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Who Understands The French Income Tax? Bunching Where Tax Liabilities Start

Raphaël LARDEUX

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Who Understands The French Income Tax? Bunching Where Tax Liabilities Start

Raphaël LARDEUX*

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*   Département des Études Économiques - Division « Redistribution et Politiques Sociales »

Qui comprend l'impôt sur le revenu ?
Réactions comportementales au seuil d'entrée
dans le barème

Résumé

Cette étude examine les réactions comportementales des foyers fiscaux au seuil d'entrée dans l'impôt sur le revenu (IR), défini comme le niveau de revenu imposable à partir duquel les contribuables doivent acquitter l'impôt. Des dispositifs spécifiques (décote et minimum de mise en recouvrement) créent une confusion entre deux seuils apparents du point de vue du contribuable : le seuil effectif de mise en recouvrement et un seuil d'imposition illusoire. Face à ces discontinuités perçues dans le profil des taux marginaux, certains contribuables ont intérêt à ajuster leur revenu imposable de sorte à se situer en deçà, produisant par agrégation une accumulation locale de déclarations fiscales. La distribution du revenu imposable issue de la base POTE des déclarations individuelles d'IR met en évidence de telles accumulations en ces deux seuils potentiels, persistAntes de 2008 à 2015. Leur analyse au regard d'un modèle de perception erronée de l'impôt révèle des réponses aux incitations potentiellement fortes, mais une attention limitée à l'égard du seuil d'entrée dans l'IR. Ainsi, le déplacement du seuil d'imposition erroné de la première vers la deuxième tranche d'imposition a suscité des ajustements significatifs entre 2011 et 2012. La dernière partie de cette étude décline cette estimation aux télédéclarants et aux déclarants papier. S'ils se caractérisent par des réponses aux incitations de même ampleur, les premiers ont une meilleure compréhension de l'impôt sur le revenu.

Mots-clés : Impôt sur le revenu, accumulation, attention, perception erronée, Internet

Who Understands The French Income Tax?
Bunching Where Tax Liabilities Start

Abstract

Lack of tax transparency may strongly impact taxpayers' behavior. This paper disentangles responses to incentives from attention to taxes at the level where French income tax liabilities start. When reporting their earnings, tax filers may be confused between two potential thresholds: the true Tax Collection Threshold (TCT), a notch, and a wrong Taxation Threshold (TT), which is a kink. Using a comprehensive dataset on individual income tax returns from 2008 to 2015, I highlight significant bunching in the taxable income distribution at both thresholds. Within a model of tax misperception, I estimate that taxpayers are far from paying full attention to the income tax system, yet display strong reactions to the marginal tax rate they perceive. This framework can account for behavioral responses to a rise in the virtual marginal tax rate at the wrong threshold and may prove useful to detect policies improving attention to taxes. Contrasting hard-copy and online tax filers, the misperception model reveals a better understanding of the tax system by the latter.

Keywords: Income tax, bunching, attention, misperception, Internet

1 Introduction

Transparency is one of the most desirable properties of taxes.[1] In contrast, the French income tax system is regularly criticized for its complexity. The income level where tax liabilities start is particularly difficult to determine. It does not match the lower bound of the first income tax bracket due to two specific mechanisms: the "*décote*" and the *tax collection minimum.* Yet, this income level is a crucial political issue. The number of exempted households–as high as 21.6 million in 2016–and especially of single minimum wage earners is a stated objective for the government.[2] Retired people exempted from income taxes automatically benefit from a lower rate of generalized social contributions. Moreover, this starting point raises marginal tax rates for households already facing the loss of social welfare benefits.

This paper disentangles responses to incentives from attention to taxes at the income level where French income tax liabilities start, using a comprehensive administrative dataset on individual tax returns from 2008 to 2015. When reporting their earnings, tax filers might be confused between two potential thresholds: the true *Tax Collection Threshold (TCT)* and a wrong *Taxation Threshold (TT)*.[3] Although only the first defines the starting point of income taxes while the second has no economic meaning, both are explicitly mentioned by the administration (Figure 8 in Appendix). Focusing on a population able to report its earnings quite freely, I highlight behavioral responses in the form of significant bunching in the taxable income distribution at both thresholds. These "twin peaks" stick to the two thresholds over time.

In order to disentangle responses to incentives at these two thresholds from taxpayers' confusion between them, I build on the tax misperception model of Farhi and Gabaix [2017]. In this model, taxpayers are not fully informed. They perceive a linear combination of the two tax schedules giving rise to the two potential thresholds, weighted by their attention to the true income tax system. Their budget set is piecewise linear with

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[1]In the *Second maxim on taxes* of his 1776 treaty on the <u>Wealth of Nations</u>, Adam Smith emphasizes that "The tax which each individual is bound to pay ought to be certain, and not arbitrary." (V, II).

[2]Therefore, in 2016, 57.3% of tax households were exempted from income taxes (Annuaire statistique de la Direction générale des Finances publiques). For single taxpayers, the threshold where income tax liabilities start has been kept very close to the full-time minimum wage. "The décote" was introduced by the 1982 Finance Law [...]. It was a substitute for an allowance system aimed at exempting from income taxes minimum wage earners with one tax unit." (Examen de la première partie du PLF 2016, Assemblée Nationale).

[3]*Seuil de mise en recouvrement* et *Seuil d'imposition* in French.

a kink at the wrong TT followed by a notch at the TCT and its slope depends on the attention parameter. Depending on the shape of their preferences, tax filers will locate at either one of the two thresholds. Overall, aggregation of individual behaviors gives rise to the twin peaks bunching.

Optimizing taxpayers display strong earnings responses to incentives, as reflected by the high elasticity of taxable income with respect to the *perceived* marginal tax rate, close to 0.7. However, they are confused by the two potential thresholds and believe that the TCT has only 75% chances to be the true point where tax liabilities start. These parameters are quite constant between 2008 and 2015. Attention to taxes is slowly increasing over time, which seems consistent with a learning process. Using the same method as Kleven and Waseem [2013], I further estimate that 80% of the sample experience optimization frictions, which are mostly informational since they face no real labor supply related frictions to adjust their income.

A competing explanation for the twin peaks bunching would be that some taxpayers perfectly understand the true tax schedule while the others always mistake the wrong TT for the TCT. However, behavioral responses to the 2012 reform of the "décote" lead to reject this hypothesis. This reform did not change the true tax schedule, but virtually raised the wrong TT from the first to the second tax bracket, which resulted in a higher perceived marginal tax rate at this threshold. Taxpayers did respond to this virtual incentive through higher bunching at the wrong TT and lower at the true TCT. Total bunching is stable over time and the higher marginal tax rate at the wrong TT only triggered a reallocation of taxpayers between the two peaks. I show that these empirical considerations validate the misperception model and discard some alternative theoretical explanations.

Finally, I use this framework to assess the efficiency of online tax reporting. Compared to people reporting taxes in hard copy, Internet tax filers display lower optimization frictions and a better understanding of the true point where tax liabilities start. Internet search skills would be associated to a better access to relevant information about the tax system, reducing the incidence of the income tax complexity on responses to incentives.

This paper contributes to different literatures in behavioral taxation. First, it extends bunching methods, developed by Saez [2010] for kinks and by Kleven and Waseem [2013] for notches, to a framework where a notch directly follows a kink. In particular, I show

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the need to consider a "minimal buncher" at the notch in order to properly identify parameters. This new method can be useful in settings with multiple non-convexities or discontinuities moving over time. For instance, Gelber et al. [2017] estimate adjustment frictions from persistent bunching at a previous kink location. Since the twin peaks are really close to each other, the bunching mass cannot be estimated through classic polynomial approximation. Rather, I rely on the 2012 reform which reduced the gap between the two thresholds in order to implement a difference in bunching strategy. Compared to similar estimations (Brown [2013]; Best et al. [2013]), I further replace the distribution by its counterfactual at the first peak to estimate bunching at the second one.

Second, this paper provides a value for the elasticity with respect to the *perceived* marginal tax rate. Previous bunching analysis estimate an elasticity at a singular position of the distributions and do not consider a potential misperception of the tax schedule. Saez [2010] estimates an elasticity of 1 among self-employed workers at the first kink of the EITC and of 0.2 where income tax liability starts resulting from itemized deductions. Bastani and Selin [2014] find an elasticity of 0.05 among purely self-employed workers at the starting point of Swedish income taxes. In both articles, workers display no behavioral responses. Kleven and Waseem [2013] estimate structural elasticities around 0.12 for self-employed workers and below 0.05 for wage earners at notches in the Pakistani Tax system. The present work also focuses on declarative responses and corrects for optimization frictions, but the estimated elasticity is higher. Indeed, incentives where liabilities start are related to earnings responses at each location in the distribution where tax filers may perceive the starting point of income taxes. Considering bunching at only one location would clearly underestimate earnings responses.

Third, I highlight *inattention* from tax filers optimizing at a wrong income threshold. A growing literature stresses that taxpayers may be confused and under-react to a complex and opaque tax system. Toll rates increased and toll saliency dropped following the introduction of electronic systems (Finkelstein [2009]). Households misperceive tax liabilities and attribute 25% of the child tax credit to an increase in their marginal tax rate (Feldman et al. [2016]). Conversely, making taxes salient can trigger behavioral responses. Including sales taxes in posted prices reduces revenues from these products by 8% (Chetty et al. [2009]).[4] The present paper estimates an attention parameter in

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[4]Chetty et al. [2009] establish a clear distinction between salience and lack of information: the former

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the case of the income tax schedule, but relies on a model of tax misperception adapted from Farhi and Gabaix [2017] and on an original bunching method in order to disentangle responses to incentives from attention to taxes. In this theoretical framework, distortions are caused by perceived marginal tax rate, which are linear combinations of true marginal tax rates, and the relevant structural elasticity is an elasticity of taxable income with respect to the *perceived* marginal tax rate.[5]

Behavioral biases are important parameters to estimate since they may have strong welfare impacts (Chetty et al. [2009], Farhi and Gabaix [2017], Goldin [2015]) but natural experiments are rather scarce. Bunching methods appear as a powerful way to track agents' understanding of the tax system. Chetty et al. [2013] use the local share of bunchers as a proxy for knowledge about the tax code. They show that access to information (tax preparers, networks) is related to improved tax perception and thus to optimization abilities.[6] Workers moving to another firm might learn fiscal rules from this new environment (Bohne and Nimczik [2016]). Peaks at a wrong location in earnings distributions may inversely identify optimization errors (Kosonen and Matikka [2015]). I show here how to use bunching estimates in order to recover an attention parameter developed by the theoretical literature.

Finally, this work takes part in the debate on policies to alleviate tax complexity. A large literature highlights informational interventions as an efficient way to raise the take-up of the EITC (Manoli and Turner [2014], Chetty and Saez [2013], Bhargava and Manoli [2015], Liebman and Luttmer [2015]). Most importantly, knowledge should be persistently manipulated to influence individual behavior on the long run. The introduction of electronic tax filing during the 1990s had a positive impact on participation in the EITC (Kopczuk and Pop-Eleches [2007]). Nowadays, the Internet could be a powerful instrument to spread knowledge about the general tax system. Hoopes et al. [2015] stresses the efficiency of Internet search to gather costly information for tax purpose and find that taxpayers behave according to rational attention. In a last part, I show how the model I estimate may be used to contrast tax filers' attention to taxes depending

matters at the steady-state while the later occurs temporarily after tax changes.

[5]Inattention may be expressed as the ratio of the elasticity of demand with respect to sales taxes over the elasticity of demand with respect to price in Chetty et al. [2009], as the ratio of the compensated elasticity of the labor supply with respect to the marginal retention rate over the compensated elasticity if the agent were rational (without income effects) for Farhi and Gabaix [2017].

[6]"Individuals who live in low-bunching areas may perceive the EITC to be a flat subsidy at a constant rate or a smoothly varying subsidy without kinks in the schedule."

on their access to information, in this case whether they report taxes online or in hard copy.

The rest of the paper is organized as follows. Section 2 sheds light on the main features of the French income tax schedule at the point where tax liabilities start. Section 3 provides informations about the dataset and the sample I focus on. Section 4 develops the model of tax misperception, which is estimated according to the difference in bunching strategy developed in Section 5. Section 6 discusses the results as regards to taxpayers' behavior and rationality.

2   Institutional background

2.1   Main features of the French Income Tax

The timing of income tax collection prevents real behavioral responses, i.e. related to effective labor supply adjustments. Indeed, French income tax parameters are voted by the parliament at the end of income year n and taxpayers report their earnings in the middle of year $n+1$. Consequently, I highlight here mostly declarative responses, which is convenient in order to pinpoint tax filers knowledge of the income tax schedule.

Each person living, working or having his major economic interests in France has to report his taxable income,[7] regardless of his income level. Low-income earners have strong incentives to report their income even if they expect not to pay any taxes, as the income tax return is necessary for many administrative procedures and in order to benefit from social and tax advantages (employment bonus, property/housing/television tax exemptions or tax reliefs,...). Therefore, becoming taxable does not involve any further filing cost.

First part of Table 1 summarizes the baseline parameters of the French income tax schedule and their evolution between 2008 and 2015: lower bound of each tax bracket and corresponding marginal tax rates. In 2008, the French income tax system is made of five brackets with marginal tax rates increasing from 0% to 40%. In 2012, a sixth bracket is created and in 2014, the first tax bracket is suppressed. Except between 2010 and 2012, brackets' bounds are pegged to inflation in order to prevent bracket creep.

Net taxable income is the sum of reported gross earnings (wages, pensions, income

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[7]The only exceptions are: diplomats, members of the International Committee of the Red Cross (CICR) and, before 2014, people whose earnings were below the guaranteed minimum or low-income retired households.

from securities, capital gains, revenue from land, agricultural, industrial and commercial or non-commercial profits)[8], net of tax allowance (10% for itemized professional expenses,...), deductible charges (intra-household transfer, pension plan contributions, social security contributions, special deductions for elderly or disabled persons,...) and previous deficits.[9]

2.2 Who is taxable ?

A taxable household has to pay positive income taxes before tax reductions and tax credits take place. General income taxes $T(z)$ are computed applying the tax brackets of Table 1 to the taxable income z.[10] However, the taxable income level where tax liabilities start does not match the lower bound of the first bracket due to two mechanisms: a tax reduction called *"décote"* and a *tax collection minimum*. Both of these happen before consideration of tax reductions and/or credits.

First, the *"décote"* raises the point of entry in the income tax as well as the marginal tax rate just above. This mechanism is characterized by two parameters, S and r, displayed in Table 1. Taxpayers are exempted from taxes as long as $T(z) \leq rS/(1+r)$ and face a marginal tax rate multiplied by a factor $1 + r$ if $rS/(1+r) < T(z) \leq S$. If $T(z) \geq S$, they are not concerned. For instance, for a single taxpayer in 2013, the marginal tax rate at the low end of the second tax bracket is officially 14% but is in fact equal to 21% due to this "décote" mechanism.[11] As evidenced by Pacifico and Trannoy [2015], this "décote" mechanism creates a new hidden tax bracket breaking the monotonicity of marginal tax rates and is thus part of the complexity and opacity of the French income tax schedule.

