Payroll tax reduction in Brazil:
Effects on employment and wages

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This document represents part of the author's study programme while at the Institute of Social Studies. The views stated therein are those of the author and not necessarily those of the Institute.

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Dedication

With love to Magda, Lucas, Jonas, and Débora.

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List of Acronyms

CAGED	Cadastro Geral de Empregados e Desempregados – General Registry of Employed and Unemployed
CBO	Classificação Brasileira de Ocupações - Brazilian Occupational Classification
CNAE	Classificação Nacional de Atividades Economicas – National Classification of Economic Activities
CNI	Confederação Nacional da Indústria – National Confederation of Industrial Employers
CNPJ	Cadastro Nacional de Pessoas Jurídicas - National Registry of Juridical Persons
CPP	Contribuição Previdenciária Patronal – Employers' Contribution to Social Security
DIEESE	Departamento Intersindical de Estatísticas e Estudos Socioeconômicos – Inter Union Department of Statistics and Socioeconomic Studies
FGV	Fundação Getúlio Vargas – Getúlio Vargas Foundation
FGTS	Fundo de Garantia por Tempo de Trabalho – Guarantee Fund for Job Duration
FNPS	Fórum Nacional de Previdência Social - National Forum of Pension Fund
GDP	Gross Domestic Product
IBGE	Instituto Brasileiro de Geografia e Estatística – Brazilian Institute of Geography and Statistics
INCRA	Instituto Nacional de Colonização e Reforma Agrária – National Institute for Colonization and Land Reform
INSS	Instituto Nacional do Seguro Social – National Institute of Social Security
IT	Information Technology
ICT	Information and Communication Technology
MTE	Ministério do Trabalho e Emprego – Ministry of Labour and Employment
OASDHI	Old Age, Survivors, Disability, and Health Insurance
PIA-Empresa	Pequisa Industrial Anual-Empresa – Annual Industrial Survey – Enterprise level.
PME-IBGE	Pesquisa Mensal do Emprego-IBGE – Monthly Employment Survey-IBGE (see above)
PNAD	Pesquisa Nacional por Amostra de Domicílios - National Household Survey

RAIS	Relação Anual de Informações Social – Annual Roll of Social Information
RGPS	Regime Geral de Previdência Social – General Regime of Social Security
SEBRAE	Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – Brazilian Agency for Small and Micro Enterprises
SENAC	Serviço Nacional de Aprendizage Comercial - National Comercial Training Service
SENAI	Serviço Nacional de Aprendizagem Industrial - National Industrial Training Service
SESC	Serviço Social do Comércio – Social Service of Commerce
SESI	Serviço Social da Indústria - Social Service of Industry
Simples Nacional	Regime Especial Unificado de Arrecadação de Tributos e Contribuições devidos pelas Microempresas e Empresas de Pequeno Porte – Special National Simplified Tax and Contribution Regime for Micro and Small Enterprises
SME	Small and Medium Enterprise
SRF	Secretaria da Receita Federal – Secretary of Federal Revenue

Abstract

This paper evaluates the effects of the elimination of a payroll tax on employment and wages in four manufacturing and service sectors in Brazil in early 2012. This tax, which accounted for 20 percent of the wage bill, was levied on employers and financed social security programmes. This study is based on administrative records from the Brazilian Ministry of Labour which contained information on formal employment contracts. Exploring the fact that the tax reform only covered firms not under a special tax regime for micro and small firms, a difference-in-differences approach with firm fixed effects was implemented to compare covered and uncovered firms controlling for sector, region and other covariates. The estimates suggest that, on average, the policy led to a 15 percent increase in employment, total labour input measured by contracted hours of work rose by 9 percent, and wages increased by 2 percent. These results indicate that in its first year of implementation the policy had positive employment effects and a partial shifting of the tax benefit onto labour.

Relevance to Development Studies

The share of labour costs represented by labour-related taxes has been receiving great attention recently, both in developed and developing countries. Under an increasingly competitive economic environment, proposals have been made to cut payroll taxes as a way to reduce labour costs and improve export competitiveness. These proposals frequently are claimed to stimulate job creation and contribute to other outcomes such as the promotion of the formalization in the labour market.

However, empirical studies have not produced conclusive confirmation of these claims and underline the need to examine the effects on different national contexts. Specificities like the prevalence of informal work arrangements, labour institutions, and social security programmes, are just a number of the intervening factors which affect labour taxation. This paper relates existing literature on the issue to the context of a Latin-American country that presents a peculiar set of institutional characteristics.

The Brazilian payroll tax reform in 2012 is a natural setting for the examination of the effect of payroll tax on the labour market. There was substantial exogenous variation in the tax rate and taxation changed for one identifiable group and not for another allowing for a selection of a counterfactual. The paper tries an innovative approach to overcome the problems and limitations of previous studies about the payroll tax reform by exploring available data at firm level.

Keywords

Payroll tax, labour demand, employment, wages, Brazil, social security.

Chapter 1
Introduction

This research paper evaluates the effects of a payroll tax reduction on employment and wages in Brazil. The policy, announced in 2011, aimed to enhance the competitiveness of Brazilian companies, to stimulate employment, and to promote the formalization of employment (Ministério da Fazenda 2012: 6). It was expected that by reducing the cost of labour, firms would increase their demand for labour and be less inclined to set informal work arrangements.

The policy initially covered four industries – parts of the textile industry, the garment industry, leather and shoe industries, and information and communication technology industries – and was later extended to include additional manufacturing and service sectors. Currently, 56 sectors are covered including almost the entire manufacturing industry, services and retail commerce.

Following an international trend, in Brazil taxation on labour has been a central pillar in the financing of the public social security system since the 1930s (Hart 1984: 55, Pochmann and Santos 1998: 4). These programmes include pension funds for retirement and survivors, unemployment benefits, workplace injury insurance and other benefits that create safety nets for the working classes.

Simultaneously, the effects of payroll taxes on the labour market and on the economy as whole have received attention from economists. Discussions are set around the importance of social security to the behaviour of agents in the labour market, as well as on whether and how payroll taxes affect the level of wages and employment.

A number of empirical studies have tested the predictions generated by theoretical frameworks but have not achieved entirely clear and generalized conclusions. It seems that specific circumstances relating to labour markets, more structured and homogeneous in developed countries, or more heterogeneous and less formalized markets in developing economies, play a key role in determining the final outcome. Studies about experiences in developing countries in particular may help to design policies compatible with such heterogeneous and less formal labour markets.

The reform of labour taxation in Brazil is an opportunity for the study of a natural experiment in a developing economy. The levels of unemployment and informality, the composition of the manufacturing sector, and institutional aspects of the Brazilian economy are similar to those in other developing countries, especially in Latin America. This study, thus, aims to contribute to the understanding of the implications of labour tax policies for the country and the region.

The research paper will investigate if and to what extent the reduction of the payroll tax implemented in Brazil in 2012 affected the employment level, labour input, and wages in four economic sectors covered by the policy. This study will also seek to answer the question whether there were differences in these effects for administrative/managerial employees and production workers, and between the primary and secondary workforce (women, young workers).

There are some limitations to this study. First, its scope is limited to the effects on the labour market, not addressing the fiscal implications of the reform. Second, possible effects of labour taxation on the formalization of jobs cannot be measured due to a lack of information about informal work at the level of the firm. Third, the natural delay of statistics in relation to social facts prevents the study of effects after 2012, the first year of the policy adoption. Fourth, the study only evaluates the impacts on the few sectors covered initially by the policy.

Notwithstanding these limitations, the study takes advantage of a labour tax reform which had two notable components. One, the change affected labour costs substantially and had the potential to influence decisions regarding employment and wages. Two, the reform did not affect all firms, thus generating potentially credible counterfactuals that allow for the identification of causal relationships. These features provide an opportunity to examine the relationships between payroll tax and employment and wages at the level of the firm.

So far, studies about the effect of the payroll tax reduction on the Brazilian labour market have not been conclusive and have produced different results (FGV Projetos 2013, Dallava 2014). This study intends to contribute to the discussion by adopting an approach that differs from these previous works. Using panel data from the Brazilian Ministry of Labour, the study adopts a difference-in-differences approach to examine whether firms covered by the policy perform differently as compared to similar firms that are not exposed to it.

Following this introduction, Chapter 2 will present the labour tax reform, contextualizing the policy both historically and in relation to the economic circumstances of its adoption. Chapter 3 summarizes the controversy around the magnitude and the effects of the so called 'social charges' on the payroll bill in Brazil in the last decades. Chapter 4 is dedicated to theoretical frameworks that put forward explanations for the relationships between payroll taxes and labour market outcomes. Empirical studies are presented and their methodological approaches are discussed in Chapter 5. After that, chapters 6 to 8 present the core of the empirical analysis, including the empirical strategy (Chapter 6), the data (Chapter 7), and the results (Chapter 8). Finally, Chapter 9 presents the conclusions.

Chapter 2
Research Problem

In August 2011, the Brazilian government announced a comprehensive plan to stimulate external competitiveness, to raise investments, and to favour technical progress – the 'Plano Brasil Maior' (MDIC 2012). One of its main components was a change in the payroll tax applicable to four economic sectors: garments, leather and shoe industries, segments of the textile industry, and IT and ICT services sectors, including call centres. The payroll tax reform was embodied in federal law n. 12.546, of 14/12/2011 (Government of Brazil 2011), and further legislation[1].

2.1 Characteristics and coverage

The payroll tax reform consisted of a substitution of the mandatory employers' contribution (CPP) to the General Regime of Pension Fund (RGPS) by a tax on gross revenues excluding export revenues. The RGPS assures workers employed by the private sector, of retirement and survivors' pensions, including temporary or permanent disability, sickness, pregnancy, arrest, death and aging. To be eligible, workers have to be registered and employers must contribute monthly.

Contributions to social security in Brazil come from both the employee and the employer. The employee contributes 8, 9 or 11 percent of his/her wage, up to a monthly taxable base limited to BR$ 4.390,24 in 2014. The employers' contribution, the CPP, is set at 20 percent of the payroll bill without any limit.

The reform reduced the CPP to zero and substituted it with a tax on gross revenues excluding exports which was initially set at 1.5 percent for manufacturing industries and 2.5 percent for service sectors. In August 2012 these tax rates were reduced respectively to 1 percent for manufactured goods and 2 percent for service sectors (Government of Brazil 2012). This measure started in January 2012 with an initial validity until December 2014. More recently, the Government enacted legislation to make the reform permanent (Government of Brazil 2014).

The labour tax reform was designed to be applicable to firms that produce a list of manufactured products and to firms registered as operating in specific service sectors (Government of Brazil 2011: see articles 7th and 8th). In the case of the service sector, the reform affects the entire firm if it is officially classified as operating in one of the sectors included. However, for manufacturing firms, coverage may be partial. If, for instance, a manufacturing firm has only 50 percent of its products included in the list, then the changes in the payroll tax is cut in 50 percent and the revenue tax is levied on 50 percent of its revenues.

[1] A summary of the relevant legislation is found in Zanghelini (2013: 30-34).

The policy did not apply to firms which were operating under the National Simplified Tax Regime for Micro and Small Enterprises (Simples Nacional) as their payrolls were already exempted from the CPP. The Simples offers firms a simplified system of tax collection, reduces paperwork, and lower the tax burden. Opting firms can pay eight different taxes[2] including the CPP by a single levy on their revenues ranging from 4.5 percent to 12.11 percent for the manufacturing industries and from 4.5 percent to 16.88 percent for the service sectors depending on their revenues. Firms with annual revenues up to R$ 3.6 million in 2012 were eligible to apply for this special regime. Therefore, the payroll tax reform affected mostly larger firms or those small and medium firms that could not or had not opted for the simplified Simples regime.

2.2 Objectives of the payroll tax reform

By reducing total labour costs, the tax reform aimed at increasing the external competitiveness of tradable goods, stimulating employment, and promoting formalization of employment contracts. The policy was also meant to result in lower prices in the domestic market and an overall increase in output. The suppressed payroll tax represents 20 percent of the wage bill, 14 percent of the legal obligations imposed on regular employment, and a substantial part of the total labour costs (see section 3.2). The government claimed that labour costs would be reduced without depressing the wage rate or damaging labour rights and labour conditions.

The intended effect on the external competitiveness of Brazilian goods was based on the fact that exports were exempted from the revenue tax, thus capturing the entire tax reduction. But production for the domestic market was also expected to benefit as the substitution of a payroll tax by a revenue tax was supposedly not neutral, that is, on average, it decreased the tax burden for firms. According to the government, the neutral revenue tax rates would be 2.32 percent for the textile and garment sectors, 3.28 percent rather than 1 percent for leather and shoe industries, and above 3 percent rather than 2 percent for the service sectors (SPE 2013: 21). Therefore, the government estimated that the fiscal benefit from the labour tax reform would be BR$ 3.6 billion in 2012 alone, which represents a 28.4 percent cut in the fiscal burden of all sectors covered by the new policy (SRF 2014: 11).

The second main objective of the reform was to boost employment. It was expected that higher external and internal competitiveness would result in more jobs or at least protect jobs from external competitors. In addition, the substitution of the payroll tax by a revenue tax was meant to benefit the most labour-intensive industries and firms, increasing the potential for job creation in the economy. As for formalization, the underlying assumption was that relatively high non-wage labour costs associated with formal employment contracts induces informal employment.

[2] They are the Income tax for juridical persons (IRPJ), Social Contribution on the net profit (CSLL), Social integration program (PIS/Pasep), Financial contribution for social security (Cofins), Tax on industrialized products (IPI), Goods and services tax (ICMS), Tax on services (ISS) and the CPP.

2.3 Background

The adoption of the new payroll taxation in Brazil had been anticipated by a series of political and legislative steps. In the early 1990s the idea that mandatory labour and fiscal charges levied on the payroll bill were causing negative effects on the labour market gathered momentum (Ansiliero and Paiva 2009). Along with a general movement towards deregulation of labour relations, this view gained increasing acceptance despite the strong opposition and some level of disagreement.

As a result of this growing acceptance, several pieces of legislation prepared for adoption of the new policy. In 1996, the introduction of the Simples Nacional shifted the tax base for Small and Medium Enterprises' (SMEs') contribution to social security from the payroll to revenues. At the same time, labour taxation on rural employers shifted from a tax levied on the wage bill to a tax on commercialized produce. In 1998, an amendment to the Federal Constitution allowed for different contributions to social security across sectors (Government of Brazil 1998), and a few years later, another amendment authorized the substitution of the payroll bill for revenue as the basis for employers' tax contribution (Government of Brazil 2002).

Later on, in 2007, the tripartite National Forum of Pension Fund (FNPS) created by the Brazilian Government to examine the need to reform the public pension fund agreed with the shift of the tax base provided that the fiscal balance of the pension fund was secured, without increasing the tax burden. The next year, the Government, in a broad proposal for constitutional reform, included the provision that the tax on the payroll bill might be replaced by a tax on gross revenue to be defined by a federal law. And again in 2008, the Ministry of Strategic Affairs made proposals to change labour taxation. That year, legislation was approved making exports of IT products exempt from the employers' contribution to social security (Ansiliero and Paiva 2009). Thus it is possible to say that the shift in the tax base from the payroll bill to the gross revenue had gained some political support though this was conditional on the guarantee of finance to social security and without damaging labour rights (CDES 2011).

2.4 Economic context

If in the 1990s a context of slow growth, high unemployment rates, and increasing informality reinforced the discourse favourable to lowering non-wage labour costs and payroll taxes in general, the general economic context at the time of the policy announcement was quite different. Brazil had experienced relatively fast growth rates in the years 2004-2008 (GDP growth rate of 4.8 percent per year on average), recovered fast from the economic crisis of 2009 (GDP grew 7.25 percent in 2010), and the economy was growing by 2.7 percent in 2011.

