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The Impact of Inflation on Income Tax and Social Insurance Contributions in Europe

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Abstract
Inflation can alter the characteristics of tax- and contribution systems in numerous ways. This paper demonstrates how inflation alters the distributive properties of nominally defined tax systems and looks at the impact of the tax revenues and social insurance contribution receipts generated. It provides quantitative estimates for Germany, The Netherlands and the UK, using a preliminary version of EUROMOD, a European tax-benefit microsimulation model. The integrated framework provided by the model permits the use of common income concepts across countries and therefore enables one to make informative comparisons of the distributive consequences of the inflation induced erosion of tax-band limits, thresholds, deductions, tax credits, etc. The paper also tests the performance of automatic indexing regimes used in two of the countries.

Der Einfluss von Inflation auf Einkommensteuer- und Sozialversicherungsbeitragszahlungen in Europa.

Kurzreferat
Inflation kann zu Veränderungen der Eigenschaften und der Wirksamkeit von Abgabensystemen fuehren. Dieser Beitrag analysiert, wodurch und in welchem Ausmass Inflation die Verteilungs- und Aufkommenscharacteristiken von Einkommensteuer und Sozialversicherungsabgaben beeinflusst. Mithilfe einer Vorabversion eines neuartigen europäischen Steuer-Beihilfen Mikrosimulations-modells (EUROMOD) werden die quantitativen Auswirkungen in Deutschland, den Niederlanden und Grossbritannien untersucht. Das Modell erlaubt unter anderem die Verwendung identischer Einkommenskonzepte für die verschiedenen Länder. Dadurch werden informative Ländervergleiche hinsichtlich der Verteilungsauswirkungen einer inflationsbedingten Aushöhlung von Progressionsstufengrenzen, Frei-, Absetz- sowie Absetzbeträgen möglich. Der Beitrag analysisert ausserdem die Wirksamkeit der automatischen Steuerindexierungsverfahren, welche in zwei der betrachteten Ländern Anwendung finden.

JEL Classification: C81; H24; D31

Keywords: Inflation; Income Tax; Social Insurance Contributions; European Union; Microsimulation.

The Impact of Inflation on Income Tax and Social Insurance Contributions in Europe

Herwig Immervoll[1]

1. Introduction

During the last three decades, the distinction between nominal and real variables has become firmly established not only in economic but also in political and public discourse. The attention and media coverage prompted regularly by the release of new inflation figures make widespread money illusion unlikely, even at low rates of inflation. Despite this general awareness, many tax rules still employ the "nominal view" of the world. This paper demonstrates how inflation alters distributive properties of nominally defined tax systems and looks at the impact of the tax revenues and social insurance contribution receipts generated. It aims to provide quantitative estimates using a preliminary version of EUROMOD, a European tax-benefit microsimulation model.

A large literature on the effects of inflation on taxation emerged in the 1970s and early 1980s when inflation was high. However, the topic has received much less attention since the widespread decline of inflation rates in the mid 1980s. It is largely still true that "the effect of inflation on the progressivity of the income tax system is important and noteworthy, but usually overlooked".[2] This is especially the case for European countries, where, during the last few years, concerns about deflation have sometimes pushed inflation, and the costs associated with it, off the headlines. There are, however, several reasons why a renewed interest in the topic seems justified, especially in Europe:

(1) Even the currently experienced levels of inflation can result in marked distortions of tax liabilities. As will become apparent in this study, infrequent adjustments of the tax system for "fiscal drag" can cause very significant additional tax burdens;
(2) Measures to neutralise inflation induced distortions of taxation are economically less costly during times of low inflation. They are also politically more feasible because (a) the associated loss in real tax revenues is smaller; and (b) adjusting the tax system for changes in the general price level will be less prone to be interpreted as "defeat" in the fight against inflation if the rate of inflation is low.
(3) For EMU countries, the loss of control over monetary policy means that there is less scope for national policy makers to control inflation. As long as there remain important

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[2] Bailey (1976), p. 296.

structural differences between different EMU countries, one would expect a unified monetary policy to lead to differing price developments across countries. Indeed, the process of "convergence" can itself contribute to such differences (European Commission, 1999). Small countries may be particularly affected since their economic situation will frequently receive less attention in the determination of monetary policy than that of larger countries. To the extent that the properties of national tax and contribution systems are influenced by inflation, a loss of influence on inflation will also reduce national policymakers' control over fiscal policy parameters.

The paper is structured as follows. Section 2 considers different kinds of taxes and discusses to what extent they are affected by inflation. The remainder of the paper limits its scope to the effects of inflation on the taxation of income. Section 3 briefly reviews the different channels through which inflation affects income tax burdens and discusses possible consequences for the distribution of incomes and tax burdens. Section 4 proceeds with a brief description of the model used in the simulations. Section 5 explains the simulated scenarios and discusses the results while section 6 concludes suggesting possible ways to extend the present analysis.

2. Tax bases affected by inflation

A nominally defined tax base will be affected in one of the following ways:

For excise taxes, fees, fines, etc. where the payable amount is calculated in relation to the number of transactions rather than their value, the nominal tax liability remains unaffected by inflation. Thus, the real value of the tax decreases with rising price levels. The same is true for taxes with a historical tax base. Examples are wealth and inheritance taxes where the tax base is not or only infrequently unadjusted. In a similar fashion, inflation reduces the real value of historically defined or otherwise fixed deductions, allowances and tax credits. In these cases, however, this causes real tax burdens to increase.

If the tax is computed as a fraction of *changes* in nominal values, inflation will also lead to increasing effective tax rates. The most important example here is the capital gains tax. A tax base is not affected by inflation if the tax is a fraction of a transaction's value *at the time of the transaction* (ad valorem taxes, VAT). For changing *general* price levels, the tax changes in line with the nominal value of the underlying transaction. Thus, the real value of the tax liability remains unchanged.

This paper's focus on the taxation of income is a direct result of the relative sensitivities of different tax bases with respect to inflation. In most industrialised countries, taxes on consumption either represent only a small part of total tax revenue (excise taxes) or are unaffected by inflation (value added taxes, ad-valorem taxes). Furthermore, the mechanics of the distortion of excise taxes are relatively straightforward while taxes on income are affected in a multitude of different ways.

3. Inflation induced distortions of the income tax

The channels through which changes in the general price level affect real tax burdens can be categorised as follows (for convenience, this section uses the term "income tax" to refer to all kinds of taxes and contributions levied on income):

(1) Influence on the real value of tax liabilities already owed.

(2) Influence on the tax base.
(3) Influence on the tax schedule.

3.1. Distortion of existing tax liabilities

This most obvious distortion of real tax burdens is caused by collection lags, which, for income tax liabilities in particular, can be sizeable. If not corrected, the reduction of tax burdens due to collection lags leads to an unequal tax treatment between pay-as-you-earn and self-assessing taxpayers. Monthly or quarterly tax pre-payments can, however, reduce this effect to a large extent.

3.2. Distortion of the tax base

If one accepts the definition of income which has become known as the Haig-Simons (H-S) income concept then income earned in a certain period is equal to the change in the *power* to consume.[3] The typical tax code, however, uses the term income rather ambiguously: Usually, a concept like "adjusted gross income" is the closest approximation to H-S income one can find. Frequently, some or all non-monetary income components (in-kind fringe benefits, unrealised capital gains and "implicit" incomes such as the benefits derived from owner-occupied housing or other durables) remain untaxed. But some types of money income, such as unemployment benefits, are often also excluded from the tax base. The taxation of nominal rather than real income adds to this list of deviations from H-S income: A nominally defined income tax base ignores changes of the potential to consume which are a direct result of

Box 1. Inflation induced tax base distortions.

Ignoring gains and losses due to changes in the value of money leads to unequal tax burdens for equal amounts of (H-S) income, depending on how and when it is earned. Inflation is, per definition, a time dependent phenomenon. It potentially affects all tax rules that determine tax liabilities on the basis of values denominated in previous periods' currency units. These rules include the taxation of capital gains and, related to the first, the tax treatment of interest income and expenses. Not adjusting the tax base for the change in value caused by the erosion of the currency in which nominal assets and liabilities are denominated often causes very substantial tax distortions. For example, if nominal gains are taxed at a rate of 30%, then an asset bought for 1,000 in 1998 and then sold for 1,050 in the following year, would be subject to a tax of 15 (in 1999 currency units). If inflation during the same period was 4% then the real capital gain was only 10. The real effective tax rate is thus 150%, a rate which can hardly be justified on economic grounds. Similarly, for nominal rates of return less than inflation but greater than zero even real losses are subject to capital gains tax.

To compensate for the effects of inflation, all transactions relevant for the calculation of value gains and losses have to be valued at *current* prices, i.e., both current and reference value of the asset have to be assessed using current money. For tax authorities and taxpayers, this means an additional layer in the computation of taxes. The administrative implementation of correcting capital gains for inflation has, for example, been described "as one of the most severe practical problems facing the implementation of the pure income tax base" (Beach et al., 1988, p. 104). Although indexation does require accounting systems and procedures, which are capable of providing the necessary additional information, most of the essential data (the relevant time periods over which inflation adjustments have to be made) are already collected as part of the conventional tax assessment procedure. In the UK, for instance, capital gains subject to tax have, until 1998, been adjusted for inflation.

[3] Haig (1921); and Simons (1938).

changes in the purchasing power of money (see Box 1).

3.3. Distortions of the tax schedule

Similarly to the effects discussed under heading 3.1, this type of distortion is also independent of the tax base. It exists for all taxes (or contributions; or other levies) that are non-proportional *and* where tax brackets, allowances, deductions or tax credits are defined in nominal terms. A nominally defined progressive tax schedule subjects higher nominal incomes to higher tax rates. During times of inflation, this results in ever increasing tax rates for constant real incomes ("bracket creep"). The extent to which inflation causes the real tax burden of a given taxpayer to rise is determined by:

1. the rate of inflation;
2. the average tax rate; and
3. the progressivity of the tax schedule. Since the resulting change in the tax burden depends on where the taxpayer is located in the income scale, it is a "local" concept of progressivity that is relevant here.[4] This progressivity, in turn, depends on:
   a) the shape of the relevant section of the (statutory) tax schedule (i.e., the number, size, and location of tax bands); and
   b) the number and size of nominally fixed deductions, allowances and tax credits.

For the economy is a whole, then, the increase in the overall tax burden also depends on the vertical distribution of the tax base among taxpayers.

The move into higher tax brackets due to inflation is equivalent to an automatic tax increase, which (1) varies with inflation and (2) has not been explicitly approved by the usual political process and is therefore less apparent to the public ("taxation without representation"). It may, thus, be tempting for policy makers to exploit the mechanism as a convenient way to finance increased public spending.