Second, income taxes are not collected as long as they are less than the cost $T_0 = 61€$

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[8]Other types of earnings are totally exempted (family benefits, saving account interests,...) or partially exempted (wages of apprentices, students' income from short contracts,...) from income taxes. Employees' social contributions are not taxable.

[9]The French legislation also defines a *reference tax revenue* ("revenu fiscal de référence"), integrating some tax allowances, exempted earnings, deductible charges compared to the taxable income. This notion is used to determine the access to social benefits and tax reductions or exemptions.

[10]This operation is realized according to the family quotient, which I will not develop here since the focus is on single taxpayers.

[11]This "décote" mechanism was created in 1981 in order to exempt from income taxes tax households of 1 or 1.5 units with an income level close to the full-time minimum wage. The aforementioned formula changed over time. The income tax burden accounting for the "décote" was $2T - \frac{S}{2}$ from 1981 to 1999 and in 2014, $\frac{3}{2}T - \frac{S}{2}$ between 2000 and 2013 and $\frac{7}{4}T - \frac{S}{2}$ in 2015. The threshold S is adjusted each year. In 2012, it was raised so as to offset the impact of the bracket creep leading many households to pay taxes. Some years, S also depends on the structure of the household. Tax Code, Article 197, I, 4.

Table 1: French income tax parameters to compute the TT and the TCT

	2008	2009	2010/11[a]	2012[b]	2013	2014[c]	2015
Bracket MTR			*Lower bound of tax brackets*				
5.5[c]	5,852	5,875	5,963	5,963	6,011	-	-
14	11,673	11,720	11,896	11,896	11,991	9,690	9,700
30	25,926	26,030	26,420	26,420	26,631	26,764	26,791
40/41[a]	69,505	69,783	70,830	70,830	71,397	71,764	71,826
45[b]	-	-	-	150,000	151,200	151,956	152,108
"Décote"[c]							
S	862	866	878	960	1016	1135/1870	1165/1920
r	0.5	0.5	0.5	0.5	0.5	1	0.75
Thresholds			*Starting point of the income tax (single taxpayer)*				
TT	11,088	11,136	11,300	11,791	12,067	13,744	14,704
TCT	11,729	11,776	11,946	12,141	12,353	13,958	14,461

Note: This table displays the parameters required to compute the taxable income level where income tax liabilities start as well as the resulting TT and TCT for a single taxpayer. Columns refer to income years. a : Tax parameters remain unchanged in 2010 and 2011 and the last bracket marginal tax rate is raised from 40 to 41% from 2010 on. b : In 2012, a 45% tax bracket is created. c : In 2014, the lower tax bracket is suppressed. The "décote" parameter S is equal to 1135 € for single taxpayers and to 1870 € for couples. Art. 197 CGI.

for the administration to collect taxes. This further increases the point of entry in the tax schedule and gives rise to a locally infinite marginal tax rate.[12]

Given taxable income z and general income taxes $T(z)$, final income taxes $T^*(z)$ have the following expression:

$$T^*(z) = \begin{cases} 0, & T(z) \leq \frac{rS+T_0}{1+r} \\ (1+r)T(z) - rS, & \frac{rS+T_0}{1+r} < T(z) \leq S \\ T(z), & T(z) \geq S \end{cases} \quad (1)$$

The left panel of Figure 1 depicts income tax revenue as a function of taxable income for a single taxpayer in 2010 and 2011. The dashed line shows the theoretical income tax schedule, the dotted blue line takes into account the *"décote"* mechanism, while the plain line further includes the *tax collection minimum*. The point of entry in the income tax, theoretically at the lower bound of the first bracket, is successively raised by the two mechanisms. In line with the French administration, I define the income

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[12]The final amount of taxes is obtained subtracting tax reductions and tax credits, but this will not be the focus of this paper. Tax deductions cannot lead to positive transfers to households while tax credit can. Main activities leading to tax reductions are charitable givings, employment of a salaried worker by a private individual, investment in small businesses, rental investment, home care services,...while tax credits concern students' loans interests, union dues, expenses for the environmental quality of the main dwelling,...Taxpayers benefiting from tax reductions also face the 61€ minimum after these reductions have been subtracted from their taxes, whereas for tax credits the tax collection minimum is 12€.

level where tax liabilities start as: *(i)* the **taxation threshold (TT)** taking only the "décote" into account and *(ii)* the **tax collection threshold (TCT)** when considering both mechanisms. Table 1 shows that, for a single taxpayer in 2010 and 2011, the lower bound of the first tax bracket is 5,963€, the TT is 11,300€ and the TCT 11,946€. The TCT is $z_n = T^{-1}\left(\frac{rS+T_0}{1+r}\right)$ and a taxpayer ignoring the tax collection minimum will see the TT $z_k = T^{-1}\left(\frac{rS}{1+r}\right)$.

Figure 1: Income tax thresholds (2010 & 2011, one tax unit)
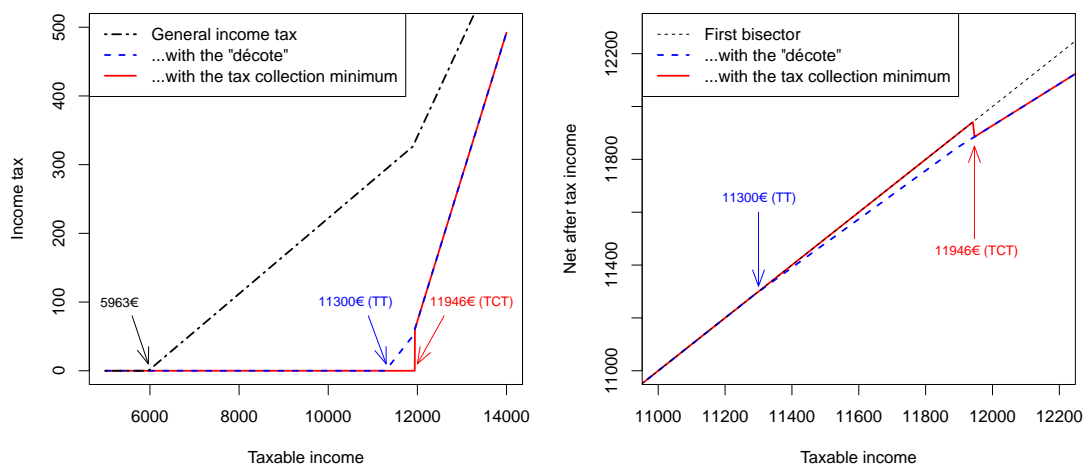
Note: Theoretical tax schedule for a tax filer with one tax unit in 2010 and 2011. The black dotted line shows the first two brackets of the income tax schedule. The dashed blue line displays income taxes once the "décote" mechanism is taken into account. The plain red line represents true income taxes after further accounting for the tax collection minimum.

Further up in the income distribution, the "décote" increases the marginal tax rate and the slope of the tax function is steeper, creating a potentially strong *kink*. The tax collection minimum generates a local drop in net income, characterizing a *notch*. These bunching features are illustrated by the right panel of Figure 1. They locally perturb individual optimization and provide incentives to locate just below in the earnings distribution.

The true point of entry in the income tax is the tax collection threshold. The TCT defines tax exemptions, such that its economic value is grounded in law.[13] However, both

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[13]Tax Code, Article 1657, 1bis. Above this threshold, some specific households loose some tax deductions or exemptions. The tax collection threshold is a condition for unemployment benefits, retirement and invalidity pensions holders to benefit from a lower rate of social contributions (CSG), for retirement

thresholds are salient and a taxpayer may misperceive the TT as the true entry point in the income tax.[14] An explanatory file (*Brochure pratique*) available on the website of the public finances services (DGFIP) and displayed on Figure 8 in Appendix explicitly mention the two thresholds, but does not clearly tell which one really matters.

3 Income tax files

3.1 General presentation

Bunching analysis is conducted using the exhaustive administrative POTE[15] data provided by the French Internal Revenue Service[16] on tax households' income tax reports from 2008 to 2015. Afterwards, the mentioned year always refers to the income year, preceding the reporting year. In 2013, approximately 36.7 million households filed a tax form. These data-sets gather information from the 2042, 2042-C and 2042-C PRO forms. Each citizen fills the 2042 form. Self-employed and non-salaried professions fill the 2042-C PRO form to provide information about their turnover, profits, status (commercial or non-commercial profits, self-employed or not) and potential tax reductions/credits. The 2042-C form mainly concerns households who benefit from tax reductions or tax credits or capital gains earners. These large scale data are particularly well-suited for bunching analysis on the whole population as well as on subgroups and their availability from 2008 to 2015 makes it possible to highlight responses to tax reforms.

Some households characteristics are available: birth date, sex, marital status, date of marriage, of separation, of death, number of children, of dependent persons (as well as their potential specific situations: disability, older age,...). The composition of gross income is very detailed according to the aforementioned categories. Finally, information

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pensions holders to benefit from a tax exemption (CASA) and for taxpayers over 65 to have a contribution deduction (for public services broadcasting). Other social benefits or tax exemptions depend either on a specific level of reference tax revenue (employment bonus, social contribution exemptions, housing and property tax exemptions, tax credits, scholarships, lower nursery and school canteens tariffs,...) or on the net taxable income level (family, housing and minimum social benefits,...). A detailed list of social advantages and tax reductions or exemptions may be found in Lefebvre and Auvigne [2014] (Fiche 1, Annexe 6, p49-51). However, these deductions and exemptions do not impact the current analysis since concerned populations are either excluded from the sample or not able to manipulate this legal structure.

[14]It would in principle also be possible for some taxpayers to misperceive the lower bound of the first tax bracket as the point of entry in the income tax. Empirical analysis of the taxable income distribution proves this hypothesis wrong, which is why I only focus on the taxation threshold and the tax collection threshold. The lack of reference to this threshold in Figure 8 may be a plausible explanation.

[15]*Fichier Permanent des Occurences de Traitement des Emissions.*

[16]*Direction Générale des Finances Publiques (DGFIP).*

about the employment status is collected when relevant, for instance to determine the employment bonus, or regarding the long-term unemployment status (> 1 year), earnings from overtime, full-time or part-time job.

3.2 Intra-family transfers

In an approach similar to Chetty et al. [2013], bunching is used here as a powerful instrument to reveal tax filers knowledge of the income tax schedule they face. Therefore, I focus on recipients of the *maintenance obligation*, who are able to quite freely adjust their reported earnings. Maintenance obligation[17] is an intra-family transfer toward low income relatives (children, parents, grand-parents or step-parents). The donor is allowed to deduct from his taxable income the amount he is giving to the recipient. In principle, every citizen can use this system as long as the recipient: *(i)* reports the exact same amount in his taxable income and *(ii)* is not part of the donor's tax household. In this way, the State subsidizes intra-family insurance through tax allowances. Legislation is quite flexible: this donation is capped only when the recipient is an adult child[18] and is not predetermined (the relevant box of the tax form is never pre-filed). Finally, there is no automatic control by the tax administration that the donation declared by the recipient matches the one reported by the donor and auditing these households is very unlikely to be profitable.

Maintenance obligation differs from alimony. In the latter case, the transfer is often the consequence of a divorce and is decided by a judge, making it hard to manipulate. The first two columns of Table 2 shows a clear over-representation of divorced women with one child among intra-family transfers recipients of two tax units. In contrast, households of one tax unit are mainly young and single, comforting the idea that most of intra-family transfers they earn are carried out under the status of the maintenance obligation. The last three columns of Table 2 detail the composition of this population, depending on the position in the taxable income distribution: around the TT kink,

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[17]*Obligation alimentaire* in French.

[18]In 2013, this cap was equal to 5,732€ or 11,464€, depending on whether the child has family responsibilities or not. Otherwise, the law only mentions that the intra-family transfer should depend on the needs of the recipient and on the resources of the giver. Moreover, parents of 25 year-old students can choose between including their child as a member of their tax household or declaring the maintenance obligation they are paying him. Maintenance obligation transfers are not parts of earnings and are thus not taken into account to compute the amount of employment bonus *Prime pour l'empoi*. However, they increase the reference tax revenue, which may then exceed an upper bound, making the tax household no eligible for the employment bonus.

Table 2: Recipients of intra-family transfers

| Nbr of tax units | 2 | 1 | 1 | 1 | 1 |
Sample	Full	Full	TT kink	TCT notch	Above TCT
Age	42.2	28.1	25.5	25.7	26.3
Women (%)	94.8	50.7	49.7	48.5	50.3
Single (%)	39.0	91.0	96.2	96.0	93.6
Married (%)	1.4	-	-	-	-
Civil union (%)	0.5	-	-	-	-
Divorced (%)	59.0	8.2	3.6	3.9	6.3
Widowed (%)	0.0	0.8	0.1	0.1	0.0
1 child (%)	71.6	-	-	-	-
Online filers	43.6	45.8	55.5	61.3	56.6
Gross income	23,316	10,141	13,940	14,239	14,414
Net taxable income	20,162	8,685	12,031	12,266	12,450
Wage	17,499	4,630	7,934	7,911	8,286
Intra-family transfers	3,050	4,298	3,710	3,616	3,960
Wage earners (%)	86.9	68.8	93.5	92.8	93.2
Autoentrepreneur (%)	1.1	1.2	0.4	0.3	0.6
RSA complement (%)	13.4	5.6	4.2	5.2	4.0
Unemployment benefits (%)	17.2	20.4	42.0	47.4	39.8
Employment bonus (%)	42.4	24.5	48.2	34.8	55.8
Observations	242,683	416,450	9,819	8,458	4,109

Note: The first two columns provide informations about the average composition of intra-household transfers recipients, restricted to households of either two or one tax units. The following three columns detail the second one for three subgroups: tax filers located around the TT kink (taxable income between 11,917 and 12,142€), around the TCT notch (between 12,153 and 12,353€) or in a 200€ interval just above the TCT notch. Recipients of intra-family transfers, reporting a positive net taxable income, metropolitan France, except retirement pensions holders. Tax files POTE 2013.

around the TCT notch or just above the TCT notch. Agents are younger, more often single and wage earners in the bunching regions. Compared to those just above the TCT notch, tax filers at this threshold declare unemployment benefits more often and are more accustomed to report their taxes online. Appendix B provides more details about recipients of intra-family transfers.

In order to prevent some features from interfering with ETI estimates, I exclude two groups from the population of interest: retirement pensioners, who benefit from specific tax allowances, reductions, credits, especially near the tax collection threshold, and overseas departments, who benefit from another tax allowance.[19]

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[19]Their income taxes are reduced by 30 to 40%. Tax Code, Article 197, I, 3.

