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The Redistributive Effects of the Tax System in West Germany, Sweden, and the United States: A Comparative Tax Incidence Study

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Luxembourg Income Study Working Paper Series

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Christoph Rosenberg

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The Redistributive Effects of the Tax System
in West Germany, Sweden, and
the United States

A Comparative Tax Incidence Study

by

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LIS-CEPS Working Paper #36

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I. Introduction

This paper attempts a comparative international tax incidence study, investigating taxation and its effects on income redistribution in three countries with quite different fiscal and social policy approaches: West Germany, Sweden, and the United States. Hence, we try an answer not only on the question "who pays the taxes", but also "where do people pay the most and the least taxes?".

Income distribution and overall progressivity of the tax system are the main focus of this study. For this purpose the population in each of the countries is split up into deciles of pre-tax income. For every single decile the average burden of income, consumption, corporate, property and payroll taxes are calculated. Moreover, effective marginal tax burdens are explored. This will provide useful insights into the economic incentives to save and to work in different countries and -- as a further step not undertaken here -- explain international divergences in economic performance and social welfare. Finally, the relation of taxes and transfers per income group are calculated, and different tax progressivity indices, like Gini-coefficient, Kakwani and Suits index are provided.

Section II includes a brief discussion of the choice of the appropriate methodology, a description of the assumptions, and some definitions used in the empirical part. In Section III the main empirical results of the study are presented. Section IV summarizes our findings and provides some concluding remarks.

II. Methodology and Assumptions

Choice of the Model

Since Arnold C. Harberger's famous paper, "The Incidence of the Corporate Income Tax" (1962), most empirical studies in the field of tax incidence apply some kind of general equilibrium analysis. The most advanced technique is certainly the application of computable general equilibrium models of the Shoven/Whalley (1976) type, making full use of the neoclassical theory and understanding tax incidence as a change in individual welfare levels. But this methodology is not without difficulties, since considerable resources, i.e. a sophisticated database including certain elasticity figures, as well as a powerful mainframe computer are required.

The following analysis will take an easier, but more feasible way and use the simplified Pechman/Okner (1974) approach. Although this is not very satisfying from the theoretical point of view, it is by no means "quick and dirty", as some critics maintain. In contrary, there are several good reasons to apply this technique in our three-country comparison. First, this approach, because of its simplicity, is very transparent in the sense that it clearly states assumptions and makes it easy for the reader to trace the reasoning. Secondly, our micro-data are ideal for this sort of analysis, because they include total factor and transfer income as well as most taxes paid per household. Thirdly and more practically, tax burdens can be calculated quite easily with a standard statistical computer program like SPSS^X.

The results of studies using more advanced techniques will, however, enter our estimations by including them in the incidence assumptions. Where there is no consensus in the literature, alternatives will be explored.

The major weaknesses of the Pechman/Okner approach are well known. First of all, the simplifying assumptions do not precisely account for the true shifting of taxes, which usually depends on elasticities and many more variables. Secondly, and more important, deadweight losses due to the tax system are omitted. We therefore only calculate part of the tax burden, namely the revenue raised by the tax collector and appearing in our data. Real excess burdens, which-- according to general equilibrium computations¹ -- have a not negligible size, cannot be captured in our simplified model. The following calculations therefore actually do not answer the question "who bears the tax burden?", but rather "who pays the taxes?".² This diminishes our results considerably -- at least from the theoretical point of view.

¹Ballard, Shoven, and Whalley (1985), pp. 128-138, calculated an average of 15-24% deadweight loss for every dollar tax revenue collected.

²The reader will note that Pechman (1985) was careful enough to choose the second question as title for his study. The first version of the Pechman and Okner (1974) report had the title "Who bears the tax burden?".