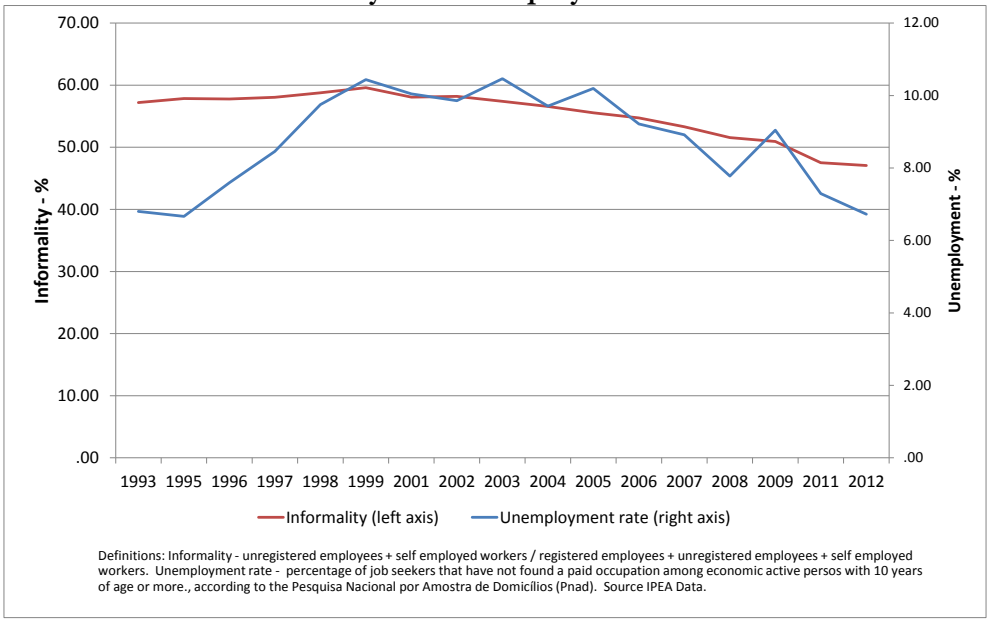
In 2011 the unemployment rate was relatively low, informality was displaying a downward trend, and wages were growing in real terms (Figure 1). According to the Brazilian Institute of Geography and Statistics (IBGE), the unemployment rate in August 2011, when the payroll tax change was announced,

was, at 6 percent, well below the 9 percent estimated in May 2009 during the economic crisis (IBGE 2011).

Informality in the labour market, measured by the share of workers without social security coverage was above 47 percent in 2011 (Figure 1). In the manufacturing sector this percentage was 25.5 percent and was 30 percent in the communication sector (which includes IT/ITC). Besides, 22.4 percent of salaried workers in non-agricultural activities did not have a formal contract, including 5.9 percent domestic workers and 14.6 percent of the urban private sector workforce (IBGE 2012: tables 4.1.6 and 4.1.10). However, informality has been trending downwards since early 2000 across many sectors, population groups and regions (Baltar et al. 2010: 13, Maurizio 2014).

Wages were increasing, fuelled by the expansion of the domestic market, as is suggested by the 2.5 percent real wage increase for registered employees in the private sector (IBGE 2011).

FIGURE 1 – Informality and unemployment in Brazil – 1993-2012



Definitions: Informality - unregistered employees + self employed workers / registered employees + unregistered employees + self employed workers. Unemployment rate - percentage of job seekers that have not found a paid occupation among economic active persos with 10 years of age or more., according to the Pesquisa Nacional por Amostra de Domicílios (Pnad). Source IPEA Data.

Despite these positive macroeconomic indicators, the performance of the manufacturing sector caused some concern. Manufacturing output stagnated in 2011 with a mere 0.3 percent growth in relation to the previous year only helped by better results of the extractive industry. Employment growth was also weak in 2011, with a meagre 0.9 percent increase in relation to 2010. In fact, growth rates in industrial output and employment were on a downward slope since the second quarter of 2010 and were negative for the major manufacturing regions in April 2011 (IEDI. 2012). Manufacturing industry branches performing particularly badly, with the largest negative indicators, were the textile industry with a 14.9 percent decrease in output and a -1.1 percent variation in employment; leather and shoes (-10.4 percent and -5.0 percent); and the garment industry, (-4.4 percent and -3.2 percent, respectively) (IEDI 2012).

The Government started the labour tax reform by these manufacturing sectors. Table 1 show the sluggish employment growth in the manufacturing sectors from 2010 to 2011 and the negative variation from 2011 to 2012, below the performance of the economy as a whole. Together with the service sector,

which was performing better, they represented 3.7 million jobs or 5.3 percent of the total formal jobs in the Brazilian economy in 2011.

TABLE 1 – Employment with a formal contract by sector and total – Brazil – 2010-2013

SECTORS	2010		2011		2012		Var.	
	N. of employees	% tot	N. of employees	% tot	N. of employees	% tot	2010-2011	2011-2012
Textile	458,244	0.7%	460,126	0.7%	453,433	0.6%	0.4%	-1.5%
Garment	1,089,083	1.6%	1,129,804	1.6%	1,104,875	1.5%	3.7%	-2.2%
Leather and shoes	681,897	1.0%	703,682	1.0%	673,573	0.9%	3.2%	-4.3%
Services	1,275,012	1.9%	1,429,717	2.0%	1,513,634	2.1%	12.1%	5.9%
Covered sectors	3,504,236	5.3%	3,723,329	5.3%	3,745,515	5.1%	6.3%	0.6%
Total Employment	66,747,302	100.0%	70,971,125	100.0%	73,326,485	100.0%	6.3%	3.3%

Source: Ministério do Trabalho e Emprego – RAIS 2011/2012/2013.

The weak performance of the manufacturing sector was related to trade. The trade balance of manufactured goods had shifted from a US$ 5 billion surplus in the period 2003-2005 to a deficit of US$ 76.7 billion in 2010 due to the increase in imports (Cano 2012: 11). Some authors and social actors identified the overvalued exchange rate and the 'custo Brasil'[3] ('Brazil' cost) as the main reasons for the difficulties faced by the manufacturing sector (IEDI. 2012, IMF 2012). The National Confederation of Industrial Employers (CNI) attributed part of the loss of competitive edge to high production costs in Brazil, which include labour costs and energy prices, alongside the heavy tax burden, high tax rates, and excessive bureaucracy for business (CNI 2011).

Despite this dark picture of industrial performance, the payroll tax reform raised concerns about the reduction in RGPS's revenues (Zanghelini et al. 2013). In 2011, contributions based on the payroll bill reached approximately R$ 106.8 billion, or 44 percent of all RGPS revenues. The government estimated the initial loss of tax revenues at BR$ 7.2 billons in the first year, expecting it to reach BR$ 14.11 billion in 2014. These figures give an idea of the impact of the tax alleviation for the funding of the private sector pension fund.

2.5 Payroll tax reduction - the evidence

Statistics available for the year 2012 show that the new tax policy lowered the tax burden soon after it became valid. For instance, the PIA-Empresa, a large industrial survey on manufacturing industries shows that the three manufacturing sectors (textile, leather and shoes, and garment) experienced reductions in the ratio between social contributions and the wage bill (Table 2). The same survey shows that these contributions were reduced by 19.6 percent in the tex-

[3] *Custo Brasil* is frequently used to mean (high) 'costs of doing business in Brazil', and includes interest rates, labour costs, transportation costs, tax rates, regulatory system, and bureaucracy (The World Bank 1996: iv).

tile industry, 38.4 percent in the leather and shoes industry, and 18.1 percent in the garment industry from 2011 to 2012.

TABLE 2 – Contribution to social security as percentage of total wages paid – selected sectors – 2008-2012

INDUSTRIES	2008	2009	2010	2011	2012
Textile	21.47%	21.74%	22.25%	21.77%	16.49%
Leather and Shoes	17.83%	17.80%	17.88%	17.33%	9.62%
Garment	11.99%	10.56%	11.31%	11.85%	8.76%

Source: IBGE – PIA-Empresa 2012.

In addition, the tax administration (SRF) reports that in January 2012 around 46 percent of the social security contributions collected from the covered sectors already came from the new tax imposed on gross revenues (SRF 2014: 14). This indicates that the shift in the tax base from the payroll to gross revenue was enforced immediately after the policy was validated.

Chapter 3
The controversy about social charges and payroll tax in Brazil

The reform of labour taxation in Brazil was preceded by a long and controversial debate among specialists about the size and effects of the social charges imposed on labour. The debate was actually not limited to the tax wedge, defined as 'a measure of the difference between labour costs to the employer and the corresponding net take-home pay of the employee and calculated by the amount of taxes paid by the employers and employees in relation to wages (OECD. 2014). It included the size and effects of labour regulation imposed on employers related to other components of labour costs.

Internationally, the theoretical debate about the effect of non-wage labour costs on the economy and on the labour market in particular received attention in the 1960s (Hart 1984). These costs - all labour costs, including contributions to social security programmes but excluding direct remuneration - expanded in developed countries mainly due to taxation used to finance the expansion of social security programmes after the Great Depression and the second World War (Brittain 1971, Hart 1984, Gruber 1997). More recently, since the 1990s, changes in labour and social security legislation have been seeking to reduce labour costs of production and improve companies' competitiveness (Tokman and Martínez 1999).

In Brazil, studies into this also started in the 1960s but intensified in the 1990s. The Constitution of 1988 introduced new labour and social rights, raising the level of workers' protection and strengthening the social security system (Amadeo and Camargo 1993). These rights referred to the working time, overtime pay rate, maternity leave, vacation allowance, cost of dismissals, and previous dismissal notice and some of them represented extra costs levied on the payroll bill. (Barros and Corseuil 2004: 276, Pochmann and Santos 1998: 5). Besides, the social security system became universal, composed of a retirement and survivor pension fund, unemployment insurance, social assistance, and health services, and in part is financed by contributions levied on the payroll bill.

However, in the early 1990s, the sources of finance for social security became eroded due to high unemployment, increased informality in the labour market, and low economic growth (Ansiliero et al. 2008). In this context, some authors began discussing the need to change the financing of social security in the face of a problem that seemed to be structural. These concerns were connected to the discussion at the international level, coming from recommendations from international organizations to the adoption of more flexible labour regulation and changes in non-wage labour costs (McBride and Williams 2001, OECD. 2014).

Three questions seem to be at the core of the debates: the size of labour obligations including the tax wedge, the importance of labour costs for economic performance of Brazilian companies, and the relationships between social charges and informal employment.

3.1 Concepts and magnitude of social charges

According to Pochmann and dos Santos (1998), mandatory contributions imposed on employers have been studied since the 1930s and 1940s, when labour market institutions became regulated. These authors locate the origin of the mainstream concept of labour and social charges defined as 'any legally imposed additional cost levied on the wage paid regardless of its nature and finality[4]' (Pochmann and Santos 1998: 5) in the 1960s. Using this concept, studies carried out in the 1970s could not find a common conclusion on the effect of payroll taxes and other labour obligations on the labour market (Jorge Jatobá. 1994, Pochmann and Santos 1998).

More recently, this concept is found in Pastore (1997: 19-21) who includes payments for non-working time imposed by labour regulations, such as payments for vacations, holidays and weekend leave, to the list of social charges. Besides, he considers the contributions to the severance fund FGTS to be a payroll tax, even though this item returns to the worker as a deferred compensation in case of unjustified dismissal. The same concept is adopted by Souza et al. (2012) who developed a methodology to measure the cost of labour and social legislation in Brazil including not only the labour and fiscal costs but also the voluntary costs incurred by firms.

The problem with this line of thinking is that it does not differentiate non-wage costs according to their nature and purpose, therefore not helping to understand the implications each of those items may have on labour demand and supply. What is particularly problematic is that some costs that are in fact part of worker compensation are classified as social charges.

A different perspective is found in authors that define social charges as a tax wedge on the payroll bill that finances the social security system (Santos 1995, Pochmann and Santos 1998, DIEESE 2011). These charges are distinct from labour obligations that make up employee compensation including paid non-working time and deferred earnings.

To understand how these concepts entail different appreciation of the effects of social charges on the economy, it is necessary to describe in detail the mandatory obligations imposed on employers. In general, an employment relationship in Brazil entails payment of a wage for a standard working time of 44 hours per week (or less for shift work) including holidays, weekends and one month of paid vacations. Vacations are paid at a rate of 133.33 percent of the monthly wage. Workers are also entitled to a 13th month salary, received usually at the end of the year, or proportionally to the duration of employment in the event of dismissal.

In addition, a severance fund, FGTS, provides workers with cash compensation in the event of unjustified termination, retirement or when the worker buys a house. Employers have to contribute 8 percent of wage monthly to the FGTS; this corresponds to one monthly wage per year of employment. On top of this, in the event of unjustified dismissal by the employer, there is a penalty fee of 50 percent of the amount already deposited in the Fund.

[4] Translated by the author.

Employees must be notified of impending dismissal at least 30 days prior to the termination. Recently this period has become proportional to the duration of employment, increasing by 3 days per year on top of the thirty-day basic period. After notification the employee may work two hours less per day than the regular working time in order to find a new job.

Firms which fall under neither the Simples nor the new labour tax policy also pay the employers contribution for social security (CPP, also called contribution to the INSS). Other taxes are added to the CPP: workplace injury insurance (2 percent, on average), contribution to public education (2.5 percent), contribution to the National Institute of Agrarian Reform and to the Industrial or Commercial Social and Training Services (SESI, SESC, SENAI, SENAC) and to the Brazilian Agency for Micro and Small Enterprise (SEBRAE) that in total amount to 3.3 percent of the payroll bill. The sum of these contributions is equal to a tax rate of 27.8 percent levied on the payroll bill (DIEESE 2011: 5), as can be calculated from Table 3 by dividing BR$ 308.89 by the wage bill of BR$ 1,111.11.

Based on the concept of social charges as the fiscal wedge on labour, DIEESE (2011) and other authors (Santos 1995, Pochmann and Santos 1998) calculate these charges in 25.1 percent of direct and deferred compensation. In this compensation package are included the deposits on the FGTS and other mandatory payments due in the event of dismissal. Thus, the CPP alone represents 14.45 percent of the mandatory labour costs associated with a formal employment relationship (calculated by dividing BR$ 222.22 by BR$ 1,538.00 in Table 3).

TABLE 3 – Total expenditure necessary to employ a worker receiving a hypothetical wage of BR$ 1.000,00 per month

ITEM		Expenditure in BR$
1. Contractual wage		1,000.00
2. 13th wage (end of year) and 1/3 wage vacation additional (monthly proportion)		111.11
3. Wage bill – basis of employer's monthly contribution to social security		1,111.11
4. FGTS - Seniority fund and dismissal fee		118.00
5. Employee monthly average earnings (3+4)		1,229.11
6. Employer social contributions based on (3)		308.89
6.1 – CPP (INSS): 20.0%	222.22	
6.2 – Labor accident insurance (2% in average)	22.22	
6.3 – Education-wage tax (2.5%)	27.78	
6.4 – INCRA (0.2%)	2.22	
6.5 –SESI or SESC (1.5%)	16.67	
6.6 – SESI or SENAC (1.0%)	11.11	
6.7 – SEBRAE (0.6%)	6.67	
7. Total employer expenditure (5+6)		**1,538.00**

Source: DIEESE 2011:5

Pastore (1996, 1997: 19-21) estimates that mandatory labour and social obligations on formal employment cost 102 percent of the per working hour wage rate. This is because he adds the cost of non-worked hours of 51.7 percent of the direct remuneration. In any case, with his calculation in mind, the CPP represents 27.6 percent of the total employment costs (wage plus mandatory non-wage costs) and its elimination cuts the mandatory labour costs by 13.7 percent, which is very close to the figure arrived at using the DIEESE calculation method.

Souza et al. (2012) estimated that the CPP represents 8.2 – 8.6 percent of the total labour costs including mandatory and voluntary labour costs for firms in the textile sector. Thus, even considering other labour costs besides those legally imposed on employers, the payroll tax cut was not, in theory, negligible.

This study will not seek to propose a new concept for social charges or solve the polemic among authors. However, based on these different concepts and related measurements outlined above, it is possible to say that the payroll tax reduction adopted in 2012 represents 14 percent of the mandatory labour and tax obligations imposed on a formal contract, and less than this percentage if the total labour costs is taken into consideration. Moreover, the tax reform changed the fiscal wedge on the payroll bill without changing the compensation for work as it has not affected social security benefits.

3.2 Non-wage labour costs and competitiveness

Beyond measurement and classification of non-wage costs, the core of the polemic seems to be around whether mandatory non-wage labour costs reduce the competitiveness of Brazilian firms and negatively affect employment.