3.3 Graphical evidence: Twin Peaks

Bunching at the income level where tax liabilities start is particularly large among maintenance obligation recipients, who can quite freely adjust their reported income. Figure 2 displays taxable income distributions for this population, from 2008 to 2015. Taxable income density is computed by 25€ bins within a [-2000€, 2000€] interval centered around the TCT. Vertical lines show location of the TCT notch, the TT kink, the minimum wage (MW) and the lower bound of the 2nd tax bracket.

In a perfectly progressive income tax system, families would have an interest to always transfer the maximum amount to poor relatives in order to minimize the total tax burden. However, in the presence of a discontinuity at the point of entry in the income tax schedule, intra-household recipients have an interest to adjust their earnings in order not to exceed this threshold. In the present case, households face an incentive to adjust their taxable income in order to locate at the TCT and avoid the notch just above. An aggregation of such behaviors should result in a local bunching in the taxable income distribution.

For every year between 2008 and 2015, Figure 2 displays a large bunching a the TCT, but also at the TT. If the taxation threshold (TT) were a real discontinuity, bunching at this location would be rational since taxpayers would react to a kink in the budget set. Yet, the TT is an illusion and only the TCT has an economic and legal status. The fact that taxpayers nonetheless bunch at the TT indicates that they act rationally but misperceive the tax schedule. More precisely, they are uncertain about which one of the TT or the TCT determines the point were tax liabilities start. Figure 8 in Appendix shows that explanatory files make the true TCT and the wrong TT particularly salient, but at best do not help taxpayers to distinguish between those thresholds, at worst confuse them even more.

These "Twin peaks" materialize a single phenomena - adjustment to the entry in the income tax, in a framework were tax households misperceive the income tax schedule and may thus locate at either of these two potential thresholds. Initially in 2008, these twin peaks are at roughly 650€ from each other. This gap is reduced from 2012 on: a higher S voted during bracket creep raised the location the wrong TT from the 1st to the 2nd tax bracket, which mechanically reduced the gap between the two thresholds. As a consequence, the perceived marginal tax rate at the TT is also bigger, jumping from

Figure 2: Twin Peaks where tax liabilities start
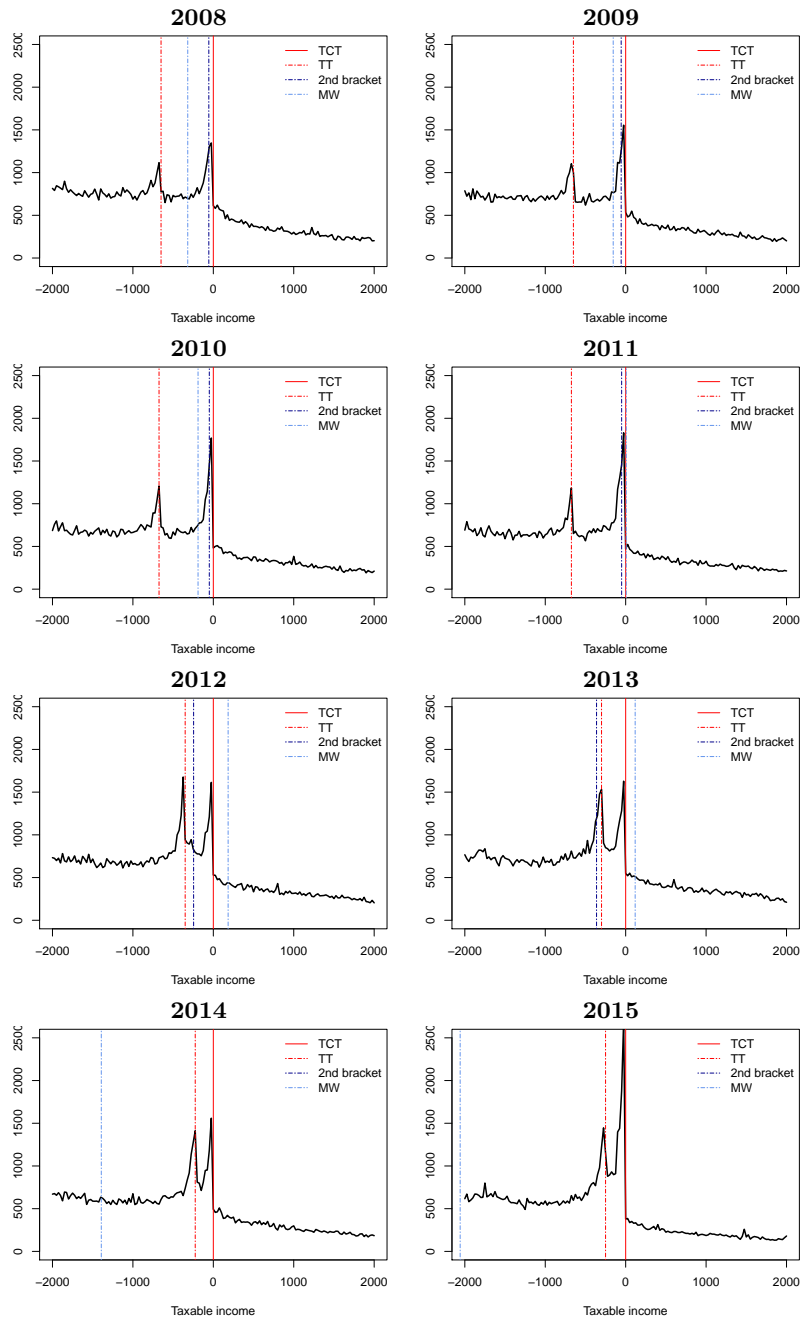
Note: Distributions of taxable income by 25€ bins are centered on the tax collection threshold (TCT). The vertical red dotted line shows the taxation threshold (TT), the dark blue line the minimum wage (MW) and the light blue line the lower bound of the 2nd tax bracket. Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. Tax files POTE 2008-2015.

8.25% in 2011 to 21% in 2012. Bunching at the TT reflects this evolution: from 2012 on, it moves towards the TCT and seems to grow as a result of stronger incentives. I use this displacement for identification in Section 5 and study the change in bunching at the TT in Section 6.

Two small peaks related to round-number bunching appear on the left side of the bunching region.[20] Estimation of the bunching mass could be biased if discontinuities in the tax schedule were located at round numbers, in which case round-number fixed effects should be included in the counterfactual density (Kleven and Waseem [2013]; Kleven [2016]). In the present case, the two thresholds of interest are not round numbers (Table 1) and rounding behavior is far from being generalized (rounding annual and/or monthly earnings at each 50, 100, 500€) thanks to the quality of the administrative data. Thus, the following estimations are carried out excluding these two points.

4   Model of Income Tax Misperception

Motivation.   Bunching at the wrong TT could not be rationalized within a classic taxation model where agents have a full knowledge of the tax system. Building on a growing literature on behavioral public finances (Farhi and Gabaix [2017], Chetty [2015]), I analyze tax filers adjustments within a model of income tax misperception. Taxpayers behavior may be assessed within the "sparse max" framework of Gabaix [2014]: they simplify reality and determine their optimal allocation using that simplified model. Timing of the decision is the following. First, taxpayers choose consumption and taxable income levels maximizing their utility with respect to the perceived representation of their budget set. Second, their real consumption is defined such that agents exhaust their budget constraint considering their perceived reported income and faced with true prices. Since the effective level of consumption is not the concern here, only perceived allocations are presented and I do not discuss taxpayers effective budget constraint.[21] Finally, the reported taxable income depends on the intensity of incentives and on the salience of the features of the tax schedule. Farhi and Gabaix [2017] rely on the "sparse max" to revisit the theory of optimal income taxation when agents misperceive the tax

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[20]Their nominal value is stable over time and the second one can be easily related to taxpayers reporting a monthly income of 1,000€.

[21]Also, Gabaix [2014] considers that agents endogenously determine their attention level. Here, I take it as exogenous and estimate the degree of attention at the taxable income level where tax liabilities start.

schedule.[22]

Behavioral responses at the taxable income level where tax liabilities start might be viewed within this framework. Complexity of the French income tax schedule makes it difficult for tax filers to determine which one of the Taxation Threshold (TT) or the Tax Collection Threshold (TCT) is the true point where tax liabilities start. Figure 8 in Appendix is taken from an explanatory file available on the website of the French Internal Revenue Service. Both thresholds are mentioned on the same page, but it is not clear which one really matters: the wrong TT is referred to as determining the tax-free status and the true TCT as determining tax exemptions. This is confusing, especially since the TCT is the only one to have a real economic and legal status. Taxpayers have an interest to take into account the maximum amount of available information, but computing the true income tax schedule is costly. The misperception model provides a relevant framework to analyze taxpayers behavior. Taxpayers perceive a tax schedule $T^s(z) = \theta T_n(z) + (1 - \theta) T_k(z)$, where $T_n(z)$ refers to the tax schedule giving rise to the TCT, $T_k(z)$ refers to the tax schedule giving rise to the TT, θ is the attention to the true tax schedule and the exponent s designates a perceived variable or function. In Farhi and Gabaix [2017]'s conceptual framework, $T_k(z)$ would be the default perceived tax schedule when ignoring the tax collection minimum and the perceived tax function can be rewritten as $T^s(z) = T_k(z) + \theta (T_n(z) - T_k(z))$. This expression shows that attention θ is allocated to adjust toward the true $T_n(z)$.[23,24]

The misperception model has two convenient features in the present case. First, it makes possible to disentangle responses to incentives, related to the shape of preferences, from misperception of the income tax schedule. Those two effects are respectively captured by the elasticity of taxable income with respect to the perceived marginal tax rate ε and by the attention parameter θ. Second, compared to a classic model of taxation, this framework brings in a "behavioral cross-influence" relating variations in earnings at one position in the income distribution to changes in marginal tax rates at other earnings

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[22]Section 4 p.34 and section 10.2 in Online Appendix.

[23]As explained in Gabaix [2014], "When taking into account some information, agents anchor on the default and do a limited adjustment toward the truth [...] When attention is partial, the perceived price is the default price, plus a fraction of the deviation of current prices from the default price (that fraction is the attention factor)."

[24]This perceived budget set is very close to the concrete example of misperception developed by Farhi and Gabaix [2017] p.89 of their Online Appendix, taking $\alpha = 1$ and specifying the default as the tax schedule ignoring the tax collection minimum.

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levels. I show in Section 6 that such a behavioral response might be evidenced following the 2012 rise in the marginal tax rate at the wrong taxation threshold.

Finally, two other models might be evoked, but would not be well-suited to the specificities of the current framework. First, taxpayers could be divided into two sub-populations, some being fully aware of the tax schedule while the others are totally mistaken. Appendix C discusses the limits of such a model. Second, the level where French income tax liabilities start could be a reference point. However, whereas a reference point should be extremely salient, obvious and stable over time, this threshold is not a round number, neither zero nor the lower bound of the first tax bracket. It depends on quite complex mechanisms and its value changes every year according to political considerations. It does not implies further administrative or hassle costs since filing a tax return is mandatory for every citizen. Taxpayers who achieve accessing informations about its location are expected to be aware of the incentives they are facing.

Setting. Quasi-linear utility $\mathfrak{U}\left(c, \frac{z}{\omega}\right)$ is increasing in the perceived net after-tax income c and decreasing in the cost of effort z/ω, where z stand for total earnings and ω for heterogeneous abilities. Taxable income adjustments through intra-family transfers involve no work efforts, but a hassle cost of filing the tax return (Benzarti [2015]). Faced with a complex tax system, tax filers may find painful to adjust their taxable income (Bhargava and Manoli [2015]). The uncompensated elasticity of substitution referred as ε is interpreted as the elasticity of taxable income with respect to the *perceived marginal tax rate*. Without discontinuity in the tax schedule, the earnings distribution $h_0(z)$ is assumed smooth, the perceived retention rate is equal to the true linear net-of-marginal tax rate $1 - \tau$ and the optimal taxable income is given by $z^* = \omega \left(1 - \tau\right)^{\varepsilon}$.

Introducing a discontinuity where tax liabilities start, taxpayers perceive the aforementioned tax schedule $T^s(z) = \theta T_n(z) + (1-\theta)T_k(z)$. The true tax schedule $T_n(z) = \left[T_0 + \tau_n\left(z - z_n\right)\right] \cdot \mathbb{I}_{[z > z_n]}$ is characterized by the tax collection minimum T_0, the marginal tax rate τ_n and defines a notch at the TCT z_n. The wrong tax schedule $T_k(z) = \tau_k\left(z - z_k\right) \cdot \mathbb{I}_{[z > z_k]}$ depends on the marginal tax rate τ_k and defines a kink at the taxation threshold z_k. Depending on the relative intensity of tax incentives, on attention θ and on their initial position in the earnings distribution, optimizing agents will locate either at the TCT or at the TT.[25] Hence the "Twins Peaks" bunching displayed by

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[25]Of course, a non-negligible share of taxpayers is not optimizing with respect to these thresholds–and

Figure 2. Tax filers face the following program:

$$\max_{c,z} \quad \mathfrak{U}(c, z; \omega) \equiv c - \frac{\omega}{1 + \frac{1}{\varepsilon}} \left(\frac{z}{\omega}\right)^{1 + \frac{1}{\varepsilon}} \tag{2}$$

$$\text{s.t.} \quad c \leq z - T^s(z)$$

The elasticity $\varepsilon = \frac{\partial z}{z} \cdot \frac{1 - T^{s'}(z)}{\partial T^{s'}(z)}$ with respect to the perceived marginal tax rate captures the full range of reactions to the discontinuity and not only those at the tax collection threshold. Indeed, if we were completely ignoring responses at the wrong TT, the apparent elasticity at the TCT would be computed as $\frac{\partial z}{z} \cdot \frac{1 - t_n}{\partial t_n}$, with t_n the implicit marginal tax rate at the notch. In this case, earnings responses would be underestimated. In a similar way as in Chetty et al. [2009], the degree of underreaction to taxes just above the TCT can be defined as the ratio of this apparent elasticity over the structural one (neglecting initial retention rates): $\frac{\partial z}{\partial t_n} \big/ \frac{\partial z}{\partial T^{s'}(z)} = \frac{\partial T^{s'}(z)}{\partial t_n} = \theta$.[26] The degree of attention θ measures by how much responses to incentives are dampened by misperceptions. If $\theta = 1$, households optimize under full knowledge of the tax schedule and the two elasticities are equal.[27]

Bunching at the TT kink is close to the baseline case developed by Saez [2010]. The marginal buncher at the kink is characterized by an ability level ω_k^* such that, before the introduction of the discontinuity, $z_k + \Delta z_k = \omega_k^*$ and after:

$$\left(\frac{z_k}{\omega_k^*}\right)^{\frac{1}{\varepsilon}} = 1 - (1 - \theta)\,\tau_k \tag{3}$$

providing a first equation to estimate structural parameters : $\frac{z_k}{z_k + \Delta z_k} = \left[1 - (1 - \theta)\,\tau_k\right]^\varepsilon$. If $\theta = 1$, nobody believes in the TT kink and there are no earning responses ($\Delta z_k = 0$), whereas if $\theta = 0$, everybody believes in this threshold and we are back to the classic framework. Earnings responses Δz_k can be recovered from bunching estimates:

$$B_k = \int_{z_k}^{z_k + \Delta z_k} (1 - \alpha(z))\, h_0(z)\, \mathrm{d}z \approx (1 - \alpha^*) h_0(z_k) \Delta z_k \tag{4}$$

most probably not optimizing at all. They do not adjust their taxable income and report z^*. Introducing a second parameter of attention would be inappropriate, since they would always be characterized by this parameter being equal to zero. Rather, I follow the path of Kleven and Waseem [2013] and consider these taxpayers facing optimization frictions as a specific population whose share is given by the parameter α mentioned below. Then, elasticity and attention parameters are estimated on optimizers.