Assumptions about Tax Incidence

Before turning to specific assumptions about the major taxes, some general simplifications are necessary. Firstly, if not noted specifically, perfect competition, perfect factor mobility, and perfect flexibility of factor and commodity prices are assumed. According to the prevailing general equilibrium theory the necessary adjustments will take place in the long run. As a consequence, there is full employment of all factors where all inputs earn their marginal product. This abstraction is necessary in order to exclude macro effects of fiscal and monetary policies from the analysis. Secondly, we assume fairly inelastic supplies of labour and capital throughout the study.³ Thirdly, deadweight losses due to the imposition of taxes are ignored.

Moreover, we only present an instantaneous snapshot of the tax burden distribution in the particular year when the LIS-data were collected (for the U.S. this is 1979, for Germany and Sweden 1981). This common procedure neglects the intertemporal effects of many taxes and benefits as well as income. There is a strong correlation between the age of heads of households and income.⁴ Income and tax burden distribution should therefore be better examined in a life-cycle model. Howe-

³In spite of Hausman's (1985) recent findings this obviously is still the predominating view for the U.S. and Germany. In Sweden there is some evidence that labour supply has been reduced by the exceptionally high marginal income taxation (Bosworth, 1987, pp. 208-241). These findings do not, however, seem convincing enough to be included in this study.

⁴For some empirical evidence based on the LIS-dataset see Hedstrom and Ringen (1985).

ver, since such methods are not developed very much yet⁵ and our household surveys do not include the necessary data, this is not feasible.

In order to simplify the analysis even more, excise taxes on alcohol, coffee, energy and so on are simply included in the incidence of the general sales tax. Death, estate, and gift taxes, taxes on non-profit organizations, as well as government fees and customs duties are omitted.

Income taxes are assumed to be borne solely by those who pay them. This is a consequence of our notion of inelastic labour supply. A general sales tax, however, is usually believed to fall on the user side, since relative prices are unchanged.⁶ The incidence will therefore be allocated according to the consumption propensities of the households.⁷ In the calculations for Germany we have to take into account that the "Mehrwertsteuer" (general VAT) is split into a basic rate of 6.5% for food and 13% (rates for 1981) for all other goods.

⁵ Danziger, Haveman and Plotnik (1981), pp. 975-1029, give an overview over the current research using lifetime models. They point out that the few existing reports using panel data suggest more equality in the society, if intertemporal considerations are introduced.

⁶Note that a consumption-based VAT or a general sales tax are equivalent to a tax on incomes with interest earnings exempt.

⁷Consumption propensities are derived from the "Einkommens- und Verbrauchsstichprobe 1978" for Germany, the "Family Expenditure Survey 1978" for Sweden and the "Consumer Expenditure Survey 1980" for the U.S.

The incidence of the corporate income tax is a lot less clear-cut. Studies using Harberger's general equilibrium model suggest that the incidence of this tax falls on all capital owners. This will hold only in a perfectly competitive economy, only in the long run and only with particular parameter schemes. An opposing view argues that in modern capitalist societies many markets are monopolistic or oligopolistic, even in the long run. This implies that firms have the power to set quantities and prices and make economic profits. How such a market structure alters the incidence of the corporate income tax depends very much on the way the situation is modelled. If the tax is treated as a scalar increase in the monopoly's cost the tax may be shifted in part on to the consumer. To what extent this is possible depends on the slope of the demand and marginal cost schedules, as well as the degree of concentration in the market.⁸

It is difficult to decide which of the two opposing views is right. In all three countries there is a fierce discussion going on whether the markets are competitive or not.⁹ We are not able to resolve this problem and therefore provide two reasonable alternative assumptions: Variant 1 assumes that all markets are competitive in the long

⁸See Krzyzaniak and Musgrave (1963) for some empirical findings.

⁹ Scherer (1980), p. 27, attempts to compare the overall market structure in our three countries by looking at average three-firm-concentration-ratios in identically defined industries. His finding, that the markets in the U.S. and Germany are in general more competitive than in Sweden is only of limited relevance, since such examinations of in-country market structure say nothing about foreign competitors. Volvo might be the only major Swedish car producer, but nevertheless there is a competitive market because of international competition.

run. Consequently, if there is limited international competition, the burden of the corporate income tax is solely borne by all capital owners, not only by the recipients of corporate dividends. Variant 2 assumes some (not closely specified) degree of concentration in the markets, even in the long run. Since a fully monopolistic case, where a large portion of the tax is shifted, is certainly unreasonable, one half of the burden is again borne by capital owners and one half is shifted on to consumers by higher prices.

