INDIRECT TAXATION IN FRANCE: MEASUREMENT OF BEHAVIOURAL AND REDISTRIBUTIVE EFFECTS USING A NEW MICROSIMULATION MODEL

Nicolas Ruiz and Alain Trannoy

30 October 2006

SUMMARY:

The indirect tax burden on households was over 95 million euros in 2005, some 12.5% of their income. Measuring the redistributive and budgetary impact of any reform of this taxation is thus of prime importance for government decision-makers. Following the 2002 Household Budget Survey and the arrival of the new tool of microsimulation, we describe the current effects of indirect taxation on households and study the impact of three reform measures (creation of a uniform VAT rate, increase in excise duties on alcohol and tobacco and increasing differentials in VAT rates for a neutral budget cost), using a new microsimulation model.

1.   Introduction

1.   Although direct taxation takes up the bulk of public debate, indirect taxes have a significant impact on households, accounting for 12.5% of their income. Potentially, therefore, they are a prime redistributive tool. However, the majority of tax reforms in France in the last ten years have hardly concerned them, if at all. Simultaneously or consecutively, few works in the literature offer an in-depth study of indirect taxation taking into account all of its peculiarities. The recent development of microsimulation as a government decision-making aid has nevertheless led to a few precursor studies in the subject (cf. Baccouche *et al.* [1986], Nichèle *et al.* [1995], and more recently Gardes *et al.* [1999] for studies more specifically focussed on VAT). Given the burden of indirect taxes in France (VAT alone adds 74.4 billion euros to the household tax burden), there seems to be a need for a microsimulation model which can identify all the budgetary and redistributive consequences of a reform of indirect taxes.

2.   The design of a microsimulation model for indirect taxes requires three non exclusive elements: a microeconomic database containing all the socio-demographic and economic characteristics of a representative sample of the population, basing the model tax system of the as closely as possible on the legislation allowing for the constraints imposed by the data (this modelling being initialised for the values of the tax parameters applicable during the observation period) and a theoretical model of people's behaviour. This article presents the construction of such a model, and the results of the three reforms.

3.   The rest of the article is organised as follows. In order to understand the impact of the reform, section 2 describes the current micro-economic impact of indirect taxation on households. Section 3 presents the behavioural core of the model, whereby the microsimulation can be approached by one of two working hypotheses: the first an accounting option, where all the variations in the parameters result in price variations which do not affect choices in household consumption; and the second, more attractive because it is more realistic, goes beyond this hypothesis of no change and considers changes in consumer choices resulting from price changes. For that, we estimate a system of demand which can identify all the price elasticities. Section 4 presents and discusses the results of the three tax reforms. The last section is a summary of conclusions.

2.   The micro-economic impact of indirect taxation

4.   Here, based on the last Household Budget Survey (BDF), we describe the burden of indirect taxation on households and its redistributive effects.

Table 1: Breakdown of calculation of implicit tax rates on spirits

Spirits	
VAT	19.6 %
Consumer duty/ hL pure alcohol	1 450
CNAM (national health insurance levy)/ hL	130
Spirits revenues (M €)	1 872
CNAM revenues (M €)	376
Average alcohol volume	44.64 %
Household BDF expenditure (M €)	2 622
National accounts expenditure (M €)	3 663
Implicit CNAM rate of taxation	**46.14 %**
Unit price of alcohol before tax/ litre	282
Unit price of alcohol before tax / litre	3
Price inc. tax/ litre for a beverage of 44°	13
Implicit rate of taxation sales duty	**229.73 %**
Implicit rate of taxation spirits combined	**275.87 %**

2.1. *The data*

5.   The BDF survey seeks to reconstruct household accounts. It collects all their expenditure, all their non-monetary consumption and their resources, supplemented by information on their socio-demographic characteristics. The collection of expenditure is the main value of the survey. Using classifications that range from 400 to 1000 items depending on the survey year, the nature and corresponding amounts are recorded. The scope of the survey is as broad as possible: all expenditure is covered. In addition to monetary expenditure as such, the survey collects information or consumption not generated by a purchase by the household, chiefly own food consumption and benefits provided by employers.

6.   The census of expenditure is supplemented by that of resources. For a survey of consumption, income essentially serves only as an explanatory variable. Since 1989, however, income has been the main attraction of the survey after expenditure. All forms of resources are recorded in it: taxable income or otherwise, social benefits and exceptional resources.

7.   The data collection for each of the surveys is spread over 12 months (in 8 periods of 6 weeks) in order to eliminate seasonal fluctuations in expenditure. Two collection tools are used:

- a questionnaire to be completed by the interviewer during three visits, the purpose of which is to record the household's socio-demographic characteristics, income and major or recurrent expenditure;
- an expenditure notebook (covering a fortnight) given to all the members of the household over 14 years of age to record daily expenditure and small irregular expenditure.

8.   Each of the expense items is allocated a reference period, then these expenditures are extrapolated for the year depending on the period of the survey.

9.   From this survey, we classified consumption into 71 fiscally consistent items. With the exception of a few items, any product distributed or sold is subject to at least one indirect tax. Measurement of a tax reform must therefore of necessity involve drawing up a classification aligned as closely as possible to the specific provisions of tax legislation.

2.2. *Regressivity of indirect taxes*

10.   In 2001, households paid an average of 3,088 € annually in indirect taxes. VAT accounts for almost three-quarters of that amount, followed by the tax on domestic petroleum products - TIPP (518 €), insurance tax -TCA (157 €), tobacco duty (93 €) and excise duty on alcohol (80 €). The average annual amounts by standard of living decile are shown in table 2.

