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Economics of Labour Income Taxation: Inequality and Redistribution

Économie de la fiscalité des revenus du travail : Inégalité et redistribution

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Résumé en français

Cette thèse examine l'effet du système fiscal et social sur la distribution des revenus, en s'intéressant particulièrement aux revenus du travail. Elle est composée de quatre chapitres traitant de l'impact de la fiscalité dans le contexte français. Elle propose une analyse empirique s'appuyant sur des données administratives nouvellement disponibles .Elle contribue à la foi au champ de l'économie du travail et à celui de l'économie de la taxation en mettant en valeur leur complémentarité sur les questions et les méthodes. Ainsi, il est montré comment les analyses du marché du travail, dont la théorie repose sur les revenus primaires (ou avant impôt), gagnent à clarifier le concept effectivement étudié empiriquement et à prendre en compte la taxation des salaires. Symétriquement, l'étude de l'impact de la taxation de salaires des plus riches est enrichie lorsqu'on les considère dans le contexte de la relation entre employé et employeur.

La première partie propose une méthodologie dont l'objectif est de décrire de l'impact redistributif du système fiscal et social français. Il s'agit de la microsimulation, une technique consistant à simuler les taxes et les transferts à partir d'un échantillon représentatif de la population française. Le modèle se caractérise par sa cohérence avec les comptes nationaux et par une analyse détaillée du haut de la distribution des revenus. Le modèle surmonte en les limites liées à l'utilisation des données d'enquête en s'assurant que la somme des revenus est cohérente avec le revenu national et que cette somme englobe tous les types de revenus, même s'ils ne sont pas observés.

Le chapitre 1 présente est avant tout méthodologique. Il présente le foncionnement, les résultats et les limites d'un modèle de microsimulation. Ce modèle propose une décomposition au niveau individuel des recettes fiscales provenant des comptes nationaux.En particulier, la sensibilité des résultats à certaines incohérences dans les différentes sources agrégées utilisées pour l'imputation est discutée.

Le chapitre 2 offre un exemple de l'utilisation du modèle. Il analyse l'impact des politiques fiscales mises en place en réponse à la crise de 2008 en France. Il englobe à la fois une analyse macroéconomique et une analyse microéconomique, s'appuyant sur les documents associés aux lois de finances et sur le modèle de microsimulation. L'étude révèle que la baisse des dépenses publiques a été a été le principal outil de politique publique mobilisé en réponse à la crise, bien qu'aucune réforme systémique de l'organisation des dépenses n'ait été réalisée.

La deuxième partie de cette thèse porte sur le processus de taxation des revenus du travail et s'appuie sur la méthodologie décrite dans la première partie. Les questions et les mé-

thodes abordées se situent à l'intersection de deux littératures académiques, celle de l'économie de la taxation et celle de l'économie du travail. Le chapitre 3 étudie la distribution des salaires dans sa globalité alors que le chapitre 4 se concentre sur les salaires les plus élevés (0.01 % de la distribution).

Le chapitre 3 montre que la taxation des salaires joue un rôle important dans les analyses du marché du travail. Il s'inscrit directement dans le débat opposant des explications de l'augmentation de l'inégalité salariale liées à la demande de travail, tel que le changement technologique, à des arguments s'appuyant sur le rôle des institutions. Ce chapitre contribue au débat en important un autre facteur explicatif venant de l'économie de la taxation. Il documente une augmentation des inégalités de coûts du travail d'environ 20% depuis 1976, apparemment en contradiction avec la stabilité des inégalités de salaires nets observée en France. La différence entre les deux mesures d'inégalité vient des cotisations sociales, dont des réformes ont petit à petit augmenté leur caractère redistributif. En raison de cette augmentation des inégalités des coûts du travail, la France ne peut plus être utilisées pour invalider les arguments selon lesquels la hausse des inégalités de salaire s'explique par des changements dans la structure de la demande de travail. L'importance des cotisations de sécurité sociale illustre ainsi le fait que des facteurs institutionnels, comme la fiscalité, peuvent avoir de puissants effets sur l'évolution des inégalités de revenus pré et post taxation.

Le chapitre 4 étudie l'impact de la taxation des revenus du travail au sommet de la distribution des salaires. L'analyse empirique met à profit une variation quasi-expérimentale créée par l'introduction de la taxe de 75% en France. Il s'agit d'une taxe temporaire qui a fait passer le taux d'imposition marginal supérieur de 64% à 75% sur les salaires supérieurs à un million d'euros de salaire brut. Je simule cette taxe sur les données administratives de sécurité social recouvrant l'ensemble des salariés en France. En regroupant les salariés les plus riches par groupes de même nombre d'individu et en omparant l'évolution de leurs salaires je montre que la taxe a été supportée à 80% par les employeurs. Il est dès lors également possible d'estimer l'élasticité du coût du travail et du salaire net à la taxe. L'effet de l'impôt a transité par une diminution du salaire net pour les cadres alors que les PDG et leurs adjoints ont vu une diminution plus faible du salaire net associée à une augmentation du coût du travail. Quant aux joueurs de football, ils ont été en mesure de faire payer à leurs employeurs la totalité de la taxe. Ce chapitre montre comment une taxe sur le salaire des plus riches se répercute sur leur salaire selon leur position dans l'entreprise .

Discipline : Sciences économiques
Mots clefs : Coût du travail, France, Impôt, Incidence, Inégalité, Microsimulation, Réponse comportementale

Summary in English

This thesis examines the role of the tax-and-benefit system on the income distribution, with a focus on labour incomes. It is composed of four chapters dealing with the empirical impact of taxation in the French context. I propose an empirical analysis relying on newly available administrative data, which allows me to study more precisely the impact of taxes at the top of the wage distribution. I build upon insights from the labour economics and from the public finance literature. I introduce taxes in the labour market approach, which focuses on primary (or pre-tax) incomes.

The first part proposes a methodology for the analysis the redistributive impact of the fiscal and social French system. It relies on microsimulation techniques, consisting in a static model simulating taxes and benefits applied to a representative sample of the French population. The model is characterized by its consistency with national accounts and by a detailed analysis of the top of the income distribution. Importantly, the model overcomes limitations related to the use of survey data by ensuring that the sum of incomes is consistent with the national income and that high incomes encompass all types of income even if not observed.

Chapter 1 presents the microsimulation methodology, results and limitation. The model proposes an individual-level decomposition of tax revenue from national accounts. and discusses the sensitivity of the results to the underlying incidence assumptions. Some limitations due to inconsistencies in the different aggregated sources used for imputation arise.

Chapter 2 analyses the impact of the post-2008 crisis political responses in France. It encompasses both a macro and a micro analysis, relying on the analysis of documents associated to the Budget Laws and on the microsimulation model. The study reveals that the decrease in public spending was the main political channel of response although no systemic reform of the organization of spending was made.

The second part focuses on the taxation of labour incomes. The questions and the methods tackled are at the intersection of the public finance and the labour economics literature. Chapter 3 studies the overall wage distribution whereas chapter 4 focuses on the very top wage earners (top 0.01% of the distribution).

Chapter 3 demonstrates that taxes on earnings can play an important role for the labour market analyses. The chapter directly belongs to the long standing debate opposing market-based versus institution-based explanations for the increase in wage inequality. It contributes to it by importing another explaining factor from the economics of taxation. The chapter documents an increase in labour cost inequality seemingly at odds with the stable net wage inequality observed in France. The main finding is that primary wage inequality on the labour

market did increase in France, by about 20% since 1976. This result comes from the comparison of inequality measures before and after social security contributions and was achieved by computing forty years of social security contributions based on payroll tax data. Because of this increase in labour cost inequality, France cannot stand any more as a counter-example to demand-side explanations for the rise in inequalities. The importance of SSCs exemplifies the fact that institutional factors, like taxation, can have powerful impacts on the evolution of net wage inequality.

Chapter 4 studies the impact of a wage tax at the very top of the distribution on the wage setting process of top labour income earners. I use a quasi-experimental variation created by the introduction of the 75% tax above in France. This is a temporary tax (2013 and 2014) on labour income, which increased the top marginal tax rate from 64% to 75% on wage above one million euros of gross wage. Simulating this tax based on payroll and firm tax data, I show that the tax was borne at 80% by employers. I estimate a negative elasticity of the labour cost and a positive elasticity of the net wage to the tax. The effect of the tax transited through a decrease in net wage for managers whereas CEOs and deputy CEOs saw a smaller decrease in net wage associated to an increase in labour cost. Football players have been able to make their employers pay for the totality of the tax. The chapter sheds a new light on the taxation process of the very top of the labour income distribution, by focusing at an income level that had never been reached before. It also studies the impact of taxation on the interaction between the firm environment and the workers.

Field: Economics
Key words: Labour cost, France, Taxation, Incidence, Inequality, Microsimulation, Behavioural response

General outline

Main introduction

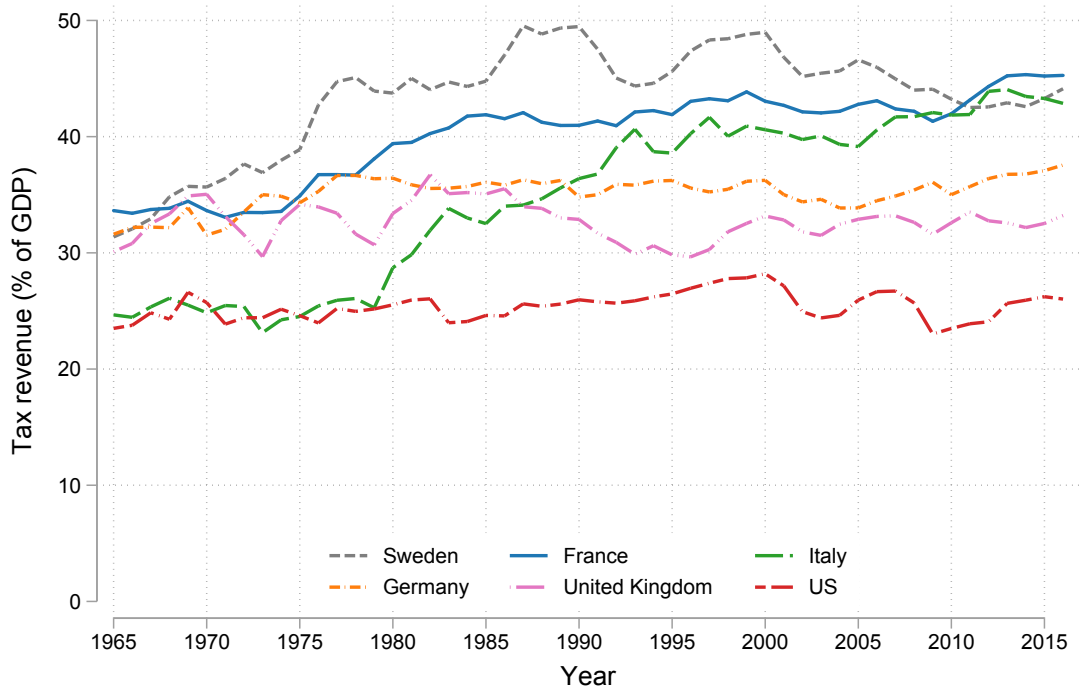
Note: on the man's pack: "750 taxes, people". On the anchor: "Anchor of mercy".
Source: "Sept cent cinquante impôts m'écrasent", BNF, Estampes, QB-1 (1799-11-10)-FOL.

The engraving in epigraph was made in 1799 when the French fiscal State recovered a viable fiscal system after the destruction of the *Ancien Régime*. It pictures a muscular fisherman who literally bears the burden of 750 taxes and who is to be drawn by the "anchor of mercy". This allegory of the economic burden of taxes falling on workers finds an echo today. With tax revenues reaching almost 45% of GDP in 2016 in France, the impact of taxation on the distribution of incomes, and its impact on wages in particular, is more than ever a topical question. Understanding who pays the taxes and how taxes affect the primary distribution of incomes is a question of first importance, both in economics and for the public policy debate.

This question is all the more crucial in the current context where inequality increases again whereas taxation is less and less progressive. Indeed, income inequality has increased in many countries during the last forty years. The diversity in the trends and levels of this inequality calls into question the different theories explaining this increase. Several explanations, among which globalization, immigration, technological change, rent-extraction and

the retreat of the State have been put forward. Taxation has been one of the many possible political responses to this increase, ranging from border shutdown to new education policies. I concentrate on the taxation response, which is the most direct institutional tool reshaping the income distribution. It has also known considerable spatial and time-based variations. For example, France experienced an increase in tax revenues from 34% of GDP in 1965 to 45% of GDP in 2016, a level in line with a few other OECD countries, such as Sweden and Italy (see figure 1). However, an essential difference between France and most of OECD countries comes from the importance of social security contributions relative to the income taxes. Indeed, the French social welfare system has historically been designed based on a social insurance model whereby workers would be taxed to fund the social security rights. The schedules of the social security contributions (SSCs) and of the income tax have been subject to many changes since the 1970s. Revenues from SSCs have become increasingly important, and at the same time, the SSCs schedule became more and more progressive. The prominent role of labour income taxation in France and the fundamental changes that occurred since the 1970s motivates me to put it at the center of my thesis. France does not only constitute an original case study. It also exemplifies the impact of high labour income taxes at a country scale, broadening the scope of the analysis.

Figure 1 – Tax revenue as a share of GDP (1965-2016)



Source: OECD.

Studying the impact of taxation requires comparing the observed impact to the purpose of taxation. Standard economic theory shows that taxes introduce distortions from the markets' prices and quantities, leading taxes to decrease the volume of exchanges. This observation leads Musgrave (1959) to decompose the purpose of taxation into three canonical categories. According to the first objective, a tax should have the smallest possible effect on the allocation of resources for a given tax revenue target. The second objective of taxation is to contribute to income redistribution. These two competing aims[1] are known as the efficiency-equity trade-off. The total amount of tax revenue and the extent of the redistribution achieved by the tax remain historical and political decisions. Documenting the evolution of the distributional impacts of taxes constitutes the first general objective of the thesis.

Yet, the canonical trade-off is can be more precisely defined in the context of labour income taxation. Standard labour economics models of supply and demand describe the wage setting process which would account for the observed increase in labour income inequality. In these models, the wage derives only from market forces and the role of labour taxation is overlooked. It is on the contrary central in the public finance literature, and even more in the field dedicated to identifying the incidence of taxes. Indeed, depending on who actually ends up paying the tax, the distributive implications differ significantly. A second transversal axis of the thesis consists in bridging this gap between labour economics and the public finance field by showing how primary income inequality are affected by the interaction of standard market forces and taxation.

The study of the impact of taxes is further complicated when it comes to top earners. On the one, labour economics studies the wage setting process of top earners as part of the employer-employee relationship. Yet, the literature concentrates on labour income and does not tackle potential optimisation behaviour. On the other hand, a strand of the public finance literature is dedicated to identifying behavioural responses to taxation. Top income earners demonstrate larger behavioural responses than the rest of the individuals. The third major pivotal question consists in studying taxation of the very top labour income earners by addressing both the employment context and the possibilities of tax avoidance.

The objective of my thesis is to contribute to the analysis of the impact of taxes on labour from a positive perspective. I propose an empirical analysis of the impact of taxes on the income distribution. The quantitative investigation relies on newly available administrative data, allowing to study more precisely the impact of taxes at the top of the wage distribution. I intend contribute both to the public economics field and to the democratic debate.

The thesis is composed of four chapters dealing with the empirical impact of taxation in

[1] The macro-economic stabilization is the third objective of taxation proposed by Musgrave (1959)

the French context. Although the chapters are independent from each other, they share an overall common approach and aim at answering at the same question: how can new sources of data contribute to improving the understanding of the impact of the tax system in order to possibly derive positive policy recommendations? My answer builds upon insights from the labour economics and from the public finance literature.

In the introduction, I first provide an overview of labour taxation in France and of its recent evolutions. Second, I give a broad overview of the literature on which the thesis stands in order to highlight my contributions in a third part. In the fourth and last part of the introduction, I present the outline of the thesis.

1 Overview of labour taxation in France

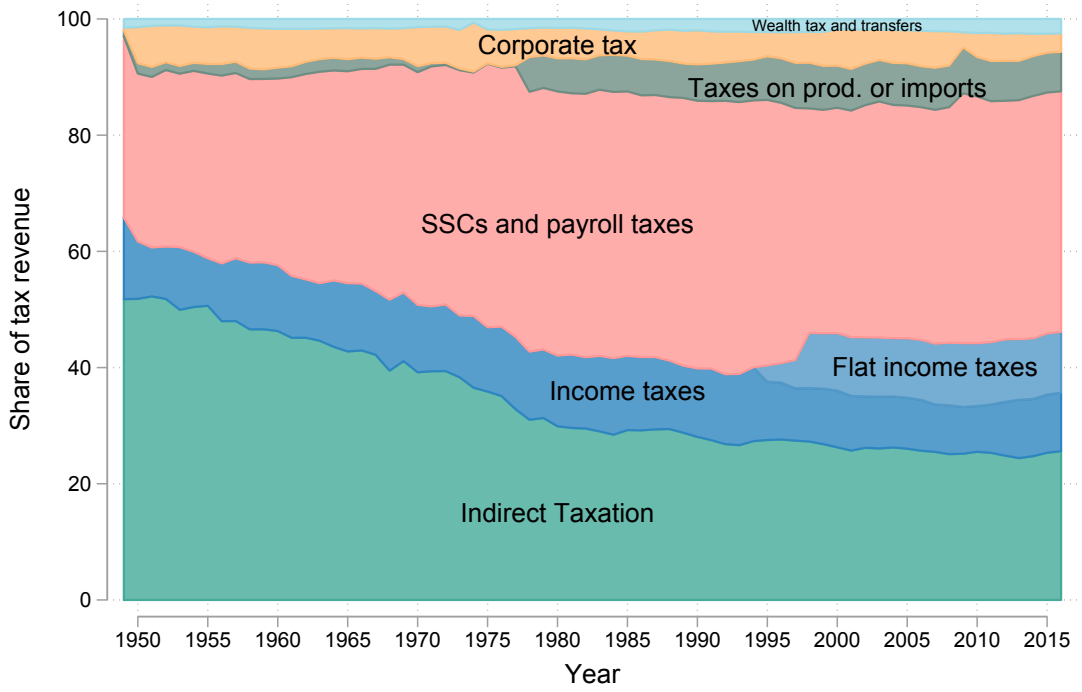
Taxation of earnings in France is mainly driven by the social security system, that took its modern form at the Libération in 1945. The reconstruction of the State in the aftermath of World War II favoured the emergence of novel and ambitious ideas. The global social security system covers workers and their families against any risk that would affect the work capacity and is financed by social security contributions. As a result, France has among the largest taxes on labour as a percentage of GDP among OECD countries, hence the relevance of studying wage taxation in that context. I first describe the different types of taxes on labour income and their relative importance. Second, I outline the main evolutions of these taxes since 1945.

1.1 Tax revenue and labour income taxation in France

Tax revenue as a share of GDP is a usual measure aiming at comparing different tax-and-benefit system in time and across country. Figure 2 presents the evolution of the composition of tax revenue in France since 1949. If indirect taxation was the main source of tax revenue in 1949 (50%), its contribution decreased up to 25% of tax revenue in 2016. This was offset by an increase in the share of social security contributions and payroll taxes that grew from 30% in 1949 to more than 40% in 2016. The third element by importance in terms of tax revenue is the (labour and capital) income taxes, which amount today to about 20% of tax revenue. Yet, the creation of a flat income tax in 1991 fundamentally modified the structure of taxation by introducing a new way to fund social protection in France.

There are three main types of taxes on earnings in France in 2018. The first one are the social security contributions (SSCs), divided into employer and employee SSCs. In that category I also include other payroll taxes that are not affected to the funding of the social se-

Figure 2 – Decomposition of the tax revenue (1949-2016)



Sources: national accounts (table 7301, table 3216 after 1995); *Annuaires statistiques de la France* 1948-1988 (table 3) and 2007 (table J.03-6).

curity because they share the same tax base[2] . On figure 2, they correspond to the "SSCs and payroll taxes" category.

Second, wages are subject to the standard progressive income tax on a tax base less inclusive than the gross wage. Indeed, fiscal households can deduce business expenses (itemized or flat-rate allowance) as well as other deductions to the income tax base. Third, a flat income tax (*contribution sociale généralisée*, CSG) was introduced in 1991. The coexistence of a both a flat and a progressive income tax had been the norm ever since the creation of the income tax in 1914 and until 1959 when the flat part of the schedule was dropped. Thus, with the CSG, a flat tax is reintroduced but it is much less salient than the income tax is, as it is directly levied from the payroll), and does not suffer from the many tax loopholes of the progressive income tax. As a result, the CSG tax revenue progressively increased and is today almost equal to the income tax revenue.

[2]Taxes on payroll correspond to the national account category *taxes sur les salaires et la main d'œuvre*. For example, the apprenticeship taxe, the tax on payroll, the contribution to the National Fund for Housing Assistance (FNAL) and the *versement transport* are taxes on payroll.

1.2 Social security since 1945: creation and evolutions

Social security contributions constitute the major component of labour income taxation and have undergone large evolutions. The social security system is characterized by the existence of several regimes and many different types of contributions. Workers contribute to the regime that is specific to the sector of their firm. When the main regime was created in 1945, it was intended to incorporate all workers in a unified framework. When extended to the farming sector and to the self-employed it did not result in a unique and comprehensive regime but rather in a constellation of different regimes. Overall, the tax schedule depends on tax rates applied to tax brackets whose thresholds are multiple of the "social security threshold" (SST). The tax base is the gross wage (or posted wage). The contributive part of SSCs gives rights to incomes differed in time, such as unemployment and old age pensions, of which amount depends on the amount contributed. The non contributive part of SSCs funds benefits that do not depend on the amount contributed, such as family and health contributions.

Since the 1970s, wage taxation in France underwent a series of reforms that increased the progressivity of SSCs and decreased the weight of the progressive income taxes. First, employer social security rates, which applied under the part of the gross wage inferior to the SST, were progressively applied to the totality of the wage. Second, some non-contributive employee social security contributions were transformed into a new flat income tax, whose tax base is larger than wages and encompasses labour and capital income. This constituted a first step toward changing the paradigm of 1945 on which stands social security. Indeed, social security from then was not to be financed anymore only by labour incomes. Third, starting in 1993, a series of reductions of employer SSCs applied on low incomes, simultaneously with an increase of minimum wage. These reforms increased the net wage at the level of the minimum wage without increasing the labour cost. They also had a redistributive purpose by increasing the progressivity of the SSCs schedule. The reductions were financed by public spending, decreasing again the share of social security spending financed by labour income.

At the origin, the French social security system was designed according to the principles of the bismarckian model of social protection system. Yet, the system relies more and more on fundings from the income taxes, which gives it a beveridgian component as well. This dual affiliation to canonical models of social insurance attests the peculiarity of the French social security system.

2 Literature review

Whereas income inequality increased during the last thirty years in the United States, it stayed relatively stable in Europe (Alvaredo *et al.*, 2018). This differential evolution questions the determinants of inequality. Many other factors can affect inequality trends, among which technology or globalisation. After documenting recent evolutions of inequality, I present the literature aiming to explain these evolutions. I then turn to questions more specifically linked to taxation.

2.1 Documenting the increase in inequality

Starting with Kuznets and Jenks (1953), a strand of literature aiming at describing the long term evolution of income inequality emerged. The field experienced a rebirth with Piketty (2001) and rapidly grew up to reaching a new step with the WID.world project (World Wealth and Income Database) and its companion website (`http://wid.world`) with time series on pre-tax income shares by country. This literature is based on a main inequality measure, the share of income accruing to a specific group among the total amount of income. The underlying income concepts, the pre-tax income, is both consistent with national income from the national accounts and with the income distribution as observed in fiscal documents.

Evolution of income inequality

In a survey of the literature on the long term evolution of inequality in the 20th century, Atkinson *et al.* (2011) compare the evolution of top income shares across countries. They show that most countries experience a common decrease in income inequality during the first half of the century due to major historical events such as the two world wars and to the depression of 1929.

The dynamics evolution of income inequality haved diverged across countries starting in the 1960s. It increased in English-speaking countries (Piketty and Saez, 2003) but remained roughly stable in European countries (excluding the United Kingdom). In France, Piketty (2001) documents the evolution and dynamics of income inequality, showing how the progressivity of the French fiscal system prevented the rise in capital income inequality. Garbinti *et al.* (2017) build on this previous work, improving the methodology, and show that income growth has been three times larger in the very top percentiles of the income distribution (3%) than in the rest of the income distribution since 1983.

The underlying methodology relies on the use of aggregate and individual tax returns data and national accounts. It consists in computing time series of income shares accruing to certain groups of individuals, based on incomes consistent with national accounts' concepts.

Inequality at the top

The top of the income distribution has received substantial academic attention. Of course, the fact that top earners bring a large share of tax revenue justifies this interest. This renewed interest is also explained by the fact that top income shares started to increase again in the United States in the 1980s, as underlined by Alvaredo *et al.* (2013). Top income shares are the main measures of the evolution of inequality.

The relative importance of capital or labour income contribution to inequality evolved over time. If capital income was overwhelmingly important in explaining total inequality at the beginning of the 20th century, the capital destruction caused by the two World Wars and the high level of taxation undermined the importance of capital in the total income of the richest for a long time (Piketty and Saez, 2003). Yet, this trend seems to have turned (Piketty, 2013), with a coming back from capital income.

In the meantime, labour income contributed significantly to the recent increase in inequality. Piketty and Saez (2003) show that wages played a major role in the increase of the top 1% share observed since the 1980s. They emphasize the role of what they call the "working rich"[3], a population of individuals earning such high wages that they reach the top of the wealth distribution with no other sources of incomes. Godechot (2007) (updated by Godechot (2017)) studies an example of a "working rich" population, the financial industry. He provides both an extensive fieldwork and a quantitative analysis on the wage setting and bonus attribution processes. Growing availability of administrative data allows him to study more precisely the factors at play in the increase in income inequality. For example, he uses payroll tax data to study the role of the financial sector in the evolution of wage inequality (Godechot, 2012), showing that the financial sector contributed to 48% and to 57% of the rise of the top 0.1% and top 0.01% income shares between 1996 and 2007.

2.2 Explaining the increase in wage inequality

The increase in wage inequality observed in many OECD countries since the seventies gave rise to a strand of the labour economic literature dedicated its causes. I decompose the explanations according to the part of the labour income distribution they target. I present first the theories addressing the increase in inequality of the whole income distribution. I focus then on the arguments specifically addressing the inequality increase at the top of the labour income distribution.

[3]Term employed by *Forbes* magazine according to Godechot (2017) and opposed to the "working poor".

Inequality among the bottom 99%

Two main families of explanations for the increase of income inequality on the labour market are traditionally opposed.

The first set of theories considers that the demand-side of the labour market is the main driver of the increase in inequality. The central factor at play is technological change. The skill-biased technological change assumption, which has it that technology affects the organisation of labour and increases the need for skilled labour relative to unskilled labour, constitutes a first interpretation of this explanation. This assumption has now been tested several times (Katz and Murphy, 1992; Card and Lemieux, 2001) and for several countries: Autor *et al.* (2008) for the United States, Dustmann *et al.* (2009) for Germany, Lindley and Machin (2011) for the United Kingdom. Recently, another explanation emerged from the same trend: technological changes would cause a job polarization (Autor *et al.*, 2006; Hunt and Nunn, 2017), with fewer jobs in the middle of the distribution relative to the low-wage low-skilled and high-wage high skilled jobs.

A second strand of explanations has it that institutional factors such as the minimum wage (Card and DiNardo, 2002) and unions (Fortin and Lemieux, 1997) played an important role in the increase in inequality. With Autor *et al.* (2008), a consensus toward demand-side explanations emerged in the literature.

Focus on the role of top wage earners

If the previous factors influence the evolution of the whole labour income inequality, top earners recently drove the increase in inequality. The explanations for the wage increase of top earners can also be classified into two main categories, opposing market-based and institutional-based arguments.

A first set of explanations develop arguments relying on the determinants of the supply-and-demand for top wage earners. Gabaix and Landier (2008) proposes a model of the competitive labour market of CEOs where the firm size explains the large differences in pay. In that context, the increase in firm sizes caused by increases in market capitalization would explain the increase in CEOs' pays. The same technological argument than before applies to top wage earners. Kaplan and Rauh (2013) provide evidence in line with the skill-biased technological change, showing that higher returns to skills were particularly important for top wage earners.

A second set of arguments highlight the role of institutional factors. According to Bertrand and Mullainathan (2001), firm's governance plays an important role as CEOs would be more able to capture profit unrelated to their actions in poorly governed firms. The level of taxation can also be considered as an important institutional factor affecting the wage setting

process of top wage earners. Piketty *et al.* (2014) show that lower top tax rates increase the bargaining power of top wage earners.

The rapidly expanding documentation of the evolution of inequality brought back on the research agenda the controversy on the economic factors affecting labour income distribution. Yet, one classic explanation in the public finance literature is too often set aside by the labour economics literature. Indeed, taxation on the labour market is a potential driving force of the evolution of wage inequality. The next section is dedicated to presenting the questions and problematics from the taxation literature relevant for the study of the wage distribution.

2.3 The impact of wage taxation

The extent to which taxes and benefits policies succeed in reducing post-tax income inequality is an empirical question. The direct effect of a policy might be counteracted by its impact of the behaviour of agents (individual and firms for example). Moreover, some political tools might be more effective than others for attaining a same level of redistribution. As an illustration, Doerrenberg and Peichl (2014) show using a cross-country analysis that social expenditure policies are more effective at reducing inequality than progressive taxation because of behavioural responses. Evaluating the impact of wage taxation relies on complex models and numerous assumptions. I first expose a methodology used for assessing the redistributive impact of taxes and benefits. I then present the findings of the literature regarding the two main assumptions underlying the previous methodology, tax incidence and the behavioural responses to taxes.

The redistributive impact of taxes and benefits

Assessing the redistributive impacts of taxes requires first to describe the taxes paid depending on the income amount, the income type and on some demographic characteristics. This is commonly achieved by micro-simulation models.

Invented by Orcutt (1957), micro-simulation is a method aiming to empirically look at the theoretical impact of change on a given population. Typically, micro-simulation methods are used to study *ex-ante* the impact of a tax change on the distribution of individual income. Models are static when there is only one period and dynamic when encompassing several time periods. First order effects of policy changes are given by their direct impact on the individual disposable income. For that purpose, every model relies on incidence assumptions regarding the range of taxes and benefits implemented. Yet, reforms can also have second order effect when triggering changes in behaviour. Behavioural modules relying on

behavioural assumptions can be incorporated to micro-simulation models in order to encompass these side effects. The underlying assumptions ruling the tax incidence and the behavioural responses are of major importance. They must be clearly stated and discussed.

Another important feature of a micro-simulation model is whether or not it is consistent with national accounts. Such a consistency ensures that incomes and taxes are in line with the amounts from the national accounts. This is useful for estimating the closest aggregate effect of a reform.

The incidence of wage taxation

The theoretical literature on incidence shows that even if a tax is legally borne by individuals or households, the economic incidence differs from the legal one. Models solve the puzzle of the economic incidence in theory (see Fullerton and Metcalf (2002) for a review of the theoretical models in partial and general equilibrium) but there is no empirical consensus on this important question of public economics.

The question is particularly relevant regarding wage taxation. Indeed, payroll taxation is legally paid by employers for employer social security contributions and by employees for employee social security contributions. Yet, the economic incidence is not necessary equal to the nominal or legal incidence. The theoretical incidence depends on the elasticity of supply and demand for labour. Empirical evidence on the incidence of taxation on labour supply and wages is still scarce and there is no consensus. The recent literature uses micro data and exploits social security reforms. But evidence goes from full-incidence on employers (Saez, Matsaganis and Tsakloglou, 2012) to full-incidence on employees (Gruber, 1997). New contributions are made by focusing on the working context or on the specificities of the taxes. For example, Saez *et al.* (2017) shed light on the importance of the firm environnement. They rely on the introduction of an age-dependent payroll tax rate cut and show that the incidence was fully on employer but that the reform also had employment effect and firm-level effects. Further, the incidence of difference taxes on a same income might differ, as shown by Lehmann *et al.* (2013). The tax-and-benefit linkage seems also to matter (Iturbe-Ormaetxe, 2015; Bozio *et al.*, 2017).

Estimating behavioural responses to taxation

Behavioural responses are inherent to taxation and should be taken into account both in theoretical models deriving optimal tax schedules and when designing public policies. They can be decomposed into three main categories. The labour supply is a first channel of real economic response encompassing changes in hours worked, migration (Kleven *et al.*, 2013, 2014) and work effort. Optimisation behaviours go through time-shifting of income (Goolsbee, 2000; Kreiner *et al.*, 2016), income-shifting (Pirttilä and Selin, 2011; Harju and Matikka,

2016) or the use of deductions. A last possible response consists in evading the tax, which is not legal, as opposed to optimisation.

Rather than studying each response individually, the new modern public finance literature focuses on a central parameter, the elasticity of taxable income (ETI) with respect to the net-of-tax rate[4]. The ETI encompasses the total behavioural responses to tax rates. Since the seminal contributions of Feldstein (1999), this strand of literature has evolved. The recent developments were surveyed by Saez, Slemrod and Giertz (2012) in a comprehensive literature review. This section reviews some aspects of the recent literature with a specific focus on top income earners.

Sufficient statistic One of the motivations for estimating the ETI is that this parameter would be a *sufficient statistics* for welfare analysis under some assumption[5]. Feldstein (1999) proposes a theoretical framework where estimating only the ETI parameter is sufficient for estimating the dead-weight loss of income taxes.

The sufficient statistic concept is at the heart of the methodological debate opposing structural versus reduced-form methods in policy evaluation. The first approach focuses on the estimation of primitives of a theoretical model and uses the result to simulate the impact of policies on welfare. The second approach relies on exogenous sources of variation for identifying causality. While structural approaches often require very strong assumption, reduced-forms approach are subject to critique à la Lucas since estimates are doomed to depend on the policy context.

The interest for the sufficient statistic approaches in public economics came back with Chetty (2009). This article contributes to bridging the gap between the two paradigms by showing how the applied economics literature has made the synthesis between the two methods. Recent developments in this literature provide extension of the theoretical models such as Kroft *et al.* (2017) and highlight some caveats. For example, Doerrenberg *et al.* (2017) show that for tax systems with deductions, the ETI might not be a sufficient statistics if the tax deductions are assumed to generate externalities and if deductions are responsive to tax changes.

Data and estimation strategies The ETI generally is estimated by difference-in-difference methods relying on three different types of data. The first evidence relied on time series of income shares. The increasing availability of micro files of income tax returns led to cross-sectional and panel data analyses.

Two main identification problems arise. The first one comes from the endogeneity of the

[4] One minus the marginal tax rate.

[5] A statistics is said to be sufficient when no other parameter from a theoretical model bring additional information.

tax rate. Auten and Carroll (1999) address this issue and propose an instrumentation strategy based on the predicted net-of-tax rate based on previous year income. A second issue arises with strategy based on panel data, the mean-reversion issue, and is particularly problematic for the richest individuals. Weber (2014) compares the existing strategies and proposes a new method for panel data addressing both identification threats.

Results Thus far, ETI estimates range between 0.1 to 0.8 and are heterogeneous in the populations. Self-employed are among the more responsive. Top income earners also demonstrate larger responses, optimisation and avoidance.

This section gave a broad overview of the questions, the findings and the methods I rely on, mixing imports from the public finance and the labour economics fiewlds.

3 General problematic

The previous section gave a broad overview of the literature on which the thesis stands. The aim of this section is to state how this work fits in and contributes to this literature. I show how I connect the labour economics and the public finance literature, relying on the use of administrative data.

3.1 Pre-tax versus post-tax earnings concepts

The labour economics literature develops arguments tackling the increase in pre-tax inequality. Indeed, the set of explanations emphasizing the role of the demand-side of the labour market implicitly relies on a comprehensive wage concept. For example, the theoretical framework developed to test empirically for the existence of a skill-biased technological change relies on the equalization of workers' wage and marginal productivity. In the real world, the closest concept to the theoretical wage is the labour cost wage. Even if it is not made explicit in the literature, the concept of labour cost applies well in theoretical models. Yet, labour costs are more often then not unavailable when it comes to testing the models, and the empirical analyses rely on the data which is available. Most of the time, administrative data contain information on posted wages only whereas survey data inform about net wages.

This is precisely where insights from the public finance literature can help filling this empirical gap. Indeed, this literature focuses on the wedge introduced by taxes between the pre-tax and the post-tax income. The pre-tax and post-tax concepts are constitutive of

the fields and of the methodologies developed, such as microsimulation. By using the microsimulation methodology from the public finance literature I contribute to the strand of the labour economics literature focused on explaining market wage inequality by simulating labour cost. Disentangling between the net wage and the labour cost in the empirical analysis does not only consitute a methodological argument. It also introduces a fundamental difference between the concept of earnings relevant from the employer's and from the employee's point of view. The introduction of a discrepancy between the two wage concepts is new to the labour economics literature, that focused on a simpler and unique market wage.

Another way of stating this point is to emphasize the role of taxation, which is at the root of the difference between the net wage and the labour cost. More precisely, the difference between the labour cost and the net wage comes in France from social security contributions and from the flat income taxes[6]. Enriching the analysis with this dual wage concept has an impact if the labour cost and the net wage did not evolve in a parallel fashion. In most countries, their long-term evolutions did not differ, or at least did not differ according to the income level. Yet, France experienced large reforms of SSCs since the 1970s that increased their redistributive power. I contribute to the literature by documenting the impact of the evolution of the legislation on SSCs on the pre- and post-tax labour income inequality.

The argument in favour of the differentiation between the labour cost and the net wage is likely to have a long term impact on the labour economic field as it is relevant for any theoretical model of the labour market. Yet, the simulation of labour cost comes at a high fixed cost, which values all the more this contribution.

3.2 Overall earnings distribution versus top earners

The empirical public finance literature aims to assessing the redistributive power of the tax system, tackling the question of incidence and of behavioural responses. Top income earners are shown to be the most responsive to taxation. The literature mainly relies on the evolution of the income shares accruing to individuals at the top of the distribution, relating them to the marginal rate of taxation. The findings disentangle between several forms of behavioural responses and different types of incomes. Yet, little is known about the specific context in which these top earners evolve, except for very specific individuals (football players for example). The top of the income distribution is often opposed to the rest of the distribution. Yet, the threshold between these two categories is often ad hoc and the categories are essentialized. Because the administrative data do not contain non tax related information, the

[6]The most relevant economic concept would be to consider a net wage that is also net of the income tax. Yet, due to the fact that the income tax base also encompasses other incomes and that the tax schedule is based on the whole household composition, I keep the previous net wage concept and define a "net-of-income tax wage", that will rely on a simpler computation of the income tax.

literature cannot detail characteristics of responsive population, such as the occupation, the educational attainment or the employment sector.

Conversely, the labour economics literature studies top labour income earners in their working environment. For example, a large strand of literature focuses on the determination of CEOs' pay in the context of the firm. I use this approach where workers belong to the firm context in order to shed a new light on the taxation process of individuals at the very top of the earnings distribution. This allows me to enrich the classical public finance questions by encompassing the worker-firm relationship. Especially for top earners, firm outcomes and choices can be an important channel of response to taxes.

3.3 Administrative data

The use of administrative data has been driven by increasingly facilitated access to researchers. They provide new sources for the empirical assessment of the evolution of earnings and gave rise to the development of new methodologies.

The literature on inequality and taxation now relies on administrative tax data that are crucial for assessing correctly the level of inequality because they are not subject to the under-declaration of income as standard surveys are. They also cover accurately the top of the income distribution and provide details on the income type. The labour economics literature also saw an increase in the use of administrative data, with the use of matched employer-employee datasets. The main interest of these data is to inform on the whole employment structure of firms. I take advantage of the fact that employer-employee datasets actually come from payroll tax returns: they are by definition tax return data.

Yet, these data are not without limitations. First, they rely on tax concepts of incomes that need be transformed into economic concepts, using microsimulation for example. I demonstrate that it is possible to simulate labour income taxes based on payroll tax data, applying the standard simulation method from public finance in the specific case of labour incomes. Second, only taxable incomes are reported, meaning that non taxed incomes are not considered. For instance, incomes such as fringe benefits are not encompassed in this data. On top of that, these data suffer from the same shortcomings as does the income tax, such as tax evasion.

Cross-utilization of several administrative sources help with these issues by allowing researchers to identify some income responses. For example, using a panel of income tax data makes it possible to highlight avoidance along the time dimension. With this in mind, I develop an algorithm building an individual panel of the universe of payroll. Matching individual and firm tax data also enables me to identify the individual-level impacts of firm-level taxation as well as the firm-level impacts of individual-level taxation. This constitutes another contribution that from labour economics into the taxation field. Indeed, it is now clas-

sical in labour economics to encompass both an individual-level and a firm-level dimension (with individual and firm fixed effects for example) but it seems that it is not enough the case in the tax responsiveness literature. Some seminal articles highlight potential substitution between business and individual income, but there is no compelling evidence bringing together firm corporate tax data and payroll tax data. I provide such an example by studying both employee- and employer-level of response to the 75% tax on millionaires.

4 Outline of the thesis

The thesis consists of two parts. The first part of the thesis is dedicated to the redistributive analysis of the French tax system. The second part focuses on wage taxation, first on the overall distribution with a long term perspective and second with an emphasis on the very top of the wage distribution.

4.1 Fiscal policy and redistribution in France

This first part analyses the redistributive impact of the fiscal and social French system. Made of two chapters, it relies on the use of microsimulation techniques. The objective is to simulate French taxes and benefits on a representative sample of the French population. A same microsimulation model is used in the two chapters. It is characterized by its consistency with national accounts and by a detailed analysis of the top of the income distribution. Importantly, the model overcomes limitations related to the use of survey data by ensuring that the sum of incomes is consistent with the national income and that high incomes encompass all types of income even if not observed.

Chapter 1, presents the methodology and the results of the model as well as a discussion of its underlying incidence assumptions. The model provides a decomposition of tax revenue among individuals consistent with tax revenue such as defined in the national account. Social security contributions constitute the major part of tax revenue all along the income distribution. The second largest share of revenue comes from indirect taxation, which is slightly regressive at the top due to saving behaviours. The income tax does not represent a large share but becomes progressive at the top. The sensitivity of the results to the most controversial incidence assumptions of the corporate tax, the property tax and the housing tax, are discussed. Some limitations due to inconsistencies in the different aggregated sources used for imputation arise.

Studying the French system in details is important regarding the public policy evaluation objective. Comparing France with other countries offers a new perspective. Indeed, the impact of a given policy depends also on macroeconomic variables. This is the main motivation for studying the macro and micro-economic impact of post 2008 crisis political answers in

a European context. The workshop on "European public finances through the financial crisis"[7] offered an ideal coordination framework where six countries (France, Germany, Ireland, Italy, Spain, United Kingdom) developed a unified framework in order to explore together the different policy responses to the crisis. The second project of part 1, chapter 2 consists in the French part of the European study and is untitled "French public finances through the financial crisis: it's a long way to recovery". It was realized in collaboration with Mathias André, Antoine Bozio and Louise Paul-Delvaux[8]. This chapter encompasses both a macro and a micro analysis, relying both on the analysis of documents associated to the Budget Laws and on the microsimulation model of microsimulation. The study reveals that the decrease in public spending was the main political channel of response although no systemic reform of the organization of spending was achieved.

4.2 Primary inequality and taxation on the labour market

The second part of this thesis focuses on the taxation process of labour incomes. The questions and the methods tackled are at the intersection of the public finance and the labour economics literature. Chapter 3 studies the overall wage distribution whereas chapter 4 focuses on the very top wages (top 0.003% of the distribution, about 1500 individuals).