The possibility that firms with monopsonistic power in the labour market shift the tax to workers by lower wages is not included, because, given the fairly strong unions in all three countries, this does not seem very likely.

Concerning the property tax there is a similar controversy as with the corporate income tax. While the "new view"¹⁰, based on general equilibrium models allocates the burden of this tax to property income in general, the traditional approach sees the incidence of structures and dwellings on the consumers.¹¹ We shall take both into account by again offering two alternatives, one regressive (variant 1) and one progressive (variant 2). Tax-benefit correlations on the local level are omitted.

¹⁰The "new view" was introduced by Mieszkowski (1972).

¹¹See, for example, Aaron (1974), p. 21.

Unfortunately our data do not differentiate between earnings from land property and structures etc. We therefore have to simplify the analysis by treating the burden on land owners (which according to the theory cannot be shifted) as a burden on all property income. Variant 2, which reflects the traditional view, takes this into account by allocating 1/4 of the total incidence to capital income and only 3/4 to consumption.

Payroll taxes in the American sense actually do not exist in Germany and Sweden, where social security is not treated as a part of the tax system, but as insurance. To make our incidence results comparable all mandatory employer and employee contributions will be defined as "payroll taxes" throughout the study.

Since we assume inelastic labour supply, the employee's portion of the payroll tax in the U.S. and in Germany (in Sweden employees do not pay such social security contributions at all) will be borne solely by those who pay it. The employers, however, will probably be able to shift their portion of the tax to their workers. This at least seems to be the consensus in the literature using partial models. On the other hand, if firms face a monopolistic labour markets with strong unions, they cannot pass the entire tax on to their workers.

Again, we will take both alternatives into account by calculating two versions: Variant 1, where the entire tax (employee and employer

part) is borne by the workers, and Variant 2, where the employee's and one half of the employer's portion of the tax is borne by the workers, the other half of the employer part is shifted on to consumers.

All taxes are allocated by a simple formula: total tax revenue of the particular tax is divided by the national total of the burdened factor or consumption (we call this fraction "burdening coefficient").¹² The tax burden is then represented by the multiplication of burdening factor with its endowment with this particular factor or with its consumption expenditure. The system was calibrated in an order-preserving way by normalizing to version 1. Table 1 summarizes our different incidence assumptions.

¹²These aggregate data are derived from the "United Nations National Account Statistics" (1985) and the "Revenue Statistics of OECD Member Countries" (1987).

TABLE 1

TAX INCIDENCE ASSUMPTIONS USED IN THIS STUDY

Tax	Variant 1 (most progressive)	Variant 2 (least progressive)
Income Tax	workers	workers
Sales Tax	consumers	consumers
Corporate Tax in general	capital owners	1/2 capital owners 1/2 consumers
Property Tax in general	capital owners	1/4 capital owners 3/4 consumers
Payroll Tax (employee's part)	employees	employees
Payroll Tax (employer's part)	employees	1/2 employees 1/2 consumers

Our specification of income is as close as possible to the very broad "Haig-Simons" definition. The LIS dataset fortunately includes many components of income, especially transfers, that other researchers had to compute or estimate troublesomely and with great efforts.¹³ Nevertheless a number of compromises, such as the exclusion of gratuitous receipts, education, housing and food benefits, as well as in-kind earnings like national defense were necessary.

