Incidence of Social Security Contributions: Evidence from France*

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Abstract

We study the earnings responses to three large increases in employer social security contributions (SSCs) in France over the period 1976–2010. Using a difference-in-differences (DiD) estimation strategy, we find evidence of increased labour cost, i.e., the absence of full tax shifting to workers, at the individual level, within five to six years after reforms that increased SSCs with little or no tax-benefit linkage. Our DiD estimates point to limited shifting of SSCs to employees in the form of lower wages, with an estimated employer share of the tax burden between 55 percent and 88 percent. In contrast, we find evidence of full shifting of increases in employer SSCs in the case of strong and salient tax-benefit linkage. We interpret these results as providing compelling evidence that the tax-benefit linkage matters for incidence, and we discuss possible explanations for the non-standard result of long-term nominal incidence of SSCs at the individual level.

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1 Introduction

Social security contributions (SSCs) represent an important part of total tax revenues in OECD countries (on average 26 percent of total tax revenues, or 9 percent of GDP), and an even larger share in countries with extended social insurance systems (37 percent of total tax revenues in France, or 17 percent of GDP). According to the OECD definition, SSCs are "compulsory payments paid to general government that confer *entitlement* to receive a future social benefit". The tax-benefit linkage is the key element that distinguishes these contributions from other forms of labour income taxation[1].

Surprisingly, these contributions have attracted much less attention in the public finance literature than income taxes. When a large literature has been devoted to measuring behavioural responses to income taxation in the U.S., and in several other countries (see Saez, Slemrod and Giertz, 2012a, for a survey), relatively few studies have looked at SSCs. The main exception is a classic literature dedicated to assessing their incidence (Musgrave, 1959; Atkinson and Stiglitz, 1980; Kotlikoff and Summers, 1987; Fullerton and Metcalf, 2002), with little recent empirical work. The literature from the 1970s has found relatively mixed results (Brittain, 1972; Feldstein, 1972; Hamermesh, 1979; Holmlund, 1983), while studies exploiting cross-country variations in SSCs to assess their ultimate incidence have concluded to a variety of possible outcomes depending on the structure of wage bargaining (Tyrväinen, 1995; Alesina and Perotti, 1997; Daveri, Tabellini, Bentolila and Huizinga, 2000; Ooghe, Schokkaert and Flechet, 2003).

Without ignoring the identification issues raised by existing evidence from cross-country studies, the textbook view that long-term incidence should be borne by employees has relied on two main arguments. First, there is no evidence of an increase in the labour share of national income (including employer SSCs) as a result of the general increase in SSCs, suggesting that employer SSCs have been shifted, at some point, to wage earners[2]. Second, a number of more recent papers, using micro data and adequate identification strategies, have found evidence of full shifting of SSCs to employees (Gruber

[1] We use the term Social Security contributions to describe what is referred to as payroll taxes in the U.S. In a number of OECD countries, including France, there exists payroll taxes alongside SSCs, which are taxes based on earnings, but conferring no entitlement to benefits. This said, the usual OECD classification relies mostly on institutional arrangements (e.g., earmarking to Social Security), and not systematically on the degree of tax-benefit linkage.

[2] A much quoted work in that line of argument suggested full shifting to employees in the long run (OECD, 1990).

and Krueger, 1991; Gruber, 1994; Gruber, 1997; Anderson and Meyer, 1997; Anderson and Meyer, 2000).

This textbook view, however, has been challenged by a recent paper by Saez, Matsaganis and Tsakloglou (2012b). The authors take advantage of a SSC reform in Greece, whereby adjacent cohorts in the labour market were treated with markedly different SSC rates over a long period of time. Using a regression discontinuity design, the authors provide compelling evidence of full incidence of employer SSCs on employers and, symmetrically, of full incidence of employee SSCs on workers, i.e., an economic incidence matching exactly the nominal or statutory incidence.

When attempting to reconcile these apparently conflicting results, one should acknowledge that there is little sense in expecting a single and uniform incidence of SSCs, as it is likely to depend on a number of features of the SSC reform under consideration, the functioning of the labour market, and the type of estimation being carried out. First, the incidence of SSCs is bound to differ in the short run (the day after the reform) and in the long run (after wages have had time to adjust). Economic incidence is expected to coincide with legal incidence in the short run, and the interesting question is how long does it take for wages to adjust to changes in SSCs (if they adjust at all). Second, the tax-benefit linkage is likely to matter for the incidence of SSCs. It has long been recognised that the intrinsic nature of SSCs, as opposed to income taxation, is to offer benefits linked with the SSC payment (Musgrave, 1959; Summers, 1989; Gruber, 1997). This distinctive feature of SSCs is actually one of the main arguments in favour of institutional constructions of the form of social insurance, as it is assumed that SSCs have, for this reason, lower efficiency cost. If wage earners incorporate in their labour supply decision not only the net wage but also the expected benefits, behavioural responses should be smaller, and with them the deadweight loss induced by SSCs. The consequence is that SSCs with strong tax-benefit linkage are expected to be fully shifted to employees. Unfortunately, prior research provides limited or inconclusive empirical evidence to support this argument.

If one takes a closer look at the two most prominent SSC incidence studies, which find opposite incidence effects, it seems clear that their institutional design differs markedly: Gruber (1997) uses the decrease in pension SSCs in Chile during the privatization of the public pension scheme to assess the incidence of these taxes and finds convincing evidence that the decrease in SSCs led to an equivalent increase in wages, which is consistent

with full incidence of SSCs on employees. In this setting, the tax-benefit linkage was extremely salient – employees needed to fund an increase in private pension contributions –, and the shifting of the reduced employer SSCs could be easily compensated by firms in the form of wage increases. On the other hand, Saez et al. (2012b) consider a payroll tax reform in Greece whereby adjacent cohorts of workers permanently faced different employer and employee SSC rates. In this unusual setting, full incidence on employees would have required firms to pay equally productive workers differently on the sole basis of their date of entry into the labour market. As suggested by the authors, this differential treatment might have raised serious fairness issues, thereby precluding full-shifting at the individual level. Despite providing remarkably clean incidence results, the Chilean and Greek reforms have the disadvantage of lacking external validity for more common SSC reforms, which makes it hard to conclude on the role played by tax-benefit linkage in their results. What is still missing in the literature is convincing evidence from standard SSC reforms with different tax-benefit linkage, which could be credibly compared.

This paper aims to bridge this gap by estimating the incidence of employer SSCs using large SSC reforms in France over a period of thirty years, based on a long panel of administrative data. France has a particularly long list of SSCs for distinct risks, and different schemes. Several reforms have modified the SSC schedule over the past four decades, affecting each time different groups of workers, and applying to SSCs that were funding different benefits – some with very little tax-benefit linkage (for instance health care SSCs, or family benefit SSCs), others with a very strong link (e.g., complementary pension schemes). For the purpose of identifying the earnings responses to changes in SSCs, we exploit three reforms which led to large increases in SSC marginal rates above the main earnings' ceiling. Two of these reforms relate to SSCs with little tax-benefit linkage, while the third one relates to complementary pension schemes, with a strong link between contribution paid and expected benefits. Importantly, the three reforms impacted individuals at a similar position in the earnings distribution (around P70). We carry out a difference-in-differences (DiD) estimation comparing wage earners just below and just above the social security threshold (SST), before and after each reform. This approach allows us to compare changes in labour costs to changes in gross earnings, in order to assess how much of the initial increase in employer SSCs has been shifted to employees. By carrying out separate estimations for every year after the reform, we can

identify effects up to six years after each reform, and hence provide evidence of incidence in the mid to long term.

Two main results stand out from our analysis. First, we find compelling evidence of increased labour cost, i.e., the absence of full tax shifting to workers, at the individual level, within five to six years after two independent reforms. Our estimates point to very limited shifting of SSCs to employees in the form of lower wages, with an estimated employer share of the tax burden between 55 and 88 percent. Our results provide support to recent research suggesting that institutional design such as nominal incidence (the nominal split between employers and employees) is much more relevant for long-run economic incidence than was previously thought (Slemrod, 2008; Saez et al., 2012b).

Second, we find evidence of marked difference in the incidence of employer SSCs depending on the degree of tax-benefit linkage. We find evidence of full shifting of increases in employer SSCs in the case of strong and salient relationship between contributions and expected benefits, whereas the two reforms for which we find a significant employer share of SSC incidence had little or no tax-benefit linkage. This result provides support for a claim long made by the literature, but not backed by direct empirical evidence to date.

The remainder of the paper is organised as follows. Section 2 presents the standard conceptual framework for analysing the incidence of employer SSCs with or without tax-benefit linkage. Section 3 describes the institutional design of SSCs in France as well as the main reforms being studied. Section 4 describes the administrative data and the microsimulation model that we use to compute SSCs. Section 5 presents the empirical framework and the results are reported in Section 6. Section 7 discusses the results and their possible interpretation. Section 8 concludes.

2 Conceptual Framework

The conceptual framework that underlines our analysis is fairly standard. In this section, we define the different earnings concepts used in our study, sketch the economics of incidence of SSCs in the presence of tax-benefit linkage, and relate this traditional approach to the more recent literature measuring the elasticity of taxable earnings.

Earnings' concepts. It is useful to begin by clarifying the different earnings concepts that will be used throughout the analysis. We call gross wage (denoted w), the hourly

posted wage, which serves as the basis for calculating employer and employee SSCs. The term *gross* is in a sense a misnomer as it does not include SSCs nominally paid by employers, but it is the most commonly used[3]. We call labour cost (denoted z), the hourly labour cost that firms have to pay in order to employ a worker, which includes employer SSCs. The concept of labour cost is close to total compensation, which includes various fringe benefits provided by employers (health insurance, forms of leave, pension plans, etc.), but differs in the sense that non-legally binding compensation are generally not included[4]. In France, labour cost is very close to total compensation as many fringe benefits are mandatory. In the U.S., labour cost – as defined above – differs from total compensation by the amount of non-voluntary non-wage compensation, notably employer-provided health insurance or pension contributions. We denote by h the annual hours of work, and hence by wh the annual gross earnings, and by zh the annual labour cost.

Textbook view. Our empirical analysis can be related to the simple partial equilibrium model of tax incidence with tax-benefit linkage (Musgrave, 1959; Summers, 1989; Gruber, 1997). In the case where the only tax is an employer SSC of rate τ (as a function of labour cost i.e., $z(1-\tau) = w$), one can express the wage setting in the labour market by a labour supply function $S(\cdot)$ and a labour demand $D(\cdot)$, which depend on the respective price of labour. The labour supply is a function of the net wage $z(1-\tau)$ plus the expected benefit from paying SSCs. Following Gruber (1997), we denote by q the degree to which employees value employer SSCs. This parameter depends on the effective tax-benefit linkage, on how benefits are discounted, and overall on the salience of the linkage to employees. The labour supply and demand functions can thus be expressed in the following way:

$$D = D(z) \tag{1}$$

$$S = S\big(z * (1 - (1-q)\tau)\big) \tag{2}$$

In this simple setting, the incidence of employer SSCs depends on the elasticities of labour supply and labour demand, denoted by ε^S and ε^D respectively, as well as on the perceived tax-benefit linkage q. Denoting μ, the share of employer SSCs borne by

[3]This concept corresponds to gross earnings in the U.K., *salaire brut* in France and *Bruttoverdienst* in Germany, all referring to what economists sometimes call posted earnings.

[4]See for example Pierce (2001) on the U.S.

employers, we have:

$$\mu = -(1-q)\frac{\varepsilon^S}{\varepsilon^D + \varepsilon^S} \tag{3}$$

We can highlight three polar cases, depending on the relative values of labour supply and demand elasticities.

(i) If the labour demand elasticity is much larger than the labour supply elasticity ($\varepsilon^D \gg \varepsilon^S$), employer SSCs are fully shifted to employees ($\mu \approx 0$). This is the usual assumption made in the labour supply/taxation literature, where it is often assumed that ε^D is infinite, or very large, and ε^D is finite and small.

(ii) If employees value the benefits as much as the SSCs paid ($q = 1$), then irrespective of the values of labour supply and demand elasticities, the incidence of SSCs is fully on workers ($\mu \approx 0$). In that setting, the employer SSCs are not really a tax as they fund benefits that are fully valued by employees[5].

(iii) If there is no tax-benefit linkage or no perception of linkage from employees ($q = 0$), and if the labour supply elasticity is much larger than the labour demand elasticity ($\varepsilon^S \gg \varepsilon^D$), SSCs are fully incident on employers ($\mu \approx 1$), i.e., the labour cost increases by exactly the amount of employer SSCs.

The dynamics of incidence are not described by this simple framework, which implicitly assumes complete wage flexibility. In the very short term (the day after the reform), one expects the measured incidence to be close to the nominal incidence, i.e., the labour cost would increase by the amount of additional employer SSCs. Depending on the extent of labour market rigidities, wages might take time to adjust, for instance through an adjustment in nominal wage growth, or through turnover. Hence, the key empirical measure of interest for incidence is the long-run change in labour cost resulting from a change in SSCs.

Earnings vs. wages. The setting described so far fits within the traditional labour supply analysis, while the more recent literature on the elasticity of taxable income has focused on a broader measure of labour compensation to assess the deadweight loss of

[5]It is possible to imagine cases where $q > 1$ if workers' valuation of expected benefits is larger than the amount of SSCs paid, for example if the mandatory insurance solves a market problem leading to more affordable insurance.

taxation (Feldstein, 1999; Saez et al., 2012a). Taxable income elasticity allows taking into account behavioural responses in the form of other margins than physical hours of work (e.g., effort), and it does not impose observing hours of work (usually not available in administrative tax data).

In our context, we define the elasticity of taxable earnings (ETE) as earnings's responses to changes in employer SSCs ($\varepsilon_{zh|1-\tau}$). In that case h can be interpreted as all possible real behavioural margins (hours, effort, etc.) and z as the productivity per unit of effort. We can express ETE as a function of incidence ($\varepsilon_{z|1-\tau}$) and behavioural responses ($\varepsilon_{h|z(1-\tau)}$) (see Appendix A for more details):

$$\varepsilon_{zh|1-\tau} = \varepsilon_{z|1-\tau} + (\varepsilon_{z|1-\tau} + 1)\varepsilon_{h|z(1-\tau)} \tag{4}$$

Equation (4) makes clear the assumptions needed to interpret ETE as a behavioural response to taxation. The standard practice is to assume that incidence is fully on workers ($\varepsilon_{z|1-\tau} = 0$), so that ETE captures all behavioural responses ($\varepsilon_{zh|1-\tau} = \varepsilon_{h|z(1-\tau)}$). Otherwise $\varepsilon_{zh|1-\tau}$ captures a mix of incidence and behavioural responses.

As we do not observe hours for some reforms we study, we will rely on ETE to measure the incidence of increases of employer SSCs. This can be done by assuming no behavioural responses. Otherwise, we can only infer a lower bound for the share of employer SSCs borne by employers, as behavioural responses would be confused with tax shifting to employees – if income effects are dominated by substitution effects.

3 Social Security Contribution Reforms

In this section, we describe the main features of the three major SSCs reforms that we exploit in the paper. Before doing so, we provide a brief overview of the architecture of SSCs in France.

3.1 Social Security Contributions in France

SSCs are a major part of taxation in France, as they represent 37.1 percent of total tax revenues, and with 17.0 percent of GDP, French SSCs are the highest among OECD countries. The share nominally ascribed to employers is also more important in France

than in other countries, representing 11.3 percent of GDP, more than twice the OECD average of 5.2 percent.

These contributions fund a number of aspects of the French welfare system, notably health care spending, pensions, unemployment benefit, but also child benefits. There is a large number of different SSCs, one for each scheme and type of risk, for instance one for the main pension system of private sector employees, one funding child benefits, another funding unemployment insurance, etc. (see Appendix Table B.1). The different schemes differ according to the type of governance and the nature of the tax-benefit linkage. For instance, the basic pension scheme for private sector earners (*Caisse nationale d'assurance vieillesse*, CNAV) is a defined benefit pay-as-you go pension scheme managed by social security administration with clear oversight from the central government. The pension benefit has an implicit contributory link, as pensions are computed with a reference to average earnings of the best 25 years; but the scheme also includes some elements of redistribution (e.g., minimum pension guaranteed for low earners). Alongside the basic scheme, two complementary schemes, one for non-executives (*Association pour le régime de retraite complémentaire des salariés*, ARRCO) and one for executives (*Association générale des institutions de retraite des cadres*, AGIRC) are also mandatory. These complementary schemes are managed solely by employer and employee unions, and, like the basic pension, are financed on a pay-as-you go basis. These schemes, however, use a point-based system which creates a very salient tax-benefit linkage (see below). On the contrary, family SSCs fund the Family Social Security scheme (*Caisse nationale des allocations familiales*, CNAF) which offers child benefits to all French residents with children, irrespective of their actual contributions, and hence with no tax-benefit linkage.

Although French SSCs vary largely in the benefits they fund, their tax schedule follows the same structure. The tax base is gross earnings capped at different thresholds. The reference threshold, which is referred to as the Social Security threshold (SST), corresponds roughly to the mean gross earnings, and SSCs can be defined as a function of one, three, four or eight times the SST. A distinctive feature of French SSCs is that the main threshold (1 SST) is lower than in most other countries (around the 70th percentile of the earnings distribution), while there are SSCs for very high level of earnings (the highest threshold being close to the 99.95th percentile). Importantly for our empirical strategy, the SSC schedule is expressed in terms of hourly wage, i.e., the SST is adapted to the

actual hours of work and duration of the job spell. This means that marginal SSC rates are unaffected by changes in hours of work – unlike income taxation.

3.2 Three SSC Reforms

During the period covered by our study, from 1976 to 2010, a number of SSC reforms have been carried out in France. Some of the most well known of these changes are the reductions in employer SSCs around the minimum wage that were put in place in the 1990s (Kramarz and Philippon, 2001). In this paper, we focus on another set of reforms, which have attracted far less attention in the literature – we are not aware of any previous analysis. These reforms involved large increases in employer SSC rates above the SST, affecting the top three deciles of the earnings distribution. Figure 1 shows the evolution of marginal employer SSC rate for different fractions of earnings for non-executive workers[6]. While the rates of employer SSCs applied to the fraction of earnings below the SST have increased modestly (from 36 percent in 1976 to 38 percent in 2001), the rates applied to the fraction of earnings above the SST have increased dramatically over the same period (from 7 percent to 38 percent).