[26] For the full-range elasticity, the implicit marginal tax rate at the notch is given by $\left[T^s(z_n + \Delta z_n) - T^s(z_n)\right] \big/ \Delta z_n = \theta\left[\tau_n + \frac{T_0}{\Delta z_n}\right] + (1 - \theta)\tau_k = \theta t_n + (1 - \theta)\tau_k$.

[27] In a symmetric way, the degree of underreaction to the wrong TT kink can be defined as: $\partial T^{s'}(z)\big/\partial\tau_k = 1 - \theta$ and relates the estimated elasticity to the apparent elasticity at the kink. This ratio is less interesting since attention is defined with respect to the true tax schedule.

where the parameter α^* is assumed locally constant between z^k and z^n. It refers to the size of optimization frictions, defined by Kleven and Waseem [2013] as the local share of taxpayers who are not optimizing their taxable income even if they would have a financial interest to do so. It is identified through the share of the population located in a dominated area just above the notch (compared to the counterfactual density h_0). Indeed, in a rational setting, even with partial inattention, no one would have an interest to report a taxable income just above the TCT, since net income is lower there than at the TCT.

Main difference with baseline bunching models is the existence of a *minimal buncher* at the notch, resulting from the sequence of discontinuities in the tax schedule. This minimal buncher, characterized by an ability level ω_n^{min}, is defined among people bunching at the notch as the taxpayer with the lowest taxable income in the absence of discontinuity: $\omega_n^{min} = z_n + \delta z_n$ such that $\left(\frac{z_n}{\omega_n^{min}}\right)^{\frac{1}{\varepsilon}} = 1 - (1 - \theta)\,\tau_k$. Then we have:

$$\delta z_n = \frac{z_n}{z_k}\Delta z_k \tag{5}$$

showing that the minimal buncher is always located above the marginal buncher at the kink as long as $z_n > z_k$.

As in Kleven and Waseem [2013], the marginal buncher at the notch has an ability level $\omega_n^* = z_n + \Delta z_n$. The bunching mass at the notch is then given by:

$$B_n = \int_{z_n+\delta z_n}^{z_n+\Delta z_n} (1 - \alpha(z))\,h_0(z)\;\mathrm{d}z \approx (1-\alpha^*)\,h_0(z_n^*)\left(\Delta z_n - \frac{z_n}{z_k}\Delta z_k\right) \tag{6}$$

This expression highlights the need to take into account the minimal buncher, since earnings responses captured by B_n belong to the $[z_n + \delta z_n, z_n + \Delta z_n]$ interval. Such restrictions of the interval of earnings responses has already been noticed by Gelber et al. [2017] in the case of two consecutive kinks. Inference about ε and θ is achieved through Kleven and Waseem [2013]'s "bunching-hole" method.

The marginal buncher $\omega_n^* = z_n + \Delta z_n$ is indifferent between bunching at the notch z_n and getting utility:

$$\mathfrak{U}_n = z_n - (1 - \theta)\,\tau_k\,[z_n - z_k] - \frac{z_n + \Delta z_n}{1 + \frac{1}{\varepsilon}}\left(\frac{z_n}{z_n + \Delta z_n}\right)^{1+\frac{1}{\varepsilon}}$$

or locating at an interior point z_I further up in the earnings distribution, on the new budget constraint, in which case he gets utility:

$$\mathfrak{U}_I = z_I - ((1 - \theta)\,\tau_k + \theta\tau_n)\,(z_I - z_n) - (1 - \theta)\,\tau_k\,(z_n - z_k) - \theta T_0 - \frac{z_n + \Delta z_n}{1 + \frac{1}{\varepsilon}}\left(\frac{z_I}{z_n + \Delta z_n}\right)^{1+\frac{1}{\varepsilon}}$$

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and the first-order condition of his maximization program is:

$$\frac{z_I}{z_n + \Delta z_n} = (1 - (1-\theta)\tau_k - \theta\tau_n)^\varepsilon$$

This indifference condition provides a behavioral version of the classic Kleven and Waseem [2013] formula featuring a degree of attention θ:

$$\frac{z_n\left(1 - (1-\theta)\tau_k - \theta\tau_n\right) + \theta T_0}{z_n + \Delta z_n} - \frac{\varepsilon}{1+\varepsilon}\left(\frac{z_n}{z_n + \Delta z_n}\right)^{\frac{1+\varepsilon}{\varepsilon}} - \frac{\left(1 - (1-\theta)\tau_k - \theta\tau_n\right)^{1+\varepsilon}}{1+\varepsilon} = 0 \tag{7}$$

Ultimately, ε and θ may be recovered from Equations (3) and (7), using estimates for earnings responses $\Delta\widetilde{z}_k$ and $\Delta\widetilde{z}_n$, which are in turn computed according to Equations (4) and (6) relying on bunching estimates at each one of the twin peaks. Optimization frictions $\widetilde{\alpha}^*$ are estimated as the ratio of the observed density over the counterfactual one in the dominated region above the TCT notch.

Figure 3: The tax misperception model ($\tau_k < \tau_n$)
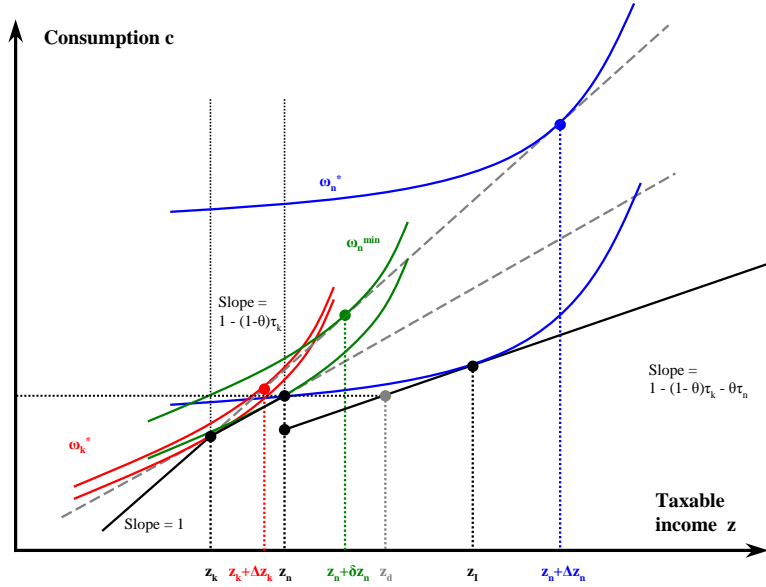
Note: This figure illustrated the conceptual framework for 2008 - 2011. The piecewise-linear budget set is depicted by the black line, with a kink at the TT z_k and a notch at the TCT z_n. The red lines are the indifference curves of the marginal buncher at the TT kink, the blue lines are those of the marginal buncher at the TCT notch and the green lines are those of the minimal buncher at the notch (lower ability agent who is bunching at the notch). z_d is the upper bound of the dominated region.

Panel A of Figure 3 illustrates this identification strategy. The budget set is piecewise linear and displays two discontinuities: a kink at the TT and a notch at the TCT. Due

to taxpayers misperceptions, its shape depends on the attention parameter θ. Tax filers bunching at the kink come in a classical manner from an interval $[z_k, z_k + \Delta z_k]$ and react to a variation in the *perceived* marginal tax rate $(1 - \theta) \tau_k$. As previously stated, tax filers bunching at the notch come from an interval $[z_n + \delta z_n, z_n + \Delta z_n]$ and react to the *perceived* pure notch θT_0 and to the *perceived* marginal tax rate $(1 - \theta) \tau_k + \theta \tau_n$ above.

5 Estimation strategy

Classic bunching estimation through polynomial approximation of the counterfactual density $h_0(z)$ as been developed by Chetty et al. [2011] for kinks and by Kleven and Waseem [2013] for notches. In the present framework, this method is not directly applicable for two reasons. First, the excluded range is wide and the counterfactual density would rely too much on the bounds of the estimation window ($\pm 2000€$ interval around the TCT in the reference estimation). Second, the twin peaks are becoming closer to each other from 2012 on, making it impossible to disentangle bunching at the notch and at the kink through classic estimation methods. However, the accuracy and the very large scale of the income tax return data enable a precise estimation of the taxable income distribution over the 2008 - 2015 period. I show here how bunching masses at each one of the two thresholds may be estimated independently from each other through difference in bunching.

5.1 Difference in bunching at the TT kink

Previous works took advantage of repeated cross-sections in order to estimate a structural elasticity. Brown [2013] estimates an elasticity of retirement age to retirement value using the difference in bunching between a pre- and a post-reform density. To measure businesses evasion responses to taxation, Best et al. [2013] rely on a kink changing location over time, but use polynomial approximation and do not constrain their counterfactual distribution to be constant over time. I use a special version of difference in bunching estimation to deal with at least two consecutive discontinuities in the budget set, whose relative position is impacted by changes in tax policy over time.

Figure 4 provides intuition about this method. Panel a) depicts the 2010 taxable income distribution (solid blue line) and its counterfactual, the 2013 distribution rescaled by the size of the 2010 population within the estimation window (black dotted line).

Figure 4: Difference-in-Bunching

a) 2010 and CF (2013)

b) 2010 and 2011

c) Difference in distributions

d) 2010 adjusted
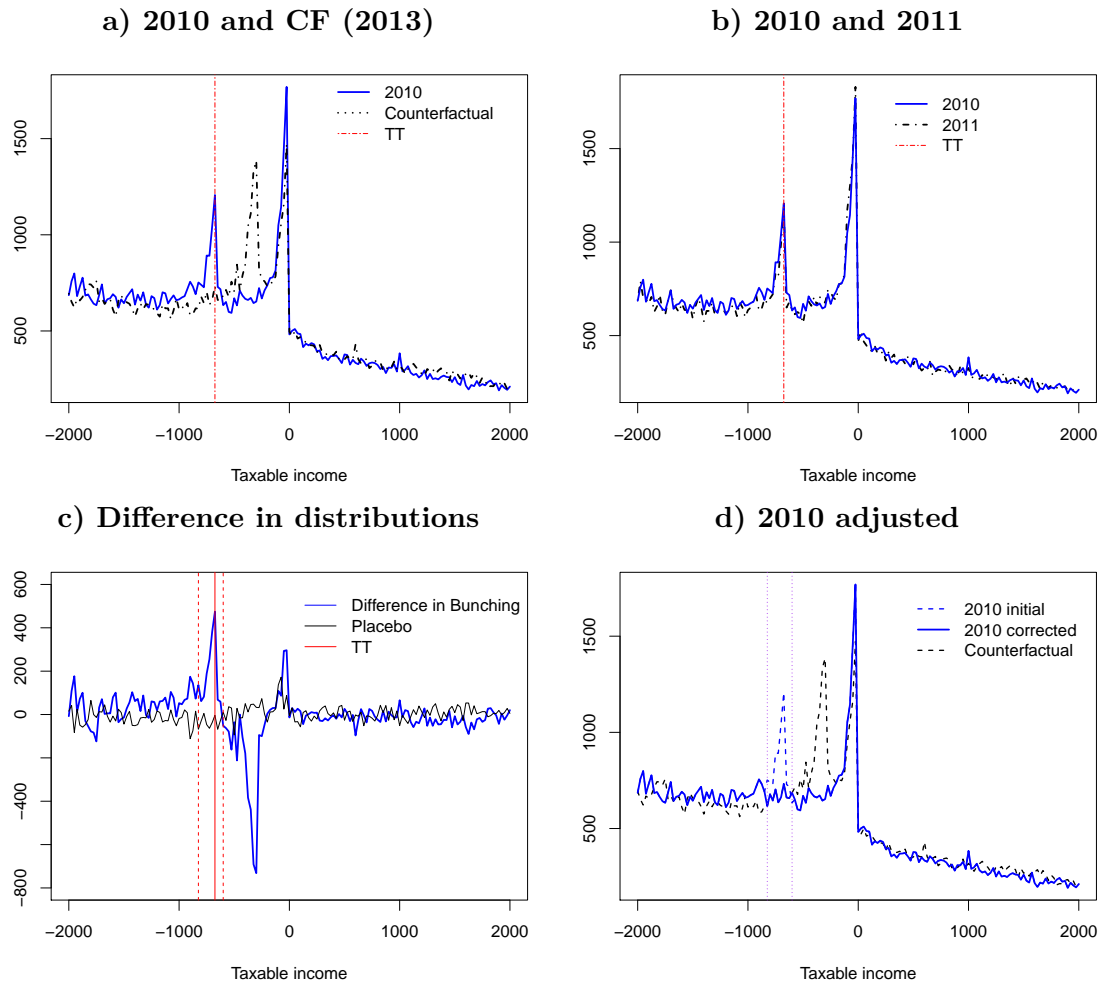
Note: *Panel a)* : the plain line displays the distribution for 2010 and the dotted line its counterfactual, the 2013 distribution rescaled by the size of the 2010 population within the [-2000,2000] interval. *Panel b)* : 2010 and 2011 distributions. *Panel c)* : per bin differences between distributions of panel a) (blue line) and between distributions of panel b) (black line). *Panel d)* : 2010 distributions, locally replaced by its counterfactual within the TT kink region. Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. Tax files POTE 2010-2013.

Both of them are centered around their respective TCTs.[28] Between 2011 and 2012, the increase in the "décote" parameter S is such that the TT jumps from the first to the

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[28]It can easily be shown that rescaling the density used as a counterfactual is the same as estimating a bunching parameter b on densities expressed as percents and as measuring the bunching mass B as the product of the total population the year of interest times the difference (in percentage points) between the two densities expressed in percents.

second tax bracket and mechanically moves closer to the tax collection notch.[29] This narrowing gap between the twin peaks enables the identification of bunching estimates at the TT kink. Furthermore, the 2010 peak at the TT fully disappears in 2013. Tax filers focus on the current absolute value of these thresholds as provided by explanatory files and do not keep track of their previous values.