Table 2: Average annual amounts by standard of living decile (euros)

Decile	Total indirect taxation	VAT	TIPP	Insurance	Alcohol	Tobacco
1	**1 888**	1 308	328	95	54	103
2	**2 197**	1 523	399	113	64	98
3	**2 501**	1 744	449	133	75	99
4	**2 734**	1 912	514	140	77	91
5	**2 930**	2 069	526	150	90	95
6	**3 137**	2 245	555	156	79	102
7	**3 253**	2 335	572	166	87	93
8	**3 745**	2 771	611	186	87	90
9	**3 889**	2 898	619	194	95	82
10	**4 606**	3 588	608	234	96	80
Total	**3 088**	**2 239**	**518**	**157**	**80**	**93**

11.　　The average amount of indirect tax rises in close correlation to standard of living as it does for all the taxes taken separately, with the exception of the taxes on alcohol and tobacco duty, which overall even decline with the rise in standard of living. This decline certainly reflects a higher level of education in households with a higher standard of living than the lower deciles, with a better awareness of the health risks related to addictive items. Overall, the average amount of indirect taxes paid by the highest decile in 2.5 times higher than that of the first decile.

12.　　An analysis of these taxes in relation to household incomes, however, shows the regressive character of indirect taxation. We define here such a ratio, which we will call hereinafter the effort ratio t_{jk} of the standard of living decile k for a given indirect tax j, as:

$$t_{jk} = \frac{\sum_{h=1}^{H_k} T_{jkh}}{\sum_{h=1}^{H_k} Rkh} , \ \forall k = 1,...,10$$

where T_{jkh} designates the amount of tax j paid by household h of decile k comprising H_k households, and R_{kh} is the gross disposable income of that household.

13.　　We consider here an aggregate definition rather than an average effort ratio (we calculate the ratio of two aggregate amounts and not the average effort ratios for each of the deciles). The definition adopted here allows correction for the non-representativeness bias resulting from the sometimes large number of zeros in the survey, which gives rise to nil tax amounts.

14.　　In order to have a common key for all the taxes studies in this article, it is useful to work with the whole population and not the population of actual consumers (as VAT concerns the whole population) and thus to use the aggregate definition of effort ratios.

15.　　Table 3 shows effort ratios by standard of living decile for all the parameters of indirect taxation. For each of the taxes and indirect taxation as a whole, the effort ratios decline with standard of living. As a comparison, the profile of the effort ratio for total indirect taxation is essentially the same (as are the similar values by decile) to Bourguignon's [1998] based on the 1995 BDF survey. As an illustration, table 4 shows effort ratios by age group of the head of household.

Table 3: Effort ratios for all indirect taxes by standard of living decile

Decile	Total indirect taxation	VAT	TIPP	Insurance	Alcohol	Tobacco
1	**16.63 %**	11.52 %	2.89 %	0.84 %	0.47 %	0.91 %
2	**14.06 %**	9.75 %	2.55 %	0.72 %	0.41 %	0.62 %
3	**13.44 %**	9.38 %	2.42 %	0.72 %	0.40 %	0.53 %
4	**13.29 %**	9.30 %	2.50 %	0.68 %	0.37 %	0.44 %
5	**13.05 %**	9.22 %	2.34 %	0.67 %	0.40 %	0.42 %
6	**12.32 %**	8.82 %	2.18 %	0.61 %	0.31 %	0.40 %
7	**11.54 %**	8.29 %	2.03 %	0.59 %	0.31 %	0.33 %
8	**11.31 %**	8.37 %	1.85 %	0.56 %	0.26 %	0.27 %
9	**9.92 %**	7.40 %	1.58 %	0.50 %	0.24 %	0.21 %
10	**7.60 %**	5.92 %	1.00 %	0.39 %	0.16 %	0.13 %
Ensemble	**12.32 %**	**8.79 %**	**2.13 %**	**0.63 %**	**0.33 %**	**0.43 %**

Table 4: effort ratios for the various taxes by age group of the head of household

	17 to 40 years	40 to 60 years	Over 60 years
Total indirect taxation, of which :	**13.48 %**	**11.84 %**	**9.62 %**
Insurance	0.57 %	0.54 %	0.62 %
VAT	9.34 %	8.16 %	6.83 %
Tobacco	0.63 %	0.42 %	0.14 %
Alcohol	0.29 %	0.35 %	0.42 %
Petrol	2.65 %	2.37 %	1.61 %

16.   The fiscal pressure exerted by indirect taxation appears regressive when it is related to income, with an effort ratio for the first decile 9 points higher than for the last. As saving is a rising function of standard of living, income in the lower deciles is allocated exclusively to consumption. The fiscal pressure of indirect taxation is thus strong for low incomes and weak at the top of the distribution. By neutralising the effects of savings on the analysis, effort ratios should be calculated in relation to expenditure, the indirect tax base, which would involved determining the apparent tax rates. For VAT, table 5 presents the values of these rates by standard of living

Table 5 : Apparent VAT tax rates

Standard of living deciles	Apparent VAT rate
1	10.5 %
2	10.6 %
3	10.8 %
4	11.0 %
5	11.2 %
6	11.3 %
7	11.3 %
8	11.6 %
9	11.5 %
10	11.6 %

17.   However, taking income as the denominator of the effort ratios instead of expenditure is essential for two reasons. The first is that fiscal pressure, whether from direct or indirect taxation, must be measured with regard to household resources. But their total expenditure is only an incomplete view, unlike income. Moreover, as saving is intended to be consumed later, it is also ultimately subject to indirect taxes.