Reform 1. The first reform we consider is the uncapping of Health Care SSCs, which was implemented in the early 1980s. Health care SSCs are a set of contributions funding access to the French health care system. The corresponding contributions fund a public health insurance (*Assurance maladie*) which reimburses individuals covered for the health expenses incurred from both private and public health care providers. Health care SSCs can be characterised as non contributory in the sense that the level of insurance does not depend on the amount of contributions paid. There was originally a contributory link insofar as eligibility to health insurance was conditional on being covered (hence on having paid contributions in the past), but a change in the rate of SSCs did not change the amount of benefits received. At the onset of the scheme, health care SSCs took the form of large employer SSCs under the SST, and much smaller employee SSCs. In the early 1980s, employer health SSCs were "uncapped" in two stages, i.e., became applicable to the full earnings instead of only the fraction of earnings below the cap. In November 1981, marginal employer SSCs on full earnings rose from 4.5 percent to

[6]Given that reform 3 concerns only non-executives, we focus on this group of workers. The rates are slightly different for executives, as they are affiliated to another complementary pension scheme.

8.0 percent (+3.5 percentage points), while remaining at 13.45 percent for earnings below the SST. In January 1984, marginal employer SSCs were further increased to 12.6 percent (+4.5 percentage points), while being decreased to the same level for the fraction of earnings below the threshold (−0.85 percentage points)[7]. The first panel in Table 1 presents the total changes in employer and employee SSC rates that were brought about by the uncapping of health care SSCs between the last pre-reform year and the first post-reform year. The reform was decided unilaterally by the French government – without the support of employer or employee unions – and was part of a larger package of health care reforms aimed at balancing the budget of the public insurance scheme[8].

Reform 2. The second reform considered in this study is the uncapping of family SSCs. These SSCs do not fund a social insurance scheme, but universal child benefits. All families with children are entitled to these benefits, irrespective of their employment status, with no link between contributions and benefits. From the onset of the scheme, family SSCs have only taken the form of employer SSCs capped at the SST. Over two years, in 1989 and 1990, these SSCs were uncapped[9], the marginal rate below the ceiling dropping from 9 percent to 7 percent and the rate above the SST jumping from 0 percent to 7 percent (see Table 1, Panel B). Similarly to the first reform, the uncappping of family SSCs was decided by the French government with no involvement of employer and employee unions.

Reform 3. Our third reform of interest is the increase in pension SSCs for the complementary pension schemes ARRCO, which covers non-executives private sector workers. Complementary pensions in France are private pension schemes, managed by employer and employee unions, without oversight from the Government or Parliament – the government's only role is to make these SSCs mandatory. Rates and benefits are determined by unions' representatives. These schemes cover earnings below and above the SST and work as unfunded defined contribution point-based systems. Wage earners pay contributions (both employer and employee SSCs) which are converted from euros into points using a shadow price $p_{b,t}$ (the value in euros to buy a point). Points are accumulated

[7]Legal references are the Decree 81-1013 of 13/11/1981, and the Decree 83-1198 of 30/12/1983.

[8]One of the rationale for uncapping health care SSCs were employment concerns for low wage earners. In the French daily newspaper *Le Monde*, dated 12/11/1981, the minister of health N. Questiaux is quoted as saying: "The decision to increase SSCs only above the threshold has been motivated by our desire to spare firms with large number of employees".

[9]Legal references are the Decree 90-5 of 02/01/1990 and Decree 89-48 of 27/01/1989.

during the entire career, before being converted into annuity pensions at retirement (R) using another shadow price $p_{s,R}$. Hence, pension at retirement P_R can be expressed as a function of past SSC contributions $\tau_t \cdot wh_t$ (see Legros, 2006, for a detailed presentation):

$$P_R = \sum_{t=t_0}^{R-1} \frac{\tau_t \cdot wh_t}{p_{b,t}} \times p_{s,R}$$

The complementary scheme ARRCO offers both a complementary pension below the SST, and a supplementary pension for earnings above the SST and up to three times the SST. In 1996, a major reform was decided by the employer and employee unions managing the ARRCO scheme[10]. It stated that ARRCO's implicit rate of return would progressively decline in order to balance the scheme in the light of increased life expectancy, and, additionally, the agreement planed a steep increase in pension contribution rates above the SST, from 4.5 percent in 1999 to 12.0 percent in 2005 for employer SSCs, and from 3.0 percent to 8.0 percent for employee SSCs (see Table 1, Panel C). For firms created from 1997 onwards, the rate increase was planed to be phased in more rapidly, to reach a target of 12 percent as soon as 2000[11].

With the formula for pension benefits highlighted above, the increase in rates decided in period R above the threshold led, for the affected workers, to an increase in the expected pension level directly proportional to the change in rates since the reform, $\Delta\tau$:

$$\Delta P_R = \left(\sum_{t=t_0}^{R-1} \frac{wh_t}{p_{b,t}} \times p_{s,R} \right) \Delta\tau$$

In summary, the three SSC reforms described in this section all increased SSCs above the SST, but differ in their timing and their tax-benefit linkage. The first two reforms affected only employer SSCs and did not lead to proportional changes in benefits; by contrast, the third reform affected both employee and employer SSCs and increased the level of expected pension benefits for the workers concerned. Additionally, the decisions to increase SSCs were made by the government for the first two reforms, while for the last reform, the changes were decided jointly by employer and employee unions without government intervention.

[10]The reform is formalised by the ARRCO agreement from 24th April 1996.

[11]In 1998, the French government decided to implement the "35-hours week" for all firms. The law was gradually implemented between 1998 and 2000 with financial incentives for early adopters of the new regulation. Importantly for our empirical strategy, all non-executive employees, control or treated, are affected similarly by this reform – even if the timing of the reform could vary across firms.

4 Data

4.1 The DADS Panel Dataset

Our primary source of data comes from the matched employer-employee panel DADS (*Déclaration Annuelle de Données Sociales*), which was constructed by the French National Institute for Statistics (INSEE) from the compulsory declarations made annually by all employers for each of their employees. The main purpose of these declarations is to provide the different social security schemes with the earnings information necessary to determine the workers' eligibility to benefits and to compute their levels, notably for pension schemes. The French national statistics office, INSEE, transforms the raw DADS data into user files available to researchers under restricted access[12]. The panel version of the DADS consists of a 1/25 sample of private sector employees, born in October of even-numbered years, from 1976 onwards. In 2002, the sample size was doubled to represent 1/12 of all private sector workers. The data includes roughly 1.1 million workers each year between 1976 and 2001, and 2.2 million workers from 2002 onwards. Unfortunately, some years of the original data sources were lost (1981, 1983 and 1990) and are therefore missing in the panel data.

The DADS Panel provides information about the firm (identifier, sector, size) and each job spell (start and end date, earnings, occupation, part-time/full-time). Importantly for our study, the raw data about earnings come under the form of "net taxable earnings", i.e., earnings reported for income tax. This definition of earnings is net of social security contributions, but not net of flat rate contributions not deductible for the income tax, namely the *Contribution sociale généralisée* (CSG) and the *Contribution au remboursement de la dette sociale* (CRDS). From 1993 onwards, additional variables are available in the panel: hours of work, CSG tax base and net earnings[13].

[12]We were granted access to the DADS data by the decisions of the *Comité du secret statistique* ME27 of 02/10/2013, ME56 of 25/06/2014 and ME91 of 25/06/2015.

[13]The CSG tax base is a slightly larger base than gross earnings taxable for SSCs. It includes remunerations in the form of stock options, or profit-sharing plans, which are not included in the SSC tax base. Before 1993, INSEE provides an estimate of gross earnings on the basis of the reported net taxable earnings, but gross earnings for SSC purpose is not available in the data released by Insee. Net earnings correspond to net earnings effectively paid by firms to employees, i.e., after deduction of some specific employee contributions to restaurant vouchers or public transport passes, but before payment of the income tax.

4.2 Microsimulation of SSCs

Microsimulation techniques are required to compute the labour cost based on the information available in the DADS Panel data. The present work relies on the use of the TAXIPP model which is developed at the Institut des politiques publiques (IPP), and in particular on the social security contribution module. The model takes as input the SSC schedule, as collected in the IPP Tax and Benefit Tables[14], and computes employee and employer SSCs, reductions in employer SSCs, flat-rate income tax (CSG and CRDS) as well as other payroll taxes. The model simulates the complexity of French SSCs in great detail, including for instance local social security schemes such as the one in place in the Alsace-Moselle region[15].

The main challenge in computing SSCs from the DADS Panel comes from the missing information in the raw data. Two main issues must be noted. First, because the only earnings measure available throughout the period under study is net taxable earnings, we need to compute gross earnings and labour cost using the microsimulation model. Second, SSCs are defined as a function of hourly wage when working part-time (the SST is defined for each period of work and adjusted for hours worked). Since we do not observe hours in the DADS data before 1993, the SSCs for part-time workers cannot be computed precisely before 1993.

5 Empirical Approach

We take advantage of the different SSC reforms described in Section 3 to identify the earnings responses to changes in SSC rates. For all reforms, the year-to-year shifts in the total amount of SSCs vary with base year earnings according to a well-defined schedule: they are null below the SST and increase linearly above it (see Figure 2).

The most straightforward way of estimating earnings responses to changes in SSCs rates is to compare, before and after the reforms, individuals with earnings *above* the SST in the last pre-reform year (treatment group) to individuals with earnings *below* the cap (control group). The validity of this difference-in-differences (DiD) approach relies on the

[14] See http://www.ipp.eu/en/tools/ipp-tax-and-benefit-tables/social-security-contributions/.

[15] A number of simplifications have nevertheless been made: local authority variations in the public transport payroll tax (*Versement transport*) were not perfectly simulated but rather approximated by size of the firm's locality, nor were the specific reductions in SSCs that are granted to firms operating in a small number of disadvantaged areas.

assumption that the average earnings of treatment and control group workers would have followed parallel trends, absent the reform.

5.1 Sample Restrictions

We construct separate unbalanced panels of workers for each of the reforms being studied. Each sample includes all workers who are observed in employment in the reference year (i.e., in last available pre-reform year) and follows these workers throughout a period which starts four years before the reform and ends eight to nine years after. These time windows were chosen to avoid contaminating the estimated earnings responses to a particular reform with the effects of other reforms. The time periods used in the analysis are (i) 1977–1988 for Reform 1 (uncapping of health care SSCs in 1981 and 1983); (ii) 1985–1997 for Reform 2 (uncapping of family SSCs in 1989 and 1990); and (iii) 1996–2008 for Reform 3 (Arrco reform of 2000–2005).

The only restrictions we impose for selecting workers in the reference year are to be employed during the entire year, to work full-time, and to be a non-executive, i.e., affiliated with the Arrco pension scheme. The working time restrictions are necessary as we do not observe hours of work before 1993, and hence are not able to compute SSCs without error for part-time workers. The reason for restricting the sample to non-executives is that executives, being affiliated with a different complementary pension schemes (Agirc scheme), experienced different SSCs changes during the period, which could confuse the impact of our reform of interest. For the third reform, we also restrict our sample to firms that were created before 1997, as the timing of the increase in SSC rates was different for new firms.

In each of the panels, workers are assigned to the treatment and control groups based on their level of gross earnings relative to the SST in the reference year. Individuals with earnings just below the SST are assigned to the control group, whereas individuals with earnings just above are assigned to the treatment group.

The main tradeoff in selecting the treatment group is that while expanding this group's upper earnings threshold mechanically inflates the reform-induced variation in average SSC rates, it also increases the likelihood of dissimilar earnings trends between the treated and controls. For our baseline analysis, we assign to the treatment group individuals whose gross earnings in the reference year were 1 to 1.4 times the SST in that year, i.e., between

P65 and P85 of the earnings distribution. We assign to the control group individuals in a smaller range of gross earnings in the base year, between 0.8 and 1 times the SST, i.e., between P56 and P65 of the earnings distribution. This range is large enough to construct a control group of significant sample size, and going further down the earnings distribution would entail the risk of including workers whose earnings were affected by the diffusion effects of increases in the national minimum wage. We provide in the appendix robustness checks based on alternative selections of treatment groups.

Table 2 presents summary statistics of the treatment and control groups for each reform design. By construction, workers in the treatment groups have higher earnings. They are also slightly older, and more likely to be male. As the SST has increased at a faster rate than median earnings, the percentile rank of the treated vs. control groups are slightly higher up in the earnings distribution when we consider the most recent reform[16].

5.2 Baseline Specification

Our main specification measures the impact of increased SSCs on labour cost based on model which is estimated using two-stage least squares (2SLS). Following Autor (2003), we adopt the following dynamic DiD specification to estimate the reduced-form equations for each of the three SSCs reforms:

$$\log(1-\tau_{i,t}) = \theta_i + \theta_t + \sum_{k=-m}^{q} \beta_k (T_i \times \mathbb{1}\{t = t_0 + k\}) + \varepsilon_{i,t} \quad (5)$$

$$\log(z_{i,t}) = \eta_i + \eta_t + \sum_{k=-m}^{q} \gamma_k (T_i \times \mathbb{1}\{t = t_0 + k\}) + \nu_{i,t} \quad (6)$$

The first-stage equation (5) regresses the log of the net-of-SSC average rate $\log(1-\tau_{i,t})$ of individual i in year t on individual fixed effects θ_i, year fixed effects θ_t, and the interactions between year dummies, which include m pre-reform years and q post-reform years, and the treatment group dummy T_i, which takes the value one if worker i's earnings are between 1 and 1.4 times the SST in the reference year, and zero otherwise. The interaction term coefficients γ_k are normalised to be equal to zero in the pre-reform year (denoted t_0), i.e., $\gamma_0 = 0$. Equation (6) regresses the log of the labour cost $\log(z_{i,t})$ on the

[16] Workers in the treatment group for the third reform are between P70 and P87, compared to a range of P65–P85 for the first reform.

same set of variables.

From these equations, we obtain the reduced-form estimates of the reform's impact on SSC rates (β_k) and labour cost (γ_k) after k years. The coefficients γ_k measure the post-reform log-differences in earnings between treated and control workers in year k, relatively to the reference year. Assuming that the earnings trends would have remained parallel for years $k \geq 1$ in the absence of reform, one can interpret the coefficient γ_k for $k \geq 1$ as "treatment effects" for each year $k \geq 1$, i.e., the reform's impact on labour cost after k years.

The employer share of the incidence of changes in SSC rates after k years, denoted μ_k, can then be recovered by estimating the following equation using 2SLS:

$$\log(z_{i,t}) = \phi_i + \phi_t + \mu_k \cdot \log(1 - \tau_{i,t}) + \sum_{\substack{l=-m \\ l \neq k}}^{q} \delta_l (T_i \times \mathbb{1}\{t = t_0 + l\}) + \lambda_{i,t} \tag{7}$$

where the interaction term $T_i \times \mathbb{1}\{t = t_0 + k\}$ is used as an instrument for $\log(1 - \tau_{i,t})$. By construction, the estimated incidence after k years is equal to the ratio of the reform's reduced-form impact on the labour cost to its reduced-form impact on SSC rates, i.e., $\hat{\mu}_k = \hat{\gamma}_k / \hat{\beta}_k$. To account for serial correlation in individual earnings, we cluster the standard errors at the individual level.

5.3 Controlling for Pre-Reform Trends

The model's key identifying assumption is that absent the SSC reforms, the average earnings of the treatment and control groups would have followed parallel trends. In light of the general pattern of rising earnings inequality during the period, this may seem an unreasonable assumption (see for instance Bozio, Breda and Guillot, 2016). This concern, however, is mitigated by the fact that our identification strategy uses relatively narrow earnings ranges around the threshold and that the parallel trends assumption can be tested for the pre-reform periods.

To relax the common trend assumption, we adopt an alternative specification which augments the previous model by including individual-specific linear time trends $\theta_i \cdot t$. These individual trends are fitted using up to five years of pre-reform data[17].

[17]The models including individual-specific linear trends were estimated using Sergio Correia's REGHDFE Stata package (Correia, 2014), which implements the estimator of Correia (2016).

6 Results

We present below the main summary of our results, which are based on the empirical approach described in the previous section. Before commenting the estimates from the regression specification, we provide graphical evidence of the earnings responses to the reforms.

6.1 Graphical Evidence

The earnings responses to the SSC reforms are graphically represented in Figures 3 to 6. For each of the three reforms, the figures compare the evolution of average gross earnings (upper panel) and average labour cost (lower panel) between the treatment and control groups around the reform years. All earnings measures are normalized to 100 in the reference year, i.e., the year immediately preceding the start of the reform[18] (denoted by a vertical red line). The vertical dotted lines denote the reforms' start and end years.

First, as a check for the common trend assumption underlying our estimation strategy, we compare the pre-reform trends among the treatment and control groups. Reassuringly, the visual inspection of the graphs suggest that those trends are well aligned for the control and treated groups in all three cases[19].

When considering the first two uncapping reforms (Figures 3 and 4), one observes that the treatment and control groups have a very similar evolution of gross earnings while labour costs diverge markedly immediately after the reforms. In the case of the first reform, treated workers exhibit a slightly lower gross earnings growth, while the difference between the two groups is barely noticeable in the case of the second reform. We are able to follow the evolution of earnings up to four years after reform 1 (and up to six years for reform 2), and we do not find evidence of full convergence in terms of labour cost.

Figure 5 shows similar graphical evidence for the third reform, but looking at gross wage and hourly labour cost since hours of work are available for that period. In contrast with the two other reforms, we find here clear evidence of lower gross wage growth for workers affected by the increased in SSCs, whereas their labour cost is slightly higher during the phasing-in of the reform but converges quickly to that of the control group. To

[18] For reforms 1 and 2, the reference year is two years before the reform as data is not available for 1981 and for 1990.

[19] A slight divergence is noticeable for gross earnings in reform 2, but not for the labour cost.

rule out the possibility that this pattern could be due to the fact that we are comparing wage rates rather than earnings, we present in Figure 6 the same graphs using earnings measures (as for the other two reforms). The patterns are very similar.

These figures provide compelling graphical evidence of different effects of SSCs on wages in these three settings. We proceed in the next subsection to the estimation of the incidence.

