavailable.

### 4.1 DATA SOURCES

Most of the data is consulted through the website of the Mexican government (Gob.mx), which contains a lot of information and databases published by institutions.

#### LABOUR MARKET DATA BY THE STPS

Information on Mexico's labour market was published by the Secretaría de Trabajadores y Provision Social (STPS) (Mexican Ministry of Labour and Social Security). The ministry is part of the federal government and works under the jurisdictions of the federal labour law to improve employment opportunities according to national development plans. It conducts research in order to identify areas of improvement and publishes this on its website. Data ranges from national statistics regarding labour productivity to detailed employment data. This employment data is collected by conducting employer surveys and household surveys identifying one's occupation and income. Furthermore, the ministry provides services to workers such as information portals and support when unemployed. The data from STPS that I consulted for this thesis consist of one dataset containing data on the informally employed population (STPS 2017a) and one on the unemployed (STPS 2017b). Both datasets contain information on the number of people working informally/being unemployed from 1995 until 2005 per Mexican state (although state-level data was missing until 2000), aggregated per sex and age group. As the STPS is a section of the Mexican Federal government and their main objective of collecting data is to design optimal policies regarding employment, I judge this source as reliable.

#### IMSS ENROLMENTS

As it is governed by law that all formal workers should be enrolled with the Instituto Mexicano del Seguro Social (IMSS) (Mexican Social Security Institute), data from this organization was consulted in order to measure the number of formally employed people in Mexico. As the

organization manages both the payments coming in from employers and employees and arranges the provision of social benefits in return, it holds datasets containing information on all accounts held by IMSS affiliates. As an accurate registration is necessary in order to use IMSS services, this dataset holds detailed information per beneficiary. The IMSS holds data on accounts for all years since 1995. The years before 2000 it only holds annual membership data, and after that it publishes a list of affiliates at every end of the month. The datasets contain information on the insured worker's region, state and municipality of residence, sector of employment, whether it concerned urban, rural, temporal or permanent employment, the size of the firm they were employed at, and information on the age, gender, and wage range of the worker (IMSS, 2018). Since it is in the IMSS own need to hold valid and accurate data on their members, this data is expected to be of high quality.

#### SECRETARÍA DE SALUD

Data on Seguro Popular was accessed through the Secretaría de Salud (Mexican Ministry of Health). Just as the ministry of labour, it is part of the Mexican federal government. Its role is to promote health and prevent diseases among the whole of Mexico's population. Their mission reads: 'to establish state policies for the population to exercise their right to health protection' (in Spanish, Secretaría de Salud, 2018). Their vision focuses on the provision of health to those in vulnerable conditions. This vision becomes reality by the provision of Seguro Popular, which was initiated by the ministry of health in 2002. As the program works on the basis of membership, the ministry holds information on the beneficiaries that are enrolled. Unfortunately, no detailed account information has been published which presents characteristics on the individual. Instead, an aggregated dataset was used containing the number of beneficiaries per state and the amount of resources in pesos spent on Seguro Popular for the years 2002 until 2013. Unfortunately, access to the website via which I consulted this specific data source is now obstructed (Secretaría de Salud, n.d.), but the dataset is available on request of the author. Furthermore, the ministry provided a more detailed dataset on beneficiaries per municipality, aggregated per sex, but since this dataset only contains data from 2004 onwards and thus could not be used for the difference-in-difference estimation.

#### CONAPO

Population data was accessed through CONAPO, the Mexican National Population Council. The institution is responsible for collecting data on demographics and devising policies based on that. I used its dataset on demographic indicators between 1990 and 2030 (CONAPO, 2018).

The dataset contains information on population per sex, state and year of which the data from 1990 until 2009 were collected based on population counts and from 2009 onwards were projected.

## INEGI

The Instituto Nacional de Estadística y Geografía (INEGI) is the national bureau of statistics of Mexico. They collect information on the country in order to know its characteristics and thereby provide tools for decision making. It focuses on measuring and diffusing information on Mexico's territory, resources, population and economy. I consulted their collection of territorial data, which contains the size of all Mexico's states in square kilometres (INEGI, 2018).

## 4.2 VARIABLES

Table 7 in the appendix presents the summary statistics on the variables used in the data analysis. This section discusses the format of the variables, how they developed over time and how they were constructed. Furthermore, the strengths and weaknesses on using them in the analysis are discussed.

### 4.2.1 DEPENDENT VARIABLES

Two dependent variables are used to conduct the difference-in-difference analysis, with which I will conduct the same, but separate, regressions are conducted. The first of these measures the degree of informality by consulting data on workers occupied in the informal sector of the labour market, and the second one considers data on enrolments in IMSS to measure the degree of formality within a state. Both measures are calculated as a percentage of total employment, since only then can be concluded whether their share has increased or decreased.

## INFORMALITY

This measure of informality consults the data on informal employment published by the STPS (STPS, 2017a). The STPS considers informal workers as those workers that are: working in unregistered economic units, working domestically, self-employed, unpaid workers and subordinated or remunerated workers who work without the protection of social security. The employed population, which is also provided in the same dataset, includes all people over the age of 14 which are engaged in some type of economic activity, independent of the hours spent on that a day or whether it entails subordinate work or remunerated work or self-consumption.

This measure thus also includes informally employed workers. The data from 2000 until 2013 is consulted and the numbers on informality and employment are merged over the age groups to finally end with data segregated by year, state and sex. As I am interested in the change in informality incidence, thus the share of people working informally, I divide the absolute numbers for informal employment by total employment. However, as the data consulted uses household surveys to classify workers as informally employed, this data is sensitive to mistakes made by the respondents, whether deliberately or not. Therefore, the use of this subjective survey-data has been supplemented by the use of more objective institutional data on formality, to see whether the results tell a different story.