The first chapter of this second part (chapter 3) documents an increase in labour cost inequality seemingly at odds with the stable wage inequality observed in France. This part directly belongs to the long standing debate opposing market-based versus institution-based explanations for the increase in wage inequality and consists in two chapters.

So far, France stands as an exception among the large literature documenting a significant increase in wage inequality in many developed countries since the eighties. The chapter contributes to the literature by revisiting the French evidence with a simple argument, i.e. that the relative demand for skilled and unskilled labour depends on their relative product wages (or labour costs) rather than their relative gross wages.

The main finding is that primary wage inequality on the labour market did increase in France, by about 20% since 1976. This result comes from the comparison of inequality measures before and after social security contributions and was achieved by computing forty years of social security contributions based on payroll tax data. The main difference between the labour cost and net wage inequality comes from changes in employer SSCs at different points of the wage distribution. Indeed, the progressivity of employer SSCs increased due to a progressive uncapping of high wage contributions and then to SSCs reductions on low wages. This happened in France where payroll taxes finance a large share of social security at the expense of the progressive income tax. Because of this increase in labour cost inequality,

[7] at ZEW, Mannheim, Germany, June 10-11, 2014

[8] Cf. corresponding published article André *et al.* (2015)

France cannot stand any more as an argument going against demand-side explanations for the rise in inequalities.

The importance of SSCs also exemplifies the fact that institutional factors, like taxation, can have powerful impacts on the evolution of net wage inequality. The impact of employer social security contributions on net wage inequality is however hard to assess, as it depends fundamentally on the ultimate incidence of these taxes and on their impact on employment or incentives to educate, an issue where robust evidence is hard to find. The analysis provides suggestive evidence that employer SSCs are shifted in the long run onto employees, and can therefore reduce gross wage inequality. At last, the suggestive findings question the relevance of the taxation tools used for reducing inequalities. The combination of a relatively high minimum wage and employer SSC deductions for low-wage earners which is in place in France might however be compared to more direct income tax credit policies.

The second chapter of the second part (chapter 4) contributes to shed light on the following question: how do top wage earners differ from the rest of the population regarding the redistributive impact of the tax, the tax incidence and the behavioural responses? It is particularly important to pay attention to the economic behaviour of top wage earners. Indeed, the taxes levied on this group represent a large amount of the total tax revenue but it is also known for its larger responses to taxes. This last chapter of the thesis is both in line with the focus on the top of the income distribution initiated in part 1, chapter 1 and with the question of the incidence of the taxes on labour, discussed both in parts 1 and 2.

I study the impact of a wage tax at the very top of the distribution (top 0.003%, about 1500 individuals) on the wage setting process of top labour income earners. Even if top earners are among the most responsive to taxes, wage earners are also the least responsive by the public finance literature. Simulating this tax based on payroll and firm tax data, I provide a short-term analysis that can be interpreted as an upper bound of potential longer term impacts. I use a quasi-experimental variation created by the introduction of the 75% tax above in France in 2013. This is a temporary tax (paid on 2013 and 2014 incomes) on top wage income which increased the top marginal tax rate from 64% to 75% on wage.

4.3 Data

This work is most of all empirical and relies on the combination of different types of data. The raw administrative data sources contain very rich information, yet they require as well a very good knowledge of the legislation in order to derive consistent economic variables from the hundred of tax variables.

National Accounts

National accounts propose each year aggregate measures of the economic activity and a decomposition of the national production, ruled by international norms. National revenue as well as tax revenue and spending are detailed. The first part of chapter 1 offers a decomposition of tax revenues among individuals or households consistent with national accounts.

IPP tax and benefit tables

The legislative parameters ruling the application of the tax-and-benefit system are laid out in a diverse range of legal documents, such as the annual Budget Laws, the tax code and other specific decrees and circulars. Studying the impact of the tax system requires to have an extensive and historical knowledge of these parameters and of their associated tax-and-benefit functions in order to feed the micro-simulation models. I contributed and used the IPP tax-and-benefit tables[9], a project aiming to consistently keep track of the ever changing parameters ruling the application of the law.

Households' and firms' income tax return data

Household income tax return data, *Échantillons lourds de déclaration*[10], consists of a sample of (500 000) tax returns, with all households in the top 1% of the income distribution for the 1997-2016 period. This dataset gives information on all types of incomes taxed by the French income tax. This dataset is precious for the preciseness of analysis it allows at the top of the income distribution. I used these households tax return data in chapter 1, when studying the redistributive impact of taxes, with a specific focus on the top 1% of the income distribution.

Firm tax return data (*FARE* since 2008) consists of balance sheets of the firm, pivotal for the determination of the corporate profit and at the root of the determination of the corporate tax. Although it contains very rich information, I only used it in Chapter 3, in order to complement the firm level information obtained from the payroll tax returns.

Matched employer-employee data

This is an administrative dataset called *Déclaration Annuelle des Données Sociales* (DADS) and coming from forms that employers fill for all of their employees. It contains job, individual and firm-level information on wages, hours and days worked, occupation, type of contract and sector. I use two versions of these data. I rely on the panel version of the DADS

[9] Available at `https://www.ipp.eu/outils/baremes-ipp/`.

[10] This data was made available thanks to a general movement contributing to increasing the access to administrative data for research purposes.

in Chapter 2 (1/24 sample before 2001, 1/12 sample after 2002). I take advantage of the universe of the employer-employee relations in Chapter 3 in order to study the very top of the wage distribution. This is the main database used today for research on the French labour market.

Part I

FISCAL POLICY AND REDISTRIBUTION IN FRANCE

This part is dedicated to the study of the redistributive impact of the French tax-and-benefit system. The main focus of this part is methodological. It consists in presenting the microsimulation technique used for describing the distributional impact of taxation.

Chapter 1 offers an introduction to the microsimulation method and its contribution to the analyses of the redistributive impact of the tax-and-benefit system. For that purpose, I present a microsimulation model of French tax revenues. This model simulates French tax revenues based on a representative sample of the French population. Its first feature is to provide a detailed distribution of top incomes, some of them being imputed. Secondly, the aggregated individual level characteristics are consistent with national account. The model decomposes at the micro-level the whole scope of tax revenues as defined in the national accounts. This enables to provide detailed redistributive analyses of fiscal reforms, including at the top at the income distribution. The chapter discusses as well the limitation of this approach. Indeed, the underlying incidence assumption as well as the absence of consistency between aggregate sources can affect the results.

Chapter 2 provides an example of policy evaluation relying on microsimulation. It analyses the impact of the post-2008 crisis political responses in France. It encompasses both a macro and a micro analyses, relying on the study of documents associated to the Budget Laws and on the microsimulation model. The study reveals that the decrease in public spending was used as the main political channel of response although no systemic reform of the organization of spending was achieved.

Chapitre 1

L'analyse redistributive des prélèvements obligatoires par microsimulation : méthodologie, usage et limites

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Ce chapitre[1] présente les apports et les limites de la microsimulation à partir du modèle TAXIPP à l'étude des prélèvements obligatoires en France[2]. L'objectif premier du modèle est la constitution d'un outil de simulation du système socio-fiscal qui permet son analyse à la fois dans des travaux universitaires et dans des études plus ponctuelles des modifications de la législation faisant débat dans l'opinion publique (par exemple l'analyse des lois de finances). À ce titre, TAXIPP a vocation à être un nouvel outil de micro-simulation du système français, similaire aux outils déjà développés par la statistique publique et les administrations[3], mais qui puisse aussi être mobilisé pour des analyses plus diverses.

Le modèle TAXIPP est un modèle standard de micro-simulation statique, qui peut simuler sur un échantillon représentatif de la population française diverses législations sociales et fiscales[4]. Il peut être mobilisé à différentes échelles – individuelle, foyer fiscal, ménage – et la législation est actuellement programmée pour les années 1990 à 2014[5]. Le modèle peut simuler des législations contrefactuelles, calculer des taux marginaux ou moyens d'imposition et permettre ainsi des exercices de statique comparative très classiques. Un module de réactions comportementales, encore rudimentaire, permet en outre de simuler ponctuellement des effets de second ordre des modifications fiscales.

L'approche classique des modèles de micro-simulation connaît néanmoins certaines limitations pour l'analyse des systèmes fiscaux. Les simulations reposent généralement sur

[1] Issu d'un article coécrit avec Antoine Bozio et Quentin Lafféter et publié dans *Economie et statistique* en 2015 sous le titre "Portée et limites du modèle Taxipp pour l'analyse redistributive des prélèvements obligatoires"

[2] TAXIPP est un modèle de micro-simulation développé par l'Institut des politiques publiques (IPP). Pour plus d'information voir la page web dédiée, `http://www.ipp.eu/outils/taxipp-outils/`.

[3] Notamment le modèle INES développé conjointement par l'Insee et la Drees, le modèle SAPHIR développé à la Direction générale du Trésor ou encore le modèle MYRIADE développé à la Cnaf.

[4] Le modèle simule l'ensemble des prestations mais cet article se concentre sur l'analyse des prélèvements obligatoires.

[5] Le calage macroéconomique ne fonctionne néanmoins que pour les années 1997 à 2014. Pour les années 2013 et 2014, le Comptes nationaux n'étant pas disponibles à la date d'écriture de cet article, les bases sont créées à partir de la dernière année disponible et d'hypothèses de croissance des revenus.

l'exploitation d'une enquête de ménages représentatifs pour lesquels est simulé le système social et fiscal. Au vu des échantillons limités de ces enquêtes, il est souvent difficile de proposer une décomposition de la distribution des revenus plus fine que le décile, et la discussion des modifications fiscales qui touchent les plus hauts revenus (le centile supérieur par exemple) n'y est qu'imprécise. Par ailleurs, il est souvent difficile de reproduire les masses agrégées de recettes fiscales en raison de la sous-représentativité des enquêtes au sommet de la distribution des revenus. Enfin, ces modèles se limitent généralement aux impôts, cotisations et prestations payés ou reçus par les ménages. En conséquence l'analyse des systèmes fiscaux repose la plupart du temps sur des sources agrégées pour comparer les évolutions des prélèvements obligatoires, prenant en compte l'ensemble des prélèvements, quand l'analyse redistributive se fait sur un sous-ensemble de ceux-ci. Dans le débat public, deux des mesures les plus visibles de la fiscalité sont le taux de prélèvement obligatoire en pourcentage du PIB et le taux marginal supérieur de l'impôt sur le revenu. Ces deux chiffres (en 2010 respectivement 42,5 % et 41 %) ne reflètent en réalité que très imparfaitement la structure de la fiscalité d'un pays.

Les concepteurs de TAXIPP[6] ont cherché à développer un modèle qui puisse dépasser, au moins en partie, ces difficultés et permettre une analyse redistributive en cohérence avec l'architecture de la comptabilité nationale. Pour ce faire, le modèle i) impute le haut de la distribution des revenus ; ii) cale l'ensemble des revenus sur les masses agrégées de la comptabilité nationale ; iii) simule ou impute l'ensemble des prélèvements obligatoires. Cette approche permet ainsi de simuler des modifications fiscales ne touchant qu'une petite partie du dernier décile ou de décomposer sur l'ensemble de la population les taux moyens de prélèvements obligatoires que l'on peut calculer à partir de la comptabilité nationale. L'outil se révèle aussi performant pour calculer des montants agrégés de recettes fiscales à partir de différentes hypothèses de réactions comportementales. La méthodologie n'est pas sans rappeler celle des travaux pionniers de Pechman et Okner (1974) à la *Brookings Institution* qui avaient développé des fichiers micro – appelés les *MERGE files* – en combinant des sources d'enquêtes, de données administratives et les données de la comptabilité nationale. Une telle décomposition micro de la comptabilité nationale a fait finalement l'objet de peu de travaux récents et le travail le plus proche sur données françaises que l'on puisse citer est Bellamy *et al.* (2009) qui présentent un exercice de comparaison systématique des agrégats de la comptabilité nationale avec les données d'enquêtes sur les revenus des ménages.

Si l'objectif est de présenter le modèle et son utilité, ce chaptitre a aussi pour but de mettre en lumière les difficultés méthodologiques d'une telle approche. Premièrement, le calcul des taux moyens d'imposition dépend des hypothèses d'incidence des différents pré-

[6] Voir Landais et al. (2011*a*) pour la présentation de TAXIPP 0.0, la première version du modèle, et Landais et al. (2011*b*) pour une première exploitation.

lèvements obligatoires. Deuxièmement, si la convergence entre approche micro et macro est particulièrement attractive, elle bute sur des contradictions entre les sources de données parfois difficilement réconciliables. Ces limites ne sont pas dirimantes ; au contraire, elles ouvrent de nombreuses pistes de recherches ultérieures visant à améliorer l'adéquation des approches micro et macro de l'analyse des systèmes socio-fiscaux.

Après avoir présenté le fonctionnement général du modèle (partie 1), nous discutons ses hypothèses d'incidence dans la partie 2. La partie 3 présente le résultat sur la distribution des taux d'effort pour l'ensemble des prélèvements obligatoires dans un cadre comptable cohérent. La sensibilité de ces résultats à certaines hypothèses est présentée dans la partie 4. Des éléments de conclusion et des perspectives de développement du modèle sont proposés en dernière partie.

1 Présentation du modèle TAXIPP

L'objectif de cette partie est de présenter de façon sommaire le fonctionnement du modèle TAXIPP dans sa version la plus récente (TAXIPP 0.3). Le modèle étant en cours de développement, chaque version conduisant à la production de résultats est archivée, numérotée, et s'accompagne d'une documentation complète[7].

L'architecture générale de TAXIPP 0.3 peut être décrite sous la forme de trois blocs principaux : i) la constitution d'une base de données source visant à reproduire les caractéristiques d'un échantillon représentatif de la population française ; ii) un modèle de micro-simulation du système socio-fiscal français par application de la législation ; iii) un module d'imputation de certains prélèvements obligatoires qui ne peuvent être simulés directement à partir de la base de données source.

Il est important de bien distinguer la nature de ces trois composantes. Le premier bloc sur les données source est certes commun à tous les modèles de micro-simulation, mais il s'éloigne fortement des travaux classiques qui reposent sur une enquête ménage principale. Le deuxième bloc de simulation de la législation constitue le cœur du modèle et a vocation à fonctionner sur d'autres bases de données, y compris sur des enquêtes ménages simples dans une utilisation plus standard[8]. Nous présentons ici chaque bloc de façon succincte.

[7] Voir ainsi Landais, C., Piketty, T. et E. Saez (2011*a*), Bozio, A., Dauvergne, R., Fabre, B., Goupille, J. et O. Meslin (2012), Bozio, A., Fabre, B., Goupille, J. et Q. Lafféter (2012) et Bozio, A., Guillot, M., Lafféter, Q., et M. Tenand (2014) pour une présentation détaillée des versions 0.0, 0.1, 0.2 et 0.3 de TAXIPP.

[8] Une version du modèle fonctionne par exemple sur les enquêtes Budget des familles 1995, 2000 et 2005 et sur les enquêtes Emploi de 1990 à 2012.

1.1 Constitution de la base de données source

La constitution de la base de données source obéit à plusieurs étapes. Premièrement, les données issues de plusieurs enquêtes ménage sont utilisées pour rassembler l'information sur la distribution de variables essentielles au fonctionnement du modèle. Cette opération est réalisée pour l'année 2006. Deuxièmement, des données issues de sources administratives permettent de générer des ménages représentatifs du haut de la distribution des revenus. Troisièmement, les variables des données source sont calées sur les agrégats externes, en particulier sur la comptabilité nationale. Dans un dernier temps, des bases pour chaque année entre 1997 et 2013 sont créées par calage sur les masses agrégées existantes.

La procédure conduit finalement à disposer d'une base de données dont les masses agrégées sont en cohérence avec les agrégats de l'économie française et les distributions en cohérence avec les informations dont on dispose dans les données micro.

Utilisation des données d'enquête

Des données d'enquêtes ménage autour de 2006 ont été utilisées pour constituer une base avec les informations essentielles pour le fonctionnement du modèle. Les données des différentes enquêtes ont été croisées par appariement statistique sur la base de la composition du ménage, de son revenu, de l'âge et le statut d'activité de la personne de référence du ménage et de l'âge des enfants.

La constitution de la base démarre avec l'enquête Revenus fiscaux et sociaux 2006 afin de rassembler les informations propres à l'enquête Emploi (distributions du temps annuel de travail, du statut d'activité et du secteur d'activité) et celles sur les revenus et les prestations effectivement perçus par les ménages. L'enquête Logement 2006 a ensuite été utilisée pour estimer les distributions jointes du revenu, du statut d'occupation du logement et de la valeur locative et l'enquête Patrimoine 2004 pour estimer des distributions de patrimoine. L'enquête Budget des famille 2005 a enfin été utilisée pour imputer à chaque ménage un panier de consommation permettant de simuler les taxes indirectes.

Imputation des hauts revenus

Toutefois, cette base de données ne décrit pas de façon satisfaisante le haut des distributions des revenus et patrimoines. En effet, les échantillons utilisés dans les enquêtes de l'Insee sont d'une taille trop limitée pour pouvoir analyser finement le haut de la distribution (10 000 ménages signifient que seuls cent ménages représentent les 1 % des plus hauts revenus et dix ménages représentent les 0,1 %, alors que l'hétérogénéité de ces sous-populations est très importante). De plus, les données de revenus collectées par enquête sont déclarées avec un biais quasi-systématique de sous-déclaration de la part des ménages.

Pour estimer plus finement le haut de la distribution des revenus, les données issues des enquêtes ménage sont dupliquées pour obtenir un échantillon d'environ 800 000 individus. Au sein du décile supérieur les différents types de revenu sont imputés à partir des distributions estimées sur les données des échantillons lourds de déclarations de revenus. TAXIPP utilise ainsi les résultats de travaux antérieurs (voir Piketty 1999, et Cabannes et Landais 2008) pour préciser la forme statistique de la distribution des revenus au sommet de la distribution. Cette opération permet de décomposer le décile supérieur par centile et type de revenus, mais ne permet pas une décomposition fine de toutes les variables nécessaires à calculer l'impôt – en particulier la complexité des diverses dépenses fiscales.

Calage sur les masses agrégées

À partir de cette première base de données, un calage systématique sur les masses agrégées est réalisé. La première source de données agrégées vient des tabulations des déclarations de revenus établis et publiés chaque année par l'administration fiscale. Elles indiquent pour chaque année le nombre de contribuables et le montant des revenus déclarés par tranche de revenu et par type de revenu. Ces données permettent de caler les masses agrégées des revenus imposables. De façon similaire les données agrégées sur les recettes de la CSG permettent d'estimer des montants agrégés de revenus selon la définition de l'assiette de la CSG.

La deuxième source de données agrégées utilisée est la comptabilité nationale (en base 2005, suivant les dernières publications de mai 2013). Les différentes sources de revenus sont systématiquement calées sur les masses de la comptabilité nationale afin de reproduire *in fine* une distribution du revenu national net au niveau micro-économique. Comme nous le verrons plus loin, ce calage pose un certain nombre de difficultés, dont des problèmes de cohérence entre les différentes sources agrégées.

À partir de la base de données de 2006, on génère des fichiers pour chaque année de 1997 à 2013 à partir des masses agrégées des dénombrements fiscaux et de la comptabilité nationale. Cette pratique consiste à faire « vieillir » les données en appliquant au niveau individuel le même ratio des masses agrégées entre l'année souhaitée et 2006 pour chaque variable souhaitée. Ainsi, nous faisons l'hypothèse que tel revenu particulier a évolué à la même vitesse pour tous les individus de la base entre 2006 et l'année considérée. En revanche, tous les revenus n'évoluent pas à la même vitesse entre ces deux mêmes années. Notre population représentative reproduit donc par construction les masses des dénombrements fiscaux et leur composition en termes de revenus, mais la modification de la distribution intra-catégorielle des revenus n'est pas prise en compte. De plus, les variables socio-démographiques ne sont pas modifiées : c'est donc la même structure familiale qui est considérée sur toute la période, dont les revenus ont évolué au prorata de l'évolution au niveau agrégé.

Finalement, si la constitution de cette base permet d'utiliser au mieux de multiples sources

de données afin de simuler une population représentative, cette approche n'en est pas moins dépendante de la qualité et la cohérence des données disponibles – points sur lesquels la partie 5 reviendra avec plus de détails.

1.2 La simulation du système socio-fiscal

Le cœur du modèle est la simulation de la législation fiscale et sociale pour les années de 1990 à 2014. Un certain nombre d'hypothèses simplificatrices est parfois nécessaire pour simplifier le calcul. L'annexe A propose une brève description des éléments simulés et une description plus précise des programmes est proposée dans les *Guides méthodologiques IPP* consacrés à TAXIPP (*op. cit.*).

Certains impôts ne sont pas simulés par le modèle, mais donnent lieu à une imputation en fonction des caractéristiques du ménage. Il s'agit entre autres des impôts nominalement assujettis sur les entreprises. Les montants agrégés sont répartis proportionnellement à certaines catégories de revenu en fonction des hypothèses d'incidence (présentées ci-dessous). Le détail de ces imputations est présenté en annexe B.

2 Analyser l'incidence de l'ensemble des prélèvements obligatoires

Pour analyser l'impact redistributif de tout prélèvement ou toute prestation, il est nécessaire de connaître son incidence, c'est-à-dire qui paie (ou qui reçoit) effectivement cet impôt (ou cette prestation). Si la plupart des modèles de microsimulation se limitent aux seuls prélèvements qui portent nominalement sur les ménages, c'est parce que l'incidence de ces prélèvements fait moins débat, alors que l'incidence des prélèvements qui pèsent formellement sur les entreprises est très discutée. Cette partie rappelle brièvement les principes théoriques de l'incidence fiscale, présente l'état de la littérature sur les mesures empiriques de l'incidence des différents prélèvements et enfin détaille les choix réalisés dans TAXIPP. La partie 4.1 présentera des tests de sensibilité à certains de ces choix.

2.1 La théorie de l'incidence fiscale

La théorie de l'incidence fiscale permet d'identifier sur qui pèsent effectivement les prélèvements obligatoires. En effet, ne supporte pas nécessairement le poids d'un impôt l'agent économique qui est chargé par la loi de verser son montant au fisc. La TVA, par exemple, est collectée et reversée au Trésor public par les entreprises, mais c'est en réalité un impôt qui pèse largement sur la consommation des ménages, la taxe induisant une augmentation

des prix de vente. Le mécanisme d'incidence repose sur le constat que les impôts ont un effet distorsif sur l'économie : la création, l'augmentation ou l'allègement d'un impôt sur un bien, un patrimoine ou un facteur de production modifie les comportements des agents économiques, et donc les prix relatifs d'équilibre. C'est cette modification des prix (des produits ou des facteurs) qui entraîne un transfert de l'impôt d'un agent à un autre. D'une façon générale, les impôts sont toujours supportés *in fine* par des ménages. Lorsque les entreprises sont nominalement assujetties, elles reportent la taxe sur les actionnaires, ou sur les consommateurs, ou encore leurs salariés. La mesure de l'incidence fiscale consiste alors à déterminer dans quelle mesure le poids d'un impôt est reporté sur les divers agents économiques qui peuvent réellement en porter la charge.

Plusieurs revues de littérature concernant l'incidence fiscale ont déjà été menées, notamment par Kotlikoff et Summers (1987), puis Fullerton et Metcalf (2002). Ces revues insistent en particulier sur le fait que l'incidence fiscale devrait en toute rigueur économique être étudiée simultanément, en incorporant tous les impôts existants dans un modèle d'équilibre général calculable. En pratique, cette approche est complexe à mener et il existe peu d'exemples de travaux de ce type[9]. L'incidence fiscale est plus souvent discutée impôt par impôt, en s'appuyant sur des résultats de la littérature empirique, comme l'ont fait Pechman et Okner (1974) puis Pechman (1985) dans leurs analyses du système fiscal américain, en présentant des variantes d'incidence reposant sur des hypothèses économiquement cohérentes entre elles.

Même envisagée ainsi, la théorie de l'incidence fiscale se heurte à des difficultés d'identification. En général, les résultats de la littérature empirique se concentrent sur des effets à court ou moyen terme, l'identification des effets de long terme étant souvent plus difficile.

2.2 Les mesures empiriques de l'incidence fiscale

L'incidence des *impôts directs* comme l'impôt sur le revenu, reposant formellement sur les ménages assujettis, fait très peu débat et la grande majorité des travaux mesurant l'impact redistributif des systèmes socio-fiscaux fait l'hypothèse que ces impôts sont payés par les ménages assujettis. Les quelques études disponibles sur l'incidence effective de l'impôt sur le revenu donnent pourtant une vision plus contrastée. Ainsi Kubik (2004) estime pour les États-Unis qu'une partie des baisses d'impôts de la réforme de 1986 a conduit à une baisse des salaires avant impôt; Bingley et Lanot (2002) estiment eux pour le Danemark qu'une partie de l'incidence de l'impôt sur le revenu est reporté sur les employeurs. Ces exemples montrent que même dans des cas apparemment simples, l'incidence fiscale peut modifier sensiblement l'analyse distributive.

[9] Ballard, Fullerton, Shoven et Whalley (1985), en effectuant cet exercice dans un modèle à 19 secteurs, ont dû se limiter à 12 catégories d'individus différant par la composition de leurs revenus.

L'incidence des *taxes indirectes* (accises, ou *ad valorem*) est généralement considérée comme portant intégralement sur les consommateurs via la hausse des prix de vente. Á court ou moyen terme néanmoins, les producteurs peuvent absorber une partie de ces taxes indirectes. En concurrence parfaite, le consommateur et le producteur partagent la taxe à long terme via une hausse de prix qui dépend des élasticités d'offre et de demande. Les études sur données françaises, notamment Carbonnier, C. (2009) montrent qu'à moyen terme la transmission moyenne sur les prix TTC est variable et de l'ordre de 70 % à 75 % en moyenne (pour la hausse de TVA de 1995, et la baisse de 2000 respectivement). Le solde est à la charge de l'entreprise, qui le répercute en diminuant d'autant la rémunération des facteurs de production.

L'incidence des *cotisations sociales* est un élément plus discuté, en particulier pour les cotisations patronales, formellement assujetties sur les employeurs. Deux hypothèses polaires dominent quant à leur incidence effective : soit celles-ci sont payées par les salariés sous la forme de salaires nets plus faibles, soit elles sont payées de façon plus générale par les consommateurs par le biais de prix plus élevés. Un faisceau d'arguments empiriques laisse à penser que les salariés supportent l'intégralité de ces cotisations salariales et patronales, au moins à long terme[10]. Ce résultat ressort du travail de Gruber (1997) sur données chiliennes, et avait également été énoncé par Brittain (1971), sur des données en coupe de 64 pays à la fin des années 1960. Ceci est cohérent avec l'analyse en équilibre partiel, car l'offre de travail passe usuellement pour être beaucoup moins élastique que la demande de travail (Salanié, 2002). Pour autant, d'autres études, plus récentes, donnent des résultats en partie contradictoires : par exemple Saez *et al.* (2012) montrent sur données grecques qu'une hausse de cotisation employeur ne s'est pas traduite, même sur le moyen terme, par une baisse au niveau individuel du salaire net.

De tous les débats sur l'incidence fiscale, celui autour des *impôts sur les sociétés* (IS) est le plus controversé. On peut néanmoins distinguer trois hypothèses courantes d'incidence. La première remonte à l'étude pionnière de Harberger (1962), qui construit un modèle d'équilibre général avec deux secteurs, l'un étant soumis à un impôt sur les sociétés et l'autre non, et deux facteurs de production. En économie fermée et sous les hypothèses de calibrage les plus consensuelles, l'IS est supporté par l'ensemble des détenteurs du capital, que ce capital soit lié au secteur taxé ou non. Une seconde hypothèse d'incidence est de considérer que seuls les propriétaires d'entreprises soumises à l'IS finissent par le payer. Suite aux travaux d'Harberger, plusieurs études ont effet estimé qu'il n'y avait pas d'éléments empiriques permettant de penser que le capital se déversait du secteur imposé au secteur non soumis à

[10] D'un point de vue macroéconomique, la stabilité du partage de la valeur ajoutée depuis les années 1970 dans les pays développés plaide dans le même sens : si les cotisations salariales avaient été payées, même partiellement, par le capital, la part de ce dernier dans la valeur ajoutée aurait diminué durablement, contrairement à ce qui peut être observé (*cf* Rapport Cotis 2009).

l'impôt sur les sociétés. Dans une telle optique, ce seraient les actionnaires qui supporteraient le poids de l'IS. La troisième hypothèse d'incidence de l'IS est celle qui a fait l'objet des travaux les plus récents. Elle postule que l'incidence de l'IS doit *in fine* porter sur les salaires dans le cadre d'une économie ouverte. Les résultats empiriques obtenus dans le cadre de modèles d'équilibre général calculable évaluent de 40 % à 60 % la part de l'IS supportée par les revenus du travail (Gravelle 2010), voire à 100 % (Simula et Trannoy (2010)), quand les travaux empiriques reposant sur des expériences naturelles conduisent tous à des taux de répercussion de l'IS sur les salaires beaucoup plus importants. Toutefois, ces résultats restent sensibles aux données et aux spécifications choisies (Gravelle 2009), ne permettant pas en l'état d'en faire une référence consensuelle. L'hypothèse retenue par la littérature est ainsi de s'en tenir au résultat de Harberger (1962) en supposant une incidence sur le capital[11].

Un autre débat important existe pour l'incidence de la *taxe foncière* (TF). En 2001, Zodrow (2001) le résume à la confrontation de trois vues différentes de la TF. La première, appelée conception « traditionnelle », repose sur une analyse en équilibre partiel : la taxe est levée sur les propriétaires des terrains, qui la répercutent le plus possible sur les locataires des terrains à travers des hausses de loyer, forts de la configuration du marché qui leur est favorable (l'impact de la taxe est alors plutôt régressif). La seconde vue suppose au contraire que la taxe foncière est la contrepartie d'un ensemble de biens publics locaux. Les agents s'installent, en fonction de leurs préférences, là où le couple taxe/équipements maximise leur utilité. En ce cas, l'incidence fiscale de la TF pèse *in fine* sur les propriétaires par le mécanisme de capitalisation fiscale : la valeur des terrains augmente du montant capitalisé des taxes futures, car elles sont perçues comme la contrepartie de futurs équipements publics. La troisième approche, dite « nouvelle » , considère la TF comme une taxe sur le capital. Elle décompose la TF spécifique à une zone comme sa moyenne nationale plus l'écart local à la moyenne nationale. En adaptant le modèle d'Harberger en économie fermée à cette analyse, Mieszkowski (1972) conclut que cet impôt est pour sa part nationale un impôt qui diminue l'intégralité des rendements du capital, et pour sa part locale un impôt qui repose essentiellement sur les consommateurs locaux du service. Sans prétendre trancher la question définitivement, Zodrow conclut que cette dernière approche est celle qui se démarque dans la littérature empirique récente. En négligeant le deuxième terme de la décomposition, l'intégralité des détenteurs de capital supporte alors le poids de cet impôt.

[11] "The standard assumption about the corporate income tax that the burden falls 100% on capital remains the standard assumption even though it is commonly believed to be false (because of international capital mobility and endogenous saving)", Fullerton et Metcalf (2002), p. 1823.

2.3 Hypothèses retenues par le modèle

Les hypothèses d'incidence retenues dans le scénario central de TAXIPP suivent généralement les indications données par la littérature, sans forcément reprendre les résultats les plus récents ou controversés :

- Toutes les cotisations sociales (salariales et patronales) sont supposées payées intégralement par les employés.
- Les impôts sur la main d'œuvre, modélisés comme des cotisations sociales, reposent sur la même hypothèse d'incidence.
- Les taxes indirectes sur la consommation (y compris la taxe professionnelle) sont supportées par les consommateurs à 80 %, les 20 % restant étant répercuté sur les facteurs de production (capital et travail).
- La taxe foncière est supposé payée par les propriétaires, ce qui revient à suivre l'hypothèse de la capitalisation.
- Pour les impôts sur les sociétés, le modèle reprend le résultat d'Harberger (1962), où l'intégralité des revenus du capital doit supporter la taxe, à travers une diminution du rendement de celui-ci. C'est également l'hypothèse retenue par les modèles de microsimulation américains du *Congressional Budget Office*, ou encore le modèle du *Tax Policy Center*.
- Les autres impôts sur le capital (DMTG, ISF) et les impôts sur le revenu sont supposés peser sur le payeur juridique.
- La taxe d'habitation est juridiquement assise sur l'occupant du logement. En l'absence d'études spécifiques sur l'incidence fiscale de cet impôt, elle est considérée comme un impôt sur la consommation d'un service de logement et donc imputée au ménage occupant le logement (qu'il soit propriétaire ou locataire).

Le cas des revenus financiers non distribués (bénéfices réalisés par les entreprises qui ne sont pas distribués sous forme de dividendes mais immédiatement réinvestis dans l'entreprise) mérite une précision supplémentaire. La comptabilité nationale considère qu'il s'agit d'une partie du revenu national net, immédiatement épargné et réinvesti. Ces revenus ne sont pas exempts d'imposition puisqu'assujettis à l'impôt sur les sociétés. Pour suivre jusqu'au bout la démarche de cohérence avec les données agrégées, il est nécessaire d'allouer ces revenus et les prélèvements afférents aux ménages. La logique de la comptabilité nationale pousse à considérer ces revenus comme ceux des propriétaires des entreprises – TAXIPP 0.3 attribue ces profits non distribués proportionnellement aux dividendes reçus par

les ménages, comme le faisaient d'ailleurs Pechman et Okner (1974) – mais un tel choix n'est pas complètement satisfaisant. D'abord, dans un monde largement mondialisé, les ménages français possèdent des actifs étrangers et, à l'inverse, des étrangers possèdent des actifs français. Cela impliquerait la prise en compte non seulement de la part des actions françaises détenues par des non-résidents mais aussi l'ensemble de revenus non distribués d'entreprises du reste du monde détenues par des ménages résidents. Ensuite, le fait de considérer ces revenus non distribués comme des revenus ré-épargnés repose sur l'hypothèse implicite d'un accès sans contraintes aux marchés financiers ; dans un monde où le financement des entreprises serait plus contraint, l'autofinancement par les revenus non distribués pourrait bien être une forme contrainte de financement, et pas seulement le résultat d'un choix d'optimisation fiscale. De fait, le traitement fiscal de ces revenus se fait essentiellement sous la forme de l'imposition des plus-values mobilières, censées refléter sur la valeur des entreprises l'impact de ces bénéfices réinvestis[12]. On pourrait envisager de s'écarter de l'approche de la comptabilité nationale en incorporant l'ensemble des plus-values réalisées chaque année mais en déduisant du revenu des ménages les bénéfices non distribués, mais le choix a été fait pour TAXIPP 0.3 de rester dans le cadre de la comptabilité nationale en excluant les plus-values des revenus des agents.

3 Mesurer la distribution des taux d'effort

3.1 La distribution des taux moyens de prélèvements obligatoires en 2010

Afin de présenter des mesures des taux moyens de prélèvements obligatoires, il est nécessaire de s'accorder sur un certain nombre d'éléments de présentation de la distribution des capacités contributives (sur la mesure du revenu, l'unité de référence – individus, foyers ou ménages –, la finesse de la distribution ou le champ de la population couvert). TAXIPP 0.3 permet de réaliser des options variées dans ces choix de représentation. Dans cette partie, l'option est de présenter des résultats par décile de revenu individuel[13] sur la population des plus de 18 ans à partir d'un certain seuil de revenu. Une décomposition plus fine du décile supérieur sera présentée dans la partie 3.2.

Une première option de décomposition consiste à prendre pour base le taux de prélève-

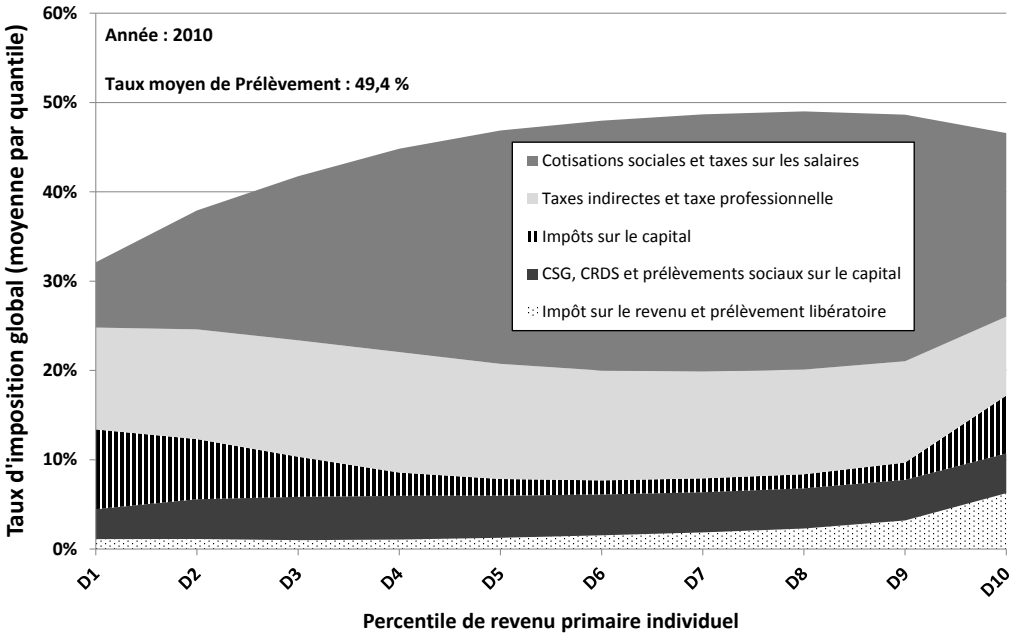
[12] Pechman et Okner faisaient remarquer en 1974 que les montants de revenus non distribués était à peu près du même ordre que le montant des plus-values, non prises en compte en tant que revenu dans la comptabilité nationale.

[13] Pour individualiser les impôts calculés au niveau du foyer fiscal, on attribue à chaque individu l'impôt proportionnellement à la part de ses revenus individuels dans la somme des revenus individuels du foyer et on divise équitablement entre le déclarant et son conjoint lorsque les revenus sont déclarés au niveau du foyer fiscal. Pour les prestations, on divise équitablement le montant reçu par l'entité concernée (ménage ou famille).

ment obligatoire moyen incluant les cotisations contributives et à le répartir sur la population en fonction de la distribution du revenu primaire. Celui-ci est calculé comme la somme des revenus primaires du travail et du capital au sens de la comptabilité nationale, mais il exclut par définition les revenus de remplacement ou les revenus de transfert.

Ainsi, un retraité dont les revenus seraient composés uniquement d'une pension de retraite apparaîtrait comme ayant un revenu primaire nul. Dans un tel cadre, le taux de prélèvement individuel inclut logiquement les cotisations contributives (retraite et chômage) alors que les revenus de remplacement correspondants sont exclus de la base des revenus. Implicitement, une telle approche considère les cotisations contributives comme des impôts comme les autres et les revenus de remplacement comme des transferts comme les autres.

FIGURE 1.1 – Décomposition des prélèvements obligatoires par décile de revenu primaire.



LECTURE : Le graphique représente le taux global d'imposition (tous les prélèvements compris) par groupe de revenu primaire, c'est-à-dire en prenant en compte l'ensemble des revenus du travail (salaires, revenus non-salariaux, etc.) et les revenus du capital, mais sans prendre en compte les revenus de transferts (allocations, minima sociaux, etc.) ni les revenus de remplacement (allocations chômage, pensions de retraite). Une décomposition par grands types de prélèvements est proposée. Les individus sont classés des plus pauvres (à gauche) aux plus riches (à droite). Le groupe D1 désigne le premier décile de revenu, c'est-à-dire les 10 % les plus pauvres, le groupe D2 les 10 % suivants, etc.
NOTES : Les taxes indirectes prises en compte sont la TVA, la TIPP, les droits sur l'alcool et le tabac. Les impôts sur le capital incluent l'impôt sur la fortune, l'impôt sur les sociétés, la taxe foncière et les droits de mutation à titre gratuit.
CHAMP : Ensemble des individus de plus de 18 ans, ayant un revenu primaire mensuel supérieur à 500 euros, soit 66,5 % de la population des plus de 18 ans (35,5 millions d'individus après pondération).
SOURCE : TAXIPP 0.3.

Le graphique 1.1 présente cette distribution des taux moyens de prélèvements obligatoires sur le champ des individus ayant un minimum de revenus primaires (500 euros mensuels). Cette représentation exclut *de facto* une part importante de la population qui n'a pas ou peu de revenus primaires[14]. Le graphique confirme l'importance – bien connue – des cotisations sociales en France qui représentent plus de la moitié des prélèvements obligatoires de l'individu médian. Le décile supérieur bénéficie d'une baisse moyenne sensible de ces prélèvements qui est essentiellement due à la baisse de la part des revenus salariaux en haut de la distribution des revenus (et dans une moindre mesure au plafonnement des cotisations contributives). La fiscalité indirecte (voir l'annexe B pour une description de l'imputation de ces prélèvements) est le second pilier de ces prélèvements, *grosso modo* proportionnelle aux revenus primaires, à l'exception du haut de la distribution où elle se révèle légèrement régressive. Les prélèvements sur le capital sont concentrés sur les hauts revenus, mais aussi sur les faibles revenus primaires qui correspondent souvent à des retraités (ayant de très faibles revenus primaires mais un peu de revenus du patrimoine). Le poids de l'impôt sur le revenu apparaît marginal par rapport aux autres prélèvements, même s'il devient significatif pour le décile supérieur[15]. Les prélèvements sociaux sont logiquement constants, sauf en bas de la distribution où une légère progressivité est décelable.

Une telle représentation, la plus cohérente avec le taux de prélèvement obligatoire agrégé habituellement discuté, est pourtant problématique à plusieurs titres : i) elle néglige la fonction d'assurance des régimes de retraite ou de chômage ; ii) elle utilise un concept de revenu économique éloigné de la représentation courante de la capacité contributive ; iii) elle exclut une partie importante de la population de l'analyse. Une autre approche est alors possible, qui tient compte du fait que les cotisations contributives ne sont pas des impôts comme les autres, mais des contributions ouvrant droit à des revenus de remplacement. On peut en effet calculer un revenu secondaire, défini comme la somme des revenus primaires et des revenus de remplacement (pensions de retraite et allocations chômage) moins les cotisations contributives qui servent à financer ces transferts. On calcule alors un taux de prélèvement net des cotisations contributives qui financent ces mêmes revenus de remplacement. Une telle représentation permet d'inclure dans les revenus l'ensemble des revenus perçus sur le cycle de vie et de se concentrer sur les prélèvements non-contributifs[16].