6.2 Estimation Results

We now present the results from the dynamic DiD regressions, which we carried out separately for each reform.

For the first reform, i.e., the uncapping of health care SSCs, the regression results based on the first specification (without individual-specific trends) are shown graphically in Figures 7 and 8, and the corresponding coefficients are reported in the first column of Table 3 (Panel A). The results suggest that after the reform, the increase in employer SSCs led to an increase in labour cost and to a small decrease in gross earnings. Four years after the end of the reform, the impact on the labour cost is still positive and statistically different from zero. We thus find evidence of partial shifting, as net earnings appear to have declined after the reform. The 2SLS estimates yield a statistically significant point estimate of the share of SSCs borne by employers four years after the end of the reform, of 56 percent, with a relatively large standard error (0.14). Results from the second specification (which controls for individual-specific trends) are shown graphically in Figure 13.a, and in Panel B of Table 3. They suggest a lower level of shifting, with an estimated share of SSCs borne by employers of 87 percent.

Evidence for the second reform, i.e., the uncapping of family SSCs, is provided in Figures 9, 10 and 13, with the corresponding coefficients reported in column 2 of Table 3. The results are qualitatively similar those obtained for the first reform – an increase in labour cost and less than partial shifting six years after the reform. The 2SLS estimates yield a point estimate of the share of SSCs born by employers six years after the end of the reform of 55 percent in the first specification (Panel A), and of 69 percent when one controls for individual-specific trends (Panel B). Again, standard errors are large, but we can reject full shifting of employer SSCs to workers.

Evidence for the third reform, i.e., the increase in pension SSCs between 2000 and

2005, is shown in Figures 11, 12 and 13, with the corresponding coefficients reported in columns 3 and 4 of Table 3. We present both the estimates using annual labour cost and hourly labour cost as the dependent variable. Since the reform was very gradual, we need to look at $t_0 + 6$ to see it fully in place. The results are here markedly different from those found for the two previous reforms: gross wages decline progressively as the reform is phased in and, conversely, after a couple years of increase, labour costs decline to revert to their pre-reform level. After the reform has been completed, wages of treated and control individuals grow at the same rate. The point estimates of the share of SSCs borne by employers are not statistically different from zero in all specifications: they are slightly negative without controlling for trends and slightly positive when controlling for individual specific trends, respectively -0.08 and 0.25. This suggest that the increases in pension SSCs that were brought about by the third reform were relatively quickly shifted to employees. The results are qualitatively similar when considering gross earnings and labor cost instead of hourly wage and hourly labor cost.

In a nutshell, we find evidence of increased labour cost and of a large employer share of incidence for the first two reforms, while the third reform exhibits quick and full shifting to employees. Our estimates cannot reject the null hypothesis of an equal employer share of incidence in the case of the first two reforms after six years ($t_0 + 8$), but they do reject this hypothesis when we compare the third reform to either reform 1 or reform 2. We obtain therefore markedly different results for our three reform settings.

6.3 Behavioural Responses at Extensive and Intensive margins

We provide two empirical estimates of potential behavioural responses to these SSCs increases: at the extensive margins for all reforms, and at the intensive margin for the third reform – the only one for which we have hours of work reported in the data.

First, we compute for our treatment and control groups the probability of entering and exiting full-time employment at each date. We lose a number of data points, as we need information on consecutive years of the panel to compute these transition probabilities – missing years of data in 1981 and 1983 explain why we have four missing years for reform 1. We use the same specification for testing the impact of the reforms, and present the results in Table 4. In Panel A, we estimate the impact of the reform on the probability of entering employment for the treatment group (compared to the control group). For

reforms 1 and 2, the estimates are mostly non significantly different from zero; three coefficients are negative and statistically significant. For the third reform, we find no evidence of any effect on the probability of entering employment. In Panel B, we report each reform's estimated effect on the probability of exiting full-time employment. Again, the estimates vary from one year to the next: for reforms 1 and 2, we find small negative coefficients, and very small positive estimates for reform 3. These results provide weak evidence of possible employment impacts of the increases in SSCs – mostly negative for reforms 1 and 2, and small for reform 3 – but we might not detect the full effects due to lack of data shortly after the SSC increases (for reforms 1 and 2).

Additionally, we report in Figure 14 the estimated impact of the third reform on hours worked. We find slightly positive effects during the phasing-in period, but no statistically significant impact after the reform. These results suggests that the behavioural responses that might be confused with the incidence effect are likely to be small, at least when considering the hours-of-work margin.

6.4 Robustness Checks

To assess the robustness of our findings, we conducted two series of tests.

First, a placebo test is necessary to check whether underlying inequality trends during our period of interest could disqualify the common trend assumption. To conduct this placebo test, we need to focus on periods when no SSC reforms were carried out. Visual inspection of Figure 1 reveals that the only reform-free period of sufficient time length is between 1992 and 1999, i.e., the time interval between reforms 2 and 3. We run a placebo test of a potential reform in 1996, and define our control and treatment groups in the placebo reference year 1995. The graphical evidence in Figure 15 and the reduced-form estimates in Figure 16 show no evidence of differential earnings trends between the treatment and control groups. Moreover, the reduced-form estimates point to zero effects on gross earnings or labour cost.

Second, we carry out variants of the main estimations by specifying two alternative treatment groups: one closer to the threshold (between 1 and 1.2 times the SST), which has the advantage of being closer to the control group, but the disadvantage of being impacted by a much smaller first-stage change in average SSC rates; another one further away from the threshold (between 1.2 and 1.4 times the SST), which comes with a larger

first stage but is further away from the control group. The incidence estimates are reported for both subgroups in Appendix Tables B2 and B3. The results are qualitatively similar to the main estimates: the employer share of incidence is large for the first two reforms (most estimates lie between 70 percent and 100 percent), whereas the estimates based on the third reform are not significantly different from zero[20].

7 Interpretation and Discussion

This section discusses the interpretation of our results with respect to three issues: whether the earnings' responses we measure truly capture incidence effects (section 7.1); how much our results for the first two reforms challenge conventional wisdom on the incidence of SSCs (section 7.2); and, finally, what is the most credible interpretation for the different result we obtain for the third reform (section 7.3).

7.1 Behavioral Responses vs. Incidence

Incidence is traditionally understood as the change in the wage rate, as opposed to behavioural responses which are captured by changes in hours worked. Our empirical strategy to estimate the employer share of incidence raises two potential concerns : (i) for two of the reforms under study, we only observe earnings; and (ii) changes in the wage rate could reflect behavioural responses through other margins than hours worked.

As we do not observe hours of work before 1993, we can only measure total earnings responses to changes in SSCs for reforms 1 and 2. Our estimates thus capture both changes in hours and changes in the wage rate induced by the increase in employer SSCs (cf. discussion in section 2). Two arguments lead us nonetheless to interpret our estimates for these reforms as incidence effects. First, in our empirical analysis, we only use wage earners working full-time and during the entire year. This is likely to mitigate the behavioural responses that may be captured by our estimates (e.g., switching from full-time to part-time). Second, an increase in SSCs should lead to a reduction in hours of work (if substitution effects dominate income effects), and hence to a reduction in to-

[20]Slight differences are observed in Appendix Table B2 when the treatment group is restricted to individuals very close to the threshold: in Panel A, column 1 for the first reform, the estimate is not significantly different from zero. Note, however, that the 2SLS estimates in that specification are based on a weak first stage – the average SSC rate increase remains limited in the immediate vicinity of the threshold.

tal earnings. As a result, behavioural responses would tend to bias our analysis towards finding incidence on employees, since we would be confounding hours response with incidence effects, and therefore to underestimate the employer share of incidence. Given that our estimates for the first two reforms yield a relatively high share of SSCs borne by employers, behavioural responses cannot credibly explain our results – unless income effects are particularly strong.

The above concern does not apply to the third reform, since we observe both hours of work and earnings, and are therefore able to estimate incidence effects using only the wage rate variable. One could still argue that other margins of behavioural responses might be at play, such as adjustments in unobserved effort. This would be in line with the literature on taxable earnings (Saez et al., 2012a), which makes a case for using earnings responses rather than working hours to capture all behavioural margins. In our setting, as we find full shifting of SSC increases for the third reform, there is no way to distinguish incidence effects from behavioural responses in the form of lower effort at work. We have seen that looking at hours of work, we find no evidence of behavioural responses along this margin. Although we cannot completely rule out the existence of behavioural responses along other margins, it seems unlikely that the observed full shifting of employer SSCs could be entirely driven by an adjustment in effort provision.

7.2 Do Employers Bear a Large Share of Employer SSCs?

If one accepts the incidence results presented above, one needs to come up with an interpretation for what could appear potentially at odds with our current knowledge of incidence effects. The most common view on the incidence of employer SSCs is that they should be borne by employees in the long run. Yet our study provides evidence of long-term (up to six years after the end of the phasing-in of the reform) incidence on employers in the case of the first two reforms.

These results are in line with those of Saez et al. (2012b) using Greek data, albeit in the case of more standard SSC reforms – the Greek reform based on differentiated SSC schedule by date of birth is relatively unusual. In the standard theoretical framework outlined in Section 2, a high employer share of employer SSC incidence would be observed in the long run only if labour demand elasticities (ε^D) are lower than labour supply elasticities (ε^S). In our setting, small labour demand elasticities combined with small

labour supply elasticities are a possible explanation for our results. For instance, in a recent meta-analysis of labour demand elasticities, Lichter, Peichl and Siegloch (2015) find that continental European countries like Germany and France exhibit relatively small labour demand elasticities, around 0.2–0.3, which is in the order of magnitude of the labour supply elasticities that have been found in the literature (Blundell and MaCurdy, 1999). Within the standard conceptual framework, and in the case of no tax-benefit linkage, similar labour demand and supply elasticities would yield incidence estimates of approximately 0.5. The estimated employer share of incidence that we find in our empirical analysis, between 0.55 and 0.88, would be consistent with a labour supply of similar size, or slightly larger, than the labour demand elasticity.

Else, one could reject the validity of the standard model at the individual level, i.e., that firms are able to shift any change in tax schedule on the individuals directly affected. For instance, fairness models might be better suited to explain why firms prefer not to shift changes in taxation to employees to avoid what could appear as unfair treatment (Saez et al., 2012b). A supplementary explanation could be bargaining norms, as pay negotiation is based on posted earnings, often carried out at the firm level, with little possibility for differentiated pay increases apart individual-specific promotions.

Importantly, the rejection of the standard model at the individual level does not imply its rejection at the firm or market level. Our results do not rule out the possibility that the incidence of SSCs falls entirely on employees in the long run through firm level adjustments. For instance, if firms do shift SSC increases through lower wage growth for *all employees*, whether or not their individual SSC rates are subject to these increases, we would measure full shifting on employers, while at firm level, employees would have borne all the tax increase. This would imply fairly different redistribution effects of changes in employer SSCs.

7.3 Does Tax-Benefit Linkage Matter for Incidence?

Our second major result is that we find evidence of a quick and full incidence of employer SSCs in the case of the third reform. How can we explain this stark contrast to the first two reforms?

A first option would be to assert that labour supply and demand elasticities have changed over time. The first reforms were carried out in the 1980s, at a time when labour

unions were stronger, the French economy less open, and under a socialist government with a policy agenda including nationalisations and higher taxes on firms. In the 1990s and 2000s, the economy became more opened to international trade, trade unions' influence had declined and the labour share of national income had also fallen. Since our reforms took place at different points in time, this interpretation is hard to test. Nonetheless, it does not seem particularly convincing. One of the main differences between the two periods is the level of inflation (very high in the 1980s, low in the 1990s and 2000s) which should have made it relatively easy for firms to shift the SSC increases induced by the first two reforms. If anything, the observed decline in the gross wages of workers affected by the third reform was harder to achieve given the lower inflation level that then prevailed.

A second interpretation would be to stress the difference in the decision processes between the two reforms. The uncapping of heatlh care SSCs (reform 1) and of family SSCs (reform 2) was unilaterally decided by the government, without involving employer and employee unions. By contrast, the increase in contribution pension SSCs (reform 3) was decided through collective bargaining between employer and employee unions, with the aim of balancing the complementary pension schemes without the possibility of borrowing. The government had no play in the resulting decision. A weakness of this interpretation, however, is that if the bargaining process could lead to a different incidence, it is not clear why trade unions, having negotiated over the level of employer contributions vs. employee contributions, would be more willing to accept a lower wage growth as a result of the reform.

A third interpretation, our preferred one, is that the tax-benefit linkage is the key explanation for the quick full-shifting we observe. The complementary pension reform implied a number of changes that were then considered as detrimental to employees, such as a lower rate of return on contributions, but the increase in SSCs above the threshold was perceived as an increase in pension rights for those affected – it was part of the demand of trade-unions in the negotiation. We lack survey evidence of the individuals' perception of the reform, and of the tax-benefit linkage, but anecdotal evidence from media reports suggests that this aspect of the reform was clearly understood. For instance, in an article from the daily newspaper *Le Monde*, it is stated that "the agreement also entails that wage earners whose wage is above the Social Security threshold would be able to constitute themselves a better pension: the contribution rate will be raised to 16 percent by 2005 for

workers of existing firms, and as soon as 2000 for firms created after January 1st 1997"[21]. As was mentioned earlier, there was no tax-benefit linkage whatsoever in the case of the first two reforms, while for the third one, the linkage was strong, at the individual level, and particularly salient for employees.

This result does not provide a test for the alternative modeling of taxation: both the standard model with tax-benefit linkage and the fairness model predict that tax-benefit linkage should lead to full shifting to employees. In the standard model, as employees understand the value of the benefit, the tax change is completely counter-balanced by the benefit change. In the fairness model, as both employees and employers understand that the SSCs change results in higher pension benefit, fairness facilitates the acceptance of shifting of employer SSCs. But these results could make sense of the contradicting results from the Chilean pension reform (Gruber, 1997) and the Greek SSC reform (Saez et al., 2012).

8 Conclusion

Using a difference-in-differences framework, we study three major SSC reforms in France over the last thirty years, all leading to marked increases in employer SSCs for wage earners above the Social Security threshold, i.e., around the percentile P70 of the earnings distribution.

Two main results come out from our analysis. First, we find compelling evidence of increased labour cost, i.e., the absence of full tax shifting to workers, at the individual level, within five to six years after two independent reforms. Our estimates point to very limited shifting of SSCs to employees in the form of lower wages, with a estimated employer share of the tax burden between 55 and 88 percent. This non-standard result could be consistent with evidence suggesting that labour demand and labour supply elasticities are small in a country like France, or that fairness considerations matter for the long-run incidence. Our results cannot rule out that employer SSCs are ultimately shifted to employees at the firm level, i.e., by lowering all wages, or that incidence at the individual level could take longer than the six post-reform years that we are able to analyse. They nonetheless provide support to recent research suggesting that institutional design such

[21] Jean-Michel Bezat, "La baisse des retraites complémentaires est programmée", *Le Monde*, 27 April 1996.

as legal incidence, i.e., who should remit the tax, is likely to matter a lot more than what was thought previously.

Second, we find evidence of marked difference in the incidence of employer SSCs depending on the degree of tax-benefit linkage. We find evidence of full shifting to employees of increases in employer SSCs in the case of strong and salient tax-benefit linkage, whereas the two reforms for which we find a significant employer share of SSC incidence had little or no tax-benefit linkage. This result provides support to a claim long made by the literature, but with little empirical evidence to date.

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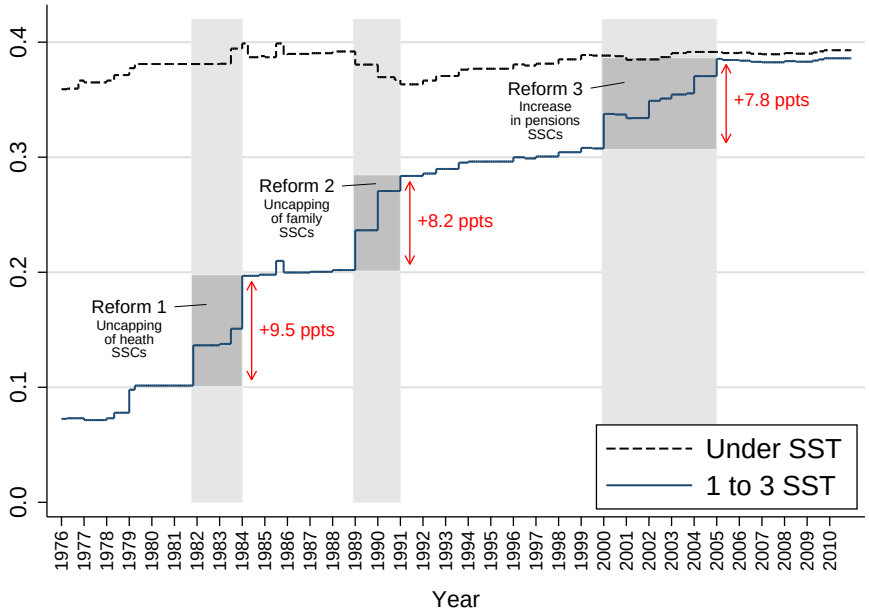
Figure 1: Marginal Employer SSC Rates, Private Sector (1976–2010)



Notes: Marginal tax rates are here expressed as a percentage of gross earnings, as they are legislated. These rates are applied to different fraction of earnings, defined with respect to the Social Security threshold (SST). The rates presented here apply to non-executives workers, i.e., workers affiliated to the Arrco pension scheme.
Sources: Institut des Politiques Publiques (2016); TAXIPP 0.4.

