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Summary

National policymakers are increasingly aware that their tax policy options are constrained by international tax competition. Important features of national tax systems - notably the tax mix, tax rates and rules which define the tax base - will influence decisions of firms and individuals regarding the location and (re)structuring of economic activities.

The aim of the present paper is twofold: Firstly, we detail the tax mix of four member states of the European Union (Germany, The Netherlands, Spain and United Kingdom). Secondly, the paper aims to trace the distribution of the tax burden over rich and poor households in these four countries. Although tax mix and tax rates differ considerably among the four countries included in the study, the distribution of tax burdens proves to be amazingly similar.

JEL: H24, D30, D31

Keywords: *Distribution of tax burden, European Union; tax mix of Germany, the Netherlands, Spain and United Kingdom*

Zusammenfassung

Die Regierenden eines Landes sind sich zunehmend bewußt, daß ihre steuerpolitischen Entscheidungsmöglichkeiten durch internationale Steuerkonkurrenz eingeschränkt werden. Wichtige Eigenschaften der nationalen Steuersysteme - insbesondere zu nennen sind hierbei die Steuerstruktur, die Steuersätze und die Steuervorschriften, die die Besteuerungsbasis definieren - beeinflussen die Entscheidungen der Firmen und der Individuen hinsichtlich der Standorte und (Re)strukturierung der ökonomischen Aktivitäten.

Mit dieser Studie verfolgen wir zwei Ziele: Zuerst gehen wir detailliert auf die Steuerzusammensetzung der vier EU-Mitgliedsländer (Deutschland, Niederlande, Spanien und Großbritannien) ein. Zweitens wird die Verteilung der Steuerlast über reiche und arme Haushalte jeweils für die vier Länder aufgezeigt. Obwohl die Steuerstruktur und die Steuersätze zwischen den vier Ländern, die in der Studie betrachtet werden, sehr unterschiedlich ausfallen, ist die Steuerlastverteilung der betrachteten Länder erstaunlich ähnlich.

JEL: H24, D30, D31

Schlagwörter: *Verteilung der Steuerlast, Europäische Gemeinschaft, Steuerstruktur von Deutschland, den Niederlanden, Spanien und Großbritannien*

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THE DISTRIBUTION OF EFFECTIVE TAX BURDENS IN FOUR EU COUNTRIES

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I Introduction

National policymakers are increasingly aware that their tax policy options are constrained by international tax competition. Important features of national tax systems – notably the tax mix, tax rates and rules which define the tax base – will influence decisions of firms and individuals regarding the location and (re)structuring of economic activities. Apart from such *passive* impacts of past and present tax policies, nation states and regions within national boundaries have demonstrated a keen interest to attract investment and capital through the *active* use of a wide array of tax instruments. Typically, incentives include generous specifications of tax deductible costs, accelerated depreciation schemes, reduced tax rates or even full 'tax holidays' for a given number of years.

Traditionally, *nominal* tax rates – set by lawmakers – get much attention when policymakers, opinion leaders and representatives of the business community discuss the position of their country in the international tax race. Of course, tax lawyers and tax economists are usually aware that it is *effective* tax rates that matter most. If high nominal rates are applied to a heavily eroded tax base, the outcome will be only moderate effective rates. There is some irony in the fact that base erosion – which, given budgetary needs, pushes up nominal rates – is partly or largely caused by skillful exploitation of existing tax incentives. This having been said, it is important to note that on the other hand social, psychological and economic impacts of nominal rates may prove to be substantial, because many taxpayers do not pierce through the veil of (high) nominal rates.

The aim of the present paper is twofold. First, to detail the tax mix of four member states of the European Union, *i.e.* – in alphabetical order – Germany, the Netherlands, Spain and the United Kingdom. Together, these countries account for over fifty percent of Gross National Product (GNP) of the Union. Secondly, the paper aims to trace the distribution of the tax burden over rich and poor households in these four countries. Since no recent data are readily available, our results relate to the situation in the early 1990s and allow conclusions to what degree the existing variation in nominal rates of major taxes (personal income tax, value added tax and social insurance contributions) leads to country-specific patterns of tax incidence. Although tax mix and tax rates differ considerably among the four countries included in the study, the distribution of tax burdens proves to be amazingly similar. Given the 'stickiness' of income distributions and relatively stable national tax mixes, our results also seem to adequately describe tax distributions as in the mid 1990s.

The paper is organised as follows. Section II introduces the tax system of the four EU member states. Next, section III discusses the empirical analysis of tax incidence. Section IV, displays the incidence of national tax systems. Section V concludes.

II Tax system of four EU member states

II.1 Introduction

This section will first present some key demographic and economic data for each nation covered by the study. Since the paper analyses tax distributions in the early 1990s, such data given here relate to that same time period. Table 1 compares the size of their populations, and GDP per capita in 1991. Germany had both the largest population and highest per capita income (data refer to former West Germany only). Purchasing power per capita in Spain was at two-thirds of the German level.

Table 1 Demographic and economic country profiles, 1991

	Germany ^{a)}	Netherlands	Spain	UK
Population (x 1 mln)	63.9	15.1	39.0	57.6
GDP per capita (\$)				
- current exchange rates	24,585	19,300	13,510	17,600
- purchasing power parity	19,500	16,530	12,675	15,720
- index ppp (Germany = 100)	100	85	65	81

^{a)} Data refer to former West Germany only.

Source: OECD, 1993a, pp. 6-7, 24-25¹

Table 2 compares the role of the public sector. In 1991, total public spending amounted to between 40.2 (UK) and 55.2 percent (Netherlands) of GDP. International comparisons of spending levels must be interpreted with care, because the role of off-budget items and tax expenditures may greatly vary from one country to another (Organization for Economic Cooperation and Development (OECD)).²

Table 2 Public sector, 1991 (% of GDP)

	Germany	Netherlands	Spain	UK
Total outlays	49.2	55.2	45.0	40.2
Current receipts	45.6	52.7	40.0	37.4
Deficit	3.6	2.5	5.0	2.8
Gross public debt	45.0	78.3	45.5	40.4

Source: EC, 1993³

By the early 1990s, all countries ran deficits, because current public receipts fell short of outlays. In 1991 Spain showed the largest gap between public outlays and current receipts. At

¹ OECD, Economic Outlook, 54, Paris, 1993a.

² OECD, 'The role of the Public Sector', OECD Economic Studies (4), Paris, 1985, pp. 27-90

³ OECD, Revenue Statistics 1965-1992. Paris, 1993b.

the time, the Netherlands boasted the smallest deficit, but on the other hand it had the largest public debt in terms of Gross Domestic Product.

Ratios of total tax revenue to GDP display much diversity among EU member states. Moreover, country positions may strongly vary according to the taxes which are taken into account. This is especially important as regards the inclusion or the exclusion of compulsory social insurance contributions. For example, excluding such contributions, in 1990 the tax level in the Netherlands was below the EU average. Including social insurance contributions, the Netherlands had one of the highest tax levels in the whole EU area. We reckon social insurance contributions as taxes here.

Table 3 shows the ranking of the four countries by their tax-to-GDP ratios. The tax structure of any country may be characterised by the relative shares of various types of taxes. In addition to total tax levels, table 3 displays the tax mix. In Germany, the Netherlands and Spain social insurance contributions are the single most important source of public revenue. In the UK they remain far behind. Receipts from this source vary strongly among countries, reflecting varying degrees of coverage and generosity of programmes, as well as different methods of financing social security transfers.