On one side, Pastore (1997: 19) argues that social charges are an excessive burden on formal employment and that Brazilian labour institutions are too rigid. In his words, in Brazil worker earnings are low but labour costs are high, emphasizing the share of non-wage costs in the total labour costs. Going even further, in his view workers and employers would be better off if they could bargain directly over some of the social charges, allowing for quick adaptation to economic shocks and increases in workers' earnings. This last conclusion is based on the idea that payroll taxes are shifted onto labour by a decrease in wages. The policy implication would then be to allow for collective bargaining to set lower standards than the legally imposed ones (the Brazilian labour code allows for collectively negotiated standards to be more favourable for workers than the legal standard).

On the other side, Santos (1995), DIEESE (1997), Pochmann and Santos (1998) share the view that labour costs are not a cause of low competitiveness by Brazilian firms. Comparative statistics showing that hourly labour costs in the manufacturing industry in Brazil in 1993 were US$ 2.68 per hour, higher than countries such as Mexico (US$ 2.41) and Hungary (US$ 1.82), but below Hong Kong (US$ 4.21), South Korea (US$ 4.93), Taiwan (US$ 5.46), US (US$ 16.40), Germany (US$ 24.87), and a long list of developed countries (DIEESE 1997: 26). These authors also emphasize that social charges in Brazil cost in the mid-1990s around RS$ 0.62 per hour, far lower than the US$ 5.00 in Germany and US$ 3.00 in the US (Pochmann and Santos 1998: 14-15). They conclude that social charges are not excessively high in Brazil, do not result in high la-

bour costs, and do not damage the external or domestic competitiveness of Brazilian manufactured goods. Moreover, they foresee a threat to labour and social rights coming from proposals that intend to reduce labour costs by changing social charges.

The labour tax policy of 2012 seems to be aligned with the view that labour costs in Brazil are relatively high, thus undermining the competitiveness of exports. According to the US Bureau of Labour Statistics, manufacturing unit labour cost in Brazil increased from US$ 5.01 in 2005 to US$ 11.67 in 2011 (see Appendices 2 and 3, US Bureau of Labour Statistics 2014). Besides, there are indications that the fiscal burden on wages is high in comparison with other developing countries. However, the same source confirms that total manufacturing labour costs in Brazil are still one of the lowest among 34 developed and developing countries suggesting that labour costs and social charges may not be the single or most important factor to affect competitiveness in face of the appreciated exchange rate, high real interest rates, and deficiencies in infrastructure.

3.3 Social charges and informality

In connection to the above, some authors discuss the relationship between labour market institutions, including payroll taxation, and informality. The question is whether the labour and fiscal wedge is so high that it induces employers and workers to engage in informal work arrangements.

Different views are found among authors who consider that the fiscal wedge on formal employment is conducive to informality. Neri (2000), for instance, found that formal and informal employment contracts do not differ in relation to compliance to the minimum wage, the limit to working hours, dates for payment or annual bonuses. However, when it comes to social security coverage, only 7.7 percent of unregistered employees contribute to social security, in contrast with the 100 percent among registered employees (Neri 2000: 40). For him 'informality in Brazil is, mainly, a fiscal phenomenon, as 'high payroll taxes levied on the wage bill and the programs that they finance stimulate tax evasion and informality' (Neri 2000: 41). In relation to the social programmes financed by payroll taxes, Neri considers that the tax/benefit links are not close. In a nutshell, he points out that some minimum social security benefits are universal and do not require previous contributions.

Carneiro (1997) explains the expansion of the informal economy and informality in the labour market in the 1990s as the result of excessive government intervention and structural changes in the economy. Government intervention is evidenced in the increasingly complex taxation systems and heavier tax burden on formal firms and employment contracts. In addition, the economic crisis in the 1990s, together with technological changes, replaced the manufacturing sector with the service sector as the centre of economic dynamism. As the service sector is regarded as more flexible and less subject to government control, it is also more conducive to informal work arrangements.

Some authors contest the idea that informality is the result of tax evasion (Ansiliero et al. 2008). If it was so, they argue, wages for informal workers would be higher than for similar employees formally hired. Yet wages are higher and other employment conditions are better for registered employees. Based

on this evidence, they argue that formal and informal segments of the labour market are highly segmented and a simple reduction in the level of tax rates might not affect the level of informality particularly for 'small and weak entrepreneurs that are on the fringes of informality' (Ansiliero et al. 2008: 24).

In summary, the debate hinges on whether workers and employers shift employment from formal to informal arrangements due to changes in non-wage labour costs. While some authors say that this shift is smooth, others contend it by saying that other factors determine informality. There is thus no consensus as to whether a tax reduction would lead to a conversion of informal jobs into formal ones. This is an empirical question that may be difficult to measure at the level of the firm as it would involve obtaining information about illegal practices such as unregistered employment. Therefore, it is likely that formalization of jobs may appear in the labour statistics as employment generation.

Chapter 4
Theories of employment and wage determination

The theoretical debate about labour taxation has been focused of the effects of taxation on economic efficiency which translates into the question of the effect of such taxes on employment.

4.1 The neoclassical framework

According to the neoclassical framework (Hart 1984, Ehrenberg and Smith 2006: 76-78), the effect of a payroll tax on the labour market depends on the interaction between labour demand and supply. Under the assumption that firms maximize profits, the output is set at a point in which the marginal revenue is equal to the marginal cost. In the short run, when other factors are fixed, it is assumed that the marginal productivity of labour is declining, as adding more units of labour will result in smaller changes in the output. Firms hire workers up to the point that the marginal revenue product of labour equals marginal labour expenditure, which is given by the wage rate (Ehrenberg and Smith 2006: 65).

When a payroll tax is imposed on employers, this non-wage labour cost raises marginal labour expenditure above the marginal revenue product of labour. The theory argues that the firm will then reduce labour demand to increase the marginal revenue product of labour and re-equalize it with the wage rate. The labour demand curve shifts inwards and unless the tax burden is shifted onto labour by a lower wage, employment will be diminished.

In the long run, when other factors can change, an increase in the wage rate affects employment by the substitution effect and scale effect. The substitution effect means that a higher price for the labour input induces the profit maximizing firm to substitute capital for labour equating the respective marginal productivities with the new ratio of input prices. The scale effect implies that higher production costs entail a lower level of output at which profit is maximized. Both effects interact to shift the demand curve inwards (Ehrenberg and Smith 2006: 70-73).

The final outcome, according to this theory, will also depend on the sensitivity of labour supply to wages. If labour supply is inelastic, under the assumption that the economy works at full employment, especially in the long-run, workers will accept a fall in wages in order to avoid unemployment (Brittain 1971, Hamermesh 1993: 172). Thus, equilibrium is achieved at the same employment level and the tax burden is completely or almost completely shifted onto workers.

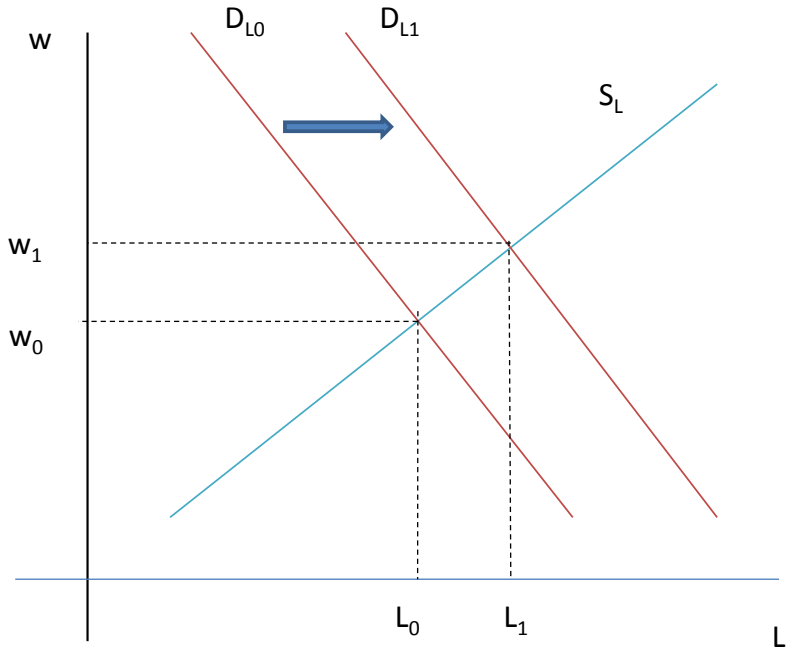
However, Hamermesh (1979) argues that the primary adult male labour force may have an inelastic supply function, but this is not true for the supply of the secondary labour-force (female, young workers). It is possible also to think that the supply of labour for the formal segment of the labour market particularly in a developing country is elastic due to the large informal segment

and long term unemployment. In this case, the presence of a tax levied on employers does not shift entirely onto labour and employment is set at a lower level that depends on the elasticities of demand and supply for labour.

In addition, some authors introduce the link between taxes and benefits as a factor that may have a bearing on the final outcome (Summers 1989, Gruber 1997). If the introduction of a payroll tax is associated with a benefit perceived by workers as part of the compensation package, there will be an outward shift of the labour supply curve. Hence, the new equilibrium will occur at a lower money wage rate and a smaller job destruction effect. The final effect, therefore, depends on how much the benefit associated with the payroll tax is valued by workers.

The reverse case of a reduction in a payroll tax under the neoclassical framework implies an outward shift of the labour demand curve towards a higher employment level illustrated in the graph below by the move of D_{L0} to D_{L1}. As the labour supply curve in this case is elastic, the clearing wage can be set at a higher level w_1. The market clearing wage and employment levels are set depending on the elasticities of labour supply and demand. In addition, if the payroll tax reduction is not liked to a reduction in the benefits, hence in the compensation package, the labour supply curve does not shift.

FIGURE 2 – The effects of a payroll tax reduction



Source: based on Summers (1989: 180).

Considering the framework presented above and conceiving the labour supply for formal activities in developing countries to be elastic, a tax reduction then implies an increase in employment and a less than proportional increase in wages (partial shifting), particularly when labour supply curve is not affected by changes in the social security benefits.

In the specific case under analysis in this paper, social security benefits were not changed, there was a large informal sector and long-term unemploy-

ment, and the policy covered a limited number of sectors. Hence, the supply curve may be thought of as elastic and it may be expected that policy effects will be positive on the formal employment and also positive but to a lesser extent, on wages.

Another important assumption for the standard neoclassical approach is that a payroll tax reduction is offset by a neutral tax so that government revenues and spending do not change (Hamermesh 1993: 167). This is not the case in this study, as the tax substitution was not neutral (see Section 2.1). In particular, for exporting firms the tax burden was clearly reduced to zero.

4.2 Imperfect competition and institutional factors

A different theoretical perspective is found in Nickell and Layard (1999), who introduce institutional factors, the market structure and the collective bargaining process to explain the effects of payroll taxation. In their model, wages are first determined by collective bargaining, with outcomes influenced by the relative power of trade unions, the unemployment rate, and the labour productivity at the level of the firm. Once the wage rate is set by collective agreement, the firm unilaterally fixes the employment level in order to maximize profits. Hence, during the period between tax reduction and wage bargaining wages are constant and it is likely that employment will increase. The final outcome also depends on the firm's power to influence the output market by increasing profit margins or expanding production (Bennmarker et al. 2009).

It is worth noting in relation to institutional factors that collective bargaining in Brazil sets the basic, initial wage for each sector at the local level. Even though less than 20 percent of the workforce is unionized, collective agreements cover almost the total registered workforce. Therefore, it is possible to assume that the collective bargaining processes is relevant to the wage-setting process. As local negotiation takes place annually in a specific month of the year, with a high concentration of negotiations in May, these negotiations might have reflected the tax policy change immediately after the new tax law was adopted in January 2012.

If collective bargaining may forestall decreases in wages when a payroll tax is imposed, it may also impel wages to grow if a tax is reduced (Cruces et al. 2010). However, in Brazil collective agreements set the basic wage for all firms regardless of the applicable tax regime. Thus, if a payroll tax change affects only some firms under the same collective agreement the wage-setting process may not reflect the tax benefit.

Therefore, the elastic supply of labour, the characteristic of tax reduction without changes in the compensation package, the non-neutral tax substitution, and the institutional factors in the Brazilian labour market, all reinforce the hypothesis above of an increase in employment and partial shifting on wages due to the new tax laws.

Chapter 5
Empirical studies

Several approaches have been adopted to test the validity of the theories summarized above, particularly to elucidate the effects of labour taxation on economic performance and on the labour market. A literature review revealed papers that have relied on time-series analysis, cross-country analysis, and, most frequently, panel data analysis. The following review positions the method chosen for the present study in relation to these approaches, giving especial attention to panel data analysis in studies conducted in Latin America in general and Brazil in particular.

5.1 Cross-section and time-series analysis

The literature includes cross-country analysis performed to obtain generalizable knowledge of the effect of payroll taxes on the labour market. For instance Brittain (1971) analysed variation in payroll tax rates across a sample of 64 nations and a refined sub-sample of 30 countries, concluding that increases in the payroll tax are fully converted into a decrease in wages with no effect on value added or employment. Several questions are raised in relation to this kind of work, like the limited number of countries and the omission of relevant variables other than taxation. Despite the merits of a general appreciation of payroll tax effects, the study of a particular case seems to need an approach that takes into consideration the national economic and institutional specificities.

A second possibility is to apply time-series analysis as carried out by Hamermesh (1979). This author studies the backward shifting of a payroll tax rate paid by employers for OASDHI (Old Age, Survivors, Disability, and Health Insurance) in the US. Based on a panel of 587 adult men, divided into two groups by age, with data for from 1967 to 1973 he observed the variation of the effective payroll tax rate in relation to wages. As the tax rate is decreasing on the share of workers with wages above the tax base ceiling, he concluded that only 36 percent of the change in the tax burden is shifted onto labour. Hamermesh suggests that this small shifting is due to 'the elastic supply of marginal labor-force participants' intervening with the wage determination (Hamermesh 1979: 1217). It can be argued that the challenges for this approach are the need to consider other factors that influence wage behaviour over time and to have a longer time series.

5.2 The use of panel data in the study of labour taxation

Panel data is perhaps best suited to analysing the direct effect of tax changes on the labour market. An influential paper that examined this issue in the Latin American context is offered by Gruber (1997). His paper analyses the effect of a cut in the employers' payroll tax of 22.5 percentage points, on average, in Chile in the early 1980s, following the privatization of the Social Security and Disability Insurance programmes. Data from an industrial survey for the

years 1979-1980 and 1984-1985 are used to compare outcomes before and after the reform. In the study, a triple difference approach is adopted including not only the change within the firm across time, but also comparing the effects of the effective tax rate on blue collar/white collar workers. A major challenge facing the author was that the reform was universal, so there was no control group that had not been exposed to the reform. Hence, the effect of the payroll tax cut was estimated by observing the correlation between the effective payroll tax rate, calculated by dividing the tax paid by the wage bill, and the wage and employment levels before and after the reform. It was found that the wage coefficient for the tax rate was close to one, suggesting that the tax cut fully shifted on to workers by a proportional increase in wages, whereas the employment coefficient was not significant (Gruber 1997: 594-595).

Two points drawn from this study seem particularly useful. First, a payroll tax cut may have different effects on administrative and production workers due to differences in the valuation of social security benefits by each group (Gruber 1997: 594). The study shows that payroll tax shifted fully onto production workers, but the shifting was even more than full for white collar workers. Even though in the Brazilian case the payroll tax cut was not associated with a change in the social security benefits as it was in Chile, it seems important to know whether effects were similar for both categories of workers. Second, a substantial mandatory wage increase influenced the estimated effects of the payroll tax cut on wages in Chile. Again, in relation to the Brazilian case, it is worth noting that in January 2012 the minimum wage was raised by 14.4 percent and this factor has to be considered in the analysis.

A similar approach is taken by Kugler and Kugler (2008) in a study of the effects of a payroll tax rise in Colombia in 1993. The paper's empirical strategy relies on exploiting temporal variations in the effective tax rate at sector and plant level to identify wage and employment effects. They analyse changes in the variables using data from 1982 to 1996, comparing pairs of years at similar points of the economic cycle, whether recessionary or expansionary. Adopting a difference-in-differences approach, the estimates show that a 10 percent increase in taxation leads to 4-5 percent decline in employment and 1.4 o 2.3 percent reduction in wages. They also find a weaker effect on wages and a stronger effect on unemployment for production workers compared to non-production workers.