Figure 2: Empirical Strategy

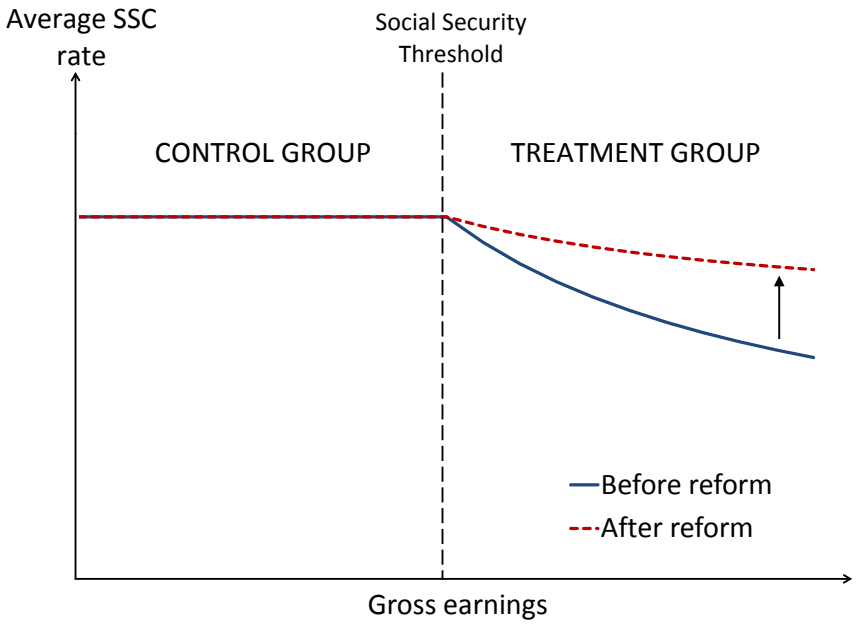
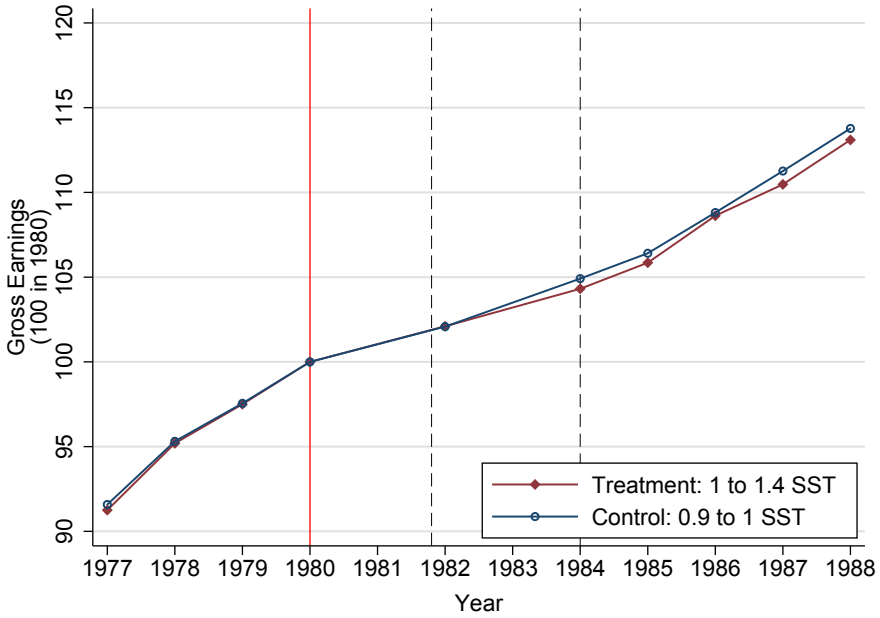
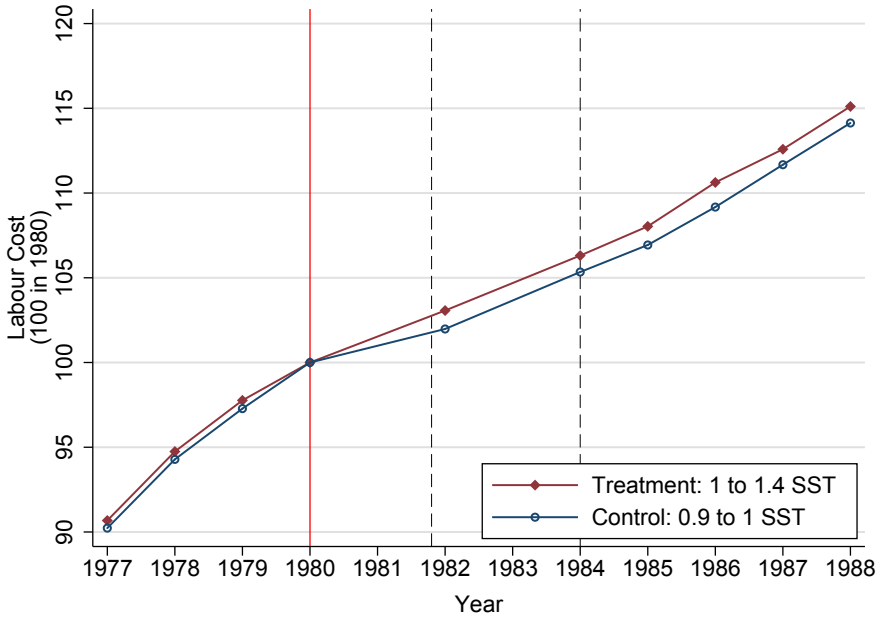


Figure 3: Earnings Responses to the Uncapping of Health Care SSCs (Reform 1)

(a) Gross Earnings (wh)



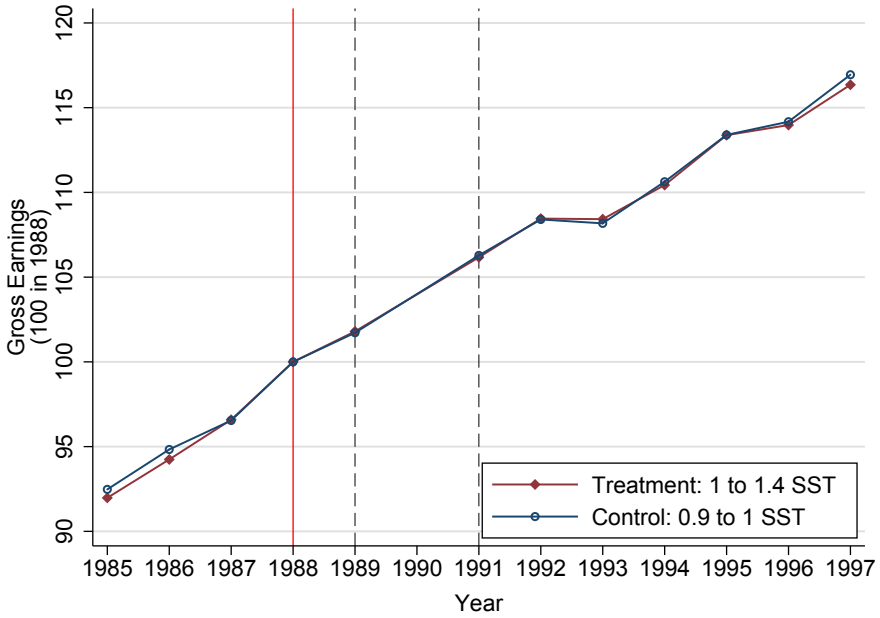
(b) Labour Cost (zh)



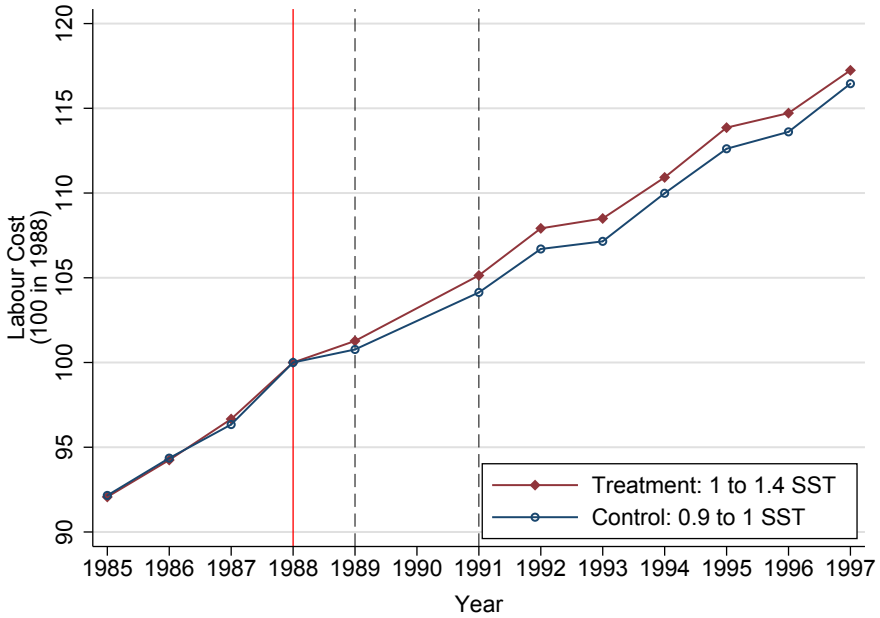
Notes: The figure shows the evolution of average real gross earnings (a) and average real labour cost (b) between 1977 and 1988 for groups that were affected differently by the uncapping of health care SSCs in 1981 and 1983. The figure is based on an unbalanced panel of individuals who are observed in the last pre-reform year (denoted by a vertical red line) and at least another year. The vertical dashed lines denote the reform years (start and end). Earnings levels are normalized to 100 in all groups in the reference year (1980). The treatment group includes individuals whose gross earnings in 1980 were 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross earnings in 1980 were 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 4: Earnings Responses to the Uncapping of Family SSCs (Reform 2)

(a) Gross Earnings (wh)



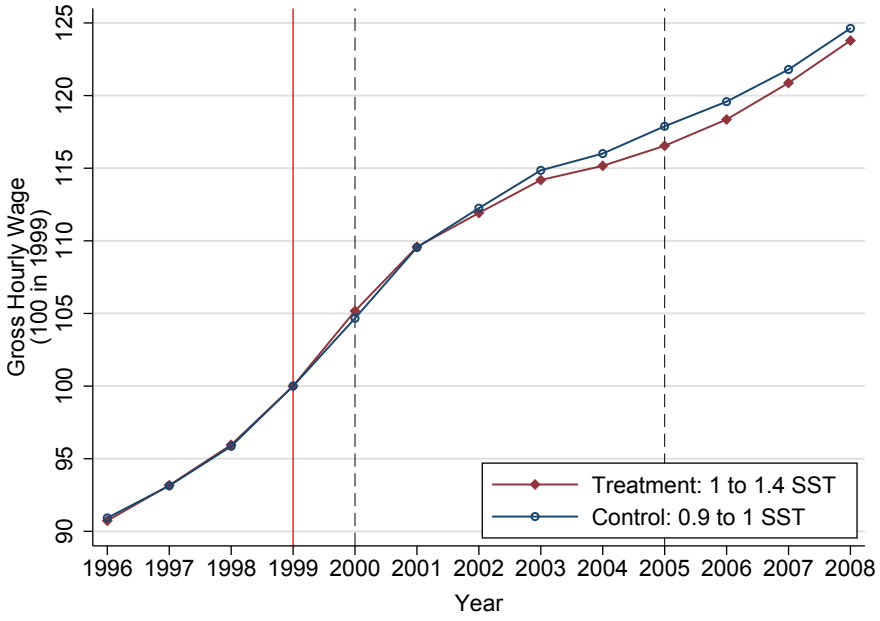
(b) Labour Cost (zh)



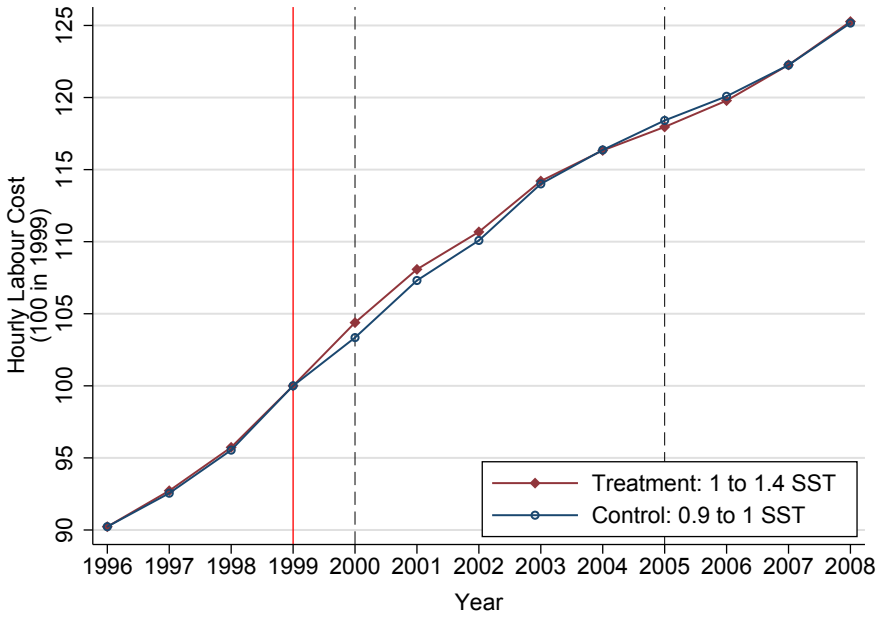
Notes: The figure shows the evolution of average real gross earnings (a) and average real labour cost (b) between 1985 and 1986 for groups that were affected differently by the uncapping of family SSCs in 1989 and 1990. The figure is based on an unbalanced panel of individuals who are observed in the last pre-reform year (denoted by a vertical red line) and at least another year. The vertical dashed lines denote the reform years (start and end). Earnings levels are normalized to 100 in all groups in the reference year (1988). The treatment group includes individuals whose gross earnings in 1988 were 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross earnings in 1988 were 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 5: Wage Responses to the Increase in Pension Contributions (Reform 3)

(a) Gross Hourly Wage (w)



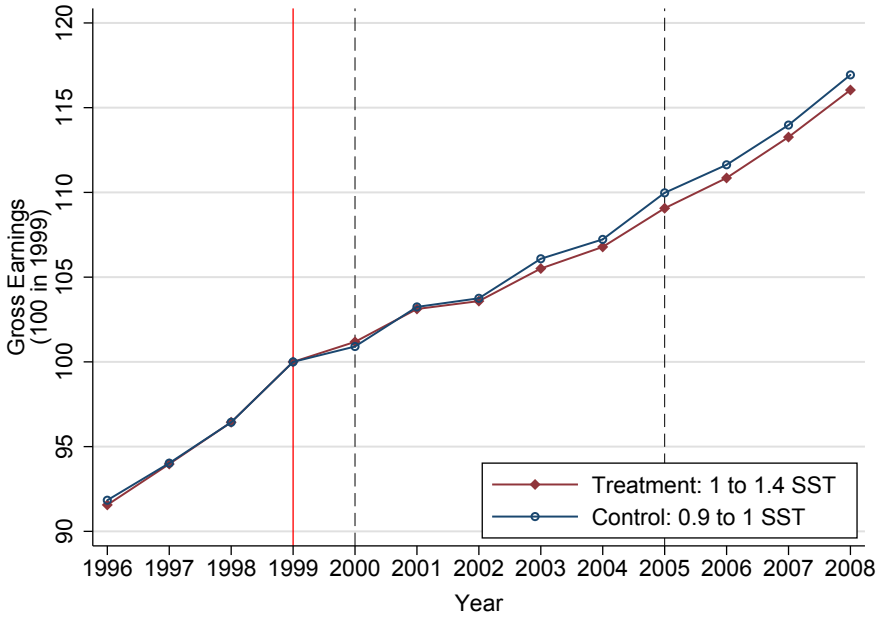
(b) Hourly Labour Cost (z)



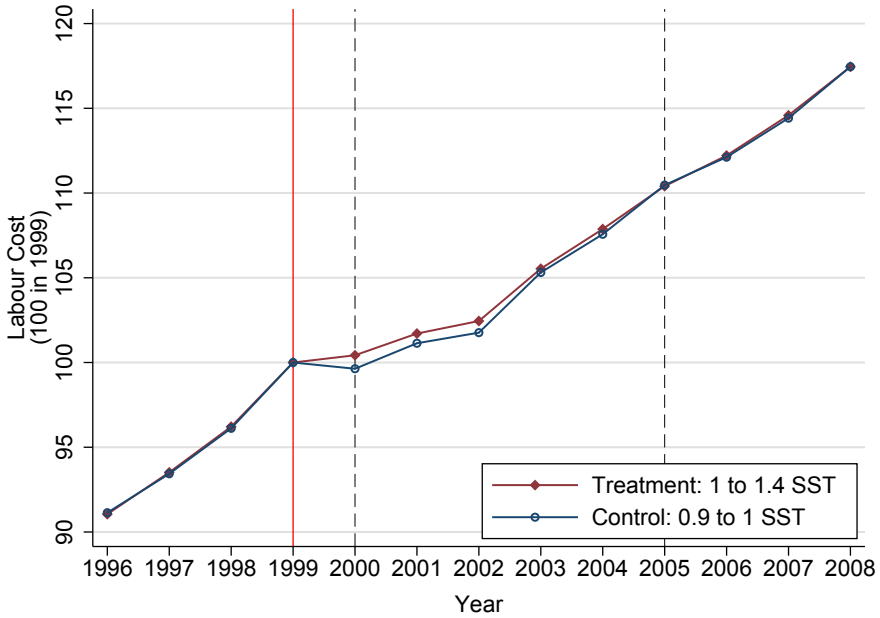
Notes: The figure shows the evolution of average real gross wage (a) and average real hourly labour cost (b) between 1996 and 2008 for groups that were affected differently by the increase in the pension SSCs for non-executives between 2000 and 2005. The figure is based on an unbalanced panel of individuals who are observed in the last pre-reform year (denoted by a vertical red line) and at least another year. The vertical dashed lines denote the reform years (start and end). Earnings levels are normalized to 100 in all groups in the reference year (1999). The treatment group includes individuals whose gross wage in 1999 were 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross wage in 1999 were 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 6: Earnings Responses to the Increase in Pension Contributions (Reform 3)

(a) Gross Earnings (wh)