Table 3 Tax mix of selected EU Member States, 1991 (% GDP)^{a)}

	Personal income	Corporate income	Property	Consumption	Social insurance contributions	Total taxes
Netherlands	12.3	3.4	1.7	11.9	17.4	47.0
Germany	10.6	1.7	1.1	10.5	15.3	39.2
United Kingdom	10.3	3.2	3.0	11.8	6.4	36.0
Spain	8.1	2.7	1.8	9.8	12.3	34.7
EU average	10.9	3.0	1.9	12.9	11.9	41.2

^{a)} Countries ranked by decreasing tax-to-GDP ratio.
Source: OECD, 1993b, pp. 75-86

Only in the Netherlands the share of personal income tax revenues exceeds the EU average. In Germany the share of the corporate income tax is below average. In relative terms, property is heavily taxed in the United Kingdom. In Spain, consumption and personal income are taxed relatively moderately.

II.2 Germany

Germany finances its public expenditures out of tax revenues and through social contributions. The personal income tax constitutes the single most important source of public revenue. In the FRG it consists of a wage withholding tax and the income tax proper. Table 4 shows that over the period 1980-1992 the share of the income tax has varied between 23% and nearly 26% of total revenue from taxes and contributions.⁴ Another important tax is the value-added tax (including the import turnover tax) with a tax share of about 15%. Various duties and consumption taxes, including the mineral oil tax and tobacco taxes, are included in table 4 as 'other taxes'. In recent years their share increased from 8% (1990) to 10% (1992).

The national social insurance system, which includes old age pensions, health insurance, disability and unemployment insurance, is financed by both employers and employees. The share of employer contributions in the tax mix has slightly decreased, to 18.5% in 1992, whereas the share of employee contributions increased from 18% (1980) to more than 21% (1992).

It is remarkable, that whereas total revenue from taxes and contributions has doubled after 1980 (from 580 bn to 1160 bn Dmarks in 1992), the structure of the tax mix has only marginally changed over the past fifteen years.

Table 4 Tax mix of Germany, 1980-1992 (% share)

	1980	1985	1990	1991	1992	DM bn (1992)
Personal income tax	25.6	23.8	23.0	23.1	23.5	273
Employee social insurance	17.9	22.0	22.5	21.5	21.2	246
Employer social insurance	19.1	18.9	19.2	18.8	18.5	215
Value-added tax	16.1	14.8	15.9	16.4	16.5	192
Other taxes	8.7	8.3	8.2	9.9	10.0	116
Local government taxes	8.9	7.9	8.0	7.4	7.5	87
Corporate income tax	3.7	4.3	3.2	3.0	2.8	32
Total	100	100	100	100	100	
Total revenue (DM bn)	580	740	930	1064		1161

Source: Statistisches Bundesamt, *Statistisches Jahrbuch*, various issues

⁴ Information given in table 4 is only available for the former Federal Republic of Germany (FRG), with the exception of data on municipal, federal and trade taxes, which as from 1991 include those of the five new states (Länder).

II.3 Netherlands

In the Netherlands, public outlays are over three-quarters financed out of taxes and social insurance contributions. Non-tax revenues and new debt bridge the gap that remains. In 1992 total tax revenues amounted to Gld 267bn (table 5), which roughly equalled 48% of GDP. In addition to Gld 162 bn in central and local government taxes, contributions to finance public social insurance programmes constitute a very important source of revenue to the public sector (Gld 105 bn).

The personal income tax and contributions to finance the general social insurances dominate the tax system, each accounting for about one-quarter of total tax revenues. Less than 10% of income tax due is collected by assessment, the remainder being collected by withholding the tax at source, the latter method being applied to wages, private pensions, social insurance and welfare benefits (wage tax), and dividends (dividend tax). Resident tax-payers are taxed on their world-wide income, that has been earned within a given calendar year. As a rule, private capital gains are not taxed. Income is taxed under a three-bracket rate schedule at 13%, 50% and 60%, respectively. Households with a net worth over (roughly) Gld 200,000 and over are liable to a net wealth tax (rate 0.8%). Revenues from this net wealth tax amount to Gld 1.4 bn.

In 1991, contributions to finance general social insurances produced nearly Gld 63 bn. All residents are covered by four *general* social insurance programmes, the most important one being the general old-age pension scheme. Contributions to finance the general social insurances have a flat rate (25%), with a cap, since these taxes are due on income in the first income tax bracket only, while the personal exemptions apply. Thus, the combined rate of the personal income tax and general social insurance contributions comes to (13+25=) 38%, 50% and 60% respectively.

Value-added tax and contributions to finance the *employee* social insurances each raise over Gld 40 bn. Participation in the employee social insurances is mandatory for all workers in the market sector. Insured workers are entitled to benefits in case of unemployment, sickness and disability. The tax basis is gross wage. Part of this flat rate tax is withheld from employee wages, part is directly paid by employers. The maximum amount of earnings subject to contributions for employee social insurances is about Gld 75,000 (1992).

Over the whole 1980-1992 period, the tax mix in the Netherlands has not fundamentally changed. However, the share of the personal income tax and employee social insurance contributions has somewhat declined, whereas the share of general social insurance contributions and local plus green taxes increased by several points.

Table 5 Tax mix of the Netherlands, 1980-1992 (% share)

	1980	1985	1990	1991	1992	Gld bn (1992)
Personal income tax	25.3	18.1	23.6	25.2	23.7	63.4
General social insurance	21.3	27.4	20.6	21.3	23.5	62.7
Employee social insurance	18.0	17.9	17.5	16.8	15.7	42.0
Value-added tax	15.7	16.1	16.0	15.2	15.1	40.5
Other taxes	7.0	7.1	7.6	7.5	7.6	20.1
Corporate income tax	6.5	6.8	7.5	7.2	6.5	17.3
Excise taxes	4.5	4.1	4.3	4.0	4.7	12.6
Local and green taxes	1.7	2.5	2.9	2.8	3.2	8.5
Total	100	100	100	100	100	
Total revenue (Gld bn)	156	192	231	256		267

Source: Central Bureau of Statistics, various publications

II.4 Spain

The present Spanish tax system has its origin in the Tax Reform of 1977 which introduced for the first time a veritable personal income tax, together with a net wealth tax. The present top rate of the income tax is 56%. Up till now, the wealth tax has not been very effective in reducing the share in national income of the most affluent individuals.

The corporation income tax was reformed in 1978. The taxation of goods and services underwent important changes in the wake of the 1986 reform of most indirect taxes, which was motivated by the entry of Spain into the former EC. Particularly, the introduction of the value-added tax should be mentioned. The share of import taxes has dramatically dropped, also as a consequence of Spain joining the European Union.

Table 6 Tax mix of Spain, 1980-1992 (% share)

	1980	1985	1990	1991	1992	Pst bn (1992)
Social insurance contributions	46.3	39.5	35.5	35.9	36.0	7555
Personal income tax	18.5	19.3	22.3	24.0	25.0	5244
Value-added tax	-	-	14.4	14.3	14.7	3079
Other indirect taxes	18.9	25.0	12.8	12.8	13.5	2833
Corporate income tax	4.8	5.3	9.2	8.0	6.8	1438
Other direct taxes	2.8	2.8	2.4	2.1	1.6	331
Wealth tax	1.0	1.0	1.1	1.1	1.1	223
Customs duties	6.9	6.6	1.7	1.3	0.8	165
Capital tax	0.7	0.7	0.7	0.6	0.6	122
Total	100	100	100	100	100	
Total revenue (Pst bn)	3908	8462	17221	18767		20990

Source: Banco de España, *National Accounts*

In Spain, social insurance contributions are the single most important revenue source of the public sector. The share of contributions in the tax mix fell during the first half of the 1980s and remained more or less stable as from the mid 1980s. Still, social insurance contributions made up over one-third of total tax revenue in 1992. The second most important tax source is the personal income tax, producing one-fourth of total revenue in 1992. The share of the personal income tax in GDP has significantly expanded, as a consequence of progressive rate increases and a marked growth in the number of persons reporting their income to the tax authorities. Given major changes in the structure of indirect taxation, the share of taxes on consumption (value-added tax and other indirect taxes) has remained remarkably stable over the 1980-1992 period, revenue from these sources amounting to over one-fourth of total tax proceeds. The share of the corporate income tax was rather volatile, with a clear peak in 1990.