Apart from the two trivial solutions to the problem (price stability or a proportional tax schedule) several methods have been proposed to reduce the responsiveness of the effective tax rate to changes in the price level. The most widely used pragmatic approach is a discretionary adjustment of the tax schedule in more or less regular intervals. The biggest problem with this solution is that it does not avoid the additional tax revenue that builds up *in-between* adjustments. Furthermore, discretionary changes, especially if they come at unpredictable intervals, affect the continuity of the tax system. Finally, these adjustments of the tax schedule can be (and frequently are) presented to the electorate as tax decreases even if they only prevent the tax burden from rising further. There have, for these reasons, been several attempts to introduce more exact and permanent inflation adjustments:[5]

(1) A general decrease of tax *rates* as the general price level increases. This approach can prevent increases in the total tax revenue but not changes in the distribution of tax burdens (for instance, low real incomes which have originally been exempted from income tax will still become taxable by being pushed out of the zero-tax bracket).

[4] One such "local" measure of progression is $dt(y) / dy = (m(y) - t(y)) / y$, where t is the average tax rate, m is the marginal tax rate and y is the tax base.
[5] See Messere (1998), p. 13 or Tanzi (1976).

(2) Deduction from the tax base of that part of nominal income, which is due to inflation. This method causes the *nominal* taxable income to remain constant while the real taxable income decreases. It will, therefore, *overcompensate* for the effects of inflation.

(3) Deflating taxable income to some base period. The tax schedule of this base year is then applied to the deflated income. The resulting tax liability is then inflated back to current period. This (rather complicated) method prevents inflation induced distortions of the tax schedule. It has been used in several Swiss Cantons (federal indexation was introduced in 1985).[6]

(4) Continually adjusting tax brackets, deductions, allowances and exemptions for inflation ("indexing"). Several variants have been proposed and/or adopted:

   (a) Full adjustment (e.g., Canada from 1974 to the mid-1980s, UK from 1981/82, USA since 1985). This approach, if applied continuously, neutralises distortions of the tax schedule and is equivalent to method (3) above.

   (b) Partial adjustment. From 1983, the Canadian income tax schedule has, for example, been adjusted only for that part of inflation which exceeds 3%. Economically, this approach would, for example, make sense if the index used to measure inflation for the purpose of adjustment is believed to overstate actual inflation. The partial adjustment approach has also been used to retain a certain degree of discretionary control (e.g., in the Netherlands).

   (c) Triggered indexation (1): Adjustments are only applied if annual inflation exceeds some predetermined threshold.

   (d) Triggered indexation (2): Adjustments are only applied if the accumulated changes in the general price level since the last adjustment exceeds some predetermined level.

   (e) "Stand-by" Indexing. Requires the degree of adjustment of the tax schedule for inflation to be determined by the parliament every year, enforcing an annual public debate of the issue. Decisions not to adjust the tax schedule (to the full extent of inflation) have to be justified as such. It is, thus, more difficult for the government to exploit the fiscal drag as a means for hidden tax increases.

   (f) Any combinations of (a) to (e).

(5) “Super-indexing”. In the literature, the term usually refers to an adjustment of the tax schedule to changes in national nominal income. If the tax brackets, allowances, deductions, etc. are adjusted for the rate of inflation, then one implicitly accepts increasing tax revenues relative to national income as a result of increasing real incomes. In rapidly growing economies, this effect can be particularly pronounced. In the Federal Republic of Germany, tax revenues as a share of national income rose from 5.14% (1958) to 7.55% (1963) and 10.6% (1975). In its earlier period of rapid growth, Japan adopted a form of annual discretionary adjustment of the income tax schedule and/or rates to avoid increases of a similar extent. Examples for tax systems where super-indexing has been introduced in the past are Iceland (in 1966) and Denmark (1974; discontinued in 1983).[7]

3.4. Distributive Effects

The interaction of inflation and a nominally defined tax system causes both unequal tax burdens for similar incomes, and changes in the vertical distribution of tax burdens. Following the structure of this section so far, I will in turn discuss the distributive impact of distortions of existing tax liabilities, distortions of the tax base and distortions of the tax schedule.

[6]see OECD (1976), p. 55; Tanzi (1980), p. 40, OECD (1985).
[7]Tanzi (1980), OECD(1986).

The distributive effects of delayed collections of income taxes are straightforward. The *relative* change of the average tax rate as a consequence of delayed tax payments is the same for all tax rates (and, thus, incomes). The impact on after-tax income, however, rises with the taxpayer's average tax rate: Individuals with incomes below the tax threshold, for instance, do not at all benefit from delayed tax payments. In general, delayed tax payments will therefore have a distributive impact that works against the progression built into the tax schedules. The more progressive the schedule, the more regressive the effects of delayed tax collection.

There have, to my knowledge, been no empirical studies incorporating the distributive effects of the inflation distortions of both tax schedule and tax base. Any study analysing the distortions of the tax schedule in isolation implicitly does, of course, assume that the income on which individuals pay tax does not change between the no-inflation and inflation scenarios. This, however, is only the case if the tax base is adjusted for inflation. The results of studies ignoring the distortions of inflation must be interpreted with caution since the changes in effective tax rates following distortions of the tax base can be much bigger than those due to bracket creep.[8] The reason why, despite the importance of base distortions, studies (including this one) have concentrated on the distributive effects of distorted tax schedules is probably twofold. Indexing the tax schedule is much less complicated than adjusting the tax base for inflation. As a consequence, many countries have actually implemented measures to index the tax schedule providing an immediate motivation for empirical studies regarding the distribution effects of the new measure. On the other hand, no country has, so far, attempted a comprehensive inflation adjustment of the tax base. Secondly, an analysis of the distribution effect of a policy requires a comparison of the *status quo* with a hypothetical scenario. In the bracket creep case this is relatively easy to accomplish because all the necessary information to compute the alternative scenario (a representative sample of personal or business income, tax band limits, allowances, tax credits and the rate of inflation) are readily available. For measures to adjust the tax base for inflation, this is not the case. Much more data are needed to establish the impact of inflation on the different components of income. Most of the required data relate to wealth and income from capital. On a household-by-household basis, this type of information is notoriously hard to come by. In most cases, income surveys do not contain the required data at the necessary level of detail. Even if they do, responses to survey questions relating to wealth tend to be unreliable. In the present study, the analysis will, for these reasons, also be limited to the impact of inflation induced distortions of the tax schedule.

Although previous studies have, therefore, not been able to provide clear-cut answers, the distributive effects would clearly depend on the distribution of income from capital. Only the effective tax rates on income from capital are directly affected by inflation induced distortions of the tax base.[9] In as far as inflation leads to a higher effective tax rate on these incomes and assuming that income from capital represents a higher fraction of overall income for individuals higher up the income distribution, the overall effect would tend to be progressive - which would reduce or possibly even over-compensate the regressive effects of delayed tax payments and bracket creep.[10] Other authors have argued that overall, wage earners tend to be more negatively affected.[11] Wage earners cannot easily delay their tax payments while capital gains taxes can, for example, be delayed for a very long time if they are not payable when they

[8]see Aaron (1976).
[9]"directly" meaning within a static analysis (first-round effects).
[10]see Halperin and Steuerle (1989).
[11]see, for example, Petrei (1975); Bossons and Wilson (1973).

accrue but upon realisation. By timing the realisation of capital gains, earners of income from capital would also have more discretion over their tax burden. Turning to the impact of taxing inflated interest payments, it can be said that the main losers are those who draw their income from savings while net debtors will frequently benefit from the deductibility of *nominal* interest expenses. If low-income earners are more limited in the amounts they can borrow, it is likely that they will be hurt to a larger extent.

> ".... failure to properly deal with inflation in the imposition of taxes has been particularly inequitable to the older, often poor people who must live on fixed incomes. It is not so much the young, aggressive consumer, starting out in life or the recently established business or, for that matter, the profligate individual or corporation, but rather the individual and the business concern that, through savings and good administration were able to accumulate capital, that suffer the most from inflation."[12]

As is the case for delayed tax payments, the distortions of the tax schedule due to "bracket creep" also depend on the progressiveness of the schedule. Here, relative changes in the tax burden are not the same for all incomes. The taxpayers most affected are those whose incomes fall into the more progressive parts of the schedule. In other words, the size of the tax increase caused by bracket creep depends on the taxpayer's marginal and average tax rate which, in turn, depend on taxable income and number and width of tax bands as well as the size of any allowances, deductions and tax credits. If average and marginal tax rates are the same, meaning that the relevant section of the schedule is "flat", then the taxpayer is not affected at all. The bottom and middle parts of the income tax is normally more progressive than the top. Inflation induced distortions of the tax schedule would therefore tend to affect high incomes to a lesser extent. For progressive tax schedules, the downward shift (in real terms) of tax band limits and the reduced real value of (flat amount-) tax credits will increase the real tax burdens for *all* taxpayers. For the highest incomes, however, the resulting increase in the average tax rate will be smaller because the tax rate by which the majority of their income is taxed (the top rate) will remain unchanged. Also, the value of tax credits is likely to be small relative to the overall tax burden. For taxpayers on smaller incomes, on the other hand, it will, in terms of the tax burden, make a larger difference if part of their income is taxed at higher rates due to bracket creep - and tax credits will have a larger relative influence on their overall tax bill. Special tax credits and allowances are frequently used to increase the disposable income of certain targeted groups such lone parents, pensioners, people with disabilities, families with children, etc. One would therefore expect these groups to suffer disproportionately from non-indexation (the extent to which such targeted groups suffer from inflation will be aggravated if applicable benefit payments are not uprated either). In addition, some individuals with real incomes too low to be taxable (before prices went up) will, despite unchanged real incomes, slip out of the zero-rate tax band and become taxable. Empirical studies have tended to confirm the regressive nature of bracket creep. They also show that the average tax rate increases for all income groups and that discretionary adjustments of the tax schedule have less than fully compensated the effects of inflation.[13]

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[12]Bedard and Lees (1977), p. 290.

[13]There been studies for Australia: Taxation Review Committee (1974); Canada: Vukelich (1972), Jarvis, et al (1977); the USA: Goetz and Weber (1971), Von Furstenberg (1975), Sunley and Pechman (1976); Italy: Majocchi (1976), Lugaresi and Di Nicola (1991). An international comparison can be found in OECD (1976).

4. The Model

I use a preliminary version of EUROMOD to compute disposable incomes, income taxes and compulsory social insurance contributions paid by "employees" (EESICs)[14] for a representative sample of households in Germany, The Netherlands and the UK.

EUROMOD is an integrated European tax-benefit model, which, at the time of writing, is under construction. EUROMOD provides us with a Europe-wide perspective on social and fiscal policies that are implemented at European, national or regional level. It is also designed to examine, within a consistent comparative framework, the impact of national policies on national populations or the differential impact of co-ordinated European policy on individual Member States. See Immervoll et al. (1999) for more details.