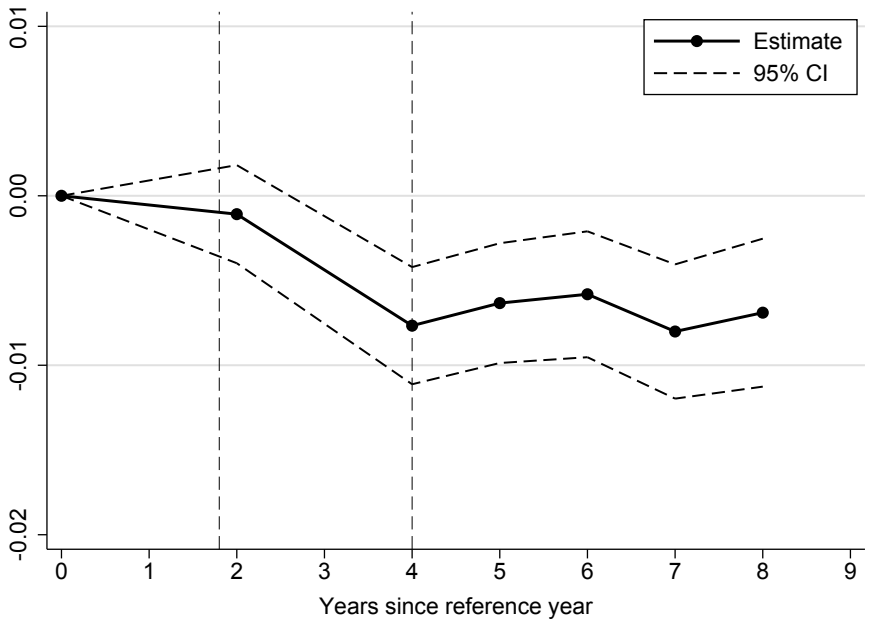
(b) Labour Cost (zh)



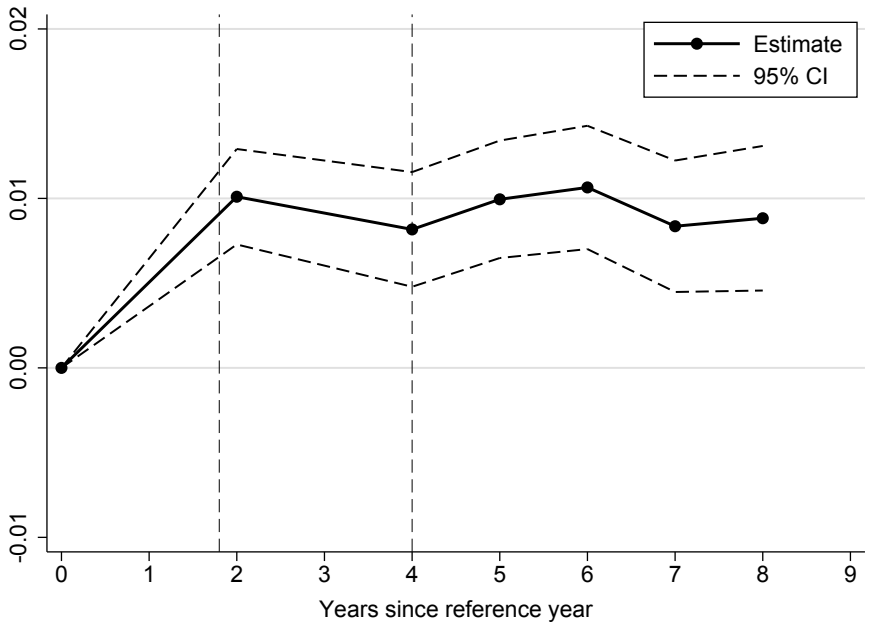
Notes: The figure shows the evolution of average real gross earnings (a) and average real labour cost (b) between 1996 and 2008 for groups that were affected differently by the increase in the pension SSCs for non-executives between 2000 and 2005. The figure is based on an unbalanced panel of individuals who are observed in the last pre-reform year (denoted by a vertical red line) and at least another year. The vertical dashed lines denote the reform years (start and end). Earnings levels are normalized to 100 in all groups in the reference year (1999). The treatment group includes individuals whose gross earnings in 1999 were 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross earnings in 1999 were 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 7: Reform 1: Reduced-Form Estimates

(a) Log Difference in Gross Earnings



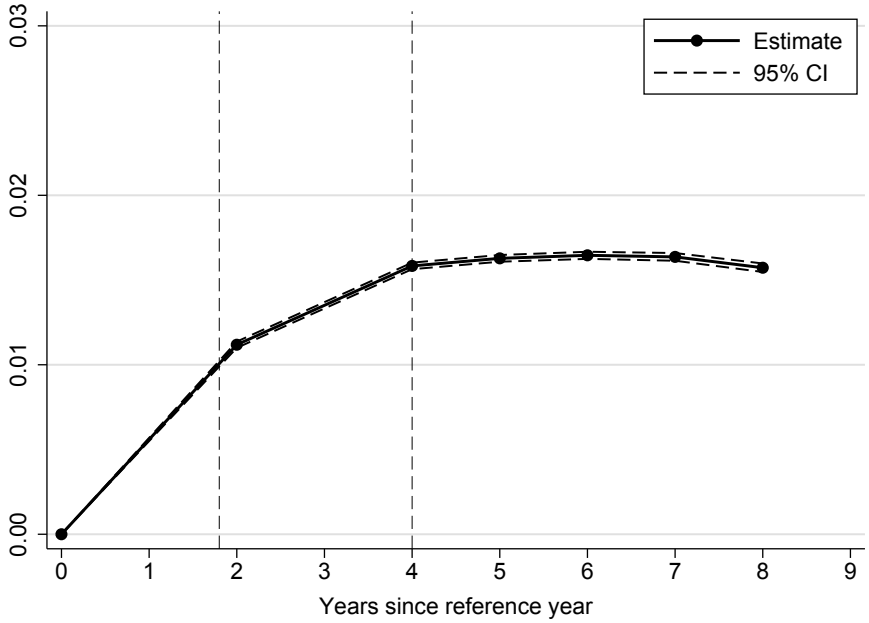
(b) Log Difference in Labour Cost



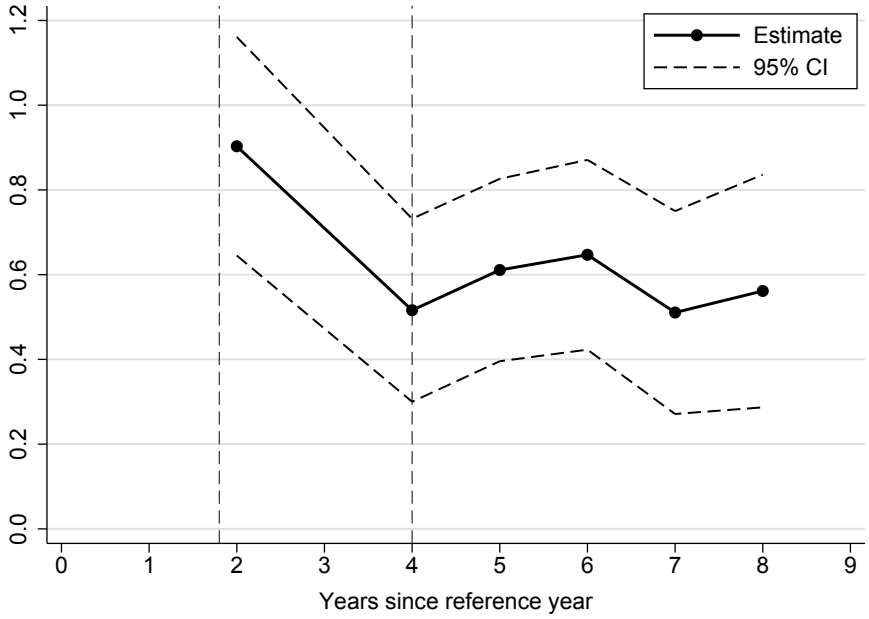
Notes: The figure shows the estimated log differences in real gross earnings (a) and average real labour cost (b) between groups of individuals who were affected differently by the uncapping of health care SSCs in 1981 and 1983. The vertical dashed lines denote the reform years (start and end). The difference-in-differences estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year and at least another year. The treatment group includes individuals whose gross earnings in 1980 were 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross earnings in 1980 were 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The solid lines show the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in the reference year (1980). The dashed lines show the 95 percent confidence intervals around the estimates.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 8: Reform 1: Estimated Employer Share of Incidence

(a) Log Difference in SSC Rates (First Stage)



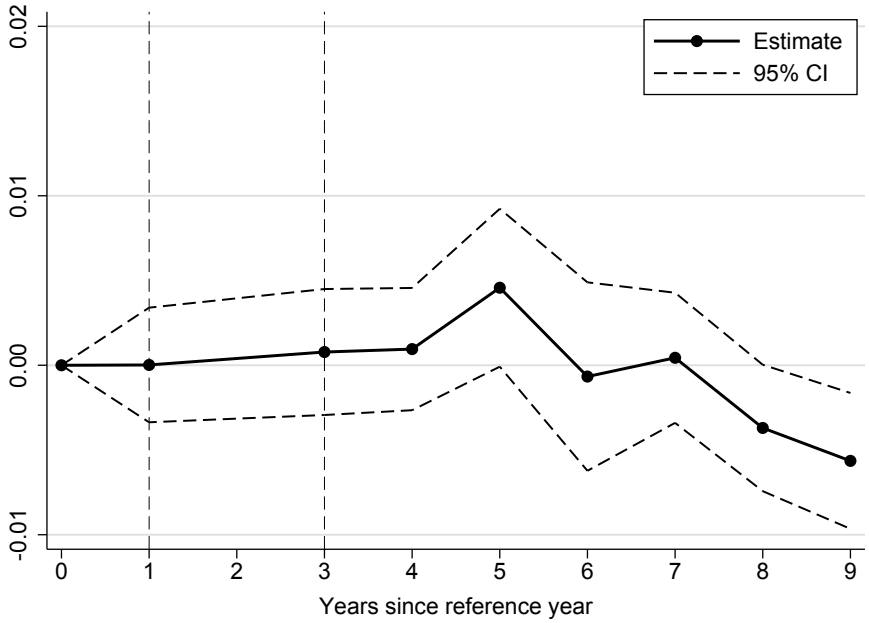
(b) Employer Share of Incidence (2SLS)



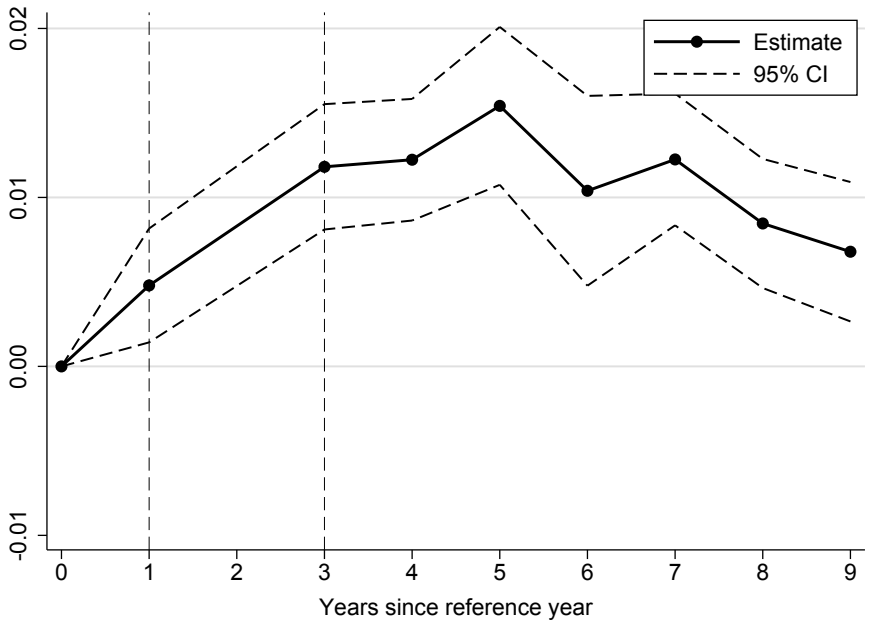
Notes: The figure shows the estimated share of the increase in SSCs that was borne by employers following the uncapping of health care SSCs in 1981 and 1983, over a period up to 8 years after the reform. The difference-in-difference estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year (1980) and at least another year. The vertical dashed lines denote the reform years (start and end). The treatment-control assignment is based on the reform-induced variation in average SSC rates. The treatment group includes individuals whose gross earnings in 1980 were in the range of 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose labour cost in 1980 were in the range of 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The first stage estimates (reform's impact on $\log(1 + \text{SSC rate})$) are shown in upper panel (a) and are obtained from the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in 1980. The estimated employer share of the incidence is shown in the lower panel (b) and is obtained from a 2SLS regression of log(labour cost) on $\log(1 + \text{SSC rate})$, where $\log(1 + \text{SSC rate})$ is instrumented by the interaction between the treatment group and year dummies. The solid lines show the estimates while the dashed lines show the 95 percent confidence intervals.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 9: Reform 2: Reduced-Form Estimates

(a) Log Difference in Gross Earnings



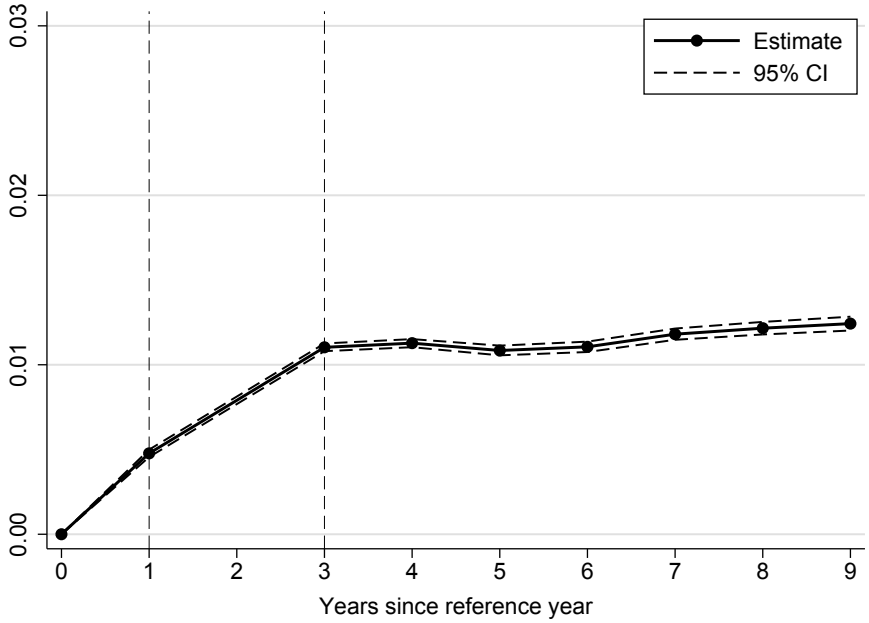
(b) Log Difference in Labour Cost



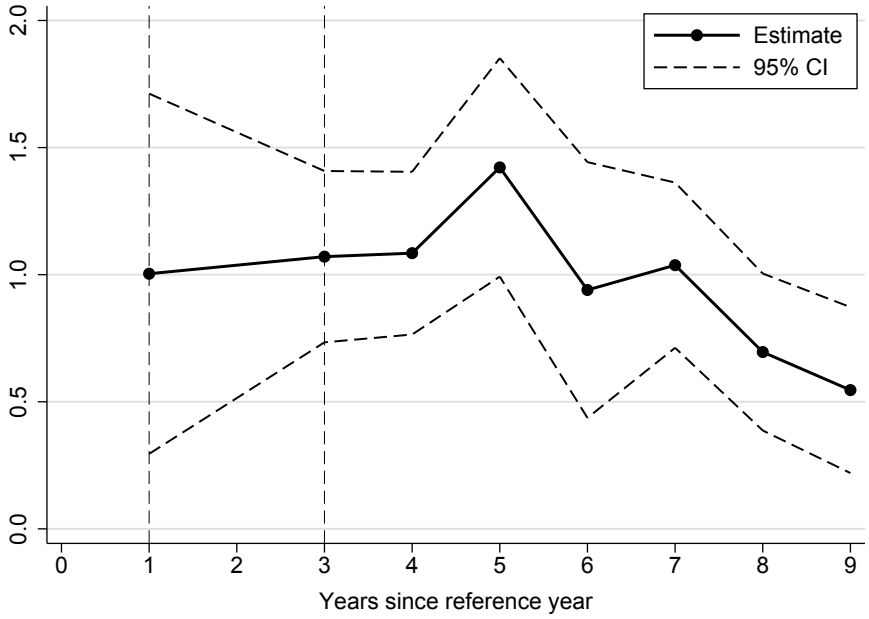
Notes: The figure shows the estimated log differences in real gross earnings (a) and average real labour cost (b) between groups of individuals who were affected differently by the uncapping of family SSCs in 1989 and 1990. The vertical dashed lines denote the reform years (start and end). The difference-in-differences estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year and at least another year. The treatment group includes individuals whose gross earnings in 1988 were 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross earnings in 1988 were 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The solid lines show the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in the reference year (1988). The dashed lines show the 95 percent confidence intervals around the estimates.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 10: Reform 2: Estimated Employer Share of Incidence

(a) Log Difference in SSC Rates (First Stage)



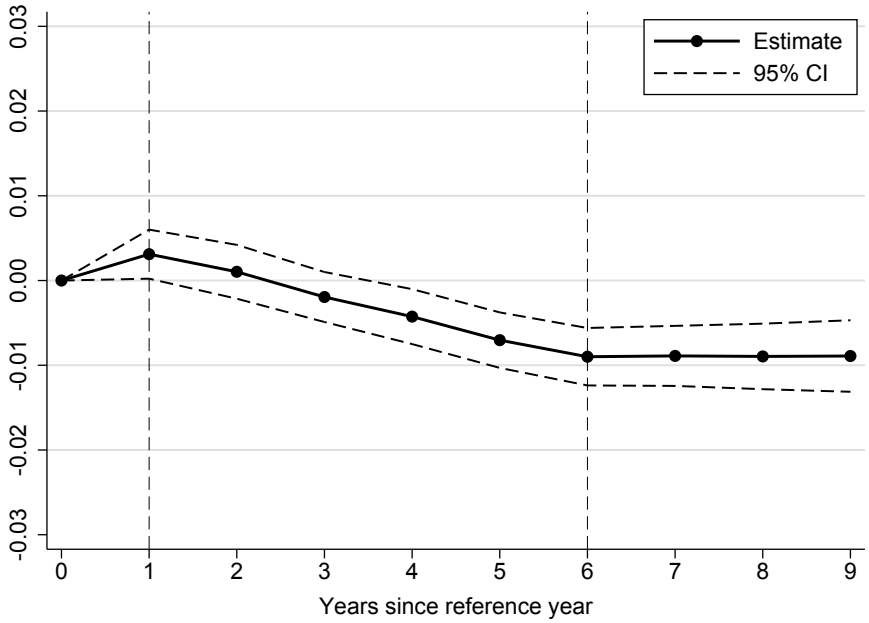
(b) Employer Share of Incidence (2SLS)