The results of these studies on Chile and Colombia suggest the possibility of asymmetric effects on employment and wages depending on whether the payroll tax is increased or reduced. In the first case, the tax cut in Chile led to a full shifting onto labour and no employment effects. In Colombia, contrarily, a payroll tax increase resulted in partial shifting with employment effects. These asymmetric effects raise the question of whether wage rigidity prevents a full shifting when the payroll tax is imposed, while shifting is not blocked when the payroll tax is cut.

A third study of the effects of changes in labour taxation in Argentina in the second half of the 1990s is provided by Cruces et al. (2010). In this country, payroll tax rates were reduced in some regions with the aim of stimulating employment and economic development. The empirical strategy explores the regional differentiation of tax rates to evaluate the policy through the method of difference-in-differences. Instead of the effective tax rate, the study uses the applicable legal tax rate for groups of firms across regions, avoiding problems

of reverse causality and measurement errors. Conversely to the Chilean study, the results show a partial shift onto wages, of 0.5 percent in wages for each percentage point less in the tax rate and no significant employment effect (Cruces et al. 2010: 747).

Another regional experiment of labour tax policies aimed at stimulating growth in a quite different economic and social context was studied by Bennmarker et al. (2009). These authors study a 10 percentage point reduction in payroll tax for firms in the northern part of Sweden in 2002. They explore changes over time and across sectors using differences in the effective tax rates between covered and uncovered regions to identify causal relationships. However, as the tax reduction had a cap value, it was not linear on the wage bill, therefore potentially resulting in reverse causality between the wage bill and the tax rate. To avoid this problem, the authors instrumented the effective tax rate with an interaction term between time and the regional legal tax rate. The study is based on a firm-level data set with 81,269 observations for the period 2001-2004 in which firms were identified by sector and municipality covered by the policy. The findings for existing companies are not statistically significant for employment, but suggest that wages increased by 0.23 percent for each percentage point reduction in the tax rate, suggesting partial shifting. However, when the analysis included the entry and exit of firms, then a positive and significant estimate is obtained suggesting that the payroll tax cut increases employment.

Drawing from the above, panel data analysis using the method of difference-in-differences is suitable for the kind of evaluation that is intended here. Instead of the effective payroll tax rate, some authors (Cruces et al. 2010, Bennmarker et al. 2009) use the legal tax rage as explanatory variable. This line will be followed here, by the use of the tax regime and associated tax rate to explain employment and wages. The tax regime will be the basis for building a counterfactual for the treatment, as in the Brazilian case there was no regional differentiation and comparison between sectors may not allow for credible counterfactuals.

5.3 Empirical studies about the Brazilian labour tax reform

Turning towards studies about the payroll tax reduction in Brazil, FGV Projetos (2013) and Dallava (2014) analyse empirically its effects on employment and wages. Both studies adopt the applicable mandated tax rate as the independent variable and apply difference-in-differences technique, but each study relies on different data sets and also differ in terms of identification strategies and results.

The study conducted by FGV Projetos (2013) is in fact composed of three parts: a prospective analysis based on a computable general equilibrium model (CGE), a regression analysis of employment and trade effects, and a qualitative survey of businessmen's opinions and expectations.

The CGE component is intended to assess the macroeconomic effects of the payroll tax reduction on the economy, beyond the directly affected sectors. In this part, the study concludes that the labour tax reform in 2012 increases exports by 0.88 percent, this being the main driver for a 0.4 percent growth in

total employment, this growth occurring primarily in the IT/ITC sector and its supply chain linkages (FGV Projetos 2013: 14).

The second part of FGV's study is dedicated to the econometric analysis of the direct effects of the payroll tax reduction in the covered sectors. Arguing that uncovered sectors are not good counterfactuals, the authors opted to develop synthetic control groups whose trajectory of employment in the pre-treatment period was similar to the treated groups. Hence, after the treatment, the only difference between the treated and the synthetic control group would be the exposure to the change in labour taxation. For the garment, shoes and leather industries, the virtual control groups were built from uncovered manufacturing sectors, whereas for the IT/ITC sector, the synthetic groups were drawn from other service sectors. The synthetic groups were estimated using monthly data on employment and wages from 2007 to 2011 sourced from the General Record of Employed and Unemployed (CAGED).

A possible shortcoming of this strategy is that all firms in the same sector were included in the treatment group, regardless of the tax regime. However, as noted in section 2.1 above, firms under the Simples were not affected by the 2012 tax reform. By doing this, it is possible that the measured effect of the payroll tax reduction in the treatment group is biased downwards by the presence of a large share of non-covered firms in the treatment group.

The results obtained by FGV show a relatively small increase in the employment level and a more substantial rise in wages. As for the employment level, the estimates are significant at 10 percent of confidence interval in the shoes and garment industries, with a 2.2 percent and 2.1 percent increase in total employment respectively. For the leather industry and IT/ITC sector, the estimates were not significant, though positive with a 3.6 percent and 0.9 percent increase respectively (FGV Projetos 2013: 89). The findings suggest that the effect on employment was mainly due to job destruction (firings) than an increase in new jobs. It calls attention to the fact that the labour-intensive IT/ITC sector did not react strongly to this substantial decrease in the labour costs.

As for the effects on wages, results are presented disaggregated to workers with intermediary or university education levels. Workers with intermediary schooling or less saw their wages increased by 1.7 percent in the shoes industry, 2.7 percent in the leather industry, and by 1.5 percent in the garment sector. Wages paid to highly educated workers were raised by 9.2 percent in the leather industry, 5.5 percent in the garment industry, and 5.9 percent in the IT/ITC sector. These larger and statistically significant estimates suggest a partial shifting onto labour. However, the summation of both effects falls short of the potential reduction of 20 percent of the wage bill.

The third part of the study by FGV is an opinion survey among 81 firms, mostly medium and large, and members of industrial associations representing the covered sectors. From the extensive set of answers, it is worth mentioning that the effects on labour costs and total costs are considered moderate, that it is not clear whether the policy results in a reduction of informal labour, and that resources freed from taxation are expected to be channelled towards wage increases rather than employment generation (FGV Projetos 2013: 17).

A second relevant study carried out by Dallava (2014) adopts a strategy hinged on comparisons between establishments in covered and uncovered sec-

tors. Her analysis relies on administrative records of formal employment, provided by the Annual Roll of Social Information (RAIS). She does not have information from the firm level and this is a limitation for comparisons between covered and uncovered firms. She tries to overcome this limitation using available information about characteristics of the establishments[5]. She considers employment contracts held by establishments located in the same municipality, with same size, economic activity, and juridical nature, as being associated with the same firm. Based on this assumption, she formed clusters of employment contracts to represent firms and assigned these clusters to treatment and control groups depending on whether the economic sector is covered or not by the tax policy. The treatment group consists of 38,579 clusters from 193 economic sub-classes of four economic sections, whereas the control group is formed by 545,738 clusters of 530 sub-classes of the same section of the national classification of economic activities (CNAE)[6] (Dallava 2014: 41).

To analyse these data, Dallava applies a difference-in-differences methodology, observing the variation in employment and wages before (in 2011) and after the policy was adopted (in 2012). It is important to note, however, that most of the industries included in the analysis were covered by the policy in April and August 2012, so that the estimates may have been influenced by a policy coverage limited in time to a few months. In addition, the use of clusters from uncovered economic sectors as counterfactuals may pose an identification problem, as sector-specific factors may vary with time and lead to biased estimates (Khandker 2010: 75).

The findings for employment are positive and statistically significant only for the information and communication industry, suggesting that the payroll tax cut increased employment by 4.3 percent. In the case of the accommodation and food services sectors, the coefficient associated with employment is also significant but negative (6.5 percent). For the effect on wages, the information and communication sector appears to have reacted to the policy by increasing wages by 2.33 percent, as did the administrative and complementary services sector, with an average rise of 5.25 percent. It is worth noting that for the manufacturing sector the estimates are not significant even though this sector is a primary target of the policy (Dallava 2014: 42).

In her model specification she includes averages of age, schooling, tenure, share of permanent employees, and male workers, as control variables. While average age and proportion of male workers are negatively associated with the increase in employment and positively with the wage rise, a stronger influence comes from the level of schooling on wages only (Dallava 2014: 43-46). The problem here may be of reverse causality, as a payroll tax cut affects employment through an expansion in the demand for specific groups of workers, for instance women and young workers. If so, by including these control variables in the model, she may have biased the estimates.

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[5] Establishments here may mean a small firm or a subsidiary of a larger firm which had a job contract under the national tax code (Cadastro Nacional da Pessoa Jurídica – CNPJ).

[6] CNAE is compatible with the International Standard Industrial Classification of all Economic Activities – ISIC 4 and has five levels: 21 Sections, 87 Divisions, 285 Groups, 673 Classes, and 1,301 Subclasses (IBGE. 2014).

As for the results, these two studies show ambiguous estimates of employment and wage effects. Dallava finds small, positive, and statistically significant coefficients only for wages and employment in the IT&ITC sector, whereas in the manufacturing sector coefficients are not significant (Dallava 2014: 42-43). Conversely, FGV Projetos indicates positive and significant coefficients for employment in the shoes and garment industries, but not significant in the leather industry and IT&ITC sector (FGV Projetos 2013: 89-91). The effect on wages seems to be more substantial and significant in the latter study for most sectors.

In order to overcome the limitations found in the literature just reviewed the identification strategy relies on the fact that firms within the same sector may or may not be covered by the policy according to the tax regime in which they fell when the policy was introduced. Similar to the above the methodological approach in this research uses panel data analysis and difference-in-differences technique but with firm level data so that it is possible to difference out time invariant effects at the firm level.

Chapter 6
Empirical strategy

As indicated above, this empirical analysis intends to evaluate the effects of the payroll tax reduction on employment, working hours, and wage levels, in the sectors covered by the policy. The outcome variables are the number of employment contracts during the year, the annual number of working hours, and the average hourly wage in Brazilian Reais, per firm. The explanatory variable of interest is binary, indicating whether a firm was covered by the payroll tax reform in 2012 or not. According to Brazilian legislation, firms not under the Simples Nacional regime were covered by the policy.

6.1 Identifying assumption and empirical approach

The identification problem comes from the fact that one cannot observe employment, hours of work, and hourly wages in a non-Simples firm that operates in a covered industry in the absence of the payroll tax reduction after the policy was adopted. For such a firm, it is only possible to measure changes in the variables of interest in the presence of a tax cut. Therefore, it is necessary to build a credible control group to be used as a counterfactual that allows for the identification of what would have happened to firms if they had not been covered by the policy.

This paper will explore the fact that the policy has not covered firms under the Simples regime, which were already exempted from the CPP before the policy change. Therefore, it is possible to construct a potentially valid control group from Simples firms and compare their performance with the non-Simples firms, that is, the group under treatment.

The question is whether employment, working hours and wages are affected by the policy. A simple comparison between covered and uncovered firms may lead to biased results, due to the effect of unobserved factors that are likely to be related to the treatment and also to the outcomes. For instance, more efficient firms may have higher revenues making them ineligible to apply for the Simples regime. Even if time variant factors like aggregate shocks, sector specific shocks and regional shocks that affect both treatment and control groups are included, the identification strategy requires consideration of time-invariant unobserved covariates that distinguish the two groups of firms. A difference-in-differences strategy with a fixed effect model will be used to address this problem, as it includes unobserved factors in the model so that the treatment and the error term will not be correlated. This will result in credible estimates of the policy effects.

This strategy relies on some conditions. First, it is assumed that, conditional on the covariates, the single change that affected firms in one group and not the other was the tax change. An investigation in the literature available and interviews with government officials, employers, experts and one accountant give support to this assumption. Besides, the tax change is additive and

constant as the employers' payroll contribution had the same rate and same tax base across firms.

The empirical approach rests on the critical parallel trend assumption, meaning that treatment and control groups would perform similarly over time in the absence of the policy. As Khandker explains, this assumption states that 'unobserved characteristics affecting program participation do not vary over time with treatment status' (Khandker 2010: 73). For instance, differences between firms in the treatment and control groups regarding entrepreneurial ability, productivity, and technology, that result in the applicable tax regime can be considered fixed over a one-year period of time.

Thus, the analysis will start by checking whether the parallel trend assumption holds. First, it will be observed whether outcome variables trended similarly for treatment and control groups during a specific period of time before the treatment. As an additional check, placebo regressions will be performed by regressing the outcome variables on the tax regime using data from 2010 and 2011, pretending that non-Simples firms were exposed to treatment in 2011. The sign and significance of the coefficients for treatment will suggest whether firms in both groups are, on average, performing differently than they were before the policy adoption.

The time dimension is introduced by a selection of a balanced panel of firms that existed, or rather, that held employment contracts, before (2011) and after (2012) the policy implementation. Hence, firms in both treatment and control groups were exposed to similar aggregate shocks such as GDP growth, aggregate labour demand, and national minimum wage adjustment.

Dealing with firms that entered or left the market is more complex as a number of intervening factors other than the change in labour taxation come into play. Given that the data base will not help to control for these various confounding factors, the study focuses on the effects on firms which existed in both periods and the analysis is based on a balanced panel of firms.

Firms were included in the study if classified in one of the following CNAE groups:

- Textile industry – CNAE division 13
- Garment industry – CNAE division 14
- Leather and shoes industry – CNAE division 15
- IT and ITC – CNAE division 62 and Group 631
- Call centre services – CNAE class 8220.2

The last two sectors were aggregated and labelled Service sectors in this study.

In addition to sector specific shocks that firms have to respond to, the sectors included in the study are heterogeneous in terms of nature of activity (manufacturing, services), firm size, main product market (domestic, export), technology, and factor intensity, among others. Sectoral heterogeneity and specific shocks are dealt with by controlling for sector-specific effects. The assumption is that sectoral shocks affect firms in both groups over time and the analysis takes into account the sector as a control variable.

Brazil is a large country and economic performance may be influenced by locational aspects. As the regional location of firms does not vary over time,

the empirical strategy will deal with regional aspects by differencing them out as fixed factors.

However, different firms may react differently to the same sectoral or regional shock. Larger firms may, for example, have more access to capital, access to external markets, subsidiaries near larger markets, and may be oligopolistic in their product markets; characteristics not observed in small and micro firms. In order to reduce this sort of heterogeneity between treatment and control groups, the analysis will first be carried out using a sub-sample of firms that, as a baseline, had less than 50 employees. Subsequently, the analysis will lift the imposed firm's size limit to check the sensitivity of estimates when larger firms are included in the sample.

As the policy change occurred in January 2012, the year 2011 will be the baseline and 2012 will be considered as the period after treatment. Annual average values for dependent and independent variables will help to avoid interference of seasonality in the analysis. Although the policy was announced in August 2011, firms knew that if passed by Congress it would be implemented in January. In order to chech if firms anticipated employment decisions and begin hiring workers in 2011, the study examines data from 2010 for firms that existed at least one year before the treatment and also existed in 2012.

A second robustness check will be performed by excluding from the sample firms from the textile sector which was covered as of April 2012. If the results are consistent with expectations, removing these latecomers is likely to produce larger coefficients for the main variable than when all sectors are included.

Firms were assigned to treatment and control groups depending on their tax regime, non-Simples or Simples respectively, in 2012. Firms may shift from one tax regime to the other depending on various factors not limited to the associated tax burden. As this is a time variant factor, shifts in tax regime are controlled for through a dummy variable indicating whether a firm shifted tax regimes in 2012.

It also seems necessary to control for the level of productivity. The data set does not provide a direct measurement of productivity but provides information on the level of schooling attained by employees, and this may be related to skills and productive technology employed by the firm. Lau et al. (1991) say that education allows a person to learn and perform tasks and to adopt new technologies as a complementary input to physical capital (Lau et al. 1991: 2, Rumberger 1987). So, assuming that productivity is correlated with higher education, the share of workers with a medium level of schooling or higher is included as a control variable.