Information about the counterfactual evolution of this distribution absent any tax parameter change is required for statistical inference. Luckily, income tax parameters remained unchanged in 2010 and 2011, as evidenced by Table 1. Panel b) of Figure 4 shows the quasi-perfect superposition of the 2010 and 2011 distributions. Differences between them are captured by an error term reflecting variability at each bin of the distribution, including in the bunching region, when the tax system remains unchanged. This variability is used to provide standard-errors for the main estimates.

Panel c) of Figure 4 graphically summarizes the estimation principle. The solid blue line is the difference between the 2010 distribution and its counterfactual. The solid black line is the difference between the 2011 and 2010 distributions, representing the placebo evolution of the distribution absent any tax change. Bunching at the 2010 kink is measured as the area between these two differences in distributions within the bunching region around the TT (dotted vertical lines).[30] Statistical inference is obtained through bootstrap, resampling the point estimates of the difference between the 2011 and 2010 distributions.

In a last step, I suppress the kink, replacing locally the 2010 distribution by its counterfactual in the bunching region (Figure 4, Panel d).[31] Bunching estimates at the TCT notch may then be recovered from this adjusted distribution.

This difference-in-bunching approach may bring some interesting features compared to polynomial approximation. Kleven [2016] lists four identifying assumptions on which bunching estimation relies : *(i)* smoothness and *(ii)* shape of the counterfactual distribution, *(iii)* a model specifying structural elasticities and *(iv)* no aggregation bias. The

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[29]The gap between the two thresholds is given by $61/\tau_k$. The virtual marginal tax rate τ_k is equal to 8.25% until 2011 and 21% after, thus this gap is worth 739 € if the 61€ are fully in the first bracket and 290 € if they are totally in the second.

[30]This bunching region is determined visually, as suggested by Kleven [2016] p.450. Estimates are not dependent of the size of the bunching region (Table 9 in Appendix).

[31]Technically, it would be necessary to correct the counterfactual distribution above the kink to take into account intensive responses, as proposed by Chetty et al. [2011]. However, Kleven [2016] (p.451) explain that such a correction may be ignored, especially when distributions are broadly flat.

first two may not be an issue in a difference in bunching estimation, as the counterfactual distribution, characterizing another time period or another group, should capture all the noise that would appear absent the tax discontinuity. Moreover, bootstrapped standard errors are estimated resampling the noise from the whole distribution, including the bunching region.

5.2   Polynomial approximation at the TCT notch

Once the observed distribution of taxable income is corrected from bunching at the TT kink, earnings responses at the tax collection threshold notch (TCT) can be recovered using the "bunching-hole" method of Kleven and Waseem [2013]. The counterfactual distribution $\widetilde{h}_0(z)$ (red line in Figure 5) is estimated through polynomial approximation of the adjusted distribution, excluding a range $[z_L, z_U]$ (vertical dotted lines) around the TCT. Given z_L, the upper bound z_U is defined such that the bunching mass $\widetilde{B}_n$ above the counterfactual distribution on the $[z_L, z_n]$ range is equal to the hole below the counterfactual within $[z_n, z_U]$. To avoid dependence on the height of $\widetilde{h}_0(z)$, an indicator of relative bunching is defined as $\widetilde{b}_n = \widetilde{B}_n \big/ \widetilde{h}_0(z)$.

This estimation is slightly different from classic bunching at a notch. Indeed, bunchers' initial location in the distribution h_0 depends on their degree of attention to the effective tax schedule. The "convergence" method may be misleading since it would estimate earning responses of taxpayers with low attention, whereas the "bunching hole" method correctly identifies the average earnings response at the TCT notch. Moreover, Kleven and Waseem [2013] shed light on a dominated region $[z_n, z_n + \Delta z^D]$ within which taxpayers have no interest to locate, since their net income would be strictly reduced compared to the TCT (Figure 1). Individuals reporting a taxable income in this range anyway would be subject to optimization frictions, and more specifically informational ones since recipients of intra-family transfers face no real adjustment costs. Therefore, the ratio $\alpha \equiv \int_{z_n}^{z_n+\Delta z^D} h(z)\mathrm{d}z \big/ \int_{z_n}^{z_n+\Delta z^D} h_0(z)\mathrm{d}z$ characterizes the share of these informational optimization frictions. Yet, the size of the bunching region Δz^D depends here on the degree of attention. In the reference estimation, I set an arbitrarily large value for the dominated region in order to minimize optimization frictions and I show in Table 9 that the main parameters do not change drastically with this value.

Finally, estimates for $\Delta \widetilde{z}_k$ and $\Delta \widetilde{z}_n$ may be recovered from $\widetilde{b}_k, \widetilde{b}_n$ and $\widetilde{\alpha}$ using Equa-

Figure 5: Bunching at the tax collection thresholds (TCT notch)
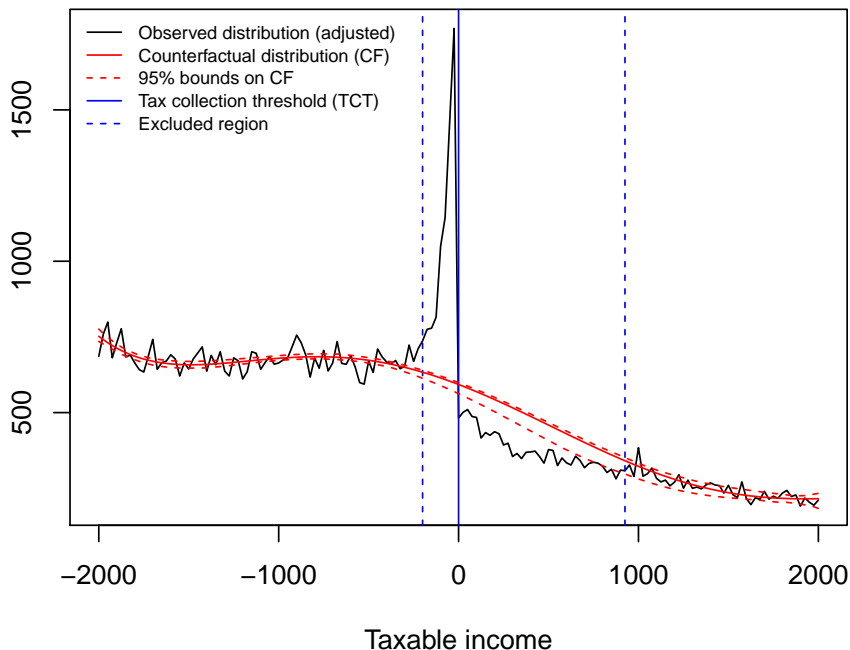
Note: 2010 adjusted taxable income distribution (black line) and its counterfactual density around the TCT notch (red line) with 99% confidence intervals computed from 1000 bootstrap replications (red dotted lines). The vertical plain blue line is the tax collection threshold and the vertical blue dotted lines delimit the bunching window $[z_L, z_U]$. Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. Tax files POTE 2010-2013.

tions (4), (5) and (6).[32]

6 Results

In this section, I first discuss estimation results over the 2008-2015 period. Then, I highlight the consequences of the 2012 rise in the virtual marginal tax rate τ_k at the wrong taxation threshold (TT): taxpayers reacted to this *perceived* incentive, which I argue validates the misperception model. Even through this model is static, it has

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[32]On a more technical note, I estimate bunching at the kink within a 225€ width window and at the notch within a 200€ width interval, meaning that $z_L = -200$ (set visually). The counterfactual density is based on a fifth-order polynomial. I take 25€ bins to insure a very local estimation and benefit from variability in the distribution. α is estimated on the extended interval $[0, z_U/2]$. Regarding the resampling process, I bound the earnings response from below by the dominated region and from above by the earning response of the convergence method, as in Kleven and Waseem [2013]. I also get rid of iteration where $\alpha \geq 1$. Overall, these cases are rare.

powerful predictive capabilities in a dynamic perspective. Finally, contrasting hard-copy versus online tax filers, this model stresses a better understanding of the income tax system by the latter.

6.1 Behavioral responses of less than fully attentive taxpayers

Table 3 presents the number of bunching tax filers $\widetilde{B}_i$, the relative bunching scaled by the height of the counterfactual distribution $\widetilde{b}_i$ and the average earnings response $\Delta \widetilde{z}_i$ corrected for optimization frictions, both at the wrong TT kink and at the true TCT notch ($i \in \{k, n\}$). Every year, bunching is significant at both thresholds. Over the 2008-2011 period, bunching at the notch $\widetilde{b}_n$ is two to three times bigger than bunching at the kink $\widetilde{b}_k$, which is consistent with the bigger peak at the TCT displayed by Figure 2. As a consequence, earnings response are stronger at the notch: the marginal buncher at the notch adjusts his earnings by roughly 815€ to locate at the TCT while the marginal buncher at the kink adjusts his earnings by 225€.

Between 2011 and 2012, the TT jumps from the first to the second tax bracket and the marginal tax rate at this kink consequently rises from $\tau_k = 8.25\%$ to 21%. Perceived by behavioral agents, this rise in the TT peak seems in line with stronger bunching at the kink and wider earnings responses, around 390€. At the notch, bunching is reduced but earnings responses remain constant. In the next subsection, I explore and interpret the reasons for the 2012 change in bunching.

This optimization behavior is not a burden for public finances. The monetary gain for a marginal buncher with earnings responses $\Delta z_n = 1000$€ is equal to 271€. Even if each optimizer had the same earnings response as the marginal buncher and if there were no compensation within the family[33], the global gain resulting from the suppression of the discontinuity would be at most 1 million€.[34]

Structural parameters may be recovered from the optimization decisions of three specific bunchers facing the perceived tax schedule. They are depicted in Panel A of Figure 3: the classic two marginal bunchers at the taxation kink (red) and at the tax

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[33]Legally, the amount reported by the donor should be equal to the amount declared by the recipient. If the later reports a bigger amount, the donor will benefit from deductions on a bigger amount, pay less taxes, which has a cost for the government.

[34]In 2013 for instance, 2876 optimizers at the TCT notch would save $61 + 0.21 \times 872$€ and 2789 optimizers at the TT kink would save $61 + 0.21 \times [399 - (12,353 - 12,067)]$€ on their income exceeding the true threshold, which amounts to $938,401$€. Assuming that each additional taxable taxpayer implies a processing cost of 61€, the net gain for public finances would only be $593,000$€.

Table 3: Bunching estimates

Year	TT Kink			TCT Notch		
	$\widetilde{B}_k$	$\widetilde{b}_k$	$\Delta\widetilde{z}_k$	$\widetilde{B}_n$	$\widetilde{b}_n$	$\Delta\widetilde{z}_n$
2008	1223	1.51	253	2830	3.87	918
	[976, 1445]	[1.21, 1.78]	[225, 523]	[2670, 3065]	[3.63, 4.32]	[817, 2066]
2009	1383	1.79	213	3047	4.37	745
	[1137, 1605]	[1.47, 2.08]	[199, 399]	[2912, 3290]	[4.16, 4.90]	[694, 1517]
2010	1641	2.21	248	3478	5.04	830
	[1392, 1860]	[1.87, 2.50]	[229, 440]	[3320, 3736]	[4.77, 5.60]	[761, 1567]
2011	1285	1.75	184	3774	5.46	770
	[1036, 1504]	[1.41, 2.05]	[169, 324]	[3623, 4088]	[5.20, 6.13]	[699, 1444]
2012	3054	3.81	416	2747	3.79	842
	[2818, 3277]	[3.52, 4.09]	[367, 1407]	[2545, 3091]	[3.49, 4.41]	[736, 3000]
2013	2789	3.22	399	2876	3.75	872
	[2556, 3009]	[2.95, 3.48]	[341, 1287]	[2624, 3269]	[3.40, 4.42]	[743, 2993]
2014	2608	3.52	426	2858	4.41	968
	[2371, 2830]	[3.20, 3.81]	[373, 1295]	[2667, 3167]	[4.08, 5.14]	[839, 3014]
2015	3545	4.97	321	5813	9.06	911
	[3320, 3764]	[4.65, 5.27]	[293, 474]	[5551, 6215]	[8.50, 10.27]	[826, 1478]

Note: $\widetilde{B}_k$ and $\widetilde{B}_n$ refer to total numbers of bunchers at the kink and at the notch respectively. $\widetilde{b}_k$ and $\widetilde{b}_n$ denote relative number of bunchers at the kink and at the notch, scaled by the height of the counterfactual density. $\Delta\widetilde{z}_k$ and $\Delta\widetilde{z}_n$ are earnings responses at the kink and at the notch in euros. 95% confidence intervals computed from 1000 bootstrap iterations are in brackets below estimates. Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. Tax files POTE 2008-2015.

collection notch (blue) as well as the minimal buncher at the tax collection notch (green). α is given by the excess mass in the dominated region above the TCT notch. Using the values of $z_k, \tau_k, z_n, \tau_n, T_0$ as well as estimates $\Delta\widetilde{z}_k$ and $\Delta\widetilde{z}_n$, I can solve for ε and θ in Equations (3) and (7).

Table 4 presents the three main parameters of the model : the elasticity ε with respect to the perceived retention rate, the degree of attention to the true tax schedule θ and informational optimization frictions α. Each year, about 80% of the sample are subject to optimization frictions: they do not adjust their earnings even if they would have an interest to do so. Since recipients of intra-family transfer do not face real barriers to adjust their reported taxable income, these frictions are more likely to be informational.

Among the remaining 20% optimizers, the elasticity of taxable income with respect to the perceived retention rate is around 0.7, significantly positive and varies over time.

Table 4: Structural parameters

Year	ε	θ	α
2008	0.87	0.69	0.85
	[0.80, 1.50]	[0.64, 0.70]	[0.83, 0.93]
2009	0.75	0.70	0.79
	[0.72, 1.22]	[0.65, 0.71]	[0.77, 0.89]
2010	0.80	0.68	0.78
	[0.76, 1.24]	[0.63, 0.69]	[0.76, 0.87]
2011	0.74	0.74	0.76
	[0.70, 1.13]	[0.70, 0.75]	[0.74, 0.86]
2012	0.60	0.73	0.77
	[0.55, 1.05]	[0.62, 0.75]	[0.74, 0.93]
2013	0.61	0.75	0.80
	[0.55, 1.21]	[0.66, 0.77]	[0.76, 0.94]
2014	0.58	0.75	0.79
	[0.53, 1.15]	[0.67, 0.77]	[0.76, 0.93]
2015	0.54	0.81	0.61
	[0.51, 0.74]	[0.79, 0.82]	[0.58, 0.74]

Note: Elasticity ε with respect to the perceived retention rate, attention to taxes θ and optimization frictions α are given by their initial values before resampling residuals. Their are significantly positive at 1%. 95% confidence interval displayed in brackets are computed from 1000 bootstrap iterations. Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. For 2014 and 2015, marginal tax rates are computed assuming $r = 0.5$ in the "décote" formula, reflecting the fact that taxpayers do not perceive this deep parameter, which has been constant since 2000. Tax files POTE 2008-2015.