In our study pre-tax income of every household will serve as base for taxes paid under different shifting assumptions¹⁴. Hence, observed incomes must be adjusted according to the shifting assumptions, because they only represent post-tax incomes. When dealing with taxes borne directly by factors and not shifted (as mostly assumed in variant 1), this is quite simple: we just have to increase the observed factor earnings by the amount of taxes paid to arrive at pre-tax income. If, however, part or all of the factor tax is assumed to be shifted to consumers, prices are increased and real incomes decline. Here the question arises, whose incomes are affected by this loss in real terms. Unlike Pechman and others we do not simply increase all factor incomes¹⁵, but only labour and transfer earnings. This is because we assume

¹³For a complete account of the factor, transfer and pension incomes included in the dataset see LIS User Package (1987).

¹⁴This comparison with a hypothetical "taxless state" is called differential incidence.

¹⁵Pechman (1985), p. 19, Footnote 23.

that capital owners, whenever they have the ability to shift their tax burden to consumers, will not permit their real income to fall.¹⁶

Some Definitions

As mentioned above, the average tax rate AT is defined as the fraction of tax payment t total pre-tax income y :

$$AT = t(y) / y \quad (1)$$

Marginal taxes MT are defined as

$$MT = \partial t(y) / \partial y \quad (2)$$

and can be calculated as soon as the functional form of $t = f(y)$ is known. Regression of t on y using the standard form

$$t(y) = \beta_0 + \beta_1 y + \beta_2 y^2 \quad (3)$$

produced -- after correction for heteroskedasticity in Germany -- significant coefficients and R2 values above 0.98.

Two variables will serve to capture the reliance of different income deciles on transfers. First, transfer intensity a , which is defined as the ratio of transfers received tr and pre-tax income y :

$$a = tr / y \quad (4)$$

Second, nettax NT, which presents the difference between taxes and transfers, divided by pre-tax income:

$$NT = (t - tr) / y \quad (5)$$

¹⁶An extensive discussion of this hypothesis as well as a (mathematical) derivation of a modified model is presented in Rosenberg (1988), pp. 80-90.

There exists a vast variety of concentration and progressivity indices in the literature. The most popular is probably the Gini coefficient, which, when comparing its pre-and post-tax value, provides a tax progressivity measure. If $F_i(y)$ represents the total share of income y received by households with y or less and $F(y)$ is the population share of those with an income no greater than y , then the Gini-coefficient G is defined as

$$G = 1 - 2 \int F_i(y) dF(y) \quad (6)$$

The Gini-coefficient approach, however, is not without problems.¹⁷ We will therefore use Suit's (1977) index S as an alternative measure, which is analogous, but plots accumulated percent of total income against accumulated average tax burdens:

$$S = 1 - 2 \int F_i[t(y)] dF_i(y) \quad (7)$$

Finally, a third common progressivity measure, the Kakwani (1980) index K will be applied. It is defined as

$$K = C_t - G \quad (8)$$

where C_t is the concentration index of tax $t(y)$.

¹⁷See Atkinson (1980), pp. 247-250.

III. Results

Transfers and Taxes

Before looking at tax burdens we will briefly examine transfer payments received by households. For this purpose the population in each of the three countries is divided up in deciles of adjusted pre-tax income. This categorization will be used throughout the following analysis.

Table 2 presents our results for the two transfer-measurement variables "transfer intensity" a and "net tax payment" NT (for version 1 and 2).

The transfer intensity indicates to what extent a household depends on transfer payments. Not surprisingly, this ratio declines, although not monotonically, with increasing income in all three countries. Nevertheless there are some important differences. First of all, the average transfer intensity in the U.S. is 0.177 and thus much lower than in Sweden (0.283) and Germany (0.286). Income redistribution seems to be the highest in Germany, where the average household income in the first three income deciles consists up to 80% of transfers. In the fourth decile it falls abruptly, so that the upper income classes almost entirely rely on factor incomes. In Sweden and the U.S. the importance of transfers as a source of household income declines much more smoothly, suggesting a less fierce income redistribution policy, at least using the tool of transfers.