II.5 United Kingdom

In 1992, UK general government receipts from taxation amounted to £210 bn, some 35% of GDP. In terms of revenue raised, the most important UK tax is personal income tax which generated 27% of total tax revenue in 1992. The other major UK taxes are National insurance (the UK social security tax), value-added tax, corporation income tax and excise duties. Together, these taxes produce over four-fifth of total UK tax revenues.

The income tax has three rates of 20%, 25% and 40%, respectively. Every individual is entitled to a personal allowance, which varies according to marital status and age. For roughly three-quarters of taxpayers, the 25% rate is their marginal rate of tax. Income tax is levied on an annual basis. The vast majority of revenue is collected by withholding the tax at source,

either by employers or by banks in the case of interest income and mortgage relief (MIRAS).

The social security tax, National insurance, is also levied on current income of employees and the self-employed. National insurance was levied at a rate of 9%, up to a ceiling of £21,840 gross income in 1993-94. Employers must also pay National insurance with a main contributions rate of 10.4% and no cap.

Value-added tax was introduced in 1973 when the UK entered the former EC. Since 1991 it has been levied at a standard rate of 17.5%. Roughly three-fifth of consumer spending is on goods that fall into the standard rate category, the major exceptions being food, children's clothing, books and newspapers and transport. Many basic necessities are taxed at zero rates. Excise duties - on beer, cider, wine, spirits, tobacco, petrol and vehicles - raise significant sums in the UK. In 1992 their revenue amounted to 70% of the proceeds from VAT.

Over the last fifteen years, the UK tax mix has changed substantially, due to both economic fluctuations and policy changes. The level of profits in the economy accounts for the changing importance of the corporation tax, while increasing personal incomes over the 1980s kept income tax revenues very buoyant, despite significant reductions in tax rates in the late 1980s. The most significant policy change has been the gradually expanding role of the value-added tax, as the standard rate rose from 8% in 1979 to 17.5% in fiscal year 1993-94.

Table 7 Tax mix of the United Kingdom, 1980-1992 (% share)

	1980	1985	1990	1991	1992	£ bn (1992)
Personal income tax	28.0	24.8	26.4	27.6	27.4	57.6
Value-added tax	13.3	14.4	15.0	16.1	17.9	37.7
National insurance	16.6	17.7	16.0	16.5	16.6	35.0
Excise duties	12.8	13.1	11.9	12.2	12.7	26.6
Corporation tax	5.9	6.9	10.8	9.3	7.6	16.2
Business rates ^{a)}	-	6.2	6.0	6.9	6.6	13.9
Other receipts	10.5	10.2	5.2	5.3	4.5	9.0
Local personal taxes ^{a)}	9.9	3.6	5.5	3.4	4.0	8.3
Capital taxes	2.0	2.2	2.4	1.9	1.9	3.9
Customs duties	1.0	0.9	0.8	0.8	0.8	1.7
Total	100	100	100	100	100	
Total revenue (£ bn)	84	137	203	208		210

^{a)} Local personal taxes in 1980 includes business rates, as they were not separately identified for this year.

Source: *Financial Statistics, Financial Statement and Budget Report, and Economic Trends Annual Supplement*, various issues

III Empirical analysis of tax incidence

III.1 Introduction

The *incidence* of a tax is measured by the reduction in real income that results from the imposition of that tax. Taxes may reduce the income of individuals as producers; or they may increase the prices of consumer goods and thus reduce the purchasing power of a given money income. Both effects will be charted here. However, no attempt is made to measure the burden that results from the reallocation of resources or the changes in consumption patterns that may be caused by taxation.

We want to establish who *pays* the taxes (*statutory incidence*) and who ultimately *bears* the tax burden (*economic incidence*). Both tax distributions will differ, since individuals and firms are inclined to *shift* taxes they must pay onto others. Although some progress has been made in recent years in improving the methodology of tax analysis, economists still disagree about the economic incidence of several of the most important taxes in the tax system. Given the state of the art, estimates of economic incidence will usually be based on a set of *incidence assumptions*. Once the statutory incidence of taxes has been established, their economic incidence may be traced under a variety of such assumptions.

To measure tax distributions, most economists will start to identify relevant income units, usually households or families.⁵ Then, many would prefer to employ a general equilibrium model to calculate the present value of tax burdens imposed upon each household over its lifetime. This burden would be compared to the households lifetime income. Recent work of Fullerton and Rogers⁶ stands as an example of the proper way to implement this methodology.

However, economists who work in the policy arena usually do not follow this "lifetime approach"⁷ (Barthold, 1993). Employing various methodologies, government organisations and policy advisors typically implement some form of "annual approach" . This approach, pioneered by Pechman,⁸ estimates the distribution of tax burdens in a given year. For all kind of practical reasons the annual approach will also be taken in this paper, although some economists would maintain the theoretical superiority of the lifetime approach.

Subsections III.2 and III.3 explore the 'Pechman approach' in greater detail and specify our shifting assumptions.

⁵ Household definitions may vary from one country to another.

⁶ Fullerton and Rogers, Who Bears The Lefetime Tax Burden?, The Brookings Institution, Washington D.C., 1993.

⁷ Barthold, 'How Should We Measure Distribution?', National Tax Journal, XLVI, pp. 291-299 (1993).

⁸ Pechmann, Who Paid The Taxes, 1965-1985, The Brookings Institution, Washington D.C., 1985.

III.2 Statutory incidence of taxes

Individuals pay taxes on the income they earn and on benefits received from the public sector.⁹ When spending their income on goods and services, given prices will usually include one or more taxes, such as value-added tax, excises and import duties. To establish how much tax an individual household actually pays in income and consumption taxes, any of two roads may be followed.

First, the necessary *data* may directly come from government or private administrations. As an example, the amount of personal income tax paid by households can be taken from the records of the tax administration. However, in most cases researchers have no access to data from government administrations. The other route for them to follow is to ask individuals or private firms how much they pay in specific taxes. As an example, researchers may organise a survey and ask a representative sample of the population how much they paid in personal income tax or wealth tax in the previous year. In most cases, however, surveys do not contain explicit questions about amounts of taxes paid. Moreover, in many cases individuals are not aware how much they pay in consumption taxes because in Europe, typically, such taxes are not separately identified on sales slips.

Still, given the necessary income and consumption data of households, the amounts paid in income and consumption taxes can be *calculated, using a microanalytic model*. Techniques available to microsimulate tax burdens of individual households are discussed in, among others, Orcutt et al.,¹⁰ Brunner and Petersen,¹¹ and Harding¹². Separate modules of such micromodels calculate personal income tax, and social insurance contributions due, given the income of each household in a representative sample, and taking account of its relevant socio-economic and demographic household characteristics. For example, the amount of personal income tax due will - apart from income - also depend on marital status and may vary with the number of children in the household. Also, provided the data set contains the relevant information, deductions and exempted income can be taken into account when simulating the amount of income tax due. If social insurance contributions are deductible for income tax purposes, the model first simulates contributions due. Next, this amount is deducted in simulating the income tax due.

Likewise, the burden of value-added tax, excises and import duties can be estimated for each individual household in a representative sample, by applying relevant tax rates to all items consumed as known from survey data.

⁹ It may be noted that many countries tend to exempt certain benefits from income taxation.

