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CONSUMPTION TAXATION AS AN ADDITIONAL BURDEN ON LABOUR INCOME

Fidel Picos-Sánchez

1. Introduction

The OECD's Taxing Wages (TW) Report[1] provides details of taxes paid on wages in the 34 OECD member countries. In particular, it covers the personal income tax and social security contributions paid by employees and their employers, as well as cash benefits received by families. The Report calculates the average and marginal tax burden on labour income for taxpayers at different income levels and with different family characteristics (single taxpayers and married couples with or without children). The aim of this paper is to explore the possible consequences of broadening the TW model by introducing consumption taxes, and so include the taxes that workers pay when they spend their wages in addition to the taxes that are paid when they earn them. This has been done by using micro data from Household Budget Surveys provided by several OECD countries and Eurostat, to simulate consumption taxes for families with similar characteristics to the eight types defined in Taxing Wages.

The inclusion of these consumption taxes into the tax wedge provides a more comprehensive measure of the extent to which the tax system reduces the quantity of goods and services that workers can purchase, in comparison with the amount that they would have to produce in order to cover their labour costs. In other words, if workers are motivated by the quantities of goods and services that they can purchase with their after-tax wages, consumption taxes have a similar effect to income taxes on the incentive to work.

However, as consumption taxes are also levied on purchases that are made with non-labour income, it is not always better to include consumption taxes in the tax wedge measure when analysing labour market behaviour. For example, somebody who is choosing between working and claiming unemployment benefit may make the decision mainly on the basis of the ratio between what their levels of consumption in the two situations. In this case, consumption taxes may have little effect on the decision, because they would have approximately the same proportional effect on the real value of the two alternative income sources. However, if one member of a couple is already working, the choice of the non-working partner is different as (s)he may well not receive benefit while not working. In this case, the decision of whether or not to work may well depend on the additional consumption that the non-working partner could bring to the household by starting to work, and this will depend on the level of consumption taxes. Thus, the results presented in this paper represent an addition to the standard Taxing Wages results and are not intended to replace them.

It is also important to note that the methodology used to include consumption taxes has significant limitations related to the lack of accurate data, the sample sizes and the high variability of consumption patterns. It has also not been possible to include all taxes on consumption. In addition, it is assumed that all consumption taxes are shifted to the consumer through higher prices, which may not always be the case. Therefore the paper is focused on the methodological issues rather than on the results, which should not be taken as a guide for tax policy. However, the pattern of results across countries and family types are sufficiently different to suggest that including consumption taxes in the tax wedge could provide useful additional information to both analysts and policy makers.

[1] For more information, see www.oecd.org/ctp/taxingwages.

Section 2 presents an overview of the levels of taxes on income and on consumption in OECD countries, using information from *Revenue Statistics*. Section 3 describes the methodology used for introducing consumption taxation into the Taxing Wages model. Availability of data is discussed in section 4, while sections 5 to 7 deal with the methodology. Section 7 also defines and shows the results, while section 8 presents the main conclusions.

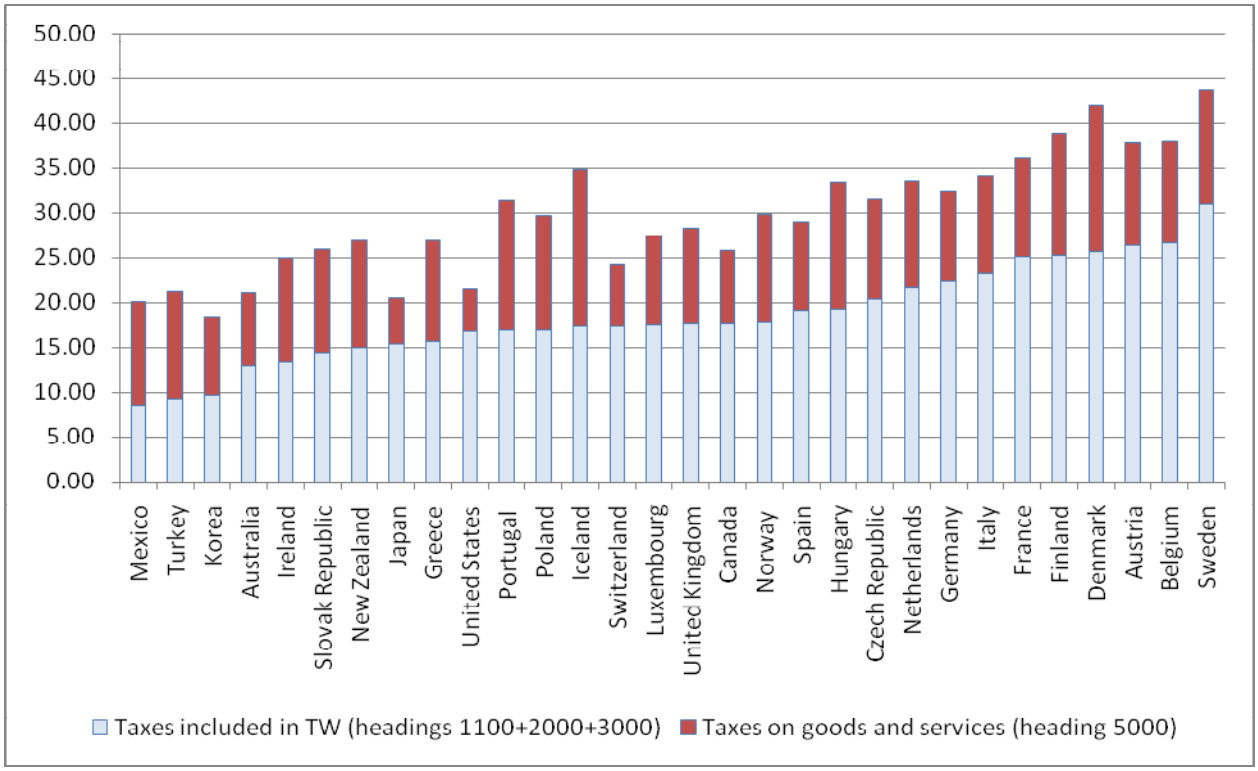
2. Tax mixes in OECD countries

OECD countries present different tax mix profiles. Figure 1 shows the share between taxes/contributions on personal income (*Revenue Statistics* headings 1100, 2000 and 3000, included in TW calculations) and taxes on goods and services (heading 5000, not included in TW), as a percentage of GDP.

Currently the TW model only takes into account the headings 1100+2000+3000, which range from figures around 8 per cent in Mexico[2] to 31 per cent in Sweden. But if the heading 5000 is taken into account, the relative positions of countries become quite different; Sweden keeps the top position, but countries like the United States, Japan, Switzerland and Canada move down the ranking, while the Slovak Republic, New Zealand, Portugal and Iceland move up. The idea of this paper is to show the tax rate position of each country in terms of the whole columns, not only the clear part as is done in TW.