TABLE 2

TRANSFER INTENSITY AND NET TAXES

Income Deciles	1.	2.	3.	4.	5.	6.	7.	8.	9.	10
<u>Germany</u>										
a	.797	.765	.631	.287	.097	.088	.073	.063	.046	.022
NT (v.1)	-.650	-.624	-.472	-.050	→ .194	.201	.234	.244	.263	.309
NT (v.2)	-.559	-.535	-.418	-.026	.197	.189	.231	.243	.252	.299
<u>Sweden</u>										
a	.593	.606	.488	.333	.223	.158	.167	.124	.084	.062
NT (v.1)	-.143	-.246	-.111	→ .078	.212	.291	.279	.323	.366	.399
NT (v.2)	.015	-.127	-.041	.122	.235	.273	.277	.318	.348	.377
<u>U.S.A.</u>										
a	.579	.493	.286	.166	.093	.056	.036	.027	.019	.015
NT (v.1)	-.154	-.243	-.074	→ .045	.163	.161	.225	.211	.264	.324
NT (v.2)	-.003	-.118	-.079	→ .089	.158	.165	.211	.217	.257	.308

The variable NT reveals to what extent households are net recipients or payers of public transfers and taxes. Naturally in the lower income deciles, where the transfer intensity is high, NT tends to be close to zero or even negative. Due to their heavy reliance on transfer payments the lowest four deciles in Germany receive the most net public benefits. As we will see later, another reason for this phenomenon is the comparatively small tax burden of low-income households in Germany. Net transfer receivers can also be detected in the first three income

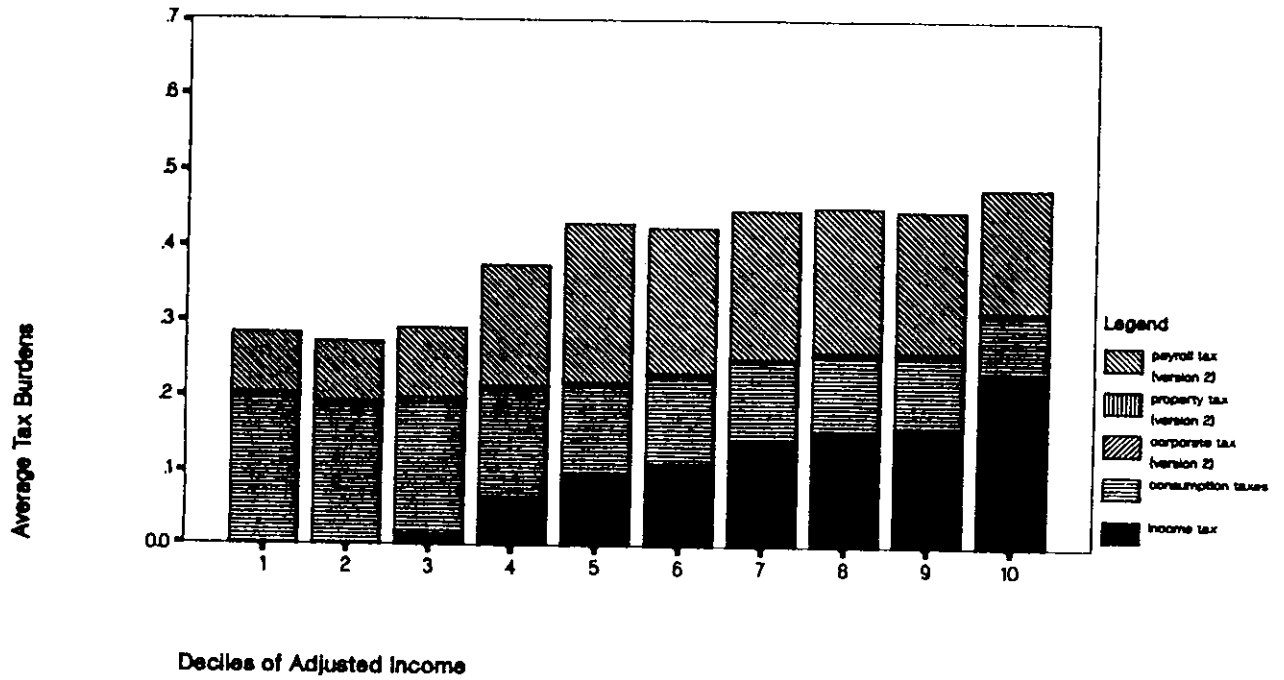
classes of the U.S. and Sweden. It is interesting to note that in version 2 the lowest decile in Sweden actually is a net payer of taxes. This is probably due to the very high consumption tax burden in this shifting assumption, which will be examined in the following section.