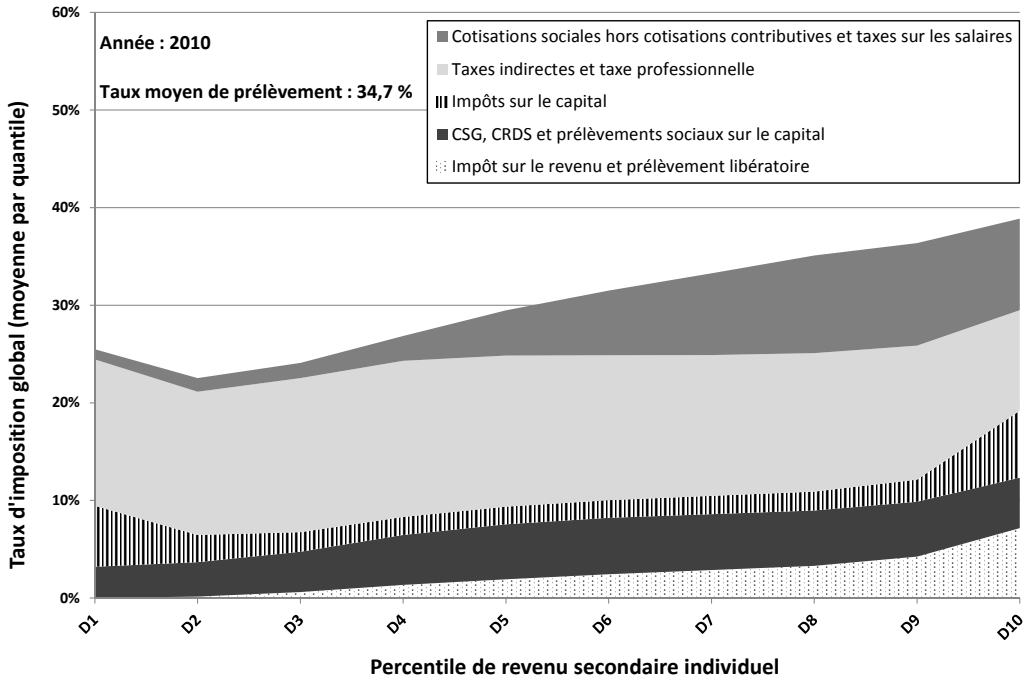
Le graphique 1.2 présente ainsi pour la population des plus de 18 ans le taux moyen de

[14] Sont en particulier exclus les chômeurs, retraités et inactifs qui n'ont pas assez de revenus du patrimoine (y compris les loyers imputés) pour dépasser le seuil, soit environ 1/3 des individus de plus de 18 ans.

[15] Ce résultat est en contradiction avec la place qu'occupe l'impôt sur le revenu dans le débat public. Cela vient du fait que l'assiette de l'impôt sur le revenu est très restreinte si on la compare au revenu superbrut, retenu dans TAXIPP comme le revenu de référence des individus.

[16] La limite d'une telle approche est de ne pas considérer les cotisations contributives comme des prélèvements obligatoires – ce qu'ils sont pour des individus à faibles revenus dont les droits accrus en termes de revenu de remplacement sont limités.

FIGURE 1.2 – Décomposition des prélèvements obligatoires par décile de revenu secondaire.



LECTURE : Les individus sont classés par groupes en fonction de leur revenu secondaire, des plus pauvres (à gauche) aux plus riches (à droite).
CHAMP : Ensemble des individus de plus de 18 ans, ayant un revenu secondaire mensuel supérieur à 50 euros, soit 92,6 % de la population des plus de 18 ans (46,6 millions d'individus après pondération).
SOURCE : TAXIPP 0.3.

prélèvement, hors cotisations contributives. La composition des déciles de revenu est foncièrement modifiée, car tous les retraités et les chômeurs indemnisés font à présent partie de l'échantillon et plus seulement ceux qui disposent d'un patrimoine générant des revenus. Le profil des taux moyens de prélèvements obligatoires dans son ensemble est fortement modifié dans cette nouvelle configuration : le taux moyen par décile, variant entre 25 % et 38 %, diminue fortement alors que la progressivité du profil des taux est rétablie pour le dernier décile. Ces deux phénomènes sont essentiellement causés par le retrait des cotisations contributives du calcul. La disparition de la régressivité au sommet de la distribution des revenus – dans cette présentation par déciles de revenu – s'explique car s'agit essentiellement de prélèvements sur les salaires plafonnés. La fiscalité indirecte joue alors le rôle principal, représentant entre un quart et la moitié des prélèvements obligatoires totaux des contribuables. La fiscalité sur les patrimoines présente un profil plus régulier, avec une augmentation de son importance en haut et en bas de la distribution des revenus secondaires.

Les cotisations contributives apparaissent comme un élément fondamental du système fiscal français. Elles représentent en effet une part importante des prélèvements obligatoires

et agissent fortement sur la représentation des taux d'effort. Selon que ces cotisations sont considérées comme de l'épargne obligatoire ou comme de simples impôts, le profil et le niveau des taux d'effort sont radicalement changés.

3.2 Étudier la fiscalité des hauts revenus

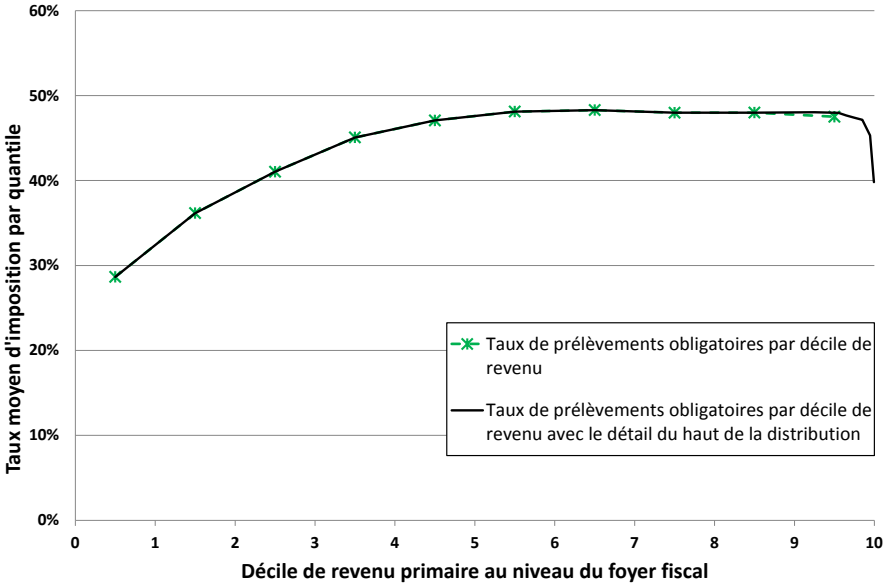
Les modèles de microsimulation fonctionnant sur des enquêtes ménage ne permettent généralement pas de décrire de façon satisfaisante les hauts revenus. Pourtant, la fiscalité des hauts revenus est un objet d'étude important à plusieurs égards : tout d'abord les débats publics sur la fiscalité se concentrent souvent sur la question de l'imposition des hauts revenus – jugés trop ou pas assez taxés; deuxièmement, cette sous-population a en soi un intérêt particulier pour les finances publiques, au vu de la part importante des prélèvements et des revenus totaux qu'elle représente. En effet, le décile supérieur des individus représente 38% du revenu primaire total et 39% des prélèvements. Cette partie vise à mettre en évidence comment TAXIPP permet d'appréhender la fiscalité de cette sous-population.

La comparaison des deux séries du graphique 1.3 permet de constater que le profil des taux moyens globaux d'imposition pour les revenus primaires de 2010 diffère fortement selon s'il est représenté en déciles ou si la population du décile supérieur des revenus est décomposée en sous-catégories. Représenter la population des contribuables en déciles revient en effet à « tasser » l'information disponible sur les hauts revenus en les assimilant à une composante numériquement importante mais nullement représentative : celle que l'on peut identifier à une catégorie « aisée ». Ce graphique permet également de souligner que l'échelle des déciles est mal adaptée pour représenter et analyser la fiscalité des hauts revenus, même si l'hétérogénéité de ces contribuables est prise en compte. Pour étudier des réformes qui ont un impact sur le taux moyen d'imposition des hauts revenus, une représentation plus fine du dernier décile sera donc utilisée.

Comment expliquer la décroissance observée dans le graphique 1.3 du taux de prélèvements obligatoire global des très hauts revenus? Il faut d'abord s'intéresser à la structure des revenus de ces foyers très aisés. Les hauts revenus étant une population hétérogène, la notion de hauts revenus ne permet pas de rendre compte à elle seule de la très grande diversité observée au sein du dernier décile[17]. Le graphique 1.4 présente la composition des revenus secondaires individuels en 2010 en détaillant le haut de la distribution. Les revenus des P10 à P99 sont pour leur plus grande part (entre 70 et 80 %) composés de revenus d'activité salariée ou de revenus de remplacement. La particularité du P0-10 tient à la présence de retraités dont les revenus fonciers constituent une part importante de leurs revenus, par rapport au montant de leur pension.

[17] Cette diversité a été mise en évidence par Piketty (1999).

FIGURE 1.3 – Taux moyens de prélèvements obligatoires simulés pour 2010 : représentation par décile et par décile décomposé sur le haut de la distribution.



LECTURE : Les taux moyens de prélèvements obligatoires sont calculés ici comme la somme des contributions, impôts et taxes rapportés au revenu primaire des foyers fiscaux. Ces deux graphiques présentent de deux manières différentes le profil des taux moyens du dernier décile sur une échelle graphique identique.
CHAMP : Ensemble des foyers fiscaux ayant un revenu primaire mensuel supérieur à 500 euros, soit 76,9 % des foyers fiscaux (27,3 millions de foyers fiscaux après pondération).
SOURCE : TAXIPP 0.3.

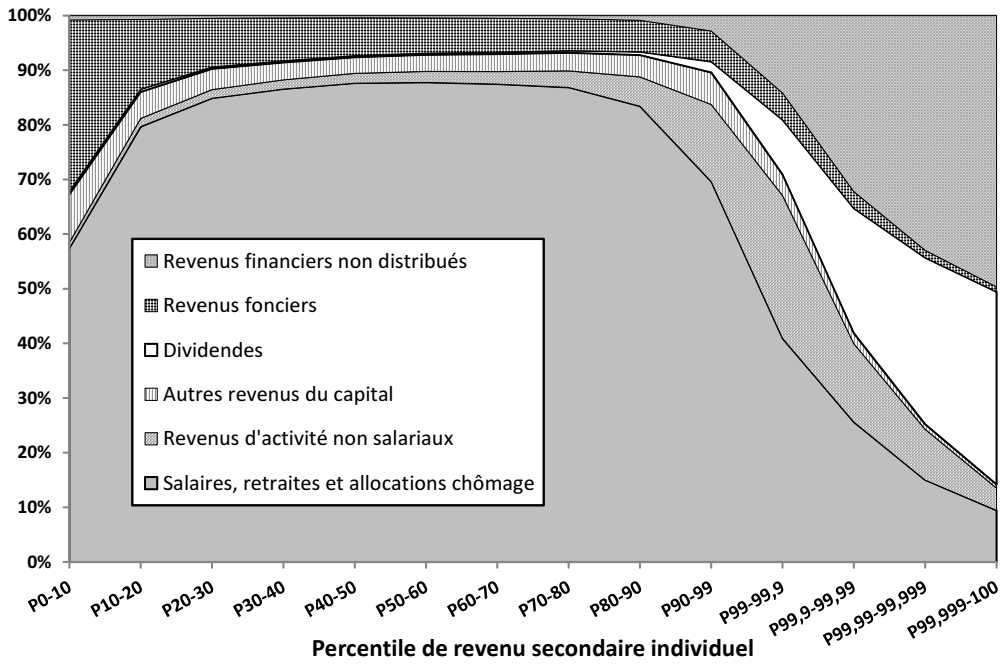
La structure des revenus commence à se modifier fortement au sein du dernier décile, décomposé dans le graphique. L'essentiel (entre 75 % et 80 %) des revenus de la première moitié du décile supérieur P90-95 reste composé de revenus du travail ou de revenus de remplacement. Les revenus du capital (financiers et fonciers) représentent seulement 10 % à 12 % du revenu total de ces individus et prennent essentiellement la forme de revenus fonciers, d'assurance-vie et d'intérêts. Les revenus non salariaux représentent quant à eux 6 % à 9 % du revenu total[18].

À mesure que l'on s'élève dans la distribution des revenus, la part des salaires et des revenus de remplacement dans le revenu total diminue, passant de 80 % pour le 90ème centile à 6 % pour les 0,001 % des individus les plus aisés. La moitié environ de cette baisse est imputable jusqu'au 99ème centile à la montée en puissance des revenus non salariaux dans le revenu total. À partir de P99,9, la part des revenus non salariaux diminue également. La diminution de la part des salaires de P99 à P99,9 puis de celle des revenus non salariaux à partir

[18] Ces revenus non-salariaux ou mixtes sont définis comme l'ensemble des revenus rémunérant à la fois le travail fourni et le capital investi par les non-salariés. Les non-salariés regroupent l'ensemble des commerçants, artisans, agriculteurs, chefs d'entreprise et des professions libérales.

de P99,9 est compensée par l'augmentation importante de la part des dividendes et des revenus non distribués dans le revenu total. La première moitié du décile semble donc être composée essentiellement de riches salariés et dans une moindre mesure d'indépendants. Puis, du 95ème centile à P99,9, la part des indépendants augmente au détriment des salariés. Enfin, à partir de P99,9, ces deux derniers s'effacent au profit d'individus qui reçoivent d'importants revenus du patrimoine. La part de ces derniers dans le revenu total croît donc à mesure que les revenus sont de plus en plus élevés. De ce point de vue, les revenus des individus situés en P90-95 se sont pas très différents de ceux du reste de la population en termes de composition, d'où leur possible identification à une classe moyenne aisée. Ce constat est de moins en moins vrai à partir du 95ème centile.

FIGURE 1.4 – Structure des revenus secondaires en 2010.

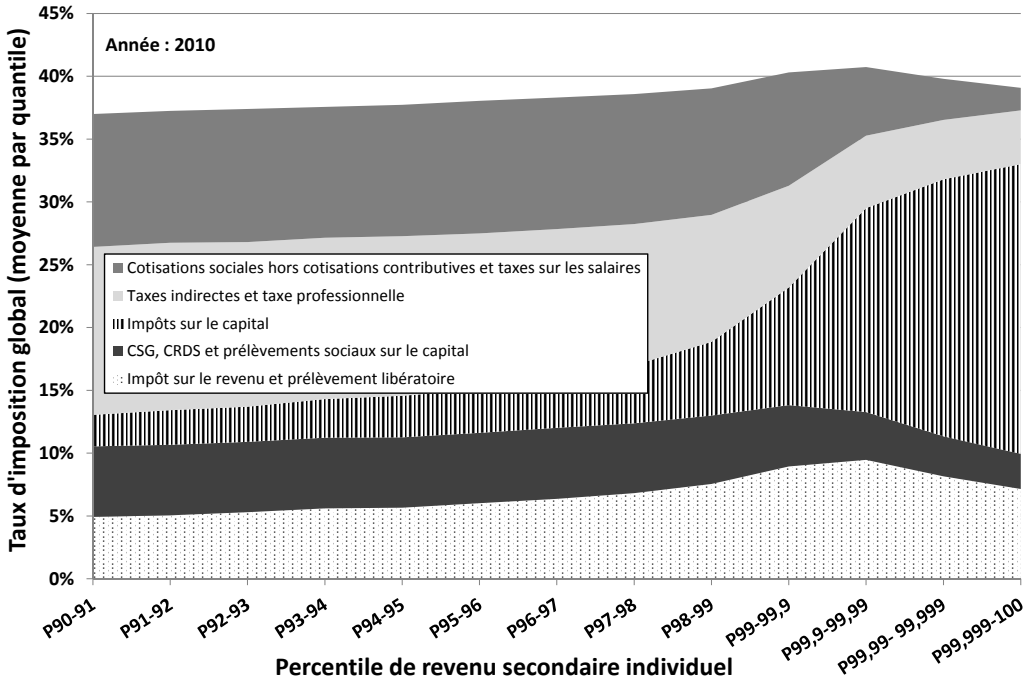


NOTE : Attention, l'axe des abscisse décompose la population en fractiles de tailles différentes afin de zoomer sur le dernier décile. Jusqu'à P90 chaque point contient un dixième de la population (déciles). Au delà du P90, le nombre d'individus que chaque point représente diminue jusqu'à ne représenter qu'un dix-millième de la population.
CHAMP : Individus de plus de 18 ans.
SOURCE : TAXIPP 0.3.

Avoir une bonne connaissance de la composition des hauts revenus permet d'analyser plus finement leur fiscalité. Le graphique 1.5 permet de dresser plusieurs constats sur les modalités de cette imposition. Tout d'abord, le taux d'imposition global des hauts revenus est pratiquement constant du 90ème centile à P98, passant de 37,3 % à 38,5 % par le biais d'une légère progression de l'IR et d'une montée en puissance des impôts sur le capital, contreba-

lancée par une baisse des taxes indirectes. Puis, on observe une hausse du taux d'imposition pour les P99-P99,9 qui s'élève jusqu'à 41,8 %. Enfin le taux d'imposition baisse à partir du 99,9ème quantile : le taux d'imposition s'établit en effet à 40,1 % pour les 0,001 % des individus les plus aisés. D'autre part, on constate que jusqu'au 98ème centile, le poids des différents impôts payés par les contribuables est relativement similaire. Une fois déduites les cotisations sociales contributives, le système fiscal français apparaît légèrement progressif en haut de la distribution des revenus.

FIGURE 1.5 – Décomposition du taux d'imposition des hauts revenus en 2010.



LECTURE : Le taux d'imposition est défini ici comme la somme des prélèvements obligatoires rapportée au revenu secondaire.
NOTE : Attention, l'axe des abscisse décompose la population en fractiles de tailles différentes afin de zoomer sur le dernier décile.
CHAMP : Individus de plus de 18 ans appartenant au décile des plus hauts revenus secondaires.
SOURCE : TAXIPP 0.3.

La part des différents impôts dans l'imposition globale est radicalement modifiée à partir du 98ème centile. La part des cotisations sociales dans le revenu secondaire passe ainsi de 10,1 % pour P97-98 à 1,9 % pour les 0,001 % des individus aux plus hauts revenus. Cela est dû à la diminution très forte de la part des revenus salariaux et non salariaux dans le revenu total à partir du 98ème centile. Elle passe en effet de 69,4 % pour P97-98 à 7,9 % pour les 0,001 % des individus les plus aisés. De même, l'imposition au titre des taxes indirectes passe de 11,6 % pour P97-98 à 4,9 % pour les 0,01 % des individus les plus aisés. Cet effet vient de l'estimation

de taux d'épargne croissant en fonction du revenu[19].

Au contraire, le taux d'imposition du capital augmente fortement pour les 2 % des individus les plus aisés. Ce taux passe de 4,1 % pour P97-98 à 21,3 % pour les 0,001 % des individus aux plus hauts revenus. Cela est dû principalement à l'impôt sur les sociétés car cet impôt est supporté principalement par les détenteurs de gros revenus financiers – dans l'hypothèse d'incidence retenue par le modèle. La part des revenus financiers dans le revenu total passe ainsi de 30 % environ pour P97-98 à 93 % pour les 0,001 % des individus les plus aisés. Les deux autres composantes de l'imposition du capital sont l'ISF et les DMTG (droits de succession). Ces deux impôts sont supportés presque intégralement par les plus gros détenteurs de patrimoine, qui sont très majoritairement regroupés dans les trois derniers centiles de la distribution des revenus.

Le taux d'imposition au titre de la CSG-CRDS décroît pour les 2 % des individus les plus aisés passant de 5,5 % pour P97-98 à 4 % pour les 0,001 % des individus les plus riches. Cela peut paraître surprenant dans la mesure où les taux d'imposition de la CSG-CRDS sont proportionnels. La spécificité de la structure des revenus des 2 % des individus les plus riches permet d'expliquer ce phénomène : ils détiennent en effet une part plus importante de revenus financiers non distribués, qui ne sont imposables qu'au titre de l'impôt sur les sociétés et des impôts sur les plus-values, mais pas à la CSG-CRDS.

Concernant l'imposition des hauts revenus au titre de l'impôt sur le revenu deux constats s'imposent. Premièrement, les taux d'imposition effectifs soumis à l'IR sont bas pour les 10 % des contribuables les plus aisés : les revenus de la première moitié du décile sont soumis à des taux d'imposition effectifs ne dépassant pas 6 %, tandis que les revenus de la seconde moitié du décile sont taxés à des taux effectifs qui n'excèdent pas 10 %[20]. Deuxièmement, à partir des 0,01 % des individus les plus aisés, l'IR a un profil paradoxalement régressif. Plusieurs éléments peuvent expliquer ces constats. Pour les individus des quantiles P90-99 et *a fortiori* des quantiles P90-99,9, l'importance des réductions d'impôt dues aux niches fiscales et, dans une moindre mesure, des réductions au titre du quotient familial réduit le taux d'imposition effectif payé. À partir du dernier centile, l'importance de ces réductions d'impôts est limitée du fait de leur plafonnement global. En revanche, l'explication de la faiblesse des taux et la régressivité de l'IR au sommet de la distribution (P99,99-100) est à chercher dans la structure des revenus de ces contribuables. La majorité des revenus de ces individus est composée de revenus du capital, dont une part importante est imposée en 2010 hors du ba-

[19] L'estimation des taux d'épargne dans TAXIPP 0.3 a été réalisée à partir des enquêtes Budget des familles, en estimant une relation entre taux d'épargne et revenu permanent. Au sein du dernier décile, les taux d'épargne ont été imputés comme linéairement croissants, passant ainsi de 25 % à 40 % de P95 à 99,99 – ce qui est une hypothèse difficile à vérifier.

[20] Ces taux d'imposition effectifs sont faibles au regard des taux marginaux du barème de l'impôt sur le revenu car ce sont des taux moyens, et qui plus est ceux-ci sont calculés en fonction d'un concept de revenu plus large que la base taxable de l'IR.

rème progressif de l'IR (à un taux forfaitaire de 18 %). Cette imposition proportionnelle à un taux de 18 % au lieu d'un taux marginal de 41 % (diminué par des mécanismes d'abattement) si les revenus étaient imposés au barème progressif explique en partie la faiblesse des taux d'imposition effectifs de ces revenus. Une explication complémentaire repose sur l'étroitesse de l'assiette taxable des revenus du capital. En 2010, environ 50 % des dividendes versés aux individus de P99,9-100 semblent échapper à toute imposition au titre de l'IR[21], auxquels il faut ajouter les revenus financiers non distribués qui sont par définition exclus de l'assiette de l'impôt sur le revenu. Au total, les 0,01 % des individus les plus riches ne sont imposés que sur moins de 50 % de leur revenu total, et imposés en grande partie à des taux forfaitaires inférieurs à ceux du barème progressif de l'IR. Ces deux phénomènes se conjuguent pour expliquer la régressivité de ces taux au sommet de la distribution des revenus en 2010.

4 Une approche qui a pourtant des limites

L'étude des prélèvements obligatoires par TAXIPP se heurte pourtant à plusieurs contraintes qui, sans réduire la portée de l'exercice, obligent à en préciser les limites et ouvrent autant de perspectives de recherches ultérieures.

4.1 Sensibilité aux hypothèses d'incidence

En premier lieu, les résultats du modèle sont sensibles aux hypothèses d'incidence fiscale détaillées dans la partie 2. C'est le cas par nature dans les tous les exercices de micro-simulation statique – les travaux de Pechman et Okner (1974) proposaient ainsi une série de huit variantes d'hypothèses d'incidence – mais il reste important d'en préciser les contours et d'évaluer l'impact des choix alternatifs qui peuvent être faits. Nous proposons ici un exercice de sensibilité du modèle à certaines de ses hypothèses d'incidence.

[21] Voir partie 4.2 pour davantage de détails à ce propos.

Encadré : Variantes d'hypothèses d'incidence.

L'essentiel des enjeux des hypothèses d'incidence concerne trois impôts : l'impôt sur les sociétés (IS), la taxe d'habitation (TH) et la taxe foncière (TF). Nous retenons deux scénarios de variantes « extrêmes », au sens où ils ont un impact redistributif marqué, soit vers plus de progressivité, soit au contraire vers plus de régressivité de ces prélèvements.

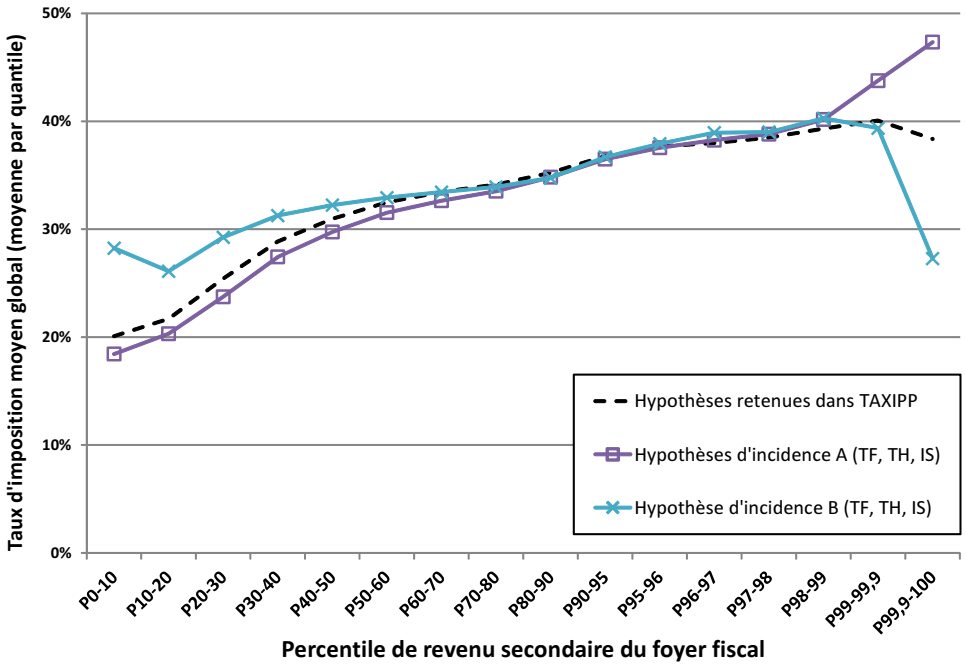
- **Scénario de** TAXIPP 0.3 :
  La première série d'hypothèses est celle qui est usuellement faite dans le modèle : l'*IS est payé par tous les revenus financiers*, la *TH partagée entre les locataires et les propriétaires*, mais la *TF est payée* in fine *par les propriétaires* de biens fonciers.
- **Scénario alternatif A (variante plus progressive)** :
  La seconde série d'hypothèses, traduite dans le graphique 1.6 par la courbe A, tend à canaliser fortement l'incidence fiscale des trois impôts vers les détenteurs de revenus du capital, qui sont également plus aisés : la *TH et la TF sont payées exclusivement par les propriétaires*, et l'*IS est payé uniquement par les détenteurs de dividendes* (les actionnaires, qui par définition possèdent les entreprises). Ces hypothèses accentuent le profil redistributif des taux de prélèvements obligatoires.
- **Scénario alternatif B (variante plus régressive)** :
  La troisième série d'hypothèses, dont l'incidence est visible à travers la courbe B, tend au contraire à canaliser ces impôts vers l'ensemble des contribuables : dans ce cas de figure, *les TH et TF sont supportées en totalité par les locataires*, alors que l'*IS est répercuté intégralement sur l'ensemble des salariés du secteur privé*. Ces hypothèses ont tendance à générer un profil plus régressif des taux de prélèvements obligatoires.

Le graphique 1.6 permet de comparer les taux d'imposition moyens des contribuables en fonction des trois jeux d'hypothèses précisés dans l'encadré. Il en ressort que le choix des hypothèses d'incidence a un impact déterminant sur le profil des taux d'imposition, particulièrement pour les très hauts revenus, mais aussi pour les foyers fiscaux à bas revenus. Pour le haut de la distribution (le dernier percentile essentiellement), ces variantes dépendent avant tout de l'hypothèse d'incidence faite sur l'IS, alors que les 50 % les plus modestes, majoritairement des locataires, sont principalement affectés par les hypothèses faites sur l'incidence de la TH et de la TF.

L'hypothèse d'incidence de l'IS apparaît comme cruciale pour l'analyse de la progressivité ou régressivité des prélèvements obligatoires au sein des très hauts revenus. En effet, ceux-ci obtiennent leurs revenus largement par le biais de dividendes ou de plus-values. Si l'IS est un impôt qui réduit avant tout les profits distribués aux actionnaires, alors il s'agit d'un prélèvement extrêmement progressif (courbe A sur la fig. 1.6). A l'inverse, si l'IS se traduit par des salaires plus faibles pour l'ensemble des salariés du secteur privé, alors son effet redistributif disparaît intégralement (courbe B sur la fig. 1.6).

Au vu des travaux récents de la littérature empirique, on pourrait légitimement critiquer

FIGURE 1.6 – Sensibilité des simulations aux hypothèses d'incidence fiscale.



NOTE : Voir l'encadré pour la présentation détaillée des hypothèses d'incidence retenues dans chaque scénario.
CHAMP : Ensemble des foyers fiscaux.
SOURCE : TAXIPP 0.3.

l'option retenue par TAXIPP 0.3 en arguant qu'elle présente un profil de l'IS probablement trop progressif. Néanmoins, ces résultats restent encore débattus et, en l'absence de consensus, il nous a semblé préférable de maintenir l'hypothèse d'incidence traditionnellement retenue.

4.2 Conflits dans les sources de données agrégées

Afin de s'inscrire dans le cadre comptable de la comptabilité nationale, TAXIPP 0.3 a recours à de nombreuses sources de données agrégées pour caler les revenus des ménages ou imputer des prélèvements particuliers. Les résultats du modèle sont donc dépendants de la qualité et de la cohérence de ces données.

Un premier exemple concerne l'usage de données agrégées de consommation et de revenus issus de la comptabilité nationale. Un problème classique des enquêtes auprès des ménages est que la consommation moyenne et les revenus moyens déclarés par les ménages sont sensiblement inférieurs à la consommation moyenne et au revenu moyen que l'on peut calculer en utilisant les données de comptabilité nationale. On peut constater en regardant le tableau 1.1 que la consommation totale des ménages telle qu'elle est mesurée

par les enquêtes *Budget des Familles* est notablement inférieure à la consommation agrégée mesurée par la comptabilité nationale. Le modèle procède alors à un calage des données de consommation sur les masses de la comptabilité nationale. Ce calage permet seulement de retrouver la masse de consommation, mais ne corrige pas l'éventuelle hétérogénéité de la sous-estimation au sein de la population, alors qu'il est vraisemblable que celle-ci ne soit pas uniforme.

TABLEAU 1.1 – La sous-estimation de la consommation dans les enquêtes *Budget des Familles* par rapport aux masses de la comptabilité nationale.

Année de l'enquête	**Masse de consommation (BdF)**	**Masse de consommation (CN)**	**Taux de couverture**
1995	569,1	660,97	86,1%
2000	670,8	782,19	85,8%
2005	784,5	946,12	83,0%

NOTE : les sommes sont en milliards d'euros.
SOURCE : enquêtes BdF 1995, 2000 et 2005, comptabilité nationale en base 2005 (Insee), et calculs des auteurs.

Un autre exemple, plus problématique, vient des discordances entre différentes sources agrégées. Les différents types de sources agrégées utilisées par TAXIPP, les dénombrements fiscaux et sociaux, les assiettes de la CSG et les masses de la comptabilité nationale, présentent parfois des divergences importantes qu'il est difficile d'expliquer. Les difficultés viennent à la fois d'un problème de définition des revenus – les notions juridiques ne correspondent pas forcément aux normes de la comptabilité nationale – mais aussi de problèmes de mesure. Le tableau 1.2 compare pour certains types de revenu les masses estimées par la comptabilité nationale avec les revenus agrégés pris en compte par TAXIPP. Le tableau reporte un certain nombre d'explications des écarts entre ces masses en s'inspirant du travail de Bellamy *et al.* (2009), qui ont effectué une comparaison systématique des sources d'enquête micro et des données de la comptabilité nationale pour l'année 2003.

Le premier écart notable touche les revenus du travail. L'assiette de la CSG représente un montant agrégé légèrement supérieur à 90 % de la masse des salaires bruts déterminée par la comptabilité nationale. En 2003, cette différence est de l'ordre de 46 Mds €. Une partie de cette différence s'explique par l'exclusion dans l'assiette de CSG de certains types de revenus considérés comme des salaires dans la CN : les rémunérations en nature si elles sont l'exclusive rémunération d'un contrat, les pensions alimentaires reçues, les salaires perçus dans le cadre d'un contrat d'apprentissage, ou les pré-retraites si les ressources du contribuable sont modestes[22]. Il est possible que le traitement par la CN des rémunérations en nature – imparfaitement reflétées par le montant des contributions payées sur ce type de

[22]Le critère retenu est celui de l'exonération de la taxe d'habitation.

TABLEAU 1.2 – Écarts dans les masses agrégées de revenu des ménages pour l'année 2003.

	Type de revenu des ménages			
	Salaire et traitement *(D11)*	***Revenu mixte (net des CCF)*** *(B3n + D422)*	***Intérêts (nets des SIFIM)*** *(D41 - 7,7 Mds €)*	***Dividendes*** *(D421)*
Masse CN	622,1	113,0	31,3	28,0
Masse TAXIPP	575,6	75,3	25,3	10,3
Composition du revenu dans TAXIPP	Revenu brut (calé sur l'assiette CSG)	Revenu brut (calé sur l'assiette CSG)	– Intérêts imposés au PFL et au barème * – Intérêts des PEL-CEL et des livrets défiscalisés ** – Revenus des terrains et gisements ***	– Dividendes imposés au barème * – Dividendes des PEA **
Taux de couverture	92,5%	66,6%	80,8%	36,8%
Montant inexpliqué	46,5	37,7	6,0	17,7
Pistes d'explication de l'écart	Exonération de certains revenus de l'assiette CSG[1]	Dissimulation d'activité[2] (34,9 Mds €)	?	?

NOTE : Les sommes sont exprimées en milliards d'euros.
* : Revenus imputés à partir des dénombrements fiscaux de l'année 2003 (déclaration 2042) et calés sur l'assiette des dénombrements fiscaux de 2003.
** : Revenus non déclarés, imputés par les auteurs à partir de l'enquête ERFS de 2006.
*** : La maquette de TAXIPP agrège les revenus des terrains et gisements (D45) aux intérêts (D41) soit 2,3 Mds € en 2003. Ce choix réduit artificiellement l'écart entre la source CN et la masse d'intérêts du modèle.
[1] : Sont par exemple exonérés de CSG les rémunérations en nature si elles sont la seule rémunération d'un contrat, les pensions alimentaires, ou les salaires perçus dans le cadre d'un contrat d'apprentissage.
[2] : Les assiettes CSG et CN des revenus non salariés sont identiques, mais les comptes nationaux y imputent par convention plusieurs éléments pour rendre compte de la dissimulation d'activité. La « fraude sur le résultat » (13,7 Mds € en 2003) représente les revenus générés par des entités légales mais non déclarés, le « travail clandestin » (21,2 Mds € en 2003) est la rémunération du travail effectué par des entités non déclarées.
SOURCE : Comptabilité nationale mise à jour en mai 2013 ; Bellamy *et al.* (2009) ; TAXIPP 0.3.

revenu – soit responsable de l'écart résiduel. Concernant les revenus mixtes, les divergences sont proportionnellement plus importantes, mais la majeure partie de l'écart est expliquée par la prise en compte de la fraude par la CN. Deux types de fraude sont distinguées : la « fraude sur le résultat » concerne la sous-déclarations de revenus par des unités légales, et le « travail clandestin » représente les revenus générés par des entités sans existence juridique (par convention, ces activités sont assimilées dans la CN à des entreprises individuelles, et donc classées dans les revenus mixtes). Notons enfin que le modèle considère les « Autres revenus distribués » (D422) comme des revenus mixtes et non comme des dividendes.

Un écart plus important est à constater pour les revenus du capital, à la fois en comparaison avec les données des assiettes de CSG et avec les dénombrements fiscaux. Pour les intérêts reçus par les ménages, une fois que les revenus exonérés d'IR et/ou de CSG sont

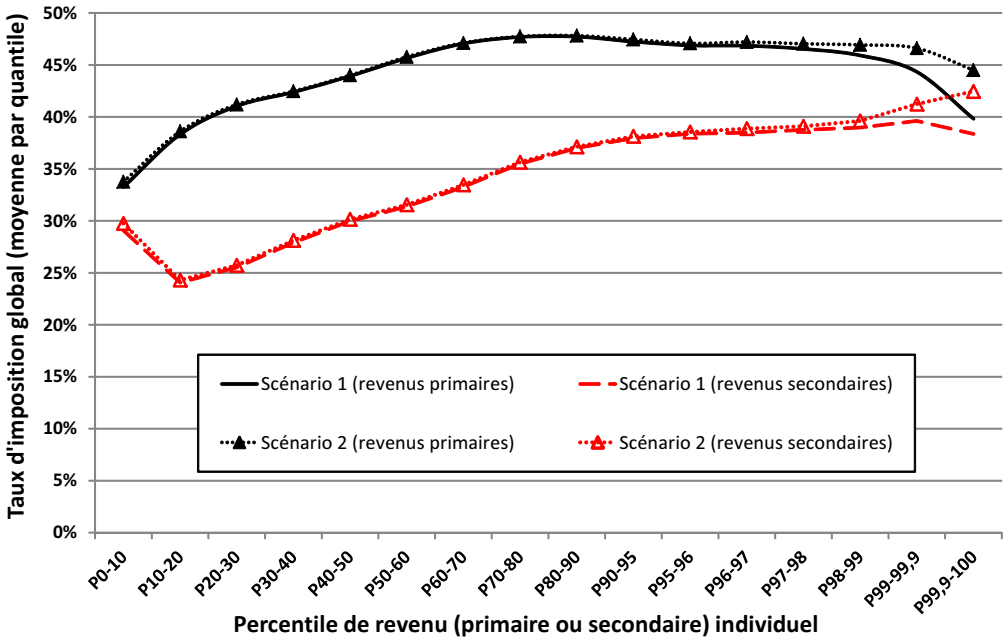
pris en compte (livrets A, livrets jeune, livrets de développement durable, livrets d'épargne populaire, etc.) et après déduction des services d'intermédiation financière indirectement mesurés (SIFIM, chiffrés à 7,7 Mds € par Bellamy *et al.* (2009) pour 2003 et repris dans ce tableau) – qui représentent la part des services rendus par les intermédiaires financiers incluse dans les estimations de la comptabilité nationale – le taux de couverture est d'environ 80 % du montant CN. Pour les dividendes, les estimations sont encore plus difficilement réconciliables : seuls 37 % des dividendes mesurés par la comptabilité nationale apparaissent dans les dénombrements fiscaux ou les assiettes de CSG, sans que l'on puisse, à notre connaissance, l'expliquer par des différences de fiscalité.

Ces écarts dans les masses agrégées de dividendes sont loin d'être négligeables, car la distribution des revenus du patrimoine font qu'ils sont susceptibles de jouer fortement sur la distribution des taux de prélèvements obligatoires, notamment en haut de la distribution des revenus. Ceci est illustré au graphique 1.7, où nous présentons le profil des taux de prélèvement individuels selon deux variantes de prise en compte des dividendes. La première variante (**scénario 1**) correspond à la manière dont TAXIPP 0.3 prend actuellement en compte les dividendes en les calant sur les données de comptabilité nationale. Une deuxième possibilité (**scénario 2**) consiste à ne prendre en compte que la masse de dividendes déclarés dans les déclarations fiscales[23].

Les différences entre les deux scénarios apparaissent essentiellement dans le dernier décile de revenu où les hypothèses sur la répartition des dividendes influent le plus la composition des revenus. Le scénario 1 est cohérent avec la comptabilité nationale mais implique une forme de fraude ou d'optimisation fiscale permettant aux ménages de ne pas déclarer l'ensemble de leurs revenus de dividendes ; à l'inverse le scénario 2 implique une complète déclaration des dividendes par les ménages concernés. À l'évidence, une meilleure compréhension des sources brutes des données agrégées et de leur estimation permettrait de mieux cerner les assiettes effectives d'imposition.

[23] En effet, les dénombrements fiscaux (augmentés des dividendes exonérés liés aux plans d'épargne en actions) et la comptabilité nationale couvrent un champ similaire des dividendes.

FIGURE 1.7 – Sensibilité des simulations à la distribution des dividendes.



CHAMP : Individus de plus de 18 ans.
SOURCE : TAXIPP 0.3.

5 Conclusion et perspectives

Ce chapitre a présenté le fonctionnement du modèle TAXIPP, un modèle de micro-simulation classique dans sa simulation de la législation socio-fiscale française, mais qui permet, par un travail d'imputation et de confrontation avec les données agrégées, de simuler de façon cohérente l'ensemble des prélèvements obligatoires et d'étudier finement la fiscalité du décile supérieur de la distribution des revenus.

L'étude des hauts revenus proposée par TAXIPP repose sur un travail en deux temps. D'abord, l'imputation des revenus à partir des résultats de travaux descriptifs sur la composition et l'évolution des revenus dans le temps en France permet d'obtenir une information plus riche que celle fournie par les enquêtes ménage. Ensuite, le calage de ces revenus réconcilie les masses de revenus agrégés avec la comptabilité nationale. Cette richesse d'information peut ensuite être exploitée dans divers travaux, notamment sur le système fiscal dans son exhaustivité ou sur les hauts revenus.

Toutefois, cette approche n'est pas sans limites. La première est un manque de robustesse du modèle vis-à-vis de certaines hypothèses d'incidence fiscale, en particulier l'incidence de l'impôt sur les sociétés, de la taxe d'habitation et de la taxe foncière. La seconde est la dépendance des résultats du modèle à la cohérence des sources agrégées. Ce chapitre a

cherché à mettre en avant les différentes sources d'écarts susceptibles d'influencer les résultats des simulations et de suggérer plusieurs approfondissements possibles sur la confrontation des sources existantes.

Enfin, si ce travail s'est concentré sur les prélèvements obligatoires, il ne s'agit évidemment pas d'une vision complète de la redistribution. Une prise en compte complète et cohérente du système fiscal et social imposerait de prendre en compte l'ensemble des dépenses et des recettes des administrations publiques. Le modèle simule certes les prestations sociales – non étudiées ici – mais il serait nécessaire, pour rester en cohérence avec l'approche systématique des prélèvements obligatoires, de proposer une analyse complète de l'ensemble des dépenses publiques, dont on connaît la difficulté à estimer l'incidence.

Annexes

A. Simulation du système socio-fiscal

- *Les cotisations sociales :*
  Les cotisations sociales salariales et patronales (cotisations chômage, retraite, et non contributives) dans le secteur privé et public, la taxe sur les salaires, la taxe sur la main d'œuvre et les versements transports, les exonérations de charges fiscales, les cotisations sociales patronales facultatives et les cotisations des non-salariés sont simulées. Sont également calculées la CSG et la CRDS sur les revenus d'activité et de remplacement. La CSG, la CRDS et les contributions sociales sur les revenus du capital sont aussi calculées (à partir de variables de revenus financiers imputées).

- *L'impôt sur le revenu :*
  Le calcul de cet impôt est pratiquement conforme à la législation en vigueur lors de la période d'étude. Seules certaines variables de réduction d'impôts sont imputées. La contribution sur les hauts revenus est aussi simulée, ainsi que la Prime pour l'emploi, sous l'hypothèse simplificatrice que le conjoint du bénéficiaire est toujours employé à temps plein.
  L'imposition du foyer fiscal sur certains revenus du capital au titre du prélèvement forfaitaire libératoire est également calculée.

- *Les prestations sociales :*
  Elles sont calculées au niveau du foyer social. Les prestations familiales (allocations familiales, complément familial, certains dispositifs de l'APJE/PAJE, allocation de soutien familial, allocation de rentrée scolaire) sont d'abord calculées.
  Les aides au logement simulées par TAXIPP se résument à l'allocation de logement familiale, calculé séparément pour les primo-accédants à la propriété et les locataires.
  Les minima sociaux sont ensuite calculés. L'allocation parent isolé est déterminée, puis le minimum vieillesse, et le RMI (devenu RSA à partir des revenus de 2010 dans le modèle). Ces minima sont ensuite individualisés.
  Un *taux de non-recours* peut ensuite être appliqué aux prestations non automatiques pour réconcilier les données – qui surestiment les masses distribuées aux ménages au niveau agrégé – avec les masses agrégées disponibles dans la documentation disponible.
  Faute de données, les prestations liées aux situations de handicap, l'allocation parentale d'éducation, les prestations familiales liées à l'adoption, certains compléments de la PAJE et les barèmes spécifiques aux Départements d'Outre-mer ne sont pas simu-

lées. L'allocation de logement sociale et l'aide personnalisée au logement ne sont pas non plus calculées.