This is done by supplementing the usual tax wedge (which will be referred to as the 'income tax wedge') with a 'consumption tax wedge', which expresses consumption taxes paid as a percentage of the workers' labour costs. The two are then combined to produce a 'total tax wedge'.

Figure 1. **Tax mix in OECD countries 2006 (percentage of GDP)**



Source: OECD *Revenue Statistics* 2008

[2] The figure for Mexico in Revenue Statistics also includes corporate income tax.

3. A methodology for consumption taxes in Taxing Wages

A major problem in simulating consumption taxation in the TW framework is that families are defined in relation to their income, not to their expenditures. But since the objective is to add information to the current model, the income-based definitions of the eight household types must be maintained, and a methodology has to be implemented to identify their consumption.

The chosen strategy is to use micro-data from Household Budget Surveys (HBS). The objective is to identify households that correspond to the eight family types, classify their expenditures according to the taxes they bear, and then simulate the average amount of VAT/sales taxes and excise duties paid by each family type. Once these calculations are made, they can be expressed as a percentage of income and added to the TW wedges.

It should be noted that this approach is somewhat different from the one used in TW. While TW uses a methodology that is entirely based on assumptions about the pre-defined families, the HBS simulations uses actual data on consumption patterns (from previous years). This leads to some problems in matching theoretical TW families with real HBS families, and also prevents the use of current year patterns, as HBS data are only available after a number of years.

Finally, the critical point of the project is the availability of HBS data, which is discussed in the next section. Once they are available, there are three stages to be completed, which are discussed in sections 5 to 7: household identification, expenditure identification/tax rate allocation and tax micro-simulation.

4. Availability and characteristics of Household Budget Survey data

The Household Budget Surveys (HBS) are usually carried out by public statistical bodies, with the objective of identifying consumption patterns and calculate consumer price indices. Therefore HBS micro-data contain thousands of household observations with detailed information on their characteristics and expenditures.

Availability of HBS micro data differ significantly from one country to another. For this paper micro-data has been retrieved for seven countries: Australia (AUS)[3], France (FRA)[4], Mexico (MEX)[5], Slovak Republic (SVK)[6], Spain (SPA)[7], Switzerland (SWI)[8], United Kingdom (UK)[9] and the United States (US)[10]. Additionally, on request average data for each household type have been kindly provided by Eurostat for

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3 Australian Bureau of Statistics (2008): Household Expenditure Survey 2003-2004, Third Edition, Expanded CURF, RADL. Findings based on use of ABS CURF data.

4 Institut National de la Statistique et des Études Économiques (INSEE) [National Institute for Statistics and Economic Studies]: Enquête « Budget de Famille » 2006 [Family Budget Survey 2006]

5 Instituto Nacional de Estadística y Geografía [National Institute for Statistics and Geography]: Encuesta Nacional de Ingresos y Gastos de los Hogares ENIGH 2006 [National Household Income and Expenditure Survey 2006]

6 Statistical Office of the Slovak Republic: Slovak Household Budget Survey 2005

7 Instituto Nacional de Estadística [National Statistics Institute]: Encuesta de Presupuestos Familiares 2004 [Household Budget Survey 2004]

8 Federal Statistical Office (FSO): Household Budget Survey 2005.

9 The results for the UK are based on the Expenditure and Food Survey, 2005-2006, produced and sponsored by the Office for National Statistics, Department for Environment, Food and Rural Affairs, and supplied by the UK Data Archive. These institutions bear no responsibility for the aforementioned results.

10 Bureau of Labor Statistics: 2006 Consumer Expenditure Survey. Provided by the Office of Tax Analysis, Office of Tax Policy, US Treasury Department.

four more countries: Austria (AUT), Belgium (BEL), Denmark (DNK) and Ireland (IRL)[11]. All the HBS databases have been directly used with no corrections or imputations on the original data.

The micro data differ among countries in terms of income variables and consumption quantities that allow simulating ad quantum (specific) excise duties on alcohol, tobacco and mineral oils; while the data from Eurostat contain expenditure and income information for all countries, but not quantities, and are provided for the average of each household type rather than individual households. These factors limit the results that can be calculated, as will be explained in the following sections.

5. Household identification

The first stage consists of searching in each survey for similar families to those defined in TW. For conciseness, the paper refers to the eight family types using the following numbers:

1. Single person without children at 67% of average earnings
2. Single person without children at 100% of average earnings
3. Single person without children at 167% of average earnings
4. Single parent with two children at 67% of average earnings
5. One-earner married couple with two children at 100% of average earnings
6. Two-earner married couple with two children, one at 100% of average earnings and the other at 33%
7. Two-earner married couple with two children, one at 100% of average earnings and the other at 67%
8. Two-earner married couple with no children, one at 100% of average earnings and the other at 33%

This search is done in two steps: first the families are chosen by their non-monetary characteristics and once then only the ones with similar income are retained for analysis. Even before taking income into account, the search for equal non-monetary characteristics usually results in very few observations, so that there is a trade-off between precision and the subsample size. In order to obtain reasonable subsample sizes, it was decided to relax some criteria, but mainly in those aspects that are unlikely to affect consumption patterns.

Once families are selected on their non-monetary characteristics, an income criterion is added. Since household definitions used in HBSs differ from the TW ones, families with the same gross income (the variable chosen in TW as a starting point) could differ in their income tax payments, thus having different net incomes (and so different amounts of money for expenditure purposes). It was therefore decided to use net incomes. This means that selected households are those whose net income variable (as defined in each HBS[12]) has a similar value to the net income (*take home pay*) calculated in TW for the eight family types.

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[11] Eurostat: harmonised Household Budget Surveys 2005. We would like to thank Mr. Peter Paul Borg and Mr. Guillaume Osier, from Eurostat, for their invaluable help in providing these data.

[12] No reliable variable for income is available in the Spanish HBS, so for Spain net income was considered to be equal to total monetary expenditure. As an exception, for families identified as paying a mortgage net income was calculated as the sum of total monetary expenditure and mortgage payments, which were imputed using information from the Spanish Institute for Fiscal Studies (IEF).

As in the previous step, the chosen criteria try to find an appropriate balance between maintaining the criteria and having a sufficient number of observations.

Table **1** shows the final criteria applied, in relation to the original criteria used in TW.

Table 1. **Changes in family definitions in relation to the TW criteria**

Concept		**Types of family affected**[1]	**Original TW criteria**	**Criteria for the HBSs**
Non-monetary characteristics	Adults	5-8	Two married adults	Not necessarily married
	Children	4-7	Two children between but not including 5 and 12	Two children under 19
	Working status of reference person	All	Employee at industry sectors C-K	Employee, employer or self-employed
	Working status of the spouse	5	No wage	Not working
		6-8	Employee at industry sectors C-K	Employee, employer or self-employed
Monetary characteristics	Income type	All	Wages, assuming there is no more income in the household	All household income.
	Net income[2]	1-2-3	Take home pay	±16-18 per cent around TW take home pay
		4-5-8	Take home pay	±25 per cent TW around TW take home pay
		6-7	Take home pay	±8-10 per cent TW around TW take home pay
	Income share between spouses	5	100/0 of gross wage	Spouse not working
		6 and 8	100/33 of gross wage	Both spouses working, all income shares are admitted
		7	100/67 of gross wage	

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.
2. Intervals below 25 per cent are set for each country to avoid overlapping between families that only differ in income.