Microdata for the Netherlands are from the 1996 wave of the Socio-Economic Panel (SEP). Households with large amounts of missing information are excluded, bringing the sample to 4568 households. For the UK we use the 1995/6 Family Expenditure Survey. No observations are excluded since the sample contains no households with significant missing information. There are 6797 UK households. The data used for Germany is the 1996 wave of the German Socio-economic Panel (SOEP) with a sample size of 6894. In each case, the samples are weighted to adjust for non-response bias and to bring the results up to population levels. The simulations are based on the systems of tax and benefit rules current in June 1998 and the income variables in the micro-data are updated using the consumer price index (GE, NL) and the retail price index (UK).[15]

Given the limitations of the underlying data, not all the relevant components of the respective tax-benefit systems lend themselves to simulation. I simulate income taxes, social insurance contributions, child benefits and other family benefits, and income-tested benefits. In computing income, components that are not simulated in the model are taken directly from the data (i.e. it is assumed that they are unaffected by switching between different policy scenarios). In particular, this is the case for contribution based payments, such as unemployment benefits or contributory pensions. Appendix 1 lists the specific instruments that have been simulated.

The microsimulation approach allows one to examine the effects of inflation in isolation from other changes in the structure of the underlying population or its characteristics. In addition it permits focusing on particular elements of the tax-benefit system. In this case, we are interested in the effects of inflation on taxes (including contributions) paid on income. These effects are explored by uprating all monetary variables[16] in the micro-data by a range of hypothetical and actual inflation rates while (a) keeping the rules describing the income tax and EESICs nominally fixed; and (b) making adjustments that reflect the uprating regime which applies to income taxes and EESICs in the respective country. All simulated and non-

[14] All contributions which are not paid by the employer. In this paper, EESICs therefore include contribution payments of employees, self-employed persons, benefit recipients, pensioners, etc.

[15] The full version of EUROMOD will permit the application of different uprating factors for each of the main types of income.

[16] Relative prices are, thus, assumed to be unaffected. This assumption follows from the aim of the simulations to isolate the effects of changes in the general price level from other changes.

simulated income components other than income taxes and EESICs are uprated in line with inflation.[17,18]

5. Simulated Scenarios and Results

For each country, the following scenarios are explored:

1. Hypothetical inflation rates of 3%, 5%, 10% with tax- and EESIC rules fixed in nominal terms.[19]
2. Actual inflation rates of the 1992-1998 period.
   A. Income tax- and EESIC rules fixed in nominal terms.
   B. Income tax- and EESIC rules adjusted according to uprating regime in place.

As discussed above, the overall distributive and revenue effects of inflation depend on the structure of the tax- and contribution systems and the distribution of the tax- and contribution base in the population. Appendix 2 briefly describes the income tax and EESIC systems as they existed in the three countries. One clear difference is obvious from figures 9-11. For the largest part of taxable incomes, the German income tax schedule is continuous rather than piece-wise linear. As a consequence, inflation leads to rising marginal tax rates for almost all taxpayers. In addition, the lowest marginal rate (about 26%) is higher than in both the other two countries. The Dutch tax schedule is also quite steep, but the largest increase in marginal tax rates occurs at a much higher level of taxable income. The UK schedule is the flattest among the three. All three EESIC systems exhibit regressive characteristics, albeit to differing extents.

Turning to the distribution of the tax base, it is evident that in Germany, a large proportion of those with positive taxable incomes are concentrated in the "tax-free" part of the schedule. As a percentage of the number of taxpayers, about 4.5% are less than 10% below the tax-threshold. There is, thus, considerable scope for inflation to push large numbers of people across the threshold into tax liability. In The Netherlands also, a large part of taxpayers is located in the more progressive part of the schedule. Of course, even those taxpayers who are in the top-rate bracket suffer average tax rate increases caused by the extremely large increase in marginal rates from 7.1% to 50%: If inflation is allowed to erode the tax band limits, a larger proportion of their income is taxable at 50%.

5.1. Hypothetical inflation rates

Table 1 shows the real revenue effects of not adjusting income tax and EESIC rules for three different rates of inflation. It is apparent from these figures that the revenue effects of not adjusting tax and contribution parameters for inflation can cause substantial revenue changes. What is also immediately obvious, is that some simulated figures match their official

[17] This is done by uprating all parameters (amounts, limits, thresholds, etc.) of the relevant rules by the rate of inflation. Note that this does not necessarily mean that the real value of these instruments will remain unchanged. Due to interactions between benefit instruments and the (changing) income tax and EESIC rules, benefit amounts may actually be influenced indirectly. One advantage of tax-benefit models is that they are capable of taking these interactions into account.

[18] In practice, uprating of benefit rules is not usually as comprehensive as simulated here. Even if benefits are said to be "adjusted for inflation", this adjustment is often incomplete (Trade Union Congress, 1999).

[19] Only the results of the 5% scenario are presented here. Results for the other two scenarios can be obtained from the author upon request.

counterparts quite well while others (UK income tax in particular) are less satisfactory. There are numerous reasons why one would expect deviations. Aggregate figures generated by a tax-benefit model may be hard to reconcile with official figures because of differences in underlying concepts and definitions. Data related issues include the scope of the underlying micro-data, under-/over-representation of specific groups of individuals, under-reporting of certain items, distortions introduced by the uprating methods used to bring the data from the original year to the policy year, etc. In addition, the model's tax-benefit algorithms themselves may bias aggregate results. Examples are simplifying assumptions made in building the algorithms and less than perfect modelling of individual choices such as optimising behaviour (tax avoidance), tax evasion and benefit take-up. In the case of UK income tax, an important factor contributing to the shortfall of simulated tax receipts is the under-representation of high incomes in the Family Expenditure Survey. This downward bias is significantly aggravated by the widening of the income distribution which took place between 1995/6 (the data year) and 1998/9 which is not accounted for in the uprating procedure used for the simulations presented here. This explanation is consistent with the very good match of social insurance contributions where, because of upper contribution limits, under-reporting of high incomes is not a problem.[20]

The Dutch income tax system exhibits the largest elasticity of real tax revenue with respect to nominal incomes. The main reason is the large jump in the marginal tax rate between the bottom (7.1%) and middle (50%) tax band mentioned before. However, compared to EESICs, income tax revenues are relatively less important in The Netherlands than in the other two countries. In The Netherlands, the overall contribution rate for employees is almost 39%. The inflation-induced erosion of the upper contribution limits therefore has a larger negative impact on EESIC revenues than in the cases of Germany or the UK.

Who pays for the revenue increases and who benefits from any decreases in real tax burdens? In terms of the impact on household incomes, the changes have a clearly progressive effect. This is illustrated by figure 1, which shows the changes in real household disposable incomes for different income groups.[21] One of the advantages of an integrated European tax-benefit model is that consistent income concepts can be used across countries (see Appendix 3 for a definition of the income concept used here).

In Germany, the equalising effect on the income distribution is strongest: Because of the continuous tax schedule, the statutory marginal tax rate increases for every DM of taxable income earned. In countries with piece-wise linear tax schedules (UK, NL), on the other hand, "bracket creep" affects only those parts of taxable income which fall below the lower limit of the taxpayer's tax band. As a result, a larger fraction of the income of high-income groups is not affected. In the Netherlands, the tax schedule is steeper than in the UK and the top tax band starts at a very high income level. Changes in nominal taxable income have, therefore, a larger effect on higher incomes than in the UK, where, compared with the two other countries, the top-rate proportional part of the schedule applies to a markedly larger proportion of taxpayers.

[20] A more detailed validation of aggregate simulation results against official figures will form part of the EUROMOD project and will shed further light on these issues.

[21] For deriving the income deciles, household disposable incomes have been equivalised using the modified OECD equivalence scale. Each household is counted only once (i.e., the households are not weighted by the number of persons in them).

Figures 2 and 3 separate the effects of income tax and contributions. Although income tax and EESICs are shown separately, the simulations do take into account the *interactions* between the two instruments (e.g., the tax deductibility of contribution payments in Germany and the Netherlands). In both Germany and the UK, the change in income taxes relative to the original tax burden is clearly much bigger for low incomes. But since income taxes are low for these income groups, these changes translate into relatively small changes in disposable incomes shown in figure 1. In the UK, the change for the lowest decile is very substantial in relative terms. However, refundable tax credits render the average tax burden for this decile negative. The relative change would, therefore, also be negative which is why the UK bar is omitted for the lowest decile.

A common feature for all three countries is that for very high incomes, tax burdens increase by a smaller fraction. For this income group, a large part of their income is located in the proportional top rate band so that bracket creep only has a small effect. Also, relative to their tax burdens, the value of nominally fixed deductions and tax-free allowances becomes less important for these taxpayers. In the Netherlands, the changes of tax burdens are much more equally distributed than in the other two countries. One reason is that one important deduction (the "professional deduction") is computed as a percentage of earnings (subject to an upper limit). One tax-free allowance (for lone parents) is computed in a similar manner. As a result, lower incomes are protected from an inflation induced erosion of these tax concessions, while higher income groups suffer tax increases once their inflated incomes cross the relevant upper limits. In addition, the point of the first large increase of the marginal tax rate (from 7.1% to 50%) is significantly further up the income scale than in Germany or the UK. Low-income taxpayers are, therefore, less affected by "bracket creep" than those with higher incomes.[22]

In principle, the story for the distributive effects resulting from the non-indexation of EESICs is rather uniform across all three countries. For low incomes, the important effect is the erosion of contribution-free limits, which leads to formerly exempt individuals being dragged across these limits where they become liable to pay contributions. For higher incomes, the dominating effect is the erosion of upper contribution limits, which decreases the real value of the contribution payments. For low-income groups in the Netherlands, the increase in EESICs is much larger than that of the income tax burden. Since these income groups also pay larger contributions than income taxes, this leads to the relatively strong impact on disposable incomes shown in figure 1. In addition, higher income individuals are not liable to pay any compulsory health insurance contributions at all. The erosion of the relevant income limit contributes further to the substantial decrease in Dutch EESIC burdens shown in figure 3 for higher income earners.

5.2. Actual inflation rates

Starting again with the 1998 data and policy rules, this section looks at what would happen if the same inflation rates that prevailed during the 6 years before 1998 were to apply from 1998 onwards.

[22] It is worth emphasising that the analysis presented here looks at the household level. It is, therefore, possible that taxpayers with very low taxable incomes are located in upper income deciles if the household income as a whole is sufficiently high. Appendix 2 shows the distribution of taxable income for *individual* taxpayers in each country (figures 9-11).

Table 2 shows the inflation rates along with the statutory adjustment factors actually applied for each year and country (details on which parameters are/are not subject to statutory uprating can be found in Appendix 2). Note that the adjustments taken into account for the simulations only reflect the *statutory* uprating factors as outlined in table 2. Any discretionary adjustments are ignored because it is not possible to separate inflation adjustments from other objectives of discretionary policy measures. Among the three countries considered, only Germany has no statutory uprating regime. In the Netherlands, most income tax parameters are uprated based on a broad consumer price index, which has been corrected for changes in a number of indirect taxes. The uprating factor is calculated as the average index of the 7th to the 18th month before the tax year divided by the average index of the 19th to 30th month before the tax year. EESICs depend, in principle, on the amounts of benefits to be paid (i.e., if unemployment is down, unemployment insurance contributions decrease, etc.). The simulations presented in this paper assume that all income components, including benefits increase in line with inflation. I also abstract from any macroeconomic changes or structural changes in the population during the period considered here. It, therefore, seems reasonable to assume that the parameters of the EESIC rules do also change in line with inflation. In the UK, the Retail Price Index is used for adjusting most income tax and EESIC parameters. Here, the time period relevant for determining the change in this index is the year to the September preceding the tax year.