6.2 Model specification

Following Wooldridge (Wooldridge 2013: 466-467) and Khandker (2010: 74) the effects of the tax policy may be evaluated by using a regression model specified as:

$$Y_{it} = \beta_0 + \delta_0 T_t + \beta_1 treated_{it} + \beta_2 taxchg_{it} + \beta_3 X_{it} + a_i + u_{it} \qquad t = 0, 1$$

where Y_{it} are the outcome variables, the number of employment contracts during the year, the annual number of working hours, and the average hourly wage in Brazilian Reais, for the firm i at the time t. T_t is a dummy variable for time, equal to 1 for 2012. The term $treated_{it}$ refers to exposure to the treatment, assuming a value of 1 if firm i is non-Simples in time-period 1. The estimate of β_1 indicates the effect of the tax reform on the outcome variables. The coefficient β_2 will capture the variation in the outcome if the firm shifts tax regimes across time from Simples (0) to non-Simples (1) or vice versa. The term X_{it} represents time-varying control variables which will be the share of the workforce with an education level equal or above the intermediary level and regional dummy variables. The term a_i is a firm fixed effect that controls for all time-invariant observable and unobservable characteristics.

Some authors point out possible differences in the effects of a payroll tax on groups of workers (Gruber 1997, Hamermesh 1979, Kugler and Kugler 2008). For instance, effects on employment and/or wages may be stronger for production workers compared to administrative staff, or for young workers and women in comparison with adult male workers. The study will further examine this possibility, observing whether the tax reform changed the labour force composition of firms measured by the share of production workers in the total number of employees or the share of adult male workers. If, for instance, the share of production workers increases for firms exposed to the policy, this will show that the reform increased the demand for these workers in comparison to administrative personnel. The same applies for the gender/age variable.

This approach will be implemented first by an OLS regression that will produce biased results by the omission of unobserved variables, even if it controls for sector and region. Subsequently, in order to avoid this bias the policy's impacts will be estimated by difference-in-differences. A non-parametric estimation of differences-in-differences will indicate the changes in averages for the outcome variables across groups and time. Finally, a regression framework of the fixed effects model will be performed to estimate the policy effects for the main sample. The same procedure will be performed for each sector and also for an enlarged sample including firms of all sizes.

Chapter 7
Data

The data source for this research is the RAIS which is an administrative record held by the Ministry of Labour with data about formal employment contracts in the country. The data are provided annually by employers and contain information about the firm (size, location, sector, tax regime, nature of capital), employment conditions (contractual wage, contractual working hours, and type of contract), and personal characteristics of the employees (age, gender, schooling). RAIS is regarded as a highly reliable data base and has been extensively used in studies about the Brazilian labour market (Dallava 2014, FGV Projetos 2013).

A panel data set of existing firms in 2010, 2011 and 2012, identified by their code number at the National Registry of Juridical Persons (CNPJ) was provided under the agreement between the Ministry of Labour and DIEESE. The use of the data set was conditional on the confidential use of the information on individual firms and employees.

The variables from RAIS used in the study are:

a. Identification variable of the firm;
b. Year;
c. Economic sector according to CNAE at two, three or five-digit level;
d. Region where the firm is located (South, Southeast, Northeast, North or Centre-West);
e. Dummy for firms not under the Simples = 1;
f. Total number of employment contracts;
g. Proportion of employees in production occupations, i.e. those in groups 3, 5-9 of the Brazilian Occupational Classification (CBO) – (see Appendix 3);
h. Proportion of employees with schooling level equal to or above the intermediary level;
i. Proportion of workers per gender (male = 1);
j. Proportion of young workers, that is those aged 24 years or less = 1;
k. Proportion male employees aged above than 24 years = 1;
l. Contractual hours of work; and
m. Hourly wage.

As this study is concerned with the effects of the policy on the demand for labour, we use information at the individual level to generate a data set that can be used for the analysis of changes at the firm level. This was done by aggregating the information on employment contracts in a particular firm identified by the CNPJ number in the original data set.

The first step in setting up the database was the selection of the sectors covered by the payroll tax change in January 2012. This was done by matching manufactured products covered by the tax change with the corresponding in-

dustrial sectors based on the comparative table published by Zanghelini et al. (2013).

Following, employment contracts with annual average remuneration equal to zero were dropped from the sample as no effective work was performed during the year under study. These employment contracts correspond in most cases to workers on long term health leave, so they were probably replaced by another worker. Thus, if these contracts were not excluded from the sample there would be a double counting of same job positions. In 2011 there were 69,980 contracts with no wage out of a total of 3,592,324 jobs, and in 2012 the number of contracts was 75,019 out of 3,699,156.

In order to obtain a more precise measure of labour input than the simple number of employees, the duration of each employment contract was calculated even if shorter than twelve months. In 2011, around 60 percent of the employment contracts were shorter than 12 months. The alternative option of using contracts valid on 31st of December would neglect employee turnover and thus might result in biased estimates of variance in total employment across time.

In addition, the measure of the total labour input considers the working hours for each employee calculated by the contractual weekly working hours multiplied by 4.33 weeks per month. Even though the data set contains information on the overtime performed it may not reflect informal arrangements between employers and workers, thus is not used in this study.

With the employment duration in months and the contractual hours of work it was possible to calculate the total hours of work performed by each worker in the year. The resulting figure seems to measure labour input better than the absolute number of employees, as it takes into account the number, duration and intensity (working hours) of employment contracts. Similarly, multiplying the average monthly wage per job by its duration in months resulted in a figure for annual earnings. Dividing this result by the contractual working hours produced the hourly wage.

The data set does not contain information about the level of labour skills. Level of schooling attained is however available and may be taken as a proxy for skills. Considering that technical training requires at least an intermediate level of education, a dummy variable was generated to indicate the proportion of employees that had completed this level of education.

Information on age and sex are used to generate variables for the share of young workers - 24 years of age or under – and the share of male workers in the workforce. A combination of sex and adulthood is used to calculate the share of employees that may be considered part of the so called 'primary' workforce: adult male workers.

Another point of interest is whether possible effects on employment will be felt in production or in administrative jobs. Therefore, an additional dummy variable was generated to aggregate the occupations that can be more directly related to productive activities, comprising employment contracts falling under Groups 3 and 5-9 of the CBO (Appendix 3).

At this point in the process, the identification variable of the firm (CNPJ) was used to produce the number of employees per year, the total number of contracted hours of work, and the annual wage bill per firm. Dividing the an-

nual wage bill by the total number of hours of work resulted in an average hourly wage. Averages on dummy variables produced the proportion of male/female workers, the share of workers with an education level above the intermediate, and other characteristics.

The main explanatory variable is treatment, which is an interaction term between the binary variable for the tax regime non-Simples (equal to 1) and time 1, i.e. the year 2012. It was seen that 3,628 firms switched from Simples in 2011 to non-Simples in 2012, whereas 2,285 firms switched in the other direction, influencing 7 percent of the sample and increasing by 1,343 the number of non-Simples firms. A dummy variable was generated to indicate whether a firm shifted between tax regimes.

7.1 Descriptive Statistics

This study is based on a sample of firms that operated in one of the four sectors covered by the payroll tax reform. Excluding a total of 237 firms that existed in 2011 or 2012 and that had employment contracts in more than one sector, region, or tax regime, there are 99,393 firms for 2011 and 101,070 firms for 2012. To obtain a balanced panel of existing firms in both years, firms that entered or left the market in 2012 were excluded, leaving 83,805 firms in the panel (Table 4).

TABLE 4 – Evolution in the number of firms – selected sectors – 2011-12 - Brazil

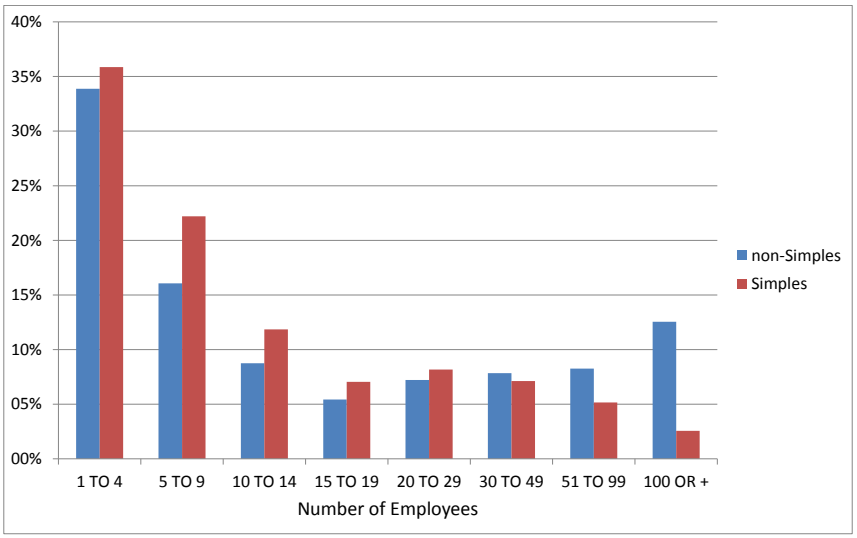
	Full sample	Non-SIMPLES	SIMPLES
FIRMS EXISTING IN 2011	99,393	24,064	75,329
Exit of firms in 2011	-15,588	-4,311	-11,277
Entry of firms in 2012	17,265	4,437	12,828
Shifts in tax regime (net)	-	1,343	-1,343
FIRMS IN 2012	101,070	25,533	75,537
EXISTING FIRMS IN BOTH YEARS	83,805	21,096	62,709

Source: Brazilian Ministry of Labour-RAIS 2011-2012

The distribution of firms and employment in 2011 based on firm size suggests that most are small and medium (Figure 3). The majority of firms had less than 10 employees in 2011 whereas firms with more than 50 employees represent around 11 percent of the total sample and less than 8 percent for the Simples group.

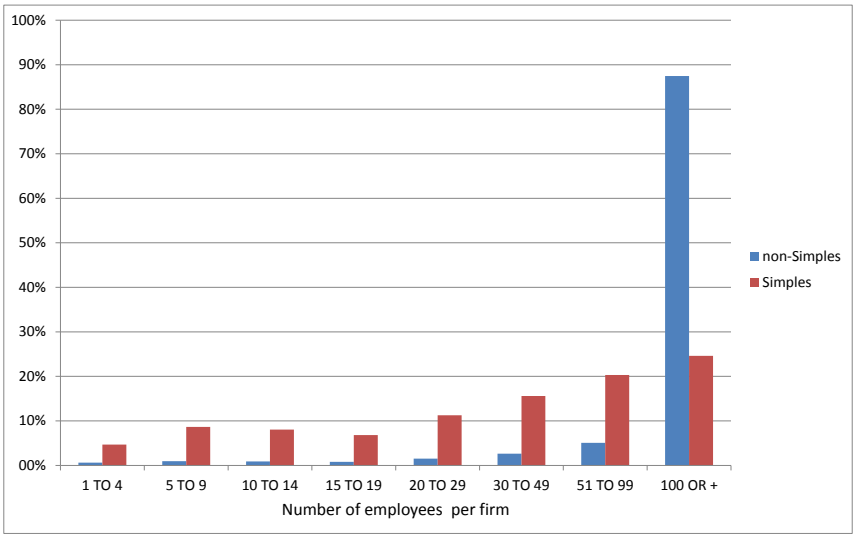
As for the distribution of employment based on firm size (Figure 4), the difference between the two groups is sharper. Almost two thirds of employment contracts were held by firms with 100 or more employees and even among Simples firms, most jobs were provided by larger firms. Notwithstanding, smaller firms seem to be more important for job creation in the Simples group when compared with the non-Simples group.

FIGURE 3 - Share of firms by number of employees – Selected sectors – Brazil – 2011 - %



Source: MTE - RAIS 2011

FIGURE 4 - Share of employment by number of employees - Selected sectors – Brazil – 2011 - %



Source: MTE - RAIS 2011

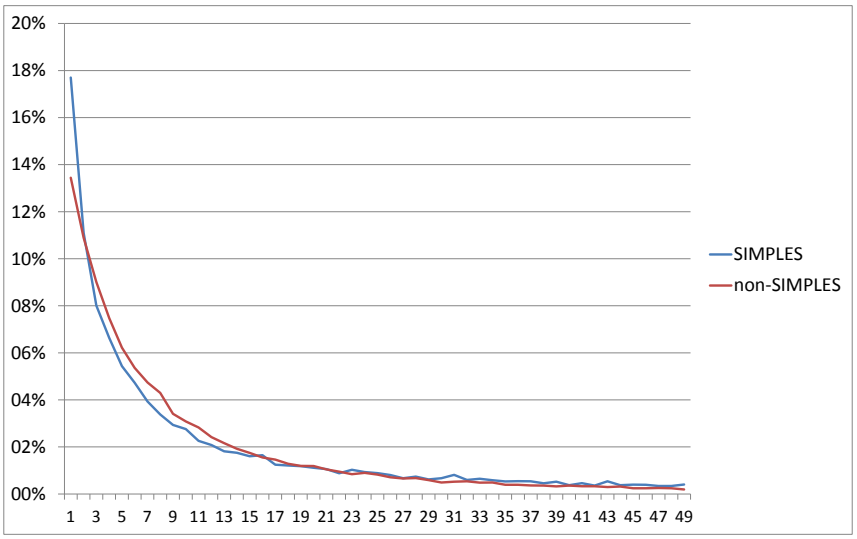
The figures above show that, compared to the control group, the treated firms are larger and exhibit other characteristics that suggest differences in technology and capital. Some of these differences may be related to the economic sector but not all.

In order to deal with heterogeneity among firms in the same sector this study estimates the effects across firms of same size. Given the lack of data on revenue, assets, or machinery, the number of employees at the baseline is taken as a measure of the firm's size.

Thus, the analysis will focus primarily on a sub-set of 74,376 firms that in 2011 had less than 50 employees at the baseline, representing 89 percent of

existing firms and 23 percent of employment. Among non-Simples firms, 79 percent fall under the cut off (7.4 percent of employment in this group), and 92 percent among Simples firms (55 percent of the jobs in these firms). After this cut off, it was observed that six firms increased the number of employees to more than 500 in 2012. These firms were considered outliers and trimmed off the sample. Figure 5 helps to see that the resulting sample is composed of firms with a similar distribution based on number of employees.

FIGURE 5 – Percentage of firms by number of employees - firms with less than 50 employees - Selected sectors – Brazil – 2011 - %



Source: MTE - RAIS 2011

Distribution of firms across sectors shows the garment industry to be the largest in terms of number of firms (57 percent) and employment (58 percent). Conversely, the textile sector is the smallest sector in terms of both number of firms and employment. The leather and shoes industry has the highest average number of employees per firm (12.3). The shares of firms and jobs in the service sector within the size range are substantial, but the average number of employees per firm is the smallest (8.5 workers).

TABLE 5 – Number of firms and average number of employees in 2011, by sector – selected sectors - firms with less than 50 employees

Sector	FIRMS		Total number of employees		Average number of employees	Stand. Dev.
Textile	7,492	10.0%	81,588	10.5%	10.89	11.10
Garment	42,350	56.7%	450,406	57.8%	10.64	10.79
Leather & shoes	9,334	12.5%	114,749	14.7%	12.29	11.88
Services	15,560	20.8%	132,629	17.0%	8.52	9.66
TOTAL	74,736	100.0%	779,372	100.0%	10.43	10.80

Source: MTE - RAIS 2011

The share of non-Simples firms was nearly 1/5 of the total, ranging from 14.5 percent in the garment industry to 40 percent in the service sector (Table 6). Thus, the labour tax reform roughly covered one in every five firms operating in those manufacturing and service sectors, but was more relevant for the service sector.

TABLE 6 – Number of firms by sector and tax regime – selected sectors - firms with less than 50 employees - 2011

Economic sector	non-SIMPLES		SIMPLES		TOTAL
Textile	1,623	21.70%	5,869	78.30%	7,492
Garment	6,133	14.50%	36,217	85.50%	42,350
Leather & shoes	1,693	18.10%	7,641	81.90%	9,334
Services	6,189	39.80%	9,371	60.20%	15,560
TOTAL	15,638	20.90%	59,098	79.10%	74,736

Source: MTE - RAIS 2011

During the period under consideration 5,374 firms shifted between tax regimes, 3,231 shifting from Simples to non-Simples, and 2,145 in the other direction. Therefore, the number of non-Simples firms after the policy was implemented was 7 percent greater than one year before.

Descriptive statistics at the baseline (Table 7) show that the average number of employees in treatment firms is 5.9 percent greater than in the control firms with a larger difference in the average number of working hours: 8.62 percent. These discrepancies may indicate that employment spells are shorter in Simples firms and turnover is faster. Treated firms have a smaller share of employees working directly in the production process than firms in the control group. A much more striking distinction can be seen in the average hourly wage which is 62 percent higher in the treatment group than in the control group[7].