¹⁰ Orcutt, Merz and Quinke (eds.), *Microanalytic Models to Support Social and Financial Policy*, North-Holland, Amsterdam, 1986.

¹¹ Brunner and Petersen (eds.) *Prospects and Limits of Simulation Models in Tax and Transfer Policy*, Campus, Frankfurt/New York, 1990.

¹² Harding (ed.), *Microsimulation and Public Policy*, North-Holland, Amsterdam, 1996.

To summarize, to establish who pays how much in taxes, researchers may:

- take tax amounts as registered in government or private administrations;
- use tax amounts as reported in household surveys;
- allocate taxes in proportion to other items known from administrations or surveys (for example, food consumption);
- microsimulate tax amounts, using relevant information from administrations or surveys.

The final column of tables 10 through 13, which detail tax incidence in each of the four Member States, indicates for each tax how its statutory incidence has been established.

From the foregoing discussion, it follows that the availability of adequate data for a representative sample of households is essential to establish who pays the taxes. For each household in the sample the files must contain data on income from various sources, and also demographic and other economic information, such as the age of household members, the consumption on goods and services, home ownership, and so on. In case the necessary microdata are not or only partially available in one and the same dataset, tax researchers may combine data from two or more sources (administrations, surveys).

If no tax and household data are available from administrations or representative surveys among the population, tax researchers might also take recourse to an analysis of the tax burden of a few selected *representative economic agents*, for example a low, medium and high income household with given socio-economic and demographic status, and calculate the statutory incidence of personal income tax and employee social insurance contributions, applying standard tax deductions only. This approach underlies calculations of the tax/benefit position of production workers that are annually published by the Organisation for Economic Co-operation and Development¹³. Likewise, the burden of consumption taxes may be estimated by analyzing data - from budget surveys, and national accounts - for a few consumer households deemed to be sufficiently representative for the population as a whole. We will not report on tax burdens of such representative households, because fortunately rich datasets are available which allow to trace taxes actually paid by a representative sample from the total population.

III.3 *Economic incidence of taxes*

We have already remarked that, in order to determine who *bears* the tax burden, it is necessary to consider how different taxes may be shifted from some individuals onto others. Studies which try to trace the economic incidence of taxes by income class must include a set

¹³ OECD, *The Tax-Benefit Position Workers, 1992-1995*, Paris, 1996.

of *assumptions* about the incidence of major taxes. Following Pechman¹⁴ we have selected a set of rather eclectic incidence assumptions which underpin the results to be presented in section IV.

A. Personal income tax (including wage tax) and net wealth tax are assumed not to be shifted and are thus borne by those who pay these taxes.

B. Value-added tax, excises, import duties, agricultural levies and the car tax are assumed to be borne by consumers of the taxed commodities in proportion to their consumption of taxed items.

C. Social insurance contributions paid by workers, self-employed and benefit recipients are assumed to be borne by them.

D. Social insurance contributions imposed on employers are assumed to be shifted for three-quarters to employees, and for one-quarter to consumers.

E. Corporation income tax (plus dividend tax) is allocated one-third to shareholders, one-third to property income in general and one-third to consumers.

F. Property tax on commercial and industrial buildings is assumed to be shifted to consumers; the property tax on houses is borne by renters and owner-occupiers respectively.¹⁵

Results presented here of course critically depend on this set of assumptions. However, our results do not change very much if alternative plausible sets of assumptions are adopted. In his pathbreaking study, Pechman¹⁶ used nine separate sets of incidence assumptions. In each case, however, assumptions A, B and C were taken to apply. Pechman used alternative assumptions to trace the economic incidence of corporation income tax, property taxes and social insurance contributions levied from employers. Because these taxes have no dominant role in most national tax mixes, it follows that the combined incidence of all taxes remains more or less stable, regardless of the alternative shifting assumptions adopted.

Our incidence assumptions may also be compared to the shifting of taxes which is embodied in 'behavioural equations' that are part of widely used macroeconomic models. There are a great many of such models, which are typically employed to analyse the short and medium

¹⁴ Pechmann, *Who Paid the Taxes, 1965-1985*, The Brookings Institution, Washington D.C., 1985. pp. 23-41.

¹⁵ As to assumption C, it might be remarked that as employer social insurance contributions increase the gap between the producer price and the consumer price of labour, they are not different in incidence from employee social insurance contributions. Hence, it might alternatively be assumed that the burden would fully be shifted to employees, and not for only 3/4.

As to assumptions D (and E) the following observation seems to be in order. Given efficient capital markets, share prices will change so as to equalise rates of return taking into account existing corporate tax regimes. For this reason, corporate taxes are not only paid by shareholders. It is most likely, that instead corporate taxes are borne in part by consumers and labour, the exact mix depending partly on the proportion of products that is exported. However, the incidence assumptions chosen here more closely reflect an 'average' of Pechman's approach.

¹⁶ Pechmann, *Who Paid the Taxes, 1965-1985*, The Brookings Institution, Washington D.C., 1985, P. 35.

term impacts of various policy measures, including effects of changes in tax rates. However, macroeconomic models are less suited to estimate the long term economic incidence of taxes, which is exactly the topic of this paper.

IV Incidence of national tax systems

IV.1 Introduction

This section estimates and discusses distributions of statutory and economic tax burdens in four selected member states of the European Union. Tax incidence will be estimated for some year in the early 1990s, using recent microdata for representative samples of households. It should be stressed that only this micro approach allows distributional analyses as presented here.

Given the limitations inherent to available microdata, it was not possible to calculate the burden of all taxes. Taxes covered in this report range from between 62% of total taxes for Germany to 98% of all taxes for the Netherlands (table 8). Also, the base year is not exactly the same for countries included in our analysis. Given the small spread in the base year (1989-1993)¹⁷ and the generally observed relative stability of tax structures and income distributions over limited time periods, results presented here still allow comparison of the distribution of tax burdens in the four EU member states under consideration.

Table 8 Taxes covered and datasets used

	taxes covered (%)	dataset	year
Germany	62	German Socio Economic Panel	
		Einkommens- und Verbrauchsstichprobe (EVS)	
Netherlands	98	Panel Survey of Income	1991
		Consumer Survey	1992
		Housing Demand Survey	1989
Spain	93	Family Expenditure Survey	1990
United Kingdom	94	Family Expenditure Survey	1993

To calculate tax distributions, a four-step procedure will be followed.

First, for each country one or more representative samples with household data have been selected. In their characteristics the households in these samples closely mirror the population at large.

Second, the taxes each household in the sample pays have to be determined. It will be

¹⁷ The German EVS (1983) is the exception here.

recalled from subsection III.2 that the amount of taxes households pay may be traced in either of three ways. Sometimes information about taxes paid is directly available in the dataset (from an administration or survey). In other cases taxes paid have been simulated, for example by combining consumption data and statutory VAT-rates. Also, given income components and household composition, levies on income may be simulated with a microanalytic model.

The final column of tables 9 through 12, which detail tax incidence in each of the four member states, contains a code, which indicates for each tax how its statutory incidence has been established:

- ADM - tax amount as registered in government or private administrations; or
 - taxes allocated in proportion to other items from administrations (for example, dividend income);
- SUR - tax amount as reported in household surveys; or
 - taxes allocated in proportion to other items from surveys (for example, food consumption);
- SIM- tax amount has been simulated, using relevant information from administrations or surveys.

Once taxes paid by each household have been determined, as a *third* step, all households are ranked in ten 10%-groups - commonly called 'deciles' - by increasing income. The first decile contains the 10% of households with lowest incomes, the tenth decile comprises the 10% of households with highest incomes.

In the *fourth* step, the share of (households in) each decile in the total revenue from each separate tax is established. The combined economic incidence of all taxes is then found by weighing distributions of individual taxes over deciles by their share in total revenue collected.