18.   The measurement of fiscal pressure on consumption indicates the regressive character of indirect taxation in France. The comparison with direct taxation and its principal instruments (income tax, corporation tax, general social contribution – CSG and social debt repayment contribution – CRDS) shows the difference between the two types of taxation.

2.3. Comparison with direct taxes

19.   The calculations of the average amounts of direct taxes and the associated effort ratios were based on the 2001 Tax Revenues Survey (ERF). As Laroque emphasises in his commentary on Bourguignon [1998], the BDF survey is not very reliable for the extremes of the income distribution. This leads in particular to a bias concerning income tax. In the BDF, the average amount is positive for all standard of living deciles, where as in reality, it is negative for the first four deciles due to the effect of the employment subsidy. For the direct tax figures we therefore took the ERF survey. We lose in possibilities of comparison what we gain in quality of results, as the BDF survey is primarily a survey of household consumption, the only one which allows calculation of indirect taxes, whereas the ERF is much more detailed and much more representative concerning incomes and thus direct taxes.

20.   The average amounts and the aggregate effort ratios for direct taxes by standard of living decile 2001 are shown in tables 6 and 7.

Table 6: Average amounts of direct taxes by standard of living decile (euros)

Decile	Total direct taxation	CSG	CRDS	Income tax
1	297	326	23	- 51
2	846	900	61	- 114
3	1 162	1 166	80	- 84
4	1 467	1 424	97	- 54
5	1 901	1 695	114	92
6	2 597	2 050	136	411
7	3 362	2 364	156	843
8	4 533	2 817	183	1 533
9	6 504	3 487	224	2 793
10	18 146	6 409	377	11 360
Total	**4 082**	**2 264**	**145**	**1 673**

21.   Overall, the average amounts of direct taxes paid by households rise with standard of living, together with fiscal pressure for each of the taxes (this effect is more marked to the right of the median of the distribution). Direct taxation thus takes a clearly progressive profile. Note that the inter-decile difference in the effort ratios between direct and indirect taxes is high. The first decile shows an effort ration for indirect taxation twice that for direct taxation, while for the last decile, the effort ratios for direct taxes is 3.5 times higher than that of indirect taxes. Thus, even if the effort ratio of direct taxation is on average 3 points higher than that of indirect taxation, the progressive profile of direct taxes is in very sharp contrast to the regressive profile of indirect taxes.

Table 7: Effort ratios of direct taxes by standard of living decile

Decile	Total direct taxation	CSG	CRDS	Income tax
1	7.2 %	7.9 %	0.5 %	- 1.2 %
2	7.0 %	7.4 %	0.5 %	- 0.9 %
3	7.5 %	7.5 %	0.5 %	- 0.5 %
4	8.0 %	7.7 %	0.5 %	- 0.3 %
5	8.9 %	7.9 %	0.5 %	0.4 %
6	10.3 %	8.1 %	0.5 %	1.6 %
7	11.6 %	8.2 %	0.5 %	2.9 %
8	13.3 %	8.3 %	0.5 %	4.5 %
9	15.6 %	8.4 %	0.5 %	6.7 %
10	24.9 %	8.8 %	0.5 %	15.6 %
Ensemble	**14.9 %**	**8.3 %**	**0.5 %**	**6.1 %**

22.   These contradictions stem principally from the difference in the base of the two types of tax. Indirect taxation, being based on household consumption but not conditional on resources, gives rise to this regressive effect in addition to the saving effect mentioned before. Conversely, the direct tax base does not depend only on household resources. By framing this tax base as well as the rates, the State can control the profile of these taxes, and establish a degree of progressivity. For indirect taxes, the State can ease rates but not the base. It is households themselves who fix the base by their choice of consumption. However, this choice is obviously dictated by resource conditions. As the poorest households have a higher propensity to consume than well-off households, they will pay a relatively higher proportion of their income in indirect taxes, which partly explains the regressive profile of these taxes.

### 3.4. Redistributivity of indirect taxes

23.   The redistributive effects of indirect taxation can be determined by calculating the usual inequality indexes. The representation of Lorenz curves before and after deduction of indirect taxes (cf. graph 1) shows that the latter do not intersect. We can therefore quantify the redistributivity of indirect taxes by calculating the Theil and Gini indexes for the two situations (cf. table 8).

**Table 8: Inequality values before and after deduction
of indirect taxes**

	Theil	Gini
Before deduction	0.2061	0.3459
After deduction	0.2237	0.3580

24.   The Theil index increases by 1.8 points compared with the initial situation and the Gini index by 1.3 points. Indirect taxes thus have a significant anti-redistributive effect.