Table 3 shows the revenue effects of overall inflation across the entire 6-year period. The changes are relative to original 1998 revenues. The figures illustrate the problem with infrequent inflation adjustments. If, starting from 1998, nominal incomes would rise at the same rate as they did between 1992-98, then adjusting income taxes only every 3 years would produce an additional tax burden of between 7% and 19% of the 1998 revenue figures. If adjustments would be made only after 6 years, the additional revenue generated by bracket creep in the meantime would range from around 31% in the UK to more than 63% in The Netherlands! The consequences of these rising tax burdens are shown in figure 4. Since inflation rates are not too different in the three countries, the results essentially mirror those shown earlier for the hypothetical 5% inflation rate (figure 1). Of course, the extents to which incomes are reduced are larger than in the hypothetical 5% case.

How well do existing adjustment regimes perform in terms of keeping real tax and EESIC burdens constant during times of inflation? Figures 5 to 7 illustrate the simulation results for each year of the 6-year period considered here. For each year, they show the change in real revenue vis-à-vis the 1998 baseline scenario. For Germany, there is no statutory uprating regime. Figure 5 therefore only shows the results of keeping the 1998 rules unchanged. In both The Netherlands and the UK, statutory uprating regimes do exist. Due to the time lag built into these uprating rules, the degree to which these rules manage to immunise the tax and EESIC system against inflationary distortions varies from year to year. Clearly, the deciding factor is whether inflation is rising or falling. During times of increasing inflation, the adjustments lag behind. As discussed above, the time lag in The Netherlands is much longer than in the UK. In addition, the index used for uprating tax rules is different from the consumer price index. In the UK “adjusted” scenario, tax revenues increase vis-à-vis the 1998 benchmark in years 2, 3 and 5 (figure 6). The reverse is true for years 1, 4 and 6, where the adjustment factors are larger than inflation.

Turning to figure 7, it may be surprising that the EESIC revenue is falling below the 1998 level despite the modelling assumption that EESIC rules in The Netherlands are uprated in

parallel with actual inflation (see table 2). The reason for this is an interdependence between income tax and People's Pension contributions which is captured by the model: The base on which People's Pension contributions are computed is identical with the income tax base. Any income tax deductions and tax-free allowances are therefore subtracted from the contribution base as well. Since the uprating factor used for adjusting income tax rules more than compensates for inflation, it follows that the contribution base is reduced by inflated (in real terms) deductions and allowances.

Finally, it is interesting that during the entire period and in both countries, real tax revenues are lower for the "adjusted" scenario than they were in the 1998 baseline system. Over the 6 year period, this causes a loss of tax revenues of about 5% (UK) and 11% (NL) of the annual 1998 revenue (last row of table 3). In both countries, higher income groups benefit more from these tax burden reductions than do households further down the income spectrum (figure 8). This is consistent with the earlier observation that the real disposable incomes of higher income groups are more elastic with respect to price level changes in a non-adjusted tax- and contribution system. If, as is the case in both countries during the 6-year period, the adjustment factor more than compensates for inflation then it is to be expected that the resulting income gains have a regressive impact on the income distribution.

6. Concluding comments

Inflation can alter the characteristics of tax- and contribution systems in numerous ways. This paper has used a novel European tax-benefit model to look at the distortions of the tax schedule in Germany, The Netherlands and the UK. The integrated framework provided by the model permits the use of common income concepts across countries and therefore enables one to make informative comparisons of the distributive consequences of the inflation induced erosion of tax-band limits, thresholds, deductions, tax credits, etc. In addition, the paper has analysed the revenue implications of these distortions and tested the performance of automatic indexing regimes used in two of the countries. The following conclusions can be drawn:

- Real income tax revenues rise and receipts from employee social insurance fall when policy rules are not adjusted for inflation. The revenue effects can be very substantial – even at the presently prevailing low inflation rates. They depend on the progressivity of the underlying tax and contribution schedules and on the extent to which tax and contribution rules rely on flat-amount deductions, thresholds, allowances and credits. If tax and contribution rules were left unadjusted, Dutch income tax payers would experience the largest tax increases. In Germany, where there is no statutory uprating regime and where income taxes are relatively more important than in The Netherlands, the increase in tax revenues is also large.
- Relative to tax liabilities, the tax increases caused by inflation when the income tax rules are left unadjusted is largest for low-income groups. The impact on social insurance contribution burdens is also regressive. For low incomes, average payments rise because lower threshold limits are eroded by inflation. Higher income groups benefit from the erosion of upper contribution limits. However, because income taxes and contributions as a fraction of disposable income are much smaller for low-income groups, the distributive effect in terms of disposable incomes is progressive.
- The inflation adjustment regimes used in The Netherlands and the UK are successful in counteracting the distortions during times of inflation. However, tax revenues and

contributions can still vary depending on (1) whether inflation rises or falls; (2) the size of the time lags built into the adjustment process; and (3) differences between the consumer price index and the index used for uprating. In the 1992-1998 period, adjustment factors have, on the whole, overstated actual inflation and have, thus, caused slight decreases in real income tax revenues.

In the present paper, I have used a preliminary version of EUROMOD for three countries. The full EU15 version of the model will permit analysing a wider range of adjustment regimes in the context of any of the 15 countries, in particular those which do not currently adjust their tax systems for inflation (e.g., Austria, Ireland, Italy) and whose current inflation rates are higher than average (e.g., Denmark, Ireland). Also, the ability of EUROMOD to simulate benefits as well as direct and indirect taxes permits an extension of the present analysis to instruments other than income tax and social insurance contributions. For instance, given the increasing reliance on indirect taxes as a revenue source, it would be desirable to include of the effects of rising prices on (non-proportional) indirect taxes and the resulting distributive effects. Also, the largest number of tax concessions is often available for individuals and families who are in danger of social exclusion. Since these concessions frequently come in the form of flat-amount deductions, credits, etc., a closer look at the distribution of inflation related tax- and contribution changes among different groups of the population, would seem important. Groups of interest would include lone parents, pensioners, families with children, the disabled, etc. In this context, it would clearly be desirable to consider to what extent benefit payments are protected from being eroded by inflation.

Changing economic conditions can affect the characteristics of tax-benefit systems in numerous ways. In particular, current and future real economic convergence of European economies will frequently cause rapid changes of economic circumstances in individual countries. Inflation is only one of the potential channels through which tax-benefit systems depend on economic conditions. Other dimensions of economic change to which the present analysis could usefully be extended include *real* income growth, changes in the primary income distribution, varying levels of unemployment, and changing demographic characteristics including new patterns of family- and household structures. It is hoped that, by providing a consistent conceptual framework for analysing different tax-benefit systems, EUROMOD will contribute to a better understanding of these issues.

Table 1. Change of real tax- and contribution receipts when rules are not adjusted for inflation.

	GE		NL		UK	
Inflation	Income Tax[1]	EESIC	Income Tax	EESIC	Income Tax	EESIC
3%	+2.8%	-0.3%	+3.8%	-0.6%	+1.8%	-0.3%
5%	+4.5%	-0.6%	+6.3%	-1.1%	+3.0%	-0.5%
10%	+8.9%	-1.4%	+12.5%	-2.3%	+5.9%	-1.0%
Simulated 1998 Revenue	DM 327.8 bn	DM 254.8 bn	NFL 54.5 bn	NFL 86.4 bn	£65.9 bn	£22.4 bn
Actual 1998 Revenue	DM 301.8 bn	DM 276.8 bn[2]	NFL 51.1 bn	NFL 84.9 bn	£86.5 bn[3]	£22.4 bn

Sources: EUROMOD; Bundesministerium für Finanzen, National Accounts (GE); Statistics Netherlands (NL); Inland Revenue, Department of Social Security (UK).
[1] Includes Solidarity Surplus Tax. [2] Employees only. [3] Provisional figure.

Table 2. Inflation rates and statutory adjustment factors.

		Germany	The Netherlands	UK
1992-93	*Inflation*[1]	4.4%	2.3%	1.4%
	Income Tax	n/a	3.9%	3.6%
	EESIC	n/a	2.3%	3.6%
1993-94	*Inflation*	2.7%	3.0%	2.4%
	Income Tax	n/a	2.7%	1.8%
	EESIC	n/a	3.0%	1.8%
1994-95	*Inflation*	1.7%	2.2%	3.2%
	Income Tax	n/a	2.5%	2.2%
	EESIC	n/a	2.2%	2.2%
1995-96	*Inflation*	1.4%	1.9%	2.7%
	Income Tax	n/a	2.2%	3.9%
	EESIC	n/a	1.9%	3.9%
1996-97	*Inflation*	1.6%	2.0%	3.7%
	Income Tax	n/a	1.4%	2.1%
	EESIC	n/a	2.0%	2.1%
1997-98	*Inflation*	1.4%	2.2%	3.1%
	Income Tax	n/a	1.9%	3.6%
	EESIC	n/a	2.2%	3.6%

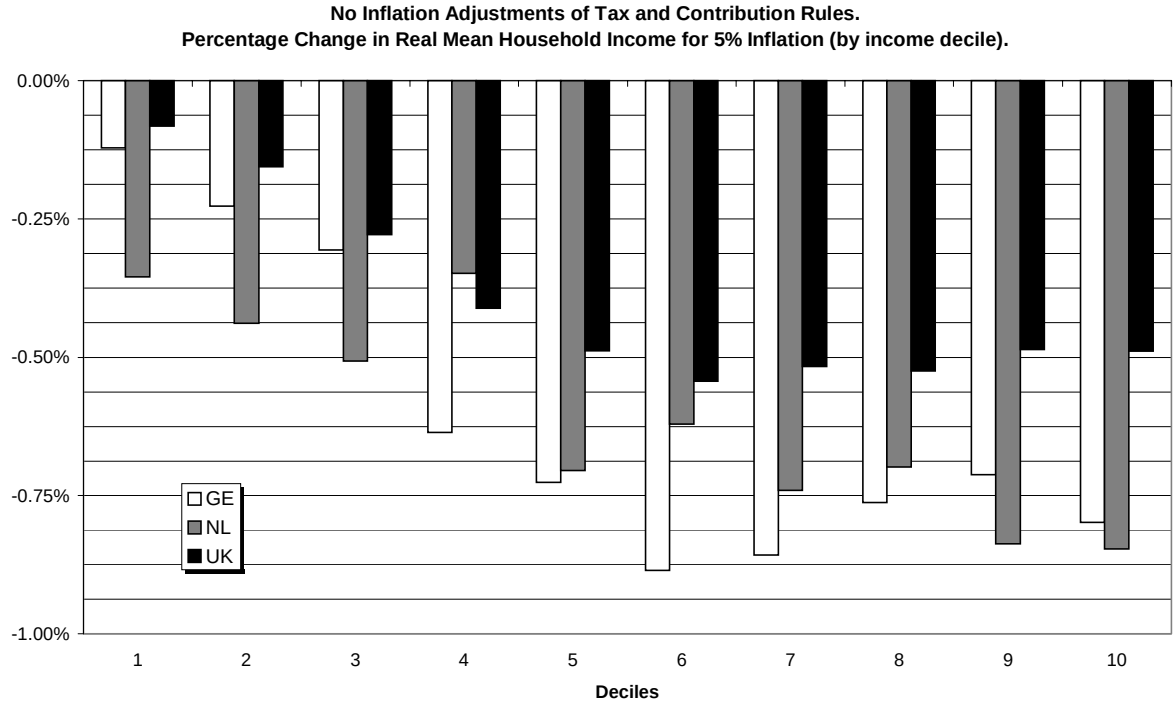
[1] Change in Consumer Price Index over the year preceding the sixth month of the tax year (June in Germany and the Netherlands, October in the UK). Source: OECD.