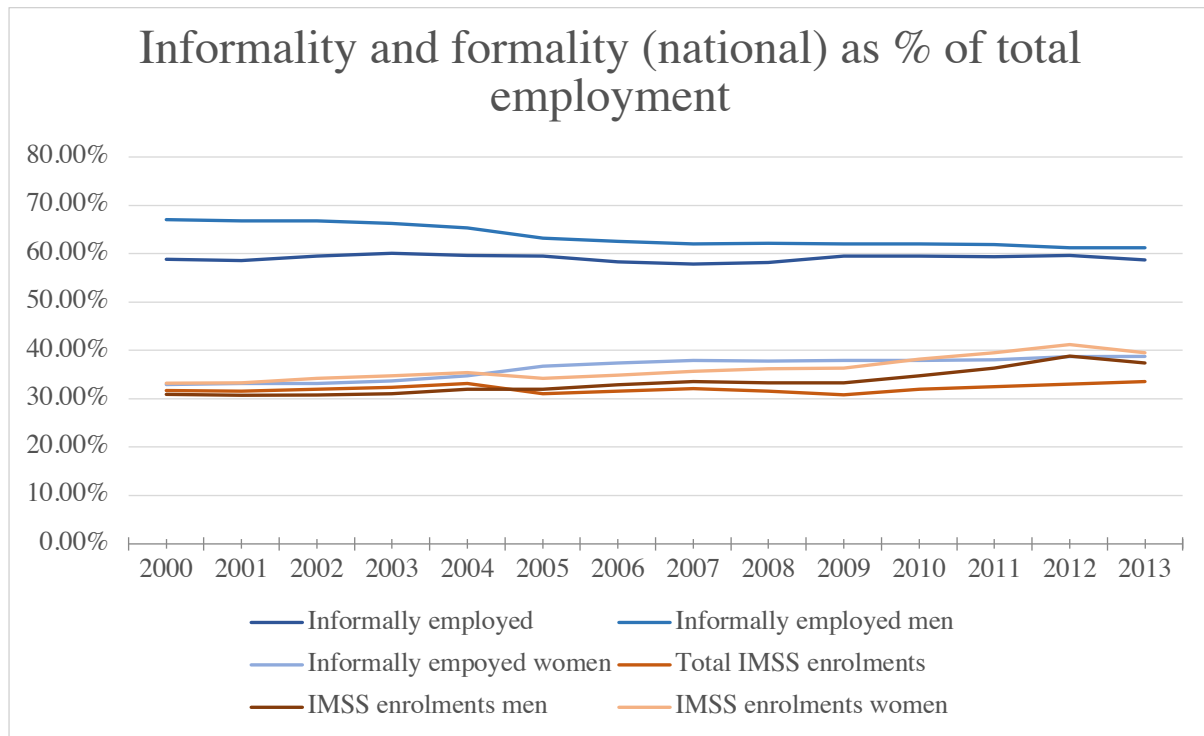
#### FORMALITY

The second variable measures formality, based on IMSS data on formal employees' enrolment with social security (IMSS, 2018). I eventually summed the insured in order to end up with the enrolments per state and sex for each year for the years 2000 until 2003. For the calculation of the formality incidence, the numbers on workers affiliated with IMSS are calculated as a share of the STPS's measure of total employment presented in their dataset on informality (STPS, 2017a). Although used in other authors' studies on the effects of Seguro Popular and seen as a good proxy to estimate the size of the difficult-to-measure informal sector, a decrease in formality does not translate into a proportional increase in informality. As explained in section 2.1.2, IMSS only regulates the social security for private-sector workers, whereas public-sector workers are enrolled with the ISSSTE. A decrease in IMSS enrolments relative to total employment could thus also be caused by a relative increase in public-sector labour. As no yearly data on ISSSTE enrolments was available, I unfortunately could not include this share of employment.

In figure 5, one can find how informality and formality in Mexico developed between 2000 and 2013 consulting the data on the dependent variables. It seems like informality (the blue lines) in total remained relatively stable over time, as the decrease in informality for men evened out the increase in informality that was felt among women. Formality, measured as those workers enrolled with IMSS saw an increase over time, also for both men and women. Looking at the summary statistics, informality is quite similar for men and women when relative to their own group. This is somewhat higher for men, contradicting the results presented by ILOSTAT (2018). Accordingly, formality is higher among women than men.



Figure 7: National level of informality & IMSS enrolments, measured as percentage of totally employed population for the period 2000-2013



Sources: Author's own calculations based on: STPS (2017a), IMSS (2018).

In the appendix, two maps are included, ranging the states of Mexico according to the degree of informal labour. One map is included for the beginning of the period (2000), and one for the end of the period (2013), to see whether the states for which informality was high at first, are also the ones presenting high informality later in time. It can be observed from these maps that the number of states showing medium or high informality decreased in 2013 compared to 2000. Also, it can be observed that the ranges of informality are quite concentrated in certain areas, where the south of the country experiences the shows the most severe incidences of informality, this becomes less pronounced in the middle of the country and the lowest incidences are found in the northern states. According to the data, informality was highest in the following states: Chiapas, Oaxaca, Guerrero, Hidalgo, Tabasco & Michoan de Ocampo, displaying degrees of informality of above 75 percent of total employment for multiple years. The lowest degrees of informality (below 40 percent of total employment) were found in Coahuila de Zaragoza, Nuevo Leon, Baja California Sur & Chihuahua.

An issue to consider when researching informality is that of measurement. Since informal labour is unregistered labour, there is not a single institution that has information on all workers within that sector (as is the case with the IMSS). The exact amount of informally employed

people can never be known, as it is such a dynamic and complex sector, which is rather defined by exclusion than by definition. There is thus no perfectly accurate information on informality within a country or state, and measures of it will always be an estimation, just as in this thesis.

#### 4.2.2 INDEPENDENT VARIABLES

##### SEGURO POPULAR

The data from the ministry of health on Seguro Popular was used to construct the dummy variable indicating the treatment of a state with the program. As the data contains information on the number of program beneficiaries per state, the dummy obtained a value of one for all the states where this number was positive. If the state did not receive treatment (had no beneficiaries) in any of the years studied, the dummy had a value of zero.

Figure 8 contains a map of Mexico that shows the states that received treatment in 2003 and the number of beneficiaries were enrolled with Seguro Popular. In this figure it can be seen that although there are some outliers, such as Sinaloa (12.83 percent), Tabasco (12.99%) and Colima (26.29%), but overall enrolment with the program in the first years was low. It can also be observed that the coverage for states that introduced the program in 2003 are generally lower than most states that started the program in 2002. From this it can be concluded that in the first years of the period, enrolment rates were low.

##### CONTROLS

Four controls were used in the difference-in-difference model to control for other indicators of informality within Mexico's states.

First of all, the population data by CONAPO (2018) is used to control for population growth. The log population per state over time is included in order to control for demographic trends within the data that could have affected the size of the informal labour market.



Second, the percentage of the population that is economically active is controlled for by the use of the variable labour participation<sup>1</sup>. This data is obtained from the STPS's dataset on unemployment (STPS, 2017b), where it identifies the economically active population as the people older than 14 that are engaged in employment or are actively seeking to perform it. This means it includes all employed and unemployed workers between the ages of 15 and 64. I calculated the rate over the total population (CONAPO, 2018) and thus identify the share of the population that is able to work within a state. As was explained in the literature, a fast-growing labour force often translates into informality in developing countries as it absorbs the excess labour as a result of a shortage in formal job growth or a skill mis-match between workers and labour demand.

Using the same source (STPS 2017b), the unemployment rate is calculated by measuring the unemployed over the economically active population. Within this database, people are considered as being unemployed when they have actively sought for economic activity during the last month. This control variable was included for two reasons: first, as voluntary unemployment becomes more attractive with the introduction of social protection programs such as Seguro Popular, as all people not covered with social security can use its services and second, because of the relationship between unemployment and informality in developing countries, explaining that informal labour often absorbs unemployed workers.

Looking at these labour market controls in the summary statistics (table 7 in the appendix), it becomes evident that men are generally working more than women in the sense that, when randomly selecting a man and a woman out of the population, chances are higher that the man is working than the woman. This relates to fact that labour force participation is much higher for men (on average 52.8 percent) than for women (on average 29.33 percent) and that unemployment is higher for women than for men. This indicates that relative to their own gender group, more men than women are employed. Figure 9 in the appendix, showing the development of the national labour force over time, shows that although labour force participation did not increase tremendously in total or for men, women increased their participation by quite a lot. Figure 10 shows that unemployment, which was extremely low (2.5 percent for 2000) in the first years of the time frame studied and a lot more pronounced

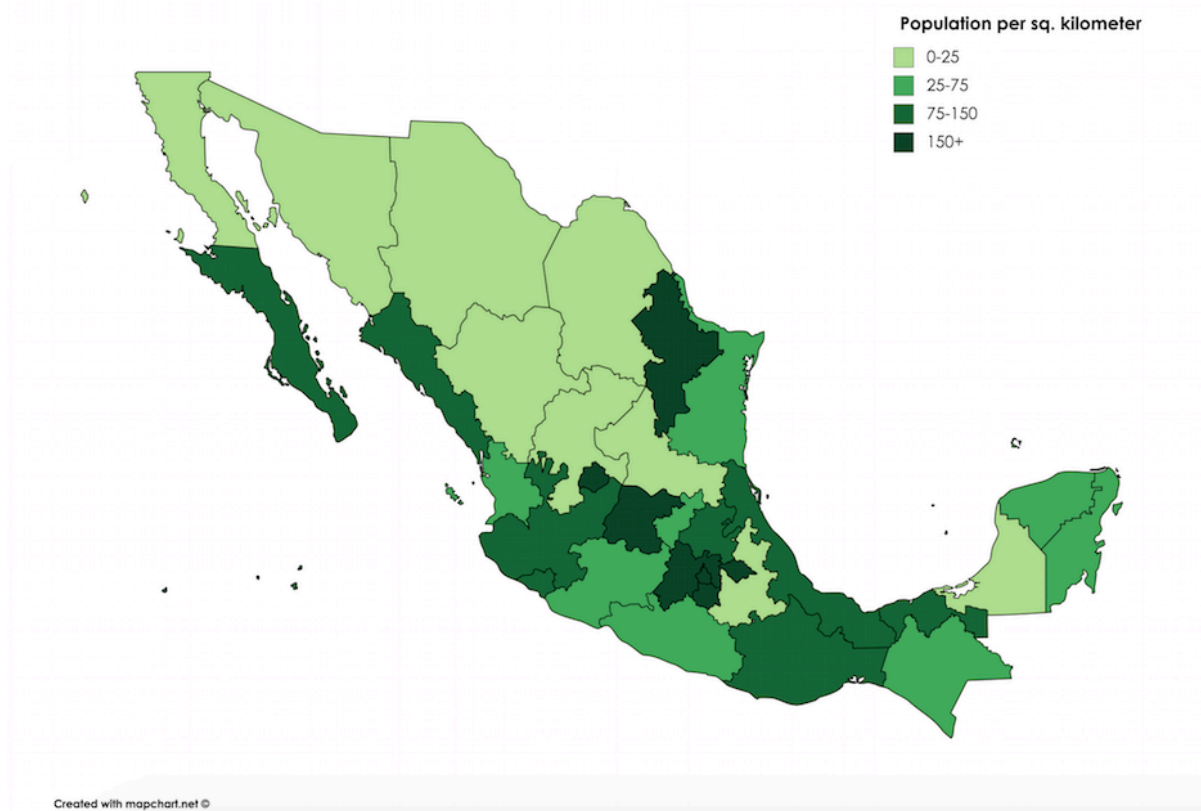
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<sup>1</sup> Note: not to be confused with labour force participation rate (LFPR) which measures the share of the economically active population over the population of the same age group, often working age (OECD, 2018).