Apart from potential weaknesses embodied in our shifting assumptions, a further caveat applies. For technical reasons the crucial concepts of 'household' and 'income' may differ between countries. Such differences and their potential consequences are more fully examined in the paper commissioned by the EU/Directorate-General of Budgets, which is available from the Commission of the EU at request.

IV.2 Germany

Table 9 shows the economic incidence of 62% of all taxes levied in Germany (distribution of tax shares by decile). The results obtained are based on survey data for 1983 (value-added tax)¹⁸ and for 1990 (all other taxes). Given available data, the incidence of only three major taxes could be traced: the personal income tax, value-added tax and employee social insurance contributions. Given the three taxes included in the analysis and the composition of the German tax mix vis-à-vis the tax mix of the other three member states, there is no reason to expect *a priori* a fundamentally different pattern of tax incidence between countries considered here. Moreover, customs duties and agricultural levies have been apportioned to households proportional to total consumption and food consumption, respectively.

From table 9 it can be concluded that in the early 1990s the top decile paid slightly over one-quarter of all taxes covered. The next 40% of households generated 50% of total tax revenue, while the bottom half of the distribution contributed only one-quarter of all taxes. Given the tax base and rate structure of levies not included in the analysis, one might assume that the distribution of *all* taxes is less skewed to deciles with higher ranking numbers.

Table 9 Distribution of tax shares, Germany (% share)

Decile	1	2	3	4	5	6	7	8	9	10	Total	Share ^{a)}	Code
Personal income tax	1	2	3	5	6	7	9	12	17	39	100	23.5	SIM
Employee social insurance contributions	1	3	5	6	8	9	11	13	16	28	100	21.2	SIM
Value-added tax	4	5	5	9	8	10	12	13	14	19	100	16.5	SIM
Customs duties	4	5	5	9	8	10	12	13	14	19	100	0.7	SUR ^{b)}
Agricultural levies	5	6	6	10	9	11	12	13	13	15	100	0.2	SUR ^{c)}
Total all taxes	2	3	5	7	7	9	11	13	16	26	100	62.1	
<i>Memorandum items</i>													
Gross personal income	2	4	6	8	9	10	11	13	15	21	100		SUR
Net personal income	2	4	6	8	9	10	11	13	16	22	100		SUR
Consumption	4	5	5	9	8	10	12	13	14	19	100		SUR

a) Share (%) in tax mix (1992).

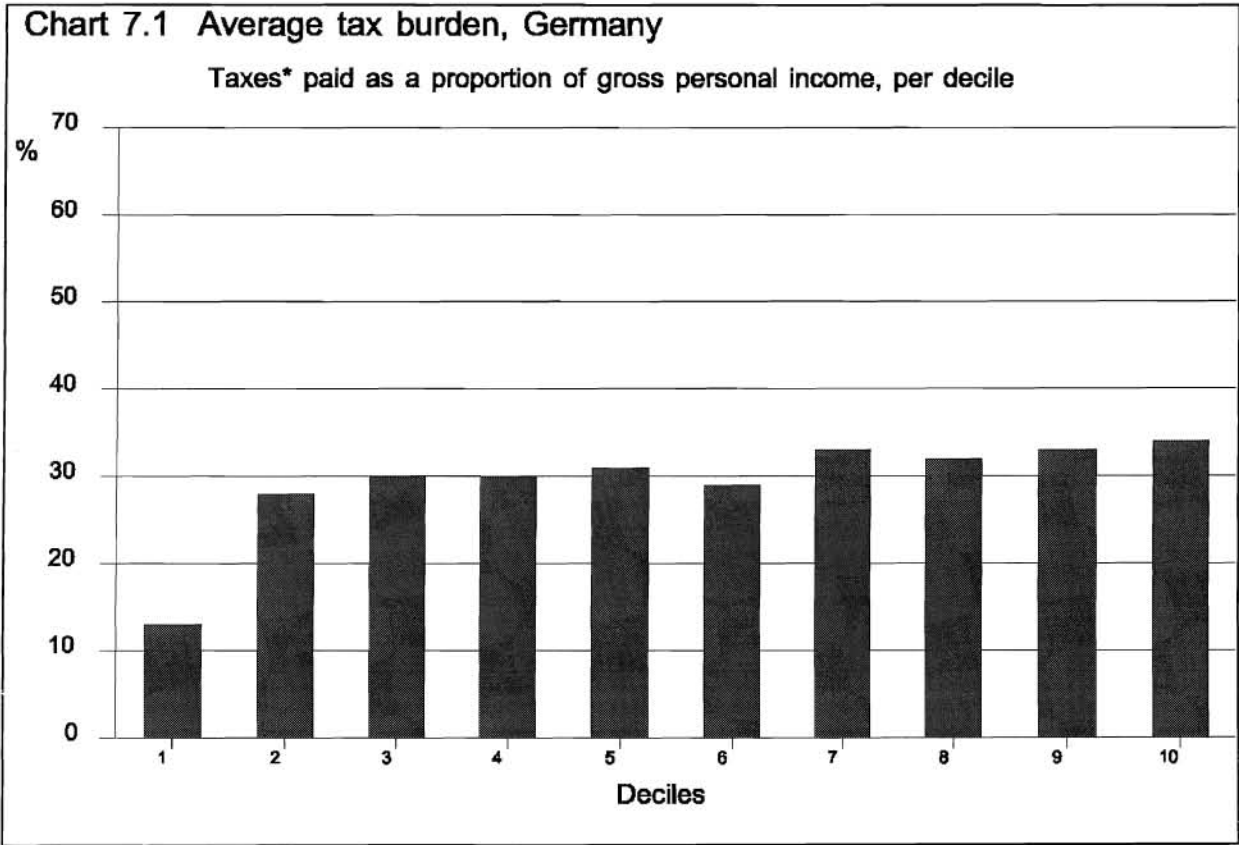
b) Tax share corresponds with share of each decile in aggregate household consumption.

c) Tax share corresponds with share of each decile in aggregate food consumption.

¹⁸ Although consumption data refer to 1983, their use seems to be admissible, given the stability of consumption patterns and the structure of VAT-rates.

Distributions of taxes paid by households in different deciles can present a misleading picture of the progressivity of the tax system, because such a presentation takes no account of the different income level in each decile. Therefore, Chart 1 also shows taxes paid by households in each decile as a proportion of *gross* personal income in that decile. This average tax burden is basically the economic incidence of all taxes included in the analysis, given our shifting assumptions.¹⁹

The distribution of the tax burden is remarkably flat, except for households ranked in the first decile. Clearly, regressive social insurance contributions largely outweigh the progressive personal income tax rate.



* Only personal income tax and employee social insurance contributions are included in this chart.

¹⁹ It should be noted that only personal income tax and employee social insurance contributions are included in chart 1.

IV.3 Netherlands

Table 10 shows the economic incidence of 98% of all taxes levied in the Netherlands (distribution of tax shares by decile). These results are based on data from the tax administration and on survey data for 1989, 1991 and 1992, respectively. In the early 1990s the top decile paid one-quarter of all taxes covered, the next 30% of households contributed 40% of total tax revenue, while the bottom half of the distribution generated 24% of all taxes.

The personal income tax and net wealth tax are clearly the most progressive levies. On the other hand, the local waste management tax – a user fee – is distributed over deciles nearly proportionally.

In the preceding section it has already been pointed out that distributions of taxes paid by households in different deciles can present a misleading picture of the progressivity of the tax system, because such a presentation takes no account of the different income level in each decile. Therefore, Chart 2 shows total tax paid by households in each decile as a proportion of aggregate *gross* household income in that decile. On average, households in the Netherlands hand over 60% of their gross income to the taxman.²⁰ The top two deciles pay only a few percentage points more. The bottom two deciles clearly experience somewhat lighter tax burdens, which makes the total distribution of tax burdens slightly progressive. Still, even the poorest households on average contribute nearly half of their gross income to the fisc.