Graph: Lorenz curves before and after deduction of indirect taxes
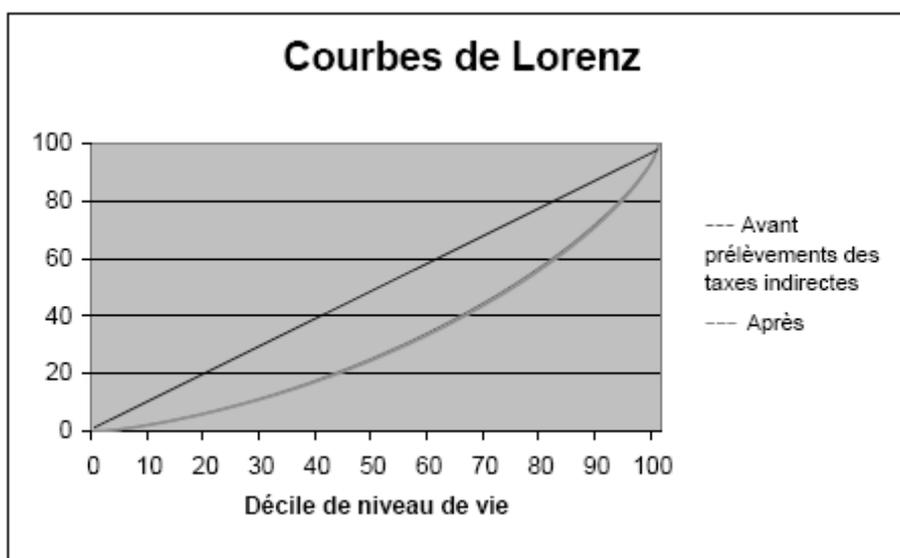
25.   For comparison, table 9 shows the values of the two indices before and after deduction of direct taxes (based on the ERF survey).

**Table 9: Inequality values before and after deduction
of direct taxes**

	Theil	Gini
Before deduction	0.2717	0.3803
After deduction	0.2146	0.3482

26.   After deduction of direct taxes, the Theil index loses 5.7 points, the Gini index 3.2 points. This confirms that quite the opposite of indirect taxes, the direct deductions show a high redistributive effect. In addition, the redistributive loss which accompanies indirect taxation does not seem to cancel out the

redistributive gain from direct taxes. This last point could, however, be quantified totally for a set of data showing both household consumption and income.

3.   Estimate of the econometric model of the demand functions for the microsimulation

27.   Any variation in the parameters of indirect taxation results in variations in consumer prices (except in the case of total absorption of supply). These variations lead to variations in demand which can be modelled in two ways: either people do not change the quantities that they consume, or they are modified as a result of their behaviour. The first case is a purely accounting framework for measuring reforms of indirect taxes. The second, by modelling demand, provides a behavioural framework.

28.   Table 10 shows the estimates based on a system of income-compensated demand price elasticities at the sample mean, and on the populations of consumers for each of 8 goods.

Table 10: Income-compensated demand price elasticities at the sample mean

	Direct price elasticities	Income elasticities
1. Eating at home	- 0.810	0.721
2. Tobacco and alcohol	- 0.522	0.398
3. Clothing	- 0.527	0.888
4. Housing and energy	- 0.383	0.670
5. Motorcar and transport	- 0.549	1.107
6. Leisure	- 1.306	1.212
7. Miscellaneous	- 0.953	1.085
8. Eating out	- 0.512	1.220

29.   The resulting price elasticities do indeed have the expected sign, magnitude and significance. In addition, the values of the elasticities rank the eight goods as might be done intuitively: eating at home, tobacco and alcohol, clothing and housing and energy are ranked as normal goods, while motorcars and transport, leisure, miscellaneous goods and eating out are treated as luxury goods, since their consumption rises faster than household income.

4.   Microsimulation: results

30.   We present the results of the microsimulation of the three French indirect tax reforms, using the simulation programmed called Indirect Tax Simulations, ITS for short (designed in a combined SAS and Excel environment). This programme measures price variations with the definition of impact factors, new household expenses and new tax amounts following changes in the various parameters of indirect taxes in France, both in an accounting framework and a behavioural framework (using for the latter the eight price elasticities estimated in the previous section, replicated for the 71 goods by means of a matrix which breaks down the eight-line classification). It is then possible, before and after the reform, to calculate by household and standard of living: total expenditure and individual expenditure for each of the 71 goods; and the breakdown of the amount paid in indirect taxes by the household for the 71 goods and also the tax by type of tax.

31.   In order to measure the redistributive impact of the reforms, the programme calculates:

- the gain or loss to each household resulting from the reform;

- the Theil and Gini indexes and the Lorenz curve for the distribution of total household income less the amounts of the reformed indirect taxes.

4.1. Reform 1: Creation of a uniform VAT rate

32.   Analysis of the incidence of taxes in general equilibrium shows that a single proportional and uniform tax on consumption is equivalent to a proportional and uniform income tax (cf. Harberger [1962]). While the introduction of a flat rate income tax is sometimes mentioned, it is interesting to see the budgetary and redistributive results of its consumption equivalent. We simulate here the creation of a uniform rate of VAT of 15.3 %, which is budget neutral. The aggregated results are shown in Table 11.

Table 11: Budgetary effect of the creation of a uniform rate of VAT

	Total expenditure (M €)	VAT at reduced rate (M €)	VAT at standard rate (M €)
Amount before reform	660 265	8 157	66 047
Amount after reform excluding behaviour	**660 261**	**22 677**	**51 523**
Variation	*0.00 %*	*178.00 %*	*- 21.99 %*
Amount after reform including behaviour	**660 014**	**21 253**	**52 914**
Variation	*- 0.04 %*	*160.54 %*	*- 19.88 %*

33.   The redistributive impact is given by tables 12 and 13. It appears that the creation of a uniform rate of VAT gives a redistributive affect, with a transfer for the tax charge from the right of the median to the left. However, by retaining only the information relating to the average gain or loss for each of the deciles, the redistributive consequences of such a reform are minor. On the other hand, separating the winners from the losers within the same decile shows considerable disparities, showing that even if the reform has only little impact on the population as a whole, these effects can modify distribution within deciles.