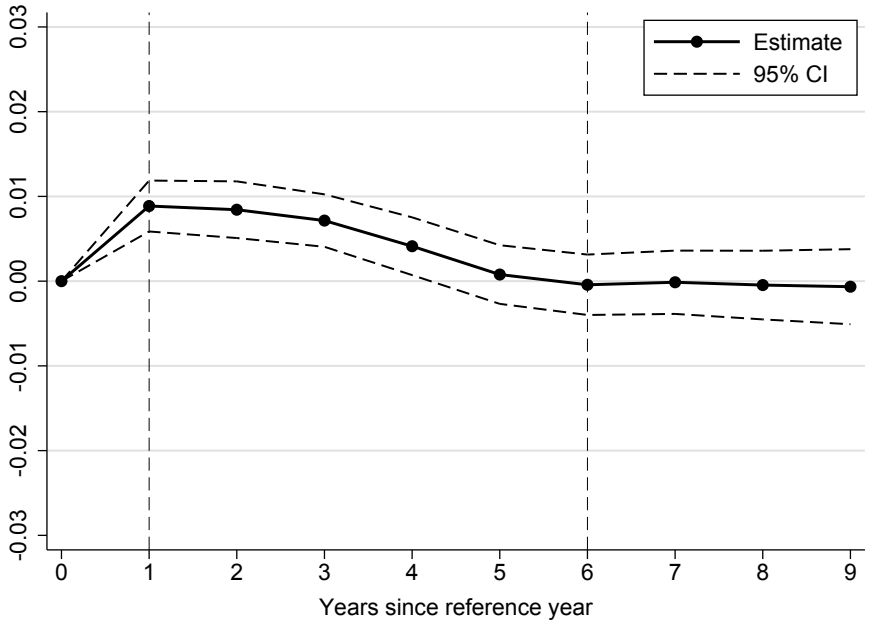
Notes: The figure shows the estimated share of the increase in SSCs that was borne by employers following the uncapping of family SSCs in 1989 and 1990, over a period up to 8 years after the reform. The difference-in-difference estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year (1988) and at least another year. The vertical dashed lines denote the reform years (start and end). The treatment-control assignment is based on the reform-induced variation in average SSC rates. The treatment group includes individuals whose gross earnings in 1988 were in the range of 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose labour cost in 1988 were in the range of 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The first stage estimates (reform's impact on $\log(1 + \text{SSC rate})$) are shown in upper panel (a) and are obtained from the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in 1988. The estimated employer share of the incidence is shown in the lower panel (b) and is obtained from a 2SLS regression of log(labour cost) on $\log(1 + \text{SSC rate})$, where $\log(1 + \text{SSC rate})$ is instrumented by the interaction between the treatment group and year dummies. The solid lines show the estimates while the dashed lines show the 95 percent confidence intervals.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 11: Reform 3: Reduced-Form Estimates (z)

(a) Log Difference in Gross Wage



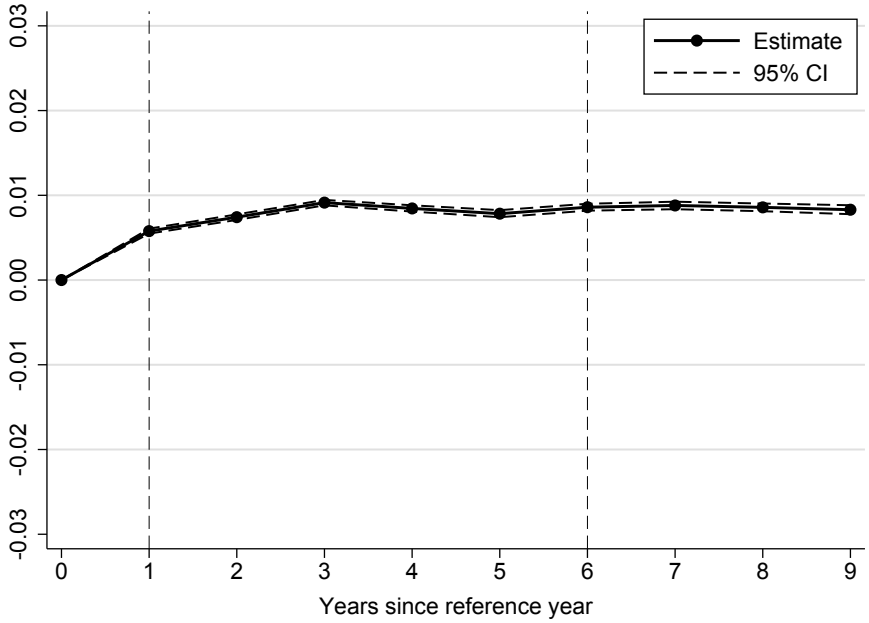
(b) Log Difference in Hourly Labour Cost



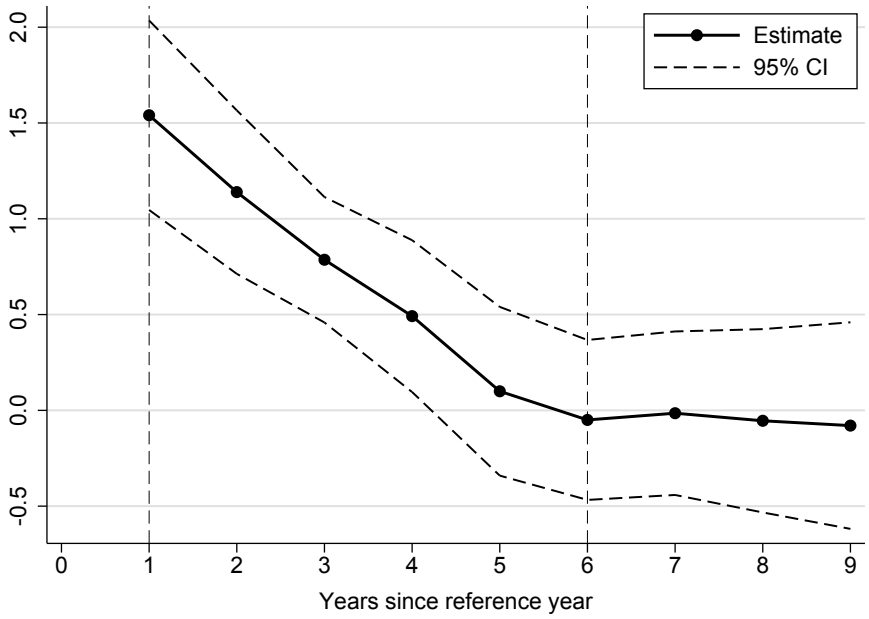
Notes: The figure shows the estimated log differences in real gross wage (a) and average real hourly labour cost (b) between groups of individuals who were affected differently by the increase in the pension SSCs for non-executives between 2000 and 2005. The vertical dashed lines denote the reform years (start and end). The difference-in-differences estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year and at least another year. The treatment group includes individuals whose gross wage in 1999 was 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross wage in 1999 was 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The solid lines show the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in the reference year (1999). The dashed lines show the 95 percent confidence intervals around the estimates.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 12: Reform 3: Estimated Employer Share of Incidence (z)

(a) Log Difference in SSC Rates (First Stage)



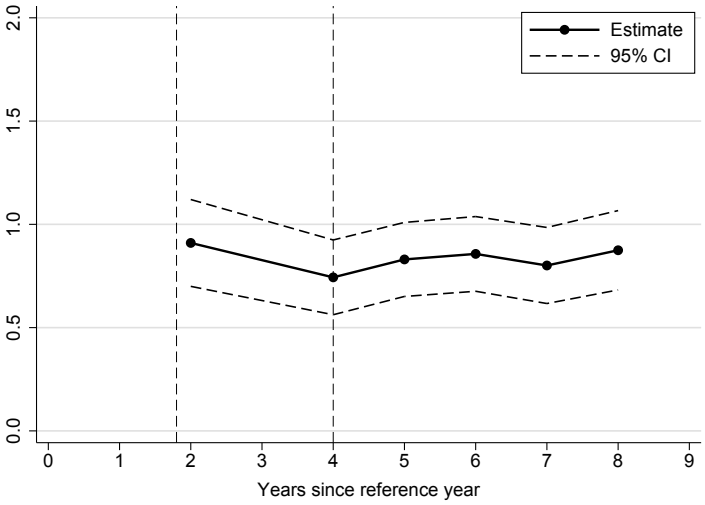
(b) Employer Share of Incidence (2SLS)



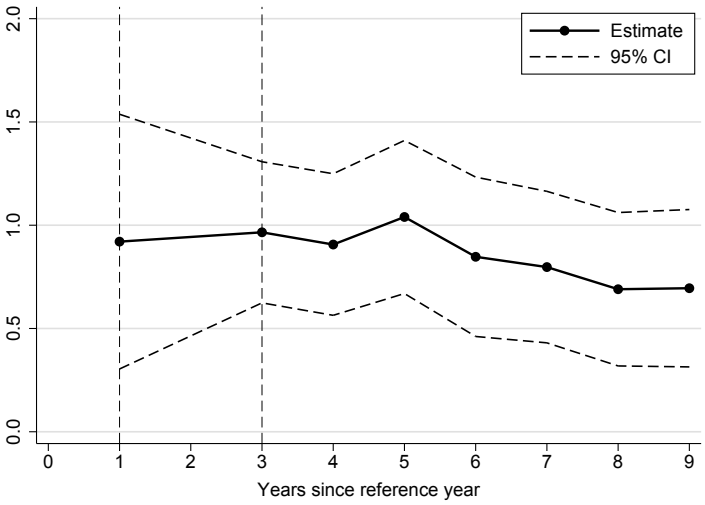
Notes: The figure shows the estimated share of the increase in SSCs that was borne by employers following the increase in the pension SSCs for non-executives between 2000 and 2005, over a period up to 8 years after the reform. The difference-in-difference estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year (1999) and at least another year. The vertical dashed lines denote the reform years (start and end). The treatment-control assignment is based on the reform-induced variation in average SSC rates. The treatment group includes individuals whose gross wage in 1999 was in the range of 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose hourly labour cost in 1999 was in the range of 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The first stage estimates (reform's impact on log(1+SSC rate)) are shown in upper panel (a) and are obtained from the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in 1999. The estimated employer share of the incidence is shown in the lower panel (b) and is obtained from a 2SLS regression of log(hourly labour cost) on log(1 + SSC rate), where log(1 + SSC rate) is instrumented by the interaction between the treatment group and year dummies. The solid lines show the estimates while the dashed lines show the 95 percent confidence intervals.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 13: Estimated Employer Share of Incidence – Controlling for Individual-Specific Trends

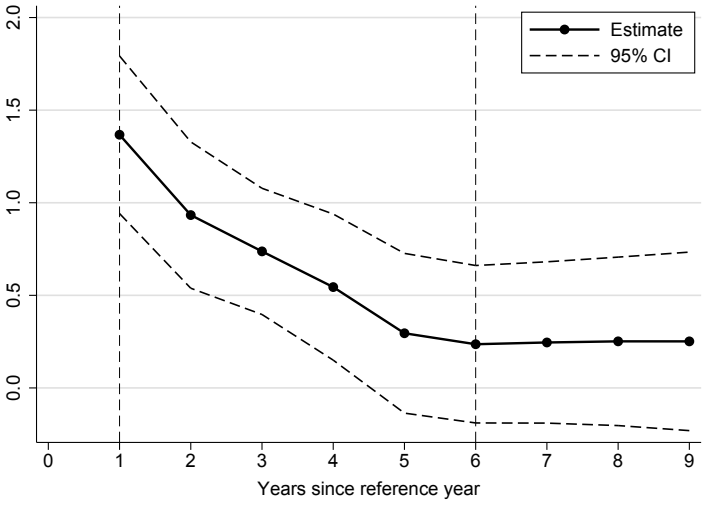
(a) Reform 1: Uncapping of Health Care SSCs



(b) Reform 2: Uncapping of Family SSCs

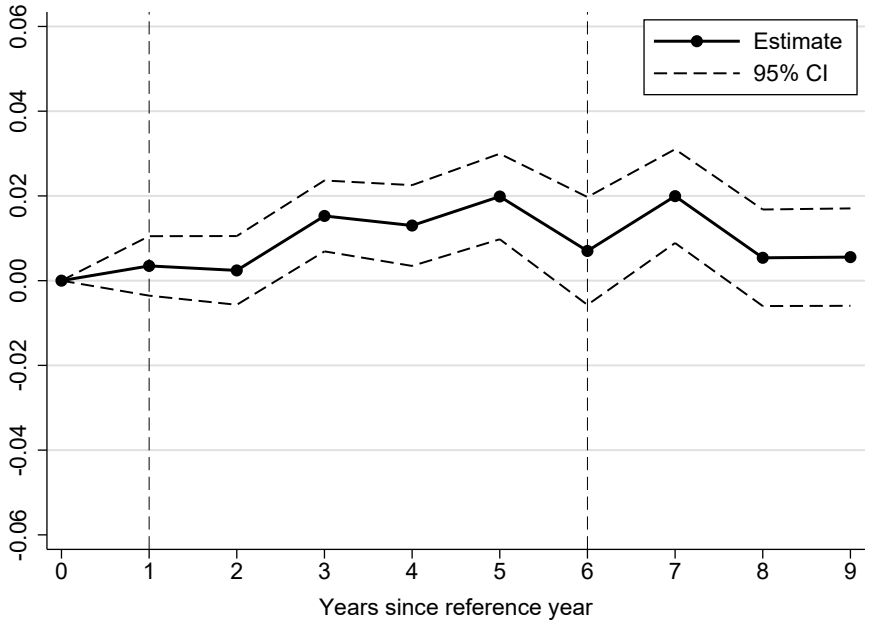


(c) Reform 3: Increase in Pensions Contributions



Notes: See notes of Figures 8, 10 and 12. The estimates are obtained from an augmented specification that controls individual-specific trends in addition to individual and year fixed effects.
Sources: DADS Panel 2010; TAXIPP 0.4.

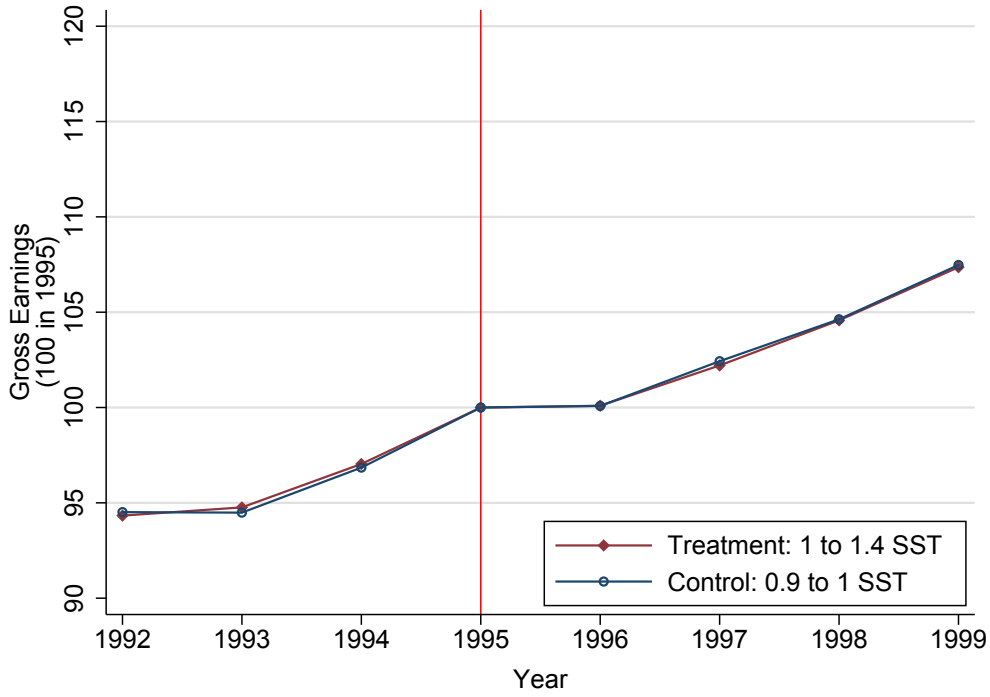
Figure 14: Increase in Pensions SSCs: Hours Response



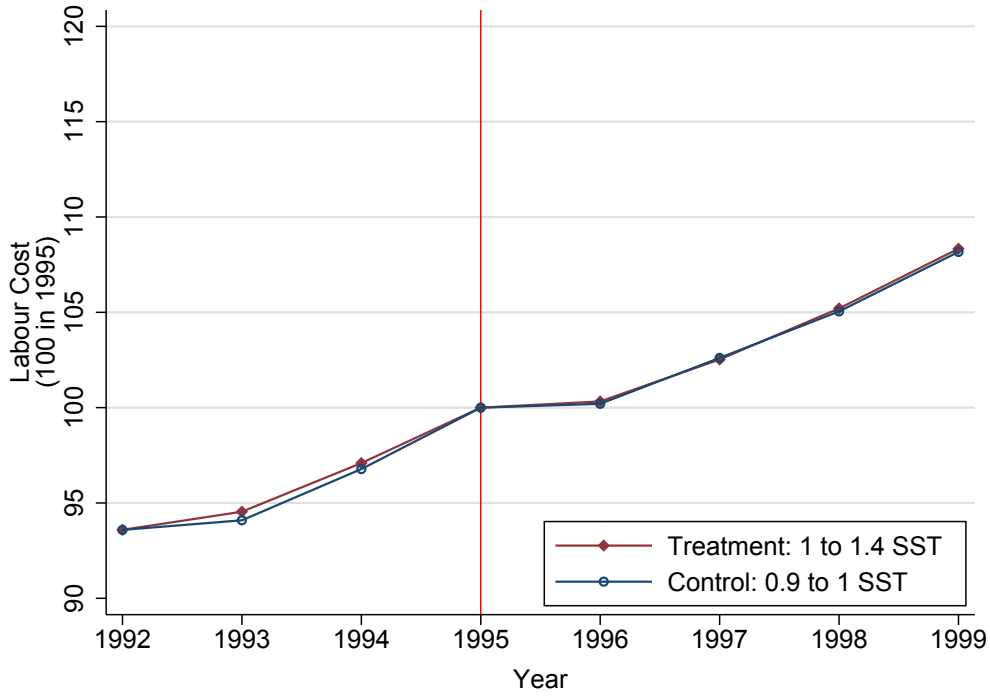
Notes: The figure shows the estimated log differences in hours of work between groups of individuals who were affected differently by the increase in the pension SSCs for non-executives between 2000 and 2005. The vertical dashed lines denote the reform years (start and end). The difference-in-differences estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year and at least another year. The treatment group includes individuals whose gross wage in 1999 was 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross wage in 1980 was 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The solid lines show the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in the reference year (1999). The dashed lines show the 95 percent confidence intervals around the estimates.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 15: Placebo Reform (1996): Graphical Evidence on Earnings Responses