Some of these distinctions between groups can be related to individual characteristics of the employees such as the higher proportions of male and adult workers, and of workers with an education level equal to or higher than intermediary in the treatment group. There are also regional and sectoral distinctions between both groups. Treated firms seem to be more concentrated in the industrialized Southeast region. In contrast, non-treated firms are distributed more evenly and with higher prevalence in the Northeast, South, and Centre-West regions. The garment and service sectors are the most represented in both groups, but for treated firms the proportion of firms in the latter sector is larger than in the former.

[7] As a comparison, hourly minimum wage was BR$ 2.86 in 2011 and BR$ 3.26 in 2012 per hour (for 44 working hours/week and 4.33 weeks/month).

TABLE 7 - Descriptive statistics - Selected sectors – firms with less than 50 employees – Brazil – 2011 - %

Variable	TREATMENT GROUP		CONTROL GROUP	
	Mean	Std. Dev.	Mean	Std. Dev.
EMPLOYMENT AND WAGES				
Average number of jobs	10.90	11.66	10.29	10.53
Employment in production	0.67	0.35	0.76	0.32
Average hours of work per firm	17,044	18,872	15,692	16,688
Average hourly wage (BR$)	7.71	9.73	4.76	2.74
EMPLOYEES' CHARACTERISTICS				
Sex (male =1)	0.47	0.35	0.34	0.34
Average age (years)	33.54	7.98	33.45	7.72
Share of employees w/ medium level of schooling	0.66	0.37	0.56	0.37
Share of employees age< 25	0.24	0.27	0.27	0.27
Share of adult male employees	0.34	0.31	0.22	0.28
REGION				
North	0.01	0.10	0.01	0.10
Northeast	0.10	0.30	0.14	0.34
Southeast	0.64	0.48	0.47	0.50
South	0.21	0.40	0.31	0.46
Centre-west	0.05	0.22	0.08	0.26
SECTOR				
Textile	0.10	0.30	0.10	0.30
Garment	0.41	0.49	0.61	0.49
Leather and shoes	0.11	0.31	0.13	0.34
Service sectors	0.38	0.49	0.16	0.37
NUMBER OF FIRMS	16,724		58,012	
NUMBER OF JOBS	182,316		597,056	

Source: MTE/RAIS 2011

These differences between treatment and control groups[8] do not necessarily affect negatively the empirical strategy chosen, as it looks at how each of those groups performs over time.

[8] An independent t-test performed on the sample, not reported, suggested that differences in means are significantly different from zero at 95 percent of confidence interval, except for the average age and for the share of firms in the North region.

Chapter 8
Results

If one examines how employment performed in industries covered by the payroll tax reform in 2012, at first glance the impression is that the policy did not have strong positive effects. As shown in Section 2.4, formal employment levels in covered sectors increased by only 0.6 percent in relation to the previous year. Even when limiting the observation to firms existed in both 2011 and 2012, firms that were supposed to perform better despite the more adverse economic environment that characterized the period, employment increased by less than 2 percent in 2012. The empirical strategy proposed in this paper intends to identify the effects of the payroll tax reform, isolating it from other factors that interfered in the performance of the labour market for the covered sectors.

Given that the empirical strategy relies on the parallel trend assumption, the first section is dedicated to examining whether this assumption holds. Then the analysis will focus on firms with less than 50 employees in 2011, both for the aggregated sectors and for each of them individually. After that, the analysis will present estimates of the policy effects on firms of all sizes.

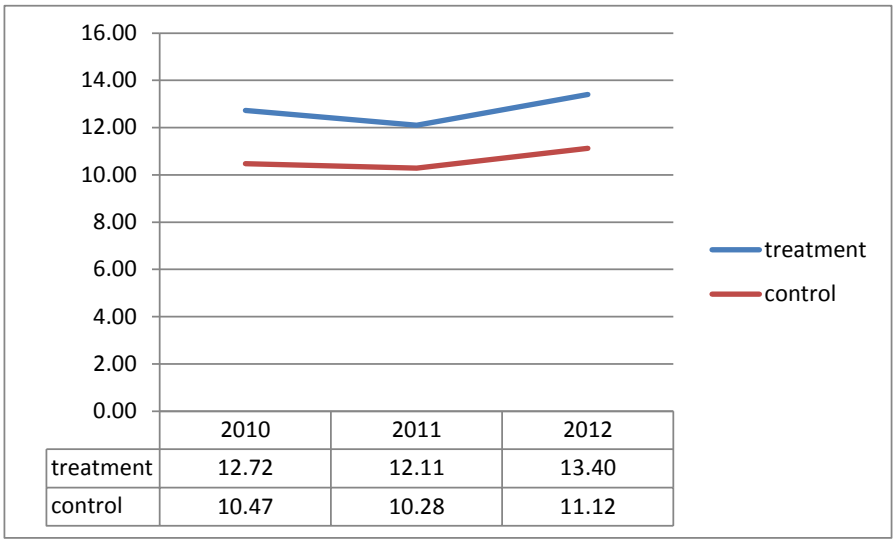
8.1 Examining the parallel trend

The empirical approach taken in this analysis assumed that unobserved heterogeneity coming from sector and region factors do not vary with time. The analysis rests on the critical parallel trend assumption, meaning that unobserved error term is not correlated with the outcomes (Khandker 2010: 73).

One way to check whether this assumption holds is to observe how variables trend for treatment and control groups in a period of time before the treatment. However, as the firm is the observational unit and a number of firms enter and leave the market every year, it is impossible to follow the same group of firms across several years. To circumvent this problem a group of 60,066 firms that existed in 2010, 2011 and 2012, plus another 11,156 firms that existed in 2010 and in 2011 but not in 2012 will be examined. The latter group of firms are assigned to control or treatment groups according to their tax regime (Simples or not) despite the fact that they did not exist in 2012.

Observing the outcome variables for these 71,222 firms, split into treatment and control, we see that from 2010 to 2011 employment did not trend similarly for both groups, falling 4.9 percent in treated firms and 1.8 percent in the control group (Figure 6). As for the labour input measured by average hours of work, trends were opposite, with a 3 percent drop in the treatment group and a 1 percent increase in the control group (Figure 7). Differences in trends are significant, even though they might be considered small (3 and 4 percentage points respectively).

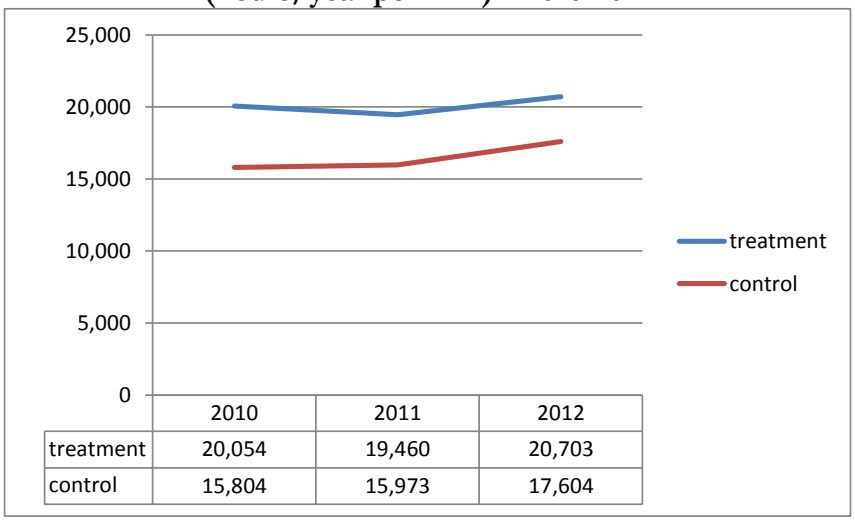
FIGURE 6 – Average employment in treatment and control groups - Selected sectors – Firms with less than 50 employees in 2011 - Brazil – 2010-2012



	2010	2011	2012
treatment	12.72	12.11	13.40
control	10.47	10.28	11.12

Source: MTE – RAIS 2010-2012

FIGURE 7 – Contracted working hours in treatment and control groups - Selected sectors - Firms with less than 50 employees in 2011 – Brazil (hours/year per firm) – 2010-2012

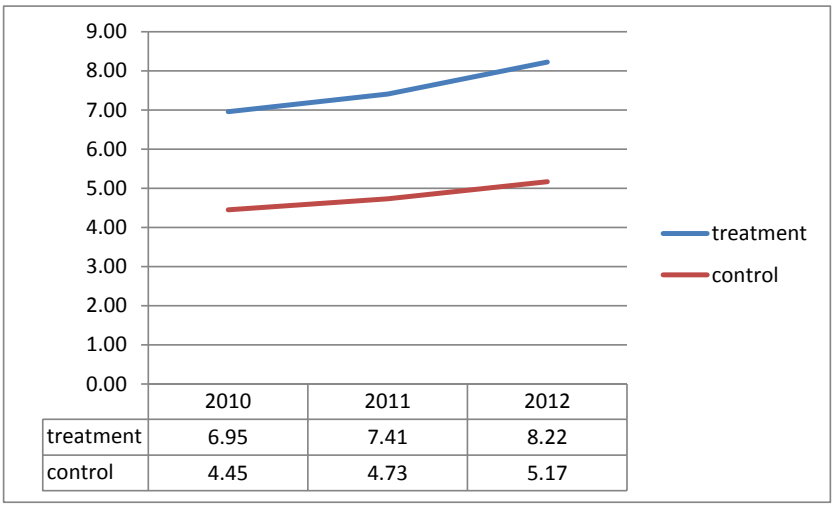


	2010	2011	2012
treatment	20,054	19,460	20,703
control	15,804	15,973	17,604

Source: MTE – RAIS 2010-2012

The average hourly wage trends similarly for both groups of firms over time (Figure 7). Wages increased 6.5 percent in treated firms in 2011 and 6.3 percent in untreated. The pay rise seems to be stronger in 2012 compared to the previous year, but the sample for 2012 is smaller in both groups.

FIGURE 8 – Average hourly wage in treatment and control groups - Selected sectors - Firms with less than 50 employees in 2011 – Brazil – 2010-2012



	2010	2011	2012
treatment	6.95	7.41	8.22
control	4.45	4.73	5.17

Source: MTE – RAIS 2010-2012

As an additional check, a placebo regression was performed, regressing the outcome variables on the tax regime using data from 2010 and 2011. The non-Simples firms in 2011 were assigned to the treatment group as if exposed to a pretend tax reduction that year. Confirming the previous discussion, the coefficients obtained were statistically significant but small and negative for employment and hours of work, and positive for wage (see Appendix 4). These coefficients suggest that compared to Simples firms, and controlling for other factors, average employment in non-Simples firms fell by 0.435 (-3.4 percent in relation to the baseline in Figure 6), average hours decreased by -770.0 (-3.8 percent, compared with Figure 7), whereas wages rose by 0.174 (2.5 percent; in relation to Figure 8).

Examining only the sample of 60,066 firms that existed for all of the three years, trends in employment and hours of work in 2010-2011 became more differentiated between treatment and control groups, while wages still performed similarly (see Appendix 5). Hence, the potential downward bias tends to increase, though this evidence is weakened by the smaller number of firms in this sample.

The evidence above shows that the treatment group was performing a little worse than the control group before the policy, while wages were growing more in the former group. If these trends were the consequence of factors that remained after the policy implementation, then they would attenuate the expected positive employment effects of the policy and amplify a potential partial effect on wages. In other words, if there are biases in the estimates of the policy effects, they might be downwards for employment and hours of work, and upwards for hourly wages.

8.2 Effects on employment and wages for firms with less than 50 employees

This section presents estimates of the policy effects for a sample of existing firms in 2011 and in 2012, limited by size. Estimates from a pooled OLS re-

gression are presented first, but these results are naïve and biased by omitted variables. Second, results of the difference-in-differences approach are reported. This approach includes time invariant unobservables and is implemented by a non-parametric estimation and by a firm fixed effects model.

Estimates obtained from a pooled OLS regression (Table 8) suggest that the change in payroll tax, controlling for the shift in tax regime and for the level of workers' education, increases employment by 2.654 employees, which is quite substantial given the average of 10.4 employees at the baseline. Treatment is also positively correlated to the number of total working hours: the estimated effect is a noticeable 3,652 hours per year (23 percent of the average at the baseline). The mean hourly wage increases by BR$ 3.08, almost 60 percent in relation to the period before treatment. All these three estimates are statistically significant.

The coefficient for the time variable is estimated positive for employment and hours of work, but negative for hourly wage. In addition, the share of skilled workforce is negatively correlated with employment and hours of work, suggesting that productivity increases with the level of skills, and wages go up. The negative sign of the coefficient associated to the shift in tax regime may be interpreted as a downward effect on the averages in the treatment group (non-Simples) whenever a Simples firm shifts into it. Simples firms are smaller, so when they enter the non-Simples group they end up reducing the averages for that group.

Using the garment industry as the base category, a second specification that includes sectors as additional covariates results in larger estimates for the treatment. The positive coefficients for the textile and leather and shoes industries indicate that the effects on employment and hours of work are more substantial than for the base category. Accordingly, the effects on the service sectors are smaller. There seems to be a higher wage increase in all these three sectors, as compared to the base category.

However, these estimates may be considered naïve. They are biased by the fact that treated firms, on average, hire more employees and tend to pay higher salaries than non-treated firms. These pooled OLS estimates are misleading as a number of factors that may affect the tax regime in which a firm lies and the outcomes are not controlled for.

TABLE 8 - OLS estimation of the effect of a reduction of contributions to Social Security on employment, hours of work and hourly wage – selected sectors – firms with less than 50 employees in 2011 – Brazil

	Average employment		Average hours of work		Average hourly wages	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Time	0.213***	0.138*	536.7***	400.4***	-0.210***	-0.0338
	(0.0710)	(0.0710)	(105.2)	(105.1)	(0.0285)	(0.0274)
Treatment	2.654***	2.947***	3,652***	4,200***	3.084***	2.340***
	(0.116)	(0.117)	(172.1)	(173.7)	(0.0466)	(0.0453)
Switch of tax regime	-1.715***	-1.818***	-2,687***	-2,877***	-1.423***	-1.160***
	(0.187)	(0.187)	(276.8)	(276.3)	(0.0749)	(0.0721)
Share of workers with intermediary schooling or +	-2.059***	-1.098***	-3,763***	-2,189***	2.482***	0.833***
	(0.0884)	(0.0970)	(131.0)	(143.8)	(0.0355)	(0.0375)
Textile		0.252**		463.8***		0.500***
		(0.113)		(167.5)		(0.0437)
Leather & shoes		1.940***		1,983***		0.193***
		(0.104)		(153.5)		(0.0401)
Services		-1.494***		-2,858***		3.925***
		(0.0924)		(136.9)		(0.0357)
Constant	11.62***	11.11***	18,176***	17,565***	3.982***	4.046***
	(0.0694)	(0.0747)	(102.7)	(110.7)	(0.0278)	(0.0289)
Observations	149,472	149,472	149,472	149,472	149,472	149,472
R-squared	0.007	0.012	0.009	0.014	0.064	0.136

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. For regional dummies, garment industry is the base category. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

A non-parametric double-difference estimate is thus more useful. It suggests that firms exposed to the tax change performed better in relation to employment levels and labour input than those not exposed. After the policy was implemented, the treatment group employed 13.8 percent more workers than the control group, and contracted 8.0 percent more hours of work (Table 9). However, when it comes to wages, the average wage per hour increased slightly more in non-treated firms than among the treatment group (-0.9 percent). For the share of adult male workers and for the composition of production or administrative workers, there were not substantial differences between groups.

TABLE 9 - Double difference estimation of employment, hours of work, hourly wage, labour force composition – Selected sectors – 2011/12 – Brazil

VARIABLE	2011	2012	Difference	%
AVERAGE EMPLOYMENT				
Treatment	10.90	12.77	1.87	17.1%
Control	10.29	10.59	0.30	2.9%
Difference	0.61	2.18	1.57	13.8%
AVERAGE HOURS OF WORK				
Treatment	17,044	19,306	2,262	13.3%
Control	15,692	16,451	759	4.8%
Difference	1,351	2,855	1,503	8.0%
AVERAGE HOURLY WAGE				
Treatment	7.71	8.26	0.55	7.1%
Control	4.76	5.15	0.38	8.1%
Difference	2.95	3.11	0.16	-0.9%
SHARE OF PRODUCTION WORKERS				
Treatment	0.67	0.67	0.00	-0.6%
Control	0.76	0.76	-0.01	-0.7%
Difference	-0.09	-0.09	0.00	0.1%
SHARE OF ADULT MALE WORKERS				
Treatment	0.34	0.35	0.01	3.2%
Control	0.22	0.23	0.01	3.9%
Difference	0.11	0.12	0.00	-0.7%

Source: MTE/RAIS 2011-2012.