for women than for men, saw a sharp increase up to five percent in the years following the global economic crisis. Also, the rates for men and women evened out during these years. Although much higher than before, an unemployment rate of five percent is still very low.

Lastly, related to the findings that informality is especially apparent amongst poor households and that those predominantly live in rural areas, plus the fact that the provision of IMSS benefits in rural areas is low, it is expected that Seguro Popular will have more effects in rural areas than in urban ones. By combining CONAPO (2018)'s population data and data from INEGI on state size in square kilometres (INEGI, 2018), a measure on population density could be estimated for each state. As a result, it can be derived which states are more and less populated, valid as a proxy for rurality. The following map was constructed to show the population density across Mexico's states.

Figure 9: Population density in Mexico as a proxy for rurality based on population for the year 2000



Source: Author's own calculations based on CONAPO (2018) & INEGI (2018). Created with [www.mapchart.net](http://www.mapchart.net)

Combining the division showed in the map above with the maps on informality for both 2000 and 2013 across Mexico's states, shows that Levy (2008)'s conclusion might be wrong: as informality is lowest in the northern states but these states are the most rural ones.

## OTHER POSSIBLE SOURCES OF VARIATION

Ideally, controls on other variables that could explain the degree of informality within a state should be included, in order to explain more variation within the dependent variable and thus to be able to estimate the effects that Seguro Popular had more accurately.

First of all, it would be beneficial to include a measure of agricultural specialization for a certain state. As in developing countries a lot of agricultural employment comprises self-employment and in Mexico self-employed workers are not recognized by social security and thus are regarded to be informal, it is expected that a lot of informality in a state could be explained by agricultural employment. A measure of agricultural activity would therefore be good to incorporate in a model trying to explain informality. Unfortunately, no data could be found on any proxy for agricultural specialization for the time studied in this research. With the rurality control, I try to explain some of the variation due to agriculture.

Another strong link with the informal sector is the quality of institutions in a certain region. People are more likely to avoid paying taxes or fees if they believe the organizations receiving those are unjust or inefficient (Schneider & Enste, 2002). In this sense, if people would be discontent with the government of their state, they would be less willing to pay taxes over their income, and thus this could lead to more of them willing to work informally. The same would hold for the quality of the IMSS, Infonavit or the Afore in case, the institutions governing social security. Here again, the disappointing quality of institutions could lead to an increase in the degree of informality. A measure or proxy for the states' residents on their satisfaction with the quality of the social security institutions and the government of that certain state would thus be an accurate control in the model. Unfortunately, no data could be found on this for the specific time period under study.

Lastly, there could be cultural differences amongst states that could explain the degree of informality. It could for example be that certain minority groups are more likely to work informal as others. As it is hard to identify which cultural indicators would affect informality in what way, I did not manage to include this possible variation in my model.

## 5. RESULTS

Taking a first look at the map of Mexico's states that were generated on the introduction of Seguro Popular and the degree of informality in the year 2000, it does not seem as if those were related. While the high, medium, and low degrees of informality were quite concentrated in certain areas of the country, the phase-in order seems scattered over the country. Of the pilot states, only Jalisco had a high degree of informality in 2000. In order to check for whether the phase-in of the Seguro Popular program was endogenous and thus was somehow related to the initial shares of informality, which could bias the results of this research, a t-test was performed. A t-test can be used in order to determine whether informality in the two groups of states used for the difference-in-difference estimation, thus the control and treatment group, was similar before treatment was implemented ( $t=0$ ). The results of the t-test are presented in table 1, where the null hypothesis tests whether the difference between the mean value of the two groups (0 = control group, 1 = treatment group) was equal to zero. From the p-values can be concluded that for both informality and formality, none of the alternative hypotheses is significant and thus the null hypothesis stating that the difference in the mean values is zero cannot be rejected. These test results do not indicate an source of endogeneity related to the time of implementation of Seguro Popular dependent on higher or lower degrees of initial informality. Therefore, I will continue to perform the regression using both dependent variables.

Table 2: T-test results for the two dependent variables informality & formality during  $t=0$ , numbers represent p-values.

<b>Diff: mean (0) – mean (1)</b>	<b>Informality</b>	<b>Formality</b>	<b>H0: diff = 0</b>
<b>HA: diff &lt; 0</b>	0.1078	0.8878	
<b>HA: diff = 0</b>	0.2075	0.2242	
<b>HA: diff &gt; 0</b>	0.8963	0.1121	

### 5.1 MAIN RESULTS

Performing the difference-in-difference analysis using an Ordinary Least Squares (OLS) regression obtained the results presented in table 3. Within this regression, informality was the dependent variable, where the standard model consists of the time dummy, the program dummy and an interaction between the two: the difference-in-difference estimator indicated by “DID”. The control variables were added to the standard model separately to measure their isolated effect on informality. “DID” is the main variable of interest as its significance would suggest an observed change in the informality incidence specifically for the states where Seguro

Popular was introduced. It can be seen that the difference-in-difference estimator is only significant in model four, including the unemployment rate as a control. However, the coefficient shows a negative sign, which is different than expected as it would indicate a decrease in informality for those states where Seguro Popular was introduced at that time. Another interesting observation is that the time dummy is significant in most of the models. This suggests that informality increased in general between the period where  $t=1$  (2002, 2003) compared to where  $t=0$  (2000, 2001), irrespective of whether a state introduced Seguro Popular at  $t=1$  or not. Besides that, labour force participation and unemployment have a significant effect on informality within this analysis, both when included individually or with the other controls (model 6). For labour force participation, the coefficient is negative, which suggests that an increase in labour force participation in a state of one percent decreases the share of informal labour with 1.5 percent individually and shows a proportionate increase when including all controls. Unemployment also has a negative effect on informality. A one percent increase in unemployment reduces the informality incidence with 0.24 percent, while this is little below 0.2 percent when including more variables. The program dummy, population and a measure of rurality present no significant effects in any cases.

In order to see whether the effects were different when considering the level of formality as a dependent variable, measured as the percentage of the employed workforce that is enrolled with social security, the same regression analysis was performed. The results of the estimations are presented in table 4. As now the opposite is being measured, opposite coefficient signs are expected in comparison to the regression results in table 3. Although indeed most variables that were significant for informality show the opposite effect for formality, the regression shows somewhat different results.



Table 3: Difference in difference estimation results for informality, standard errors clustered by state.