The application of these criteria results in the number of observations shown in Table **2**. It must be noted that, even after relaxing some criteria, there are some household types for which very few observations are found, thus making it impossible to draw conclusions for them.[13] Furthermore, for some Eurostat countries data are not available for all family types.

Table 2. **Number of observations by family type**

Family[1]	AUS	AUT	BEL	DNK	FRA	IRL	MEX	SVK	SPA	SWI[2]	UK	US
1	198	216	75	46	327	37	142	52	76	(32)	217	133
2	284	276	139	142	304	51	139	63	63	143	161	179
3	159	95	153	98	129	66	90	20	30	185	72	161
4	31	24	2	2	45	-	40	13	5	-	37	29
5	107	168	6	3	58	30	221	80	152	(28)	32	37
6	54	84	6	10	134	-	86	69	83	(20)	65	24
7	82	75	10	26	108	-	80	56	78	(41)	70	39
8	222	248	21	44	322	65	99	73	123	50	380	101
Total	1137	1186	412	371	1427	249	897	426	610	507	1034	703

13 However, without information on the sampling procedure and a proper statistical analysis it is not possible to determine whether the subsample sizes used are sufficiently representative for each family type.

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.
2. Due to restrictions by Statistics Switzerland, results for family type 4 cannot be published because they would be based in less than 10 observations. Results for family types 1, 5, 6 and 7 will be shown between brackets because they are based in a number of observations between 10 and 49.

Source: calculated from HBS data.

6. Expenditure identification and allocation of VAT/sales taxes rates and excise duties

Once the families are selected, it is necessary to identify their expenditure items and the corresponding tax rates (VAT/sales taxes and excise duties) in order to calculate their tax payments. This was done using the 2006 edition of the OECD publication *Consumption tax trends: VAT/GST and excise rates, trends and administration issues*.[14] It was possible to identify and calculate the tax for most of the expenditure items, but in several cases either additional information was retrieved from other sources or some interpretation or assumptions had to be made.[15] Furthermore, the degree of detail in the HBS is not sufficient to precisely allocate the tax rates in all cases, so additional assumptions had to be made. This fact may introduce some minor errors in the results.

In general, all expenditure classified as such in the HBSs has been included in the simulations, with the exceptions of new motor vehicle purchases and both purchase and renting of housing. This avoids comparability problems on tax rates on expenditure among countries that would otherwise arise as a result of the complexity and sometimes incomplete information on expenditures. However, it does result in reduced measured tax rates on net income and tax wedges for all countries.

In addition, it is necessary to make extra assumptions in those countries whose HBS databases do not include sufficient quantity information, and therefore direct simulation of ad-quantum excise duties is not possible. In these cases, information on average prices has been used, in most cases provided by the national authorities. Taking the monetary expenditure as a starting point, it is divided by the average price, thus getting an estimate of the consumed quantity that can be multiplied by the ad-quantum rate to obtain the amount of tax paid. This may cause simulations of excise duties to be less precise than simulations of VAT/sales taxes. Additionally, it is usual that consumption levels for some goods subject to excise duties are underestimated in HBS.

Finally, two limitations arise from the fact that taxes are simulated only at the end of the supply chain. Firstly, excise duties might be overestimated, since they were simulated on prices paid by consumers, while they are actually applied at (lower) producer prices earlier in the supply chain. Secondly, and in relation to VAT, lack of data meant that zero-rated and exempt goods and services had to be treated the same way, even though their economic effects clearly differ: while a zero rate means no taxation, exempted goods still include the VAT paid in earlier stages of production. So, countries that rely more on exemptions will present tax rate values below the real tax burden of their economies.

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14 In particular, information on VAT/GST and excise duties on alcoholic beverages, tobacco and mineral oils has been used; it is possible to find other excise duties in some countries, but they are not considered in this Special Feature. Additionally, since the OECD Consumption tax trends publication does not include sales taxes, the information for the United States was provided by the national authorities.

15 National tax legislation is simulated for all countries except the United States, for which the consumption taxes in force in Detroit, Michigan are simulated, because it is the city chosen for the Taxing Wages publication. An individual city had to be chosen because of the substantial differences in tax rates across sub-national governments.

7. Micro-simulation and results

After the different expenditures have been correctly identified, a micro-simulation program calculates the amount of VAT/sales taxes and excise duties paid by each household, applying the tax rates to the expenditure amounts.[16]

Table 3 summarizes this process for each product consumed by each family[17], and also shows other variables that will be used further on in this section.

Table 3. **Calculation of tax payments for each family**

		Good/service i, family j	*Total (for family j)*
Quantity		Q_{ij}	
Consumption (expenditure after taxes)		C_{ij}^{at}	$C_j^{at} = \sum_{i=1}^{n} C_{ij}^{at}$
Tax rates	Ad quantum excise duties	d_i^{aq}	-
	Ad valorem excise duties	d_i^{av}	-
	VAT	v_i	-
Expenditure before taxes		$C_{ij}^{bt} = \frac{C_i^{at}}{(1+v_i)*(1+d_i^{av})} - d_i^{aq} * Q_{ij}$	$C_j^{bt} = \sum_{i=1}^{n} C_{ij}^{bt}$
Tax payments	Ad quantum excise duties	$D_{ij}^{aq} = d_i^{aq} * Q_{ij}$	$D_j^{aq} = \sum_{i=1}^{n} D_{ij}^{aq}$
	Ad valorem excise duties	$D_{ij}^{av} = d_i^{av} * (C_i^{bt} + D_i^{aq})$	$D_j^{av} = \sum_{i=1}^{n} D_{ij}^{av}$
	All excise duties	$D_{ij} = D_{ij}^{av} + D_{ij}^{av}$	$D_j = \sum_{i=1}^{n} D_{ij}$
	VAT/sales taxes	$V_{ij} = v_i * (C_{ij}^{bt} + D_{ij})$	$V_j = \sum_{i=1}^{n} V_{ij}$
	Total	$T_{ij} = D_{ij} + V_{ij}$	$T_j = \sum_{i=1}^{n} T_{ij}$
Net income		-	Y_j^{net}

Once the individual tax payments for each family are obtained, additional calculations are carried out to show the proportion that the consumption taxes represent in relation to income. In particular, three tax rates on net income are calculated for each family (j): VAT/sales taxes (V_j), excise duties (D_j) and total

16 It must be noted that implicitly no tax evasion is assumed, as in the TW framework.

17 As it can be observed, the simulation order is (1) ad quantum excise duties, (2) ad valorem excise duties and (3) VAT, meaning that each tax base includes the tax amounts of the previous tax(es). This is, with slight differences, the method applied in the European Union.

consumption taxes (T_j) expressed as a percentage of the HBS family net income (Y_j^{net}), being the denominator equivalent to the TW take-home pay. These rates give an idea of the proportion of disposable income spent in paying consumption taxes.