Table 12: Redistributive impact of the creation of uniform rate of VAT, excluding behaviour

Decile	% winners	% losers	Average gains of winners (€)	Average losses of losers (€)	Average gain or loss of the decile (€)
1	29.6 %	70.4 %	238	- 234	- 94
2	30.4 %	69.6 %	272	- 235	- 81
3	30.3 %	69.7 %	343	- 243	- 65
4	33.7 %	66.3 %	401	- 261	- 37
5	38.8 %	61.2 %	401	- 281	- 16
6	43.1 %	56.9 %	398	- 268	19
7	44.0 %	56.0 %	417	- 292	20
8	45.6 %	54.4 %	527	- 308	73
9	46.8 %	53.2 %	506	- 325	64
10	51.3 %	48.7 %	621	- 409	119

Table 13: Redistributive impact of the creation of uniform rate of VAT, including behaviour

Decile	% winners	% losers	Average gains of winners (€)	Average losses of losers (€)	Average gain or loss of the decile (€)
1	29.8 %	70.2 %	215	- 213	- 85
2	30.8 %	69.2 %	244	- 214	- 73
3	30.4 %	69.6 %	312	- 221	- 58
4	33.9 %	66.1 %	366	- 237	- 33
5	38.1 %	61.9 %	373	- 252	- 13
6	42.9 %	57.1 %	366	- 242	19
7	43.7 %	56.3 %	385	- 263	20
8	45.3 %	54.7 %	485	- 277	69
9	46.6 %	53.4 %	462	- 292	59
10	51.1 %	48.9 %	565	- 367	110

4.2. Reform 2: Increase in prices of alcoholic and tobacco products by a rise in excise duty

34.　　In order to increase taxes on risk behaviour, we simulate here a rise in excise duties on alcohol and tobacco. These are increased so as to produce an increase of 10.5% in the products concerned (the prices excluding tax remaining the same). The simulation has two stages. In stage one, only the increase in excise duties is considered. In stage two, we impose budget neutrality by offsetting the rises in excise duties by a reduction in the standard rate of VAT. For the first stage, the aggregated results are given in the following table.

Table 14: Budget figures for the creation of a uniform rate of VAT (in M €)

	0- Initial situation	1- Rise in duties	*Total difference*	2- Fall in VAT	*Total difference*
TVA at standard rate	66 000	66 500	*500*	63 500	*- 2 500*
of which TVA on alcohol and tobacco duties	*2 200*	*2 700*	*500*	*2 600*	*400*
Excise duties	11 300	13 800	*2 500*	13 800	*2 500*

35.　　The budgetary gain of the reform is 3 billion euros in the accounting simulation. The redistributive impact of the reform is shown in tables 15 and 16.

36.　　The two successive reforms thus show a slightly anti-redistributive net effect, although the gains and losses are small. It should be noted that for this simulation, taking behaviour into account significantly modifies the conclusions. Budget neutrality is clearly not achieved. The reduction in the standard rate following a rise in excise duties generates gains for all households, except for the first three deciles. In the accounting case, on the other hand, what is seen, rather, is a shift of the fiscal burden from the right of the median to the left.

Table 15: Redistributive impact of the reform, excluding behaviour

Decile	% winners	% losers	Average gains of winners (€)	Average losses of losers (€)	Average gain or loss of the decile (€)
1	57.6 %	42.4 %	76	- 256	- 64
2	58.9 %	41.1 %	86	- 245	- 50
3	58.7 %	41.3 %	97	- 244	- 43
4	62.9 %	37.1 %	115	- 251	- 21
5	62.4 %	37.6 %	122	- 259	- 21
6	66.3 %	33.7 %	131	- 283	- 8
7	65.5 %	34.5 %	146	- 267	4
8	69.9 %	30.1 %	173	- 264	42
9	70.1 %	29.9 %	185	- 259	52
10	75.4 %	24.6 %	221	- 272	99

Table 16: Redistributive impact of the reform, including behaviour

Decile	% winners	% losers	Average gains of winners (€)	Average losses of losers (€)	Average gain or loss of the decile (€)
1	59.4 %	40.6 %	68	- 183	- 34
2	62.5 %	37.5 %	76	- 180	- 20
3	62.5 %	37.5 %	86	- 175	- 12
4	66.2 %	33.8 %	104	- 180	8
5	67.9 %	32.1 %	107	- 191	11
6	70.5 %	29.5 %	117	- 209	21
7	69.4 %	30.6 %	131	- 191	32
8	73.8 %	26.2 %	155	- 190	65
9	74.6 %	25.4 %	163	- 186	74
10	80.3 %	19.7 %	193	- 203	115

4.3. Reform 3: Increasing differentials in VAT rates

37.   Here we propose a reform consisting of increasing the differentials between VAT rates. The increase of one point in the standard rate is equivalent in budget terms to an increase of two points in the reduced rate. In order to propose a budget neutral reform, we then reduce the reduced rate by two points and increase the standard rate by one point.