VARIABLES	(1) log Informality	(2) log Informality	(3) log Informality	(4) log Informality	(5) log Informality	(6) log Informality
Time	0.018* (0.009)	0.016* (0.009)	0.0074 (0.020)	0.099*** (0.030)	0.008 (0.018)	0.070** (0.033)
SP	0.108 (0.139)	0.114 (0.144)	0.054 (0.116)	0.090 (0.128)	0.096 (0.135)	0.052 (0.112)
DID	0.003 (0.011)	0.003 (0.011)	0.039 (0.024)	-0.056** (0.027)	0.011 (0.018)	-0.014 (0.030)
log Population		0.055 (0.044)				0.034 (0.043)
log Labour Participation			-1.505*** (0.380)			-1.059*** (0.380)
log Unemployment				-0.243*** (0.0597)		-0.197*** (0.070)
Rural					-0.094 (0.085)	-0.062 (0.086)
Constant	3.960*** (0.131)	3.147*** (0.641)	9.469*** (1.371)	4.173*** (0.132)	3.988*** (0.132)	7.521*** (1.667)
Observations	124	124	124	124	124	124
R-squared	0.031	0.063	0.222	0.250	0.055	0.378

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4: Difference-in-difference estimation results for formality, standard errors clustered by state.

VARIABLES	(1) log Formality	(2) log Formality	(3) log Formality	(4) log Formality	(5) log Formality	(6) log Formality
Time	-0.001 (0.019)	0.004 (0.018)	0.015 (0.035)	-0.130*** (0.044)	0.026 (0.033)	-0.079 (0.047)
SP	-0.156 (0.169)	-0.176 (0.184)	-0.073 (0.130)	-0.129 (0.155)	-0.121 (0.153)	-0.076 (0.133)
DID	0.021 (0.022)	0.021 (0.021)	-0.035 (0.039)	0.114** (0.049)	-0.001 (0.034)	0.052 (0.050)
log Population		-0.186*** (0.058)				-0.148** (0.059)
log Labour Participation			2.327*** (0.606)			1.403** (0.539)
log Unemployment				0.383*** (0.091)		0.325*** (0.083)
Rural					0.276** (0.104)	0.179* (0.098)
Constant	3.710*** (0.150)	6.452*** (0.853)	-4.803** (2.211)	3.374*** (0.162)	3.627*** (0.143)	0.410 (2.500)
Observations	124	124	124	124	124	124
R-squared	0.022	0.172	0.212	0.249	0.106	0.501

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Again, the difference-in-difference estimator is only significant in the model controlling for unemployment solely, which in accordance with the results on informality, has a positive effect on formality. This can be interpreted as that the states which implemented Seguro Popular in the second time period, had a higher formality incidence than those that did not. Also labour force participation and unemployment have a significant effect on formality, either when controlled for individually or in combination with other variables. In this case, both have a positive effect on formality which is in both cases bigger than for informality, meaning that an increase in either unemployment or labour force participation, increases engagement in the formal sector.

Interesting to see is that unlike for informality, the time variable is not significant except from in model 4. Again, it takes the opposite direction of the “DID” estimator, which is odd, meaning that formality in general decreased between the two periods, but that it increased for the states that introduced Seguro Popular. Furthermore, the statistics show that population has a negative effect on formality, meaning that an increase in population would lower the formality incidence in a certain state. This is remarkable in comparison to the effect of labour force participation, where an increase has a positive effect on formality. In line with the effect of the population variable and the maps presented earlier in this thesis, the dummy “Rural” shows a positive and significant effect on formality, indicating that the formality incidence is higher when population density is low, which is opposite from what the literature predicted. This would mean that densely populated areas are more sensitive to informality.

What can also be concluded from the results presented in this thesis is that although informality and formality within this sample are negatively correlated with each other, they do not respond to the same variables. The correlation between the variables is -0.892, meaning that an increase in informality suggests a decrease in formality of almost 90 percent. However, when comparing the results in table 3 and 4, it seems as if that the variables included in my model do a better job in explaining formality than informality. All controls included in the second regression (table 4) are significant, either when included separately or together, while this is not the case for informality in the first regression. As rurality seems to have a positive effect on formality, it would be expected that this would relate negatively with informality, but this is not the case. The same holds for the variable controlling for population. When looking at the values for r-squared, it can be seen that the model explains more variation for formality (0.501) than for

informality (0.378). In general, it is suggested that informality for the population as a whole has increased over time, and that Seguro Popular has had the opposite than expected effect on informality and formality in the states where it was introduced during the second period.

## 5.2 REGRESSIONS PER SEX

That the difference-in-difference estimator has a different effect of informality than expected in the previous section, could be the result of testing the effects of Seguro Popular over a too broad sample. Related to the differences in labour market participation and unemployment between men and women, the same regressions as before are performed but now on subsamples of the population segregated by gender, to see whether this will show more pronounced and/or other relations.

In this sense, I have calculated the degrees of informality, formality, labour participation and unemployment in relation to the subsample's own sample group such that informality measures the male informal workers as a share of total male workers, the number of men in the labour force over the total male population and so forth, repeating this for the female sample. Population (growth) and the dummy for rurality are specified for the state as a whole and not per gender as they indicate state-specific characteristics. The regression results for men and women separately can be found in tables 5 and 6 on the next pages.

### INFORMALITY FOR MEN

The "DID" estimator for men shows significance when including either labour force participation or unemployment. Only in combination with labour force participation, which correlates negatively with informality, the difference-in-difference estimator has the expected effect on informality: that the states that introduced Seguro Popular experienced higher levels of informal labour when considering male workers. When including unemployment, which has a negative but highly significant effect on male informality, the difference-in-difference estimator indicates that informality was lower for states that introduced Seguro Popular. Furthermore, the results indicate that informality for male workers increased over time, as the time dummy is significant for every situation except in model 5 including the rural dummy, which is not significant in any case. When considering the model as a whole, informal labour for men increased as a percentage of total employment, while negatively correlating with both

labour force participation and unemployment. The other controls had no significant effect for this subsample.

#### INFORMALITY FOR WOMEN

For women, the introduction of Seguro Popular had no significant effect on the share of informal labour, as the “DID” variable shows no significance in any of the models regressed. As for the population as a whole and men specifically, informality for women correlates negatively with both labour force participation and unemployment, although the effects are less pronounced. Only when including the unemployment control, it seems as if informality for women increased over the time period considered in the regressions, indicated by the significant coefficient for “Time”.

Having presented the main results following the difference-in-difference analysis, now in the next section I will explain what we can derive from this regarding the research question and hypothesis posed in this thesis and related to the findings of other authors.

Table 5: Difference-in-difference estimation results for informality for men, standard errors clustered by state.

VARIABLES	(1) log Informality men	(2) log Informality men	(3) log Informality men	(4) log Informality men	(5) log Informality men	(6) log Informality men
Time	0.016* (0.008)	0.014* (0.008)	0.009* (0.005)	0.112*** (0.026)	0.008 (0.016)	0.097*** (0.028)
SP	0.096 (0.139)	0.101 (0.144)	0.048 (0.111)	0.073 (0.120)	0.086 (0.139)	0.045 (0.110)
DID	0.002 (0.011)	0.002 (0.010)	0.025* (0.013)	-0.062** (0.023)	0.008 (0.016)	-0.040 (0.024)
log Population		0.055 (0.046)				0.056 (0.041)
log Labour Participation men			-1.413** (0.555)			-1.012** (0.449)
log Unemployment				-0.264*** (0.057)		-0.244*** (0.063)
Rural					-0.076 (0.083)	-0.010 (0.079)
Constant	3.987*** (0.130)	3.183*** (0.674)	9.560*** (2.174)	4.174*** (0.117)	4.010*** (0.138)	7.328*** (1.906)
Observations	124	124	124	124	124	124
R-squared	0.024	0.054	0.157	0.308	0.039	0.415

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: Difference-in-difference estimation results for informality for women, standard errors clustered by state.