- *L'impôt de solidarité sur la fortune :*
  L'ISF est calculé au niveau du foyer fiscal.

- *Le bouclier fiscal :*
  Il est d'abord déterminé sans prendre en compte les comportements de non-recours. Dans un second temps, le taux de non-recours est pris en compte pour réconcilier les données simulées et la documentation disponible.

B. Imputations d'impôts et de prestations

Contrairement aux impôts calculés à partir des variables contenues dans les bases de données, certains éléments du système socio-fiscal sont imputés. Cela signifie que le montant dû par les foyers au titre de ces impôts peut être approximé en fonction d'un certain nombre d'hypothèses. TAXIPP distribue donc la masse agrégée de l'impôt aux foyers, proportionnellement à une ou plusieurs variables corrélées au montant d'impôt payé. En pratique, c'est souvent une hypothèse empruntée à la littérature théorique de l'incidence fiscale qui décide du choix de la variable servant à l'imputation. Ce choix revient à appliquer un même taux moyen d'imposition aux contribuables (déterminé par le ratio des masses agrégées), en fonction du ou des revenus concernés en dernière analyse par l'incidence de l'impôt en question. Les impôts et taxes imputés dans TAXIPP 0.3 sont :

- *La taxe foncière :*
  La TF est imputée au niveau du foyer fiscal au prorata des revenus fonciers de chaque foyer fiscal, en prenant toutefois en compte les exonérations et dégrèvements éventuels. Elle est donc supportée par les propriétaires de biens immobiliers.

- *L'impôt sur les sociétés :*
  L'IS payé par le foyer fiscal est imputé au prorata de tous les revenus financiers (distribués et non-distribués) du foyer. Des scénarios alternatifs d'incidence sont également possibles.

- *La taxe d'habitation :*
  La TH est imputée au prorata des loyers – qu'ils soient payés par les locataires ou "payés" par des propriétaires en tant que loyer fictif –, en prenant toutefois en compte

l'exonération au titre de faibles revenus. Elle est donc partagée entre locataires et propriétaires, mais suppose une répercussion totale de la taxe sur les locataires.

- *Certains impôts sur le patrimoine :*
  Les DMTG sont imputés proportionnellement au patrimoine total (professionnel et non-professionnel) des foyers fiscaux à partir des 5% des patrimoines les plus importants – les autres patrimoines étant *de facto* exonérés de DMTG par un important système de dégrèvements. Les droits de mutation à titre onéreux (DMTO), qui représentent moins d'un milliard d'euros de recette en 2010, ne sont pas simulés.

- L'ensemble des *taxes indirectes – y compris la contribution économique territoriale*
  La procédure d'imputation de ces taxes est différente. Elle fait appel à un module de simulation indépendant qui calcule des taux d'effort[24] moyens des ménages pour chaque impôt indirect en fonction de plusieurs déterminants : le niveau de la capacité contributive des ménages (définie comme le montant consacré à la consommation du foyer, c'est-à-dire la fraction du revenu disponible qui n'est pas épargnée) et certaines caractéristiques socio-démographiques de la composition du ménage. Le profil de taux d'épargne obtenu est cohérent avec les profils observés dans les enquêtes *Budget des Familles* successives, mais demeure stable autour de 20 % pour les foyers aisés. Pour raffiner le calcul du taux d'épargne de cette sous-population, on postule son doublement au sein des 5 % des foyers les plus aisés, afin de le porter graduellement de 20 % à 40 % environ.
  Finalement, le taux d'effort est appliqué au prorata du montant dépensé en consommation par chaque foyer social.

Cotisations sociales exceptées, tous ces impôts, taxes et prestations sont exprimés au niveau du foyer fiscal ou du foyer social. Pour homogénéiser ces montants d'impôts entre eux, une procédure d'individualisation permet de convertir ces montants à une échelle individuelle. Pour cela, l'hypothèse retenue consiste à faire reposer sur chaque membre d'un foyer fiscal une part de l'impôt du foyer équivalente à la part qu'apporte l'individu au revenu imposé concerné au niveau du foyer fiscal. En ce qui concerne les prestations, l'hypothèse retenue est de séparer en deux parts égales pour chaque membre du couple le montant distribué au foyer social. Une imposition au niveau des ménages est également facilement reconstituable à partir des montants individuels.

[24] Défini comme le montant payé par un individu ou ménage au titre de chaque taxe indirecte rapporté à sa consommation hors loyer.

Chapter 2

French public finances through the financial crisis:

A macro and a micro analysis

This chapter[1] seeks to give an empirical assessment of the political response to the 2008 financial crisis based both on the analysis of public finance documents and of the use of the microsimulation model presented in chapter 3.

Even before the financial crisis hit, France's economic situation was worrying: the long term unemployment rate was high, the public finances were weak, and the growth rate of the economy was below what many countries in Europe were enjoying. French policymakers were obsessed by the example (or counter-example for some) of Germany, which had implemented through labour market reforms, and had a balanced budget and low unemployment. But there was no consensus on the policies needed in France. Because the financial crisis has affected France less than its neighbours, it has not acted as the impetus for structural reforms that some expected. In a sense, France stands midway between the experience of Southern European countries – where the crisis led to a massive recession and dramatic reforms – and Northern European countries, which were in a much better position to absorb the shock of the crisis. This chapter describes the French experience of the financial crisis, setting out the long term evolution of the economy and public finances and the recent policy measures that have been implemented. Section 1 presents the macroeconomic situation and how the crisis unfolded in France. Section 2 focuses on the public finance situation before and during the crisis and what the overall fiscal response has been, while Section 3 describes in more detail the specific policy measures that have been taken. Section 4 concludes.

[1] The chapter comes from an article untitled "French public finances through the financial crisis: it's a long way to recovery", written with Mathias André, Antoine Bozio and Louise Paul-Delvaux and published in *Fiscal Studies* in 2015

1 Impact of the financial crisis: the macro picture

1.1 National income

A very short overview of growth in France since the end of the war will highlight 'les Trente Glorieuses' (i.e. the Glorious Thirty), the period between 1946 and 1975 when growth in France was strong and above the European average. The causes have been much discussed and explanations range from technological catch up to a large demographic shock (the baby-boom), but the period has framed many French policymakers' attitude towards macroeconomic conditions, with an almost endless aspiration to return to these 'golden years'. From 1979 onwards, the second oil shock led to a marked slow-down of growth. Since that time, the economy of the country has more often been described as in 'crisis' than back on the trend from the previous period. But that gloomy perception – compared to the idealised vision of the 1960s – puts aside two periods of higher growth in the late 1980s and again in the late 1990s; these periods were then followed by periods of stagnation.

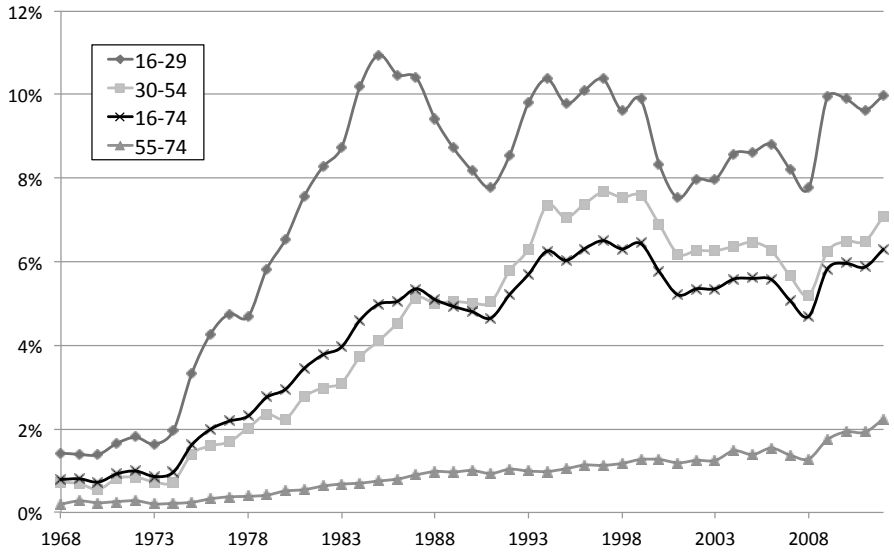
In historic perspective, the financial crisis of 2008-09 led to a dramatic drop in national income, on a scale not seen since the end of World War II: between 2007 and 2009, real GDP fell by 3.2%, while real GDP per capita fell by 4.2%. Perhaps more worrying for the French economy, the stagnation seems to be lasting, as national income per head is still below the pre-crisis peak – something not uncommon in the experience of the other euro zone members – and is expected to decline further over the next few years, falling (by 2017) to a level 4.6% below the 2007 peak.

1.2 Labour markets

Even more than the growth experience, the situation in the labour market has been the major cause for concern for French policymakers. Unemployment has repeatedly been ranked in opinion polls as the top priority for French voters. Figure 2.1 presents the share of the population unemployed (using the ILO definition) by age group – this metric is different from the more usual ILO unemployment rate defined as a share of the active labour force. The impact of macroeconomic trends is clear, with a massive increase in unemployment in the 1970s and early 1980s, and again in the early 1990s. The recent crisis has led to a marked increase in unemployment back to levels not seen since the mid-1990s. It has removed almost entirely the drop in unemployment rate which occurred in the pre-crisis years. Youth unemployment, which was already very high, rocketed to 9.9% of the 16 to 29 age group in 2012.

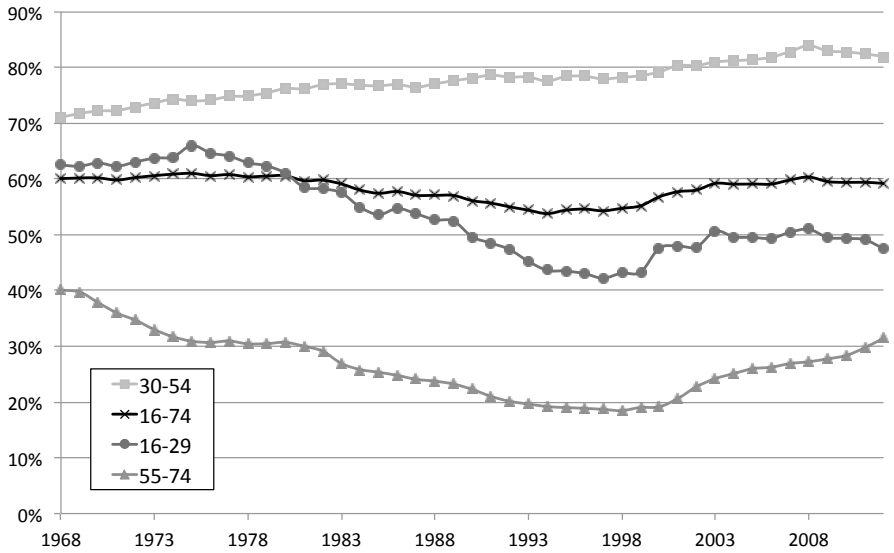
The share of population unemployed does not offer a complete picture of the long term trends in labour markets, especially in France, where policies aimed at reducing labour force

Figure 2.1 – Evolution of unemployment rate in France, by age group (1968-2012).



NOTE: Figures shows the fraction of the population of a given age who were unemployed (using the ILO definition) in a given year. There is a break in the series in 2003 (start of the continuous labour force survey); the break has been corrected here. SOURCE: Insee, enquête Emploi (i.e. French Labour Force survey).

Figure 2.2 – Employment rate by age groups (1968-2012).



SOURCE: Blundell *et al.* (2011), updated to 2012. .

participation of older people have long been in place (in particular, early retirement policies in the 1970s and 1980s). Figure 2.2 presents the employment rates for different age groups across the last forty years. Prime-aged adults in France (that is, those aged from 30 to 54)

have seen their employment rate increase steadily over time due to the increase in female labour market participation. However, the picture is radically different for the young and the old. Both these groups experienced a major decline in their employment until the late 1990s, when the situation somewhat reversed. The reversal in trend for the older workers reflects a change in policies targeted at this group: for example, abandoning early retirement policies aimed at "releasing jobs for the young", and introducing pension reforms to incentivise older workers to postpone retirement. The upward trend in employment of older workers has continued since the crisis started – in fact, if anything, it has been reinforced. The young, on the other hand, have been most hit by the crisis, seeing not only an increase in unemployment but also a reduction in their labour market participation.

An important feature of the French labour market since the financial crisis has been the dynamics of unit labour cost, which have grown at a much more rapid pace than productivity. This has caused concerns in France as it implied a significant detrimental impact on unemployment. The causes behind this feature of French labour markets have been much discussed (see for instance Askenazy *et al.* (2013)) and are best understood by comparing to other countries. Within the Euro zone, with low inflation and no ability to devalue the currency, even small nominal wage growth translates into high unit labour cost increases. With little flexibility to reduce nominal wages (for example, because of legal barriers to renegotiating contracts or laying-off workers, and multiple-year wage bargaining agreements), French firms preferred to stop recruiting and not to renew short-term contracts. Furthermore, unlike Germany, France had not experienced a prolonged period of wage moderation before the crisis; this low wage growth prior to the crisis allowed France's neighbour to absorb the productivity shock. It is in this context that some of the French policy response (such as cutting employer social security contributions) can be understood.

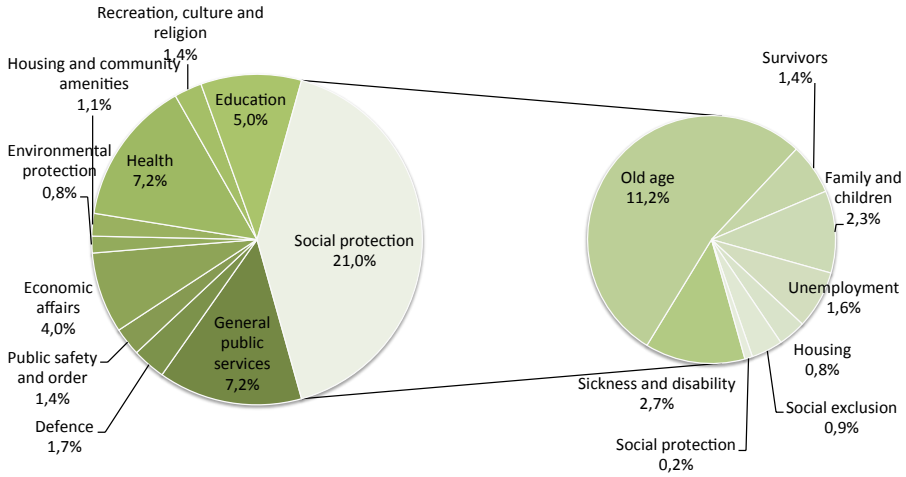
2 Public finance responses

2.1 Fiscal stance before the crisis

On the eve of the crisis, France was a relatively high tax country (42.1% of GDP in 2007) with an even higher level of spending (52.2% of GDP in 2007), part of which was funded by significant revenues from dividends and other non-tax sources (7.6% of GDP in 2007). The difference was made up by borrowing (2.5% of GDP in 2007). France's relatively high level of spending compared to most other European countries can mostly be accounted for by its higher level of social security spending (see Figure 2.3), in particular spending on pensions (12.6% of GDP in 2007).

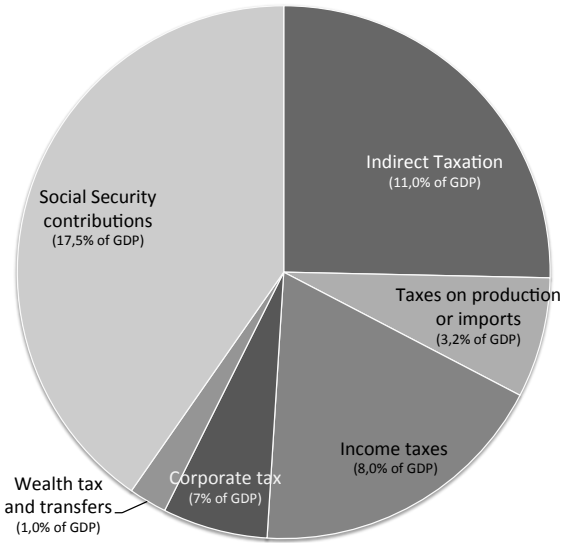
The high level of coverage and a strong contributory links inherent in the French pension

Figure 2.3 – Composition of public spending in 2007.



SOURCE:National accounts (account of public administration), INSEE base 2010. NOTE: the graph represents the structure of public spending in 2007; data labels show the share of GDP spent on each item.

Figure 2.4 – Structure of taxation in France in 2007.



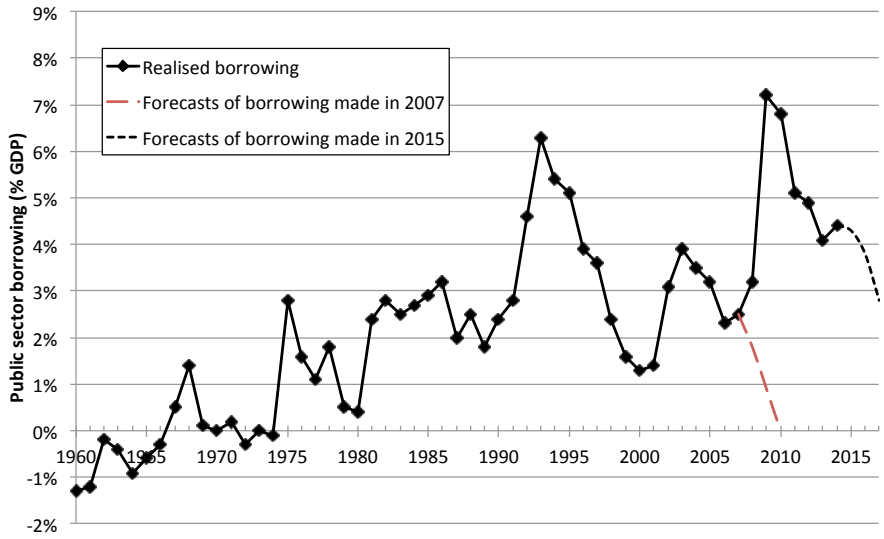
SOURCE: National accounts (account of public administration), INSEE base 2010. NOTE: the graph represents the structure of compulsory taxes and social contributions in 2007; data labels show the share of GDP raised in revenue by each tax.

and unemployment systems have limited the development of private insurance in France and partly explain the current structure of French public spending, although spending is also high in other domains (such as, health care and defence). The structure of taxation in

France pre-crisis reflected the emphasis on social insurance: a large share of tax revenue came from social security contributions (17.5% of GDP), while income taxes only amounted to 8% of GDP (Figure 2.4). VAT and other indirect taxes represented a smaller share of taxes than they do in other high tax countries, such as the Nordic countries, but still amounted to 11% of GDP.

Before the crisis hit, France was already in the red (with borrowing at 2.5% of GDP), although still within the limit of the Maastricht treaty target of 3% of GDP. France had experienced deficits in every year since the first oil crisis hit in 1974. The Maastricht rules were only met in 5 out of the 9 years in which they were in place before the crisis. This happened because the official public finance forecasts were repeatedly too optimistic about the prospects for economic growth (see Box 1). The forecast before the crisis, in 2007, was an expected strengthening of the public finance position until a balanced budget was expected to be achieved in 2010 (see Figure 2.5).

Figure 2.5 – Borrowing 1960–2017.



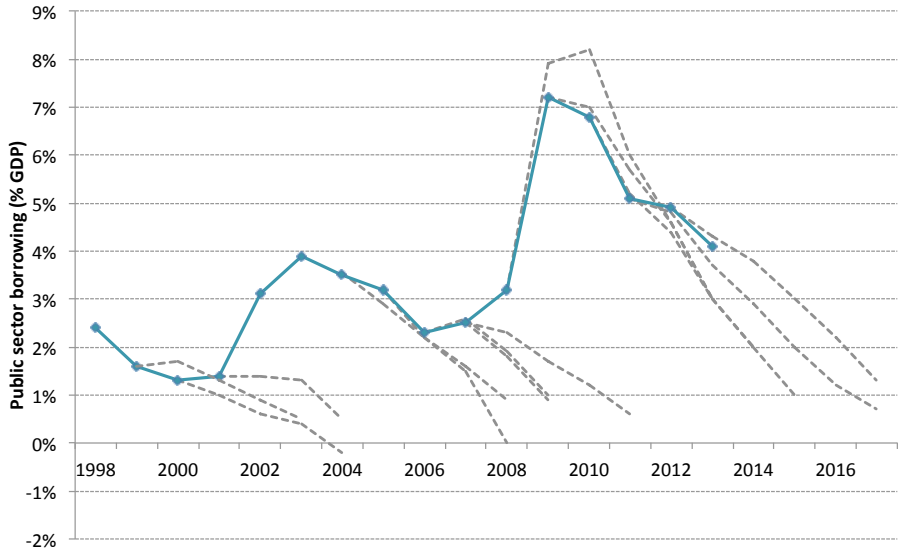
SOURCE: The borrowing series comes from the National Accounts (INSEE, base 2005); the 2007 forecasts for borrowing are the last pre-crisis forecasts made by the Stability Programme 2009-2012 in November 2007; the forecast for borrowing made in 2015 comes from the Finance Law for 2015.

Box 1. The French budgeting process.

The French budget is discussed at the French Parliament with two separate documents, one for the State, loi de finances, and one for social security administrations, loi de financement de la sécurité sociale. The two parts of the French budget are discussed sequentially by members of parliament although the overall position of the public finances hinges on tax and spending measures contained in both documents. They also both rely on common macroe-

conomic forecasts, devised by the French Treasury under the control of the Finance minister. It has often been argued that boosting the expected rate of growth used in preparing the budget has been an easy way to balance the budget. As can be seen in Figure 2.6 below, prior to the crisis the expected balance of the French budget exhibited a systematic optimistic bias, with deficits being always higher than what they were envisaged in previous budgets, even during the period 2001 to 2007 when macroeconomic conditions were relatively good.

Figure 2.6 – Expected public sector borrowing vs. realised borrowing (1998-2017).

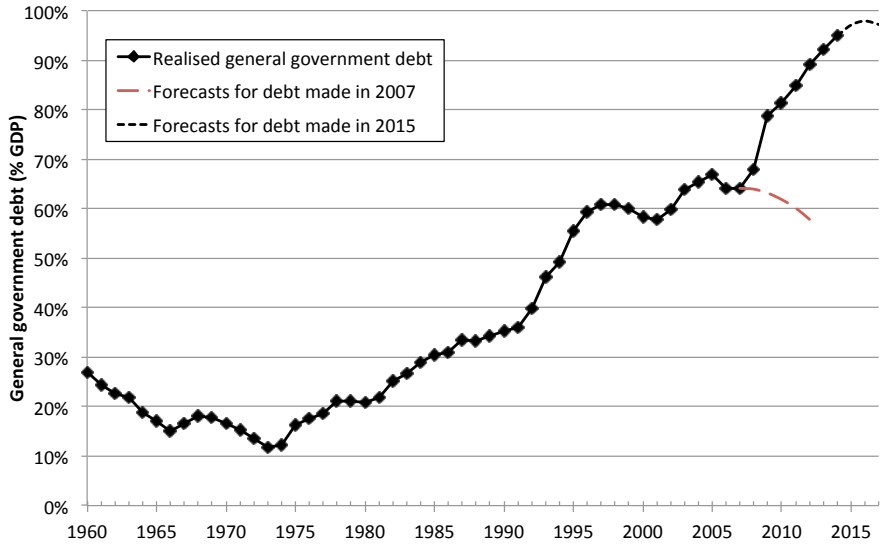


NOTE: Realised borrowing is represented with the straight blue line, while forecasted public sector borrowing is represented with dash grey lines. SOURCE: National accounts and forecasts presented in Loi de finances.

This situation has raised concerns both in France and at the European Commission. In 2012, a new independent body, *le Haut conseil pour les finances publiques* (HCFP), was created with the aim of increasing external scrutiny of the budgeting process. Its mission is to make an external assessment of the macroeconomic forecasts embedded in the French budget and examine the coherence of French public finance plans. The role of the HCFP is likely to improve the growth forecast underpinning the budgeting process. However, for the costing – or scoring – of policy measures, the French Treasury is still almost unchallenged by external scrutiny.

Figure 2.7 shows the cumulative impact of repeated borrowing, and weak economic performance, on public sector debt. From a low of 11.8% of GDP in 1973, public debt rose quickly to 60% in the mid-1990s, when it reached the Maastricht treaty debt ceiling. An effort was then made to remain under this ceiling for a few years, until it was broken in 2003, and then climbed to 66% of GDP in 2007. The stability plan pre-crisis forecasted a progressive decrease of the level of public debt, aiming for a level below the 60% ceiling by 2012.

Figure 2.7 – Debt as a share of GDP (1950-2017).



SOURCE: The public debt series comes from the National Accounts (INSEE, base 2010) for the years 1978 to 2013; the series from 1950 to 1977 come from Pierre Villa's series (CEPII); the 2014 number is the INSEE 3rd quarter estimation; the forecasts of public debt from 2007 are the last pre-crisis forecasts made by the Stability Programme 2009-2012 in November 2007; the 2015 debt forecast was made by the Finance Law for 2015.

2.2 How did the crisis affect the public finances?

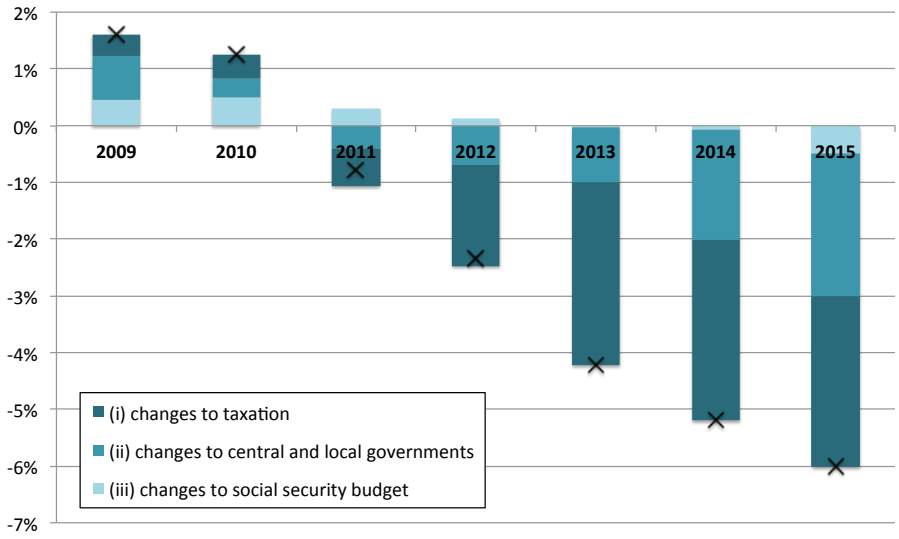
The crisis has affected France's public finances through a sizeable negative shock to national income, leading to an increase in spending measured as a share of national income, causing public sector borrowing to soar. Figure 2.9 highlights the key figures showing how the crisis has affected France's public finances, reconstructing counterfactual revenues, spending and borrowing in the absence of the estimated direct effect of policy responses. The macroeconomic shock can be decomposed into a permanent shock to national income, mostly visible in 2009, and a change in growth pattern leading to a progressive drift in spending as a share of GDP. Without policy response, we estimate that the public sector deficit would have reached 9% of GDP by 2014.

2.3 What was the fiscal response to the crisis?

The first part of the fiscal response to the crisis was a stimulus package – mainly in 2009 – comprising increased spending and tax cuts. The size of this stimulus was relatively modest compared to what some other countries undertook: the total fiscal expansion was 1.6% of GDP in 2009. The extra spending in 2009 took the form of large public works (high-speed train lines, tunnels, etc.) and funds directed at firms. In 2010, additional spending took the

form of investment spending for higher education and research (Plan campus and investissement d'avenir) funded through extra borrowing. There was also some limited government intervention to support the financial sector, mostly in the form of loans to troubled banks. After this period of measured fiscal stimulus, the French government decided to tighten fiscal policy, mostly through increased taxation: in 2011 the reversal of the temporary stimulus measures and new tax rises amounted to 1.1% of GDP, with a further 1.1% of GDP tax rise implemented in 2012, while in 2013 another tax hike added a further 1.4% of GDP. Figure 2.8 presents the composition of fiscal changes from 2009 to 2015, showing changes to taxation and spending, split into central and local government budgets and social security (pensions, health care, work-related accident and child benefits). By 2014, 61% of the fiscal tightening had been done through increased taxation, while public spending cuts only represented 39% of the total effort.

Figure 2.8 – Composition of the public finances responses, 2009 onwards.

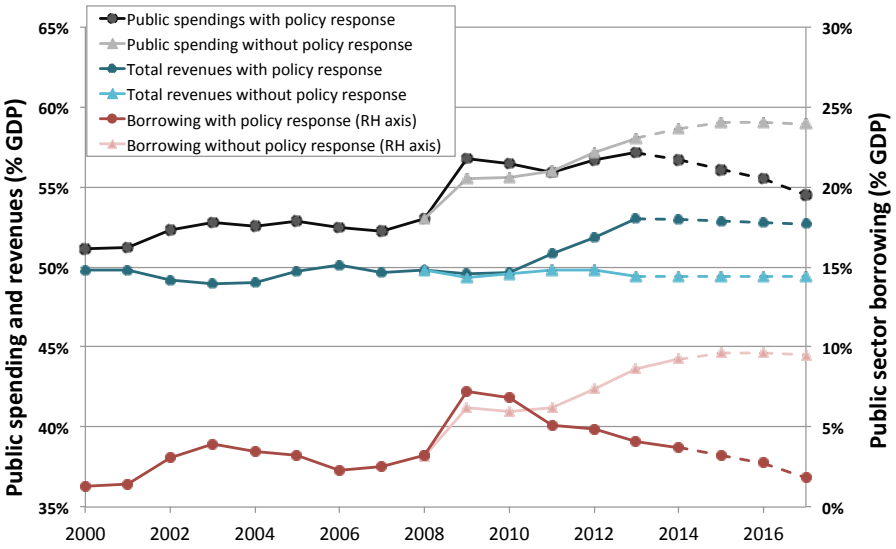


NOTE: the cross X indicates the total impact of public finances responses. SOURCE: National Accounts, INSEE base 2010 and Budgets (lois de finances) from 2009 to 2014.

Since 2014, the French government has decided to stop increasing taxation and, therefore, mostly use reductions in public spending as a way to balance the public finances. Reductions in public spending reached 2% of GDP in 2014 and a further 1.5% of GDP is planned for 2015. Within public spending, social security spending has contributed little to the overall cuts in public spending, while most of the cuts have been delivered by cuts to central and local government budgets. By 2015, according to government plans, the fiscal tightening will have been done 46% through net tax rises and 54% through net spending cuts. It is important to note, however, than these estimates of spending 'cuts' are against the counterfac-

tual spending trends shown in Figure 2.9. In the French case, the increase in counterfactual public spending is largely driven by expected increases in health care and old-age pension spending (see section 3.2).

Figure 2.9 – Taxation, spending and borrowing with policy responses, 2007 onwards.



SOURCE: National Accounts, INSEE base 2010 and Budgets (lois de finances) from 2009 to 2015. The dashed lines for policy response come from the 2014 – 2017 public finance programming law.

In 2009 and 2010 public policies were countercyclical (increasing public spending and borrowing compared to the situation without any response). From 2011 onwards, policy responses have reduced borrowing to below 5% of GDP. So far this has mostly been done through significant increases in taxation, as shown in Figure 2.9, but over the next two years spending cuts are expected to deliver further borrowing reductions while no further tax increases are currently planned.

3 Policy responses: an opportunity for reform?

3.1 Changes to tax and benefits

This section presents micro analysis of changes to the tax and benefit system introduced after the crisis. These have been almost entirely on the tax side, with increases in taxes that started in 2011 and 2012 with the centre-right government, were further increased by the centre-left government in 2012 and 2013, before being halted in 2014. Detailing all the tax changes over the period is outside the scope of this chapter, since the increase in the tax burden has taken the form of numerous small changes, but it is possible to summarize the

main changes, as shown in Table 1.

Table 2.1 – Major tax changes post-crisis.

	Year(s) of implementation	Total revenues (as % GDP)
Household income taxation		
Increase in top marginal rates of income tax	2009 to 2013	0.05%
Additional tax on incomes above € 150 000	2011	0.04%
Increase in the discount to the tax schedule (décote)	2013 and 2014	-0.03%
Reduction of quotient familial maximum tax reduction	2013 and 2014	0.08%
Reduction of the tax loopholes	2012 and 2013	0.04%
Changes in wealth taxation	2011 to 2013	-0.03%
Freeze of the income tax brackets	2012; 2013	0.17%
Capital gain taxation	2010-13	0.29%
Changes in flat-rate income tax (CSG)	2009-2012	0.04%
Income tax reduction of low income households	2015	-0.13%
Social Security contributions (SSCs)		
Increase in pension SSCs	2014	0.13%
Increase in SSCs on capital income	2009 to 2013	0.33%
Creation and increase of the forfait social, an employer contribution on earnings not previously subject to SSCs	Since 2009	0.28%
Reduction in SSCs	2015	-0.27%
Firm taxation		
Increase in payroll tax (taxe sur les salaires)	2013-2014	0.02%
Reform of the corporate tax (impôt sur les sociétés)	2012 -2014	0.14%
Tax credit for competitiveness and employment (CICE)	2013-2014	-0.47%
Reform to business rates (taxe professionnelle)	2010-2011	-0.35%
Research tax credit	Since 2009	-0.04%
Anti tax evasion and exile of firm taxation	Since 2011	0.15%
Creation of a new social solidarity contribution on firms	Since 2011	0.07%
Other fiscal measures on firms	Since 2010	0.16%
Employer levy on earnings above 1M euros ("75% tax")	2013 -14	0.01%
Indirect taxation		
VAT : creation of a new category and increase in VAT rates and modulation of the tax base	2012; 14	0.40%
Increase rates on tobacco and alcohol, creation of a tax on soda, food taxation	2009 to 2011	0.07%
Pigouvian taxes for ecological concerns	2009 to 2015	0.17%
Other indirect taxes	2010; 2013	0.02%
Total of selected tax measures		1.59%

SOURCE: Rapport des Prélèvements obligatoires 2009-2015.

Income taxation has been increased by three main measures. First, by failing to uprate tax thresholds, the French government has caused a general increase in income taxation, using an effect known as fiscal drag or bracket creep. Second, by increasing top income tax rates, high incomes have been particularly targeted by these tax increases. The increase in top marginal tax rates has happened in three steps: first in 2011 with an additional tax on incomes above €150,000, then with the increase in the top marginal tax rate from 40% to 45%, and finally – and largely symbolically – with the temporary 75% tax rate on incomes above one million Euros (see Box 2 for more details).

Tax increases have also been concentrated on capital incomes. These increases first took the form of an increase in the flat of rate income tax charged on capital incomes, which was raised from 20.1% to 36.5% between 2009 and 2012. Then the government decided, from 2013 onwards, to incorporate most capital income into the progressive income tax schedule (from which they had previously been exempted). This led to further increases in capital income taxation for households whose income put them in the top marginal tax bracket.

A second set of changes were those made to firm taxation. In 2012 the government announced a major expansion of the corporate tax base, before announcing a major reduction

of corporate tax through a tax credit (*crédit d'impôt compétitivité emploi*, CICE) computed on earnings paid by firms. This tax credit is in effect a reduction in employer social security contributions of 6% of gross earnings under 2.6 times the minimum wage (i.e. earnings up around to the eighth decile of earnings), which can be deducted from the corporate tax.

In order to fund this tax credit, the government increased VAT rates, with the normal rate going from 19.6% to 20% and the intermediate rate from 7% to 10%. This increase in the intermediate rate happened five years after its introduction for hotels and restaurants. Finally there have been significant increases in mandatory pension contributions, both for public sector and private sector employees. Assessing the efficiency effects of these various tax changes is difficult as many of these changes have had contradictory effects that may off-set each other. The increases in income tax have led to an increase in marginal tax rates for the richest households, but most of the increase has been directed towards the taxation of capital, rather than labour, income. On the downside, these changes will have reduced economic efficiency by reducing marginal incentives to work and save. However, on the upside, they have had the positive effects of reducing the difference in marginal taxation across different types of income – hence moving to a more neutral tax system, albeit one with higher marginal rates. The increases in pension contributions may also have reduced labour supply if wage earners do not realise that these contributions help fund their pension benefits – although one should note that the recent increases in contributions have not been matched by benefit increases, but rather a reduction in the pension system's long term liability.

Two other measures that improved the efficiency of the tax system were the tax credit for competitiveness, the CICE, which effectively reduced employer social security contributions) and the increase in reduced rates of VAT. As presented in the previous section, the structure of French taxation puts high weight, and perhaps too much weight, on raising revenues from employer social security contributions. These contributions, in combination with a high gross minimum wage have been criticised for likely reducing labour demand, and thus increasing the structural unemployment rate. The tax credit that was implemented, which reduced these contributions for 80% of wage earners, are likely to have a positive impact on employment, and reduce the efficiency cost of these contributions. However, the design of a tax credit on corporate tax to off-set high levels of social security contributions is far from optimal, and may well be much less efficient than a direct reduction in social security contributions. Increasing the reduced rate of VAT could also be positively assessed. There has been much discussion of the efficiency costs of the large range of products which can benefit from reduced VAT rates in France, particularly since the reduced rate was expanded to cover restaurants and hotels in 2009. There are likely to be efficiency gains from reducing the gap between the full and reduced rates of VAT.

Box 2 – The "75% tax".

During the 2012 presidential election, Mr Hollande promised to introduce a 75% tax on annual incomes above one million Euros. This announcement made international headlines at the time. The introduction of the tax, however, has been convoluted with a first attempt declared unconstitutional by the Constitutional Court in 2012 because it failed to take into account family composition. The final version of the tax voted by the French Parliament takes the form of an employer tax on earnings above 1 million Euros at the rate of 50%. The tax is temporary – only for two years from 2012 to 2014, and therefore no longer in place – and also had a cap at 5% of turnover.

This reform changed the marginal tax rate for those on the very highest salaries subject to this tax. The calculation of the marginal rate can be made for an individual receiving only salary-related income (see Bozio *et al.* (2013)): for such a person, the '75% tax' increases the top marginal rate on net income from 66.1% to 75.7%.

While this tax is notionally paid by employers, the effective incidence is still unknown. We do not know by how much employers adjusted for it in salaries (by lowering them), in relation to shareholders (by reducing dividends) or consumers (by increasing prices). The government hoped to discourage firms from offering salaries of more than one million Euros, but since the tax is temporary, it is difficult to imagine it having a lasting effect on remuneration policies.

Above all, this tax is liable to entail a multitude of evasion tactics, whether it be delocalisation (making use of tax havens or shifting financial operations off-shore), or tax avoidance (changes to salary reporting, forms of remuneration, etc.), all of which lead to a reduction of the desired receipts from the tax. The government estimated that it would raise a relatively small 260 million Euros in 2014 and even that is probably an overestimate.

However, taken as a whole, the need for significant changes to the tax system over the last few years has not been used as an opportunity to improve the coherency or simplicity of income taxation or social security contributions. French taxation continues to have two separate income taxes and more than 17 different social security contributions. Complexity still plagues the French tax system but an overhaul has definitely not been on the agenda during the post-crisis period, even though it was discussed by Francois Hollande during the 2012 presidential election campaign.

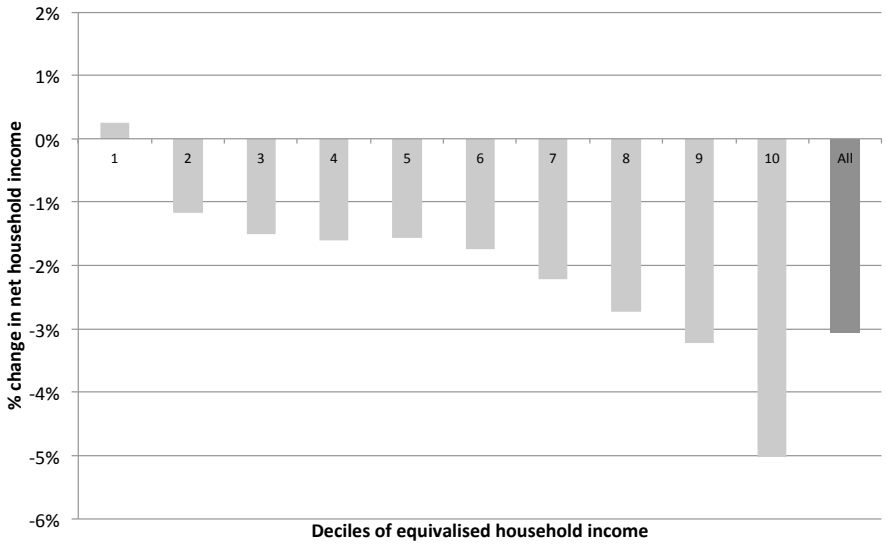
Changes in benefits (see Table 2) have been much smaller than changes in taxes. Similar to the bracket creep that affected tax thresholds, some benefits were frozen, such as family benefits in 2010 and the uprating of pensions. But partially offsetting this was an above-inflation increase in the Revenue de solidarité active (RSA) and Allocation aux adultes hand-

icapés (AAH), which was intended to compensate the poorest households for the rise in indirect taxation; RSA is an income support programme for households with no or very limited resources, while AAH is a disability benefit.

Table 2.2 – Major benefit changes post-crisis

	Year(s) of implementation	% of GDP
Temporary measure for low-income households (2010 only)	2010	0.05%
Freeze of the family benefits	2010	-0.05%
Increase of the disability benefits (AAH)	2010 to 2012	0.04%
2% more than inflation increase of the RSA	2013 and 2014	0.02%
Freeze on the uprating of pensions	2014	-0.05%
Reform of family allowances	2015	-0.02%

Figure 2.10 – Redistributive impact of tax and benefit changes by decile of equivalised household income.



NOTE: Redistributive impact of tax and benefit changes (2010 - 2014) SOURCE: TAXIPP 0.3

Figure 2.10 shows the net change in household disposable income from the tax and benefit measures implemented between 2010 and 2014[2]. It is worth noting that these simulations exclude some tax changes such as changes to firm taxation[3]. Overall we have simulated 60% of all tax and benefit changes implemented during this period.

[2]The redistributive impact of the tax and benefit changes has been estimated using TAXIPP the microsimulation model of the IPP.