This value is close to the upper bound of classic bunching estimates of the ETI, which lie within a 0.05 to 1 range depending on the population of interest. Such a high value can be explained by three factors. First, I consider a full-range elasticity with respect to the *perceived* marginal tax rate, taking into account behavioral responses not only at the true TCT but also at the wrong TT.[35] Second, this elasticity is corrected for informational optimization frictions, which inflates earnings responses Δz_k and Δz_n. Third, taxable income is expected to be more elastic for recipients of intra-family transfers compared to other taxpayers since they are able to adjust the amount they report. From 2008 to 2011, the ETI is above 0.75 and drops to 0.6 in 2012, consistently with the rise in the perceived marginal tax rate τ_k at the TT kink. I will come back to this point in the next section.

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[35]For instance in 2010, the apparent elasticity ignoring responses outside the TCT region would be equal to $\theta\varepsilon = 0.54$ instead of $\varepsilon = 0.8$.

The attention parameter θ is significantly positive and equal to 0.75: optimizing taxpayers assign on average a degree of attention of 75% to the effective tax schedule and to the tax collection threshold (TCT), but still take into account the wrong taxation threshold (TT) when reporting their taxable income. They are not fully-attentive. Moreover, perception of the true income tax schedule is slowly but significantly increasing over time, from 69% in 2008 to 81% in 2015, which seems consistent with a process of aggregate learning.

Appendix D shows that estimated parameters are robust to alternative values for the size of the bunching region, the estimation window, the order of the polynomial, the choice of the counterfactual density and the size of the dominated region.

6.2 Cross-behavioral influence in a dynamic setting

In 2012, a rise in the "décote" parameter S was voted in order to compensate for the bracket creep of 2010 - 2012. Consequently, the wrong taxation threshold (TT) mechanically increased from the first tax bracket to the second one and the corresponding marginal tax rate τ_k rose from 8.25% to 21%. In a classic taxation model with fully-attentive taxpayers, this change should not have impacted the reported taxable income since agents only care about the true marginal tax rate τ_n and the tax collection minimum T_0. Consequently, the distribution of taxable income should remain unchanged.

Yet, Table 3 shows a significant rise bunching at the kink B_k and a significant drop in bunching at the notch B_n between 2011 and 2012, which is consistent with a bigger peak at the TT and a smaller one at the TCT (Figure 2). In order to confirm this evolution, I look at individual transitions from year to year between four locations in the taxable income distribution: around the TT kink, around the TCT notch, below the TT kink and above the TCT notch. Panel A of Figure 6 depicts the number of taxpayers moving toward the wrong taxation kink among the population of interest. These transitions are quite constant over time, but increase in 2012, specifically for taxpayers initially located at the TCT notch in 2011. Panel B displays similar transitions for a group of single taxpayers reporting no family transfers, thus not able to adjust their taxable income. In contrast to optimizing taxpayers, their transitions to the TT kink remain constant between 2011 and 2012.

This empirical evidence illustrates the concept of "behavioral cross-influence" mentioned in Farhi and Gabaix [2017]. Regardless of their taxable income and even when lo-

Figure 6: Transitions toward the TT kink bunching region

Panel A: Recipients of intra-family transfer
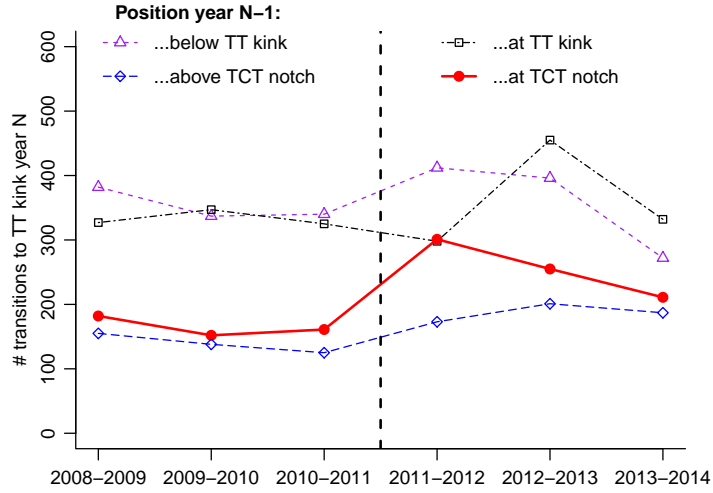
Panel B: Placebo
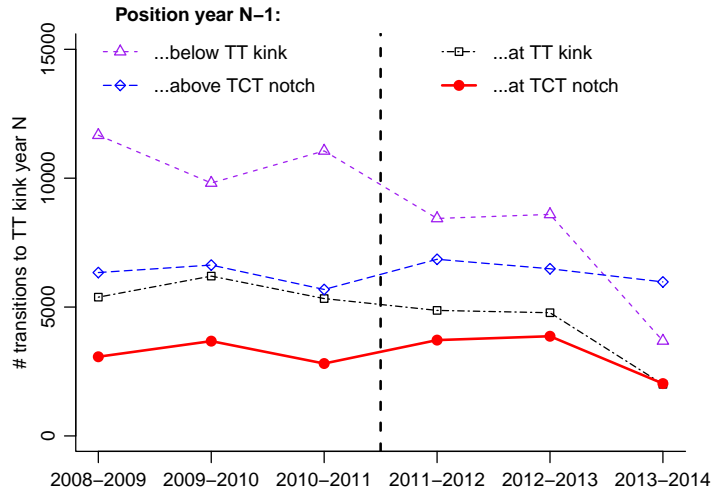
Note: This figure contrasts different groups located in the TT kink bunching region year N depending on their position year N-1: at the TT kink, at the TCT notch, just below the TT kink or just above the TCT notch. The first red circle of Panel A shows that, among households located at the TCT notch in 2008, 200 move to the TT kink in 2009. On the population of interest (Panel A) these transitions to the wrong TT kink are quite constant over time until 2011. Between 2011 and 2012, they are growing, especially for optimizers previously located at the TCT. A placebo test on taxpayers who report no intra-family transfers shows that these transitions remain constant over time (Panel B). Metropolitan France, except retirement pensions holders. Tax files POTE 2008-2014.

cated at the true TCT notch, optimizing taxpayers pay attention to the virtual marginal tax rate τ_k at the wrong TT kink. In 2012, they reacted to a rise in this virtual marginal tax rate, which resulted in a bigger bunching mass at this wrong threshold.

Figure 12 depicts the predicted consequences within the model of misperception. This reform immediately raises the slope of the budget set by $(1-\theta)(\tau_n - \tau_k)$ over the $[z_k, +\infty)$ interval, giving rise to wider earnings responses $\Delta z'_k$ and a bigger bunching B'_k. Mechanically, the lower bound δz_n on earnings responses at the notch and the interior point z_I increase. However, the pure notch θT_0 and the variation in the retention rate at the notch ($\theta \tau_n$) remain unchanged. As the formula for earning responses at the notch is nonlinear, the impact on Δz_n is not straightforward. In any case, changes in incentives are much stronger at the kink compared to the notch.[36] Assuming a locally constant elasticity ε, earnings responses should rise much more at the kink than at the notch. Finally, from Equation 6, the bunching mass at the notch B_n is expected to fall. Table 3 confirms these mechanisms, since between 2011 and 2012, $\Delta \widetilde{z}_n$ increases much less than $\Delta \widetilde{z}_k$ and $\widetilde{B}_n$ drops. The misperception model is able to rationalize the 2011-2012 evolution in bunching at both thresholds.

In addition, model predictions are consistent with behavioral responses to the perceived marginal tax rate at the TT kink. Taking structural parameters for 2011, the taxation threshold for 2012 and $\tau_k = 21\%$ rather than 8.25%, the simulated response at the kink is $\Delta z_k = 500$. This value is clearly above the upper bound of the observed $\Delta \widetilde{z}_k$ for 2009 to 2011, but within its confidence interval for 2012 to 2015 (Table 3).[37] Therefore, even though this misperception model is static and estimated in cross-section, its dynamic predictions match quite well the observed evolution of earnings responses over time.

Besides the internal validation of the misperception model, this dynamic approach is also helpful to discard an alternative model based on two types of workers, some being totally right and other completely wrong. Indeed, in such kind of model, fully-attentive taxpayers should not respond to the variation in τ_k and bunching at the TCT notch should remain unchanged between 2011 and 2012. I discuss this point in more details in

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[36]Changes in incentives are first-order at the kink and second-order at the notch. This may be proven computing, at each threshold, the ratio of the percent change in the retention rate after over before the reform, $\frac{\tau'_1 - \tau'_0}{1 - \tau'_1} \cdot \frac{1 - \tau_1}{\tau_1 - \tau_0}$. We find $\frac{\tau_n}{\tau_k}\left[1 + \frac{(1-\theta)(\tau_n - \tau_k)}{1-(1-\theta)\tau_n}\right]$ at the kink and $1 + \frac{(1-\theta)(\tau_n - \tau_k)}{1-\tau_n}$ at the notch.

[37]Considering structural parameters for 2009 or 2010 leads to even bigger simulated responses.

Appendix C.

In spite of stronger reactions at the wrong TT kink, the structural ETI drops between 2011 and 2012. The reason is a lack of extensive responses. Indeed, total bunching at both peaks is constant over time and stronger bunching at the TT kink mostly comes from reallocation of tax filers between the twin peaks (Figure 6). As noticed by Chetty et al. [2011], it takes time for non-optimizers to react to new incentives.

6.3 Hard-copy vs. online tax reports

In a complex environment, taxpayers search for information in order to optimize their reported earnings. Even maintenance obligation recipients, who are allegedly able to perfectly adjust their reported income, display around 80% informational optimization frictions. Costs of information may be non-negligible. Alleviating these costs could be a way to increase taxpayers' understanding of the income tax system.

Table 5: Structural parameters : Internet vs. Paper

| Year | Internet | | | Hard copy | | |
	ε	θ	α	ε	θ	α
2011	0.80	0.74	0.73	0.65	0.74	0.79
	[0.75, 1.18]	[0.71, 0.75]	[0.70, 0.83]	[0.60, 1.35]	[0.66, 0.75]	[0.77, 0.93]
2012	0.61	0.76	0.73	0.59	0.68	0.83
	[0.57, 1.08]	[0.70, 0.77]	[0.69, 0.88]	[0.51, 1.14]	[0.57, 0.71]	[0.78, 0.94]
2013	0.61	0.79	0.77	0.55	0.70	0.81
	[0.57, 0.98]	[0.75, 0.81]	[0.74, 0.89]	[0.48, 1.11]	[0.59, 0.73]	[0.76, 0.94]
2014	0.56	0.80	0.76	0.55	0.70	0.83
	[0.52, 0.92]	[0.76, 0.81]	[0.73, 0.88]	[0.48, 1.06]	[0.61, 0.73]	[0.79, 0.95]
2015	0.53	0.84	0.58	0.50	0.75	0.71
	[0.50, 0.67]	[0.83, 0.85]	[0.54, 0.68]	[0.45, 1.06]	[0.66, 0.77]	[0.65, 0.91]

Note: Structural parameters are given by their initial values and are significant at 1%. 95% confidence interval displayed in brackets are computed from 1000 bootstrap iterations. Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. Tax files POTE 2011-2015.

The Internet appears as a relevant source of information, increasingly used by households when filing their tax returns (Hoopes et al. [2015]). To assess the link between online tax filing and attention to the income tax, I divide the sample into two groups, depending on whether tax households report their taxes online or in hard copy.[38] Fig-

[38]Online tax reporting was introduced by the decree of March 22, 2002 and encouraged through

Figure 7: Taxable income distribution : hard copy vs. Internet.
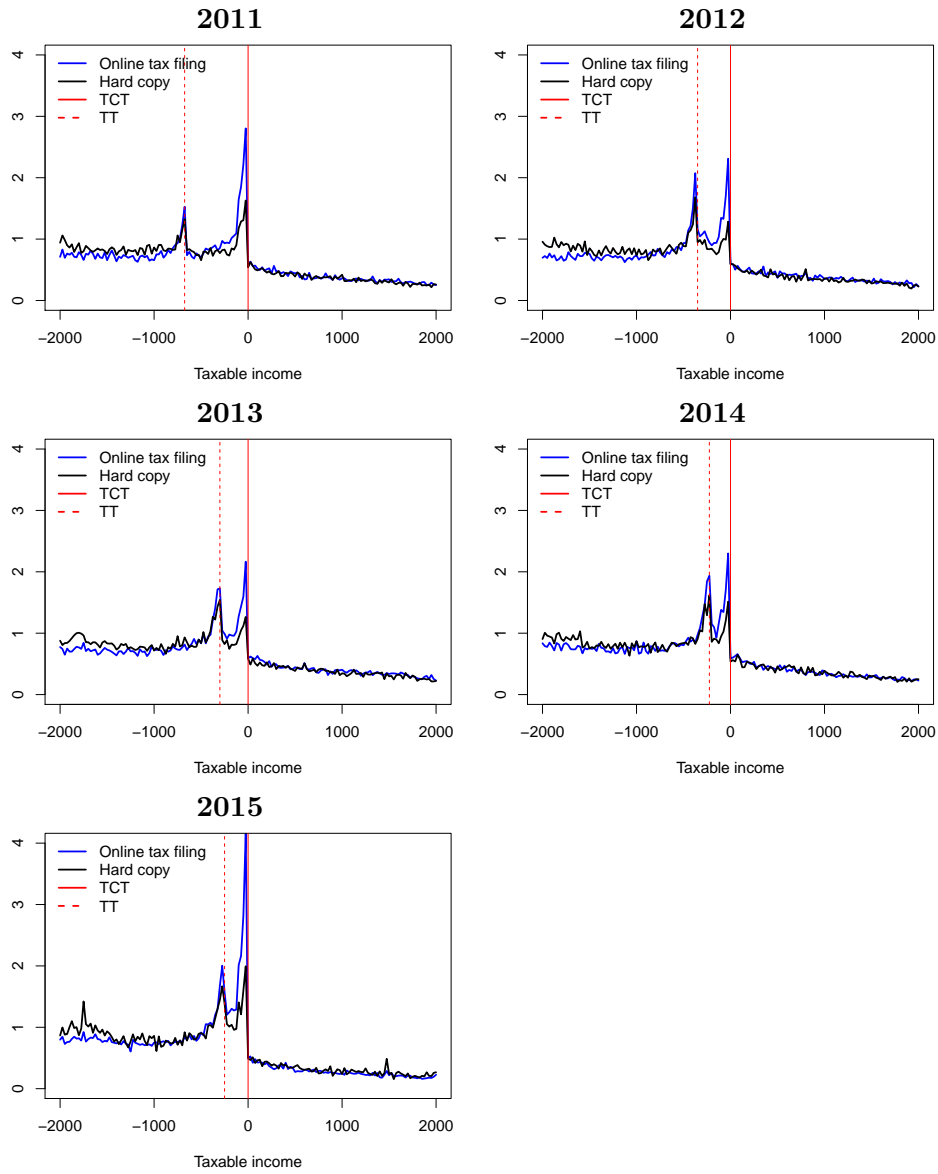
Note: Distributions of taxable income by 25€ bins for online filers (blue line) and hard-copy filers (black line) are centered on the tax collection threshold (TCT). The vertical red dotted line shows the taxation threshold (TT). Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. Tax files POTE 2011 & 2013.

ure 7 shows taxable income distributions in a 2000€ interval around the TCT for these two groups. Two facts are noticeable. First, total bunching at both peaks is bigger for online filers. Second, relative bunching at the true TCT compared to bunching at the wrong TT is also stronger for online filers. Since both groups face the same tax schedule, discrepancies should be driven by differences in attention and in optimization frictions.