VARIABLES	(1) log Informality women	(2) log Informality women	(3) log Informality women	(4) log Informality women	(5) log Informality women	(6) log Informality women
Time	0.015 (0.014)	0.014 (0.014)	0.011 (0.027)	0.067** (0.026)	0.001 (0.026)	0.042 (0.041)
SP	0.138 (0.158)	0.144 (0.163)	0.118 (0.155)	0.127 (0.160)	0.120 (0.140)	0.097 (0.135)
DID	0.0129 (0.017)	0.013 (0.017)	0.0342 (0.031)	-0.028 (0.027)	0.025 (0.027)	0.006 (0.043)
log Population		0.055 (0.042)				0.026 (0.047)
log Labour Participation women			-0.518** (0.237)			-0.433* (0.252)
log Unemployment				-0.172*** (0.056)		-0.150** (0.064)
Rural					-0.143 (0.104)	-0.142 (0.117)
Constant	3.894*** (0.151)	3.089*** (0.619)	5.585*** (0.765)	4.089*** (0.179)	3.937*** (0.132)	5.143*** (1.181)
Observations	124	124	124	124	124	124
R-squared	0.050	0.078	0.106	0.150	0.098	0.246

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.10

## 6. DISCUSSION

This thesis aims to provide an answer on the widely discussed debate whether the introduction of Seguro Popular in Mexico increased the share of informal employment within the country. The social protection health program has been blamed to make informal employment more attractive than formal employment as a result of the combination between an inefficient social security system and receiving free health care when not being formally employed. In order to answer this question, two hypotheses were constructed to test Seguro Popular's effects, where the first predicts a positive effect of the program on informality, and the second a negative one when considering formality.

Based on the regression results in table 3, the first hypothesis can be rejected. As the only time the interaction variable measuring the presence of Seguro Popular was significant displayed a negative coefficient, it seems as if the program had the opposite than expected effect on informality. Furthermore, the significance of the time dummy leads to believe that informality in general increased but that this was not specific to states that implemented Seguro Popular. Therefore, it cannot be concluded that informality increased due to the program.

However, what is interesting to see is that this negative effect of Seguro Popular on informality only appears for the models which include the unemployment rate as a control. For the models not including this variable, the difference-in-difference estimator shows a small and insignificant, but positive coefficient. The already predicted negative correlation between informality and unemployment in the literature, leads to believe that a high increase in unemployment might have caused informality to decrease in the states where Seguro Popular was introduced, rather than the program itself. When looking at the mean unemployment rates of both the treatment and control group, it can indeed be concluded that unemployment was higher for states that received treatment. It could thus be the case that the unexpected decrease in informality was caused by higher unemployment rather than program effects of Seguro Popular.

Also, hypothesis two, expecting a negative correlation between Seguro Popular and formality, can be rejected. As again the only significant difference-in-difference estimator is apparent for the model including unemployment as a control and since the coefficient displays the opposite



than expected sign in relation to informality, it is likely that this was not caused by the introduction of Seguro Popular but because of higher unemployment rates in the states where the program was introduced. When leaving this model outside of consideration, no significant effects between the introduction of Seguro Popular and a change in formality can be observed.

Another unexpected finding in this thesis is that the control measuring labour participation had a strong negative effect on informality and a strong positive effect on formality. This does not relate to the findings by the International Labour Organization (2002) predicting that informality is positively correlated with a growing population and labour force as the informal sector in this case would absorb the excess workers that cannot find a formal job. As this sample shows the opposite results, this could indicate that the increase in labour force participation at the time was accompanied by an increase in formal jobs, such that there was less excess labour to be absorbed by the informal sector.

From the regressions for men and women separately it became clear that there were more significant effects on informality for men than for women within this dataset. A probable explanation for this phenomenon is that women in Mexico are considerably less involved in labour, which could limit the effects shown on their decisions within the labour market. However, it cannot be concluded that the introduction of Seguro Popular increased informality for either sex.

Considering the findings above, this research shows that the effects of the implementation of Seguro Popular on Mexico's labour market were negligible. To be precautionary here in stating that there were no effects, the research question guiding this thesis can be answered by stating that there were no significant effects shown within this sample, treating the states of Mexico as the units under study.

Finally, this research presents interesting findings regarding the relation between formality and informality. Although negatively correlated, the variables for both phenomena seem to respond to different variables within the model. For informality, the labour market controls included relate to informality different than expected in the literature. Therefore, it seems as if the choice of workers to work either formally or informally can better be explained by intrinsic motivations rather than labour statistics. Brandt (2011), who found that informality in many

developing countries is a consequence of either a skill mismatch between labour demanded and supplied, or an issue related to excess labour, states that this case is different in Mexico. Despite the demand for formal jobs and a wage surplus when working in the formal sector, many workers choose to work informally. It was found that the inefficiencies of social security were one of the main reasons for workers to make this decision (Brandt, 2011). Some rather want to be self-employed than working for a firm, and as only subordinated workers can enrol for social security in Mexico, these workers are also regarded to work informally. Related to this and Levy (2008)'s model, it would thus be expected that the introduction of Seguro Popular would have significant effects on informal labour, as it affects the benefits of the workers.

An explanation for the smaller than expected results of the effects of Seguro Popular on the degree of informality in Mexico, could be the design of this research. As the period under study contained only four years, the number of observations for the regressions was limited. Related to this issue, the effects of Seguro Popular were only estimated for two consecutive years right after implementation. As can be seen in the map displaying program coverage up to 2003, it can be seen that the number of beneficiaries in these years in general was low. As the program was still in start-up phase, it could have been the case that the accessibility of the program was still limited and also that not many workers were familiar with its existence. Since the hypothesized effect of Seguro Popular on informality comes from the assumption that workers are aware of a free alternative other than social security, the fact that the program was still small could reduce the observed effects. Besides that, only knowing about the program is not enough, workers also have to change their labour status accordingly. It might take some time for workers to adjust their behaviour regarding the policy change. As a consequence, it would be interesting to observe the program effects later in time as then the program would be better integrated in the Mexican system of social policy. This can also be seen when looking at the findings of for example Bosch & Campos-Vázquez (2010), Aterido et al. (2011) and Duval & Smith (2011), who found higher effects when considering a longer period after the introduction of the program. However, as the strength of the difference-in-difference method as was chosen for this thesis, lies with comparing the effects on a treatment group and a control group to isolate the possible effects of the program, it was not possible to include a bigger time span in this analysis. As the phase-in period of the program was so short and spread over consequent years, adding one more year to the sample immediately would add four more states to the treatment group, leaving only two states as controls. As including only two states to measure the benchmark would be too limited, it was unfortunately not possible to extend the time period

studied in this research to see whether more pronounced effects would be observable in that case.

Another limitation of this study that could explain the small effects of the program on informality could be the scale on which the effects were measured. It could be that measuring the program effects on state-level is too broad and that more pronounced effects were only visible when considering smaller units. While still measuring the effects on the total labour force, it was attempted to study the program effects on municipalities instead of states. Even though a phase-in method was used over the municipalities which would thus allow for a difference-in-difference analysis of the program's effects of informality, the right data for this estimation was not available.

Furthermore, the measurement issues with regard to the informal sector constitute a limitation to this thesis but also to the estimation of informality in general. The difficulty here relates to two issues. First, the definition of informal labour knows many different forms and thus its measures can be based on many of these different definitions. Obviously, different measures of the same variable can present different results. Another issue with informal labour is that it comprises an unregistered form of labour. In that sense, there will never be an institution that can observe the true number of informal workers, numbers on informality can only be estimated. Especially with regard to this thesis, aiming to observe informality in a developing country where data collection methods are expected to be of less quality, the estimations on informality are expected to be understated in relation to its true size.

## 7. CONCLUSION

This thesis studies the effects of the introduction of a social protection program on the labour market in a developing country, characterised by a high incidence of informality. The Seguro Popular program that was introduced in Mexico in 2002 has received a lot of critique, most of it related to offering informal workers, among others, free health care and thereby increasing the attractiveness of informal jobs relative to formal ones. By assessing macro-data aggregated on the state level, this thesis tries to see whether this critique is valid. While a wide range of research has tried to answer this question, most of them used micro-data and focused on very specific subsamples of the population, not presenting a clear conclusion on the net results. By estimating the effects of the introduction of Seguro Popular on informality on the state-level, this thesis tries to paint a more conclusive picture on the consequences for the different states of Mexico and therefore for the country as a whole. This can set the effects found amongst subsamples by other authors in perspective.