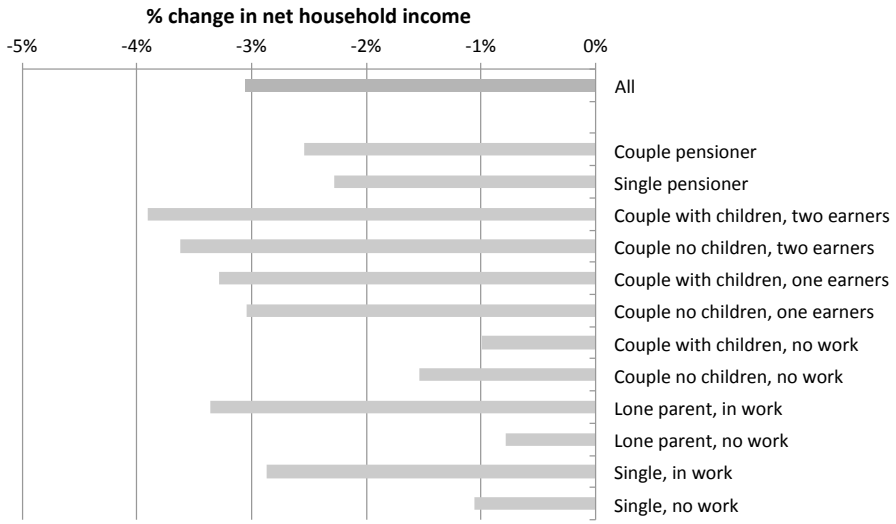
[3]One can make assumptions about the long run incidence of various changes to firm taxation and estimate the likely impact on household disposable income but for comparability between countries, the estimates presented here only capture changes to household taxation. To be more precise, VAT changes have been incorporated assuming that the incidence will largely be on consumer, but the reduction of employer contributions in the form of CICE has not been imputed to wage earners.

On average, French households experienced a reduction in disposable income of 3.0%. The total impact of these changes is continuously progressive, with the bottom 10% of the income distribution having marginally benefited from these changes, while the rest have seen their net incomes reduced by tax increases. Deciles 2 to 8 have been affected to a lesser extent than the overall population. The richest decile of French households saw a reduction in disposable income of 5.0%.

As Table 2 made clear, the changes to benefits have been minimal in France over the period and it is mostly changes to taxation that explain the majority of the distribution effects. The only exception to this is the small gain observed for the first decile, mainly driven by the 2% above inflation increase of the RSA.

Figure 2.11 presents a similar picture decomposing the impact of tax and benefit changes by different family types. Both the working age population and pensioners have been affected negatively. However, pensioners have lost less than the overall population, while working age people with children have tended to lose more than otherwise similar working age people without children; the latter is mainly because of the decrease in the cap on income tax reductions that children can provide.

Figure 2.11 – Redistributive impact of tax and benefit changes by family type.



NOTE: Redistributive impact of tax and benefit changes (2010 - 2014)
SOURCE: TAXIPP 0.3

3.2 Changes to public spending

As highlighted by Figure 2.8, the fiscal tightening coming from cuts to central and local government budgets is planned to amount to 2.7% of GDP by 2015, with an additional 0.9%

coming from social security budgets. Most of this reduction will be achieved simply by maintaining spending at 2008 real terms level – compared to a counterfactual of no policy change which would imply an increase in public spending in real terms. By 2017, according to the 2014-2017 public finances programming law, real terms reductions in central government spending (i.e. French State) will amount to 8.7%, or a contraction of 0.9% of GDP compared to a real terms freeze.

Using these spending plans up to 2017, we decompose in Figure 12.A the planned cuts to the major areas of central government spending between 2010 and 2017[4]. Planned cuts are mainly targeted on general administration (labour, finance and ecology ministries), defence, and other smaller areas (e.g. culture and public aid to development). Spending on schools, police or research has been relatively protected from the cuts with an average real terms cut of less than 4%, compared to 8.7% for all central government spending. Within the state budget, the main exception is the programme named "solidarity, insertion and equality of opportunity" which exhibits a real increase in spending over the period, mostly accounted for by an increase in incapacity benefits and income support (AAH and RSA).

Figure 12.B presents similar numbers for the social security budget (included in *lois de financement de la sécurité sociale*)[5]. Overall the social security budget is still expected to increase in real terms over the period from 2010 to 2017, especially for old-age pensions (+12.0%) and health care (+5.7%). Nevertheless, these increases are below counterfactual spending trends and represent a policy tightening relative to pre-crisis plans in the case of health care, which would have seen a 22% increase by 2017 in the absence of policy change (according to 2014–15 social security budget laws). In contrast, old-age pensions have been largely protected from spending cuts. Spending on family-related benefits (child benefit, child-care subsidies, etc.) are planned to be reduced in real terms (-4.5%) – similar to other relatively protected items in the central government budget – compared to a counterfactual 8% real-term increase by 2017.

3.3 Other structural reforms

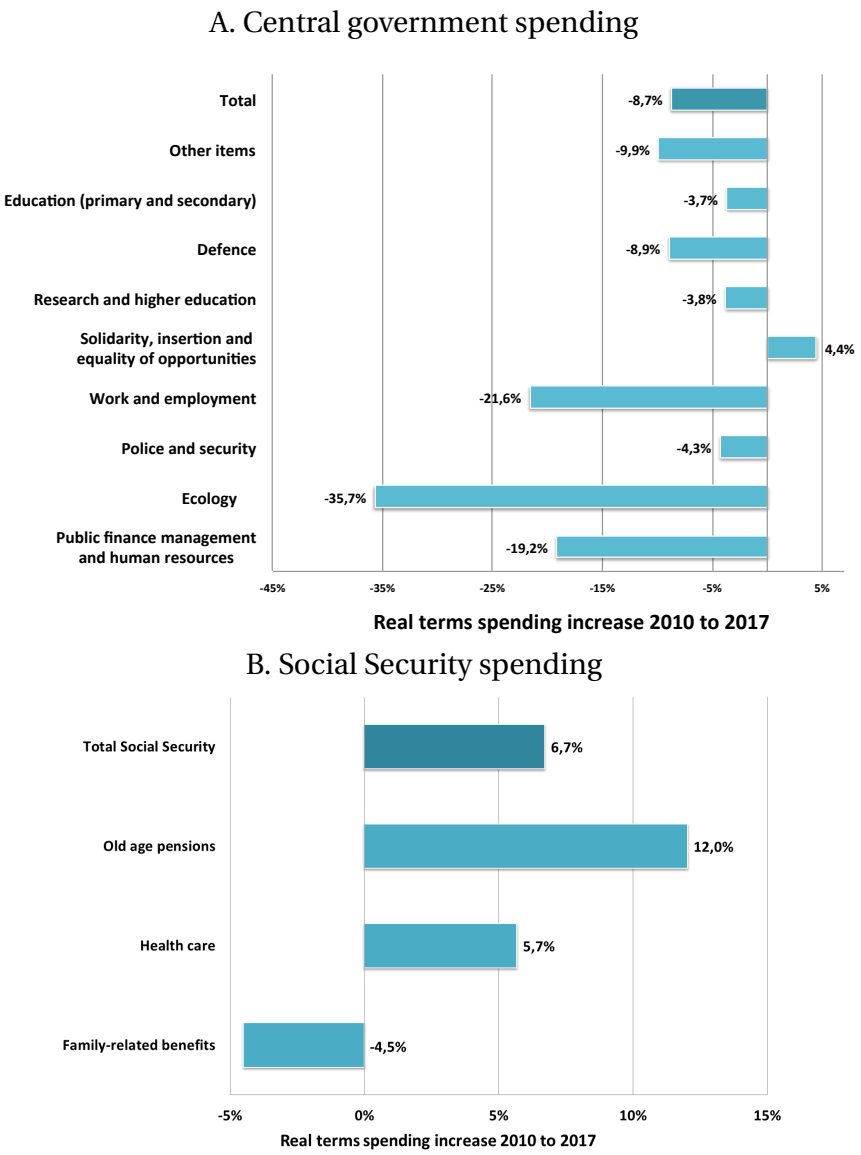
France has introduced a number of structural reforms since the financial crisis hit, albeit timid ones. There are three notable categories of reforms: changes to labour market rules, changes to the structure of local government and changes to market regulations.

There has been much discussion in France of the need for reform of labour market regulations. Some economists have argued that one of the sources of high unemployment in

[4] Central government spending accounts for 56% of total local and central government budgets.

[5] The social security budget does not encompass all social security public spending as defined by national accounts. It does not for instance include complementary pension schemes or unemployment insurance, both of which are mandatory schemes (included by national accounts in public spending) but managed by representatives of employers' and employees' unions, with no oversight of the French Parliament.

Figure 2.12 – Real terms increase in central government and social security spending by major functions (2010 to 2017).



SOURCE: Finance Law for 2010 and Programming Law for 2014-2017 (panel A). Social security budget laws 2012 and 2015 (panel B).
NOTE: Panel A shows the seven biggest items of public spending within central government, ranked from the biggest to the smallest (in amount). These items include both benefits and public services. Panel B presents all spending within Social security budget – work-related accident have been incorporated in the health care item.

France is regulations that prevent firms from terminating employees' contracts for economic reasons (for instance Cahuc and Kramarz (2004)). In January 2013, employee and employer unions signed an agreement (Accord interprofessionnel sur la sécurisation de l'emploi) aiming to facilitate mass redundancies and to reduce the possibility of judicial interference with

firms' decisions to reduce the size of their workforce. This agreement was judged to be too timid by proponents of further reforms of the French labour market, but was nonetheless criticised by others as being an attack on employees' legal protections. Overall the reform has the benefit of reducing the legal uncertainties around mass redundancies but it remains to be seen whether this can have a significant impact on the efficiency of labour markets. Another agreement (reached in December 2013) led to a reform of the funding and organisation of on-the-job training by firms. This might also have a beneficial impact, although it is likely to be small.

The administrative map of France is complex, with multiple different layers of administration – state, regions, departements, cantons and communes. This administrative structure was originally set up during the French revolution and Napoleonic years – splitting between a highly centralised state, and local authorities divided into the departement and the smaller communes. A major reform in the early 1980s created larger local entities (regions). Over time these have gathered more and more powers and greater control over spending. However, in recent years it has been recognised that simplifying the administrative map further could lead to substantial savings by cutting duplicate administrations. Options put forward ranged from removing departements to merging communes, but finally the reform adopted led to merging regions. The 22 original regions were reduced to 13 new regions by a law passed in 2014. The reform is clearly a step towards a better and more efficient administrative map but the savings will not materialise for a few years (as merging administration takes time), and the latest reforms only go part of the way to simplifying France's complex administrative structure: 36,660 communes and 101 separate departments remain.

Finally, a law – currently being discussed by the National Assembly – aims to remove barriers to entry into and deregulate the practice of a number of protected trades and professions (*loi pour la croissance et l'emploi*). In particular, the law would remove legal barriers to creating bus links between French towns (these were previously banned if there was a public train service operating on the same route), gives more power to the competition authority to address firms' abuse of a dominant position on the high street, extends Sunday trading, and proposes reforms to reduce tariffs of regulated legal professionals (including notaries). Most of these reforms are small steps towards facilitating business and trade in France, but they are not a radical reform as the list of caveats and conditions for each measure makes it difficult to envisage them having a large overall impact.

4 Conclusion

Although France was not severely affected by the crisis – at least compared to many other countries – the recovery has been particularly slow, with GDP per head still below its peak in

2007 and expected to remain so up to, and probably beyond, 2017. Borrowing is not expected to be back to pre-crisis levels until 2016 and public sector debt will remain at a higher level than before the crisis throughout the next decade.

The crisis has so far pushed France's public finances towards a higher level of taxation and a higher level of public spending as a share of GDP. Over the three years from 2011 to 2014, new policies have been introduced – by both centre-left and centre-right governments – that increase tax revenues by 3.0% of GDP. This is a very significant tax increase which has led to public anger in France. From 2014, further consolidation of France's public finances will rely mostly on reductions in public spending, with the stated aim of returning spending to pre-crisis levels as a share of GDP. This will be achieved through real terms cuts to many areas of central government spending – including education and defence – and to limitations to health care spending growth in the social security budget. Overall the spending squeeze is expected to reduce spending by 3.5% of GDP, meaning that spending cuts will account for just over half (54%) of the fiscal consolidation measures by 2015.

The large increase in taxation has not been used as an opportunity to simplify the structure of French taxation, but there have been some improvements. The reduction in employer social security contributions and the increase in the reduced rate of VAT are positive steps towards a more balanced structure of taxation, even if the implementation lacks simplicity and transparency. There have also been various positive attempts to reform French labour markets, removing barriers to trade and opening up some protected professions to competition. But these positive steps are all relatively small and are unlikely to bring decisive change to the prospects for France's public finances.

Part II

PRIMARY INEQUALITY, INCIDENCE AND BEHAVIOURAL RESPONSES ON THE LABOUR MARKET

This second part focuses on the taxation of labour incomes and rests upon the methodology presented in the first part. The questions and the methods tackled by this part are at the intersection of the public finance and the labour economics literature. Chapter 3 studies the overall wage distribution whereas chapter 4 focuses on the very top wages (top 0.003% of the distribution, about 1500 individuals). These two chapters are complementary in the sense that the first one focuses on the long term evolution of taxation and labour inequality of the broad wage distribution whereas the second chapter is centred on top 0.01% of the same distribution.

Chapter 3 demonstrates that taxes on earnings can play an important role for the labour market analyses. The chapter directly belongs to the long standing debate opposing market-based versus institution-based explanations for the increase in wage inequality. It contributes to it by importing another explaining factor from the economics of taxation. The chapter documents an increase in labour cost inequality seemingly at odds with the stable net wage inequality observed in France. The main finding is that primary wage inequality on the labour market did increase in France, by about 20% since 1976. This result comes from the comparison of inequality measures before and after social security contributions and was achieved by computing forty years of social security contributions based on payroll tax data. Because of this increase in labour cost inequality, France cannot stand any more as a counter-example to demand-side explanations for the rise in inequalities. The importance of SSCs exemplifies the fact that institutional factors, like taxation, can have powerful impacts on the evolution of net wage inequality.

Chapter 4 studies the impact of a wage tax at the very top of the distribution on the wage setting process of top labour income earners. I use a quasi-experimental variation created by the introduction of the 75% tax above in France. This is a temporary tax (2013 and 2014) on labour income, which increased the top marginal tax rate from 64% to 75% on wage above €1m of gross wage. Simulating this tax based on payroll and firm tax data, I show that the tax was borne at 80% by employers. I estimate a negative elasticity of the labour cost and a positive elasticity of the net wage to the tax. The effect of the tax transited through a decrease in net wage for managers whereas CEOs and deputy CEOs saw a smaller decrease in net wage associated to an increase in labour cost. Football players have been able to make their employers pay for the totality of the tax. The chapter sheds a new light on the taxation process of the very top of the labour income distribution, by focusing at an income level that had never been reached before. It also studies the impact of taxation on the interaction between the firm environment and the workers.

Chapter 3

Primary inequality of labour incomes: taxation and technological determinants

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This chapter[1] documents an increase in labour cost inequality seemingly at odds with the stable wage inequality observed in France. A large literature has documented a significant increase in wage inequality in many developed countries since the 1980s. Studies on U.S. data have shown very steep increase in overall wage inequality in the 1980s (Bound and Johnson, 1992; Katz and Murphy, 1992 and Katz and Autor, 1999 for a survey), a continued increase in the upper half of the distribution in the 1990s while the widening of the wage inequality halted in the bottom half of the distribution during that period (Autor *et al.*, 2008). A similar pattern has been found for the U.K. (Gosling *et al.*, 2000), and recent work has highlighted that Germany has not been an exception to this trend (Dustmann *et al.*, 2009), albeit in a smaller scale and with a different timing.

The explanations of these secular trends in widening wage inequality in developed countries have been debated. First, the hypothesis that technological change was the driving force behind these trends, named skilled-biased technological change (henceforth SBTC) rests on the idea that modern IT technology has shifted the demand for labour in favour of skilled workers: those using computer technology see their productivity increase while unskilled workers see their tasks replaced by computerisation (Katz and Murphy, 1992; Card and Lemieux, 2001; Autor *et al.*, 2008). A variant of the SBTC highlights polarisation of skills in the more recent period with declines in labour demand more pronounced for those clerical tasks, used to be realised by middle skilled workers, while the demand for unskilled labour is less affected, notably due to the demand for services that are hard to be replaced by IT technology (Autor *et al.*, 2006; Goos and Manning, 2007; Goos *et al.*, 2009; Autor, 2015). Second, the hypothesis that institutional changes are the main cause for widening inequality has been put forward with particular attention to the impact of the minimum wage in the U.S. (Lee, 1999; Card and DiNardo, 2002; Card and Lemieux, 2001; Lemieux, 2006), but also unionisation and economic deregulation (Fortin and Lemieux, 1997).

[1] This work comes from a working paper co-written with Antoine Bozio and Thomas Bréda untitled "Primary inequality and redistribution through employer Social Security contributions: France 1976-2010".

In this debate, evidence from the UK and Germany (e.g. Lindley and Machin, 2011 for the UK; Dustmann *et al.*, 2009 for Germany) have provided support for the SBTC hypothesis. The case of France was, on the contrary, cited as a counter-example. A series of recent academic papers (Koubi *et al.*, 2005; Charnoz *et al.*, 2011, 2013; Verdugo, 2014) have shown that France is almost the only developed country where overall wage inequalities have been decreasing over the past 40 years. For instance, the ratio d9/d1 of wages at the 9th and 1st deciles of distribution of net wages decreased from about 3.6 in 1976 to slightly less than 3 in 2010. This decrease is mostly driven by a reduction in lower-tail net wage inequalities (d5/d1), while upper-tail inequalities (d9/d5) remained roughly constant over the period 1976-2010.

This "French exception" casts doubts on the main demand-side explanations for the rise in inequalities, such as SBTC or job polarization. As those explanations derive from global technological changes, they should have hit all developed countries, and it is hard to claim that IT technologies or computerisation have not been adopted in France. However, studies of the French wage structure have concluded that SBTC does not apply in France, and suggested that institutional factors – in particular expansion of education – have been the main drivers for the compression of the wage distribution (Goux and Maurin, 2000; Charnoz *et al.*, 2011; Card *et al.*, 1999; Verdugo, 2014).

In this paper we revisit the French evidence with a simple (but often forgotten) argument, i.e. that the relative demand for skilled and unskilled labour depends on their relative product wages (or labour costs) rather than their relative gross wages. The main difference between the two measures of wage inequality comes from changes in employer social security contributions (SSCs) at different points of the wage distribution. For some countries the difference is small and only marginally change the overall picture on widening inequality. For instance, in the U.S., the combination of small increase in employer payroll tax (+1.6 ppt) and a relatively high payroll tax threshold (around the 9th decile) over the period 1970-2010, means that labour cost inequalities are only marginally different from gross wages inequalities[2] [3].

The picture is very different in France, where employer SSCs have changed dramatically over time and across the wage distribution. France has had historically high employer SSCs, with total employer marginal rates close to 40% under the social security threshold (SST). However, during the 1980s and 1990s, two sets of policies have radically transformed the distribution of employer SSCs: first, in the 1980s, a number of contributions have been "un-

[2] According to our computations, inequalities computed with the two concepts are virtually equal except for workers in the top decile of the distribution which got partly caught up by the payroll tax threshold and thefore experienced a slightly larger increase in their average payroll tax rate than other workers over the period 1970-2010.

[3] Another issue in some countries like the U.S. or the U.K. would be other form of remuneration (e.g. health insurance, employer contributions to pension funds) that are not mandatory and not included in posted gross earnings.

capped", i.e. applied to all earnings above the threshold. Second, during the 1990s, reductions in employer SSCs around the level of the minimum wage have been implemented. These policies were motivated by the concern that the French minimum wage was too high, contributing to high unemployment of unskilled workers. Over 40 years, these successives policies mean that employer SSCs have been reduced on low earners and increased on high earners, leading to a very different picture when one looks at labour cost inequality or gross wage or net wage inequality. Using administrative data spanning from 1976 to 2010, we show that labour cost inequalities have actually increased in France by more than 15%, while net and gross wage inequalities have decreased by 5 to 10%.

Then, using labour cost measures of wage inequality, we revisit the SBTC hypothesis on French data. We follow the framework developed by Katz and Murphy (1992) and Autor *et al.* (2008) to estimate shifts in demand for skills using variations in their supply. Because the supply of skilled versus unskilled workers has been constantly increasing in France over this period, we cannot distinguish shifts in supply from time trend or SBTC, as has been shown using U.S. data. We offer an alternative evidence by calibrating the canonical SBTC model, with US estimates of the elasticity of substitution between skill groups. We show that French data, when labour cost is considered, is consistent with the SBTC hypothesis.

If the French case is not an exception that can be used against the SBTC hypothesis, it also exemplifies the fact that institutional factors, like taxation, can have powerful impacts on the evolution of net wage inequality. Most of the institutions studied carefully in the inequality literature concentrate on minimum wage, unionisation and education policies. Taxation seems to have attracted a lot less scrutiny from scholars looking at wage inequality, with the notable exception of top incomes inequality (Piketty and Saez, 2003; Piketty *et al.*, 2014). The impact of employer social security contributions on net wage inequality is however hard to assess, as it depends fundamentally on the ultimate incidence of these taxes and on their impact on employment, an issue where robust evidence is hard to find. Our analysis provides suggestive evidence that employer SSCs are shifted in the long run onto employees, and can thefore reduce gross wage inequality.

The rest of the paper is organised as follows: Section 1 presents the data and the institutional setting that make labour cost important to analyse in the French case. Section 2 reproduces the standard analyses of skill biased technical change using labour costs per worker instead of gross or net wages. In section 3, we discuss the relationship between the long term incidence of employer SSCs and the efficiency of these taxes to reduce gross wage inequalities. Section 4 concludes.

1 Labour cost inequalities in France

In this section we briefly describe the institutional setting, then the data we use before presenting basic results on labour cost inequalities in France over the 1976-2010 period.

1.1 Labour cost and social security contributions

SSCs are a very important part of taxation in France representing close to 40% of total tax revenues. They fund a number of aspects of the welfare system, notably health spending and pensions, but also family benefits, unemployment insurance and housing 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 employee, one funding family benefits, another one funding unemployment insurance, etc. Each scheme differs according to the type of governance (State, Social security, management by employer and employee unions) and according to the nature of the contributory link between SSC and benefits (pensions are contributory, health is not).

The tax schedule of SSCs is similar in France to most other OECD countries. The tax base is gross wage (or posted wage) capped at different thresholds. The reference threshold, called *social security threshold* (SST) is roughly mean gross earnings for full-time employees, and SSCs can be defined as a function of 1, 3, 4 or 8 SST. The SSC schedule is defined for each period of employment and adjusted for the number of hours worked: for instance, an employee working one hour for a high wage will be pay SSC based on the different multiple of hourly SST. One distinctive feature of French SSCs is that the main threshold (1 SST) is lower than in most other countries (around P70), while there are SSCs for very high level of earnings (the highest threshold is at P99.95).

During the period of our data (1976-2010) a number of reforms to SSCs have been carried out in France. Figure 3.1 offers a rapid summary of these, by showing average SSC rate over labour cost by decile of earnings. Two periods stand out: the most recent period spans from mid-1990s to the present day, when SSC average rates stabilise around 46% for the top half of the earnings distribution and average rates drop for lower deciles (to 34% for the first decile, to 40% for the second decile). This is the result of a set of measures, i.e. reductions of employer SSCs, implemented to reduce labour cost at the minimum wage by various governments[4]. These exemptions are total for workers paid the national minimum wage and decrease linearly up to the point where they have entirely disappeared (1.6 times the minimum wage in 2010). As a consequence, they have impacted only the three first deciles of the

[4]See Appendix 3.A. Those exemptions started for workers whose wage was below 1.3 times the national minimum wage. They have been progressively extended to higher levels of the wage distribution, up to 1.6 times the national minimum wage during the period covered by our data.

gross wage distributions. These reforms were motivated by the fear that high minimum wage combined with high employer SSC were detrimental to employment. They have been widely studied to assess their efficiency in terms of employment (Kramarz and Philippon, 2001).

The first period has attracted much fewer work. From 1976 to mid-1990s, SSCs increased substantially for all workers but even more so for top earners. For instance, for the median earnings the average SSC rate climbed from 35% to 45%, while the top decile of earnings started from 24% to reach 44%. This can be explained by two set of reforms of SSCs: a) uncapping of SSCs (previously capped at 1SST) for the main schemes (health, family, pensions); and b) increase in rates for complementary pension schemes for earnings above the SST. The uncapping of SSCs concerned mostly non-contributory benefits (health care and family benefits), implying that there was no individual-level link between the increase in the contributions and the benefits provided. The second set of increase in SSCs was different in nature as it led to both increase in contributions and in expected pension benefits.

1.2 Data

The data we use in this study come from administrative data called *Déclarations annuelles de données sociales* (DADS). DADS are individual level earnings data that each employer needs to fill for each employee. The main objectives of the data is to provide social security schemes with earnings information necessary to compute eligibility or level of benefits, notably for pension schemes. The French national statistics office, Insee, transforms the raw DADS data into user files available to researchers under restricted access[5]. The panel version of DADS presents a 1/25 sample of all employees, those born in October in pair years, from 1976 onwards. In 2002, the sample double to represent 1/12 of all workers. This represents roughly 1.1 million workers sampled each year from 1976 to 2001, and 2.2 million from 2002 onwards[6].

The data provide information about the firm (identifier, sector, size) and each job spell (start and end date, earnings, occupation, part-time/full-time). Hours of work are available since 1993. Although we cannot compute hourly wages for the entire period, we measure wages using daily earnings for full-time workers. Importantly, raw data about earnings come under the form of "net taxable earnings" (earnings reported for income tax). This definition of earnings is net of social security contributions and gross of income tax, but does not recover exactly net earnings as some flat rate contributions are not deductible for the income tax, and therefore added in the net taxable earnings[7]. Earnings reported include basic

[5]We got access to the DADS data through decisions from *comité du secret* ME27 of 02/10/2013, ME56 of 25/06/2014 and ME91 of 25/06/2015.

[6]A number of years are unfortunately missing (1981, 1983, 1990). See Appendix 3.B for more details.

[7]*Contribution sociale généralisée* (CSG) is partly deductible from the income tax base and *Contribution au remboursement de la dette sociale* (CRDS) is not-deductible.

earnings, as well as performance and non-performance related premiums and bonuses. We divide them by the numbers of working days in a given employment spell to obtain our *net wage* concept.

Gross wage corresponds to net wage plus employee social security contributions. Gross wage corresponds to the amount of pay stipulated in labour contracts, i.e. the posted wage, and on which negotiations typically take place. Gross wages are available in the DADS from 1993 onwards. Before that date, they have been computed from the net wages using the model TAXIPP, the microsimulation model of the *Institut des politiques publiques* (IPP)[8].

We call *labour cost* the actual cost paid by a firm for a given worker a given year. It includes both employer and employee social security contributions and has been entirely computed from net wages using TAXIPP. The rules for computing the numerous distinct employer SSCs are rather complex in France, as they depend on hourly wage, firm size, location of the firm, and affiliation to different pension schemes. Importantly, one serious limitation of the panel DADS before 1993 is the absence of hours of work, meaning that we cannot compute labour cost for those working part-time before 1993.

The net wage concept we can derive form DADS data is gross of income tax. As income taxation is in France assessed at the household level and thus depends on the family structure, we are not able to derive *net of tax wage*. To estimate this concept – important for cross-country comparison – we make use of another restricted-use data, the *Enquête Revenus Fiscaux et Sociaux* (ERFS), i.e. the Labour Force survey matched with tax records. Using this data we estimate the income tax paid each year by each household and assuming income tax is split between household members proportionally to their earnings, we infer *net of tax wage* (see Appendix 3.B for all computation details).

1.3 Labour cost inequalities in France (1976-2010)

Figure 3.2 presents the change in log real wage by percentile for male working full-time over the 1976-2010 period. We show the two often used measures, gross (i.e. posted) and net wage, which are slowly decreasing over the wage distribution and contrast them with the labour cost measure which is monotonically increasing over the wage distribution. This pattern can be compared to results from other countries, where this upward sloping curve has been well documented. Notwithstanding comparison issues of exact period, the French wage inequalities in terms of labour cost have been increasing, albeit on a smaller scale than in the U.S., but close to the German case (Dustmann *et al.*, 2009).

Figure 3.3a shows the evolution of the log of the ratio d9/d1 for the net wage, gross wage and labour cost distributions. It confirms the striking difference it makes when one look at

[8]The TAXIPP model has been adapted for the purpose of this study to the DADS data. See Appendix 3.B for more details.

gross or net wage inequalities or labour cost inequalities in France. While the net wage d9/d1 ratio has decreased by 7 log-points over the period 1976-2010, the labour cost equivalent has increased by 16 log-points. Gross wage inequalities have also decreased, but slightly less than net wage inequalities[9]. To put these results in perspective, Table 3.1 compares our measures of inequality for France with the ratio d9/d1 in terms of gross wages provided by OECD for a series of other countries. We see that the increase in inequalities in France measured in terms of labour costs is comparable to that of the U.K or Australia when gross wages are used.

Figure 3.3b is similar but also includes the ratio d9/d1 for the net of tax wage. Changes in the income tax schedule have not counteracted the reduction in net wage inequalities, implying that inequalities in terms of wages net of all social security contributions and taxes have also decreased. Figure 3.3b finally shows wage inequalities in terms of a net wage measure that includes the value of contributory contributions, which fund for instance pension benefits. We find some evidence that part of the increase in SSC has been used to fund higher pension benefits for higher earners and has not reduced net total remuneration as much as the net wage measure might imply.

If we now look separately at the change in wage inequalities in the upper and lower tail of the income distribution, with the D9/D5 and D5/D1 ratios (Figure 3.4), we can clearly see the two periods we mentioned earlier in terms of SSC policy. The uncapping carried out in the 1980s and 1990s have only affected the upper tail of the distribution. As the SST lied around the 7^{th} decile of the gross wage distribution, only individuals in the top 3 deciles have been concerned by these increase in SSCs. Lower-tail inequalities in terms of labour cost or net wage have remained almost unchanged. In the second half of the period, this is the opposite. Reductions in employer SSCs have only affected in the 1990s-2000s the lower-tail of the wage and labour cost distributions.

These timing of the increase in wage inequalities differ markedly in France from what has been observed in other countries, namely the U.S. and the U.K. (and in some respect Germany too). The increase in the D5/D1 ratio happened in France later, but it is important to keep in mind that these policies aiming to reduce employer SSCs have been designed as a response to the rise of unemployment among unskilled paid at the minimum wage.

2 Revisiting demand-side explanations of inequalities using tax changes

In this section, we revisit demand-side explanations of inequalities. First, the standard supply/demand model Katz and Murphy, 1992 is amended to take into account that labour de-

[9] See also Appendix 3.C for log ratios d8/d2 and d7/d3.

mand depends on labour cost wages, while labour supply is either exogenously determined by the influx of new (educated) workers in the economy, or depends on net wages. Second and more importantly, taxes are used as a new source of identification of demand shifts towards skilled workers.

2.1 Supply, demand and wage premium for skilled workers

Before turning to a more formal analysis, we present and discuss time series for the supply, demand and wage premium of skilled versus unskilled workers. Following the previous literature, we define skilled workers with a college degree or more and unskilled workers as high-school equivalents or high-school dropouts. It is useful to mention from the onset that the standard definition of skilled versus unskilled, which makes sense in an U.S. institutional context, might not be as pertinent in all institutional settings. For instance Lindley and Machin (2011) suggest that the difference between postgraduates workers and workers with a college degree or less might be more appropriate in the U.K. In the French context, one could defend defining unskilled as high school dropouts, as they represent such a large share of low skills given the later development of secondary education (compared to the U.S., see Verdugo (2014)). Using this definition does not change significantly our conclusions. We therefore leave aside these considerations, and using the standard definition (college/no college), we compute year-by-year the wage premium and relative supply of skilled versus unskilled workers, either measured in terms of net wage or in terms of labour cost (Figure 3.5).

First, these figures alter significantly the position of the French case relative to the SBTC hypothesis. When we compare the estimates for the labour cost (panel A) or net wage (panel B), we obtain increasing skill premium in terms of labour cost, compared to a stable pattern in terms of net wage[10]. This dismisses the idea that no secular trend in the wage premium for skilled workers was evident in France.

Second, the increase in the relative (labour cost) wage premium for skilled workers has been smaller in France than what has been shown for the U.S. The skill premium increased by about 6 log-points over the period 1976-2010 in France, compared to an increase of about 20 log-points in the U.S. over the same period – using gross wage measures (Autor *et al.*, 2008). In that sense we do not dismiss earlier studies on French wage structure which tried to explain the almost flat net wage premium for skilled workers by the continuous expansion of higher education. The relative supply curves in Figure 3.5 demonstrate the linear increase in the supply of skilled workers in France over the period. As explained by Gurgand and Maurin (2006) and Verdugo (2014), the democratisation of education occurred later in France than

[10]Following previous literature for the U.S., we have split workers with some college equally between the skilled and the unskilled. Charnoz *et al.* (2011) and Verdugo (2014) actually find a moderate decrease in the education net wage premium over the period. This is explained by differences in the construction of the groups of skilled and unskilled, as well as in other methodological choices (see appendix 3.B).

in the U.S., and induced a much faster and larger change in the relative supply of skilled workers (see Verdugo, 2014, Figure 2). This rapid and steady rise in the relative supply of skilled workers may have limited the growth of their relative wage and labour cost, even with a parallel shift in demand.

2.2 The standard supply/demand model with taxes

To test demand-side explanations of the increase in wage inequalities more formally, the standard route is to estimate a version of the macro-level supply/demand model initiated by Katz and Murphy (1992). In this approach, demand shifts towards skilled workers are identified from the long-term changes in the relative wages of skilled and unskilled workers that cannot be explained by changes in the relative supply.

The idea is as follows. Variations in the relative wages of skilled workers (as compared to unskilled) over time are the result of combined variations in the supply and demand for those skilled workers. Absent of variations in demand, an exogenous increase in the relative supply of skilled workers (as compared to unskilled) should lead to a concomitant decrease in their relative wages. Hence, concomitant increases of both the relative supply and the relative wages of skilled workers suggests an increase in the demand for those workers. Changes in the relative tax burden of skilled workers does not invalidate this argument but calls for a clarification of the wage concepts in the standard approach. This is our first methodological contribution.

We then go a step beyond by using another simple supply/demand argument to uncover demand shifts from tax changes. The idea is as follows. In the absence of variations in relative supply and demand curves for skilled individuals, an increasing tax wedge accruing to these skilled workers should unambiguously lead to a decrease in their relative equilibrium quantity on the labor market, an increase in their relative labor cost wage and a decrease in their relative net wage. Hence, holding the observed supply constant, concomitant increases of both the relative tax wedge and the relative quantity of skilled workers in the labour market suggests an increase in the demand for those workers. We formalize this argument in the standard supply/demand model.

We start with the standard assumption that aggregate output Q depends on two labour inputs, skilled (s) and unskilled (u) according to the following CES production function:

$$Q_t = [\alpha_t(a_t N_{st})^\rho + (1-\alpha_t)(b_t N_{ut})^\rho]^{1/\rho} \tag{3.1}$$

where N_{st} and N_{ut} are the quantities of skilled and unskilled workers in period t. a_t and b_t are technical change parameters augmenting skilled and unskilled labour inputs. α_t is a time-varying technology parameter; $\sigma = \frac{1}{1-\rho}$ is the elasticity of substitution between skilled

and unskilled workers. A demand shift towards skilled workers means that a_t/b_t or α_t increase over time.

Assuming profit maximization, the demand for skilled or unskilled workers can be obtained by equating their cost (and not their wage) to their marginal products. We can then derive from equation (3.1) the following relationship between the relative demand for skilled workers and their relative labour cost:

$$\ln\left(\frac{w_{st}}{w_{ut}}\right) = \ln\left(\frac{\alpha_t}{1-\alpha_t}\right) + \rho \ln\left(\frac{a_t}{b_t}\right) - \frac{1}{\sigma}\ln\left(\frac{N_{st}}{N_{ut}}\right) \tag{3.2}$$

where D_{st}, w_{st}, D_{ut} and w_{ut} are the demand functions and labour costs associated with skilled and unskilled workers.

Equation (3.2) can be rewritten:

$$\ln\left(\frac{w_{st}}{w_{ut}}\right) = \frac{1}{\sigma}\left[\text{Shift}_t - \ln\left(\frac{D_{st}}{D_{ut}}\right)\right] \tag{3.3}$$

where Shift_t represents relative demand shifts favouring skilled workers. It is common in the literature Katz and Murphy, 1992; Autor, 2015; Autor *et al.*, 2008 to write this equation directly with the supplies of skilled (S_{st}) and unskilled (S_{ut}) instead of their demands. This is because market clearing is assumed ($D_{st} = S_{st}$ and $D_{ut} = S_{ut}$). Assuming as well that labor supply is exogenous (due to an exogenous influx of young educated workers on the labor market), and approximating Shift_t by a time trend, one gets a wage equation of the type:

$$\ln\left(\frac{w_{st}}{w_{ut}}\right) = \beta_0 + \beta_1 t + \beta_2 \frac{S_{st}}{S_{ut}} + \varepsilon_t \tag{3.4}$$

which is sometimes augmented to take into account the unemployment rate or institutional factors such as the minimum wage (see equation (4) of AKK). Our first exercise is to estimate equation 3.5 using labor cost wage instead of net wage. It is indeed correct to use labor cost wage in this equation that only captures production-side parameters. The reason why net wages do not intervene is that that labor supplies are assumed to be exogenous, meaning that their elasticities to net wages are 0.

The impact of changes in relative skill supplies on relative wages depends inversely on the magnitude of σ, the aggregate elasticity of substitution between the two skill groups.

It is common in the literature to approximate $Shift_t$ by a time trend, and augment this equation to take into account the unemployment rate or institutional factors such as the minimum wage, as in equation (4) of AKK:

$$\ln\left(\frac{w_{st}}{w_{ut}}\right) = \beta_0 + \beta_1 t + \beta_2 \frac{N_{st}}{N_{ut}} + \beta_3 RealMinWage_t + \beta_4 Unemp_t + \varepsilon_t \quad (3.5)$$

In the U.S., the supply/demand model has done an excellent job in relating variations in the skill wage premium over time to concomitant accelerations and slowdowns in the accumulation of skills on the labour market. However, doing such an exercise appears almost impossible in France. This is because over the period 1976-2010, there have been no breaks in the relative supply of skilled labour. As evident in Figure 3.5, the supply of college-educated workers relative to high-school equivalents has risen linearly. The time trend in Figure 3.5 predicts almost entirely this rise (R2 = 0.99), making practically irrelevant to include in a same regression a linear time trend and the relative supply in skilled workers[11].

To get around this identification issue, we suggest another test for the presence of SBTC in France. We estimate equation (3.5) but we constrain β_2 to be the same value as the one estimated in other countries (in this case the U.S.). In doing so we effectively calibrate ex ante the elasticity of substitution σ between skilled and unskilled workers. This second-best strategy relies on the assumption that technologies used by firms in developed countries are close enough for the technological parameters to be of the same order of magnitude. The question we ask then becomes the following: "Assuming that the effect of supply shifts on skills prices are the same in France and in the U.S., can we conclude that demand shifts have the same effects in both countries?" We can thus compare the coefficients β_1 to assess the size of the SBTC in France with respect to the US, and similarly for the coefficients β_3 and β_4.

2.3 Results

Results of the estimation of equation (3.5) are presented in Table 3.2. The three first columns directly report the estimates on US data from AKK (see AKK, Table 2). In the next columns, we estimate the same three models on French data using either log relative labour costs as dependent variable (models 4 to 6) or log relative wages (models 7 to 9). To construct the time series of wages, labour costs and supplies of skilled and unskilled workers, we apply the quality and composition adjustments made in previous literature (see Appendix 3.B.2)[12]. In all cases, the effect of the relative supply of skilled versus unskilled is constrained to be equal to the value estimated in the corresponding model in the U.S.

[11] Verdugo (2014) provides estimates obtained from the slightly more sophisticated approach of Card and Lemieux (2001). In this approach, experience groups are imperfect substitutes nested within each skill group. Verdugo reaches the same conclusion regarding the reliability of the estimated elasticity of substitution between skill groups, and therefore on the ability to estimate SBTC on French data.

[12] Because of the colinearity issue, minor changes in the construction of the series usually have huge impacts on the estimates when the estimated effect of the relative supply is unconstrained. However, once this effect is constrained, the other estimates become very robust to small methodological changes in the construction of the changes. This is one more indication in favour of constraining the elasticity of substitution between skilled and unskilled workers.

The estimated effect of the linear time trend (β_2) is identical in all the three models based on labour costs. When we include a more flexible time trend, we find that trend demand growth for college relative to non-college workers slowed down over time. If anything, it seems to have slowed down slightly more in France which is perfectly consistent with the fact that we focus on a slightly more recent period than AKK, with the last years of this period being possibly less concerned with SBTC. Given that we expect little difference in labour cost measures of inequality in the US, we believe that the comparison of models (1) to (3) for the U.S., and (4) to (6) for France suggests very similar extent of SBTC in both countries. Or more precisely, we contend that it is impossible to reject that SBTC has been of similar magnitude in the two countries.

If we now turn to the comparison between the French estimates based on labour cost or net wage (columns (4) vs (7), and (6) vs (9)), two results stand out. First, the time trend coefficient is significantly smaller when net wage measure is used, suggesting that estimates based on net wage can underestimate the extent of SBTC when there is redistribution through SSCs. Those estimates, presented for the sake of completeness, should be interpreted very cautiously since, as we explained, the labor/supply framework should only be applied to labour costs. For example, the elasticity of substitution between skilled and unskilled workers that we took from AKK estimates captures the relationship between relative supply and relative labour cost. It is not clear that this elasticity should be used in a the relative net wages equation. Second and perhaps more interestingly, the impact of the real net minimum wage is much bigger than when we use the series of the minimum wage in terms of labour cost. The relatively high French minimum wage (in net terms) seems to have reduced the net wage skill premium more in France than in the U.S., while the impact in terms of labour cost is as muted as in the U.S. Figures 3.6 and 3.7 illustrate these simple facts: expressed in gross wage, French minimum wage as a share of median wage has been kept at high level (60% of median wage) during the entire period, while it was decreasing in most countries. Expressed in labour cost, i.e. once reductions for employer SSCs have been incorporated, the French minimum wage has also declined as a share of median (labour cost) wage – even if it still remains higher than in most other OECD countries.

3 Impact of taxation on wage inequalities

After the previous analysis, it is tempting to jump to the conclusion that employer SSCs changes have been one of the reason for the lower net wage inequalities observed in France (along with the higher supply of skilled labour). But such a conclusion would depend largely on the ultimate incidence of these SSC changes, and the behavioural responses they triggered in terms of employment or incentives to educate. We offer below a discussion of these

potential effects, not pretending to any definite conclusions.

3.1 Can we infer SSC incidence from SBTC?

The issue of the long-term incidence of SSCs has been central within the public economics literature (see Fullerton and Metcalf, 2002, for a survey). The question is whether SSCs are ultimately shifted to employees under the form of lower net wage, or do they impact labour cost, reducing profits (and employment), or alternatively are they shifted to consumers through higher prices. Depending on the ultimate incidence of SSC, the counterfactual wage distribution in the absence of any tax changes could have been radically different. We know that labour cost and net wage inequalities would have evolved according to parallel trends (mechanically) but we do not know how they would have evolved.

Figure 3.8 illustrates two polar cases regarding these parallel trends, assuming that either i) SSCs have been shifted fully to employees, or ii) SSCs have been shifted to employers. In the former case, labour cost inequalities would have evolved similarly with or without SSCs reforms, while in the latter case, it is net wage inequalities that would have remained the same in the absence of changes in the relative wedge of social security contributions. These polar cases make a strong implicit assumption, i.e. that SSC changes have not led to any behavioural changes, neither in terms of quantity of labour supplied or demanded – we come back to that issue in the next subsection.