In order to test this hypothesis, I estimate the misperception model on both populations. Table 5 displays the resulting parameters from 2011 to 2015. Both groups are characterized by the same elasticity ε, which is consistent with the fact that they have no reason to react differently to similar incentives. Yet, online tax filers face lower optimization frictions α and display a stronger degree of attention θ to the true tax schedule, indicating an overall better access to efficient information about the income tax schedule.

Without implying any causal effect of the Internet use on tax knowledge, this finding confirms the ability of the misperception model to efficiently disentangle responses to incentives from attention to taxes.

7   Conclusion

Analyzing bunching where French income tax liabilities start within a model of tax misperception, I show that even optimizing tax filers do not fully understand the tax schedule. Bunching occurs both at the true starting point of the income tax and at a wrong threshold without economic nor legal meaning. From these twin peaks, I estimate an elasticity of 0.7 with respect to the perceived marginal tax rate and an attention of 75% to the true tax schedule. Evolution of bunching in response to a change in the virtual marginal tax rate at the wrong threshold validates the choice of the model.

Based on a comprehensive fiscal database over the 2008 - 2015 period, this paper brings several contributions to the literature on bunching and behavioral taxation. The classic bunching approach is extended to the case of a budget set where a notch follows a kink and the difference in bunching estimation is adapted to estimate earning responses at both discontinuities. Such a framework is particularly convenient to disentangle responses to incentives from attention to taxes and illustrates the usefulness of bunching methods to estimate behavioral parameters from the field. These parameters

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deadline extensions compared to paper tax reports. The website where tax households report their taxes also provides a simulator of the income tax and explanatory material.

prove in turn useful to contrast knowledge about income taxes from different taxpayers, depending on their use of the Internet.

Finally, this paper emphasizes the importance of transparency for policy design, since complex systems may at best be totally misunderstood, at worst trigger unintended behavioral responses from taxpayers.

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Appendix

A   Ambiguity between the taxation (TT) and tax collection (TCT) thresholds

Figure 8: Extract from the French income tax guide

DÉCOTE

Si votre impôt sur les revenus soumis au barème (y compris l'impôt relatif aux revenus et plus-values imposés selon un système de quotient) est inférieur à **960 €**, vous bénéficiez d'une décote égale à la différence entre 480 € et la moitié de votre impôt.

Cette décote est applicable quel que soit votre nombre de parts. Toutes les réductions d'impôt s'imputent après application éventuelle de la décote.

EXEMPLE

Votre impôt avant décote s'élève à 549 €.
La décote est égale à 480 € – 274,50 € = 205,50 € arrondi à 206 €.
Votre impôt après décote s'élève à 549 € – 206 € = 343 €.

LIMITES D'EXONÉRATION

Vous êtes non imposable (votre impôt est égal à zéro) lorsque votre revenu net imposable³ est inférieur aux limites indiquées dans le tableau 6.

Votre cotisation d'impôt sur le revenu est inférieure à 61 € (seuil de mise en recouvrement) et vous n'avez donc pas d'impôt à payer, si votre revenu net imposable³ (après tous abattements) est inférieur aux limites indiquées dans le tableau 7.

Vous êtes exonéré d'impôt si votre revenu net de frais professionnels n'excède pas 8 610 € ou 9 410 € si vous avez plus de 65 ans ou êtes invalide *(CGI, art. 5-2 bis).*

TABLEAU DE CALCUL DE L'IMPÔT

Le tableau 8 donne le montant de l'impôt brut (avant application du plafonnement des effets du quotient familial).

EXEMPLE

Un couple marié avec deux enfants à charge (3 parts) dispose d'un revenu net imposable de 45 000 €.
– Calculer le revenu par part: 45 000 €/3 = 15 000 €
Cette somme est comprise entre 11 896 € et 26 420 €
– Multiplier le revenu net imposable par le taux correspondant à cette tranche de revenu:
45 000 € × 0, 14 = 6 300 €
– Déduire du résultat 1 339,13 € × 3 = 4 017,39 €
– Impôt brut: 6 300 € – 4 017,39 € = 2 282,61 € arrondi à 2 283 €

Tableau 6. *Seuils d'imposition.*

NOMBRE DE PARTS	1	1,5¹	2	2,5	3	3,5	4	4,5	5	5,5	6
Revenu net imposable	11 791	14 772	17 754	20 735	23 717	26 698	29 680	32 661	35 643	38 624	41 606

1. Pour les contribuables vivant seuls et ayant coché la case E, ce revenu est égal à 12 712 €.

Tableau 7. *Seuils de mise en recouvrement.*

NOMBRE DE PARTS	1	1,5¹	2	2,5	3	3,5	4	4,5	5	5,5	6
Revenu net imposable	12 141	15 500	18 481	21 463	24 444	27 426	30 407	33 389	36 370	39 352	42 333

1. Pour les contribuables vivant seuls et ayant coché la case E, ce revenu est égal à 12 998 €.

Tableau 8. *Calcul de l'impôt.*

Si le revenu net imposable par part R/N¹ est compris entre...	0 et 5 963	5 963 et 11 896	11 896 et 26 420	26 420 et 70 830	70 830 et 150 000	Supérieur à 150 000
... multipliez le revenu net imposable par le taux correspondant	–	R × 0,055	R × 0,14	R × 0,30	R × 0,41	R × 0,45
... et déduisez du résultat	–	327,97 × N	1 339,13 × N	5 566,33 × N	13 357,63 × N	19 357,63 × N

1. revenu net imposable divisé par le nombre de parts.

3. Hors plus-values taxées à un taux forfaitaire.

Note: This page is taken from the 2013 "Brochure pratique", a book detailing the way the income tax return should be filed. The upper-right paragraph "Exemption limits" mentions: *"You are not taxable (your taxes are equal to 0) when your net taxable income is below the limits indicated in Table 6".* (**Taxation Threshold** of 11,791€ for a single tax filer) and *"Your income tax is less than 61€ and you do not have to pay income taxes if your net taxable income is below limits indicated in Table 7."* (**Tax Collection Threshold** of 12,141 euros for a single tax filer).

B   Recipients of intra-family transfers

The bunching analysis rests on the assumption that recipients of intra-family transfers have an incentive to under-report the amount they benefit from in order not to pay income taxes. It is not possible to match empirically donors and recipients of these transfers in order to check whether they report the same amount or not. Nor is it possible to verify that the amount they report is equal to the effective donation.

However, statistics on these reported intra-family transfers would provide a lower bound for truthful behaviors. In 2013, among the 72,074 tax filers of the sample whose taxable income lies in a 2000€ interval around the TCT: 20,953 (22.5%) report intra-family transfers exactly equal to the upper bound for elderly relatives (3,386€ or 3,359€ depending on whether they consider the current or the previous year), 11,299 (12.2%) report transfers equal to the upper bound for an adult child (5,698€) and 12,819 (13.8%) report a multiple of 1000€, which is unlikely to allow them to bunch at one of the two thresholds. Overall, at least 48.5% of these recipients do not seem to consider firstly income taxation when reporting intra-family transfers and 34.7% stick to reference point, reporting the maximum amount allowed. Figure 9 shows the density of these transfers. Strong bunching appears at the maximum amounts of transfers for elderly relatives and adult children.

Figure 9: Distribution of intra-family transfers for taxpayers close to the thresholds
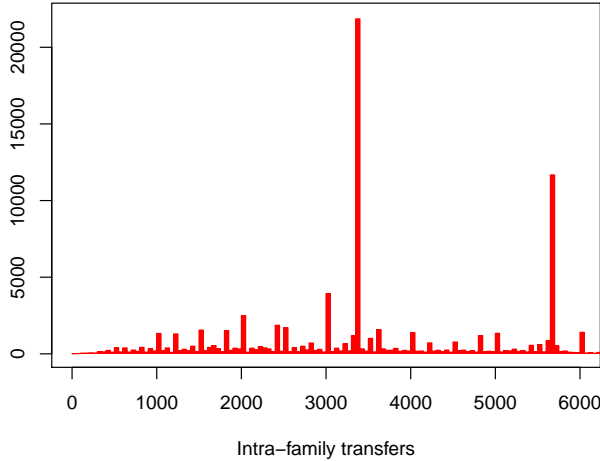
Note: Tax files POTE 2013. Taxpayers with a taxable income within a 2000€ interval around the TCT. Distribution of intra-family transfers by 50€ bins. Bunching appears at round-numbers, as well as at the upper bound for transfers to adult children (5,698€) and to elderly relatives (3,386€). Interestingly, a thorough examination shows that, in the last case, some people report the previous year's amount (3,358€).

However, these taxpayers do not completely ignore the tax collection threshold. Figure B depicts the taxable income distribution of taxpayers reporting a transfer received equal to an upper limit (either for adult children or elderly relatives), pooling data for 2012 to 2014. Around the two thresholds of interest, this density is clearly smoother than the baseline one. Yet, the steeper slope in the region where tax filers start paying taxes indicates a global deformation of this density, resulting from a global bunching mechanism similar to Kosonen and Matikka [2015]. Taxpayers would be more likely to report the maximum amount of transfer if it does not triggers income taxes.

Figure 10: Taxpayers reporting intra-family transfers at reference points
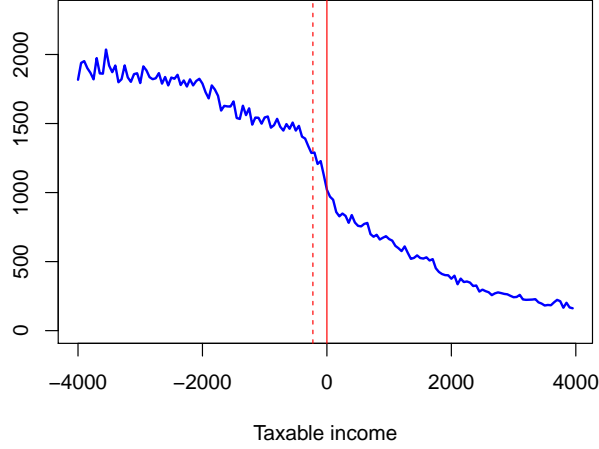
Note: Tax files POTE 2012-2014 (pooled). Taxpayers with a taxable income within a 2000€ interval around the TCT, reporting received intra-family transfers at reference point (maximal amounts of transfers for elderly relatives and adult children) for 2012, 2013 or 2014, meaning in the set: $\{3359, 3386, 5698, 3403, 5726\}$.

Table 6: Robustness excluding "truthful" recipients of family transfers

	B_k	Δz_k	B_n	Δz_n	ε	θ	α
2009	1384	363	2531	1074	0.99	0.61	0.76
	[1168, 1527]	[328, 618]	[2426, 2718]	[941, 1966]	[0.91, 1.52]	[0.58, 0.63]	[0.73, 0.86]
2010	1436	343	2942	1056	0.96	0.63	0.71
	[1237, 1582]	[325, 481]	[2874, 3096]	[997, 1560]	[0.92, 1.26]	[0.61, 0.64]	[0.70, 0.80]
2011	1312	309	3243	1071	0.95	0.66	0.70
	[1114, 1459]	[289, 442]	[3140, 3435]	[993, 1654]	[0.91, 1.28]	[0.64, 0.67]	[0.68, 0.79]
2012	2455	540	2416	1112	0.71	0.71	0.71
	[2227, 2620]	[506, 922]	[2276, 2665]	[1038, 2010]	[0.68, 1.04]	[0.67, 0.72]	[0.70, 0.83]
2013	2469	547	2452	1142	0.71	0.71	0.74
	[2257, 2622]	[504, 1387]	[2310, 2715]	[1051, 2962]	[0.67, 1.23]	[0.63, 0.72]	[0.72, 0.90]
2014	2235	554	2385	1227	0.67	0.73	0.75
	[2029, 2394]	[516, 1053]	[2290, 2567]	[1130, 2497]	[0.63, 1.01]	[0.69, 0.73]	[0.73, 0.87]
2015	2728	368	4969	1087	0.60	0.81	0.52
	[2512, 2881]	[349, 471]	[4831, 5207]	[1021, 1444]	[0.58, 0.73]	[0.80, 0.81]	[0.50, 0.63]

Table 6 shows estimates on a sample excluding tax filers reporting intra-family transfers either equal to the maximum amount allowed or rounded at the nearest 1000 euros. Main parameters are not changing dramatically. The elasticity ε is higher than in the baseline estimation and optimization frictions α are lower, since the sample focuses on a more responsive population.

C   An alternative model with two populations

The tax misperception model developed infra assumes that taxpayers see both the taxation threshold and the tax collection threshold but are not able to determine which one really matters. They face different incentives at these thresholds and choose the optimal level of taxable income maximizing their preferences under a perceived budget set, which takes the form of a linear combination of the two potential tax system. This budget set features a kink at the taxation threshold and a notch at the tax collection threshold. The location of optimizing taxpayers at either one of these two thresholds depends on the relative intensity of incentives there conditional on their salience.

Another model could consider two types of taxpayers: a fraction θ would perfectly understand the effective tax schedule and choose his optimal allocation with respect to the true budget set featuring a notch at the TCT, while a fraction $1 - \theta$ would only perceive the wrong tax schedule and locate at the TT kink. In such a framework, individuals are either completely right or completely wrong about the tax schedule. Gabaix [2014] explains that such an "all-or-nothing" view on attention is a sub-model of the misperception model with a restriction on the attention function. Yet, conclusions are radically different, since there is no more "behavioral cross influence": taxpayers with an income level z should not respond to incentives with respect to the marginal tax rate at another income level $z' \neq z$. As a consequence, the observed distribution of taxable income would be the superposition of the distributions for the two subpopulations.