Taking advantage of the gradual phase-in approach by which the program was implemented, a difference-in-difference analysis compares the degree of informality in states that had introduced the program to the ones that had not. It can be concluded that there were no significant differences in informality between treated and non-treated states. Therefore, this thesis does not show a significant effect when estimating the consequences of Seguro Popular on the labour market in Mexico's states. Also, when segregating the sample by gender, the estimations show no significant effects of the program on informality for either men or women.

Related to the limitations of this thesis, there are some points on which this research could be elaborated. First of all, it would be interesting to estimate the effects felt on the state level more accurately by considering data on its municipalities. As Seguro Popular was also implemented within states using a phase-in approach on their municipalities, a similar approach as for this thesis could be used by comparing levels of informality in municipalities which received early treatment compared to those who did so later to aggregate the effects on these lower levels into a more accurate estimation of its consequences for states.

Another suggestion for future research relates to the incentives for workers to engage in informal employment. As it seems from this thesis that workers in Mexico base their decisions on other factors than in the general case, more research has to be done on this topic. This could be conducted by household surveys questioning the respondents on their employment and what

their motivations are behind this type of employment and integrate this to predict informality more accurately. Furthermore, as social policy seems of major influence on a worker's decision to work formally, complementing research on affiliates' opinions on social programs would be beneficial in order to find the solution to informality in Mexico.

As informality is so big within Mexico's economy and seen as one of the main consequences and causes of its stagnant growth, devising policies to limit its size are of major importance for the future of the country. However, the difficult task of conceptualizing and estimating it, makes it hard to measure its true size. A famous quote by Kanbur describes this issue well '*Informality is a term that has the dubious distinction of combining maximum policy importance and political salience with minimal conceptual clarity and coherence in the analytical literature*' (Kanbur, 2009, pp: 33). Therefore, much research on informality and its interactions with other parts of an economy are important to materialize its behavior to be able to translate it into a set of workable policies. Something that this research has contributed to.

## REFERENCES

- Aterido, R., Hallward-Driemeier, M., & Pages, C. (2011). Does Expanding Health Insurance Beyond Formal-Sector Workers Encourage Informality? Measuring the Impact of Mexico's Seguro Popular. *World Bank Open Knowledge Repository, Policy Research Working paper* no. WPS 5785.
- Azuara, O. & Marinescu, I. (2011). Informality and the Expansion of Social Protection Programs: Evidence from Mexico. *University of Chicago*.
- Baah-Boateng, W. (2015). Unemployment in Africa: How Appropriate is the Global Definition and Measurement for Policy Purpose? *International Journal of Manpower*, Vol. 36 (5), pp: 650-667.
- Banerjee, A.V. & Duflo, E. (2007). The Economic Lives of the Poor. *Journal of Economic Perspectives*, vol. 21(1), pp: 141-167.
- Barros, R. (2008). Wealthier But Not Much Healthier: Effects of a Health Insurance Program for the Poor in Mexico. *Stanford Institute for Economic Policy Research, Discussion papers* 09-002.
- Barber, W.J. (1961). Disguised Unemployment in Underdeveloped Economies. *Oxford Economic Papers New Series*, vol. 13 (1), pp: 103-115.
- Bosch, M.M. & Campos-Vazquez, R. (2010). The Trade-offs in the Labor Market of Social Assistance Programs: The Case of the 'Seguro Popular' Program in Mexico. Mimeo.
- Brandt, N. (2011). Informality in Mexico. *OECD Economics Department Working Papers*, no. 896, OECD Publishing, Paris.
- Campos-Vázquez, R. & Knox, M. (2013) Social Protection Programs and Employment: The Case of Mexico's Seguro Popular. *Economía Mexicana Nueva Época*, vol. 22 (2), pp: 403-448.

CEFP. (2013). Indicadores Sobre Seguridad Social en México. Available Online: <http://www.cefp.gob.mx/indicadores/gaceta/2013/iescefp0152013.pdf> [Accessed 13 May 2018]

CONAPO. (2018). Indicadores Demográficos 1990/2030. Available Online: <https://datos.gob.mx/busca/dataset/proyecciones-de-la-poblacion-de-mexico/resource/78bc123d-0399-48cc-8266-a42780b74ff7> [Accessed 24 April 2018]

De Soto, Hernando. (1989). *The Other Path: The Invisible Revolution in the Third World*. New York: Harper and Row.

Dougherty, S. & Escobar, O. (2013). The Determinants of Informality in Mexico's States. *OECD Department working papers*, no. 1043. OECD Publishing, Paris.

Duval, R., & Smith, R. (2011). Informality and Seguro Popular under Segmented Labor Markets. Mimeo. Centro de Investigación y Docencia Economicas (CIDE), Mexico.

Frenk, J., Gómez-Dantés, O. & Knaul, F.M. (2009). The Democratization of Health in Mexico: Financial Innovations for Universal Coverage. *Bulletin of the World Health Organization*, vol. 87, pp: 542-548.

The Guardian. (2016). Mexico City Officially Changes Name to – Mexico City. Available Online: <https://www.theguardian.com/world/2016/jan/29/mexico-city-name-change-federal-district-df> [Accessed 01 May 2018]

Hanson, G.H. 2010. Why Isn't Mexico Rich? *Journal of Economic Literature*, vol. 48 (4), pp: 987-1004.

ILO Social Protection (2015). Employment Programs and Unemployment Benefits. Available Online: <http://www.social-protection.org/gimi/ShowTheme.do?tid=2667&lang=EN> [Accessed 27 May 2018].

ILOSTAT. (2018). Informal Employment and Informal Sector as a Percentage of Employment by Sex (%). Available Online:

<http://www.ilo.org/ilostat/faces/oracle/webcenter/portalapp/pagehierarchy/Page27.jspx>  
[Accessed 18 May 2018]

International Labour Organization (ILO). (2018). Informal Economy (Employment Promotion). Available Online: <http://www.ilo.org/global/topics/employment-promotion/informal-economy/lang--en/index.htm> [Accessed 25 January 2018]

International Labour Organization (ILO). (2002). Resolution Concerning Decent Work and the Informal Economy. Available Online: <http://www.ilo.org/public/english/standards/relm/ilc/ilc90/pdf/pr-25res.pdf> [Accessed 18 May 2018]

IMSS, (2018). Asegurados – Conjuntos de datos. Datos Abiertos IMSS. Available online: <http://datos.imss.gob.mx/group/asegurados> [Accessed 7 April 2018]

INEGI. (2018). Cuéntame – Información por entidad. Available Online: <http://cuentame.inegi.gob.mx/monografias/default.aspx?tema=me> [Accessed 23 May 2018]

Jonasson, E. (2011). Informal Employment and the Role of Regional Governance. *Review of Development Economics*, vol.: 15(3), pp. 429-441.

Junco Machado, D. G. (2015). Seguro Popular: Mexico's Progress in Protecting the Right to Health. Open Global Rights. Available Online: <https://www.openglobalrights.org/seguo-popular-mexicos-progress-in-protecting-the-right-to-health/> [Accessed 15 May 2018]

Kanbur, R. (2009). Conceptualising Informality: Regulation and Enforcement. *The Indian Journal of Labour Economics*, vol. 52 (1), pp: 33-42.

La Porta, R., Shleifer, A. (2014). Informality and Development. National Bureau of Economic Research Working Paper Series, no. 20205.

Levy, S. (2008). Good Intentions, Bad Outcomes: Social Policy, Informality and Economic Growth in Mexico. *Brookings Institutions Press*, Washington D.C.



Mason, A. D. (2007). Informality, social protections, and antipoverty policies. *Informality: Exit and Exclusion*. World Bank, Washington, DC, pp: 199–215.