38.   By increasing the differential between these two rates, we are trying to modify the redistributivity caused by indirect taxation. A modification in the reduced rate of VAT which concerns almost exclusively only food goods (whose budget share decreases with income) would be tantamount to reducing the tax burden on the poorest households, and would be offset in budget terms by the increase in the standard rate, which for its part would be borne rather by well-off households. Table 17 shows the aggregated results of the reform

Table 17: Budget figures for differential rates of VAT

	Total expenditure (M €)	VAT at reduced rate (M €)	VAT at standard rate (M €)
Amount before reform	660 265	8 157	66 047
Amount after reform excluding behaviour	**660 668**	**5 191**	**69 416**
Variation	*0.06 %*	*- 36.36 %*	*5.10 %*
Amount after reform including behaviour	**660 428**	**5 265**	**69 001**
Variation	*0.02 %*	*- 35.45 %*	*4.47 %*

39.   Following this reform, the aggregate expenditure of households hardly varies. The redistributive effects are given by the following tables.

Table 18: Redistributive impact of the reform, excluding behaviour

Decile	% winners	% losers	Average gains of winners (€)	Average losses of losers (€)	Average gain or loss of the decile (€)
1	64.1 %	35.9 %	46	- 53	10
2	61.7 %	38.3 %	47	- 60	6
3	62.1 %	37.9 %	47	- 75	1
4	60.7 %	39.3 %	49	- 92	- 6
5	55.7 %	44.3 %	54	- 94	- 12
6	49.9 %	50.1 %	52	- 93	- 21
7	50.9 %	49.1 %	55	- 100	- 21
8	48.1 %	51.9 %	58	- 123	- 36
9	45.7 %	54.3 %	64	- 118	- 35
10	42.8 %	57.2 %	79	- 148	- 51

Table 18: Redistributive impact of the reform, including behaviour

Decile	% winners	% losers	Average gains of winners (€)	Average losses of losers (€)	Average gain or loss of the decile (€)
1	69.8 %	30.2 %	46	- 49	17
2	68.2 %	31.8 %	47	- 55	15
3	68.8 %	31.2 %	48	- 70	11
4	65.6 %	34.4 %	52	- 83	5
5	60.6 %	39.4 %	55	- 83	1
6	56.0 %	44.0 %	53	- 83	- 7
7	55.4 %	44.6 %	58	- 87	- 7
8	53.6 %	46.4 %	61	- 109	- 18
9	52.3 %	47.7 %	65	- 104	- 16
10	48.0 %	52.0 %	81	- 127	- 27

40.   Despite its potential political scope, this reform hardly generates any redistributive effect. The neutral budget constraint clearly plays a key role in limiting these effects. The reform nevertheless allows a shift of the tax burden due to VAT from the first deciles to the last deciles.
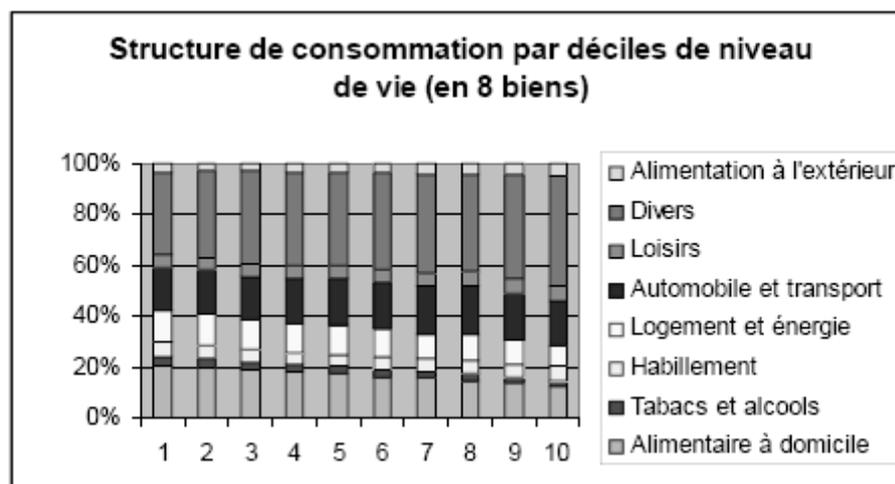
41.   Thus, even if this reform does not significantly modify the redistributive impact of indirect taxes, it nevertheless allows a shift of the tax burden comparable to a spontaneous creation of consumption with a neutral budget effect. Indeed, as the average propensity to consume declines with income, the easing of VAT is converted *a priori* into consumption for households with a low standard of living.

4.4. Discussion

42.   The plurality of indirect taxes in France and their weight in the household budget shows the predominant character of this taxation in France. For all that, can these taxes satisfy the redistributive objectives of reducing the regressivity introduced by the initial system (cf. section 2)? For the first simulated reforms, the answer is clearly negative. The first increases the effort ratios between the two extremes of the distribution. The second reform, which increases excise duties on all addictive products (tobacco and alcohol), coupled with a reduction in the standard rate, has a less marked effect due to the budgetary compensation. It nevertheless gives rise to a shift of the tax burden from the right of the median to the left. In the behavioural context, this reform eases indirect taxes on households overall, but budget neutrality is no longer achieved.

43.   The third reform attempts to satisfy the redistributive objectives. In that respect, it is of the "big-bang" type. It concerns the indirect tax on which households spend most, VAT, and involves a fundamental change in the rates. It then has an impact on all household consumption and not just a few targeted goods. In order to leave aside the debate about budgetary cost, and to focus better on the redistributive consequences of such a reform, we imposed the constraint that the cost must be nil. The differentiation of rates causes a shift in the VAT paid by households from the bottom to the top of the income distribution, and thus spontaneously generates consumption. However, these transfers, even if real, are modest. The small variation in the tax burden due to VAT does not alter the regressive profile of the effort ratios. Thus, apart from the political acceptability of such a reform, this simulation tends to show that indirect taxation is not a suitable instrument for vertical redistribution, for two reasons. The first lies in the excessive similarity of household consumption patterns. Otherwise, heavy taxation of goods and services consumed by the most well-off households, and low taxation on products consumed by poor households would meet the criteria of redistributivity. However, consumption patterns by income group, although different at a very subtle level of disaggregation, are relatively close when aggregated, and do not allow significant differentiation of the indirect tax burden. Graph 2 illustrates this similarity well. Despite the differences, the patterns along the standard of living deciles are not sufficiently differentiated.