(a) Gross Earnings



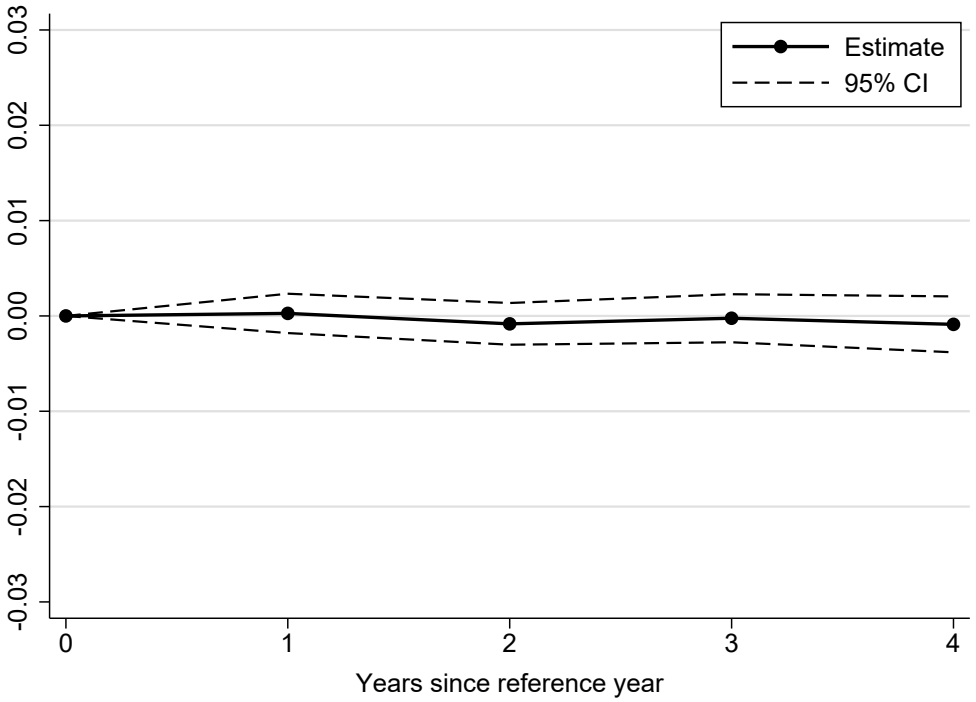
(b) Labour Cost



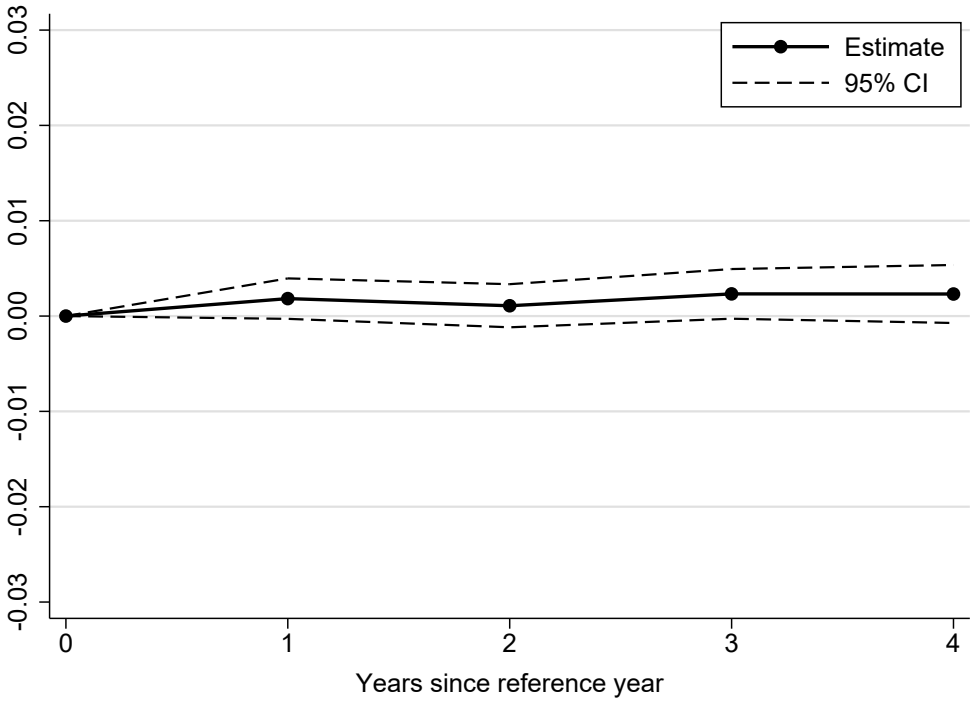
Notes: The figure shows the evolution of average real gross earnings (a) and average real labour cost (b) between 1992 and 1999 for two groups of workers around a placebo reform which is set in 1996. The figure is based on an unbalanced panel of individuals who are observed in the last pre-reform year (denoted by a vertical red line) and at least another year. Earnings levels are normalized to 100 in all groups in the reference year (1995). The treatment group includes individuals whose gross earnings in 1995 were 1 to 1.4 times the SST that year. The control group includes individuals whose gross earnings in 1995 were 0.9 to 1 times the SST that year.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure 16: Placebo Reform (1996): Reduced-Form Estimates

(a) Log Difference in Gross Earnings



(b) Log Difference in Labour Cost



Notes: The figure shows the estimated log differences in real gross earnings (a) and average real labour cost (b) between groups of individuals after a placebo reform which is set in 1996. The difference-in-differences estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year and at least another year. The treatment group includes individuals whose gross earnings 1995 were 1 to 1.4 times the SST that year. The control group includes individuals whose gross earnings in 1995 were 0.9 to 1 times the SST that year. The solid lines show the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in the reference year (1995). The dashed lines show the 95 percent confidence intervals around the estimates.
Sources: DADS Panel 2010; TAXIPP 0.4.

Table 1: Change in Marginal SSC Rates Before and After each Reform

	Employer SSCs			Employee SSCs		
	Under SST	1 to 3 SST	Difference	Under SST	1 to 3 SST	Difference
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Uncapping of Health Care SSCs (1981 and 1983)						
1980	38.1	10.2	−28.0	12.8	8.1	−4.7
1984	39.0	19.7	−19.3	15.2	9.7	−5.5
Difference	0.9	9.6	8.7	2.4	1.6	−0.8
Panel B. Uncapping of Family SSCs (1989 and 1990)						
1988	39.2	20.2	−19.0	17.0	10.9	−6.1
1991	36.3	28.4	−8.0	17.3	11.3	−6.0
Difference	−2.9	8.2	11.0	0.3	0.4	0.1
Panel C. Increase in Pension SSCs (2000–2005)						
1999	38.9	30.8	−8.1	13.4	7.5	−6.0
2005	39.1	38.5	−0.6	13.6	12.2	−1.5
Difference	0.2	7.7	7.5	0.2	4.7	4.5

Notes: Marginal tax rates are here expressed as a percentage of gross earnings, as they are legislated. These rates are applied to different fraction of earnings, defined with respect to the Social Security threshold (SST).
Sources: Institut des Politiques Publiques (2016); TAXIPP 0.4.

Table 2: Summary Statistics for Treatment and Control Groups in Reference Year

Sample:	Control Group		Treatment Group	
Gross earnings (w):	0.9 to 1 SST		1 to 1.4 SST	
	Mean	S.D.	Mean	S.D.
Panel A. Uncapping of Health Care SSCs (1981 and 1983)				
Reference year (t_0): 1980				
Rank in the earnings distribution	[P56–P65]		[P65–P85]	
Age	37.7	(10.7)	39.3	(10.1)
Male	0.73	(0.44)	0.75	(0.43)
Annual gross earnings	22,418	(684)	27,452	(2630)
Annual labour cost	32,021	(1,074)	38,208	(3,130)
Average SSC rate	0.300	(0.01)	0.282	(0.02)
Number of individuals	35,044		73,297	
Number of observations	238,917		511,796	
Panel B. Uncapping of Family SSCs (1989 and 1990)				
Reference year (t_0): 1988				
Rank in the earnings distribution	[P58–P67]		[P67–P85]	
Age	39.2	(9.3)	40.8	(8.8)
Male	0.70	(0.46)	0.74	(0.44)
Annual gross earnings	26,073	(790)	31,767	(3,015)
Annual labour cost	37,679	(1423)	45,169	(3,959)
Average SSC rate	0.308	(0.01)	0.297	(0.02)
Number of individuals	26,134		49,337	
Number of observations	222,372		422,994	
Panel C. Increase in Pensions SSCs (2000–2005)				
Reference year (t_0): 1999				
Rank in the earnings distribution	[P62–P70]		[P70–P87]	
Age	41.7	(8.8)	43.5	(8.3)
Male	0.68	(0.47)	0.71	(0.45)
Annual gross earnings	30,324	(919)	36,710	(3,420)
Annual labour cost	44,082	(1,854)	53,023	(4,932)
Average SSC rate	0.312	(0.02)	0.307	(0.02)
Number of individuals	21,808		37,326	
Number of observations	203,865		349,578	

Notes: Each panel corresponds to a different SSCs reform: (i) the uncapping of health care SSCs in 1981 and 1983 (Panel A); (ii) the uncapping of family SSCs in 1989 and 1990 (Panel B); and (iii) the increase in pensions SSCs between 2000 and 2005 (Panel C). Summary statistics in the reference year are provided separately for individuals whose earnings in the pre-reform year were in the range of 1 to 1.4 times the SST (treatment group) with individuals whose earnings in the pre-reform year were in the range of 0.9 to 1 times the SST (control group). Standard errors are in parentheses.
Sources: DADS Panel 2010; TAXIPP 0.4.

Table 3: Employer Share of SSC Incidence: Baseline Estimates

Reform:	Reform 1: Uncapping of Health Care SSCs	Reform 2: Uncapping of Family SSCs	Reform 3: Increase in pensions contributions above the SST	
Reference year (t_0):	(1980)	(1988)	(1999)	
Dependent variable:	Log(labour cost)	Log(labour cost)	Log(labour cost)	Log(hourly labour cost)
	(1)	(2)	(3)	(4)
	Panel A. Without controlling for individual-specific trends			
t_0+1	n/a	1.004***	1.336***	1.541***
	n/a	(0.296)	(0.185)	(0.210)
t_0+2	0.903***	n/a	0.839***	1.139***
	(0.122)	n/a	(0.198)	(0.216)
t_0+3	n/a	1.071***	0.841***	0.786***
	n/a	(0.174)	(0.163)	(0.178)
t_0+4	0.516***	1.085***	0.488**	0.492**
	(0.116)	(0.174)	(0.216)	(0.225)
t_0+5	0.611***	1.422***	0.314	0.100
	(0.119)	(0.246)	(0.243)	(0.258)
t_0+6	0.647***	0.940***	0.230	−0.050
	(0.127)	(0.286)	(0.239)	(0.249)
t_0+7	0.511***	1.037***	0.150	−0.015
	(0.136)	(0.189)	(0.252)	(0.258)
t_0+8	0.561***	0.696***	−0.014	−0.054
	(0.154)	(0.181)	(0.281)	(0.289)
t_0+9	n/a	0.546***	−0.230	−0.079
	n/a	(0.189)	(0.318)	(0.318)
N	743,477	642,181	551,664	546,066
	Panel B. Controlling for individual-specific trends			
t_0+1	n/a	0.921***	1.231***	1.367***
	n/a	(0.302)	(0.188)	(0.214)
t_0+2	0.910***	n/a	0.809***	0.933***
	(0.111)	n/a	(0.197)	(0.221)
t_0+3	n/a	0.966***	0.818***	0.737***
	n/a	(0.190)	(0.177)	(0.201)
t_0+4	0.743***	0.906***	0.615***	0.545***
	(0.106)	(0.201)	(0.216)	(0.238)
t_0+5	0.830***	1.040***	0.496**	0.295
	(0.108)	(0.234)	(0.239)	(0.264)
t_0+6	0.857***	0.847***	0.445**	0.236
	(0.112)	(0.249)	(0.240)	(0.264)
t_0+7	0.801***	0.797***	0.357*	0.246
	(0.116)	(0.232)	(0.251)	(0.273)
t_0+8	0.875***	0.690***	0.290	0.252
	(0.122)	(0.236)	(0.263)	(0.287)
t_0+9	n/a	0.695***	0.233	0.252
	n/a	(0.243)	(0.280)	(0.303)
N	743,477	642,181	551,664	546,066

Notes: Each column corresponds to a different SSCs reform: (1) the uncapping of health care SSCs in 1981 and 1983 ; (2) the uncapping of family SSCs in 1989 and 1990; and (3) and (4) the increase in pensions SSCs between 2000 and 2005. Estimates are obtained from a difference-in-difference specification that compares individuals whose earnings in the pre-reform year were in the range of 1 to 1.4 times the SST (treatment group) with individuals whose earnings in the pre-reform year were in the range of 0.9 to 1 times the SST (control group). Panel A presents the estimates without trend, Panel B with individual specific trends. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Sources: DADS Panel 2010; TAXIPP 0.4.

Table 4: Impact of SSC Reforms on Probability of Entering or Exiting Full-time Employment with Earnings above the SST: Difference-in-Difference Estimates)

Reform:	Reform 1: Uncapping of Health Care SSCs	Reform 2: Uncapping of Family SSCs	Reform 3: Increase in Pensions contributions
Reference year (t_0):	(1980)	(1988)	(1999)
	(1)	(2)	(3)
Panel A. Impact on probability of entering full-time employment with Earnings above the SST			
t_0+1	n/a	0.002	−0.002
	n/a	(0.003)	(0.002)
t_0+2	n/a	n/a	−0.003
	n/a	n/a	(0.002)
t_0+3	n/a	n/a	−0.006
	n/a	n/a	(0.003)
t_0+4	n/a	0.001	0.001
	n/a	(0.003)	(0.003)
t_0+5	−0.007**	−0.002	0.005
	(0.003)	(0.003)	(0.002)
t_0+6	0.002	−0.003	0.000
	(0.003)	(0.004)	(0.002)
t_0+7	0.003	−0.017***	−0.002
	(0.003)	(0.004)	(0.002)
t_0+8	−0.010***	0.004	−0.003
	(0.003)	(0.004)	(0.002)
t_0+9	n/a	0.005	−0.003
	n/a	(0.003)	(0.002)
N	720,947	735,839	1,305,266
Panel B. Impact on probability of exiting full-time employment with Earnings above the SST			
t_0+1	n/a	−0.009**	0.005*
	n/a	(0.003)	(0.003)
t_0+2	n/a	n/a	0.005*
	n/a	n/a	(0.003)
t_0+3	n/a	n/a	−0.002
	n/a	n/a	(0.003)
t_0+4	n/a	−0.005*	0.010***
	n/a	(0.003)	(0.003)
t_0+5	−0.005	−0.004	0.007***
	(0.003)	(0.003)	(0.002)
t_0+6	−0.011***	−0.024***	0.004
	(0.003)	(0.004)	(0.002)
t_0+7	−0.002	−0.012**	0.005**
	(0.003)	(0.004)	(0.002)
t_0+8	0.000	−0.005*	0.006***
	(0.003)	(0.003)	(0.002)
t_0+9	n/a	−0.005*	0.004**
	n/a	(0.003)	(0.002)
N	720,611	745,264	1,244,658

Notes: Each column corresponds to a different SSCs reform: (1) the uncapping of health care SSCs in 1981 and 1983 ; (2) the uncapping of family SSCs in 1989 and 1990; and (3) and (4) the increase in pensions SSCs between 2000 and 2005. Estimates are obtained from a difference-in-difference specification that compares individuals whose earnings in the pre-reform year were in the range of 1 to 1.4 times the SST (treatment group) with individuals whose earnings in the pre-reform year were in the range of 0.9 to 1 times the SST (control group). Panel A presents the estimates without trend, Panel B with individual specific trends. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Sources: DADS Panel 2010; TAXIPP 0.4.

Appendix for

Incidence of Social Security Contributions: Evidence from France

Antoine Bozio Thomas Breda Julien Grenet

In this appendix we present derivations of formulas presented in the conceptual framework (Appendix A), and additional results from the main analysis presented in the paper (Appendix B).

Appendix A Derivations of Incidence Formulas

Our conceptual framework is the standard analysis of incidence of earnings taxation. We denote by z the labour cost per unit of effort and h the effort which could be physical hours, work intensity or any other margin of labour supply. zh is thus the total earnings (in terms of labour cost or pre-tax earnings).

We are interested in the earnings' responses to change in employer SSCs τ on earnings, that we call elasticity of taxable earnings (ETE), $\varepsilon_{zh|1-\tau}$. We would like to relate that statistics to the incidence concept, defined as $\varepsilon_{z|1-\tau} = \frac{1-\tau}{z} \cdot \frac{dz}{d(1-\tau)}$. We decompose below ETE into incidence and behavioural responses:

$$\varepsilon_{zh|1-\tau} = \frac{1-\tau}{zh} \cdot \frac{d(zh)}{d(1-\tau)} \tag{8}$$

$$\begin{aligned}
\varepsilon_{zh|1-\tau} &= \frac{1-\tau}{zh}\Big[\frac{hdz + zdh}{d(1-\tau)}\Big] \\
&= \frac{1-\tau}{z} \cdot \frac{dz}{d(1-\tau)} + \frac{(1-\tau)z}{zh} \cdot \frac{dh}{dz(1-\tau)} \cdot \frac{dz(1-\tau)}{d(1-\tau)} \\
&= \varepsilon_{z|1-\tau} + \frac{1}{z}\Big[\frac{dz}{d(1-\tau)}(1-\tau) + z\frac{d(1-\tau)}{d(1-\tau)}\Big]\varepsilon_{h|z(1-\tau)}
\end{aligned}$$

$$\varepsilon_{zh|1-\tau} = \varepsilon_{z|1-\tau} + (\varepsilon_{z|1-\tau} + 1)\varepsilon_{h|z(1-\tau)} \tag{9}$$

In the elasticity of taxable income literature, the common (mostly implicit) assumption is that incidence is fully on workers ($\varepsilon_{z|1-\tau} = 0$). In that case, the earnings' response captures behavioural responses. Otherwise, earnings' responses capture both incidence and behavioural responses.