There are strong theoretical arguments for supporting the idea that SSCs are passed on workers in the long run, because labour costs should not depart from workers' productivity for long periods of time. Even in very rigid labour markets, with strong hiring and firing costs, firms that hire skilled and unskilled workers according to their marginal productivities are more efficient, and thus more likely to survive and to take over in the long run. This basic theoretical line implies that labour costs should not be impacted by taxes in the long run. Unfortunately the empirical evidence related to the incidence of SSCs has been limited at best, and a number of studies show that even after many years, some employer SSCs seem not to have been fully shifted to employees even many years after a reform occured (Saez, Matsaganis and Tsakloglou, 2012; Lehmann *et al.*, 2013; Bozio *et al.*, 2017). An additional concern for France is the role played by the minimum wage and the reduction in employer SSCs. They cannot be analysed separately as the latter ones have made possible the policy of increasing or maintaining a high minimum wage. As a result, the evidence from the change in wage inequality in the bottom half of the distribution is plagued by the joint interaction of minimum wage and SSC policy.

The changes in the upper half of the wage distribution is more interesting in that sense, because it provides evidence without any possible contamination from the policies around the minimum wage. In that case, changes in workforce composition due to employment ef-

fects are also less of an issue as the unemployment rate is close to zero among (potential) top wage earners. Figure 3.4 show that labour cost inequalities in the upper half of the distribution increased steadily between 1980 and the early 2000s, which is exactly the period when the bulk of technical change took place. In contrast, net wage inequalities increased only marginally over the same period. This suggests that the increase in employer SSCs over the social security threshold that occurred in the 1980s and early 1990s have likely been passed on to workers whose wages would have otherwise become more unequal, as in virtually all other developped countries.

3.2 Behavioral responses and the impact of taxes on wage inequality

The previous discussion relied largely on the assumption that changes in SSCs did not lead to behavioural responses in terms of the quantity of skilled/unskilled labour supplied or demanded. This is obviously a very strong assumption. There are two main channels for which one could expect SSC to change supply and demand for different skills.

First, what has been most debated, is the possibility for high employer SSCs to impact employment due to rigid wages, and an inability of employers to shift these contributions to employees in the form of lower net wages. We have seen that there are arguments for full shifting to employees in the upper end of the distribution, but at the minimum wage, any increase in employer contribution cannot be shifted into lower net wage. This had led to the concern that the high cost of the minimum wage in France combined with high employer SSCs could have caused the high unemployment experienced by low skilled workers, while preserving low level of wage inequality. In that respect, reduction in employer SSCs for low-wage earners may have been directly incident on employers, leading to a rise in the employment of low skilled workers (Kramarz and Philippon, 2001) without changing much wage inequality in the bottom half of the distribution.

Second, depending on its incidence, the large redistribution carried out by changes in SSC must have impacted negatively either the relative supply or the relative demand of skilled workers (or both)[13]. On the one hand, if changes in SSC were incident on workers, they would have changed the relative reward for acquiring skills in France (compared to other countries at least). This could have led to lower accumulation of skills from individuals. On the other hand, if changes in SSC were incident on firms, they would have changed the relative value of skilled workers and may have led firms to specialise in lower skills technology. Some have claimed that these mechanisms were at play in France, and were explaining the lack of innovations of French firms.

We do not have direct evidence on either of these possible impacts of taxes on the rela-

[13] In standard theory without market rigidities, wage bargaining or social norms, the incidence is a simple function of supply and demand elasticities and is mostly on the least elastic side of the market.

tive quantity of skilled labour. We may nevertheless try to get a couple of insights from our analysis. To start with, the stock of skilled workers has increased steadily over the past four decades. The changes in SSC have not been matched by a slowdown in the inflow of young skilled workers on the labour market, suggesting either that (i) they have not been incident on workers, (ii) they have been counteracted by concomitant policies favoring education, (iii) or they have not been large enough to discourage human capital investments. The absence of any reaction on the supply side is perhaps not surprising since the relative net wage premium for skilled workers has remained constant over the recent period.

Then, if it reflects the incidence of SSC changes on employers rather than pure market forces, the increase in the relative cost of skilled workers should have triggered a downward shift in their relative demand (counteracting SBTC). As shown in Figure 3.9, the unemployment rate of workers with at least some college education has remained limited over the entire studied period: about 10% for very unexperienced workers, and less than 5% for all workers with more than 5 years of experience. This contrasts sharply with the unemployment outcome of high school dropouts for whom unemployment rates have strongly increased over the recent period to reach levels around 50% for the least experienced and still higher than 10% for those with more than 10 years of experience. These simple unemployment series show that there is excess supply of unskilled workers while this is not the case for skilled ones: firms keep hiring almost all workers with a college degree despite their increasing average employer SSC over time, and despite the employer SSC deductions for less skilled workers. The dramatic SSC changes that occurred in the four previous decades have thus been sufficient to maintain and even decrease slightly inequalities in terms of gross wages, but in the presence of a binding minimum wage, they were still insufficient to shift back the relative demand for unskilled to the levels observed in the early 1970s. Finally, the unemployment series for low-educated workers also suggest that firms have invested in low-skill technology or jobs. We may actually even worry about what would have been the employment and wage positions of unskilled workers in the absence of the SSC changes.

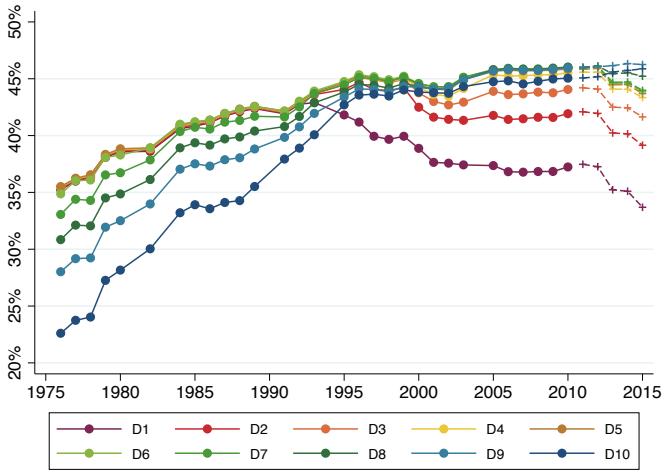
4 Conclusive comments

Taken together, the former considerations suggest that taxes may be an efficient tool for redistribution against SBTC. However, our argument here is only tentative and the question remains largely open. Whatever the response, we contend that the issue of how to incorporate taxation into the framework explaining the secular changes in wage structure opens many interesting research perspectives and prospects. It will help understanding to what extent taxation can be an well-suited institutional tool to limit growing inequalities among the "other 99 percent" (Autor, 2014).

For the purpose of reducing inequalities, Contrasting the effectiveness of these different approaches also appears as an interesting research avenue.

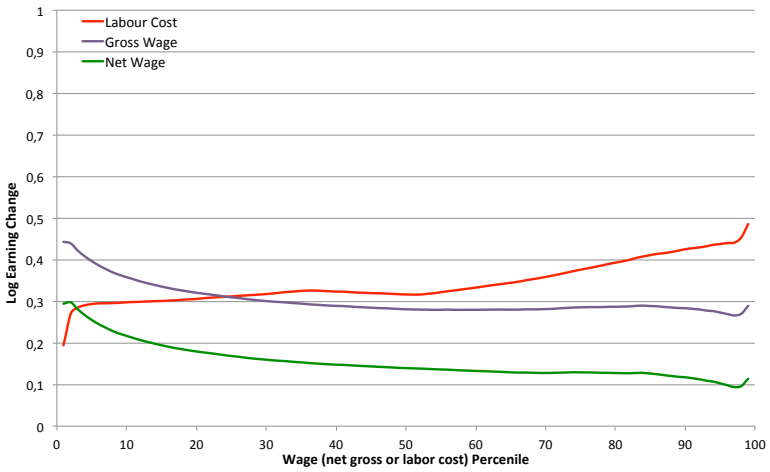
Figures and tables

Figure 3.1 – Total Averag social security contributions as a fraction of average labour costs in the different deciles



SOURCE: DADS data 1976-2010. The figure provides the ratio of the average total social security contributions (employer and employee part) to the average labour cost in each decile of the labour cost distribution.

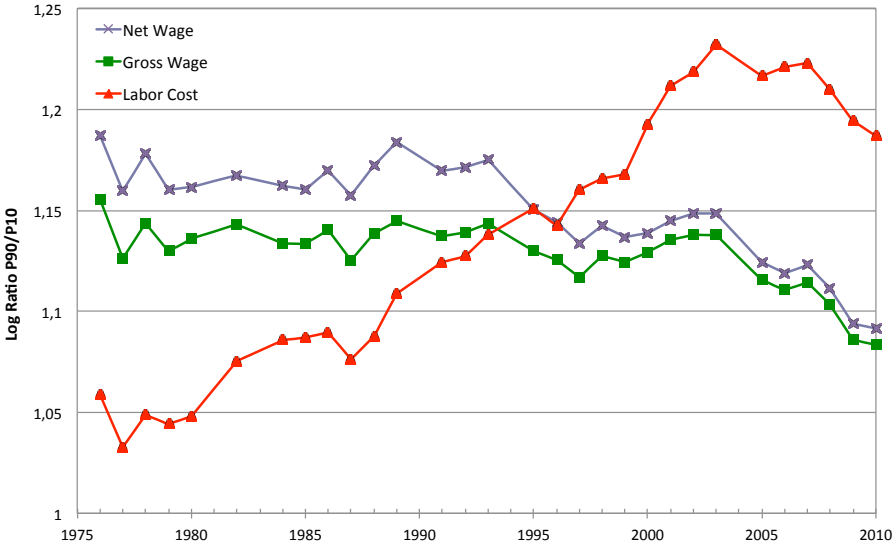
Figure 3.2 – Change in log real wage by percentile, full-time male workers, 1976-2010



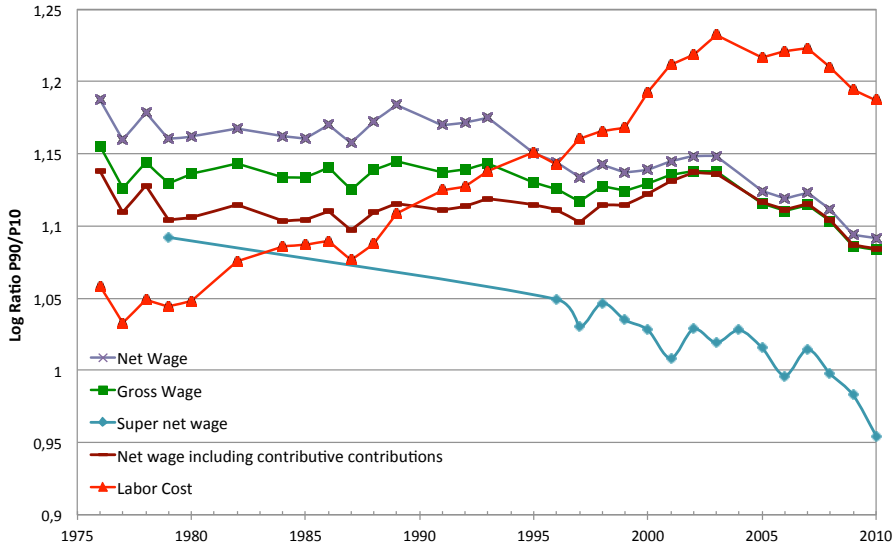
SOURCE: DADS data 1976-2010. The figure shows the log of the ratio of real 2010 earnings to real 1976 earnings for net, gross and labour cost wages of male workers of the private sector working full-time full-year and by percentile of the relevant earning distribution.

Figure 3.3 – P90-P10 ratio, full-time male workers, 1976-2010

(a)



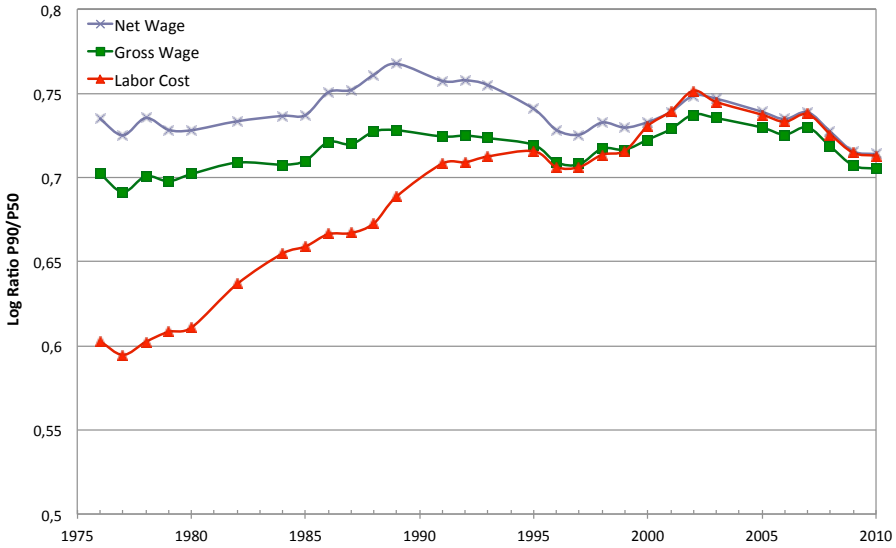
(b)



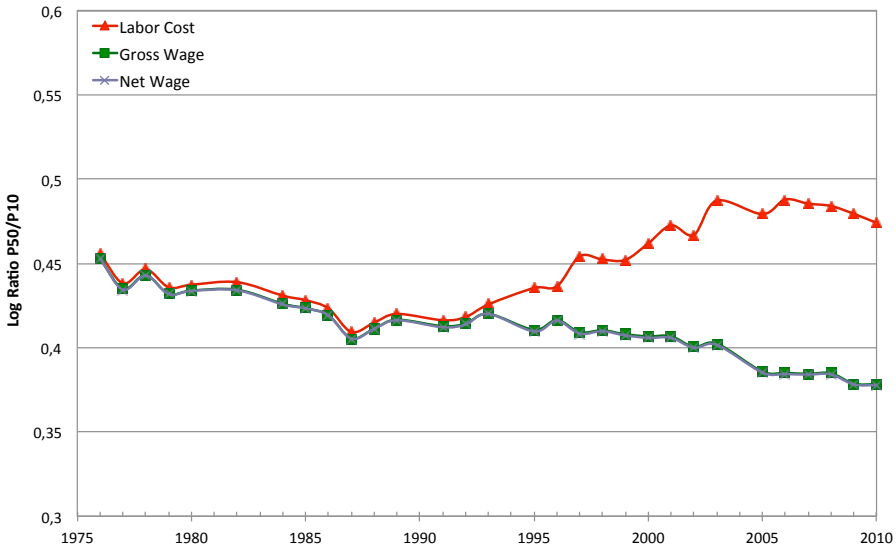
SOURCE: DADS data 1976-2010. The figure depicts the P90-P10 log wage gaps for net, gross and labour cost wages of male workers of the private sector working full-time full-year. Panel B include as well the P90-P10 log wage gaps for supernet wage and for a net wage including contributive employer and employe contributions.

Figure 3.4 – Upper-tail and lower-tail wage inequalities, full-time male workers, 1976-2010

(a) Upper-tail, ratio D9/D5



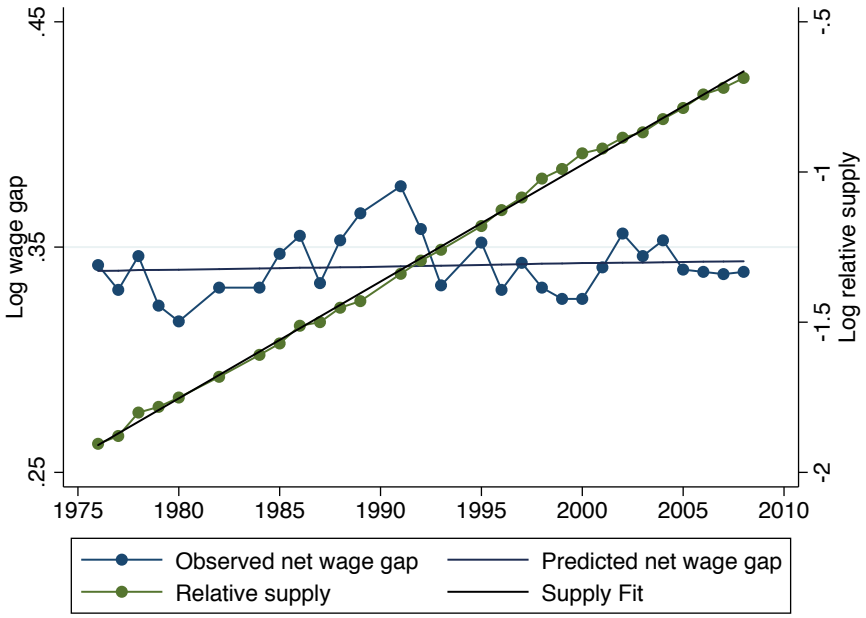
(b) Lower-tail, ratio D5/D1



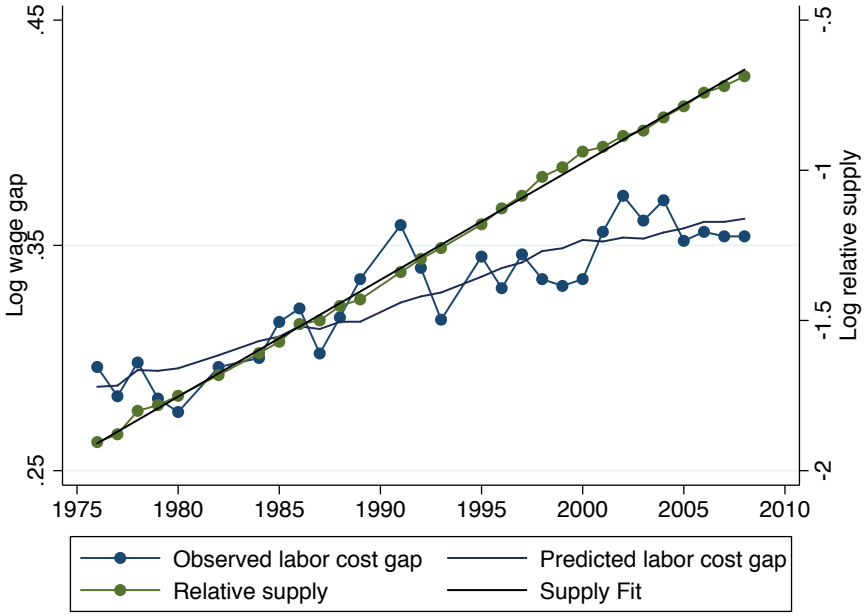
SOURCE: DADS data 1976-2010. The figure depicts the P90-P50 (panel A) and P50-P10 (panel B) log wage gaps for net, gross and labour cost wages of male workers of the private sector working full-time full-year.

Figure 3.5 – College versus high school wage differential and relative supply, 1976-2008.

(a) Net wage

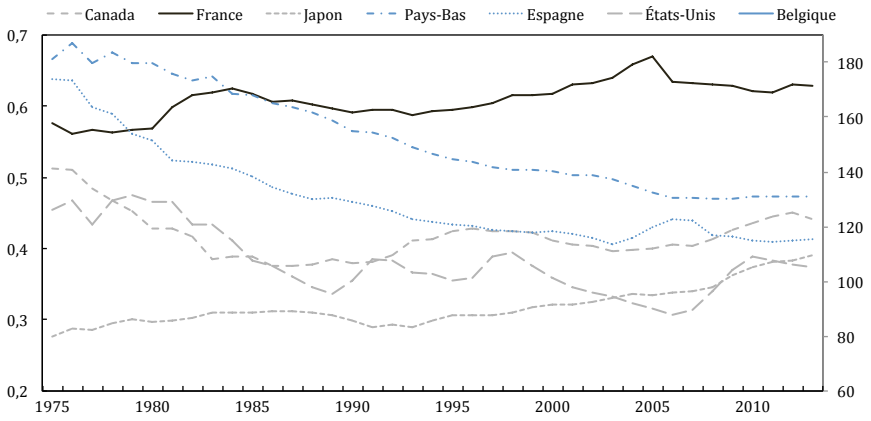


(b) Labour cost



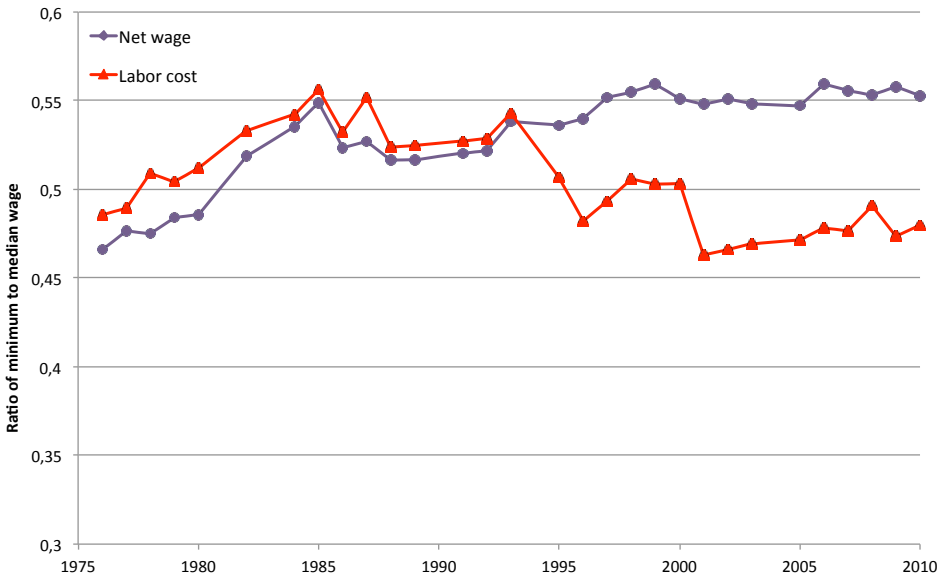
SOURCE: DADS-EDP data 1976-2008.

Figure 3.6 – Ratio of minimum to median gross wage, OECD countries, 1975-2013



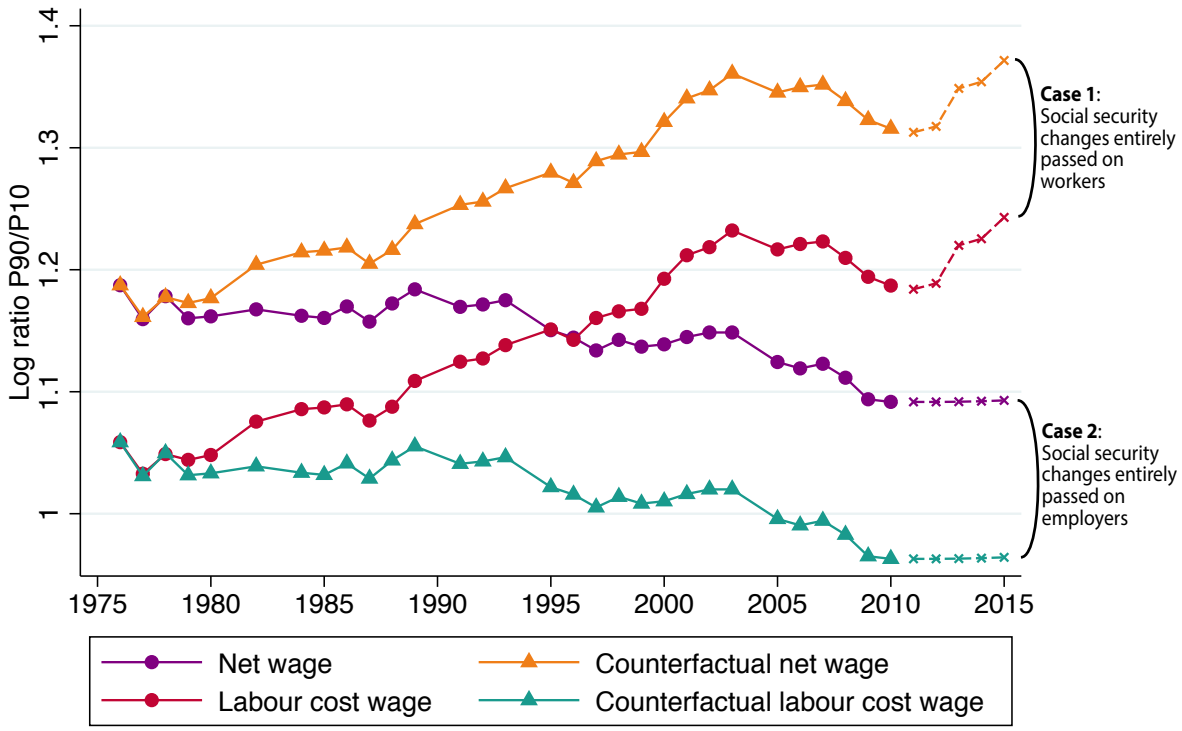
SOURCE: OECD.

Figure 3.7 – Ratio of minimum to median wage, France: net versus labour cost



SOURCE: DADS data 1976-2010.

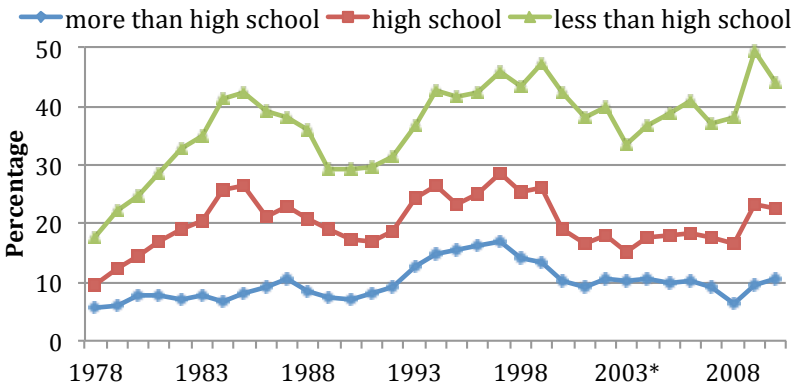
Figure 3.8 – Wage inequalities in the absence of tax changes: two polar cases.



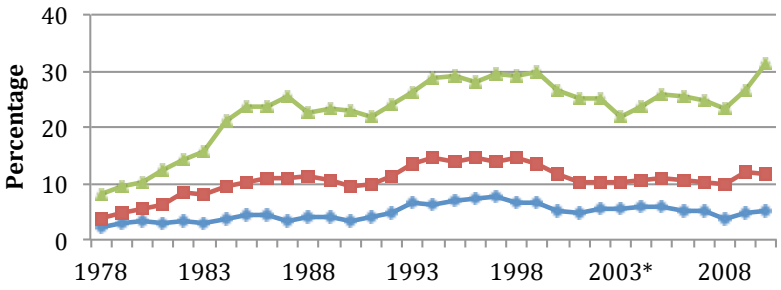
SOURCE: DADS data 1976-2010. The figure propose two scenarios of incidence, on workers or on employers, absent any behavioural responses, for male workers of the private sector working full-time full-year.

Figure 3.9 – Unemployment rate by educational attainment, 1978-2010

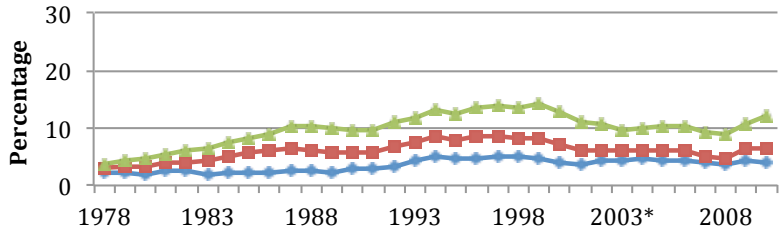
(a) Workers with less than five years of experience



(b) Workers having between five and nine years of experience



(c) Workers having more than ten years of experience



SOURCE: labour force survey 1978-2010.

Table 3.1 – Changes in P90/P10 by country, 1980-2010.

	1980	1990	2000	2010	% change, 1980-2010
Poland	2.81	2.88	3.56	3.96	0.33
U.S.	3.83	4.34	4.49	5.01	0.20
Sweden	1.96	1.99	2.35	2.23	0.20
U.K.	2.99	3.43	3.46	3.58	0.16
Australia	2.83	2.81	3.01	3.33	0.16
France labour cost	3.00	3.14	3.32	3.46	0.13
Finland	2.47	2.49	2.41	2.52	0.02
Japon	3.00	3.16	2.97	2.96	-0.01
France net wage	3.28	3.30	3.04	2.99	-0.08
New Zealand	–	2.43	2.63	2.83	–
Italie	–	2.20	2.22	2.22	–

SOURCE: net, gross and labour cost wages from the DADS data 1980-2010 for France, gross wage from the OECD for the other countries. When a value is missing for one year but given for the year before and the year after, we take the average between the two years.

Table 3.2 – Regression models for the College/High School og wage and log labour cost gap, 1976-2010.

	AKK estimates for the U.S. 1965-2005			Log Labour cost gap in France			Log Net wage gap in France		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CLG/HS relative supply	-0.411	-0.599	-0.403	-0.411	-0.599	-0.403	-0.411	-0.599	-0.403
	(0.046)	(0.112)	(0.067)	*calibrated*	*calibrated*	*calibrated*	*calibrated*	*calibrated*	*calibrated*
Log real minimum wage			0.117			0.114			0.319
			(0.047)			(0.107)			(0.063)
Male prime age unemp. Rate			0.001			-0.002			-0.002
			(0.004)			(0.197)			(0.114)
Time	0.018	0.028	0.017	0.017	0.028	0.017	0.014	0.025	0.014
	(0.001)	(0.006)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time2/100		-0.011			-0.014			-0.012	
		(0.006)			(0.004)			(0.003)	
Constant	0.043	0.143	0.266	-0.587	-1.015	-1.66	-0.534	-0.960	-1.747
	(0.037)	(0.108)	(0.112)	(0.000)	(0.000)	(0.018)	(0.000)	(0.000)	(0.000)
Observations	43	43	43	31	31	31	31	31	31
R2	0.934	0.940	0.944	0.987	0.993	0.987	0.987	0.993	0.988

SOURCE: DADS data 1976-2010.

NOTE: Standard errors in parentheses. All variables are in 2010 euros. Minimum wage is net terms in columns (4) to (6) and in labour cost in columns (7) to (9).

Appendix

3.A Institutional details on social security contributions and income tax in France

3.A.1 Uncapping of the social security contributions

The social security contribution schedule involves thresholds evolving every year, namely, the social security ceiling (*plafond de la sécurité sociale*). In the 80s and 90s, some of the social security contributions were uncapped. As a result, the overall rate of contribution increased. Yet, this concerns the earnings above the cap i.e. who belong to the top 3 deciles of the distribution of employment incomes. The social security rates of the high-income deciles progressively caught up with those of the lower-income deciles. The health and family contributions were progressively uncapped between 1981 and 1984, and 1989 and 1990 as well as the contribution covering work-related injuries and retirement contributions in 1991.

3.A.2 Reduction of employer social security contributions

Starting in 1993, social security reductions were created for low incomes under 1.3 minimum wages. Since then, there has been a succession of reduction schemes (*exonérations famille, ristourne Juppé, allègements Aubry et Fillon*[14]). The maximum rate of reduction over the period is of 26%[15] of the gross wage and concerns employees paid at the minimum wage. The reduction schedules are such that the rate of reduction is the highest at the minimum wage level and decrease with the increase of the wage, until it fades away. The maximum level of wage giving the right to reductions ranged between 1.3 and 1.7 minimum wage.

In the context of high unemployment in 1998, a policy aimed at reducing the working time, hoping that it would contribute to job creations. This led to many changes in the reduction scheme. Indeed, two different schedules prevailed between 2000 and 2003 for firms who implemented the reduction of the working time and for firms who did not. After 2003, the Fillon law framed the convergence of the two schedules and came about with a unified schedule for all firms.

[14] We do not calculate the Robien scheme of 1996 because of lack of information and do not study the CICE (Crédit d'impôt pour la compétitivité et l'emploi), created in 2013.

[15] 28.1% for firms with fewer than 20 employees.

3.B Data and methods

3.B.1 Data and variables

DADS panel - EDP The database is a panel that comes from two sources. Wages and job-related information comes from the DADS panel and education information from the EDP database. First, the DADS panel is a representative extraction of the DADS (Déclarations Annuelles de Données Sociales) data, which is the main administrative data source constructed by the French national statistical office (INSEE) from social security records on all private sector French workers (see Appendix B and Charnoz et al, 2011). We used all the annual extractions, except for 1981, 1983 and 1990 years due to missing data and 1994 due to bad quality of the data. The panel contains individuals born in October of even years and who worked at least once in the private sector. Second, the EDP database (*Échantillon Démographique Permanent*) consists of demographic information, including the highest degree for individuals born one of the four first days of October of even years. Information is available for census years: 1968, 1975, 1982, 1990 and 1999 for the old census design and one fifth of the population every year starting in 2003. The two databases are matched by the French statistical administration based on date of birth and names.

Working time variables Hours worked are available from 1993 onwards. This prevents us from studying hourly wages for the whole period. Nevertheless, number of days of each job spells are available as well as a full-time dummy variable. Restricting ourselves to full-time full-year jobs thus enables us to measure wages. Because of these data issue, our analysis is based on the full-time full-year population.

Earning variables and tax simulation with TAXIPP We use three concepts of individual annual earning, calculated from the net fiscal earning variable using the Institute of Public Policy tax simulator (TAXIPP). TAXIPP applies the payroll tax legislation to compute employers' and workers' social security contributions since the beginning of the 70s. To our knowledge, it is the most comprehensive existing simulator, including both a long time-span, and a large set of small specific contributions on top of the general schedule. Hence, it allows the computation of the contributions at the individual level taking into account relevant individual characteristics (private sector, white collar worker, number of hours worked) and firm characteristics (number of employees). It is key for this study to be able to rely on a simulator that can account for most of the complex rules of the French legislation, which includes several thresholds where marginal tax rates change, a different schedule for white and blue collars, and several exemptions and special rules.

Table 3.B1 – Education variable

dip_tot	French label	English label	Education variable
1	Aucun diplôme déclaré (aucun diplôme ou pas présent au recensement)	No diploma	1
2	CEP, DFEO	Elementary school	1
3	BEPC, BE, BEPS	Junior High School	1
4	CAP, BEP, EFAA, BAA, BPA, FPA	Vocational basic	1
5	Baccalauréats technique et professionnel, Brevet professionnel, autres brevets	Vocational advanced	2
6	BEA BEC BEH BEI BES BATA, Baccalauréat général, brevet supérieur, CFES	High School Graduate	2
7	BTS, DUT, DEST, DEUL, DEUS, DEUG, diplôme professions sociales ou de la santé	Undergraduate university	3
8	Diplôme universitaire de 2ème ou 3ème cycle, diplôme d'ingénieur, grande école	University Graduate	4

The broader concept of earning is the labour cost, which includes all social security contribution. It is the actual cost paid by the firm. The gross wage does not include employers' social security contributions but include the workers' contribution. The net wage is net of all social contributions but is not net of the income tax.

Education variable We use the variable (*dip_tot*) homogenized by the French National Institute of Statistics (INSEE) coming from the censuses. Following Abowd and ali. (1999) and Charnoz et al (2011), we use a breakdown of the highest diploma in eight categories. We then construct four education groups (right column of table 3). Unfortunately, the precision of the original census variable does not allow us to differentiate between graduates and post-graduates. We use a four-categories education variable: high school dropouts, high school graduates, some college and university graduate.

School-leaving age and school leaving year The school-leaving age is available for years 1968, 1975 and 1982. As information collected by these three censuses is not always consistent, we correct the information by keeping the higher school-leaving age stated as the correct one. For 75% of the global sample, we have missing information because the individual finished her studies after 1982. For missing data, we impute a school-leaving age based on the educational attainment information (legal minimum school-leaving age for high school dropouts, 18 for individuals who only high school graduate, 21 for graduates, 24 for post graduates).

Experience variable Unlike the article using the CPS databases, we do not define experience as the number of years since the end of schooling. Instead, we take advantage of the long panel nature of our data and define experience as the cumulative sum of time worked

over years. Charnoz et al, 2011 do likewise. Share of working days per year are cumulated over the years since the beginning of the panel, 1976. For people who were presumably working before 1976, we use their school leaving year and assume that they worked full-time between the end of their study and 1976. We argue this is not a strong assumption because the male working force between 25 and 60 years old was mainly full-time (cf. Bozio, Blundell, Laroque IFS WP 2011) and male employment rate was high. For missing years, we impute an annual share of working days based on the year before. Following Autor *et al.* (2006), we cluster experience into four categories (0-9, 10-19, 20-29, 30-39 years).

3.B.2 Methodology

To a large extend, our methodology is based on the one of Autor, Katz and Kearny (2008). We consider two different samples for the measure of wage premiums (*wage sample*) and for the relative labour supply measure (*supply sample*). Indeed, the wage premiums measure the price of the different education groups and must be as homogenous as possible along the period. The relative supply measure is based on a broader conception of the sample, where we try to recompose aggregate quantities of labour supplied across groups.

The *wage sample* contains full-time full-year workers from the private sector aged 26 to 60 with 0 to 39 years of potential work experience. We trim the bottom part of the distribution by excluding people whose total annual earning is less than 75% of the minimum wage.

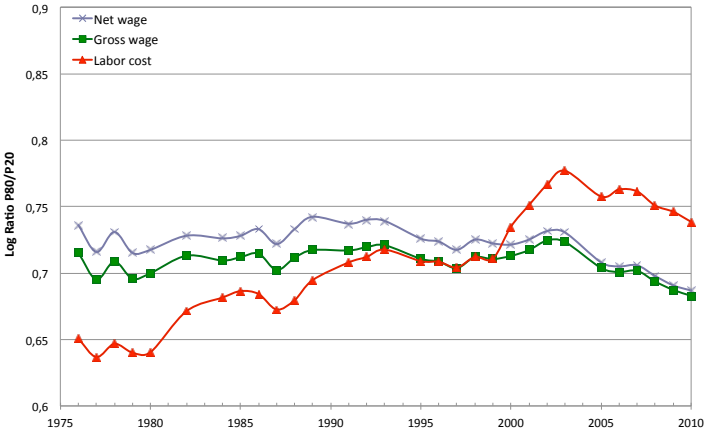
The only restrictions on the *supply sample* are imposed by the data. Because they were introduced in 2002, we have to drop unemployed individuals receiving benefits. Yet we do not restrict the sample to full-year or full-time workers.

Relative Wage Series We calculate the composition-adjusted college/high school relative wage series using the previous *wage sample*. The following method applies two the three concepts of wage considered. The data are sorted into two sexes – four categories of education (high school dropouts, high school graduates, some college and university graduate) – four groups of experience (0-9, 10-19, 20-29, 30-39 years). For each year and sex, the log real wage is regressed on dummies of the four-categories education variable, a quartic in experience, geographic dummies for the population density, interaction of the experience quartic with three education dummies (university graduate, some college and high school graduate). For each education – sex – experience cell, the composition-adjusted log wage is the predicted value from the previous regressions evaluated for the mean geographic region as well as for the corresponding education, sex and experience of the cell. These 992 cells (we have 31 years) are collapsed at the education and year level by a weighting average over the group. For each year, we calculate the weight as the number of individual in a cell divided by the total number of individual.

Relative Supply Measures We calculate the relative supply measures using the previous *supply sample*. The quantity each individual supplies each year cannot be a number of hours because of missing information. Instead, we count one for each individual. These quantities of labour supplied are aggregated at the number of experience year, sex and education level to form a *quantity series*. At the same time, we calculate a normalized price measure at the experience group – sex – education categories level by averaging over the years the wage of each cell normalized by the wage of high school graduate male with ten years of potential experience. This latter series of price is called *"efficiency unit"* price, as it is supposed to represent how efficient is a cell relative to the others in the production process. These *efficiency units* are computed based on the reduced *wage sample*. For each year, prices and quantities are brought back together by the aggregation of quantities over sex and experience groups: at the education level, the supply is the sum over sex and experience groups of each group efficiency unit wage multiplied by the quantity of labour supplied by the group.

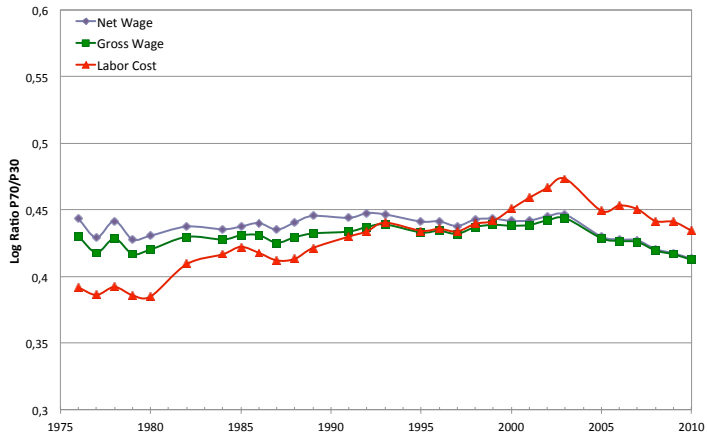
3.C Additional Figures

Figure 3.C1 – Wage and labour cost inequalities in French private sector for male workers: 1976-2010, P80/P20.



SOURCE: DADS data 1976-2010. The figure depicts the P80-P20 log wage gaps for net, gross and labour cost wages of male workers of the private sector working full-time full-year.

Figure 3.C2 – Wage and labour cost inequalities in French private sector for male workers: 1976-2010, P70/P30.



SOURCE: DADS data 1976-2010. The figure depicts the P70-P30 log wage gaps for net, gross and labour cost wages of male workers of the private sector working full-time full-year.

Chapter 4

Who paid the 75% tax on millionaires? Optimisation of salary incomes and incidence in France

The increase in income inequality is more and more documented across space and time. The top of the income distribution, where labour and capital incomes grow much faster than in the rest of the income distribution, plays a major role: income growth is not evenly distributed and is up to three times larger in the top 0.01% of the income distribution than in the rest of the distribution (Garbinti *et al.*, 2017). Labour income was identified to be key in explaining the increase, with the emergence of a "working rich" population (Piketty and Saez, 2003), who earns such high wages that they can reach the top of the wealth distribution without any other source of wealth. On top of that a recent literature documents an increase in CEO pays (Bell and Reenen, 2013) and investigates some explaining factors for the increase (Bertrand and Mullainathan, 2001; Gabaix and Landier, 2008; Bell and Reenen, 2016). Because of their position in the firms, CEOs are particularly subject to take advantage of the differences in firm and individual taxation in order to optimise their net income. Taxation constitutes a counteracting political tool to limit inequality growth. Yet, its impact on top income earners is not clear and is likely to heavily depend on the overall tax design. On top of that, it is crucial to understand how taxation affects the very top wage earners as theoretical models of optimal top tax rates depend on the answer.

In that context, understanding the impact of taxes on this working rich population is key for redistributive and efficiency purposes. Yet, it is very difficult to identify how these workers respond to tax changes as the possibilities are very diverse. After a tax increase, they can migrate, change the timing of bonus receipt, optimise the nature of the income received, decrease their labour supply, bargain over their income so as to extract a rent and shift the tax burden onto employers. This paper provides new evidence on this question using a quasi-experimental variation created by the introduction of the 75% tax above €1m in France in 2013[1]. The tax increased the top marginal tax rate from 64% to 75% on wage. It was temporary and nominally paid by employers like a payroll tax.

[1] *Taxe exceptionnelle de solidarité sur les hautes rémunérations versées par les entreprises*, created by the Finance Law for 2014, article 15.

The 75% tax on millionaires provides an ideal setting for assessing the response of top wage earners at an extremely high level of income (top 0.003%, about 1500 individuals). I do not intend to interpret the impact of the tax variation as coming from a permanent tax change but rather to shed light on the individual and firm optimisation response. Even if top earners are among the most responsive to taxes, wage earners are also the least responsive. Simulating this tax based on payroll and firm tax data, I propose a short-term analysis that can be interpreted as an upper bound of potential longer term impacts. I provide evidence of the impact of the tax both at the individual level and at the firm level, adopting a dual approach that has never been used for such high wage earners. I also interpret the results in terms of elasticity to the tax. The large and salient change in marginal tax rate enables me to identify the impact of the tax. The phasing in and the phasing out of the tax provide two variations for the identification. I rely on the universe of matched employer-employee relationships for 2009-2010, which come from payroll tax data, and on firm corporate tax data. There is a unique firm identifier that enables me to match payroll tax data and firm tax data and to create a panel of firms.