Graph 2: Pattern of consumption by standard of living deciles

Structure de consommation par déciles de niveau de vie (en 8 biens)

Legend:
- Alimentation à l'extérieur
- Divers
- Loisirs
- Automobile et transport
- Logement et énergie
- Habillement
- Tabacs et alcools
- Alimentaire à domicile

44.   Two approaches are then possible to make this differentiation achievable, on the assumption that all the legislative constraints are removed. The first would be to create specific taxes for goods actually consumed more by well-off households, after a detailed analysis of the disaggregated consumption patterns. This solution advocates a disaggregation of indirect taxation, and more particularly an increase in the number of VAT rates. The second would be to create a rising scale depending on the quality of the products consumed. Thus "Label Rouge" meat would be taxed at the standard rate, while standard quality meat would be at reduced rate. Even if such a system led to a shift of consumption of the higher quality good to ordinary quality goods among well-off households, the search for a better quality of products consumed as standards of living rose would prevent a really significant shift. Measuring such reforms would require the use of dynamic consumption models and the use of panel data.

45.   Added to these problems relating to the tax system and consumer patterns across households are problems related to the methodology commonly used in microsimulation.

46.   The use of the microsimulation tool is still fairly new in the economic sciences. Thus, the majority of the models like ours are only partially balanced, as their construction relies only on parts of the economic and fiscal landscape, and not all of it. Of course, the design of comprehensive tools is still extremely complex. They could nevertheless radically change the conclusions obtained from a partial balance, especially in the case of indirect taxes with large scale reforms such as our scenario 3. The marginal effects generated could even be totally offset by others caused by the variations in VAT rates. The most striking example of this is the following: failing to take account of inflation mechanisms masks variations in the general price index following a large scale reform of indirect taxes. As the indexation of the minimum growth wage (SMIC) and the majority of social minima to inflation is automatic in France, this means that a change in VAT rates could lead to a general fall in prices which could offset the redistributive effects of the initial reform. Indeed, while the real wages of the lower deciles would not be altered due to the perfect indexation, the upper deciles would see their real wages rise as a result of the often imperfect indexation of that group. This simple mechanism masks a hugely complex modelling process in a microsimulation environment, since, strictly, the degree of anticipation of inflation and the degree of price and income adjustments should be taken into account. The resulting choice of working hypotheses is then not the subject of a defined consensus. This example raises the choice of methodologies inherent in any microsimulation model, chiefly the question of behaviour.

47.	To simulate indirect taxes, we need to choose a demand model which can describe people's consumer choices within a rational framework. It is on such a model that the compensated price elasticities are based which will allow us to move on from accounting to behavioural microsimulation. There too, in this field, there is no clearly defined consensus. As indirect taxation sometimes applies to specific goods, or heterogeneous goods within a same group (such as the plurality of taxes within the food group, for example) it would be useful to work with disaggregated demand systems (cf. Ruiz [2005]). It would also be preferable to consider all correlated prices by means of a multivariate demand system. But taken them exhaustively into account would considerably complicate the design of the microsimulation software. Furthermore, the censor phenomenon which we mentioned in section 2 is present in our data for 3 lines out of 7. This invalidates the theoretical bases of perfectly integrable demand systems and, moreover, in econometric terms, skews their estimation. There is currently nothing in the literature on demand systems that takes account of all these difficulties (cf. Deaton [1997]). In this article, we chose a modelling system which remains open to debate. It nevertheless has the advantage of being fairly simple so that our tool does not lose all transparency. Note that the procedure of personalising price indexes is sufficiently easy to use provided that one has disaggregated consumption data. This method allows some of the unobservable heterogeneity of households to be controlled in our equations and enhances price information by making it continuous while the simple indices process it in discrete form. It is this procedure which allows us to obtain useable price elasticities and thus go on to behavioural microsimulation, which is not the case of simple indices (cf. Nichèle and Robin [1995]). The question of behaviour and the difference between accounting and behavioural simulation is important.

48.	Thus, even if the amounts at stake are minor as regards transfers between the bottom and top of the distribution, our simulations show that taking behaviour into account can modify the results for the State budget constraint (cf. reform 2) and also significantly alter the redistributive effects (cf. reform 3, variation in the tax burden due to VAT for the first decile from – 0.59% excluding behaviour to – 1.01% including it). Whence the accounting framework seem *a priori* too crude to provide satisfactory results which can be used by government decision-makers.