Table 3. Cumulative changes of real revenue – actual inflation rates.

	GE		NL		UK	
	Income Tax	EESIC	Income Tax	EESIC	Income Tax	EESIC
No Inflation Adjustments						
3 years	+18.6%	-2.7%	+19.1%	-3.3%	+7.4%	-1.1%
6 years	+51.1%	-8.0%	+63.8%	-11.7%	+31.6%	-6.1%
Actual Statutory Inflation Adjustments						
3 years	n/a	n/a	-5.6%	-1.1%	-2.9%	+0.5%
6 years	n/a	n/a	-10.9%	-2.2%	-5.1%	+0.3%

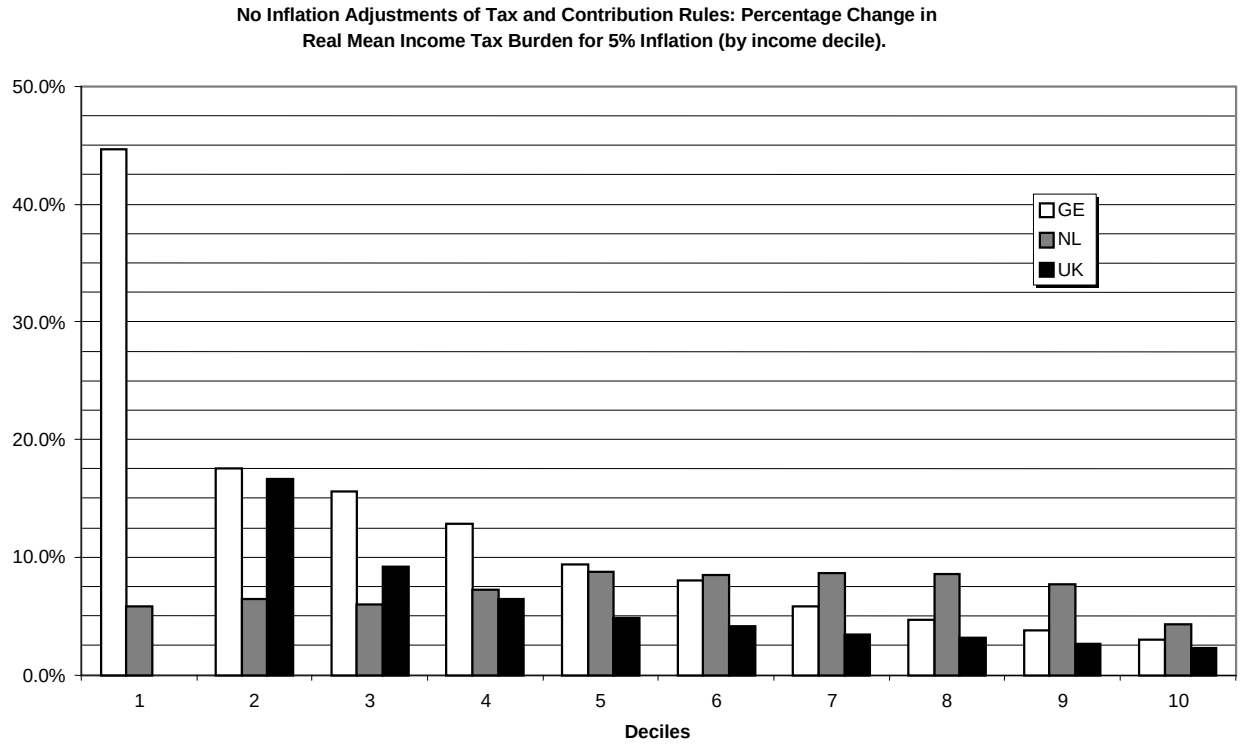
Source: EUROMOD

Figure 1. Disposable incomes at the household level – 5% inflation.



Source: EUROMOD

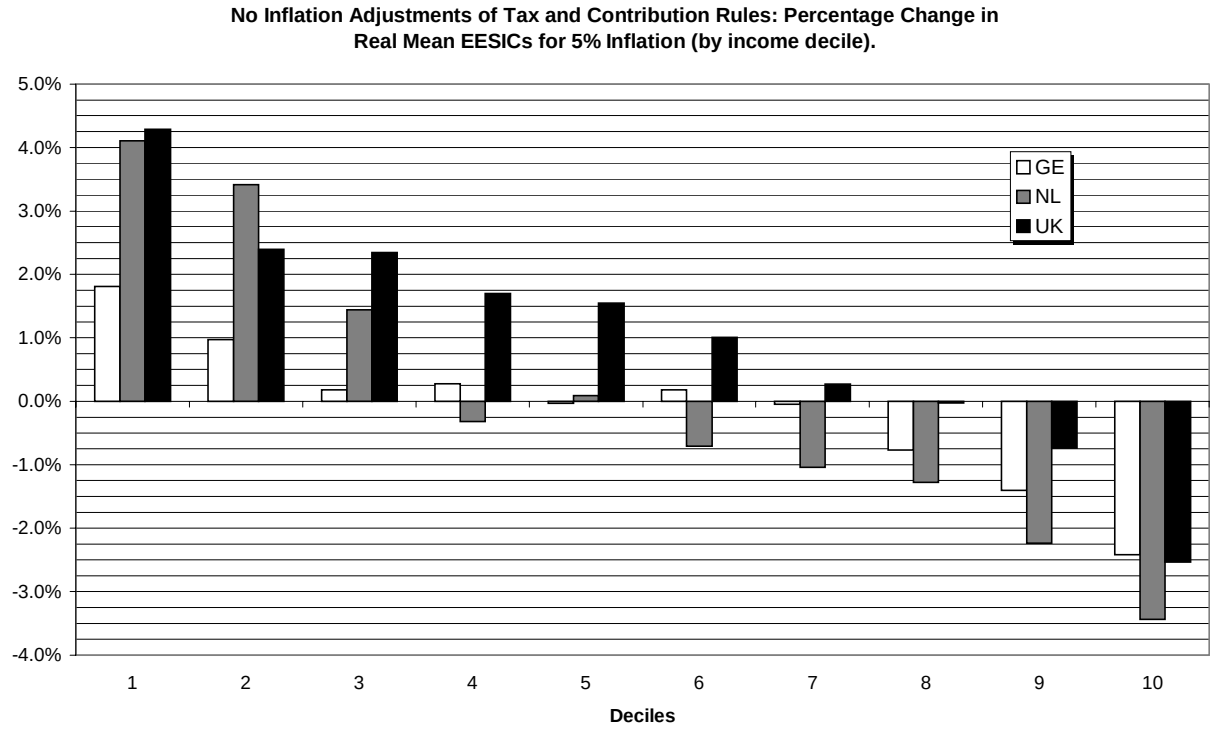
Figure 2. Income taxes at the household level.[1]



Source: EUROMOD

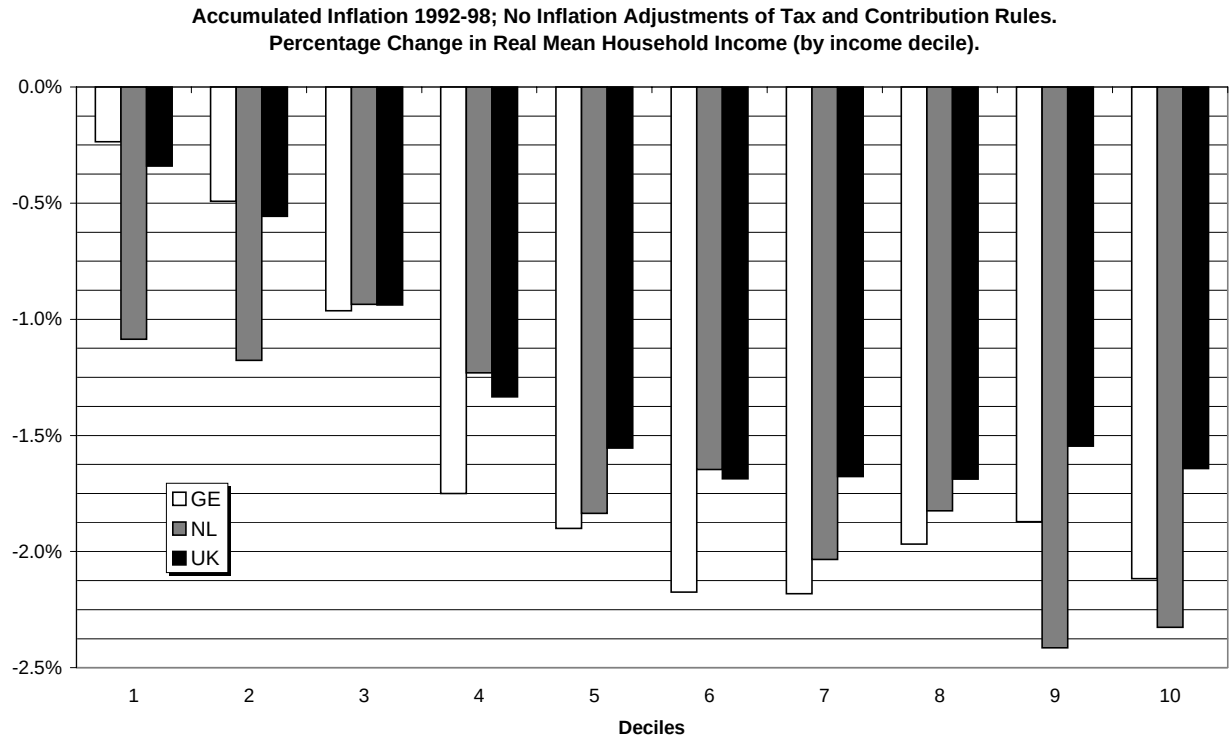
[1] The change for the lowest decile in the UK is omitted in the graph because the *average* income tax is negative for decile 1 (due to refundable tax credits): The average annual tax burden of this income group increases from minus £6.80 to minus £2.70.