I first provide graphical evidence on the extensive margin of response and show compelling evidence that the tax triggered a sizeable response. Second, I study more precisely the mechanisms at play by first looking at the individual and firm-level effects of the tax on wages. I identify the incidence of the tax comparing the evolution of average income by percentile in a difference-in-differences setting and find that the tax was shifted at 20% on employees even though the nominal incidence was on employers. This shared incidence may be due to the bargaining power of employees. The second part of analysis documents the firm-level impacts of the tax, taking advantage of the fact that the tax nominally applied to firms. The aim is to identify how the tax changed the intra-firm profit growth and distribution as well as the remuneration of the different production factors. The identification strategy is based on the difference in treatment intensity of the firms, defined as the share of the payroll subject to the tax. I find that the tax decreased overall employment and profit of the most affected firms.

Third, I study the behavioural responses to the tax, and find an elasticity of income with respect to the net-of-tax rate of -0.1 for the labour cost and of 0.2 for the net wage. This elasticity encompasses all the margins of behaviour and cannot be interpreted as pure labour supply response. Following the framework of the three elasticities proposed by Piketty *et al.* (2014), I interpret this elasticity as a mix of optimisation and bargaining response.

This chapter contributes to the existing literature in several ways. First, such a large tax variation at this level of earnings is quite unique and enables me to analyse the behavioural response of top earners on labour income, usually thought to be not very responsive to taxation. Second, the tax affects a broader category of workers than the existing studies that focus

on precise occupations such as CEOs and football players (Kleven *et al.*, 2013) or on specific outcomes such as migration. Third, the tax being nominally paid by firms, I encompass the behaviour of firms in the analysis whereas the literature on the behavioural responses to taxation focuses traditionally on individual taxation.

The remainder of the chapter is organised as follows. Section 1 presents the literature. Section 2 describes the institutional setting of the tax and the reform. Section 3 presents the administrative data and the microsimulation method used to compute the tax. Section 4 presents the worker-level and firm-level impact of the tax on wages. Section 5 proposes different estimation strategies of the behavioural elasticity triggered by the tax. Section 6 concludes.

1 Literature

This chapter is built on four strands of literature. The first one concentrates on the evolution of top income earners inequality. The second strand relates to theoretical models of optimal taxation of top labour income earners. The third strand gathers papers documenting the different types of behavioural responses to taxation and developing empirical estimation methods. The last one focuses on identifying the economic incidence of labour income taxation.

Inequality at the top The increase in wage inequality over the last forty years is well documented for many developed countries (Katz and Murphy, 1992; Autor *et al.*, 2008; Bozio *et al.*, 2016). Overall inequality as well as inequality at the top are increasing, though to a lesser extent in European continental countries. A srand of literature concentrates on top labour income inequality and investigates the contribution of the financial sector to the increase as well as the one of CEOs' pay. The "working rich" are studied by Godechot (2007, 2017) using both qualitative and quantitative methodologies. He concentrates on workers of the financial sector. The wages of this population depends more directly on the firm's profit, he shows. The presence of rents in this sector is documented by Philippon and Reshef (2009) who show that wages are 50% to 60% higher in the financial sector than in other sectors, for a same educational achievement. (Bell and Reenen, 2013) focus on CEOs' pay and show that CEOs' wage has driven top income inequality in the US and the UK. Different explanations for this increase has been considered (Bertrand and Mullainathan, 2001; Gabaix and Landier, 2008; Bell and Reenen, 2016). I focus on the taxation of these top income earners and investigates whether this can be an effective tool for limiting the increase in top labour incomes.

Top optimal tax rates The level of top optimal tax rates on wage is debated in the literature. The parameters of the debate depend on how responsive these individuals are and on their type of response (real economic behaviour, avoidance) as well as on their rent-extraction power. An optimal taxation framework encompassing three different types of responses has been proposed by Piketty *et al.* (2014). Their main contribution is to take into account the consequence of rent extraction behaviour on top optimal tax rates. The model encompasses three channels of response. The first two belong to the standard supply-side explanation whereby low tax rates favour entrepreneurship and the tax avoidance response. The third one is the compensation-bargaining response, that is limited by a tax reducing rent extraction possibilities. They show that CEOs have a higher bargaining power when top tax rates are lower. Yet, the relative weights of the three elasticity components are difficult to assess. In particular, optimisation response and bargaining are difficult to disentangle empirically. I document the behavioural and distributional impact of the 75% tax, providing evidence that the tax is mainly borne by employers, which support a bargaining story. I also provide evidence of optimisation response, taking the form of time-shifting of income.

Behavioural responses to taxation A large literature surveyed by Saez, Slemrod and Giertz (2012) attempts to estimate the elasticity of taxable income to the marginal net-of-tax rate (one minus the marginal tax rate) using tax returns data. The literature shows that top income earners are the most responsive to taxes and documents several margins of response to taxation that can be divided into three categories: (i) real economic behaviours in terms of labour supply; (ii) re-timing of income; (iii) shifting some income from one income category to another.

Real economic response of top earners does not transit through the intensive margin of labour supply, which is the main channel for the rest of the income distribution. Instead, the literature documents responses at the extensive margin such as migration. For example, Kleven *et al.* (2014) use a preferential Danish tax scheme targeting foreigners to study the migration response and find a very large elasticity.

In the case of the French 75%, A pure re-timing strategy would cause an increase in the marginal tax rate in 2012 and/or 2015 incomes and a decrease in 2013 and 2014 incomes. Wages are known to be rigid and hence less subject to time-shifting than other incomes such as capitalised gains and stock options. Yet, top income earners are typically prone to larger behavioural responses. Both capitalised gains and stock options were shown to be affected by re-timing behaviour (Auerbach, 1988). Goolsbee (2000) shows that there was a short-term time-shifting response to the 1993 tax increase in the US concentrated on top earners with stock-options. Yet, Kreiner *et al.* (2016) provide evidence that re-timing of wages can happen and that the size of the response increases with earnings. Saez (2017) also shows that there

was some re-timing of wages for the top 0.1% in 2012, in anticipation of the 2013 tax increase in the US. The 75% tax could cause some re-timing, especially on 2015 incomes since the date of the tax removal was known in advance.

The 75% tax increased the difference between the tax rate of labour and capital income. This could lead to a shift toward non-wage remuneration. Harju and Matikka (2016) propose elasticity estimates which disentangle the income-shifting component from the real response. Taking advantage of the 2005 reform of the dividend tax in Finland, they show that the income-shifting response accounts for 2/3 of the overall response among business owners.

Even if individuals at the top of the income distribution are shown as the most responsive, there are also the ones for whom it is the most challenging to identify a response due to econometric issues such as mean-reversion of income from year to another. I do not expect any labour supply response at the intensive margin for such high income earners. The tax could trigger a migration response. This is unlikely since the migration cost would have to be borne by only two years of taxes. Because of its temporary nature, the 75% tax is likely to trigger time-shifting rather then income-shifting responses.

Tax incidence The strand of the literature studying the behavioural responses of top income is mainly using income tax variation. Studying a tax on labour income paid by employers, I broaden the question on the behavioural response to the more general question of the incidence of a tax on the very top wage earners. Classic theory on incidence shows that even if a tax is legally borne by individuals or households, the economic incidence is not necessary the same as the legal one: the one paying the tax might not be the same than the one who bears in the end the burden of the tax. Fullerton and Metcalf (2002) review the theoretical models in partial and general equilibrium. In the case of labour income, this depends on the elasticity of supply and demand for labour. Yet, empirical evidence on the incidence of taxation on labour supply and wages is still scarce and there is no consensus. The recent literature uses micro data and exploits social security reforms. But evidence goes from full incidence on employers (Saez, Matsaganis and Tsakloglou, 2012) to full incidence on employees (Gruber, 1997). The tax-and-benefit linkage seems to matter (Bozio *et al.*, 2017; Iturbe-Ormaetxe, 2015). More recently, Saez *et al.* (2017) analyse a tax cut on the wage of young workers. They provide evidence that the incidence was borne by employers. They also demonstrate that the tax cut had firm-level effects, as the most treated firms expanded more after the reform.

Studying the incidence of a tax on very high wage earners seems particularly relevant since these workers, most of the time CEO or managers, play a direct role on the profit distribution.

2 Context

This section presents the main features of labour taxation in France (subsection 2.1) as well as the 75% tax (subsection 2.2).

2.1 Taxing Labour Income Earners in France

Compulsory taxes in France amount to 43.6%[2] of GDP in 2012 (44.8% in 2013). These taxes rely on several tax schedules and associated tax bases[3]. Incomes from salary work, which I am interested in here, are concerned both by the income and payroll taxes. Wage earnings are first subject to payroll taxes. On top of the regular employer and employee social security contributions (SSCs) schedule, there are two French-specific proportional contribution, the CSG (*Contribution Sociale Généralisée*) and the CRDS (*Contribution pour le Remboursement de la Dette Sociale*). There are also other taxes on payroll, such as the *taxe sur les salaires*, which is nominally paid by firms. The tax base for these three types taxes (SSCs, CSG-CRDS and other taxes on payroll) is the gross income (or posted wage). Second, wage earnings net of SSCs and part of the CSG are aggregated with other sources of income to constitute the income tax base. Table 4.B.1 shows the importance of each of these tax devices as a percentage of GDP in 2012. Payroll taxes appear as the main channel of taxation on labour earnings (amounting to 16.8% of GDP) as compared to the two income taxes[4].

Income taxe rates Figure 4.B.3 shows the overall marginal and average tax rates on a logarithmic scale of total labour cost. The simulation is done for the test case scenario of an individual single with no child, working full-time full-year and earning an annual labour cost wage varying between the minimum wage (*SMIC*) and 1500k€. The tax rates encompass the progressive and flat income taxes as well as payroll taxes. Even if the official tax thresholds are expressed in terms of the relevant tax base, I chose to translate all the thresholds and rates in terms of labour cost in order to have a complete picture of the tax wedge. The vertical lines stand for these thresholds (green for the income tax schedule, blue for the SSCs schedule).

The figure 4.B.3 shows that the average rate of labour taxation is not increasing everywhere, meaning that the overall schedule is not fully progressive. Indeed, the tax base for some employer SSCs is capped at 8 times the social security threshold (SST). The introduction of the 75% tax restored the progressivity above the €1m (of gross wage) threshold. The importance of payroll and income taxes for a wage earner with €2m of labour cost is pictured on figure 4.B.2. The tax wedge corresponds to the average tax rate. In this example, there is

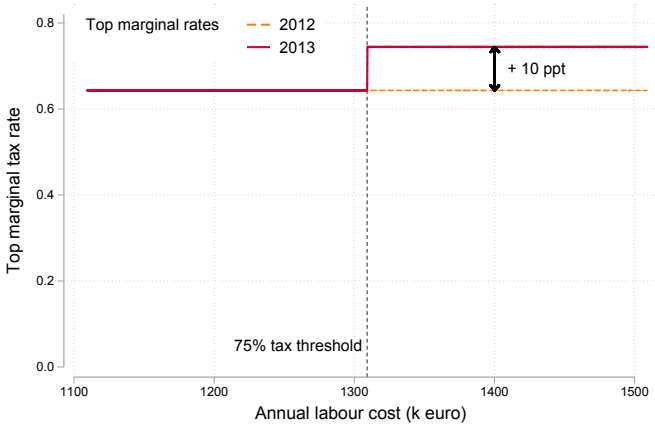
[2] National Accounts
[3] Among which salary and non-salary labour incomes, capital incomes, wealth, products.
[4] See André and Guillot (2014) for a brief history of the income taxes in France.

a 65% tax wedge, meaning that the employee has in the end a disposable labour income of €0.7m (35% of the labour cost).

2.2 The 2013-2014 reform

The 75% tax on wages above €1m During the 2002-2012 period, the effective tax rate on top (labour and capital) income earners decreased by 3.6 ppt according to Bozio *et al.* (2012). When running for the presidential election in 2012, F. Hollande committed to end this decreasing trend with a token measure: a marginal tax rate of 75% for incomes above €1m. The purpose of this promise was to force the wealthiest to contribute to the post-crisis recovery. The practical implementation took time and faced criticism. The first version of the tax relied on an individual (capital and labour) income but was not deemed constitutional by the Constitutional Council in 2012. The second version is restricted to labour income and has a legal incidence on employers. It was finally accepted on December 29th, 2013 and was implemented by the Budget Law for 2014 (article 15) for earnings of 2013 and 2014 only. Another feature of the tax is that the total tax paid by the firms was capped at 5% of the total firm profit, due to protests from football players and teams. I take that into account in my computation of the tax.

Figure 4.1 – 11 ppt increase in the top marginal rate on labour



Note: the figure shows the marginal tax rate for a worker (single, no child) with labour income only. I take into account all SSCs, taxes on payroll and the flat (CSG+CRDS) and progressive income taxes. The only difference between 2012 and 2013 comes from the introduction of the 75% tax above 1000k€ of gross annual income. The marginal tax rate reached 75% in 2013 for income above 1309k€ of labour cost (=1000k€ of gross income). The new marginal rate of 50% on gross earnings introduced by the Budget Law is translated in terms of labour cost. I use the TAXIPP model developed at the Institut des politiques publiques (IPP) to compute payroll and income taxes. I assume that the firm is subject to the VAT and not to the tax on payroll (*taxe sur les salaires*).
Source: TAXIPP 0.3.

Figure 4.1 pictures the change in marginal tax rate relative to the labour cost. The marginal

tax rate on 2013 (gross) labour income above 1 000 k€ is 11p.p.t. higher than it was in 2012. The threshold of 1 000 k€ is expressed in gross labour cost and corresponds to a labour cost of 1 309 k€[5]. The marginal rate did not change for incomes below the threshold. The new 50% marginal tax rate relative to gross income corresponds to a marginal tax rate of 28% (cf. figure 4.B.1 for a decomposition of the marginal tax between what comes from the income tax, the SSCs and taxes on payroll, or the 75% tax).

The 75% tax base consists of the following types of revenue:

- all types of salary incomes, including in kind payments
- attendance fees to the executive board (tokens)
- profit sharing and incentives plan
- stock options and shares.

Importantly, chief executives' compensations (fixed and variable parts of the pay, tokens), which are not paid by a wage but by a special remuneration decided by the executive board, are subject to the tax.

Tax revenue: forecasts and estimations The revenue of the 75% tax cannot be found in the National Accounts nor in any other official document. I was only able to find an ex-ante estimation in the draft law. Table 4.1 compares this estimation (column 1) with my own computation (column 2 to 4). Around 1000 employees and 450 firms are subject to the tax every year.

The ex-ante evaluation done in the draft of the Finance Law is based on the 2011 administrative dataset on payroll. I use the same dataset in order to compare my simulations with the official forecast (column 2). The figures are very consistent regarding the tax base, yet I estimate that the total tax revenue almost 30% higher than what was expected by the government. The difference might come from some behavioural assumption that are not detailed in the draft law. I then compute the tax revenue for 2013 and 2014, based on realized incomes in 2013 and 2014. I find a total tax revenue consistent with my ex-ante estimation.

The most striking result is that the tax did not seem to raise less revenue than expected. This raw back of the envelop calculation suggests that there were little behavioural responses to the tax. Yet, one would have to compare the revenue with a counterfactual tax revenue where the tax base evolves like it would have in the absence the tax in order to come to this conclusion.

[5] I had to inverse the tax schedule to compute that threshold.

Table 4.1 – Tax revenues: forecasts and estimations

	Comparison with the Budget Law 2013 or 2014		Own estimations 2013	Own estimations 2014
	Budget Law	DADS 2011	DADS 2013	DADS 2014
	(1)	(2)	(3)	
Firms with at least one millionaire	470	483	430	460
No. Employees subject to the tax	1000	1004	937	966
Tax base	715	716	708	790
Gross tax (total)	310	358	354	395
Net tax (total)	210	271	253	281
Net / gross tax	68%	76%	71%	71%
Total revenue expected	**420**	**542**	**534**	

Notes: revenues are in million Euros. Column (1) shows the official forecast for the tax revenue and the tax base, as published in the appendix of the Budget Law for 2014. In column (2), I use the same database used by the government and try to reproduce their findings. Columns (3) and (4) present the results of my computation of the tax for 2013 and 2014.

3 Data and descriptive statistics

The analysis is based on three administrative datasets. The first two can be matched and constitute a linked employer-employee database with detailed information on the outcomes of the firms. The third one is a sub-sample of the income tax returns data, containing all individuals of the top percentile of the taxable income distribution.

3.1 Linked employer-employee dataset

Payroll tax data (DADS Postes)

This dataset is the administrative database constituted by the universe of payrolls in France (available since 1993). I focus on the 2009-2015 period, because the data changed in 2010 with the introduction of the public sector. The information unit is the job, but it can be aggregated at the individual level and at the plant/firm level. The database contains information at the job level, such as the gross wage, the number of hours and days worked during the year, the occupation and the sector. At the firm level, the number of employee as well as the complete structure of employment are available. Each year t of data contains information for year t and for the previous year $t-1$.

The DADS database is available at the regional level and contains all employees living or working in the regions. Hence, individuals working and living in two different regions are present twice: I choose to keep in my database only the individuals working in the region.

Then, I drop the following categories of jobs:

- employees employed by individual employers (*particuliers employeurs*);

- region or activity unknown;
- farm sector;
- trainees, interns, subsidized employment (*emploi aidé*).

This choice does not impact the analysis since employees from these categories earn low wages.

In order to aggregate information at the individual level, I consider two concepts of earnings. First, I select one job by individuals, considering the job that is associated with the highest earning. I choose to proceed like that in order to consider all information related to this specific job, such as the firm, the sector and the occupation. My second earning concept is defined by the aggregation of the incomes from all the jobs. These two concepts are very close since almost all workers in my sample work full-time full-year. The simulation of social security contributions ultimately relies on the gross wage, which is the most comprehensive income variable available in the database. This income concept is larger than the salary part of the pay, and encompasses also non pay elements, such as profit-sharing and participation. Importantly, the pay of CEOs as well as tokens are included in the gross wage. Yet, I cannot disentangle between these different labour income components using payroll or income tax data. Stock options, which are included in the 75% tax base, are not observed. I focus on the top 0.01% of the wage distribution. Table 4.2 presents some descriptive statistics.

Firm data (FARE)

I use a richer dataset to complement the information on firms, FARE (*Fichier Approché des Résultats Esane*). It contains balance sheet and accounting documents that detail the production and net profits of the firms. The FARE data come from the administrative documents used for corporate tax returns.

The firm and payroll tax data are matched on the firm identifier. The population of FARE is constituted by the firms subject to the corporate tax, apart from 50% of the financial sector (national account definition) and all the farm sectors. A significant share of firms from FARE are not in the DADS dataset because they do not have any employees. Conversely, firms from the public sector are in the DADS but are not in FARE. I reduce my sample to the firms present in the DADS, dropping the firms with no employee, by definition not subject to the tax. Importantly, the matching allows me to use information on firm profit for the computation of the 75% tax. I provide descriptive statistics of the firm data when I present the empirical strategy at the firm level (Table 4.4).

3.2 Income tax return data

I use a 500 000 households sample of the income tax files containing all individuals in the top percentile of taxable income. This database gives detailed information on the different com-

Table 4.2 – Descriptive statistics

Variable	2010	2011	2012	2013	2014	2015
Worker characteristics						
Male	.92	.92	.92	.92	.9	.9
	(.27)	(.27)	(.27)	(.28)	(.3)	(.3)
Age	49.1	49.6	50.34	50.73	51.2	51.31
	(10.7)	(10.21)	(10.18)	(10.14)	(9.9)	(9.91)
Share of full-time employees	.99	1	.99	1	1	.99
	(.1)	(.06)	(.08)	(.06)	(.06)	(.08)
No. of millionaires	1050	1094	1016	961	1025	1268
	(.47)	(.47)	(.46)	(.45)	(.46)	(.49)
Net wage	975.97	929.54	914.2	891.89	920.9	1074.22
	(1145.94)	(657.12)	(743.28)	(711.15)	(800.86)	(973.34)
Gross wage	1098.11	1049.92	1033.46	1009.36	1043.08	1212.89
	(1253.9)	(720.73)	(815.36)	(780.01)	(879.94)	(1070.18)
Labour cost	1426.69	1367.1	1347.01	1413.69	1471.03	1568.74
	(1566.41)	(905.24)	(1027.81)	(1329.97)	(1511.89)	(1343.6)
Artists	.01	.02	.01	.01	.01	.01
	(.12)	(.12)	(.11)	(.11)	(.1)	(.09)
Managers	.51	.52	.52	.51	.53	.53
	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)
Sportsmen	.09	.08	.08	.07	.06	.06
	(.28)	(.27)	(.27)	(.25)	(.24)	(.24)
CEOs and deputy CEOs	.31	.3	.31	.32	.31	.31
	(.46)	(.46)	(.46)	(.47)	(.46)	(.46)
Employer characteristics of the workers						
No. of full-time equivalent workers	2102.57	2859.67	2459.18	3029.82	3190.48	3232.62
	(8397.37)	(10293.17)	(9174.28)	(19489.31)	(9473.91)	(9827.44)
Share of employers from the private sector	.98	.99	.98	.98	.98	.98
	(.13)	(.12)	(.13)	(.15)	(.15)	(.15)
Sector: industry	.05	.06	.06	.08	.07	.07
	(.22)	(.23)	(.23)	(.26)	(.25)	(.26)
Sector: business	.08	.09	.1	.09	.1	.09
	(.28)	(.29)	(.3)	(.29)	(.3)	(.29)
Sector: information and communication	.08	.06	.07	.06	.06	.06
	(.26)	(.25)	(.25)	(.24)	(.23)	(.24)
Sector: finance	.29	.3	.28	.29	.3	.29
	(.45)	(.46)	(.45)	(.45)	(.46)	(.46)
Sector: consulting	.32	.32	.32	.32	.32	.33
	(.47)	(.47)	(.47)	(.47)	(.47)	(.47)
Sector: administrative	.05	.04	.05	.04	.04	.04
	(.21)	(.2)	(.21)	(.2)	(.21)	(.19)
Sector: entertainment	.09	.09	.08	.07	.07	.06
	(.29)	(.28)	(.28)	(.26)	(.25)	(.24)

Notes: revenues are in millions euro 2013.
Source: DADS 2010-2015, sample of individuals in the top 0.01% of the annual labour income distribution.

ponents of the taxable income. The taxable income is composed by the aggregation of labour

income from wage earners and from self-employed as well as capital incomes. Depending on the incomes, the information is disposable at the individual or at the fiscal household level.

3.3 Simulation of income and payroll taxes

Income and payroll taxes are not directly observed in the data, so I have to simulate them. I use a program developed at the Institute of public policies, TAXIPP 0.3[6], in order to compute income and payroll taxes as well as marginal and average overall tax rates. In order to compute marginal and average rates of taxation, I assume that all individuals are single with no child and only earn labour income. This simplification is driven by the underlying data (payroll tax data), that does not contain any demographic information nor any other type of income. This enables me to compare the pre-reform to post-reform tax rates and to have a mere idea of the taxation faced by these incomes.

3.4 Descriptive statistics and graphical evidence

The first evidence is a descriptive graph of the evolution of the number of wage income earners. Figure 4.2 depicts the number of people with earnings above the tax threshold T (€1m of gross wage) (solid line) and compares it with two groups, the number of employees with earnings between 0.9T and T (long dash line) and between 0.8T and 0.9T (short dashed line). The y-axis unit is set at 100 in 2012, meaning the yearly number of employees in each group is rescaled relative to the 2012 number. The vertical dashed lines denote the two reform years. On the graph, the numbers next to the points give information about the number of individuals in each group. In 2013 and 2014, about 1000 employees are the subject to the 75% tax. I provide the same picture with two different datasets. The first panel 4.2a uses the income tax returns data whereas the second panel 4.2b uses payroll tax data. The two graphs are very similar in trends and in levels[7]. The income tax returns data allow me to have a longer time perspective, validating the approach. But I mainly use the payroll tax data as I can compute social security contributions using this database with more accuracy.

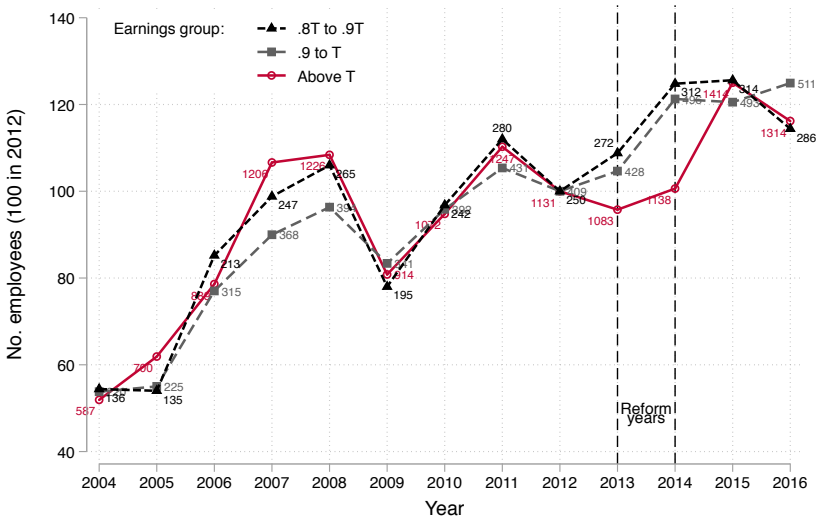
Before the reform, the three groups follow the same trend. The increase between 2009 and 2010 can be explained by the 2009 post-crisis recovery. After the reform, the groups clearly diverge. The number of employees whose income is above the threshold is stable during reform years apart from a decrease by 5% in 2013, whereas there is a stark increase in the number of individuals in the control group, which increases by more than 20% in 2014 relative to 2012. After the reform, the two groups evolve in a parallel trend again. Moreover,

[6] See Bozio *et al.* (2015) for a description of the model as well of its underlying assumptions.

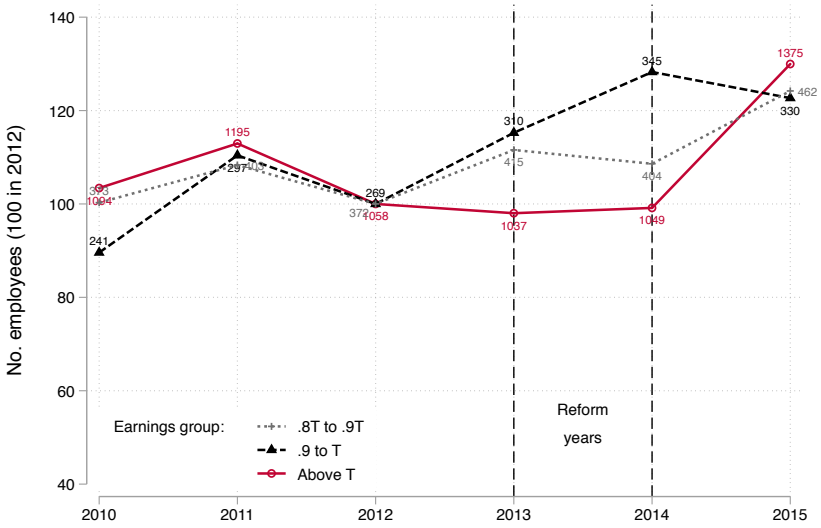
[7] There is nonetheless a difference in the number of employees in each group that is difficult to interpret, as both data contains the universe.

Figure 4.2 – Number of employees in different earnings groups

(a) Income tax return data



(b) Matched employer-employee dataset



Note: the number of millionaires increased by 23% between 2014 and 2015. T corresponds to the tax threshold: €1m of annual gross wage which is equivalent to €1.309m of annual labour cost.

Source: Income tax return sample (*Échantillons lourds des déclarations de revenus*) for panel 4.2a. Payroll tax data (DADS) for panel 4.2b.

the number of millionaires (in terms of annual gross wage income) increases in 2015 by exactly as much as the control group did in 2013 and 2014: the two lines are overlapping as they did before the reform.

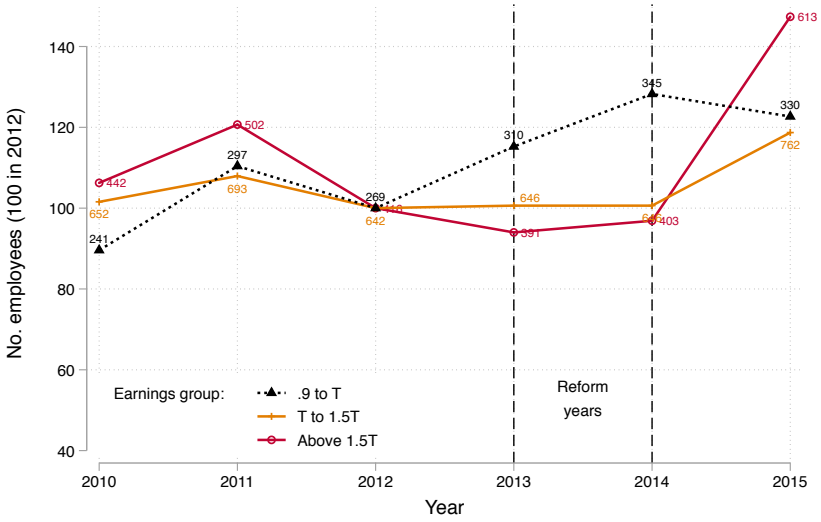
Figure 4.3a further decomposes the previous evidence of behaviour by dividing the group of millionaires into two, wages between €1m and €1.5m (in orange) and wages above €1.5m (in red). The two groups of millionaires behave similarly, suggesting that they react similarly. Yet, the number of millionaires above €1.5m increases much more than the number of millionaires below €1.5m in 2015. This is a suggestive evidence of time shifting after the tax is abolished.

Figure 4.3b decomposes the number of employees depending on the previous year income. Conditioning on being millionaire one year, what is the wage next year? Among the 1011 millionaires of 2011, 50% still are millionaires (503) in 2012 and 6% (64) have a wage between €0.9m and €1m. The increase in the €0.9m to €1m category observed in 2013 comes from about additional 32 millionaires in 2012. 10% of the millionaires of 2012 have a wage between €0.9m and €1m, hence a difference of 4ppt with 2012. This suggests that a small yet identifiable fraction of millionaires saw a wage decrease in 2013.

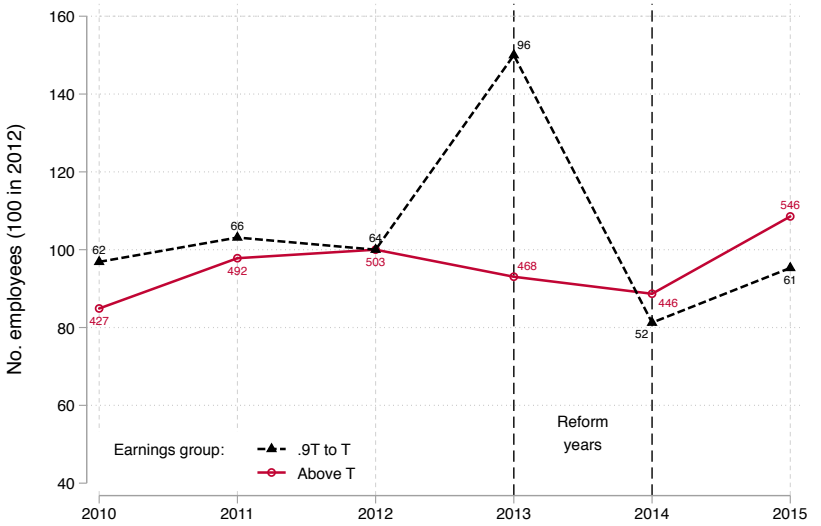
Many things can explain the temporary divergence between the number of millionaires and the number of employees just below the million. A first explanation is that some millionaires decreased their income in order to stay just below the threshold, as shown by Figure 4.3b. But the number of individuals in the €0.9m to €1m group should then decrease in 2015, unless some new individuals enter this group. A second possibility is that employees whose income was on an increasing trend did not overtake the threshold and reached the .9T to T groups instead. Yet, I do not observe a large bunching at the threshold, maybe due to the low density of workers around the threshold. These two explanations are not exclusive from one another and underpin the presence of some kind of time-shifting behaviour, both when the tax is introduced and when it is abolished. Yet, it is also possible that there was some income-shifting. Another possible channel of response is migration of top incomes out of France. I investigate these different optimisation possibilities in part 5.

Figure 4.3 – Number of employees in different earnings groups - additional evidence

(a) Decomposition of millionaires



(b) Conditioning on income above €1m the previous year



Note (a): this graph is similar to 4.2 but decomposes the millionaires into two groups.
Note (b): the black line represents the number of employees in the .9T to T group who were millionaires the previous year. The red lines represent the number of millionaire employees two years in a row.
Source: Payroll tax data (DADS))

4 Worker-level and firm-level effects on wage

4.1 Wage incidence

In this section, I focus on the employees belonging to the top 0.01% of the salary income distribution.

I decompose the individuals from the top 0.01% into ten groups of equal size according to the wage distribution. Millionaires belong to the top 0.003%. I compare the evolution of the wage by group, looking at the group-level wage growth. I focus on two earning concepts. The first and most inclusive one is the labour cost. It contains employer and employee social security contributions (SSCs) as well as all other payroll taxes[8]. The second one is the net wage, obtained by deducting employee SSCs from the gross wage. These income concepts can be considered as wages since almost all of the top earners are working full-time and full-year.

Graphical results The figure 4.4 shows, for each category of the income distribution (deciles of the top 0.01%), the average wage of the category, relative to the average wage as of 2012 (the last pre-reform year). Panel 4.4a presents the evolution of the net wage and panel 4.4b the evolution of the labour cost. In 2013, the net wage decreases and the labour cost increases starting at the 99.997 percentile, exactly where the 75% tax kicks in. The divergence directly comes from the computation of the tax and increases with the income category. In the richest group, the net wage decreases by almost 5% and the labour costs increases by almost 20% in 2013. In 2014, there is the same difference between the growth of the two wage concepts, but the net wage of the richest group increases relative to 2012. The top 0.001% group behaves differently from the rest of the top 0.01%: individuals belonging to this group gained back the net wage that they had lost in 2013. In 2015, labour costs and net wages of the top 0.01% increase relative to 2012 by around 10%. Starting at the 99.997 percentile, the growth is increasing with the percentile. The top 0.01% enjoyed an overall wage increase, larger for the top 0.03%. This general wage growth in 2015 is likely to come from the implementation of a bonus cap in the banking sector in the European Union. Bonuses were capped at 100%[9] of the fixed part of the salary.

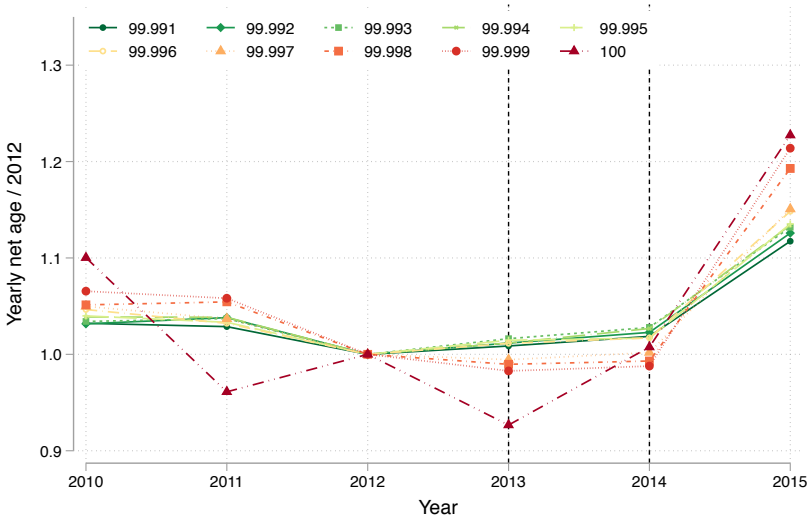
Regression results In order to estimate the incidence of the 75% tax on millionaires I propose a regression analysis relying on a cell-based approach corresponding to the previous graphical results. I use the following difference-in-differences specification to estimate the

[8] Except for the tax on wage targeting sectors not subject to VAT.

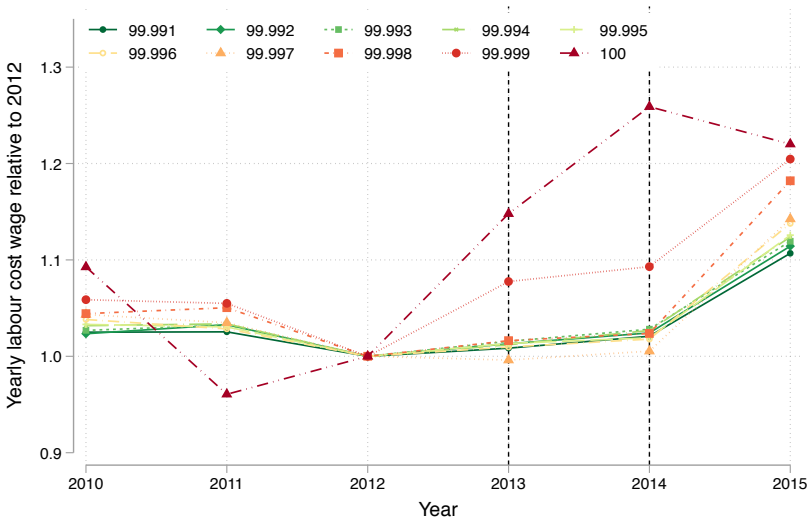
[9] The cap can reach 200% of the salary if the firm's shareholders agree on that.

Figure 4.4 – Incidence of the tax

(a) Net wage



(b) Labour cost



Notes: The figure presents the evolution of the average net wage (Panel 4.4a) and labour cost (Panel 4.4b) by groups of percentile.

Source: Payroll tax data (DADS) and TAXIPP 0.3.

treatment effect of the reform:

$$w_{pt} = \alpha_p + \beta_t + \gamma \cdot \mathbb{1}(p \geq p_{eligible}) \cdot \mathbb{1}(t = 2013, 2014) + \epsilon_{pt} \tag{4.1}$$

where

- $p = 99.990 - 99.991, ..., 99.999 - 100$ denotes 10 percentiles categories,
- t denotes 8 years (2008 to 2015),
- w_{pt} is the net wage or labour cost annual average income for percentile p and year t
- $\mathbb{1}(p \geq p_{eligible})$ is a dummy equal to one if the percentile group is subject to the 75% tax,
- $\mathbb{1}(t = 2013, 2014)$ is a dummy equal to one for reform years,
- ϵ_{pt} is the error term

The objective is to estimate the treatment effect γ, the coefficient on the interaction percentile eligibility and reform-years dummy.

Table 4.3 – Incidence of the tax, top 0.01% details

	(1)	(2)	
	2013-14	2013	2014
Net wage	-58.26	-84.53	-31.99
	(71.07)	(93.92)	(93.92)
Labour cost	194.46	140.54	248.37
	(106.78)	(140.95)	(140.95)
Pass-through	0.77	0.62	0.89
	(0.09)	(0.23)	(0.02)
N	80	80	

Sources: DADS POSTES 2008-2015 and TAXIPP 0.3.
Note: the pass-through is the share of the tax paid by employers. Standard errors of the pass-throug are estimated by the delta method.

Table 4.3 displays regression results. Column (1) provides the baseline estimates and column (2) decomposes the reform-years dummy into 2013 and 2014. I find a large positive effect of the tax on labour cost and a smaller (not significant) negative effect on the net wage, consistent with figure 4.4. Using these estimates, I compute a measure of the wage incidence, the pass-through, defined as the share of the tax borne by employers. I find that 77% of the tax increase is borne by employers. The estimate is highly significant (standard errors are estimated by the delta-method). The decomposition of the effect between 2013 and 2014 shows that the incidence on wage was more important in 2013 and decreased in the following year, which is in line with the increase in net wage observed for the top 0.001% in 2014.

One limitation of this approach is that the individuals in each yearly cells are not necessarily the same from year to year. Due to the high wage variability that is attributed to this population, the composition effects associated with the construction of the cell might affect the results. This can be addressed with a panel strategy.

4.2 Wages and employment at the firm level

The previous subsection 4.1 shows that employers bore most of the cost of the tax. After studying the employee level, I focus on the employer level of response. The legal incidence of the 75% tax being on the firm, the tax is likely to impact the workers through a strategy operating at the firm level. I develop an empirical strategy aiming to identify the effect of the tax on wages and employment at the firm level. I address the following underlying research question: how do taxes ultimately affect the share of the value added of the firm? There is to my knowledge no article on the impact of top income taxation at the firm level even though top income earners have been studied in their employment context.

Data and empirical strategy Exploiting the variations in intensity of the intention to treat across firms, I look at firms' outcomes. The treatment intensity is defined by the payroll share affected by the tax.

Figure 4.5a presents the distribution of the treatment intensity in 2012. I decompose the 467 firms having a positive treated share of payroll in 2012 into two groups of same size (below and above the median)[10] and exclude the bottom 1% and the top 1% of the distribution. I call the bottom 50% firms the *lower share* (blue in figure 4.5) and the top 50% the *upper share* (red in figure 4.5). I cannot further split the sample because of its small size. Figure 4.5b shows the evolution of the share of payroll affected by the group in the two groups. The share of payroll decreases more in the more treated group than in the less treated group. Figure 4.5c provides a check that the simulation of the tax is relevant. Using the information from the accounting data of the firm, I compute an effective tax rate. It is defined by the total amount of taxes on payroll paid by the firm divided by the total payroll of the firm. Indeed, according to this accounting information, the more affected firms experienced a 40% increase of the tax rate in 2013 and 2014 only. Table 4.4 presents some descriptive statistics on a panel of firms made of the firms from figure 4.5a. The less treated group contains a much larger number of employees than the more treated firms. The firm sectors also differ according to the treatment group. Firms with lower share of treated payroll belong more to the industry, business and information & communication sectors whereas more treated firms belong more to the financial and consulting sector.

Evolution of wages at the firm level In order to identify the impact of the tax on wages at the firm level, I compare the evolution of the average wage between the two groups of firms for the workers of the top 0.005% of the wage distribution (Figure 4.6a), for the workers of the following 0.005% (Figure 4.6b) and for all workers excluding the top 0.001%. The top 0.005% workers experienced a small decrease in net wage, comparable in the two groups.

[10] I exclude the few firms who hit the cap.