Using a firm Fixed Effects model to estimate the effects of the payroll tax reduction on firms in all four sectors, the results are significant and coefficients are large for the main outcome variables (Table 10)[9]. These results suggest that firms covered by the labour tax policy increased their total employment by 1.567 jobs on average, which represents a 14.4 percent increase in relation to the baseline (10.90 jobs; see Table 9).

Coefficients for total hours of work are also statistically significant and suggest that the policy expanded the amount of labour input by 1,500 hours on average, representing an 8.8 percent increase. This percentage is higher than the positive variation, also statistically significant, in the average hourly wage of BR$ 0.17, or 2.1 percent in relation to the baseline.

[9] Hausman test, not reported, was performed to check whether Fixed Effects or Random Effects produced consistent and unbiased estimates for each specification. The null hypotheses were rejected in all cases, indicating that the FE model produces consistent and unbiased estimates.

TABLE 10 – Estimates of effects of reduction in Social Security contribution on employment, hours of work and hourly wage using Fixed Effects – selected sector – firms with less than 50 employees in 2011 - Brazil – 2011/12

	Average employment		Average hours of work		Average hourly wage		Share of prod. workers	Share of adult male
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Time	0.314***	0.345***	778.5***	809.8***	0.378***	0.382***	-0.004***	0.009***
	(0.0429)	(0.0432)	(55.28)	(55.74)	(0.0126)	(0.0127)	(0.001)	(0.001)
Treatment	1.567***	1.698***	1,500***	1,633***	0.165***	0.183***	0.001	0.003*
	(0.0904)	(0.0934)	(116.5)	(120.4)	(0.0266)	(0.0275)	(0.001)	(0.002)
Switch of tax regime		-0.834***		-849.0***		-0.116***	-0.003	-0.005**
		(0.151)		(194.1)		(0.0443)	(0.002)	(0.002)
Share of workers with intermediary schooling or +	-0.963***	-0.961***	-1,094***	-1,092***	0.330***	0.331***	-0.088***	0.0107***
	(0.192)	(0.192)	(247.5)	(247.5)	(0.0565)	(0.0565)	(0.003)	(0.00314)
Constant	10.99***	10.99***	16,629***	16,628***	5.229***	5.229***	0.792***	0.242***
	(0.114)	(0.114)	(147.6)	(147.5)	(0.0337)	(0.0337)	(0.002)	(0.00187)
Observations	149,472	149,472	149,472	149,472	149,472	149,472	149,472	149,472
R-squared	0.008	0.009	0.009	0.009	0.020	0.020	0.012	0.003
N. of firms	74,736	74,736	74,736	74,736	74,736	74,736	74,736	74,736

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

The second specification reported in Table 10 includes a dummy variable for shifts in the tax regime and the share of workers with at least an intermediate education level. Larger and statistically significant coefficients for the main explanatory variable suggest that the effect of the payroll tax reduction is stronger when controlled for other intervening factors. The effect of treatment is estimated, on average, at 1.698 more employees (15.6 percent increase), 1,633 more hours of work (9.6 percent), and a BR$ 0.18 (2.4 percent) wage increase. The coefficient relative to the shifting of the tax regime is significantly different from zero and suggests that switching firms decreases mean employment, the average hours of work and the average wage. A possible explanation is that these firms are typically smaller and reduce the outcome averages.

As for the educational level of workers, as it rises it seems to decrease the employment and labour input, and increase wages. These findings are intuitive based on the relation between schooling, productivity, and wages.

The last two columns in Table 10 show that treatment did not significantly affect the share of production workers and produced a small increase of 0.3 percentage points in the share of adult male workers.

To check the robustness of these estimates, the same model was estimated excluding textile firms from the sample. Results for the treatment variable increases employment by 1.752 (16.5 percent of the baseline), in hours of work by 1,748 (10.6 percent variation), and in wages specification by BR$ 0.189 (2.4 percent increase) (Appendix 6). Thus, it is possible to say that, *ceteris paribus*, the longer the firm was covered, the stronger the policy effect.

A second check was performed to verify whether firms already anticipated employment decisions in 2011, once the policy was announced, by including another round of data for 2010 for firms that also existed in 2012. Controlling for the switch in tax regime and educational level of workers, the coefficients for the treatment became smaller, but still positive and significant: 1.166 more employees, 762 more hours of work and a BR$ 0.26 increase in the average wage (see Appendix 7). Instead of increasing by the inclusion of another round of data, the coefficients decrease, suggesting that the impact is stronger when a comparison is made between 2011 and 2012, thus not anticipated. The smaller coefficients may be explained by the worse performance from 2010 to 2011 of potentially treated firms when compared to the control group.

In summary, the difference-in-differences with firm Fixed Effects approach results in positive, significant, and large estimates of the effects of the payroll tax reduction on employment. For firms covered by the policy, the payroll tax reduction of 20 percent of the wage bill resulted in 14-16 percent more formal jobs and a 9-10 percent increase in working hours, on average. Furthermore, there was a 2 percent average partial shift of the tax benefit. The next section presents sector-specific estimates.

8.3 **Results by economic sector**

Examining the policy effects by economic sector, results are presented in Table 11 (for full estimates, see Appendix 8). The second column contains the means at the baseline (2011), the third column shows the coefficients for the treatment effect on the outcome variables, and the fourth column presents the effects in percentages of variation.

These results indicate that in all four sectors employment and average contractual hours of work increased in treated firms substantially more than in non-treated firms. However, the largest effects are seen in the leather and shoes industry, with a more than 35 percent increase in employment, 24 percent increase in working hours, and a larger rise in wages. In the other three sectors the coefficients suggest that employment expanded by around 8-13 percent, and labour input from 3 to 6 percent.

TABLE 11 – Fixed Effects estimates of effects of reduction in Social Security contribution on employment, hours of work and hourly wage by economic sector – firms with less than 50 employees in 2011 - Brazil – 2011/12

Dependent variable: Average employment	Mean value at baseline	Treatment	% change
Garment	10.66	1.35***	12.7%
Textile	13.10	1.23***	9.4%
Leather and shoes	13.44	4.71***	35.4%
Services	9.83	0.82***	8.3%

Dependent variable: Contracted working hours	Mean value at baseline	Treatment	% change
Garment	17,135	949.4***	5.5%
Textile	21,331	656.6**	3.1%
Leather and shoes	20,808	5,067.0***	24.35%
Services	14,709	935.5***	6.4%

Dependent variable: Average hourly wage	Mean value at baseline	Treatment	% change
Garment	4.93	0.035	0.7%
Textile	5.82	0.133**	2.3%
Leather and shoes	5.06	0.131***	2.6%
Services	11.95	0.277***	2.3%

Note: for the estimates results, see Appendix 8. *** p<0.01, ** p<0.05, * p<0.1

The data do not offer enough information to explain this differentiation in employment and working hours among sectors. However, it is worth noting that the leather and shoes industry may be more export-oriented than the other sectors (ABDI 2008: 184-185, Lemos et al. 2008: 6, Nascimento 2007). This seems to support the hypothesis that the greater reduction in the tax burden for exporting firms enhanced their competitiveness, and expanded their demand for labour.

As for the wage specification, the results seem to be more homogeneous across sectors. Only in the garment industry is the coefficient for treatment in the wage specification not significantly different from zero, even at a 10 percent confidence level. The reason for this may be that where wages in treated firms were closer to the minimum wage, like in the garment industry, its increase in 2012 may have equally influenced wages paid in treatment and control groups alike, thus reducing the effect of the treatment.

8.4 Estimating effects for firms of all sizes

The analysis so far has compared firms within a range of sizes to reduce heterogeneity between the treatment and control groups. However, it is worth checking whether these estimates are sensitive to firm size when the size restriction is raised. This is done by estimating the Fixed Effect model on a sample of firms of all sizes.

The results from this estimation procedure are also positive and significant, though less strong (Table 12). Looking at average employment and total hours of work, the variations suggest that firms exposed to the tax change demanded more labour than those firms not exposed. In the specification that

includes as covariates the dummy for shifts in tax regime and the share of workers with a higher education, the treated firms seem to have hired 4.6 percent more workers (4.596 jobs in relation to 108.75 jobs at the baseline – see Appendix 9) as a result of the treatment and 2.1 percent more hours of work were contracted (3,257 hours on top of the 154,496 hours at the baseline). Wages also went up, on average by 3.4 percent (BR$ 0.27 cents on top of BR$ 7.93 at the baseline for the treated firms).

TABLE 12 - Fixed Effects estimates of effects of reduction in Social Security contribution on employment, hours of work and hourly wage – selected sectors – Brazil – 2011/12

VARIABLES	Average employment		Contracted working hours		Average hourly wage	
	(1)	(2)	(3)	(4)	(5)	(6)
Time	-0.319	-0.219	-28.48	37.43	0.388***	0.393***
	(0.418)	(0.421)	(461.1)	(464.7)	(0.0118)	(0.0119)
Treatment	4.596***	4.969***	3,011***	3,257***	0.245***	0.267***
	(0.830)	(0.853)	(915.9)	(941.1)	(0.0234)	(0.0241)
Switch of tax regime		-2.747*		-1,812		-0.160***
		(1.446)		(1,595)		(0.0408)
Share of workers with intermediary schooling or +	-2.746	-2.736	-3,087	-3,080	0.346***	0.347***
	(1.911)	(1.911)	(2,109)	(2,109)	(0.0539)	(0.0539)
Constant	41.68***	41.67***	59,763***	59,759***	5.346***	5.346***
	(1.127)	(1.127)	(1,243)	(1,243)	(0.0318)	(0.0318)
Observations	167,610	167,610	167,610	167,610	167,610	167,610
R-squared	0.000	0.000	0.000	0.000	0.025	0.025
Number of firms	83,805	83,805	83,805	83,805	83,805	83,805

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

It is worth noting that switching tax regimes has negative effects significantly different from zero only for employment and hourly wages. As commented above, it is likely that firms that switch tax regime are smaller and thus reduce the average for the non-Simples group. The share of employees with higher than intermediary level schooling is positive and significant for the wage specification. This may be interpreted as having an effect on the level of productivity and employees' compensation.

These results suggest that even when the comparison is made between more heterogeneous groups, the payroll tax reform was followed by an increase, though small, in employment, and labour demand, and a larger effect

on wages in the treated group. It is possible that because the labour tax law was initially only valid until December 2014, it may have had a limited effect on long term investments to increase employment levels. If this problem is more frequent among larger firms, then this might explain why the policy effects on employment are weaker among this group. It is also worth noting that the counterfactual in this estimation is less credible as sharper differences in sizes may imply time variant factors affecting differently firms in the treatment and control groups.

Chapter 9
Conclusion

This study attempted to estimate the effect of a change in labour taxation in Brazil on employment and wages. Starting in January 2012, firms not under the special tax regime for small and micro enterprises (Simples) that operated in four economic sectors experienced a cut in the employers' contribution to social security of 20 percent of the wage bill. Relying on administrative data that allowed for a firm level analysis, the study explored information on the tax regime to build a potentially credible counterfactual necessary for the measurement of the policy effects.

The main results suggest that treated firms increased the number of formal employment contracts by 14-16 percent, total working hours by 8-10 percent, and wages by 2-2.3 percent, in relation to untreated firms in the same sector and size range. These figures indicate that the payroll tax reduction resulted in employment generation, increase in labour demand, and in a small increase in wages in its first year of implementation.

These estimates are statistically significant in almost all specifications. They seem robust to the exclusion of the textile sector, which was only covered later, as the effects become stronger if the analysis is limited to firms in the sectors covered earlier. The study also confirmed that employment and labour demand were not anticipated by firms in 2011, as the bulk of the policy effects seem to have happened after the policy adoption. Besides, weaker effects on employment and labour input were found when larger firms are included in the analysis.

When the analysis is disaggregated by sector, the largest coefficients of variation in employment and wages were estimated in the leather and shoes industry, while the textile sector shows the smallest. The garment industry and services sectors fell in between the two. On the one hand, the leather and shoes industry is the most export-oriented sector, thus may have captured the full benefit of a payroll tax reduction designed to stimulate exports. On the other, the textile sector was only fully covered by the policy at a latter moment in time, which seems to explain the smaller effects in 2012.

Empirical studies carried out in Latin-America and elsewhere tend to show small employment effects and partial shifting of payroll tax changes on to wages (Gruber 1997, Cruces et al. 2010, Bennmarker et al. 2009). This study points in the opposite direction, suggesting a substantial employment effect. The reasons might be that the analysis here is limited to a few sectors and does not attempt to evaluate the overall impact on the aggregate employment level.

The employment effect is consistent with the theory that a decrease in labour costs results in an expansion in the demand for labour at firm or sector levels. The shift in demand interacts with an elastic labour supply to the formal labour market, determined by the size of the informal economy and the high unemployment rate, resulting in the adjustment by the employment with smaller effect on wages.

Results presented here contrast with two studies about the Brazilian payroll tax reform that found small positive effects on employment, though not

across all covered sectors (Dallava 2014, FGV Projetos 2013). It is believed that the empirical approach adopted in this paper, and the control for firm fixed effects, offers a better solution to the identification problem that comes from the evaluation of such policy, as seen by more intuitive results and highly significant estimates.

Once data for 2013 and 2014 are available, a broader policy evaluation using this approach could include sectors that were covered in the second half of 2012 onwards. It is also possible to undertake further evaluations using other data sources that contain information about relevant covariates such as capital intensity, and gross revenue. Moreover, the aggregate impact of the payroll tax reduction and its substitution by a revenue tax could be evaluated more broadly by use of an adequate methodology and including fiscal and inter-sectorial interactions.

The policy seems to have achieved the expected increase in formal employment and perhaps an enhanced competitiveness, at least for the covered industries and in its first year. However, given the limitations of this study, these conclusions do not imply that aggregate effects will be the same. Besides, reductions in other non-wage labour costs in Brazil may not have similar effects, as changes in each component of labour costs will trigger specific effects on the labour market. Instead of a simplistic generalization, it seems also necessary to consider the implications of changes in social security, training, and the financing of other social programmes.