Meghir, C., Narita, R. & Robin, J.M. (2011). Wages and Informality in Developing Countries. *Institute for Fiscal Studies*. Accessed Online: [https://www.ifs.org.uk/docs/meghir\\_narita\\_robin.pdf](https://www.ifs.org.uk/docs/meghir_narita_robin.pdf) [Accessed 20 May 2018]

OECD. (2008). Declaring Work or Staying Underground: Informal Employment in Seven OECD Countries. *OECD Employment Outlook 2008*, Annex 2.A3 to chapter 2. Accessed Online: <http://www.oecd.org/employment/emp/40843646.pdf> [Accessed 29 May 2018]

OECD. (2015). OECD Employment Outlook 2015 – Enhancing Job Quality in Emerging Economies. OECD iLibrary. Available Online: [https://www.oecd-ilibrary.org/employment/oecd-employment-outlook-2015/incidence-of-informality-in-emerging-economies\\_empl\\_outlook-2015-graph65-en](https://www.oecd-ilibrary.org/employment/oecd-employment-outlook-2015/incidence-of-informality-in-emerging-economies_empl_outlook-2015-graph65-en) [Accessed: 4 May 2018].

OECD. (2018). Labour Force Participation Rate. Available Online: <https://data.oecd.org/emp/labour-force-participation-rate.htm> [Accessed 19 May 2018]

Pages, C. (2010). La Era de Productividad. Inter-American Development Bank, Washington D.C.

Perez-Estrada, J. (2011). The Employment and Wage Effects of Expanding Health Insurance Coverage: The Case of Mexico. Mimeo. University of California, Los Angeles (UCLA), The United States.

Schneider, F. & Enste, D.M. (2002). Hiding in the Shadows: the Growth of the Underground Economy. *International Monetary Fund Economic Issues*, no. 30.

Secretaría de Salud. (2017). Padrón Nacional de Beneficiarios del Sistema de Protección Social en Salud. Available Online: <https://datos.gob.mx/busca/dataset/beneficiarios-de-proteccion-social-en-salud-de-seguro-popular> [Accessed 7 April 2018]

Secretaría de Salud. (2018). Que Hacemos? Available Online: <https://www.gob.mx/salud/que-hacemos> [Accessed 25 May 2018]

Secretaría de Salud. (n.d.) Personas Afiliadas y Recursos Ejercidos en el Seguro Popular de Salud. Was Available Online: <https://datos.gob.mx/busca/organization/salud> [Accessed 8 April 2018]

Secretaría del Trabajo y Previsión Social (STPS). (2017a). Tasa de Informalidad Laboral – Objetivos de Desarrollo Sostenible. Datos.gob.mx. Available Online: <https://datos.gob.mx/busca/dataset/objetivos-de-desarrollo-sostenible-tasa-de-informalidad-laboral-til--1> [Accessed 10 April 2018]

Secretaría del Trabajo y Previsión Social (STPS). (2017b). Tasa de Desocupacion – Objetivos de Desarrollo Sostenible. Datos.gob.mx. Available Online: <https://datos.gob.mx/busca/dataset/objetivos-de-desarrollo-sostenible-tasa-de-desocupacion> [Accessed 10 April 2018]

Tümen, S. (2016). Informality as a Stepping Stone: A Search-Theoretical Assessment of Informal Sector and Government Policy. *Central Bank Review*, vol. 16 (3), pp: 109-117.

UNECA. (2011). Addressing the Youth Education and Employment Nexus in the New Global Economy. *African Youth Report*. UNECA, Addis Abeba.

World Bank. (2018a). Unemployment, total (% of the labor force) (national estimate) – Mexico. World Bank Data. Available Online: <https://data.worldbank.org/indicator/SL.UEM.TOTL.NE.ZS?locations=MX> [Accessed 26 May 2018]

World Bank. (2018b). Social Protection. Available Online: <http://www.worldbank.org/en/topic/socialprotection/overview> [Accessed 27 May 2018]

World Bank. (2012). Mexico's System for Social Protection in Health and the Formal Sector. *World Bank Human Development Department*, June 2012 – Latin America and the Caribbean regional office.

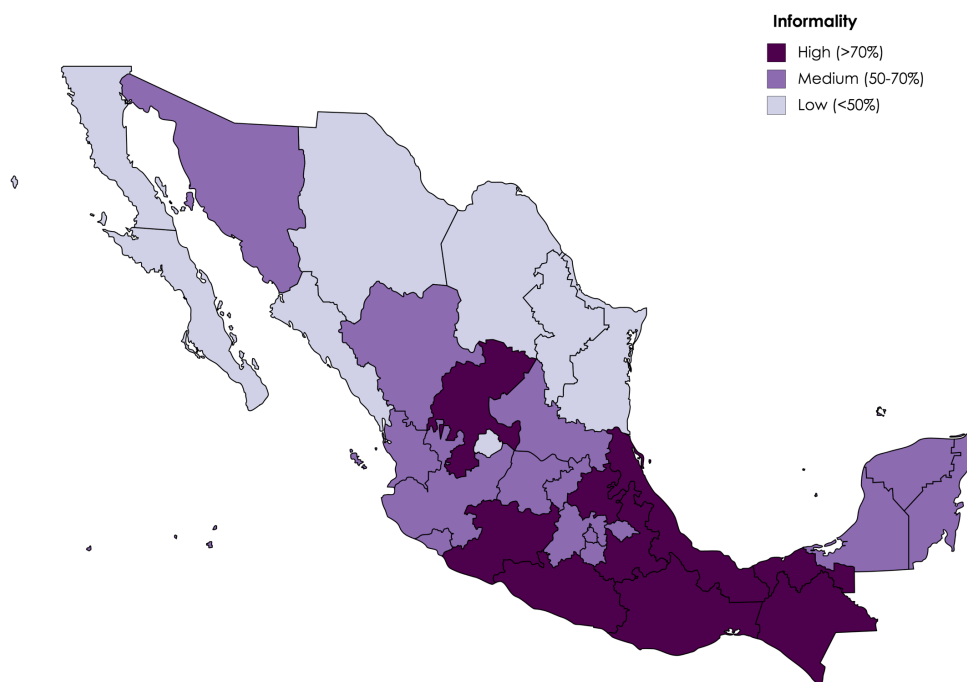
## APPENDIX

Table 7: The states of Mexico grouped according to year of implementation of Seguro Popular

Year of launch	States
2002 (pilot)	Aguascalientes, Campeche, Colima, Jalisco, Tlaxcala
2002	Baja California, Chiapas, Coahuila de Zaragoza, Guanajato, Guerrero, Hidalgo, México, Morelos, Quintana Roo, San Luís Potosi, Sinaloa, Sonora, Tabasco, Tamaulipas, Zacatecas
2003	Baja California Sur, Michoacán de Ocampo, Veracruz de Ignacio de la Llave, Yucatán
2004	Nayarit, Nuevo León, Puebla, Querétaro
2005	Chihuahua, Distrito Federal (Ciudad de México), Durango

Source: Secretaría de Salud (n.d.)

Figure 10: Mexico's states ranged from low to high degrees of informality for the year 2000



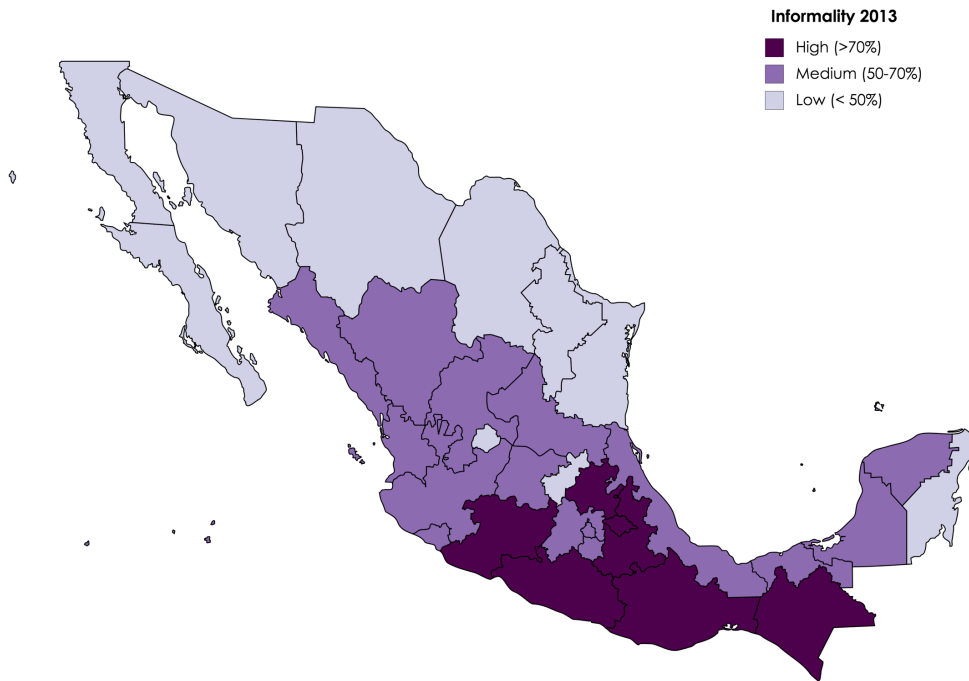
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Source: Author's own calculation based on STPS (2017a). Created with [www.mapchart.net](http://www.mapchart.net).