²⁰ Taxes in the Netherlands amount to 48% of GDP, and absorb 60% of aggregate gross income of private households. Various factors may explain the difference. Mainly, value added tax (over 6% of GDP), retained corporate profits (around 4% of GDP) and investment income of pension funds (some 6% of GDP) are all included in GDP, but none of these components is received as current income by private households.

Table 10 Distribution of tax shares, the Netherlands (% share)

Decile	1	2	3	4	5	6	7	8	9	10	Total	Share ^{a)}	Code
Personal income tax	1	2	3	4	5	7	9	12	17	39	100	24.3	ADM
Value-added tax	4	5	6	8	9	10	12	13	15	19	100	15.5	SIM
Corporate income tax ^{b)}	3	2	4	5	6	7	10	12	16	36	100	7.2	ADM/SUR
Excise duties	2	4	6	9	10	11	13	13	15	17	100	4.8	SUR
Motor vehicle tax	2	3	6	10	11	11	11	13	15	18	100	1.6	SUR
Special tax on cars	0	0	4	3	3	6	21	13	23	26	100	1.3	SIM
Customs duties ^{c)}	5	5	7	8	9	10	12	13	14	18	100	1.3	SUR
Green energy taxes	4	6	7	9	10	11	12	12	14	16	100	0.5	SIM
Net wealth tax	12 ^{d)}	1	1	1	2	5	6	10	14	48	100	0.8	ADM
Agricultural levies ^{e)}	5	6	7	9	9	10	12	13	13	16	100	0.3	SUR
Local property taxes	5	5	6	7	10	10	11	12	15	21	100	1.3	SUR/SIM
Local waste man. tax	9	9	9	10	10	10	10	11	11	11	100	0.5	SUR
Local sewer tax	6	8	9	9	12	9	12	12	11	12	100	0.3	SUR
General social insurance contributions	2	3	5	7	9	11	13	14	16	19	100	28.8	SIM
Employee social insurance contributions													
- employees	2	3	6	8	10	11	13	14	16	17	100	2.3	SIM
- employers	2	4	6	8	10	11	13	14	15	16	100	7.3	SIM
Total all taxes	2	3	5	6	8	9	11	13	16	25	100	98.1	
<i>Memorandum items</i>													
Gross household income	3	4	5	7	8	10	11	13	15	24	100		ADM
Net household income	3	5	6	7	8	10	11	13	15	22	100		ADM/SUR
Labour income	1	1	3	5	8	10	13	15	19	25	100		ADM
Property income	2	2	3	5	7	9	10	13	17	33	100		ADM
Dividend income	2	0	1	1	2	4	7	10	16	57	100		ADM
Consumption	5	5	7	8	9	10	12	13	14	18	100		SUR

a) Share (%) in tax mix (1992).

b) Includes dividend withholding tax.

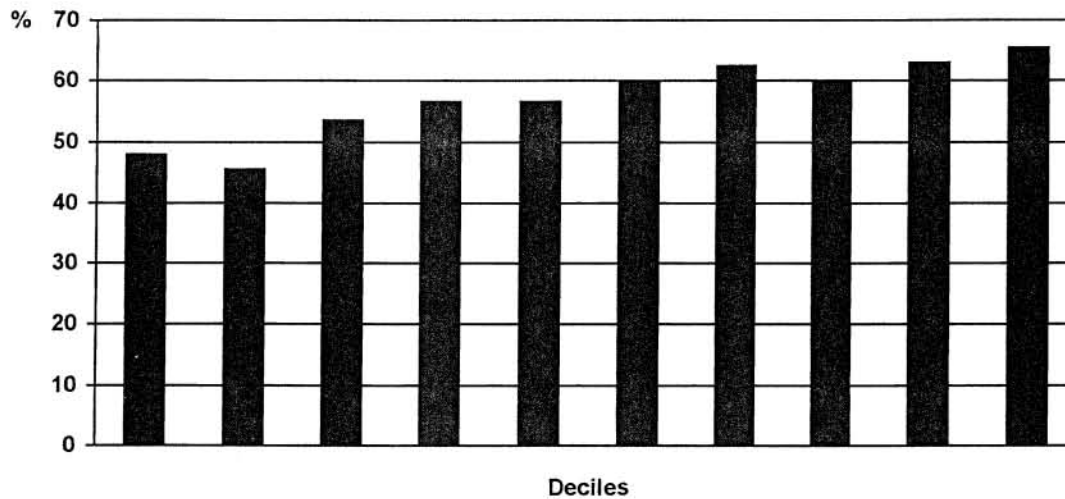
c) Tax share corresponds with share of each decile in aggregate household consumption.

d) The specific distribution of the Dutch wealth tax is a direct consequence of current tax planning practice. Several thousands of the most wealthy taxpayers have no (taxable) income and are therefore ranked in the first decile. Taxpayers with zero taxable income get a refund of wealth tax. Households concerned cover their costs of living through loans and tax-exempt capital gains.

e) Tax share corresponds with share of each decile in aggregate food consumption.

Chart 7.2 Average tax burden, Netherlands, 1991-1992

Taxes* paid as a proportion of gross personal income, per decile



* only personal income tax and employee insurance contributions are included in this chart.

IV.4 Spain

Table 11 shows the economic incidence of **93%** of all taxes levied in Spain (distribution of tax shares by decile). These results are based on survey data for 1990. In that year 26% of all taxes covered were paid by the top decile, and 50% by the next 40% of households, while the bottom half of the distribution contributed 23% of total tax revenue. Similar to the case of the Netherlands, the personal income tax and net wealth tax are clearly the most progressive levies.²¹ The corporate income tax and consumption taxes are much more evenly spread over deciles.

Chart 3 illustrates the average burden of all taxes included in table 11. On average, households in Spain hand over 53% of their gross income to the taxman. The top two deciles pay only two points more. The bottom three deciles experience somewhat lighter tax burdens, which makes the over-all distribution of taxes slightly progressive.

²¹ It might be noted that in the case of Spain the wealth tax has been fully allocated to the tenth decile, not on the basis of survey data but based on statistical data as published by the Administration.

Table 11 Distribution of tax shares, Spain (% share)