Table 4, Table 5 and Table 6 show the average results for the rates on net income.

Table 4. **Average VAT/sales taxes rates on net income (per cent)**

Family[1]	AUS	AUT	BEL	DNK	FRA	IRL	MEX	SVK	SPA	SWI[2]	UK	US
Year	2003	2005	2005	2005	2006	2005	2006	2005	2004	2005	2006	2006
1	5.6	11.2	8.2	14.6	9.5	12.0	8.4	15.9	8.5	(2.2)	7.3	2.3
2	5.4	9.9	7.2	12.9	9.6	9.1	7.9	13.4	8.5	2.4	6.4	1.7
3	5.1	7.6	6.4	10.9	7.9	7.6	8.2	11.1	8.5	2.2	7.2	1.5
4	5.2	11.3	7.5	12.1	10.7	-	7.1	16.7	7.7	-	9.1	2.5
5	6.8	11.1	9.8	14.4	10.5	13.3	6.8	16.5	8.3	(2.4)	8.5	2.9
6	5.2	9.4	7.1	10.9	9.7	-	6.7	12.5	8.4	(2.3)	9.6	8.0
7	5.5	8.9	7.5	12.7	9.7	-	7.2	13.1	8.4	(2.6)	7.4	1.6
8	5.8	9.0	5.7	13.0	9.3	8.2	5.9	13.5	8.3	2.9	7.3	2.2

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.
2. In accordance with the conditions issued by Statistics Switzerland for the use of their data, the results between brackets indicate that they are based in a number of observations between 10 and 49.

Table 5. **Average excise rates on net income (per cent)**

Family[1]	AUS	AUT	BEL	DNK	FRA	IRL	MEX[2]	SVK	SPA	SWI	UK	US
Year	2003	2005	2005	2005	2006	2005	2006	2005	2004	2005	2006	2006
1	1.8	3.1	2.0	4.2	3.8	4.8	0.7	2.2	1.6	(1.8)	3.6	1.8
2	1.5	2.5	1.9	3.0	2.8	4.0	0.3	1.2	2.3	1.7	3.1	1.3
3	0.7	1.9	1.5	2.3	1.8	3.3	0.2	2.3	2.1	-	2.1	0.9
4	1.1	1.6	1.7	1.3	3.2	-	0.0	0.8	1.0	0.9	3.6	1.5
5	1.1	2.5	1.9	2.1	3.1	5.5	-0.1	2.7	2.5	(2.8)	2.7	1.8
6	0.6	2.4	1.9	1.3	2.6	-	-0.1	1.9	2.2	(1.5)	2.7	1.7
7	0.8	1.7	2.2	3.3	2.3	-	-0.1	2.5	2.3	(1.8)	2.3	0.9
8	1.4	2.8	1.3	2.2	3.1	3.8	0.2	2.4	2.8	2.0	3.3	1.8

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.
2. The simulations for Mexico include a tax on fuels designed to compensate for the variability in international prices. In 2006 this led to negative rates.

Table 6. **Average total consumption tax rate on net income (per cent)**

Family[1]	AUS	AUT	BEL	DNK	FRA	IRL	MEX	SVK	SPA	SWI	UK	US
Year	2003	2005	2005	2005	2006	2005	2006	2005	2004	2005	2006	2006
1	7.4	14.3	10.2	18.8	13.3	16.8	9.1	18.1	10.1	(4.0)	10.8	4.2
2	6.9	12.4	9.1	15.9	12.4	13.1	8.2	14.6	10.8	4.1	9.4	3.0
3	5.8	9.5	8.0	13.2	9.7	10.9	8.4	13.4	10.6	3.6	9.3	2.4
4	6.3	12.9	9.2	13.5	13.9	-	7.0	17.5	8.7	-	12.7	4.0
5	8.0	13.6	11.7	16.6	13.6	18.8	6.6	19.2	10.8	(5.2)	11.2	4.7
6	5.8	11.8	9.0	12.2	12.3	-	6.6	14.4	10.6	(3.8)	12.3	9.7
7	6.2	10.6	9.7	15.9	12.0	-	7.2	15.6	10.6	(4.4)	9.6	2.5
8	7.2	11.8	7.0	15.3	12.5	12.1	6.1	16.0	11.0	4.9	10.6	4.0

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.

When families with different incomes are compared (see 1-2-3 and 6-7), the average VAT/sales taxes rate on net income (**Table 4**) does not show a clear pattern. If families spent all their disposable income, consumption tax liabilities would probably be lower for low income families, since VAT/sales taxes exemptions and lower and zero rates usually apply to basic commodities and services such as food (which represents a larger share of expenditure for low income families). But as the savings rate tend to increase with income, expenditure of low income families (and so their consumption taxes) represent a higher proportion of their income, so the effect of lower rates could be offset. Concerning families with the same income, it is observed that families with children have in general higher rates than families without children (6 higher than 8, 7 than 3 and 5 than 2), probably because their savings rate is lower, so they consume a higher proportion of their disposable income.

Concerning average excise duties (**Table 5**), there are quite clear patterns in a number of cases. In the case of single families with different income (1-2-3), for most countries the rate decreases with income, which could be due to similar absolute levels of expenditure in excise rated goods. If families with the same income are compared (6 with 8, 7 with 3 and 5 with 2), it can be seen that when the number of adults differ, the rate is normally higher in two-adult families (7 higher than 3 and 5 higher than 2), since excise rated products are consumed mainly by adults. When the number of adults is the same, it seems that childless couples spend more in these products than couples with children (8 is usually higher than 6).

If these results are added to the ones found in VAT/sales taxes (Table 6), it can be seen that some trends are reinforced (when all taxes go in the same direction), while others are offset (when they show opposite results). In short, single individuals without dependents tend to show lower rates as income increases (3<2<1) and lower rates than larger families with the same income (2<5, 3<7).

To achieve the objective of this paper it is necessary to calculate a rate comparable with the TW tax wedge, which is defined as the "sum of personal income tax and employee plus employer social security contributions together with any payroll tax less cash transfers, expressed as a percentage of labour costs" (labour costs are defined in turn as "gross wage earnings income plus employer's social security contributions and payroll taxes"); therefore a *consumption tax wedge* is calculated as total consumption taxes (T_j) expressed also as a percentage of labour costs. Since the denominator is the same as in TW tax wedge, it is possible to add the two rates up in order to have an overall tax rate for each type of family. As in HBS there is not sufficient information for calculating labour costs, we assume that the HBS families

have the same ratio net income/labour costs as the ones in TW. So, to obtain the consumption tax wedge, the consumption tax rate on net income ($\frac{T_j}{Y_j^{net}}$) is multiplied by that ratio ($\frac{Y_{TW}^{net}}{L_{TW}}$). This means that the consumption tax wedge is just a change of scale of the consumption tax rate on net income, but this change is different for each family and each country.