Figure 3. Contributions at the household level.



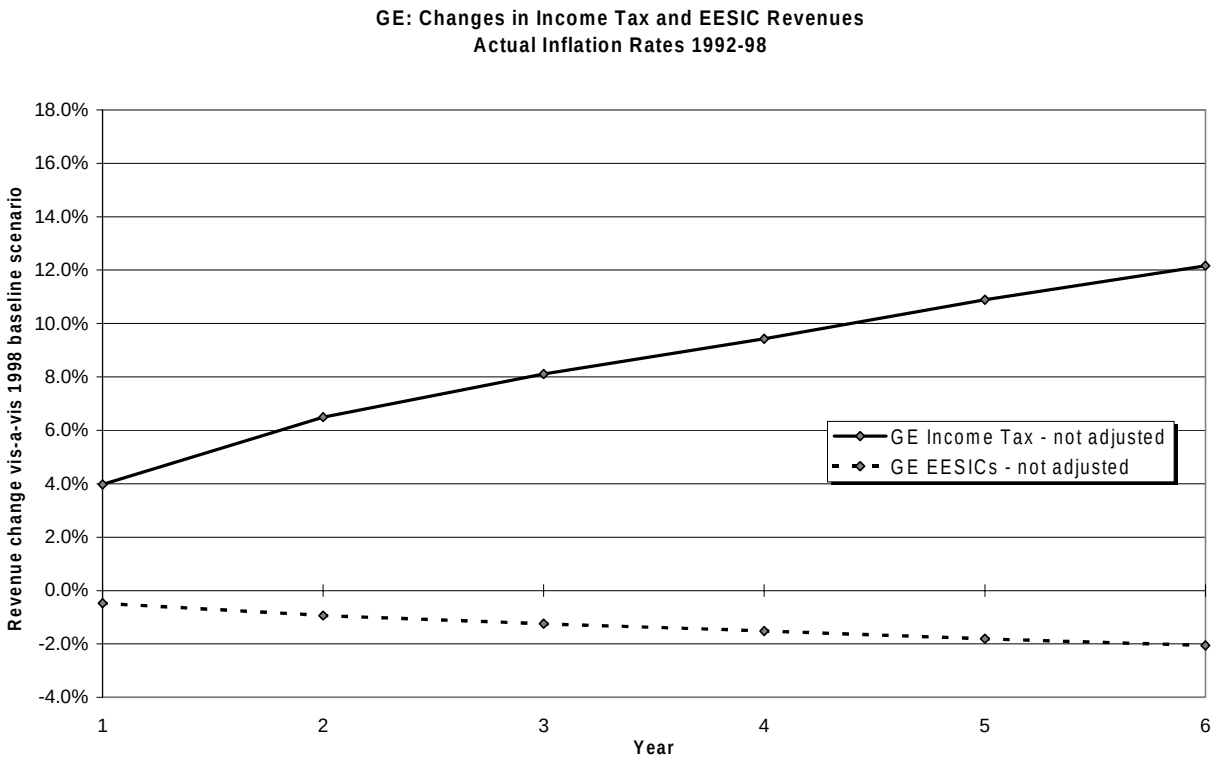
Source: EUROMOD

Figure 4. Disposable incomes at the household level – actual inflation.



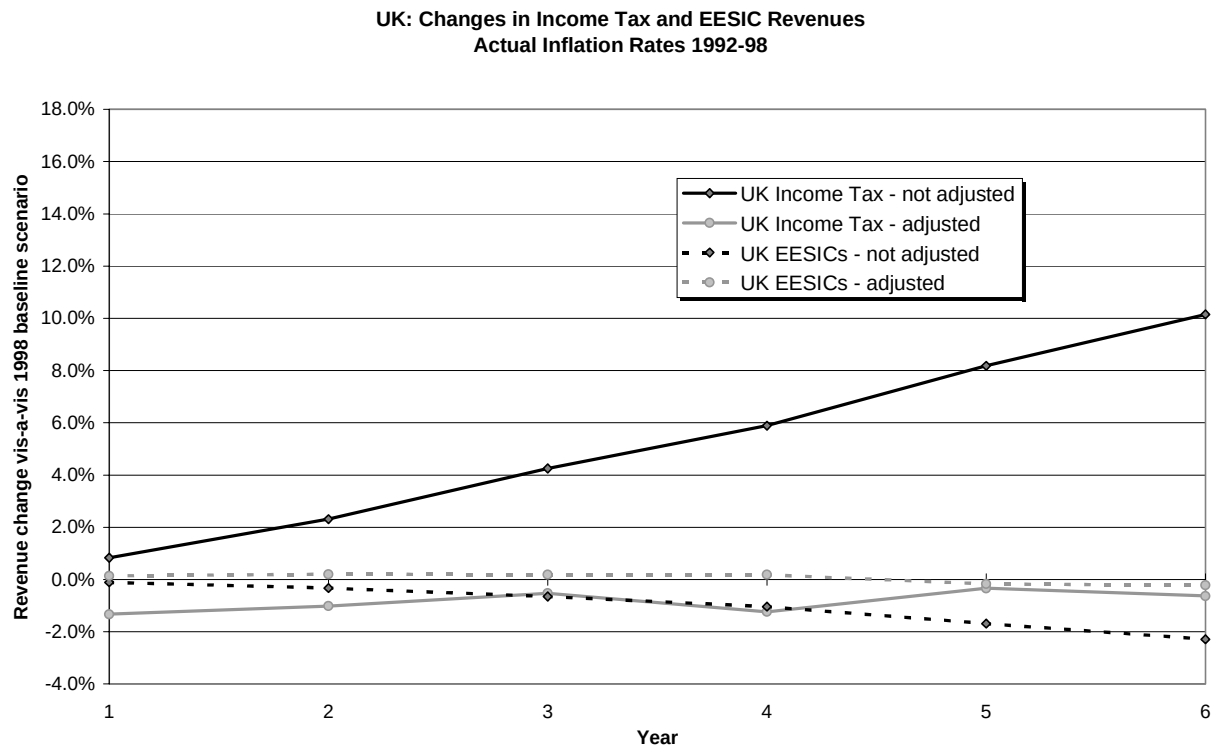
Source: EUROMOD

Figure 5.



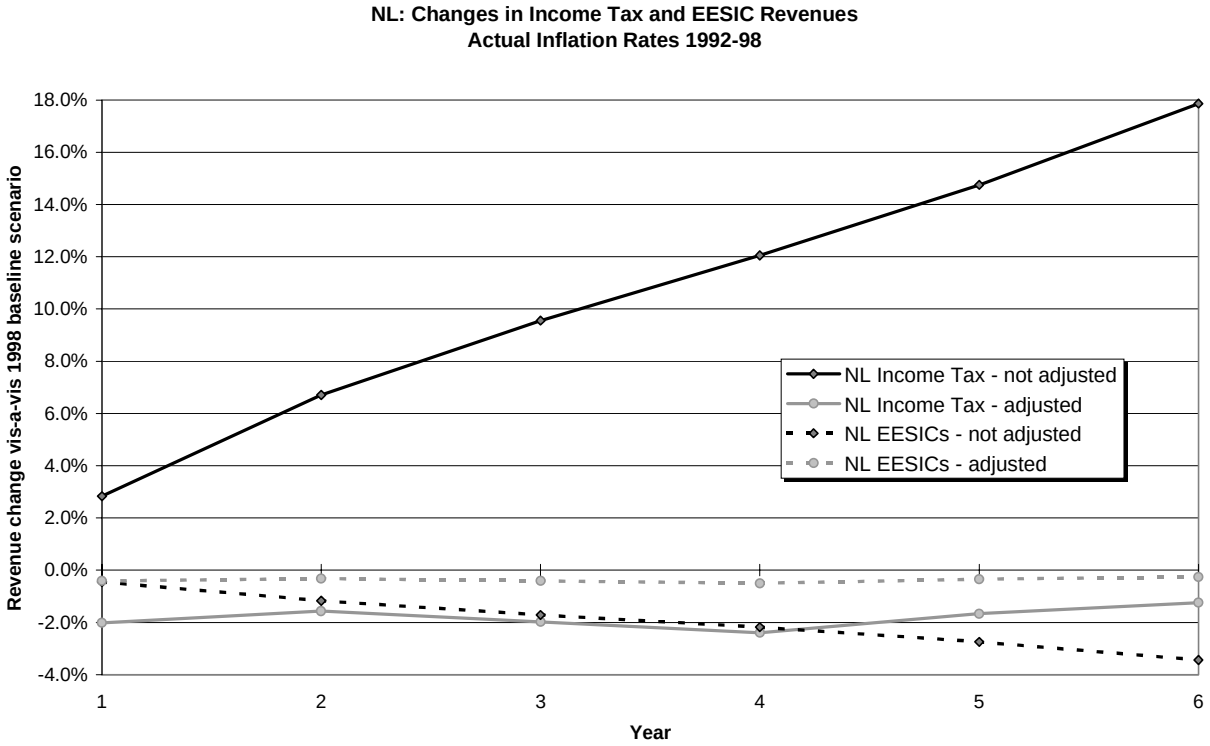
Source: EUROMOD

Figure 6.



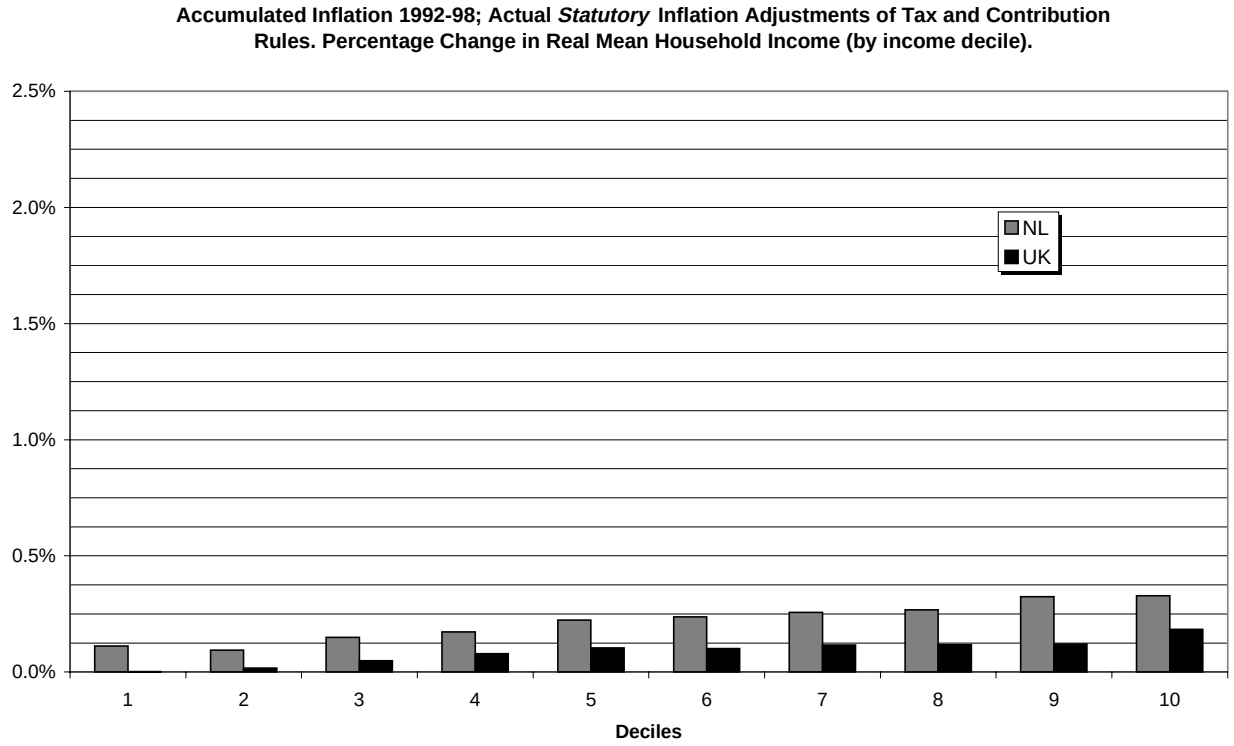
Source: EUROMOD

Figure 7.