Table 7: A model with two types of taxpayers

Year	ε	θ	Δz_k	Δz_n
2008	0.77	0.66	734	992
	[0.7, 1.05]	[0.63, 0.67]	[668, 1001]	[846, 1622]
2009	0.66	0.67	638	780
	[0.64, 1.06]	[0.63, 0.68]	[610, 1019]	[722, 1666]
2010	0.71	0.64	687	887
	[0.67, 1.22]	[0.58, 0.65]	[650, 1183]	[806, 2085]
2011	0.67	0.72	648	803
	[0.62, 1.02]	[0.67, 0.72]	[604, 992]	[709, 1599]
2012	0.54	0.72	1510	571
	[0.51, 1.01]	[0.65, 0.74]	[1408, 2817]	[498, 1744]
2013	0.56	0.75	1587	620
	[0.5, 0.95]	[0.56, 0.77]	[1433, 2702]	[506, 1852]
2014	0.53	0.75	1726	711
	[0.49, 1.36]	[0.46, 0.77]	[1583, 4422]	[607, 7591]
2015	0.51	0.82	1734	718
	[0.48, 0.77]	[0.79, 0.82]	[1627, 2611]	[640, 1407]

Note: Parameters estimated from a model with two types of taxpayers. They are significantly positive at 1%. 95% confidence interval displayed in brackets are computed from 1000 bootstrap iterations. Single recipients of intra-family transfers, metropolitan France, except retirement pensions holders. For 2014 and 2015, marginal tax rates are computed assuming $r = 0.5$ in the "décote" formula. Tax files POTE 2008-2015.

Estimation of this model provides very similar values for the elasticity ε and the degree of attention θ, but much different ones for earning responses. In particular, earnings responses at the TT kink Δz_k are 3 to 5 times bigger than in the baseline model and exceed earnings responses

at the TCT notch Δz_n from 2012 to 2015. Table 7 presents the results of this estimation.

This model faces major limits. First, it is very unlikely that taxpayers have knowledge of only one threshold when both of them are mentioned on the same sheet of paper (Figure 8). Second, if tax incentives are stronger at the TCT and if a majority of taxpayers have knowledge of this effective threshold, it is very unlikely for earnings responses at the wrong TT kink to be wider than earnings responses at the TCT notch (Δz_k is 2 times higher than Δz_n from 2012 on according to Table 7). Third, from a dynamic perspective, any change in the marginal tax rate τ_k at the wrong TT kink should leave bunching at the TCT unchanged since there are no behavioral cross-influence (taxpayers at the TCT do not see the TT). Yet, there is a significant drop in total bunching between 2011 and 2012 (Table 3). Fourth, one could object that the rise in τ_k deeply impacted the structure of optimizing taxpayers, increasing the share of those who perceive the wrong tax schedule. However, this estimation does not display a significant drop in attention θ between 2011 and 2012.

In conclusion, such a model featuring taxpayers either fully aware of the tax schedule or being totally mistaken, does not seem well-suited to analyze behavioral responses at the starting point of income taxes.

D Robustness

The difference in bunching estimation relies on many assumptions regarding the estimation window, bunching regions, the dominated region, counterfactual distributions. However, Tables 8 and 9 show that these choices do not alter the estimation results.

Table 8: Robustness on counterfactual distribution at the TT kink

	B_k	Δz_k	B_n	Δz_n	ε	θ	α
2008	1537	331	2873	1012	0.95	0.63	0.85
	[1277, 1761]	[298, 712]	[2732, 3107]	[916, 2294]	[0.88, 1.72]	[0.57, 0.65]	[0.83, 0.93]
2009	1682	273	3094	824	0.82	0.65	0.79
	[1422, 1906]	[253, 402]	[2975, 3273]	[768, 1277]	[0.79, 1.11]	[0.62, 0.66]	[0.77, 0.86]
2010	1858	291	3509	883	0.85	0.64	0.78
	[1614, 2094]	[273, 502]	[3339, 3767]	[823, 1640]	[0.81, 1.31]	[0.60, 0.65]	[0.76, 0.87]
2011	1498	222	3804	818	0.79	0.70	0.76
	[1255, 1734]	[202, 393]	[3603, 4100]	[735, 1561]	[0.74, 1.22]	[0.66, 0.71]	[0.74, 0.86]
2012	3235	470	2813	929	0.63	0.71	0.78
	[2987, 3452]	[420, 899]	[2641, 3047]	[804, 1840]	[0.58, 0.92]	[0.66, 0.73]	[0.75, 0.88]
2013	3096	474	2962	984	0.65	0.73	0.80
	[2854, 3307]	[406, 1580]	[2746, 3301]	[844, 3298]	[0.59, 1.18]	[0.45, 0.74]	[0.77, 0.94]
2014	2922	509	2809	1057	0.60	0.72	0.80
	[2681, 3139]	[468, 1142]	[2618, 3104]	[962, 2591]	[0.57, 1.01]	[0.67, 0.73]	[0.78, 0.91]
2015	3881	371	5803	969	0.56	0.79	0.61
	[3646, 4094]	[343, 513]	[5600, 6235]	[901, 1407]	[0.53, 0.71]	[0.77, 0.80]	[0.58, 0.72]

Note: Tax files POTE 2008-2015. Counterfactual distributions are: 2014 for 2008-2011 and 2009 for 2012-2015 (rather than 2013 and 2011 respectively).

In the difference in bunching procedure, the distribution of taxable income for 2013 is taken as a counterfactual for the for the estimation of bunching at the kink from 2008 to 2011, while the distribution for 2011 is taken as a counterfactual for 2012 to 2015. This choice is arbitrary, but as shown in Table 8, considering respectively the distribution for 2014 and 2009 instead of the 2013's and 2011's ones leaves the results unchanged. Similar conclusions are in order when considering different values for the size of the dominated region Δz^D, the width of the estimation window, the order of the polynomial or the width of the bunching regions at each of the two thresholds (Table 9). The most unstable parameter is the elasticity ε, which is also the parameter the most imprecisely estimated.

Table 9: Robustness checks

	ε	θ	α
Reference	0.791	0.754	0.762
	[0.743, 1.229]	[0.722, 0.763]	[0.738, 0.866]
Size of the dominated region Δz_D			
100	0.895	0.739	0.803
	[0.779, 1.278]	[0.706, 0.757]	[0.758, 0.873]
200	0.826	0.750	0.778
	[0.751, 1.089]	[0.731, 0.762]	[0.746, 0.842]
$z_U/3$	0.803	0.753	0.768
	[0.748, 1.086]	[0.733, 0.763]	[0.742, 0.844]
500	0.792	0.754	0.763
	[0.751, 1.111]	[0.734, 0.763]	[0.742, 0.843]
700	0.795	0.753	0.765
	[0.759, 1.108]	[0.734, 0.762]	[0.748, 0.843]
Width of the estimation window			
± 1800	0.778	0.751	0.758
	[0.727, 1.270]	[0.710, 0.760]	[0.734, 0.873]
± 2200	0.820	0.752	0.767
	[0.765, 1.264]	[0.719, 0.762]	[0.742, 0.867]
± 2500	0.860	0.755	0.776
	[0.798, 1.533]	[0.710, 0.767]	[0.748, 0.896]
Order of polynomial			
4	0.769	0.758	0.752
	[0.713, 1.085]	[0.730, 0.769]	[0.723, 0.843]
6	0.725	0.752	0.742
	[0.688, 1.126]	[0.716, 0.760]	[0.722, 0.853]
7	0.733	0.753	0.746
	[0.689, 1.459]	[0.675, 0.762]	[0.722, 0.909]
Range of bunching regions			
Kink — *Notch*			
$[-75, 75]$ -200	0.757	0.791	0.764
	[0.708, 1.110]	[0.764, 0.798]	[0.741, 0.858]
$[-150, 75]$ -150	0.765	0.748	0.761
	[0.715, 1.211]	[0.711, 0.758]	[0.736, 0.870]
$[-75, 75]$ -150	0.723	0.786	0.759
	[0.681, 1.070]	[0.755, 0.794]	[0.735, 0.859]

Note: Tax file POTE 2011. Reference is estimated with $\Delta z_D = z_U/2$, a window of 2000 with an upper bound of 1700, a bunching region of $[-150, 75]$ for the TT kink and $z_L = -200$ for the TCT notch and a 5th order polynomial. For the width of the estimation window, the upper bound for excluded range is respectively 1600, 1900 and 2200.

E   Figures

Figure 11: Share of online tax filers (in %)
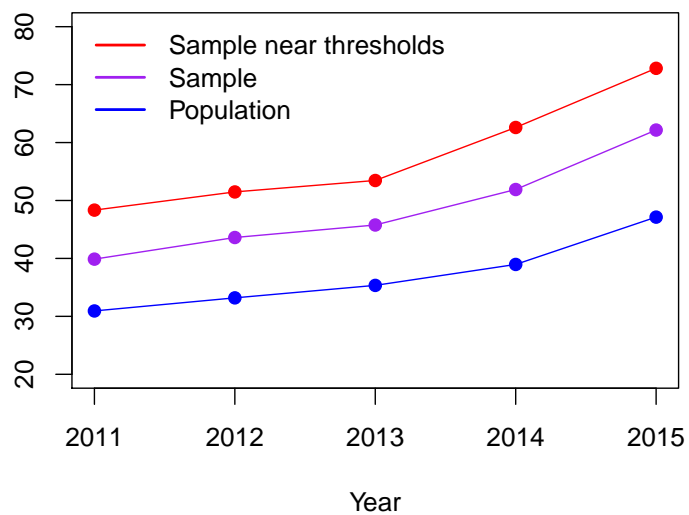
Note: Tax files POTE 2008-2015. The sample is composed by recipients of intra-family transfers. Taxpayers are considered to locate near the two thresholds when their taxable income lies in a 2000€ interval around the TCT. Individuals are recorded as online taxpayers when they are given an ADONIS number.

Figure 12: Misperception of the threshold where tax liabilities start

Panel A: $\tau_k < \tau_n$ **(2008 - 2011)**
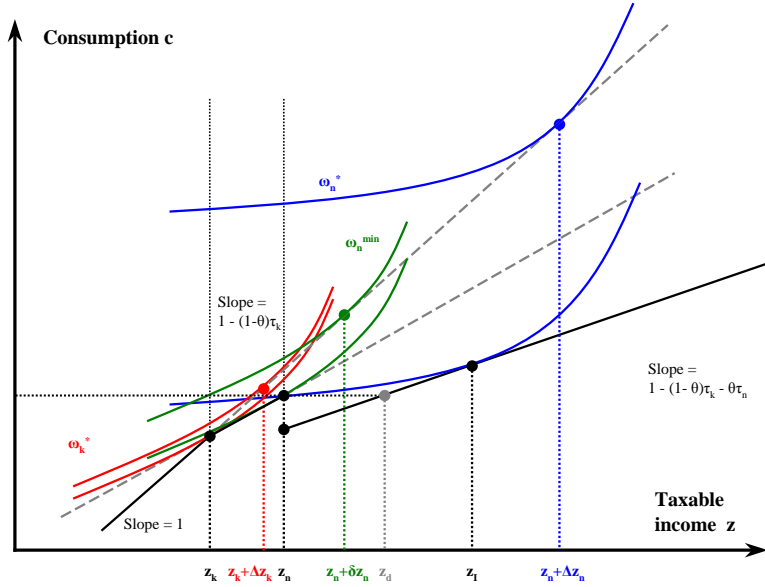
Panel B: $\tau_k = \tau_n$ **(2012 - 2015)**
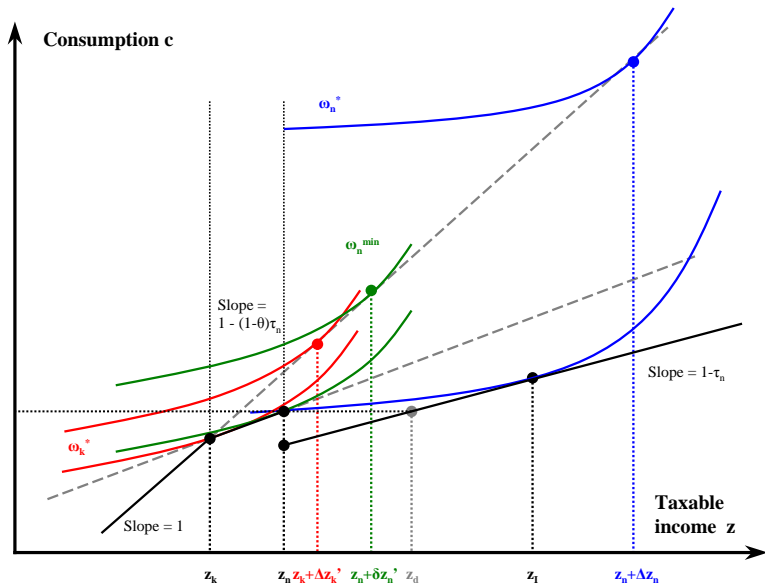
Note: *Panel A* displays the setting for 2008 - 2011 and *Panel B* for 2012 - 2015. The piecewise-linear budget set is depicted by the black line, with a kink at the TT z_k and a notch at the TCT z_n. The red lines are the indifference curves of the marginal buncher at the TT kink, the blue lines are those of the marginal buncher at the TCT notch and the green lines are those of the minimal buncher at the notch (lower ability agent who is bunching at the notch). z_d is the upper bound of the dominated region.

Table 10: Taxation threshold (TT) and Tax collection threshold (TCT)

Units	2009 TT†	2009 TCT†	2010 & 2011 TT	2010 & 2011 TCT†	2012 TT	2012 TCT	2013 TT	2013 TCT	2014 TT Single	2014 TT Couple	2014 TCT Single	2014 TCT Couple
1	11,136	11,776	11,300	11,946	11,791	12,141	12,067	12,353	13,744	-	13,958	-
1.5	14,073	14,800	14,281	15,005	14,772	15,500	15,190	15,917	18,589	-	18,803	-
2	17,011	17,738	17,263	17,987	17,754	18,481	18,195	18,922	23,434	26,063	23,648	26,277
2.5	19,948	20,675	20,244	20,968	20,735	21,463	21,201	21,928	28,279	30,908	28,493	31,122
3	22,886	23,613	23,226	23,950	23,717	24,444	24,206	24,933	33,124	35,753	33,338	35,967
3.5	25,823	26,550	26,207	26,931	26,698	27,426	27,212	27,939	37,969	40,598	38,183	40,812
4	28,761	29,488	29,189	29,913	29,680	30,407	30,217	30,944	42,814	45,443	43,028	45,657
4.5	31,698	32,425	32,170	32,894	32,661	33,389	33,223	33,950	47,659	50,288	47,873	50,502
5	34,636	35,363	35,152	35,876	35,643	36,370	36,228	36,955	52,504	55,133	52,718	55,347
5.5	37,573	38,300	38,133	38,857	38,624	39,352	39,234	39,961	57,349	59,978	57,563	60,192
6	40,511	41,238	41,111	41,839	41,606	42,333	42,239	42,966	62,194	64,823	62,408	65,037

Note : The taxation threshold for 2010-2015 and the tax collection threshold for 2012-2015 are provided by the "Brochure pratique" files. †: values computed from the income tax system parameters (brackets, rates, tax collection minimum and "décote" parameter S) are subject to a small approximation ($\leq 5€$ compared to years where the true thresholds are available). From 2014 on, thresholds depend on the household structure.

Liste des documents de travail de la Direction des Études et Synthèses Économiques