Table 7, **Table 8** and **Table 9** show the average tax wedges for all the countries.

Table 7. **Average consumption tax wedges (per cent)**

Family[1]	AUS	AUT	BEL	DNK	FRA	IRL	MEX	SVK	SPA	SWI	UK	US
Year	2003	2005	2005	2005	2006	2005	2006	2005	2004	2005	2006	2006
1	5.6	8.1	5.2	11.4	7.4	14.0	8.1	11.7	6.6	(2.9)	7.5	3.0
2	5.0	6.5	4.0	9.3	6.2	10.0	7.0	9.0	6.6	2.9	6.2	2.1
3	3.7	4.7	3.1	6.7	4.5	7.1	6.5	8.0	6.1	2.4	5.8	1.5
4	6.7	9.5	6.0	11.7	9.0	-	6.3	13.6	6.1	-	10.8	3.7
5	6.5	8.6	7.0	11.7	7.9	17.7	5.6	14.8	7.2	(4.2)	8.1	3.9
6	4.6	7.4	5.3	8.0	7.4	-	5.8	10.3	6.9	(2.9)	9.1	7.6
7	4.8	6.3	5.0	10.2	6.7	-	6.2	10.7	6.8	(3.3)	6.8	1.9
8	5.5	6.5	3.6	9.3	6.9	10.0	5.3	10.3	7.1	3.6	7.4	2.9

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.

Table 8. **Average income tax wedges (per cent)**

Family[1]	AUS	AUT	BEL	DNK	FRA	IRL	MEX	SVK	SPA	SWI	UK	US
Year	2003	2005	2005	2005	2006	2005	2006	2005	2004	2005	2006	2006
1	24.3	43.3	49.3	39.2	44.3	16.8	10.6	35.2	35.2	(26.7)	30.7	27.7
2	28.0	48.0	55.5	41.1	50.2	23.5	15.0	38.3	38.7	29.5	34.0	29.9
3	36.0	50.4	60.9	49.3	53.2	34.9	21.9	40.3	42.4	33.9	37.9	35.2
4	-4.4	26.3	35.2	13.1	35.6	-	10.6	22.0	29.5	-	14.7	7.0
5	19.6	36.6	40.3	29.2	41.9	5.8	15.0	23.1	32.9	(18.5)	28.2	17.8
6	21.5	37.5	41.4	34.2	39.9	-	12.7	28.9	35.1	(21.0)	26.2	21.9
7	23.9	40.2	48.2	35.9	43.7	-	13.2	31.6	35.7	(24.0)	29.5	24.3
8	24.7	44.9	48.0	39.3	44.5	17.5	12.7	35.7	36.1	27.4	30.7	27.8

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.

Source: Taxing Wages.

Table 9. **Average total tax wedges (consumption + income) (per cent)**

Family[1]	AUS	AUT	BEL	DNK	FRA	IRL	MEX	SVK	SPA	SWI	UK	US
Year	2003	2005	2005	2005	2006	2005	2006	2005	2004	2005	2006	2006
1	29.9	51.4	54.5	50.6	51.7	30.8	18.7	46.9	41.8	(29.6)	38.2	30.7
2	33.0	54.5	59.5	50.4	56.4	33.5	22.0	47.3	45.3	32.4	40.2	32.0
3	39.7	55.1	64.0	56.0	57.7	42.0	28.4	48.3	48.5	36.3	43.7	36.7
4	2.3	35.8	41.2	24.8	44.6	-	16.9	35.6	35.6	-	25.5	10.7
5	26.1	45.2	47.3	40.9	49.8	23.5	20.6	37.9	40.1	(22.7)	36.3	21.7
6	26.1	44.9	46.7	42.2	47.3	-	18.5	39.2	42.0	(23.9)	35.3	29.5
7	28.7	46.5	53.2	46.1	50.4	-	19.4	42.3	42.5	(27.3)	36.3	26.2
8	30.2	51.4	51.6	48.6	51.4	27.5	18.0	46.0	43.2	31.0	38.1	30.7

1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.

The conclusions for the average consumption tax rates on net income (Table 6) also apply for the average consumption tax wedges (Table 7), and they are even reinforced. This can be due to the fact that lower income families and families with children pay less in income taxes, so they have more net income (available for expenditure) in relation to their corresponding labour costs; i.e. the ratio $\frac{Y_{TW}^{net}}{L_{TW}}$ is higher for them because the numerator and the denominator are closer figures. However, it can be easily observed that none of the results found for consumption wedges are maintained when the TW (income) wedge is added (Table 9), because the larger figures of the latter have stronger effects than the smaller figures of the former.

In addition, comparisons across countries show that the relative positions in TW (**Table 8**) are mostly kept when adding consumption wedges (**Table 9**). Some changes can be found, but they are usually swaps between two countries that present similar income tax wedges (e.g. Spain and the Slovak Republic for family 8 or Austria and Denmark for family 3).

Since these averages do not show the variability in consumption patterns, Figures S.2 to S.9 present for each family type the median (line) and the 10th (dot) and 90th (arrow) percentiles of the overall tax wedges (OTW), together with the income tax wedge (ITW, as a cross). Nevertheless it must be noted that they only show countries for which the individual data were available.

Figure 2. **Tax wedges for family type 1: Single person without children at 67% of average earnings.**

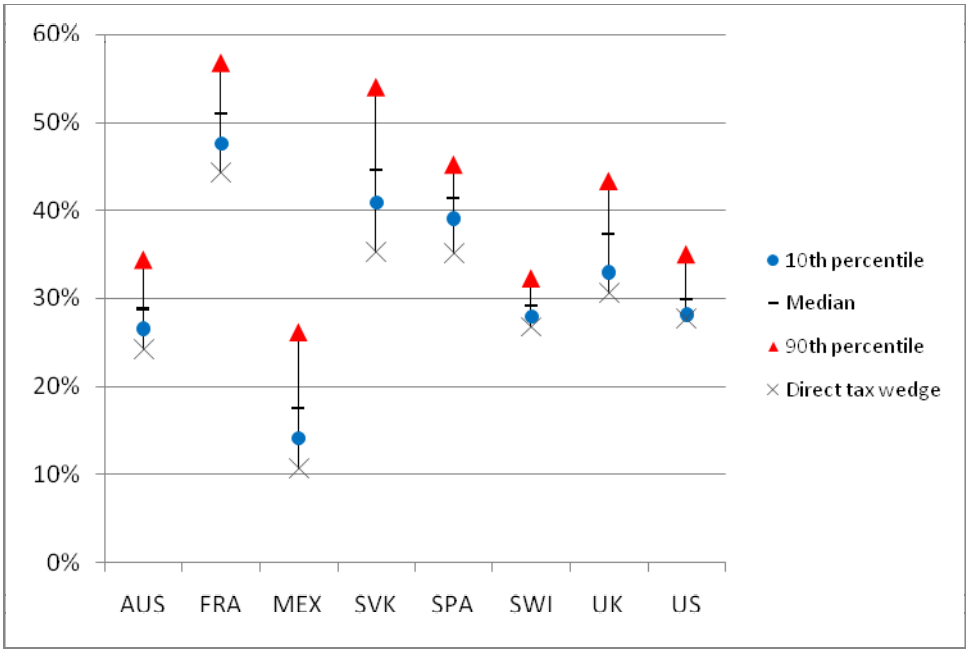


Figure 3. **Tax wedges for family type 2: Single person without children at 100% of average earnings.**