Source: EUROMOD

Figure 8.



Source: EUROMOD

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Appendix 1. Tax-benefit instruments in the preliminary version of EUROMOD used in this paper.

Germany

Simulated	***Not Simulated (but included from data)***
Child Benefit	Unemployment Payment
Federal Education Benefit (“Bundeserziehungsgeld”)	Unemployment Benefit
Provincial Education Benefit (“Landeserziehungsgeld”)	Military Payment
Social Assistance ("Sozialhilfe”)	Retraining Payment
Employee Social Insurance Contributions (unemployment, pensions, disability, health)	Old Age Transition Payment
Employer Social Insurance Contributions	Own Old Age Pension
Income Tax	Miners' Pension
Solidarity Surplus Tax (“Solidaritaetszuschlag”)	Civil Servants' Pension
	War Victims' Pension
	Farmers' Pension
	Accident Pension
	Widow/Orphan Old-Age Pension
	Bad Weather Payment / Short-time Benefit
	Housing benefit (“Wohngeld”)[1]
	Nursing Home Insurance Payment Received ("Pflegeversicherung")

[1] will be simulated in the full version of EUROMOD.

The Netherlands

Simulated	***Not Simulated (but included from data)***
Child Benefit	Basic disability benefit ("AAW")
Earnings Transfer Allowance	Basic Old Age Pension ("AOW")[1]
Survivor's Benefit ("ANW")	Disability Insurance (former civil servants)
Social Assistance for the older unemployed and disabled unemployed ("IOAW")	NL Disability Insurance ("WAO")
Social Assistance ("ABW")	Social Assistance for self-employed ("UBZ")
Employee Social Insurance Contributions (unemployment, peoples' pensions, health)	Unemployment Benefit for civil servants
Self Employed' Social Insurance Contributions (disability)	Unemployment Benefit ("WW")
Employer Social Insurance Contribution (health)[23]	Sickness Insurance Pay ("ZW")
	Student Grants/Payments
Income Tax	Housing Benefit[1]

[1] will be simulated in the full version of EUROMOD.

[23] This is not part of the output income concept but necessary for computing income tax and peoples' insurance contributions. See also appendix 3.

UK

Simulated	***Not Simulated (but included from data)***
Child Benefit	Incapacity Benefit
Family Credit	Invalid Care Allowance
Income Support	Disability Working Allowance
Employee National Insurance Contributions	Disability Living Allowance
Self-Employed National Insurance Contributions	Mobility Allowance
Income Tax	Severe Disablement Allowance
	Attendance Allowance
	Industrial Injury Benefit
	Retirement Pension
	War Pension
	Widow Benefit
	Unemployment Benefit (Job Seekers Allowance)
	Statutory Sick Pay
	Maternity Payments
	Student Grants/Payments
	Council Tax Benefit[1]
	Housing Benefit[1]

[1] will be simulated in the full version of EUROMOD.

Appendix 2. Description of simulated Income Tax and EESIC rules.

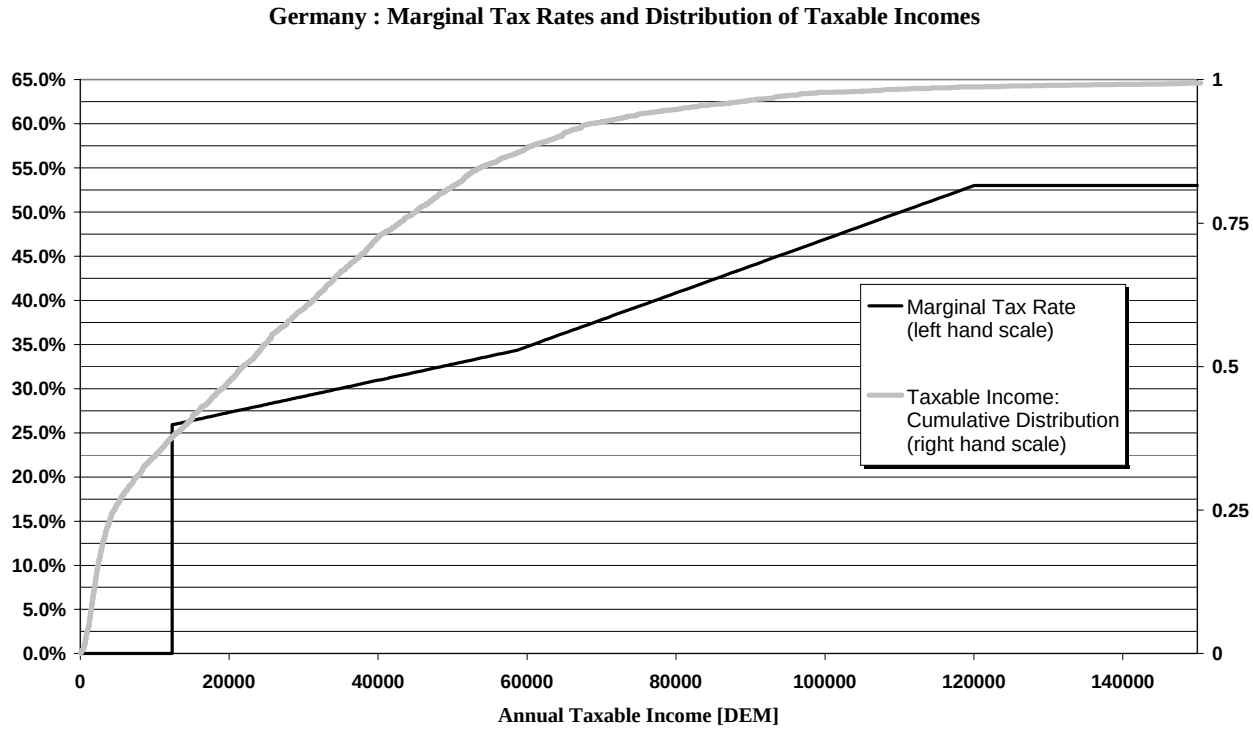
Germany

The German income tax schedule is continuous rather than piece-wise linear. Depending on the taxable income, income tax is calculated as follows:

1998 rules; annual amounts	Taxable Income (y)	Income Tax
	< DM 12,366	nil
	DM 12,366 – DM 58,643	(91.19*(y-12312)/10000 + 2590) * (y-12312)/10000
	DM 58,644 – DM 120,041	(151.91*(y-58590)/10000 + 3434) * (y-58590)/10000 + 13938
	> DM 120,041	0.53 * y - 22843

Married couples benefit from (optional) "income splitting". The income tax itself is the base for the so-called "Solidaritätsbeitrag" (solidarity surplus). For the solidarity surplus, a set of tax-free allowances applies (these are different for different income sources and not currently simulated in EUROMOD). The rate structure itself is linear (in 1998 the rate was 5.5%).

Figure 9.



Source: EUROMOD

The light grey line in figure 9 shows the cumulative distribution of individuals' taxable income. For a relatively large proportion of individuals, taxable income falls within the zero-tax band while about 68% of all individuals in the population pay income tax.[24] 79% of

[24] In cases where couples are eligible for "split" taxation, both partners are counted as paying tax.

taxpayers are in the flatter part of the continuous section of the schedule while 19% are located in the steeper part. Only 2% pay the top marginal rate of 53%.

EUROMOD simulates the following components of income tax:

	statutory uprating
Wage Earners Deduction ("Werbungskosten")	no
Lone Parent Tax Free Allowance ("Haushaltsfreibetrag")	no
Civil Servants Pension Deduction	no
Deduction from Investment Income ("Werbungskostenpauschale"; "Sparerfreibetrag")	no
Old Age Deduction	no
Expenditure Deduction ("Sonderausgabenabzugsbeträge")	no
Child Tax Free Allowance	no
Income Tax Schedule	no

Social insurance contributions are calculated as a fixed percentage of the contribution basis (different rates apply in Eastern and Western Germany). Below a certain threshold (again, different in Eastern and Western Germany), no contributions are payable. The contribution basis is subject to an upper limit. In 1998, the self-employed were not liable to compulsory social insurance contributions.

1998 rules; annual amounts	Rate (East/West)	Threshold (East/West)	Upper Contr. Limit (East/West)
Pension Contributions	10.15% / 10.15%	DM 6,240/7,440	DM 84,000/100,800
Unemployment Insurance Contribution	3.25% / 3.25%	DM 6,240/7,440	DM 84,000/100,800
Health Insurance Contribution	7.0% / 6.8%	DM 6,240/7,440	DM 63,000/75,600
Disability Insurance Contribution	0.85% / 0.85%	DM 6,240/7,440	DM 63,000/75,600

Contribution payments are deductible from the income tax base (as part of the “Expenditure Deduction”; certain conditions and limits apply).