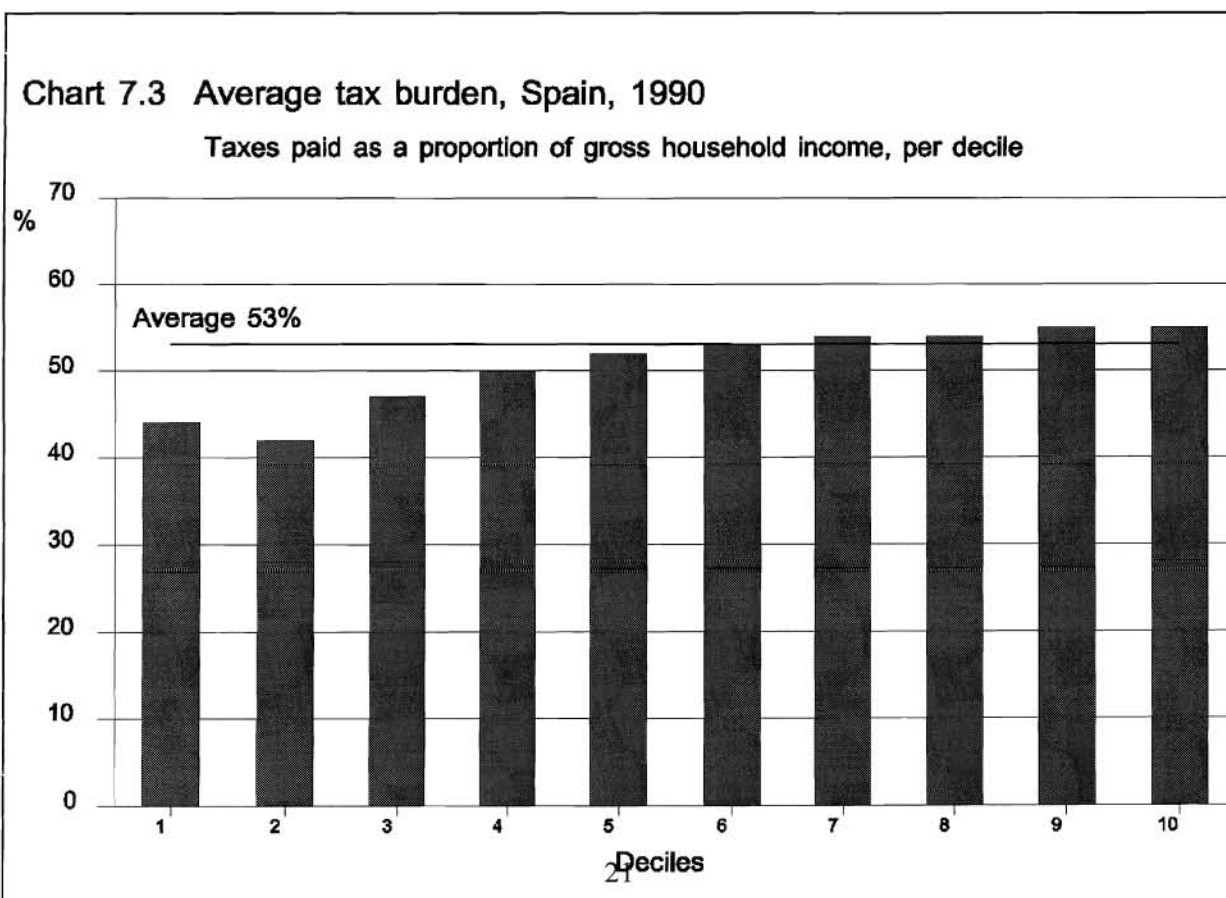
Decile	1	2	3	4	5	6	7	8	9	10	Total	Share ^{a)}	Code
Personal income tax	0	0	2	3	5	7	10	14	19	41	100	25.0	SIM
Net wealth tax	0	0	0	0	0	0	0	0	0	100	100	1.1	SIM
Corporate tax	4	5	6	7	9	8	10	10	14	27	100	6.8	SUR
Other direct taxes	5	6	7	8	9	10	11	12	14	19	100	1.6	SIM
Social insurance taxes													
- employer	2	3	5	7	8	11	12	15	17	21	100	25.6	SIM
- employee	1	2	4	6	8	9	12	15	19	25	100	10.4	SIM
Value-added tax	4	5	7	8	9	10	11	13	14	18	100	14.7	SIM
Excise duties	2	4	6	8	9	11	12	14	15	18	100	6.8	SUR
Customs duties ^{b)}	4	5	7	8	9	10	11	13	14	18	100	0.8	SUR
Agricultural levies ^{c)}	5	7	8	10	10	11	11	12	12	14	100	0.1	SUR
Total all taxes	2	3	4	6	8	9	11	14	16	26	100	92.7	
<i>Memorandum items</i>													
Gross household inc.	2	4	5	6	8	9	11	13	16	27	100		SUR
Net household income	3	4	6	7	8	9	11	13	15	24	100		SUR
Labour income	0	1	4	6	8	10	12	16	17	26	100		SUR
Property income	3	5	5	6	8	8	10	10	15	30	100		SUR
Dividend income ^{d)}	1	3	3	4	7	5	8	7	16	45	100		SUR
Consumption	4	5	7	8	9	10	11	12	14	19	100		SUR

a) Share (%) in tax mix (1992).

b) Tax share corresponds with share of each decile in aggregate household consumption.

c) Tax share corresponds with share of each decile in aggregate food consumption.

d) Includes interest.



V.5 United Kingdom

Table 12 shows the distribution of tax shares of nearly 94% of all taxes paid in the UK based on survey data for 1993.²² The table shows that the top decile pays over 30% of taxes covered, the next 40% of households generate slightly over 50% of total tax revenues, while the bottom half of the income distribution contribute only 17%.

The UK Income Tax, being the most progressive tax, is skewed very strongly to richer households, nearly half of its revenue is paid by the top decile alone. The tax share paid by the top deciles is also relatively high for Social Security taxes (National Insurance) and VAT. National Insurance paid by employers is more progressive because there is no ceiling on payments. In comparison, other UK taxes and especially excise duties have burdens spread more evenly amongst income deciles. In particular, beer and cigarette revenues have burdens that are spread evenly across the income distribution.

Table 12 Distribution of tax shares, United Kingdom, 1993-1994 (% share)

Decile	1	2	3	4	5	6	7	8	9	10	Total	Share ^{a)}	Code
Personal income tax	0	0	1	2	4	6	9	13	19	46	100	27.4	SIM
Social insurance taxes (NI)													
- employee	0	0	1	3	5	9	13	16	23	29	100	5.1	SIM
- employer	1	1	2	3	6	8	12	15	21	32	100	10.5	SIM
Value-added tax	3	3	5	6	8	11	11	14	16	23	100	17.9	SIM
Excise duties	3	4	6	8	9	11	12	13	16	18	100	12.7	SUR
Council tax + rebate	3	4	6	8	10	11	12	14	15	17	100	4.0	SIM
Corporation tax	2	3	5	5	6	8	9	12	13	37	100	7.6	SUR
Business rates	3	4	6	7	8	11	11	13	16	21	100	6.6	SIM
Customs duties ^{b)}	3	4	6	7	8	11	11	13	16	21	100	0.8	SUR
Agricultural levies ^{c)}	4	5	7	8	9	10	11	13	15	18	100	0.1	SUR
Total all taxes	1	2	3	5	6	9	11	14	18	31	100	93.7	
<i>Memorandum items</i>													
Gross household inc.	2	3	4	5	7	9	11	13	17	29	100		SUR
Net household inc. ^{d)}	3	4	5	6	7	9	10	13	16	27	100		SUR/SIM
Labour income	0	0	1	3	5	8	12	15	21	35	100		SUR
Property income	1	2	3	2	2	3	8	10	14	55	100		SUR
Dividend income	1	1	3	4	4	6	6	10	11	54	100		SUR
Consumption	3	4	6	7	8	11	11	13	16	21	100		SUR

a) Share (%) in tax mix (1992).