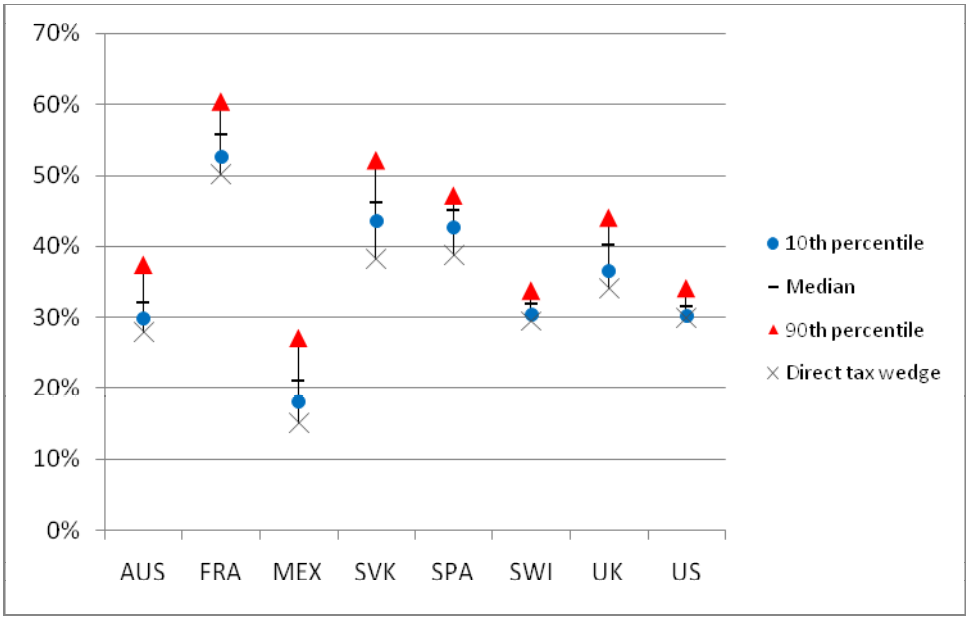


Figure 4. **Tax wedges for family type 3: Single person without children at 167% of average earnings.**

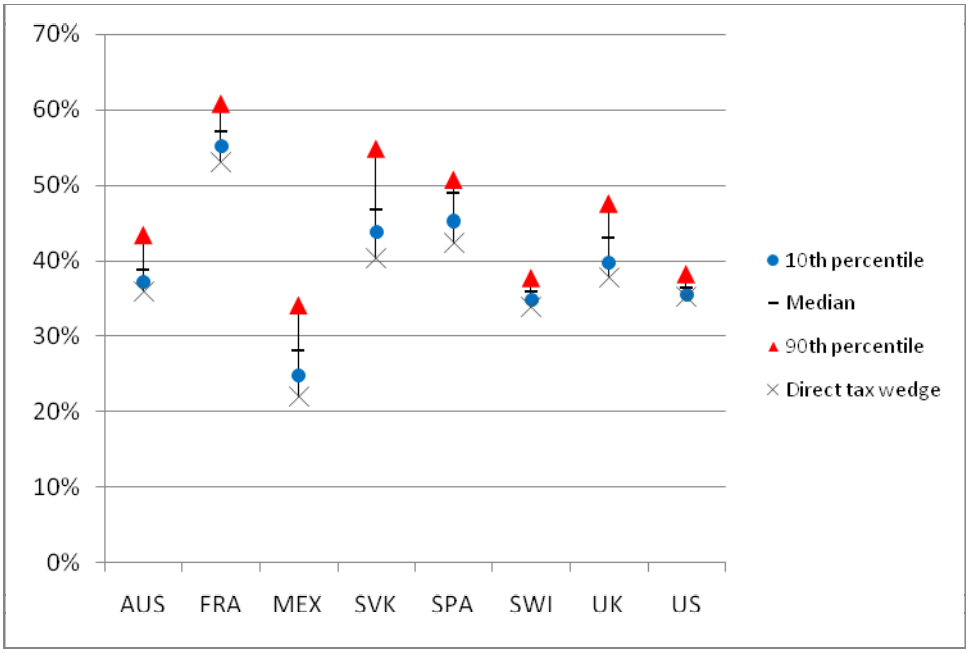


Figure 5. **Tax wedges for family type 4: Single parent with two children at 67% of average earnings.**

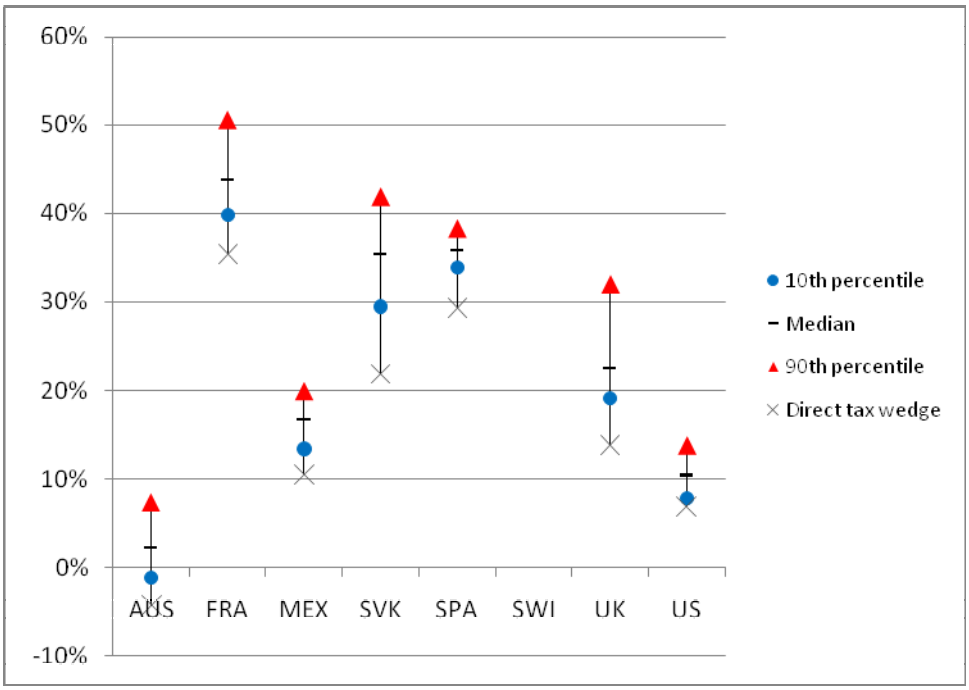


Figure 6. **Tax wedges for family type 5: One-earner married couple with two children at 100% of average earnings.**