Table 4.4 – Descriptive statistics at the firm level

Variable	Group	2010	2011	2012	2013	2014	2015
No. of employees	Lower	2021.64	2118.99	2039.92	1987.50	2027.19	2022.16
	share	(8363.17)	(8456.96)	(8166.74)	(7852.31)	(7757.11)	(7709.41)
	Upper	75.75	51.68	45.71	45.56	44.69	49.29
	share	(425.65)	(127.50)	(76.17)	(77.27)	(77.02)	(81.94)
No. of employees in the top 0.005%	Lower	2.00	2.54	2.81	2.50	2.52	2.54
	share	(3.49)	(4.65)	(3.43)	(4.19)	(4.12)	(5.66)
	Upper	2.22	2.63	2.98	2.50	2.33	2.25
	share	(4.18)	(4.67)	(4.40)	(4.51)	(4.30)	(4.33)
No. of employees in the next 0.005%	Lower	2.19	2.60	2.45	2.31	2.36	2.20
	share	(3.46)	(4.85)	(4.11)	(4.09)	(3.79)	(4.63)
	Upper	1.10	1.09	0.98	0.90	0.94	0.95
	share	(2.06)	(2.08)	(1.98)	(1.72)	(1.79)	(1.84)
Net wage by employee (k€2013)	Lower	63.52	67.25	68.60	67.21	70.13	74.29
	share	(50.04)	(63.78)	(55.73)	(58.36)	(68.70)	(76.94)
	Upper	295.96	334.19	389.23	317.51	293.45	311.68
	share	(368.33)	(419.60)	(538.92)	(373.15)	(367.09)	(449.10)
No. of millionaires	Lower	1.34	1.58	1.81	1.57	1.59	2.04
	share	(2.56)	(2.84)	(1.97)	(2.75)	(2.78)	(4.86)
	Upper	1.71	2.09	2.46	1.74	1.56	1.92
	share	(3.44)	(3.92)	(3.70)	(3.42)	(3.26)	(3.90)
Treated share of payroll	Lower	0.04	0.05	0.07	0.05	0.05	0.06
	share	(0.06)	(0.07)	(0.05)	(0.08)	(0.09)	(0.10)
	Upper	0.29	0.35	0.48	0.33	0.27	0.29
	share	(0.33)	(0.31)	(0.25)	(0.34)	(0.31)	(0.32)
Sector: industry	Lower	0.15	0.15	0.13	0.12	0.13	0.13
	share	(0.36)	(0.35)	(0.34)	(0.32)	(0.33)	(0.34)
	Upper	0.05	0.03	0.04	0.03	0.03	0.03
	share	(0.21)	(0.18)	(0.19)	(0.18)	(0.17)	(0.16)
Sector: production	Lower	0.00	0.00	0.00	0.00	0.00	0.00
	share	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	Upper	0.01	0.01	0.01	0.01	0.01	0.01
	share	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.10)
Sector: business	Lower	0.14	0.16	0.18	0.18	0.18	0.18
	share	(0.35)	(0.36)	(0.38)	(0.39)	(0.38)	(0.39)
	Upper	0.05	0.05	0.04	0.04	0.03	0.03
	share	(0.22)	(0.21)	(0.20)	(0.20)	(0.18)	(0.18)
Sector: information and communication	Lower	0.12	0.12	0.12	0.11	0.11	0.11
	share	(0.32)	(0.32)	(0.32)	(0.32)	(0.31)	(0.31)
	Upper	0.06	0.05	0.06	0.06	0.05	0.05
	share	(0.24)	(0.22)	(0.24)	(0.24)	(0.21)	(0.22)
Sector: finance	Lower	0.22	0.21	0.21	0.21	0.20	0.20
	share	(0.41)	(0.41)	(0.41)	(0.41)	(0.40)	(0.40)
	Upper	0.36	0.37	0.36	0.36	0.36	0.37
	share	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)
Sector: consulting	Lower	0.24	0.24	0.24	0.23	0.24	0.24
	share	(0.43)	(0.43)	(0.43)	(0.42)	(0.43)	(0.43)
	Upper	0.35	0.37	0.36	0.35	0.35	0.37
	share	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)	(0.48)
Sector: administration	Lower	0.04	0.04	0.04	0.03	0.04	0.04
	share	(0.20)	(0.20)	(0.19)	(0.18)	(0.18)	(0.19)
	Upper	0.05	0.04	0.05	0.05	0.04	0.04
	share	(0.21)	(0.20)	(0.21)	(0.21)	(0.19)	(0.19)
Sector: entertainment	Lower	0.03	0.03	0.03	0.03	0.04	0.04
	share	(0.16)	(0.17)	(0.17)	(0.18)	(0.18)	(0.19)
	Upper	0.05	0.05	0.05	0.05	0.05	0.05
	share	(0.21)	(0.21)	(0.21)	(0.21)	(0.21)	(0.22)
Sector: rest	Lower	0.01	0.00	0.00	0.02	0.01	0.00
	share	(0.09)	(0.00)	(0.00)	(0.15)	(0.09)	(0.00)
	Upper	0.00	0.00	0.00	0.02	0.05	0.03
	share	(0.00)	(0.00)	(0.00)	(0.14)	(0.21)	(0.18)

Notes: the table presents the descriptive statistics for a panel of firms. I consider the firms who have at least on employee treated in 2012 and divide them into two group of treatment intensity (the lower share and the upper share).
Source: Payroll tax data (DADS), firm tax data (FARE).

For workers of the following 0.005% and of the rest of the wage distribution, nothing really changes with the tax nor differs between the two groups of treatment. This suggests that the

tax on millionaires induced a comparable wage decrease in the two groups and did not have spillovers on the wages of the other workers of the firms.

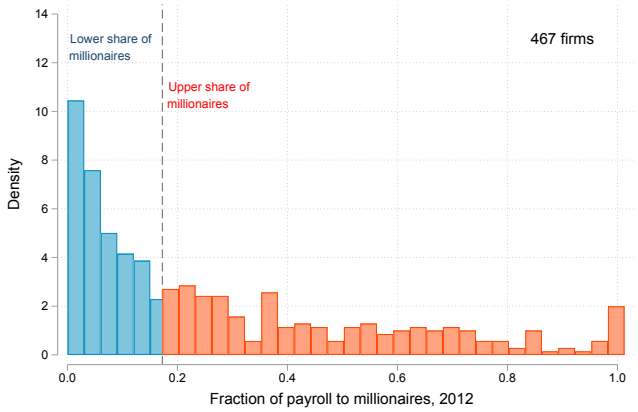
Evolution of employment at the firm level If the workers' wages of the two treated groups are affected the same by the reform, this is not the case when it comes to employment. Figure 4.7 presents the evolution of the number of millionaires (Figure 4.7b) and of the number of workers whose wage is just below the threshold, showing that there is a reallocation of workers in the two groups happening at the firm level. In the more treated group, millionaires were substituted into workers paid just below the threshold. This can be achieved by two different strategies: either wages decrease at the individual level, either millionaires are laid off and replaced by lesser paid workers.

At the firm level, it appears that wages evolve similarly depending on the intensity of the treatment. Yet, this translates into a more visible substitution between employees affected by the tax and employees with a wage just below the threshold. The firm is possibly the theatre of a more complex optimisation strategy, if non-wage remunerations are paid. Firms could for example pay some employees with stock options or with dividends for those who own shares. This is however difficult to identify based solely on payroll and firm tax data[11].

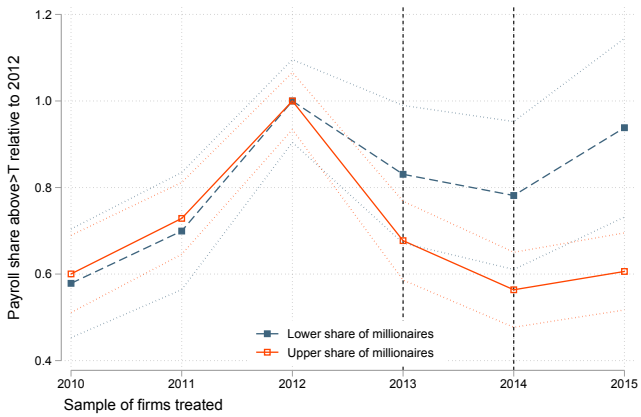
[11] In the firm tax return data, the dividend variable mixes information from the two previous years. The income tax data informs on the dividends received. Yet, there was a reform on dividend taxation in 2013, which affected greatly the dividends received in 2013.

Figure 4.5 – Treatment definition at the firm level

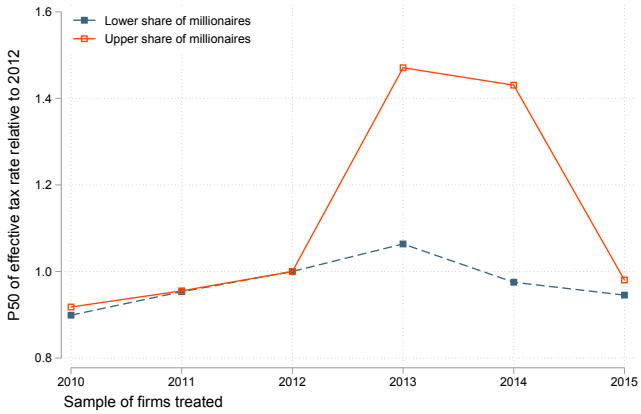
(a) Density of payroll share in 2012



(b) Payroll Share of millionaires, by 2012 groups



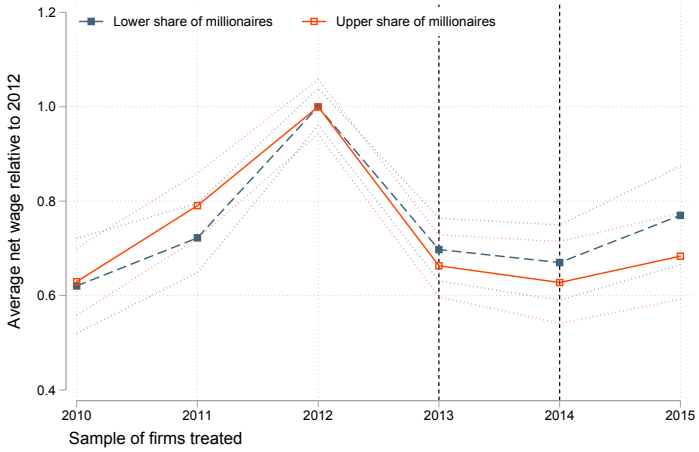
(c) Evolution of the effective tax rate



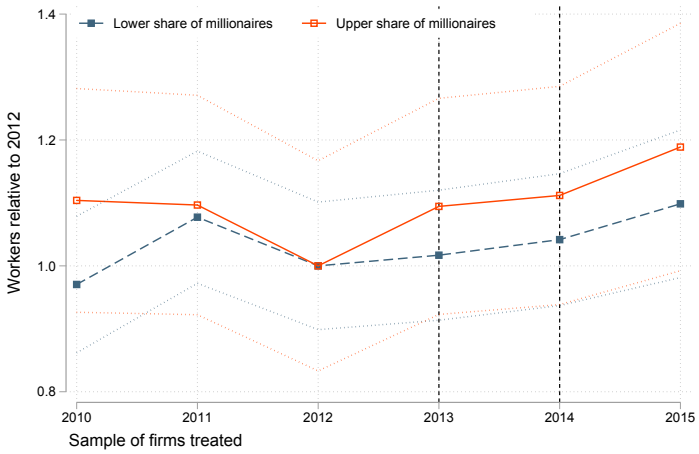
Notes: the panel 4.5a depicts the distribution of the share of payroll affected by the tax. The sample is divided in two categories: the lower half of the distribution (below the median) constitutes the *lower share* group and the upper half of the distribution is the *higher share* group. Panel 4.5b presents the evolution of the share of payroll affected by the tax in the two groups. The dashed lines denote the 95% confidence intervals.
Source: Payroll tax data (DADS), firm tax data (FARE) and TAXIPP 0.3.

Figure 4.6 – Firm-level wage effects

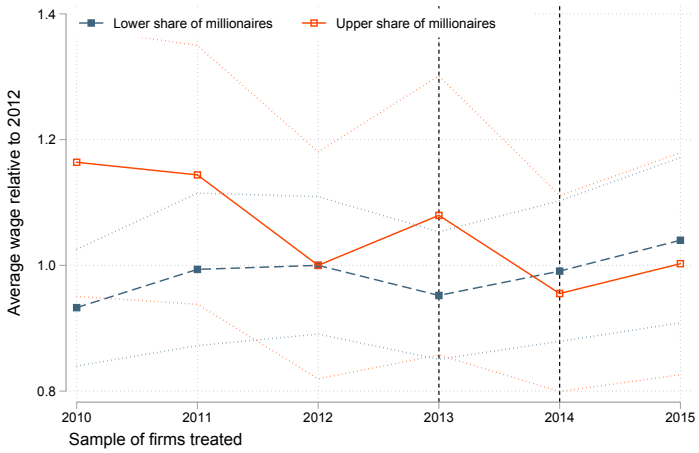
(a) Average wage of top 0.005% earners



(b) Average wage of 0.01% earners excluding the top 0.005%



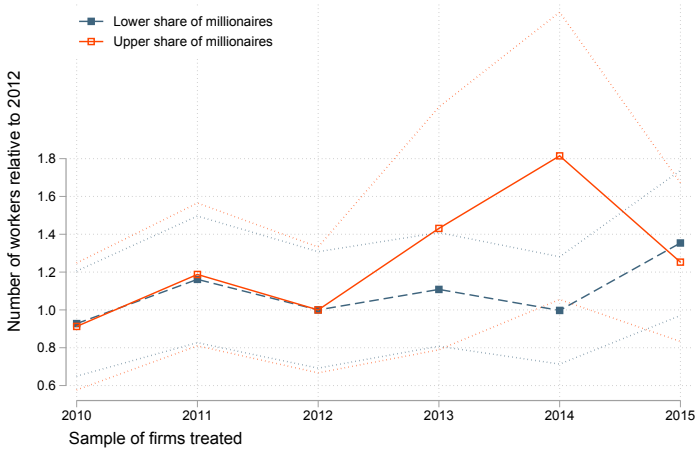
(c) Average wage of rest of the workers



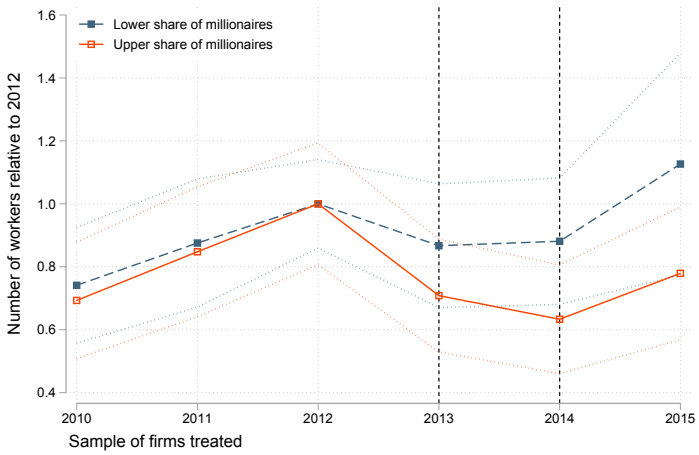
Notes: the figure depicts the evolution of average net and labour cost wage of workers for the top 0.005% earners (panel 4.6a) and for the next 0.005% (panel 4.6b). The dashed lines denote the 95% confidence intervals.
Source: Payroll tax data (DADS), firm tax data (FARE) and TAXIPP 0.3.

Figure 4.7 – Firm-level employment effects

(a) Evolution of the number of worker with a wage between 0.8T to T



(b) Evolution of the number of worker with a wage above T



Notes: the figure depicts the evolution of number of employees whose wage is between 0.8 to 1 T groups (panel 4.7a) and (panel 4.7b). T = 1 309k€ is the top bracket threshold. The dashed lines denote the 95% confidence intervals.
Source: Payroll tax data (DADS), firm tax data (FARE) and TAXIPP 0.3.

5 Optimisation behaviour of the individual

5.1 Conceptual Framework

I rely on the traditional economic model used in the taxable income literature. It departs from a standard labour supply model by assuming that individuals chose to maximise a utility function $u(c,z)$ depending positively on c, the disposable income or consumption and negatively on z, the reported income. In my case, c is the disposable labour income and z is the labour cost, as pictured in figure 4.B.2. Following Kopczuk (2005), I choose to look at the broader measure of income, labour cost. Utility is maximised subject to the following budget constraint $c = z - \mathrm{T}(z) = (1-\tau).z + y$ where τ is the marginal tax rate and $y = \tau.z - \mathrm{T}(z)$ is virtual income. Solving the optimisation problem leads to the following labour supply function: $z = z(1-\tau, y)$, implying the following specification:

$$\log(z_{it}) = \alpha + e.\log(1-\tau_{it}) + f.\log(y_{it}) + \epsilon_{it} \tag{4.2}$$

where e is the uncompensated elasticity of the reported income with respect to the marginal net-of-tax rate. f is the income elasticity. I will further assume that there is no income effect, as is common in the literature.

The literature proposes different strategies to estimate equation 4.2. The most straightforward strategy relies on time series. A second type of approach estimates equation 4.2 by difference-in-differences using repeated cross-sections. A third and more demanding approach requires a panel dataset. I compare the results using two different strategies, a cell-based approach and a regression approach.

Equation 4.2 has an endogeneity issue because the marginal tax rate τ_{it} depends on the level of income z_{it}. Diverse instruments are proposed to tackle this endogeneity issue. With repeated cross-sections, the log of the net-of-tax rate is instrumented using the interaction between a post-reform and a treatment group indicator. Panel data allows for more complex instrumentation strategies. The classical strategy consists in instrumenting the log of the net-of-tax rate using the predicted net-of-tax rate, i.e., applying the year t tax schedule to the income of year $t-1$. Yet, the instrumentation strategy for the panel estimation is known to have further limitations. Indeed, problems related to an intrinsic evolution of incomes can further cause endogeneity of the instrument. The income process can be divided into a transitory and a permanent component. The fluctuations of the transitory component can cause a mean-reversion bias. The instrumentation based on the predicted net-of-tax rate magnify this problem since the income of year $t-1$ enters the estimation *via* the instrument. On top of that, income growth can affect the estimates. Including time trends allow to control for homogeneous income growth. Yet, income growth might be heterogeneous according to the

level of income, especially at the top of the distribution. This happens for example when inequality is rising. To control for the different levels of growth of the permanent component of income, several income controls from previous years can be included in the panel regression. I discuss these endogeneity problems occurring when using panel data in appendix 4.A.

5.2 Cell-based approach

In order to exploit the diversity of the individual responses according to the wage level, I consider a cell-based approach similar to the one presented for the wage incidence analysis. The only difference comes from the rescaling of the effect of the treatment, needed to interpret the parameter of interest in terms of elasticity. The elasticity measures the percent change in income when the net-of-tax rate increases by 1%. The estimated equation is the same than equation 4.1 except that I use for treatment the log of the net-of-tax rate instead of the interaction term. The outcomes are the same than for the incidence approach and are pictured on figure 4.4.

Table 4.5 presents the regression results for net wage and labour cost. Consistent with the previous estimates, I find a negative elasticity for the labour cost and a positive elasticity for the net wage. The elasticity of the labour costs is driven by the phasing in of the reform in 2013 whereas the result for the net wage is driven by the phasing out. The elasticity of the labour cost is -0.082. The negative sign is consistent with the increase in labour cost following the reform. The elasticity of the net wage is around 0.121, which is small as compared to the rest of the literature[12].

Table 4.5 – Elasticities using top income share time series

Decomposition of the phasing in and out of the tax	Labour cost	Net wage
1. Phasing in (2012-2013)	-0.106*	0.095***
	(0.06)	(0.031)
2. Phasing out (2014-2015)	-0.018***	0.188***
	(0.076)	(0.031)
3. Full time-series (2010-2015)	-0.082*	0.121***
	(0.042)	(0.028)

Notes: estimates are obtained using series from figure 4.4 by the following OLS time-series regression $log(w_{pt}) = \alpha_p + \beta_t + e \cdot ln(1-\tau_{pt}) + \epsilon_{pt}$. The two first rows decompose the phasing in (2012-2013) and the phasing out (2014-2015) of the 75% tax. The third line groups all the years.
Standard errors in parentheses. *$p < .05$, **$p < .01$, ***$p < .001$.
Sources: DADS POSTES and FARE 2009-2014.

[12] See for example Saez (2017) who finds an elasticity of wages for the top 0.01% of 1.34.

5.3 Repeated cross-section approach

The approach relying on repeated cross-sections is very similar to the previous cell-base approach. It further allows me to differentiate the effect according to individual characteristics.

I estimate the following two-stage-least-squares equation

$$\log(z_{it}) = \alpha_t + \beta.1(\text{top 0.003 percent}) + e.\log(1-\tau_{it}) + \epsilon_{it} \tag{4.3}$$

using the reform indicator and the treatment group interaction as an instrument.

Table 4.6 presents the results of the repeated cross-section approach. Panel A first restricts the estimations to the phasing in (2012-2013) and the phasing out (2014-2015) of the tax. Consistent with the cell-based approach, the negative elasticity associated to the labour cost is driven by the phasing in period whereas the positive net wage elasticity comes from the phasing out of the tax. The elasticity is then decomposed by occupation[13]. The aggregate results are driven by the CEOs and the deputy CEOs category. Net wages of managers are more negatively affected by the tax than those of CEOs, reflecting maybe the lower bargaining power of managers. The elasticity of labour cost is negative and even lower for artists and sportsmen. This can be due to the fact that highly paid sportsmen (mainly footballers) negotiated a net wage.

The cell-based and the repeated cross-section approaches give consistent results. Yet, they do not take into account possible sorting effects in the treatment category, as it is defined each year. I develop a panel strategy addressing this issue (presented in appendix 4.A) but that is also plagued with problems inherent with the use of the panel.

[13] I take advantage of the panel dimension of the database, which is not used in this approach, by categorizing individuals according to their main occupation across the period. Because of that, individuals cannot change between occupation category across the period.

Table 4.6 – Elasticities using repeated cross-section

		Labour cost	Net wage
Panel A. Maximum revenue			
A1. Phasing in		-0.156*	0.183**
		(0.085)	(0.084)
	Obs.	4282	4282
A2. Phasing out		-0.001	0.323***
		(0.09)	(0.088)
	Obs.	4168	4168
A3. 2010-2015		-0.101*	0.231***
		(0.052)	(0.052)
	Obs.	12519	12519
Panel B. Total revenue			
B1. Phasing in		-0.176**	0.146*
		(0.084)	(0.084)
	Obs.	6562	6562
B2. Phasing out		0.064	0.382***
		(0.09)	(0.089)
	Obs.	6491	6491
B3. 2010-2015		-0.097*	0.222***
		(0.052)	(0.052)
	Obs.	19399	19399
Panel C. Decomposing by occupations			
Artists and sportsmen		-0.655**	-0.205
		(0.259)	(0.259)
	Obs.	1436	1436
CEOs and deputy CEOs		-0.16*	0.161*
		(0.082)	(0.083)
	Obs.	6185	6185
Managers		0.089	0.384***
		(0.067)	(0.068)
	Obs.	10364	10364
Others or missing		-0.207	0.095
		(0.16)	(0.161)
	Obs.	1686	1686

Notes: estimates are obtained from 2SLS regression: $\log(z_{it}) = \alpha_t + \beta.1(\text{top 0.003 percent}) + e.\log(1-\tau_{it}) + \epsilon_{it}$ using the reform indicator and the treatment group interaction as an instrument. Outcomes are the log of the labour cost (left column) and the log of the net wage (right column). I control by the sex and the log of the firm profit. Panel A and B decomposes the phasing in (2012-2013), the phasing out (2014-2015) of the 75% tax and groups all the years. The outcome is the maximum of the different wages earned by an individual in panel A and the total of all wages in panel B. Panel C decomposes the estimation by occupation. Standard errors in parentheses. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.
Sources: DADS POSTES and FARE 2009-2014.

6 Conclusion

This chapter looks at a large variation of the very top marginal tax rate on wages, created by the 75% tax (new tax rate of 50% on gross wages) above €1m. It addresses the short-term responses of labour incomes. About 400 employers paid the tax each year and about 1000 employees were concerned. Even if the tax defies the first principles of taxation with its very narrow tax base on unstable incomes for a very short period of time and a large marginal tax rate, it seems to have contributed to raise the total tax revenue. Simple graphical evidence of the evolution of the number of millionaires suggest that the tax triggered a sizable response.

I document that the tax was largely borne by employers, who paid 77% of the tax. Looking at the difference in the intensity of the intention to treat, I further look at how firms share the tax burden on workers. The analysis shows that the wages of the workers who were not affected by the tax did not decrease.

Taking advantage of the short term nature of the tax, I show suggestive evidence that the tax triggered important optimisation responses of wage earners, taking the form of time-shifting. I study the elasticity of the pre-tax labour income to the net-of-tax rate (1 minus the marginal tax rate) and find an elasticity of -0.1, consistent with the fact that the cost of the tax was mostly paid by employers. The elasticity of the net wage to the net-of-tax rate is nonetheless positive and around 0.2. These elasticities are driven by the CEOs and the deputy CEOs. Interestingly, the elasticity of the net wage is larger for managers than it is for CEOs, meaning that their wage decreased more. This difference illustrates the importance of the bargaining power in the wage setting process of these top wage earners.

Appendix

4.A Panel regression approach

4.A.1 Building a panel data from administrative datasets

Each yearly payroll tax data contains two years of information. I take advantage of this in order to build an individual panel dataset. The procedure consists of three steps:

- First, for each year y, I consider the year y database and divide it into two databases. The first database contains the information relevant for year $y-1$ whereas the second database contains the information relevant for year y. For each individual, I keep only one observation: the one related to the job with the maximum gross wage.
- The second step performs a matching between the information of year $y-1$ from the database of year $y-1$ with the information of year $y-1$ from the database of year y. The matching is exact for the firm identifier, the municipality of residence, the month and place of birth when available. I allow for a maximum difference of 10€ between the gross wages and for a 1 year difference in age[14]. The outcome of this step is a dictionary of individual identifiers for data of year $y-1$ and of year y.
- The third step puts together all the year-to-year dictionaries and to use them in order to compute a unique individual identifier.

As these steps are very computationally demanding, I do them separately for men and women and append the two final databases. I perform the match for 2010 to 2015, since the scope of the DADS data was extended in 2010 (inclusion of the public sector). Using the information available for 2009 in the 2010 database, I am able to build an individual panel for 2009 to 2015.

4.A.2 Estimation strategy

Equation 4.2 takes the following first-difference form:

$$\log \frac{z_{it}}{z_{it-1}} = e.\log \frac{1-\tau_{it}}{1-\tau_{i-1}} + \alpha_t + \epsilon_{it} \tag{4.4}$$

where α_t are year fixed effects.

A panel dataset allows to address the endogeneity issue with a different instrumentation strategy. The classical instrument is defined by the change in the predicted net-of-tax rate

[14] Depending on the cases, the age can be the one of the beginning or of the end of the year.

$1-\tau_{it}^{p}$= value of $1-\tau_{it}$ if income is z_{it-1}:

$$X_{it}^{0} = \log\left(\frac{1-T_t(z_{it-1})}{1-T_{t-1}(z_{it-1})}\right)$$

It is valid under two conditions: the existence of the first stage and the exclusion restriction (instrument uncorrelated with any other determinants of the dependent variable). Yet, according to Weber (2014), this second condition might not be respected and the instrument might be still endogenous as it is a function of the dependent variable. Two other identification problems threaten the exogeneity of the instrument, mean reversion and heterogeneous income trends. These two problems are particularly relevant for the study of the 75% tax as they significantly affect top earners. The literature addresses them by using different types of base-year income controls. Yet, Weber (2014) also questions the endogeneity of these income controls and proposes a methodology dealing with it. First, she proposes the following family of instruments, depending on k:

$$X_{it}^{k} = \log\left(\frac{1-T_t(z_{it-1-k})}{1-T_{t-1}(z_{it-1-k})}\right)$$

Second, very high incomes are subject to important variations from one year to another. Indeed, the income can be considered as the sum of a permanent and a transitory component, the latter causing mean-reversion. Kopczuk (2005) proposes to control for the initial level of income by including splines of the log of the base year income and for the transitory income component using splines of log deviation of current income to base year income.

As noted by Saez, Slemrod and Giertz (2012), it is not possible to provide graphical evidence for the panel approach because of the regression to the mean phenomenon.

4.A.3 Estimation results

Table 4.A.1 shows the estimation results for the panel strategy. The columns stand for the labour cost and the net wage. Panel A presents the estimation results relying on the standard predicted net-of-tax rate as an instrument (based on the base year income). Panel B uses further lags of the income in order to construct the instrument. The results of panel A are in line with the repeated cross-section estimates. When using the instrumentation strategy proposed by Weber (2014), the estimates are not consistent any more with the previous results. This problem is inherent with the instrument used: even if it is supposed to be less endogenous, it is also weaker. This lack of consistency illustrates that the higher the incomes, the more difficult it is to disentangle between the response to the tax and mean reversion.

Table 4.A.1 – Elasticities using panel

		Labour cost	Net wage
Panel A. IV: predicted net of tax rate			
A1. No income controls		-0.106	0.201*
		(0.108)	(0.112)
	Obs.	26357	26357
A2. Splines of base year income		-0.187*	0.063
		(0.098)	(0.101)
	Obs.	26357	26357
A3. Restriction of A2 to individuals present		-0.241**	0.007
3 years in a row		(0.109)	(0.112)
	Obs.	16049	16049
Panel B. IV: predicted net-of-tax rate using lagged incomes			
B1. No income controls		0.745***	1.252***
		(0.245)	(0.252)
	Obs.	15994	15994
B2. Splines of base year income		0.257	0.678***
		(0.232)	(0.238)
	Obs.	15994	15994

Notes: Equation 4.4 (two-years differences) estimated by 2SLS. Controls are sex, log of firm profit. Standard errors in parentheses. *$p < .05$, **$p < .01$, ***$p < .001$.
Sources: DADS POSTES and FARE 2009-2014

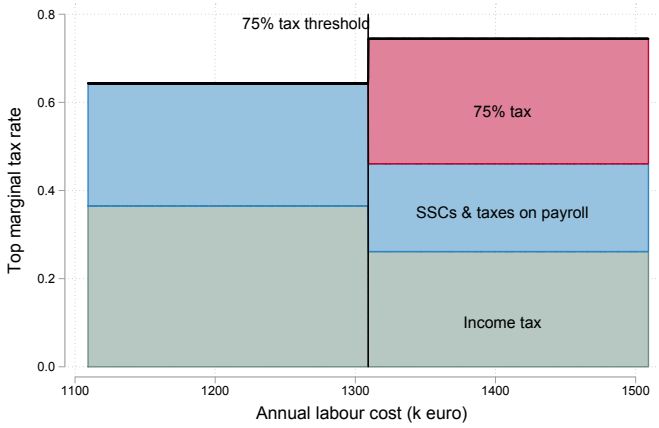
4.B Additional tables and figures

Table 4.B.1 – Structure of taxation in France (2012)

		% of GDP
Indirect taxes		10.8
Taxes on production or imports		3.1
Progressive and flat income taxes	Flat income tax (CSG and CRDS)	4.7
	Income tax	2.9
Other income taxes		1.0
Corporate tax		2.0
Wealth tax and transfers		1.2
Payroll taxation	Other taxes on payroll	1.5
	Employer SSCs	11.3
	Employee SSCs	4.0
Self-employed labour income taxes		1.3
Compulsory tax rate		**43.6**

Notes: In 2012, compulsory taxes amount to 43.6% of GDP.
Source: National accounts (tables 3.212 and 7.301).

Figure 4.B.1 – Decomposition of the top marginal rate on labour income



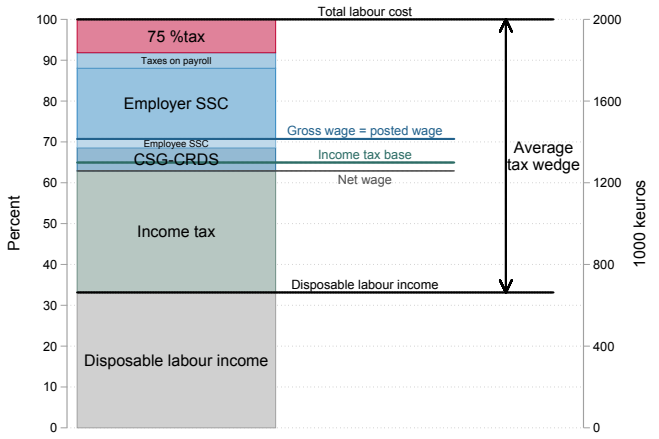
Note: The graph decomposes the total marginal rate of taxation (figure 4.1 relative to the total labour cost into three components:

1. the marginal income tax rate;
2. a marginal rate aggregating all social security contributions as well as the taxes on payroll;
3. the marginal rate of the 75% tax, introduced in 2013.

The income tax and payroll taxes marginal rates relative to labour cost decrease above 1 309 k€ because the denominator of their marginal rates is impacted by the new tax.

Source: Taxipp 0.3.

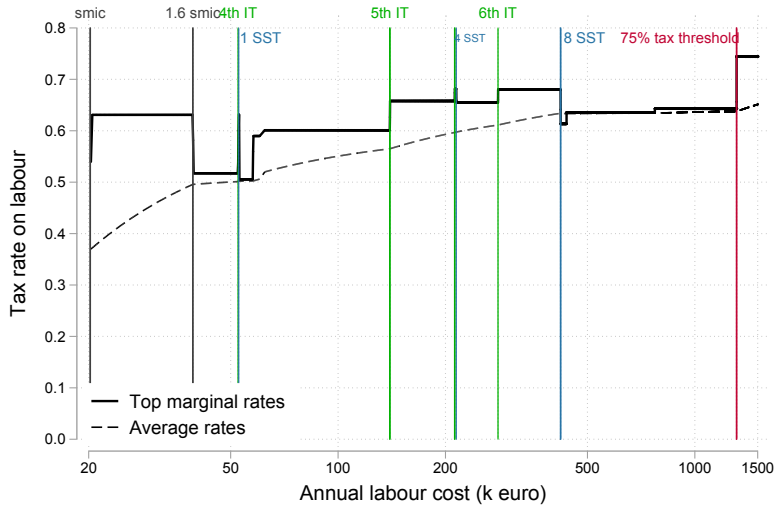
Figure 4.B.2 – Decomposition of the average labour wedge for a labour cost of 2000 k€



Note: in 2013, an employee with 2000 k€ of annual labour cost receives after all payroll and income taxes a disposable labour income of 700 k€, which represents 35% of the initial labour cost. The tax wedge is of 65%. In the law, a tax schedule is defined by tax rates that are applied to a tax base: the tax base for the CSG-CRDS, the SSCs, the taxes on payroll (blue areas) and the 75% tax (red area) is the gross wage and the tax base of the income tax (green) is the income tax base. Yet, only the total labour cost and the disposable income are of interest, as they are in theory the only ones playing an economic role.

Source: Taxipp 0.3.

Figure 4.B.3 – Labour tax rate along the income distribution (2013)

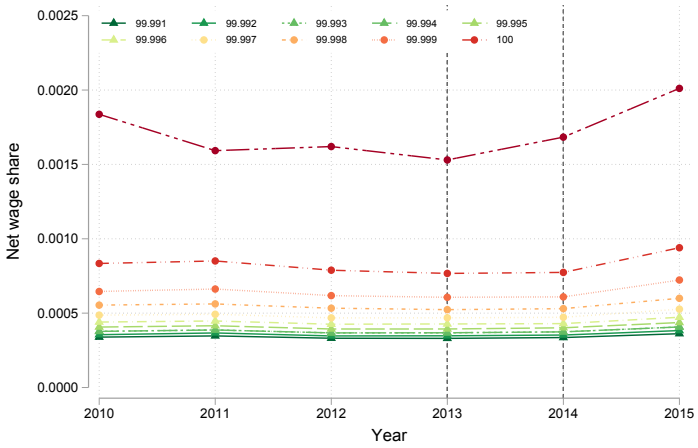


Note: The graph shows the marginal and average rates of taxation relative to the total labour cost for a labour income earner (single, no child) with a labour cost between the minimum wage and 1 500 k€. I assume that labour is the only source of income. The x-axis is in log-scale. The vertical lines show the thresholds of the overall payroll and income tax schedule:

- grey lines are at 1 and 1.6 times the minimum wage;
- green lines are the inferior threshold of the fourth, fifth and sixth income tax (IT) brackets;
- blue lines are the social security thresholds (SST, 4*SST and 8*SST).

Source: Taxipp 0.3.

Figure 4.B.4 – Top income shares



(a) Net wage

(b) Labour cost

Source: Payroll tax data (DADS) and TAXIPP 0.3.

Main conclusion

This thesis proposes original empirical results regarding the impact of taxes on labour income throughout the income distribution in France. It aims to contribute to the labour and the public finance field. To conclude, I first come back on the main results and policy implications of the thesis. I then discuss some limitations faced by this work and present how I intend to overcome them in the future.

Contributions and policy implications

If the thesis focuses on the French context, the contribution is broader and brings new evidence to the literature on public finance and labour economics. Indeed, the case of France illustrates the importance of taxation in the context of the labour market. This is the main point of this thesis. I present in the first part the microsimulation technique, coming from the public finance field. I show in a second part how this methodology can be used to contribute to the labour economics literature.

Part I In the first part of this thesis, I study the redistributive impact of taxes, using the microsimulation method. Both chapters of this part bring together national accounts and public finance data from fiscal documents with legislative parameters and with a representative sample of the French population. The microsimulation technique complements administrative tax data used in the public finance literature by providing a method for turning fiscal incomes into economics concepts. It is also a tool used for policy analyses.

The first chapter presents the microsimulation methodology and discusses the assumptions and results of static model of the French tax-and-benefit system. The model decomposes total tax revenues according to individual incomes, applying the model to a representative sample of the French population. Importantly, the model is more precise for the top 1% of the income distribution, where the amount tax revenues levied are more significant. The chapter also discusses the main methodological assumptions regarding the tax incidence and the inconsistency of the major aggregate sources. The contribution is mainly methodological and has important potential policy implications since the model constitutes a powerful tool for *ex-ante* policy evaluations of reforms of the tax-and-benefit system.

Chapter 2 proposes an evaluation of the main policy reforms taken in the aftermath of the 2008 financial crisis. It is based on a dual approach, encompassing both a macro and a micro analyses. The study reveals that the decrease in public spending was the main political channel of response although no systemic reform of the organization of spending was achieved. The main contribution of the chapter lies in the complementarity of the approaches. If the

micro part uses the previous microsimulation model, the macro part required to translate the fiscal concepts from the budget laws into their economic counterpart. The methodology developed in this chapter was then taken over in policy briefs aiming to provide yearly evaluations of the Budget Laws.

Part II The second part seeks to shed light on the impact of taxation on wages. Labour markets faced two main challenges since the 1980s. First, technological changes spread at the expense of lower wage earners. Second, the more and more globalised economy impacted both firms, affecting their input and output prices, and individuals, increasing tax avoidance and evasion opportunities.Pre-tax income distribution were affected by these two elements. I look at the impact of labour taxation on both pre- and pos-tax incomes in chapter 3 and 4. Chapter 3 suggests that taxation might constitute a well-suited institutional tool to limit growing wage inequalities. Focusing on top wage earners taxation, chapter 4 provides evidence that these workers benefit from a strong bargaining power that would be limited by higher tax rates.

Chapter 3 shows that primary labour income inequality is affected by the long term evolution of labour income taxation. Using the case of France, we show that employer social security contributions matter as they completely change the evolution of French labour inequality since the 1970s. Indeed, net wage inequality has decreased by about 5%, while labour cost inequality has increased by 15% over the 1976-2010 period. We were able to provide this long term picture because we applied forty years of legislation to employer social security data. This has never been done and constitute an important contribution both to the field of labour economics and of public finance. This empirical demonstration using the case of France motives the main point of the chapter which is nonetheless theoretical: labour demand depends on labour cost, and labour market models should take the discrepancy between the net wage and labour cost into account. This amounts to underlying the important role that labour income taxation plays on the labour market.

Chapter 4 constitutes a first attempt to analyse behavioural responses to labour income taxation at such a high level in the income distribution. A quasi-experimental variation, the 75% tax on millionaires implemented in 2013 and 2014, and evaluation of public policies methods (difference-in-difference method) are used to document the incidence of the tax and the individual and firms' behavioural responses. I find that the incidence of this tax is borne at 80% by employers. Individuals also demonstrate some time-shifting behaviour. The incidence on employers suggests that millionaires have a high bargaining power. Yet, a small fraction of the millionaires, mainly employed by holding companies, are able to shift part of their income after the reform. The very specific context of this tax should be kept in mind when trying to propose general policy recommendations. Indeed, if this tax were to be

permanent, it is likely that the avoidance response would take the form of income-shifting rather than time-shifting. Yet, theoretical models show that higher taxes reduce the wage-earner bargaining power. This sustain the idea that high tax rates on the very top of the wage distribution act as a corrective taxation tool.

Limitations and perspectives for future research

As a whole, this work does not pretend to give the full picture of the dynamics of the impact of taxes on labour income inequality. I come back on some of its limitations and provide some ideas on how I intend to overcome them.

Part I The first part of the thesis could benefit from different types of extension.

This part focuses mainly on tax revenues whereas encompassing also the benefits is necessary in order to give a complete assessment on the redistribution of income. Benefits amount indeed for a large part of public spending. On top of that, it is always possible to improve the extent to which the legislation is simulated. Improving the precision of the underlying individual database for the simulation is a first step. Enlarging the scope, both in time and in space is another ambitious direction. I am addressing these limitations in a following up project on the longer term redistributive impact for the whole tax-and-benefit system with Antoine Bozio, Bertrand Garbinti, Jonathan Goupille and Thomas Piketty.

Second, the microsimulation model is static and does not encompass any behavioural response. A behavioural module of labour supply response could be designed and would give a more accurate picture of the redistributive impact of tax reforms. This static dimension also affects the measure of inequality as lifecycle effects are not taken into account. Indeed, tax revenues are used to redistribute income among individuals at one point in time. The system can also be viewed as the redistributing individual income across the lifetime. This lifecycle dimension is much more difficult to address and requires more ambitious microsimulation models. Indeed, it is possible to simulate the evolution of labour income in a lifetime but encompassing major life events (educational choices, family status) as well as all other sources of income in the analysis has never been done. Another solution would be to rely on a long term panel including these information, which does not exist in France to my knowledge.

Part II Chapter 3 from part II documents an inequality increase, but the identification of the factor(s) explaining this increase is still weak. The chapter does not disentangle between the role of the technology and the one of the labour supply. The problem comes from the co-linearity of the technological change, which is linear by assumption, and of the relative supply, which happens to be linearly increasing in France. Improving the measure of the technological change, using the evolution of the product of the information and communication

sector as a share of GDP for example, is a first idea that might help by introducing some variations. I could also decompose the analysis at the industrial level, where the relative stock of skilled labour supply might be less linear. Another option would be to extend the comparison of skilled to unskilled labour cost and net wage to many countries. The identification of the effect of the tax and of the one of the labour supply would rely on the cross-country variations in both the relative skilled supply and the redistributive impact of taxation.

In chapter 4, millionaires have different channels of response and there is no empirical framework allowing for a standard decomposition of the behavioural elasticity. To further understand how the dynamics of the behavioural responses of top labour income earners to taxation, a panel dataset would allow for a better identification of income mobility. Such a panel dataset would be also very useful for studying more in detail how CEOs react to taxation and how this impacts the firm outcomes.

Finally, part II tackles the question of incidence but from a very global point of view in chapter 3 and from a very precise point of view in chapter 4. I would be interested in deepening the complementarity of problematics from public and labour economics by focusing on a sectorial tax affecting the financial sector in France, the *taxe sur les salaires*. Such a research project would complement the analysis of part II by looking at a key sector regarding the evolution of inequality (the financial sector) and by tackling the question of incidence applying an innovative research strategy to newly available administrative data. Indeed, the tax returns data of the *taxe sur les salaires* exists and can be matched with the payroll and firm tax data on the firm identifier.

From a more general point of view, my analysis of labour income taxation is at the intersection of two methodologies, two complementarity approaches and two economic fields. Indeed, this thesis benefits from the micro and macro approaches, the use of microsimulation and public policy evaluation methods as well as from research questions coming both from the public finance and from labour economics literature. Bridging the gap between these different perspectives was central to this thesis and will, I hope, continue to animate my future research projects.

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