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Appendices

Appendix 1 - Hourly compensation costs in manufacturing, U.S. dollars, 2005-2012

Country or Area	2005	2010	2011	2012
Norway	42.04	57.66	64.76	63.36
Switzerland	40.10	51.10	60.40	57.79
Belgium	41.00	50.72	54.76	52.19
Sweden	35.39	43.51	49.21	49.80
Denmark	37.05	47.93	51.67	48.47
Australia	28.55	39.68	46.47	47.68
Germany	38.03	43.84	47.42	45.79
Finland	33.72	41.44	45.05	42.60
Austria	32.37	39.98	43.23	41.53
France	32.66	39.12	42.12	39.81
Netherlands	33.29	39.54	42.26	39.62
Ireland	28.64	38.57	39.74	38.17
Canada	26.26	34.36	36.34	36.59
United States	30.14	34.81	35.51	35.67
Japan	25.25	31.75	35.71	35.34
Italy	27.71	33.57	36.15	34.18
United Kingdom	29.72	29.11	30.77	31.23
Spain	20.74	26.66	28.44	26.83
New Zealand	16.26	20.42	23.38	24.77
Singapore	13.25	19.42	23.13	24.16
Korea, Republic of	14.83	17.89	19.25	20.72
Israel	13.27	19.22	21.14	20.14
Greece	15.25	22.36	22.68	19.41
Argentina	5.51	12.77	15.98	18.87
Portugal	9.54	11.94	13.15	12.10
Czech Republic	7.30	11.42	12.71	11.95
Slovakia	5.82	10.72	11.77	11.30
Brazil	**5.01**	**10.01**	**11.67**	**11.20**
Estonia	5.51	9.47	10.42	10.41
Taiwan	7.93	8.37	9.34	9.46
Hungary	6.71	8.39	9.17	8.95
Poland	5.60	8.16	8.68	8.25
Mexico	5.61	6.14	6.49	6.36
Philippines	1.20	1.89	2.02	2.10

Note: Compensation costs include direct pay, social insurance expenditures, and labor-related taxes. Except for Argentina, Japan, Philippines, Singapore, and Taiwan, data relate to manufacturing as defined by the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4. 'NA' means data not available.
Source: U.S. Bureau of Labor Statistics, International Labor Comparisons, August 2013

Appendix 2 - Hourly social insurance expenditures and other labor-related taxes as a percent of total hourly compensation costs in manufacturing, 2005-2012

Country or Area	2005	2010	2011	2012
Sweden	33.2	33.0	32.9	33.3
Brazil	**32.8**	**32.0**	**32.8**	**32.8**
Belgium	30.8	32.2	32.2	32.2
Mexico	30.7	30.0	30.1	30.2
France	31.1	29.9	29.9	29.9
Italy	30.7	28.9	28.9	28.9
Slovakia	27.2	27.5	27.1	27.1
Czech Republic	26.6	27.0	26.6	26.6
Estonia	25.6	26.4	26.0	26.1
Spain	25.7	26.1	25.4	25.9
Austria	25.2	25.7	25.7	25.7
United States	22.4	24.6	24.4	23.9
Hungary	27.9	23.8	23.5	23.5
Greece	22.1	23.1	23.1	23.1
Finland	21.6	22.3	22.3	22.3
Netherlands	21.9	21.2	21.2	21.6
Korea, Republic of	17.4	20.3	20.8	21.5
Germany	22.4	21.9	21.6	21.2
Canada	18.4	20.0	20.0	19.9
Australia	21.3	20.0	19.8	19.7
Portugal	20.1	19.7	19.7	19.7
Japan	17.8	18.1	18.1	18.1
Norway	17.9	17.9	17.9	17.9
Ireland	14.5	16.6	15.8	17.5
Argentina	17.4	17.4	17.4	17.4
Israel	16.2	16.6	17.7	17.2
Singapore	14.2	16.2	16.5	16.7
United Kingdom	14.4	14.8	15.4	15.6
Switzerland	15.5	15.3	15.3	15.3
Taiwan	13.0	14.8	14.4	14.5
Poland	15.4	12.6	12.6	12.6
Denmark	10.5	9.6	9.6	9.6
Philippines	8.8	8.5	8.5	8.5
New Zealand	3.2	3.7	4.2	4.2

Note: Employer social insurance expenditures are legally required, private, and contractual social benefit costs, and labor-related taxes minus subsidies. Except for Argentina, Japan, Philippines, Singapore, and Taiwan, data relate to manufacturing as defined by the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4.

Source: U.S. Bureau of Labor Statistics, International Labor Comparisons, August 2013

Appendix 3 – Brazilian Classification of Occupations – CBO - Groups

Groups	Titles
0	Armed forces, policemen and military firefighters
1	High level members of public entities, directors of public organizations, enterprises and managers
2	Professionals of sciences and arts
3	Intermediary level technicians
4	Workers in administrative services
5	Workers in services, salesmen in shops and markets
6	Workers in agriculture, livestock farming, forests, hunting and fishing
7	Workers in industrial goods and services
8	Workers in industrial goods and services (continuous production processes)
9	Workers in maintenance and reparation

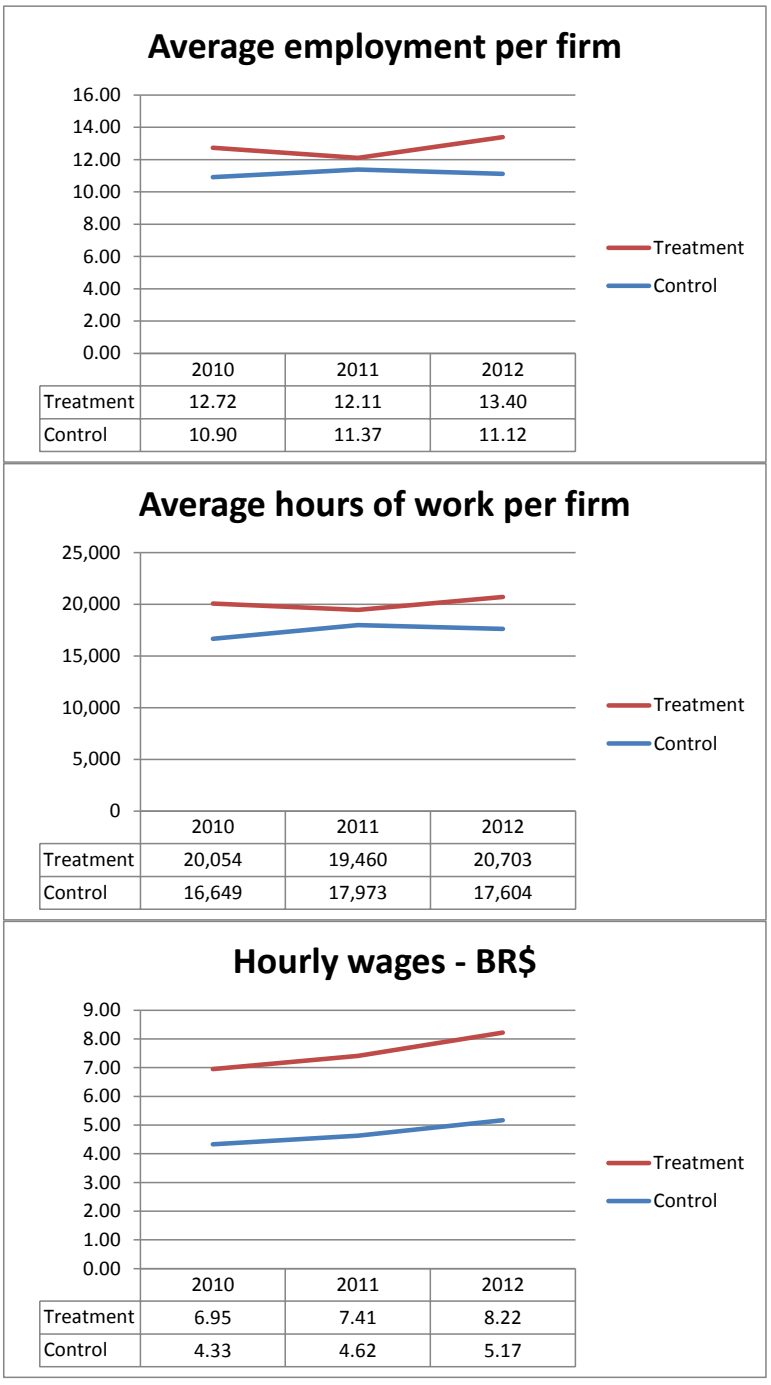
Source: Brazilian Ministry of Labour. http://www.mtecbo.gov.br/cbosite/pages/informacoesGerais.jsf#6.
Translated by the author.

Appendix 4 – Fixed effects estimates – placebo regression of outcome variables on the tax regime – existing firms in 2010 and 2011 with less than 50 employees in 2011 – selected sectors – Brazil

VARIABLES	Average employment		Contracted working hours		Average hourly wage (BR$)	
	FE	RE	FE	RE	FE	RE
Time 1	-0.177***	-0.273***	185.8***	34.21	0.276***	0.142***
	(0.0359)	(0.0354)	(51.71)	(51.19)	(0.0142)	(0.0141)
Treatment	-0.435***	0.177**	-770.0***	218.5*	0.174***	0.755***
	(0.0820)	(0.0768)	(118.2)	(111.9)	(0.0324)	(0.0307)
Share of workers with intermediary schooling or +	-0.660***	-1.890***	-939.2***	-3,149***	0.294***	1.735***
	(0.161)	(0.0944)	(231.6)	(143.5)	(0.0634)	(0.0381)
Constant	11.26***	11.94***	17,131***	18,352***	4.760***	3.964***
	(0.0916)	(0.0690)	(132.1)	(105.9)	(0.0362)	(0.0279)
Observations	142,444	142,444	142,444	142,444	142,444	142,444
R-squared	0.002		0.001		0.009	
Number of firms	71,222	71,222	71,222	71,222	71,222	71,222

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

Appendix 5 – Parallel trends for firms with less than 50 employees in 2011 and that existed in 2010, 2011 and 2012 – selected sectors – Brazil



	2010	2011	2012
Treatment	12.72	12.11	13.40
Control	10.90	11.37	11.12

	2010	2011	2012
Treatment	20,054	19,460	20,703
Control	16,649	17,973	17,604

	2010	2011	2012
Treatment	6.95	7.41	8.22
Control	4.33	4.62	5.17

Source: MTE-RAIS, 2010, 2011, 2012

Appendix 6 – Estimates of effects of reduction in Social Security contribution on employment, hours of work and hourly wage using Fixed Effects – excluding textile sector – firms with less than 50 employees in 2011 - Brazil – 2011/12

VARIABLES	Average employment		Contracted working hours		Average hourly wage	
	(1)	(2)	(3)	(4)	(5)	(6)
Time	0.321***	0.355***	803.3***	839.8***	0.377***	0.382***
	(0.0452)	(0.0456)	(58.91)	(59.40)	(0.0137)	(0.0138)
Treatment	1.608***	1.752***	1,593***	1,748***	0.169***	0.189***
	(0.0954)	(0.0986)	(124.4)	(128.5)	(0.0289)	(0.0299)
Switch of tax regime		-0.914***		-978.3***		-0.130***
		(0.158)		(206.1)		(0.0480)
Workers with intermediary schooling or +	-1.067***	-1.066***	-1,215***	-1,213***	0.313***	0.313***
	(0.204)	(0.204)	(265.8)	(265.8)	(0.0619)	(0.0619)
Constant	11.01***	11.00***	16,581***	16,580***	5.287***	5.286***
	(0.123)	(0.123)	(160.8)	(160.7)	(0.0374)	(0.0374)
Observations	134,488	134,488	134,488	134,488	134,488	134,488
R-squared	0.009	0.009	0.010	0.010	0.019	0.019
Number of firms	67,244	67,244	67,244	67,244	67,244	67,244

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

Appendix 7 – Estimates of effects of reduction in Social Security contribution on employment, hours of work and hourly wage using Fixed Effects – selected sectors – firms with less than 50 employees in 2011 - Brazil – 2010/12

VARIABLES	Average employment		Contracted working hours		Average hourly wage	
	(1)	(2)	(3)	(4)	(5)	(6)
Time 1	-0.0669	-0.0517	320.1***	338.7***	0.425***	0.421***
	(0.0411)	(0.0412)	(55.83)	(55.91)	(0.0124)	(0.0124)
Time 2	0.331***	0.391***	1,250***	1,317***	0.793***	0.787***
	(0.0447)	(0.0454)	(60.66)	(61.60)	(0.0135)	(0.0137)
Treatment	1.073***	1.166***	671.5***	761.6***	0.244***	0.257***
	(0.0801)	(0.0821)	(108.8)	(111.4)	(0.0242)	(0.0247)
Switch of tax regime		-0.694***		-686.9***		-0.0792**
		(0.127)		(172.3)		(0.0383)
Workers with intermediary schooling or +		-0.680***		-876.5***		0.277***
		(0.129)		(175.2)		(0.0389)
Constant	10.67***	11.04***	16,071***	16,560***	4.974***	4.818***
	(0.0304)	(0.0782)	(41.21)	(106.2)	(0.00915)	(0.0236)
Observations	212,028	212,028	212,028	212,028	212,028	212,028
R-squared	0.004	0.004	0.006	0.006	0.035	0.035
Number of firms	75,981	75,981	75,981	75,981	75,981	75,981

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

Appendix 8 - Estimates of effects of reduction in Social Security contribution on employment, hours of work and hourly wage using Fixed Effects by economic sector – firms with less than 50 employees in 2011 - Brazil – 2011/12

	Dependent variable Average employment in levels			
VARIABLES	Garment	Leather and Shoes	Textile	Services
Time	0.132***	0.524***	0.249*	1.082***
	(0.0484)	(0.168)	(0.137)	(0.111)
Treatment	1.351***	4.707***	1.227***	0.816***
	(0.127)	(0.393)	(0.290)	(0.171)
Switch of tax regime	-1.042***	-2.327***	-0.0892	0.0735
	(0.183)	(0.611)	(0.493)	(0.309)
Workers with intermediary schooling or +	-0.456**	-4.809***	-0.120	0.570
	(0.210)	(0.722)	(0.570)	(0.597)
Constant	10.87***	14.25***	10.95***	8.018***
	(0.114)	(0.311)	(0.296)	(0.533)
Observations	84,700	18,668	14,984	31,120
R-squared	0.004	0.026	0.005	0.020
Number of firms	42,350	9,334	7,492	15,560

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

Appendix 8 – continuation

	Dependent variable: Contracted working hours			
VARIABLES	Garment	Leather and Shoes	Textile	Services
Time	538.3***	1,091***	541.7***	1,785***
	(65.40)	(224.3)	(157.4)	(129.2)
Treatment	949.4***	5,067***	656.6**	935.5***
	(171.3)	(523.6)	(333.5)	(200.1)
Switch of tax regime	-973.3***	-2,975***	309.9	316.9
	(246.4)	(814.1)	(567.7)	(360.4)
Workers with intermediary schooling or +	-594.1**	-5,243***	-84.15	1,008
	(284.1)	(962.5)	(656.2)	(696.8)
Constant	16,845***	20,391***	17,192***	11,708***
	(153.4)	(415.2)	(340.8)	(621.9)
Observations	84,700	18,668	14,984	31,120
R-squared	0.003	0.021	0.004	0.033
Number of firms	42,350	9,334	7,492	15,560

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

Appendix 8 – continuation

	Dependent variable: Average hourly wage			
VARIABLES	Garment	Leather and Shoes	Textile	Services
Time	0.355***	0.382***	0.382***	0.485***
	(0.0125)	(0.0164)	(0.0269)	(0.0541)
Treatment	0.0354	0.131***	0.133**	0.277***
	(0.0327)	(0.0383)	(0.0569)	(0.0838)
Switch of tax regime	-0.114**	-0.156***	0.0139	-0.00179
	(0.0471)	(0.0596)	(0.0969)	(0.151)
Workers with intermediary schooling or +	0.0937*	0.438***	0.470***	1.591***
	(0.0543)	(0.0705)	(0.112)	(0.292)
Constant	4.393***	4.374***	4.740***	7.412***
	(0.0293)	(0.0304)	(0.0581)	(0.260)
Observations	84,700	18,668	14,984	31,120
R-squared	0.023	0.081	0.045	0.016
Number of firms	42,350	9,334	7,492	15,560

Note: dependent variables in levels. Treatment is a dummy variable for firms not under the Simples regime in 2012. Switch of tax regime is a dummy = 1 if a firm shifted the tax regime from 2011 to 2012. Standard errors in parentheses - *** p<0.01, ** p<0.05, * p<0.1.

Appendix 9 - Descriptive statistics - Selected sectors – Brazil – 2011 - %

VARIABLES	CONTROL		TREATMENT	
	Mean	Std. Dev.	Mean	Std. Dev.
Average number of jobs	17.00	31.36	108.75	1,613.39
Employment in production	0.77	0.31	0.68	0.33
Average hours of work per firm	25,525	45,935	154,496	1,902,618
Average hourly wage (BR$)	4.74	2.67	7.93	9.57
Sex (male =1)	0.34	0.33	0.48	0.33
Average age	33.25	7.53	33.18	7.37
Share of employees w/ medium level of schooling	0.55	0.37	0.65	0.36
Share of employees age< 25	0.27	0.26	0.25	0.25
Share of adult male employees	0.22	0.27	0.34	0.30
REGION				
North	0.01	0.10	0.01	0.10
Northeast	0.14	0.34	0.10	0.30
Southeast	0.47	0.50	0.62	0.48
South	0.31	0.46	0.22	0.41
Centre-west	0.07	0.26	0.05	0.21
SECTOR				
Textile	0.10	0.30	0.13	0.33
Garment	0.61	0.49	0.39	0.49
Leather and shoes	0.14	0.35	0.13	0.34
Service sectors	0.15	0.36	0.36	0.48
FIRMS	62,709		21,096	
JOBS	1,066,287		2,294,230	

Source: MTE/RAIS 2011