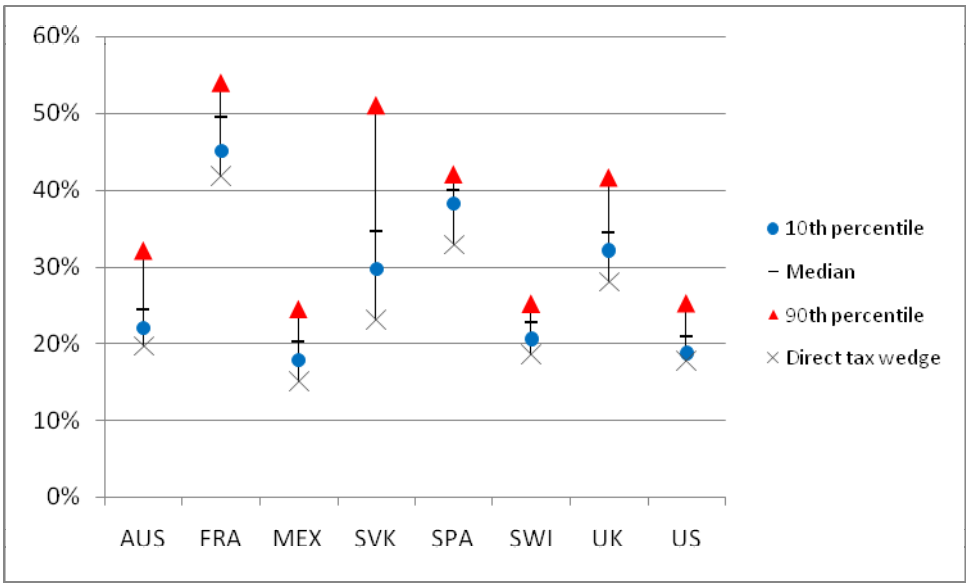


Figure 7. **Tax wedges for family type 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%.**

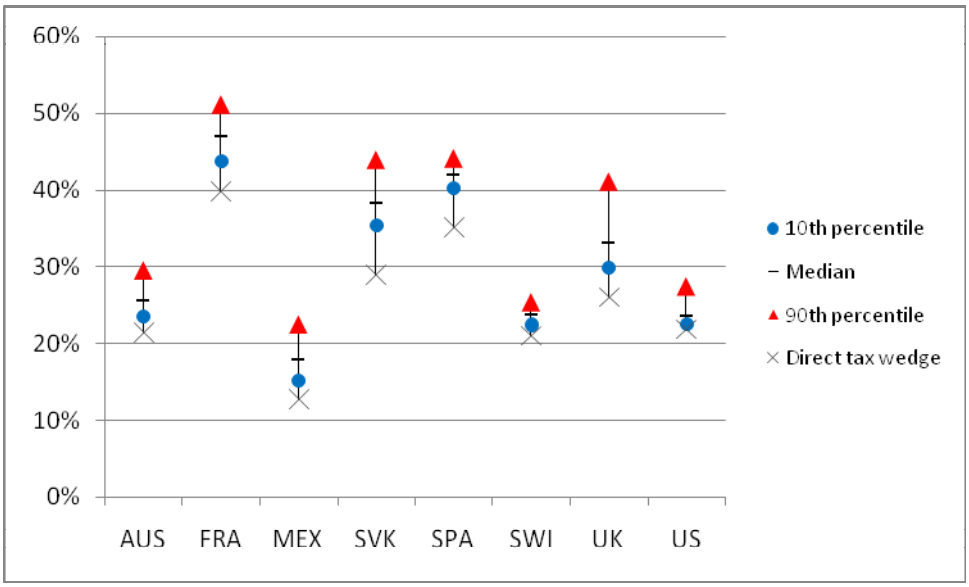


Figure 8. **Tax wedges for family type 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%.**

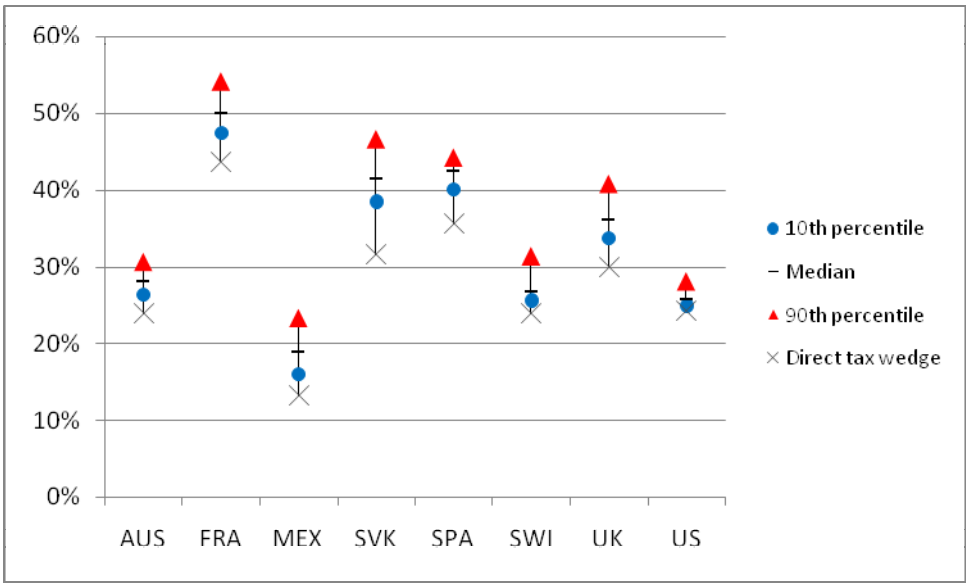
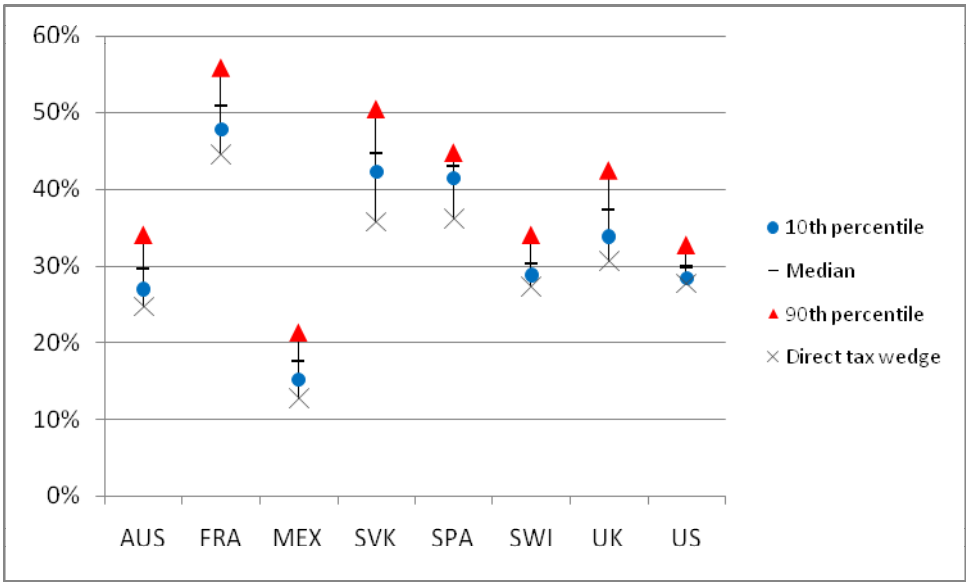