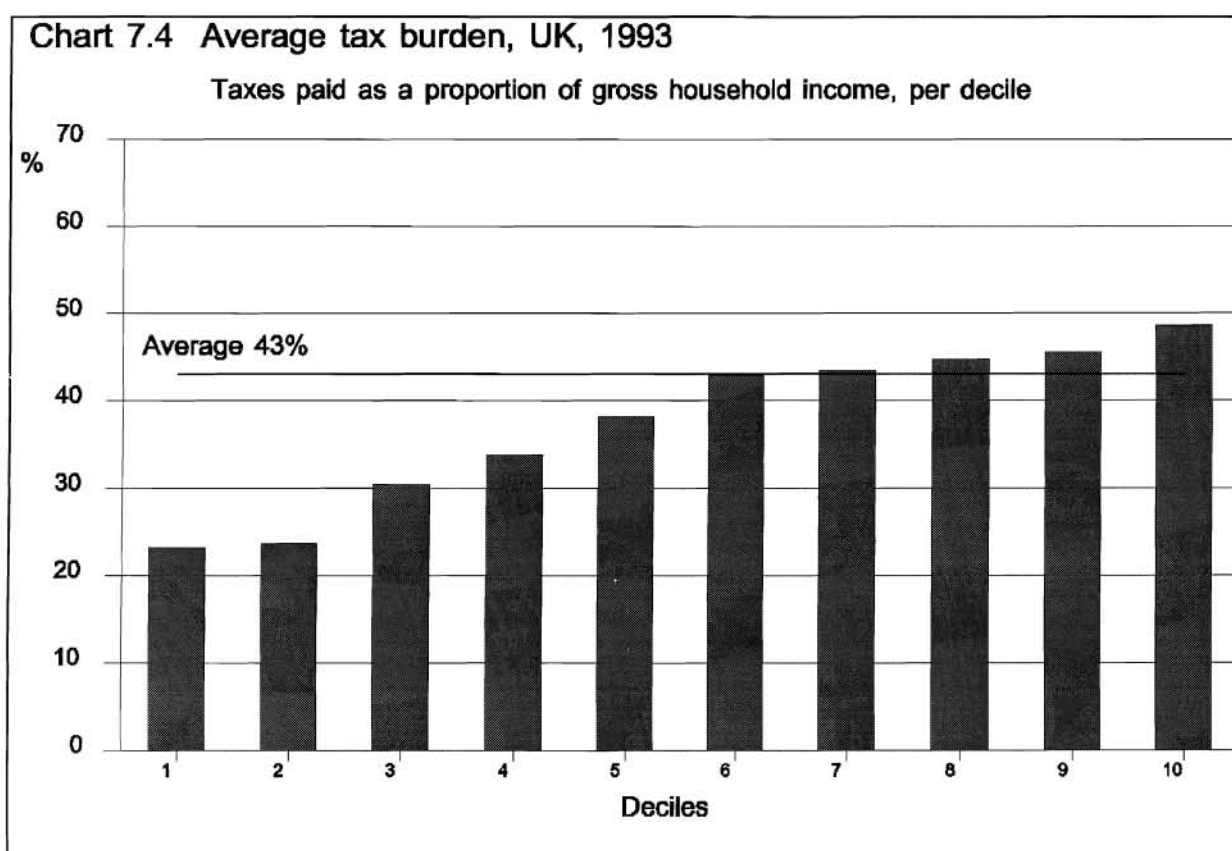
b) Tax share corresponds with share of each decile in aggregate household consumption.

c) Tax share corresponds with share of each decile in aggregate food consumption.

d) Income after deduction of all taxes that can be apportioned to individual households.

²² The taxes not modelled are capital taxes such as capital gains tax and inheritance tax. The incidence assumptions underlying table 12 are as in A-F (subsection III.3), except for corporation tax, which is allocated 50% to consumers and 50% to dividend income, because of data problems.

Chart 4 shows total taxes paid by households included in each decile as a proportion of aggregate *gross* income in that decile. On average, households pay 43% of their gross income to the Government in the included taxes. The distribution of payments is strongly progressive. The top decile pays several points more (48%) while households in lower deciles experience much lower average tax burdens. The sharply progressive nature of the UK tax system arises from the Income Tax system that exempts significant proportions of many households incomes and yet contributes more than a quarter of total government revenue. This very sharp increase in tax burdens displayed in Chart 4 would be slightly lessened if all taxes were included because the distribution of tax shares of the excluded taxes was found to be less progressive.



Note: this chart includes business taxes, customs duties and agricultural levies for which average burdens could not be simulated. These taxes account for 15% of tax revenues. Average burdens were therefore calculated using the distribution of the tax share, the distribution of gross income and the total tax revenue collected. Because the definition of gross income used in the graph gives lower outcomes than administrative figures (for example because employer social security contributions are excluded), the impact of these taxes on the overall burden is overstated.

IV.6 Comparison of tax distributions

For three major national taxes we can compare the distribution of tax shares over deciles in all four EU member states: the personal income tax (table 13), employee social insurance contributions (table 14) and the value-added tax (table 15).

Table 13 compares distributions of the *personal income tax*. Given differences in the distribution of personal incomes, the tax base and rate structures, the similarity of income tax distributions over deciles in Germany and the Netherlands is striking indeed. The share in aggregate income tax revenue of Spanish households in deciles 8-10 is two points higher than it is in the two northern member states. The distribution found for the UK income tax is still substantially more progressive. Two reasons may be driving the apparent finding of a more progressive income tax structure, either a more unequal distribution of the income tax base itself, or the more progressive structure of UK income tax, due to the generous allowances against tax. As a result of these allowances, very few households in the bottom deciles have any income tax liability.

Table 13 Distribution of personal income tax (% share)

Decile	1	2	3	4	5	6	7	8	9	10	Total
Germany	1	2	3	5	6	7	9	12	17	39	100
The Netherlands	1	2	3	4	5	7	9	12	17	39	100
Spain	0	0	2	3	5	7	10	14	19	41	100
United Kingdom	0	0	1	2	4	6	9	13	19	46	100

Table 14 compares national distributions of employee social insurance contributions. For the UK, which finances its social security rather different from the other three Member States, we have selected National insurance contributions. In the Netherlands households in deciles 1-5 bear 30% of this tax, as against 23% in Germany and 21% in Spain. On the other hand, in three member states the share of the top decile exceeds 25%, to be compared with a share of only 17% in the Netherlands. As a result, the distribution of employee social insurance contributions is least progressive in the Netherlands.

Table 14 Distribution of employee social insurance contributions (% share)

Decile	1	2	3	4	5	6	7	8	9	10	Total
Germany	1	3	5	6	8	9	11	13	16	28	100
The Netherlands	2	3	6	8	10	11	13	14	16	17 ^{a)}	100
Spain	1	2	4	6	8	9	12	15	19	25	100
United Kingdom ^{b)}	0	0	1	3	5	9	13	16	23	29	100

a) Because several caps apply, the share of the top decile in the Netherlands is smaller than in the other three Member States.

b) National insurance.

Finally, table 15 compares distributions of the value-added tax. The tax shares of deciles are amazingly similar in Germany, the Netherlands and Spain. The distribution of the VAT-burden is clearly most progressive in the UK, probably as a consequence of the rate structure in that Member State (a number of basic necessities are zero-taxed).

Table 15 Distribution of value-added tax (% share)

Decile	1	2	3	4	5	6	7	8	9	10	Total
Germany	4	5	5	9	8	10	12	13	14	19	100
The Netherlands	4	5	6	8	9	10	12	13	15	19	100
Spain	4	5	7	8	9	10	11	13	14	18	100
United Kingdom	3	3	5	6	8	11	11	14	16	23	100

V Concluding remarks

Presently, the tax mix, tax rates and the tax base differ considerably from one EU member state to another. Nevertheless, the distribution of tax burdens over income classes (each comprising of 10% of all households) seems to be remarkably similar in the four EU member states – Germany, the Netherlands, Spain and the United Kingdom – that are included in our analysis. Apparently, countries with higher nominal top rates offer their taxpayers more opportunities to reduce the tax base. In sum, the distribution of tax burdens tends to converge, even if tax-to-GDP ratio's and top rates of the personal income tax differ considerably.

One might hope that the results reported here will stimulate further research who really pays the taxes in EU member states and what the implications are for the relative position of each country, now that the 'tax theatre' in Europe is characterised by increasing tax competition. Such research efforts might first extend our analysis from four to all fifteen member states. Next, it seems highly relevant to further analyse the contribution of major individual taxes to

overall distributions of tax burdens, taking into account the role of personal exceptions, the structure of nominal rates and the erosion of tax bases.

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