Appendix B Additional Results

Table B1: Social Security Contributions for Private Sector Non-Executive Wage Earners, 1976 and 2010.

Social Security contribution	Threshold	Rate	
		1976	2010
Panel A. Pensions			
Main pension scheme (CNAV) – employee	SST	3.25%	6.65%
Main pension scheme (CNAV) – employer	SST	7.50%	8.30%
Main pension scheme (CNAV) – employee	uncapped	0.0%	0.10%
Main pension scheme (CNAV) – employer	uncapped	0.0%	1.6%
Complementary scheme (ARRCO) – employee	SST	1.76%	3.0%
Complementary scheme (ARRCO) – employer	SST	2.64%	4.5%
Non-executive complementary scheme (ARRCO) – employee	SST-3SST	1.76%	8.0%
Non-executive complementary scheme (ARRCO) – employer	SST-3SST	2.64%	12.0%
Additional complementary scheme (AGFF) – employee	SST	0.0%	0.8%
Additional complementary scheme (AGFF) – employer	SST	0.0%	1.2%
Additional non-exec. comp. scheme (AGFF) – employee	SST-3SST	0.0%	0.9%
Additional non-exec. comp. scheme (AGFF) – employer	SST-3SST	0.0%	1.3%
Panel B. Unemployment insurance			
Unemployment insurance – employee	SST	0.48%	2.4%
Unemployment insurance – employer	SST	1.92%	4.0%
Unemployment insurance – employee	SST-4SST	0.48%	2.4%
Unemployment insurance – employer	SST-4SST	1.92%	4.0%
Panel C. Health care			
Health insurance – employee	SST	2.5%	0.0%
Health insurance – employer	SST	10.45%	0.0%
Health insurance – employee	uncapped	1.5%	0.75%
Health insurance – employer	uncapped	2.5%	12.8%
Panel D. Family benefits			
Family benefits – employer	SST	9.0%	0.0%
Family benefits – employer	uncapped	0.0%	5.4%

Notes: SST refers to the Social Security Threshold and 4SST to four times this threshold. The SSCs presented in this table are the main SSCs for private sector non-executive wage earners. It does not include specific schemes like regional schemes or various payroll taxes.

Table B2: Employer Share of SSC Incidence: Estimates using Alternative Definition of Treatment Group (Gross Earnings between 1 and 1.2 SST in Reference Year)

Reform:	Reform 1: Uncapping of Health Care SSCs	Reform 2: Uncapping of Family SSCs	Reform 3: Increase in pensions contributions above the SST	
Reference year (t_0):	(1980)	(1988)	(1999)	
Dependent variable:	Log(labour cost)	Log(labour cost)	Log(labour cost)	Log(hourly labour cost)
	(1)	(2)	(3)	(4)
	Panel A. Without controlling for individual-specific trends			
t_0+1	n/a	0.893	1.166***	1.556***
	n/a	(0.681)	(0.352)	(0.383)
t_0+2	0.662***	n/a	0.613**	1.149***
	(0.187)	n/a	(0.308)	(0.327)
t_0+3	n/a	1.200***	0.740***	0.851***
	n/a	(0.302)	(0.231)	(0.247)
t_0+4	0.339**	1.326***	0.247	0.410
	(0.173)	(0.289)	(0.292)	(0.301)
t_0+5	0.533***	1.818***	0.003	−0.106
	(0.174)	(0.387)	(0.335)	(0.351)
t_0+6	0.521***	1.029**	−0.086	−0.332
	(0.184)	(0.461)	(0.314)	(0.325)
t_0+7	0.236	1.455***	−0.038	−0.151
	(0.200)	(0.289)	(0.327)	(0.335)
t_0+8	0.228	0.888	−0.318	−0.322
	(0.231)	(0.277)	(0.373)	(0.382)
t_0+9	n/a	0.738**	−0.476	−0.260
	n/a	(0.290)	(0.421)	(0.421)
N	563,275	504,120	448,170	444,336
	Panel B. Controlling for individual-specific trends			
t_0+1	n/a	0.883	1.081***	1.349***
	n/a	(0.595)	(0.290)	(0.325)
t_0+2	0.723***	n/a	0.674**	0.941***
	(0.150)	n/a	(0.270)	(0.296)
t_0+3	n/a	1.197***	0.830***	0.851***
	n/a	(0.295)	(0.225)	(0.250)
t_0+4	0.624***	1.149***	0.589**	0.579**
	(0.135)	(0.293)	(0.264)	(0.288)
t_0+5	0.779***	1.333***	0.471	0.269
	(0.133)	(0.312)	(0.291)	(0.321)
t_0+6	0.776***	1.092***	0.470*	0.224
	(0.135)	(0.323)	(0.283)	(0.312)
t_0+7	0.682***	1.135***	0.419	0.318
	(0.137)	(0.304)	(0.292)	(0.319)
t_0+8	0.764***	0.947***	0.409	0.359
	(0.142)	(0.307)	(0.301)	(0.330)
t_0+9	n/a	0.984***	0.393	0.398
	n/a	(0.313)	(0.319)	(0.347)
N	563,275	504,120	448,170	444,336

Notes: Each column corresponds to a different SSCs reform: (1) the uncapping of health care SSCs in 1981 and 1983 ; (2) the uncapping of family SSCs in 1989 and 1990; and (3) and (4) the increase in pensions SSCs between 2000 and 2005. Estimates are obtained from a difference-in-difference specification that compares individuals whose earnings in the pre-reform year were in the range of 1 to 1.4 times the SST (treatment group) with individuals whose earnings in the pre-reform year were in the range of 0.9 to 1 times the SST (control group). Panel A presents the estimates without trend, Panel B with individual specific trends. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Sources: DADS Panel 2010; TAXIPP 0.4.

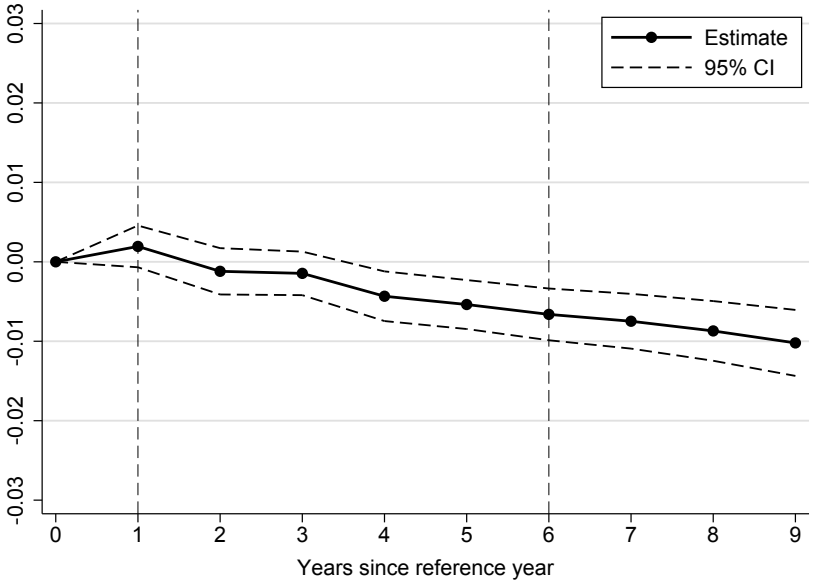
Table B3: Employer Share of SSC Incidence: Estimates using Alternative Definition of Treatment Group (Gross Earnings between 1.2 and 1.4 SST in Reference Year)

Reform:	Reform 1: Uncapping of Health Care SSCs	Reform 2: Uncapping of Family SSCs	Reform 3: Increase in pensions contributions above the SST	
Reference year (t_0):	(1980)	(1988)	(1999)	
Dependent variable:	Log(labour cost)	Log(labour cost)	Log(labour cost)	Log(hourly labour cost)
	(1)	(2)	(3)	(4)
	Panel A. Without controlling for individual-specific trends			
t_0+1	n/a	1.074***	1.506***	1.530***
	n/a	(0.250)	(0.184)	(0.204)
t_0+2	1.137***	n/a	1.067***	1.129***
	(0.117)	n/a	(0.167)	(0.177)
t_0+3	n/a	0.982***	0.946***	0.719***
	n/a	(0.123)	(0.131)	(0.140)
t_0+4	0.656***	0.919***	0.740***	0.578***
	(0.091)	(0.117)	(0.162)	(0.165)
t_0+5	0.671***	1.146***	0.609***	0.299*
	(0.091)	(0.151)	(0.169)	(0.179)
t_0+6	0.742***	0.881***	0.545***	0.235
	(0.093)	(0.176)	(0.163)	(0.171)
t_0+7	0.715***	0.744***	0.334*	0.121
	(0.095)	(0.118)	(0.172)	(0.174)
t_0+8	0.804***	0.561***	0.280	0.208
	(0.108)	(0.117)	(0.190)	(0.194)
t_0+9	n/a	0.408***	0.015	0.103
	n/a	(0.125)	(0.231)	(0.228)
N	416,754	359,335	306,699	303,530
	Panel B. Controlling for individual-specific trends			
t_0+1	n/a	0.944***	1.385***	1.391***
	n/a	(0.217)	(0.155)	(0.179)
t_0+2	1.098***	n/a	0.950***	0.926***
	(0.096)	n/a	(0.153)	(0.168)
t_0+3	n/a	0.795***	0.804***	0.613***
	n/a	(0.129)	(0.132)	(0.150)
t_0+4	0.850***	0.723***	0.646***	0.507***
	(0.079)	(0.131)	(0.157)	(0.173)
t_0+5	0.876***	0.812***	0.522***	0.323*
	(0.079)	(0.142)	(0.168)	(0.187)
t_0+6	0.931***	0.655***	0.417**	0.248
	(0.079)	(0.149)	(0.168)	(0.186)
t_0+7	0.909***	0.526***	0.286*	0.163
	(0.080)	(0.143)	(0.173)	(0.191)
t_0+8	0.976***	0.481***	0.150	0.127
	(0.083)	(0.146)	(0.184)	(0.202)
t_0+9	n/a	0.455***	0.043	0.080
	n/a	(0.151)	(0.198)	(0.216)
N	416,754	359,335	306,699	303,530

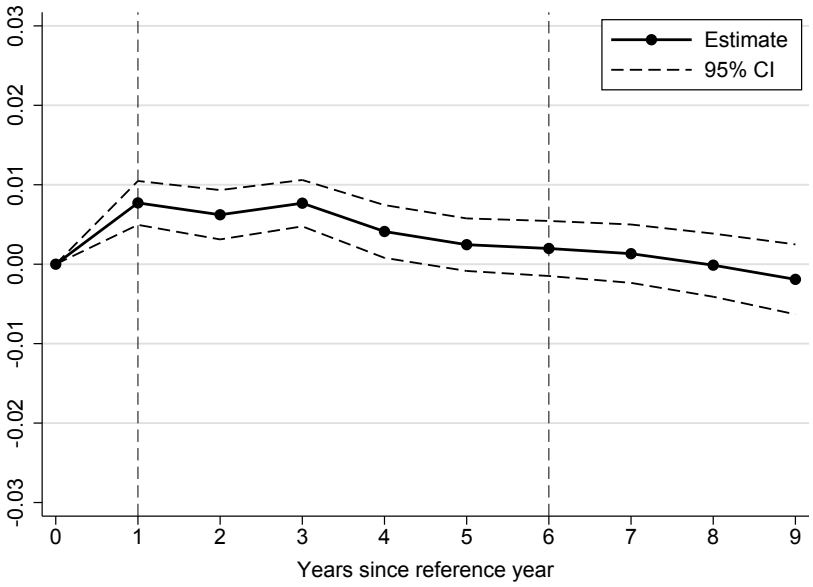
Notes: Each column corresponds to a different SSCs reform: (1) the uncapping of health care SSCs in 1981 and 1983 ; (2) the uncapping of family SSCs in 1989 and 1990; and (3) and (4) the increase in pensions SSCs between 2000 and 2005. Estimates are obtained from a difference-in-difference specification that compares individuals whose earnings in the pre-reform year were in the range of 1 to 1.4 times the SST (treatment group) with individuals whose earnings in the pre-reform year were in the range of 0.9 to 1 times the SST (control group). Panel A presents the estimates without trend, Panel B with individual specific trends. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure B1: Reform 3: Reduced-Form Estimates (zh)

(a) Log Difference in Gross Earnings



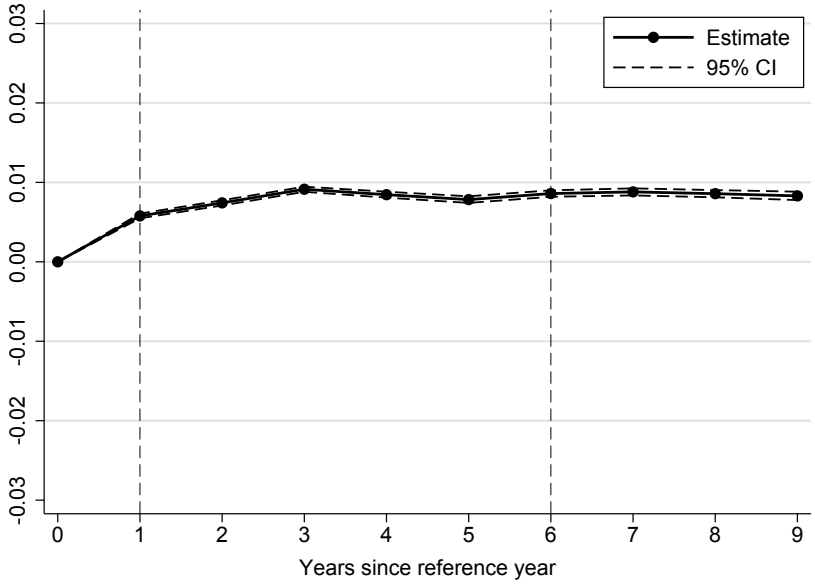
(b) Log Difference in Labour Cost



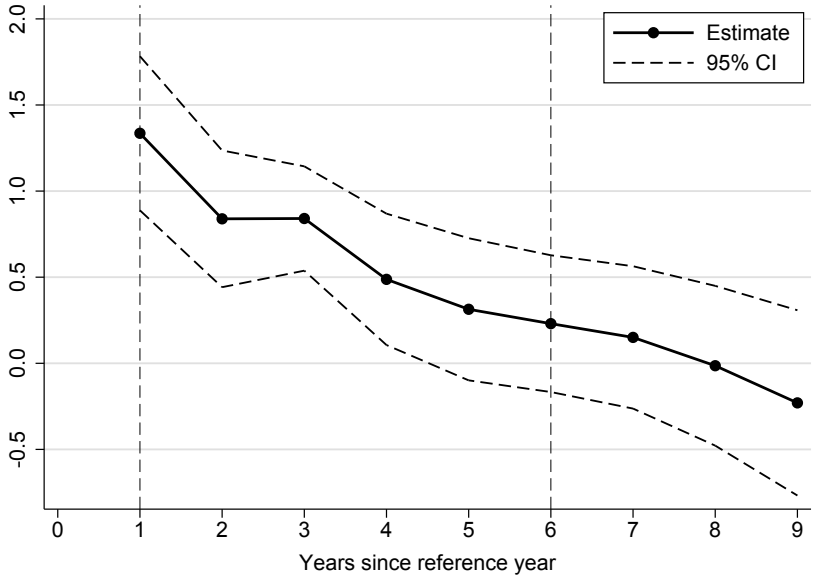
Notes: The figure shows the estimated log differences in real gross earnings (a) and average real labour cost (b) between groups of individuals who were affected differently by the increase in the pension SSCs for non-executives between 2000 and 2005. The vertical dashed lines denote the reform years (start and end). The difference-in-differences estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year and at least another year. The treatment group includes individuals whose gross earnings in 1999 was 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose gross earnings in 1999 was 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The solid lines show the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in the reference year (1999). The dashed lines show the 95 percent confidence intervals around the estimates.
Sources: DADS Panel 2010; TAXIPP 0.4.

Figure B2: Reform 3: Estimated Employer Share of Incidence (zh)

(a) Log Difference in SSC Rates (First Stage)



(b) Employer Share of Incidence (2SLS)



Notes: The figure shows the estimated share of the increase in SSCs that was borne by employers following the increase in the pension SSCs for non-executives between 2000 and 2005, over a period up to 8 years after the reform. The difference-in-difference estimation is performed on an unbalanced panel of individuals who are observed in the last pre-reform year (1999) and at least another year. The vertical dashed lines denote the reform years (start and end). The treatment-control assignment is based on the reform-induced variation in average SSC rates. The treatment group includes individuals whose gross earnings in 1999 was in the range of 1 to 1.4 times the SST that year. These workers experienced an increase in their average SSC rate due to the reform. The control group includes individuals whose labour cost in 1999 was in the range of 0.9 to 1 times the SST that year. These individuals did not experience a change in their average SSC rate due to the reform. The first stage estimates (reform's impact on $\log(1 + \text{SSC rate})$) are shown in upper panel (a) and are obtained from the parameter estimates on the interaction between the treatment group and year dummies, which is normalized to zero in 1999. The estimated employer share of the incidence is shown in the lower panel (b) and is obtained from a 2SLS regression of log(labour cost) on $\log(1 + \text{SSC rate})$, where $\log(1 + \text{SSC rate})$ is instrumented by the interaction between the treatment group and year dummies. The solid lines show the estimates while the dashed lines show the 95 percent confidence intervals.
Sources: DADS Panel 2010; TAXIPP 0.4.