Table 8: Summary statistics for the variables consulted, totals and segregated by men and women.

<i>Variable</i>		<i>Observations</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
<i>Informality incidence obtained (share of total employed)</i>	<i>Total</i>	434	59.12%	12.37%	34.64%	82.94%
	<i>Men</i>	434	59.21%	12.87%	33.78%	85.68%
	<i>Women</i>	434	58.78%	11.98%	25.86%	81.74%
<i>Formality incidence (share of total employed)</i>	<i>Total</i>	434	40.43%	12.28%	14.89%	72.36%
	<i>Men</i>	434	39.25%			
	<i>Women</i>	434				
<i>Labour force participation (share of total population)</i>	<i>Total</i>	434	40.89%	3.57%	32.11%	51.18%
	<i>Men</i>	434	52.80%	3.35%	42.65%	61.56%
	<i>Women</i>	434	29.33%	4.36%	18.34%	42.43%
<i>Unemployment (share of active labour force)</i>	<i>Total</i>	434	3.71%	1.59%	0.44%	8.35%
	<i>Men</i>	434	3.51%	1.67%	0.36%	8.47%
	<i>Women</i>	434	4.09%	1.64%	0.61%	8.82%
<i>Seguro Popular Beneficiaries (share of total population)</i>	<i>Total</i>	353	27.60%	19%	0	74.05%
	<i>Men</i>	353	25.99%	17.90%	0.20%	70.44%
	<i>Women</i>	353	28.95%	19.61%	0.21%	75.34%

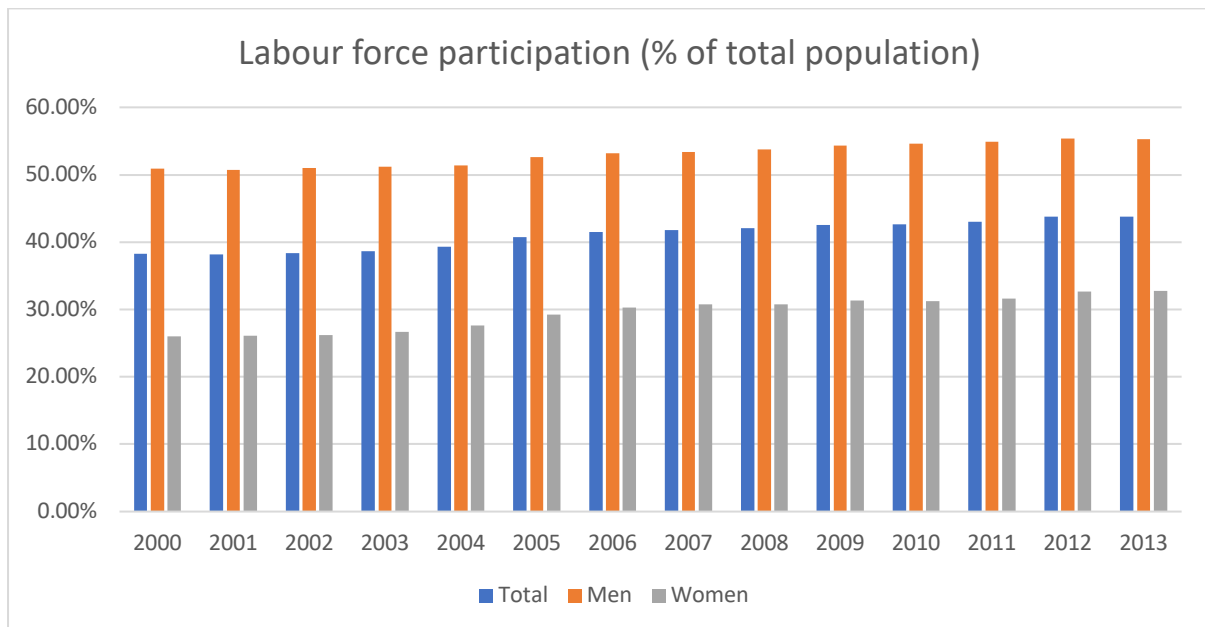
Figure 11: Mexico's states ranged from low to high degrees of informality for the year 2013



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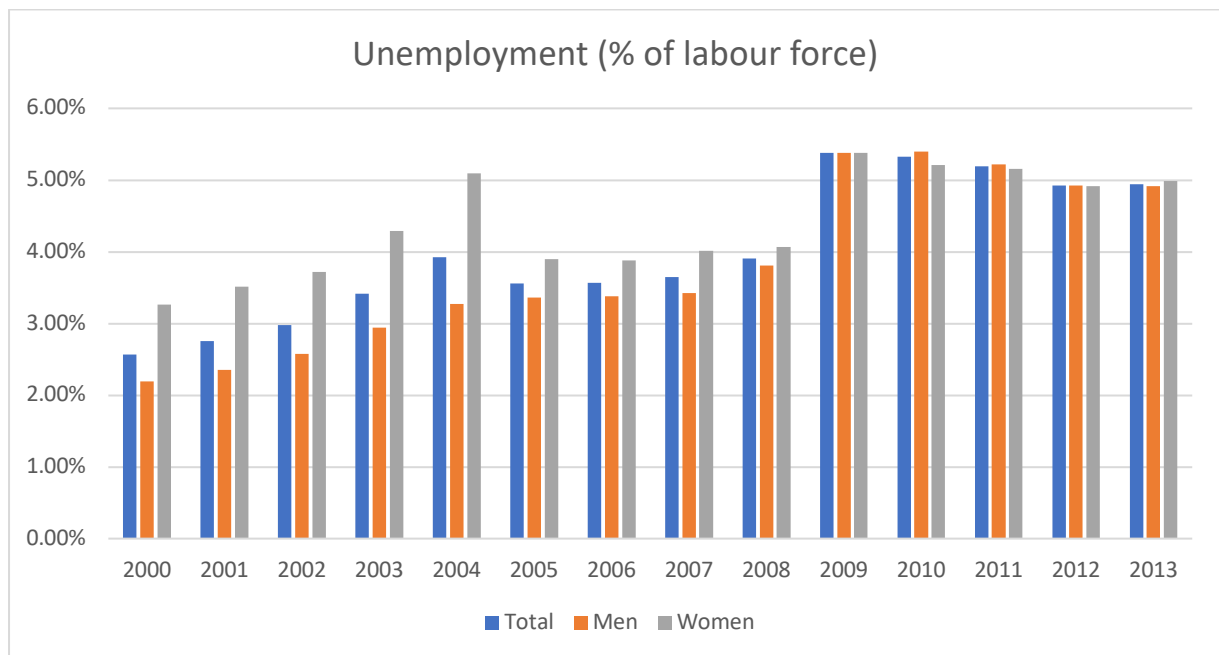
Source: Author's own calculation based on STPS (2017a). Created with [www.mapchart.net](http://www.mapchart.net).

Figure 12: National labour force participation rates measured as a percentage of total population for the period 2000-2013



Source: Author's own calculations based on STPS (2017b) & CONAPO (2018).

Figure 13: National unemployment rates measures as a percentage of total labour force for the period 2000-2013.



Source: Author's own calculations based on STPS (2017b).