## 5.	Conclusion

49.	In this article we have proposed measuring the actual and alternative impact of indirect taxation by designing a new microsimulation model. In the first part, we described the redistribution introduced by this taxation. Overall, even if the amounts of tax paid rise with standard of living, when compared with household incomes they show the regressive character of indirect taxation. The comparison with direct taxation is revealing in this regard. Where France differs from other OECD countries by the small proportion of income tax in relation to all taxes collected, it is the latter, however, which presents the most progressive profile. Conversely, indirect taxes present the largest share of taxes collected, yet they have the most pronounced regressive character. This fact underlies the design of a microsimulation model of indirect taxation in France, based on the 2001 Household Budget Survey, with the objective of creating a tool for government decision-makers to test certain reforms currently envisaged in France, and also to carry out large-scale reforms aimed at modifying the anti-redistributive effects of the initial taxation. For that, in the second part, we estimated 8 demand functions based on a Qaids specification for a selected sample, which forms the behavioural core of our model. We also incorporated an element of unobservable heterogeneity of households by constructing personalised prices indices. We thus obtained a set of price elasticities with the expected sign and magnitude. Section 4 is devoted to the microsimulation. It describes the functioning of the ITS programmes and presents in detail the results of the three reforms effected with this programme. The first two reforms concern respectively abolition of the reduced rate and increase in excise duties on alcohol and tobacco. Finally, the third is a reform which seeks to modify the redistributivity introduced by indirect taxation by increasing the differential between VAT rates with a budget neutral cost. Overall, the resulting transfers of indirect tax from the lower to the upper deciles are minimum in this reform, despite its scale.

50.   The results obtained ultimately show that by taxing the consequences rather than the cause, indirect taxes can only marginally satisfy redistributive objectives, as any reform is only an imperfect means of achieving the true variable which it is desired to differentiate, namely income. Indirect taxation, therefore, should be seen rather as a "budgetary reserve" on which the State could draw to finance reforms of direct taxes which would provide a real redistributive impact. Linking both types of tax in the same environment is one of the approaches possible with microsimulation. The body of micro-economic data necessary for such simulations could be constituted by matching the BDF survey with the ERF survey by the cellulation method (cf. Ruiz [2005b] applied to the BDF survey). The matched data would allow simultaneous simulation of the variations in direct and indirect taxes. This is a highly topical theme in relation to the concept of "Social VAT" where a reduction in social contributions would be offset by an increase in VAT on certain products. In the present case, VAT is indeed a "budgetary reserve" which can be used to meet redistributive objectives.

REFERENCES

Banks, J., R. W. Blundell, and A. Lewbel (1997): "Quadratic Engel Curves, Indirect Tax Reform and Welfare Measurement", Review of Economics and Statistics, 79, 527-539.

Baccouche, R., and F. Laisney (1986): "Analyse Microéconomique de la Réforme de la TVA de Juillet 1982 en France", Annales d'Economie et de Statistique, 2, 37-74.

Bourguignon, F. (1998): Fiscalité et Redistribution. Rapport du Conseil d'Analyse Economique.

Bourguignon, F., and A. Spadaro (2003): "Les Modèles de Microsimulation dans l'Analyse des Politiques de Redistribution: une Brève Présentation", Economie et Prévision, 160-161, 231-238.

Code Général des Impôts - Livre des Procédures Fiscales (2001). Direction Générale des Impôts: Ministère de l'Economie, des Finances et de l'Industrie.

Davidson, R., and J. G. MacKinnon (2004): Econometric Theory and Methods. Oxford: Oxford University Press.

Deaton, A. S. (1980): The Analysis of Household Surveys. World Bank: The Johns Hopkins University Press.

Deaton, A. (1987): "Estimation of Own- and Cross-price Elasticities from Household Survey Data", Journal of Econometrics, 36, 7-30.

Duncan, A. (2001): "Microsimulation and Policy Setting in the UK" (Communication, Journée Modèles de Microsimulation et Evaluations des Effets Redistributifs des Réformes en Cours)

Gardes, F., B. Lhommeau, and C. Starzec (1999): "Introducing Behavioural Response into Microsimulation Model: Simulation of VAT Modifications on Consumers" (Communication, Microsimulation in the New Millenium-Challenges and Innovations)

Forgeot, G., and C. Starzec (2003): "L'Impact Redistributif des Impôts Indirects en France", Economie Publique, 13, 165-205.

Harbeger, A. (1962): "The Incidence of the Corporation tax", Journal of Political Economy, 70, 215-240.

Labeaga, J. M., and A. Lopez (1994): "Estimation of theWelfare Effects of Indirect Tax Changes on Spanish Households: an Analysis of the 1992 VAT Reform", Investigaciones Economicas, 18, 289-311.

Labeaga, J. M., and A. Lopez (1997): "Flexible Demand System Estimation and the Revenue and Welfare Effects of the 1995 VAT Reform", Revista Espanola de Economia, 13, 181-197.

Lewbel, A. (1989):"Identification and Estimation of Equivalence Scales under Weak Separability", The Review of Economic Studies, 56, 311-316.

Myles, G. D. (1995): Public Economics. Cambridge: Cambridge University Press.

Nichèle, V., and J. M. Robin (1995): "Simulation of Indirect Tax Reforms Using Pooled Micro and Macro French Data", Journal of Public Economics, 56, 225-244.

Picard, N., N. Ruiz, and A. Trannoy (2005): "Une Nomenclature de la Consommation en 71 Postes pour Etablir l'Impact Microéconomique de la Fiscalité Indirecte" (Insee working paper)

Pollak, R. A., and T. J.Wales (1992): Demand System Specification and Estimation. Oxford: Oxford University Press.

Ruiz, N. (2005a): "Identification des Effets Prix dans les Systèmes de Demande par Construction d'Echelles d'Equivalences" (mimeo, THEMA)

Ruiz, N. (2005b): "Contiguïté des Lois de Consommation en Dimensions Transversale et Longitudinale sur Systèmes de Demande Désagrégés" (mimeo, THEMA)