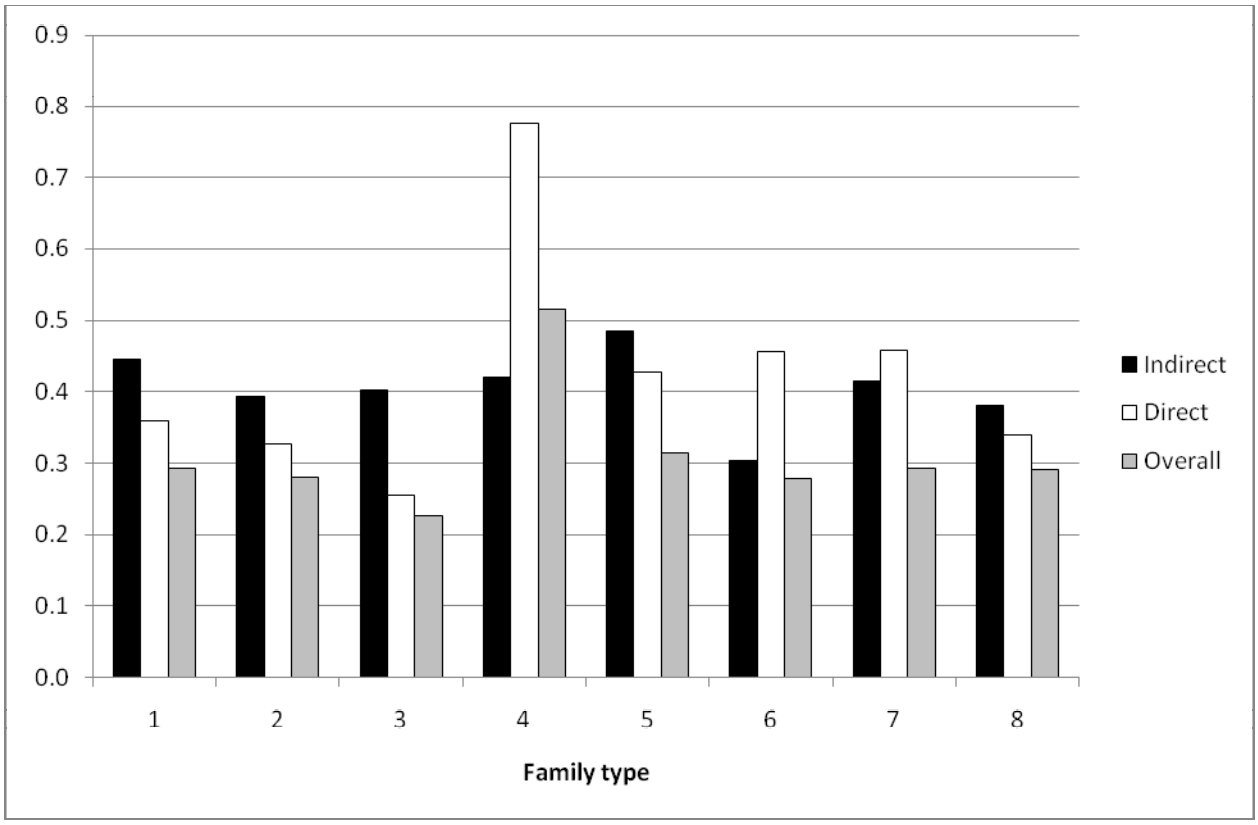
Figure 9. **Tax wedges for family type 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.**



As was seen in the tables, the inclusion of consumption taxation does not change the relative positions of countries in a relevant way. But unlike when averages are considered, if the whole range between the 10% and the 90% percentile is analysed, many cases of overlapping can be found. This means that when a country has a lower income tax wedge than another country, there may be some people in the former country that may bear a higher overall wedge than in the latter. This happens mainly in EU countries, the Slovak Republic being the clearest example, since its large ranges make some people face larger overall tax wedges than in other EU countries, even though their direct tax wedges are lower.

Finally, a simple analysis is carried out regarding tax mix issues. As already stated, since OECD countries present different tax mix patterns, it could be expected that when both consumption and income taxation are taken into account, tax rates tend to converge. To test this, **Figure 10** shows the coefficient of variation for the three wedges in tables 7 to 9. It can be seen that for all families the coefficient for the overall tax rate is always lower than the one for income tax rate, so it seems that dispersion clearly reduces as a result of the inclusion of consumption taxation.

Figure 10. **Coefficients of variation of tax wedges among the eight countries**[1]



1. Family types are: 1: Single person without children at 67% of average earnings; 2: Single person without children at 100% of average earnings; 3: Single person without children at 167% of average earnings; 4: Single parent with two children at 67% of average earnings; 5: One-earner married couple with two children at 100% of average earnings; 6: Two-earner married couple with two children, one at 100% of average earnings and the other at 33%; 7: Two-earner married couple with two children, one at 100% of average earnings and the other at 67%; 8: Two-earner married couple with no children, one at 100% of average earnings and the other at 33%.

8. Conclusions

The objective of this paper is to give an idea of the possible consequences of broadening the Taxing Wages model by including consumption taxation. To deal with this objective, an experimental methodology has been developed, using microdata from Household Budget Surveys to simulate consumption taxes for the eight Taxing Wages family types. Once calculated, these taxes are added to the income taxes traditionally calculated in Taxing Wages, in order to obtain an overall tax wedge that reflects simultaneously the amount of income and consumption taxes paid by families in relation to total labour costs.

This approach has been shown to have several important limitations, including the unknown quality of the data used, the small size of some subsamples, the imprecise allocation of some tax rates, the difficult treatment of housing costs and the treatment of VAT-exempt goods as if they were zero-rated. All these shortcomings make it unwise to use the results at this stage to make international comparisons or as a guide for tax policy.

Nonetheless, even though the results are subject to error, the methodology has shown substantial differences in VAT/sales tax among the analyzed countries (the excise results being less robust). These differences offset the differences in income tax wedges to a considerable extent. In short, it can be concluded that, though the methodology is far from being an accurate approach, it proves that the inclusion of consumption taxation has a significant effect in the Taxing Wages comparisons, so improved or alternative ways of including it should be explored.

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