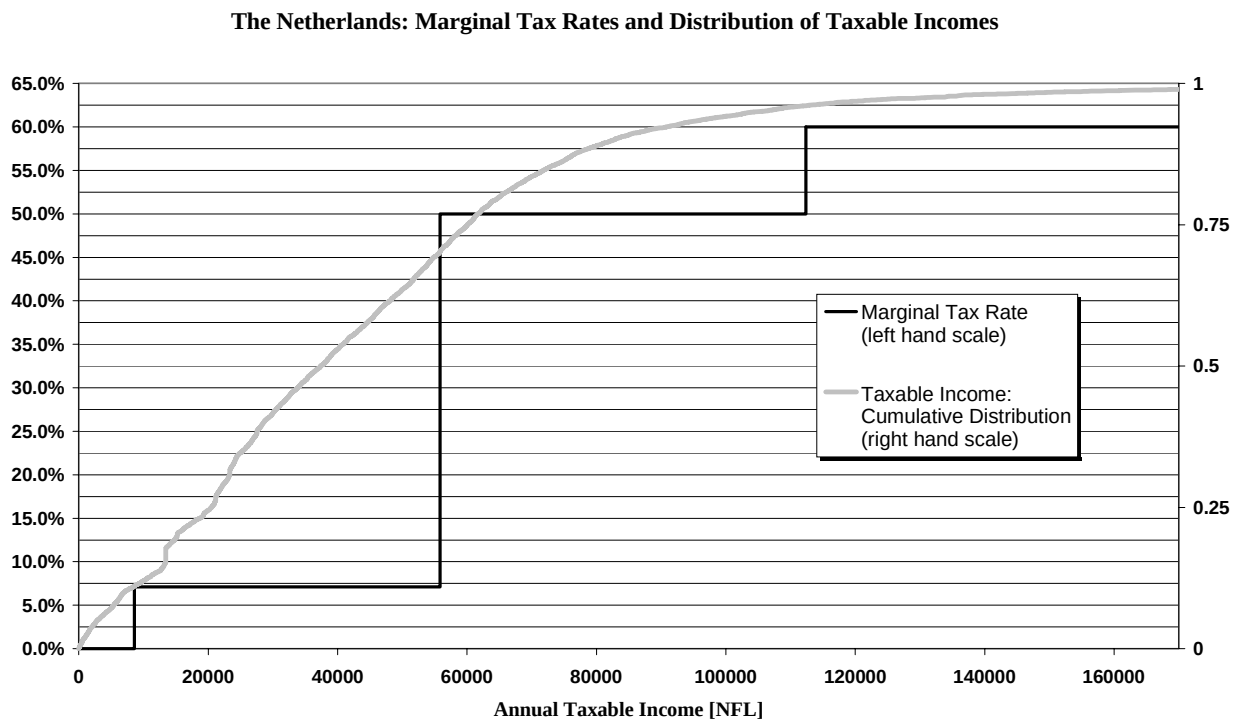
The Netherlands

There are three different tax bands in the Dutch income tax schedule:

1998 rules; annual amounts	Taxable Income	Marginal Rate
	< NFL 47,184	7.1%
	NFL 47,184 – NFL 103,774	50.0%
	> NFL 103,774	60.0%

In addition, the main tax free allowance amounts to NFL 8,617 per year. The major part of any unused tax-free allowances is transferable between spouses. To improve comparability with the German schedule, the main tax-free allowance is shown here as a zero-rate tax band (figure 10). The distribution of taxable income as shown below is the income *before* applying any tax-free allowances.

Figure 10.



Source: EUROMOD

According to the simulations, about 64% of the population pay income tax. 3% of taxpayers pay the top 70% marginal rate.

EUROMOD simulates the following components of income tax:

	Statutory uprating
Professional Deduction	yes
Self Employment Deduction	yes
Life Assurance Premia Deduction	yes
Mortgage Interest Deduction	n/a
Old Age Deduction	yes
General Tax Free Allowance	yes
Investment Income Tax Free Allowance	no
Lone Parent Tax Free Allowance	yes
Income Tax Schedule	yes

Overall Employee Social Insurance Contributions exceed the receipts from income tax considerably. Contributions to the "People's Insurance" form the largest share of the former (1998: NFL 68.5 bn[25]). People's contributions cover the basic state pension, the survivors' pension, the disablement pension and exceptional medical expenses. They are paid at a fixed percentage subject to an upper contribution limit. Everybody is in principle liable to pay this contribution: the base is the same as for income tax (i.e., all deductions and tax free allowances apply to the pension contribution base as well). Note that the upper contribution limit is equal to the limit of the first income tax bracket. In other words, people's insurance contributions are only paid on taxable income in the first bracket. Different income bases are relevant for unemployment, health and disability insurance. For unemployment insurance contributions, there is a zero rate band. A fixed percentage is paid only on income exceeding this limit. Health insurance contributions are also paid as a fixed percentage of the basis (higher rates apply for pensioners). On top of the percentage contribution, a "flat amount" is payable. There is an upper contribution limit. In addition, if the contribution basis exceeds an "upper income limit" *no* health insurance contributions are payable at all (high-income individuals are assumed to find their own private health insurance). Disability insurance contributions are only payable by the self-employed (for employees they are paid by the employer).

1998 rules; annual amounts	Rate	Zero Rate Band	Upper Contr. Limit	Upper Income Limit	flat amount
People's Insurance Contr.	29.25%	n/a	NFL47,184	n/a	n/a
Unemployment Insurance Contr.	6.35%	base<NFL27,144	NFL78,561	n/a	n/a
Health Insurance Contr.	1.20%	n/a	NFL52,983	NFL62,200	NFL216
Disability Insurance Contr.	7.9%	base<NFL29,000	NFL84,000	n/a	n/a

Only unemployment and disability insurance contributions are deductible from the income tax base (and, consequently, the contribution base of People's Pension contributions).

[25] Source: Statistics Netherlands.

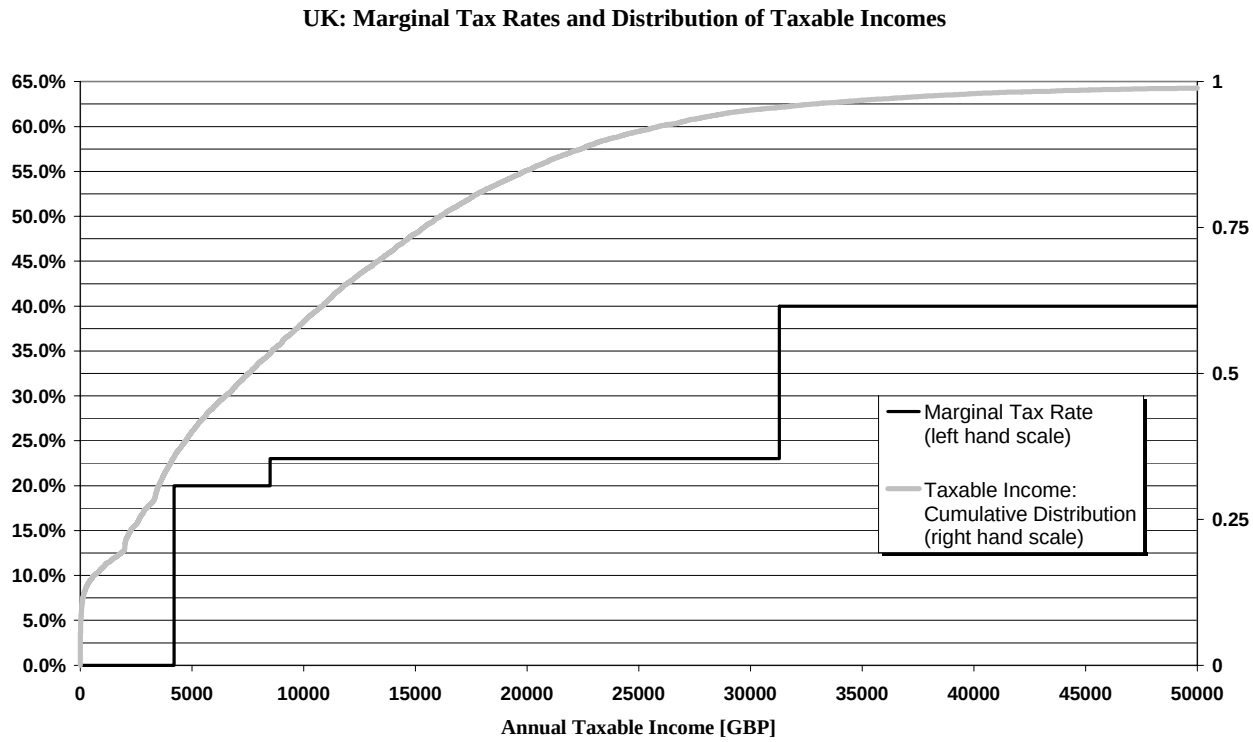
UK

The UK income tax schedule also consists of three tax bands:

1998/99 rules; annual amount	Taxable Income	Marginal Rate
	<£4,301	20.0%
	£4,301 – £27,100	23.0%
	> £27,100	40.0%

In addition there are several tax credits (tax reduction for investment income, lone parent allowance, married couples allowance, mortgage interest rate supplement). A basic tax-free allowance of £4,195 per year is available to all taxpayers. To improve comparability with the German schedule, the main tax-free allowance is shown here as a zero-rate tax band (figure 11). The distribution of taxable income as shown below is the income *before* applying any tax-free allowances.

Figure 11.



Source: EUROMOD

Only 42% of individuals pay income tax. Relative to the other two countries, there is a much larger proportion (7.6%) of taxpayers who pay the top rate (which is markedly lower than in both Germany and The Netherlands).

EUROMOD simulates the following components of income tax:

	statutory uprating
Main Tax Free Allowance	Yes
Age Related Tax Free Allowance	Yes
Income Tax Schedule	Yes
Tax reduction for investment income in second tax band	Yes
Lone Parent Allowance	Yes
Married Couples Allowance	Yes
Mortgage Interest Rate Supplement	No

For employee social insurance contributions in the UK, there is no differentiation according to the purpose of the insurance. However, it is possible to "opt out" of the State Earnings Related Pension Scheme (SERPS), in which case lower rates apply. Different rules apply for the self-employed. If the base does not exceed a certain limit (limit2 below) then only a flat amount is payable. In addition, for the part of the base, which exceeds the limit, a percentage contribution applies. For both employee and self-employed contributions, there is a lower limit below which no contributions are payable and an upper contribution limit.

1998 rules; weekly amounts	Lower limit	Rate on amount above limit	Rate if opted out of SERPS	Upper contribution limit
Employees	£64	10% (plus 2% of 64)	8.4% (plus 2% of 64)	£485

1998 rules; weekly amounts	Lower limit1	Amount if above lower limit1	Lower limit2	Rate for amount > lower limit2	Upper contribution limit
Self-employed	£64	£6.35	£140.58	6%	£485

In the UK, social insurance contributions are not tax deductible.

Appendix 3. Disposable Income Definition used for the purpose of this paper.

For the current exercise we use the following definition of household disposable income: wage and salary income (including sick pay paid by government), plus self-employment income, plus property income (rent, dividends, interest), plus other cash market income and occupational pension income (regular private transfers, alimony and child maintenance), plus cash benefit payments (social insurance, disability, universal and social assistance benefits, including state pension payments and near-cash benefits), minus direct taxes and social insurance contributions, as defined in (Atkinson *et al.*, 1995, Table 2.1).

Components that are not part of our output income concept include imputed rent from owner occupation, the value of home production, other non-cash incomes, unrealised capital gains or losses, the value of credit or loans (repayments and interest payments are not deducted) and irregular lump sum incomes (regular bonuses are included). Employer contributions are neither added nor deducted. Forms of "committed expenditure" such as housing costs, child maintenance, alimony payments, etc. are not deducted.