The overall conclusion from the examination of transfers is that Germany obviously has the most redistributive fiscal system, paying high transfers to low income classes and taxing high income earners heavily. This seems to be a contradiction to our findings in the first section of this chapter.

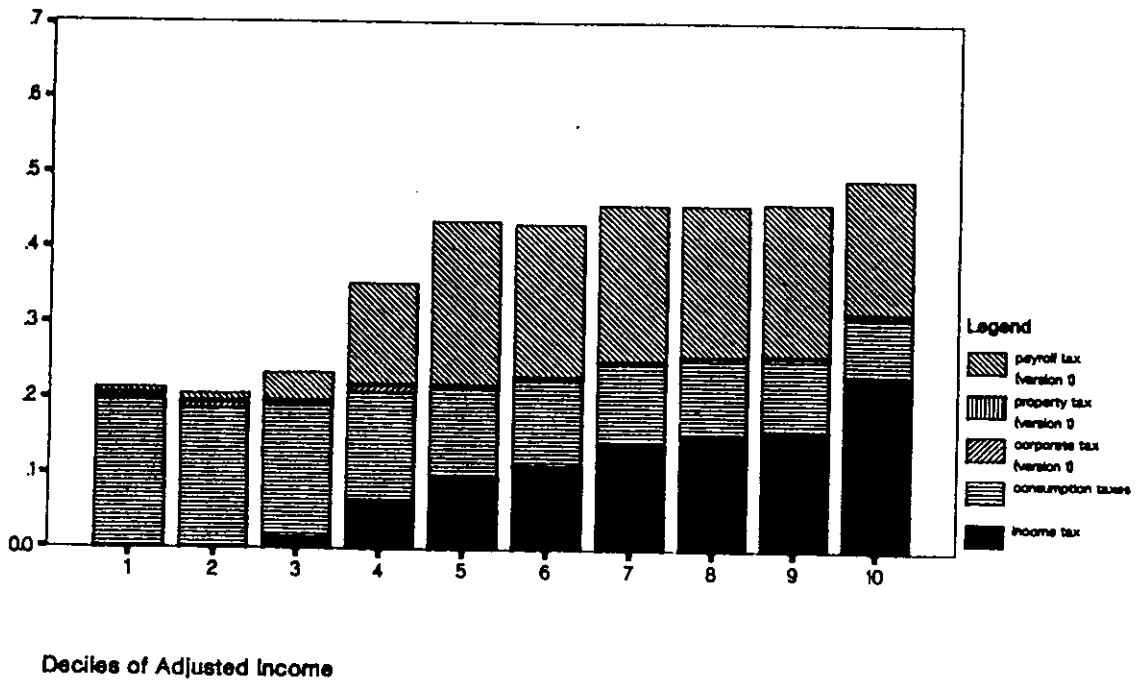
Average Tax Burdens

Main focus of this study are the average tax burdens per income group in each of the three countries. The procedure of determining these rates as a percentage of pre-tax income was described above. We are now prepared to present the results of our calculations, first for Germany. Figures 1 and 2 display average tax burdens per income decile under both shifting assumptions for each of the five taxes considered in this study.

The results for the two main taxes are not surprising; while the income tax is progressive, the consumption taxes are regressive. Note that the first two deciles do not pay any personal income tax at all. This is in accordance with our finding that lower income classes in Germany rely heavily on transfer income, which is for the most part not taxable.



1
 Fig. 8. Distribution of Average Tax Burdens in Germany (Shifting Assumption 1)



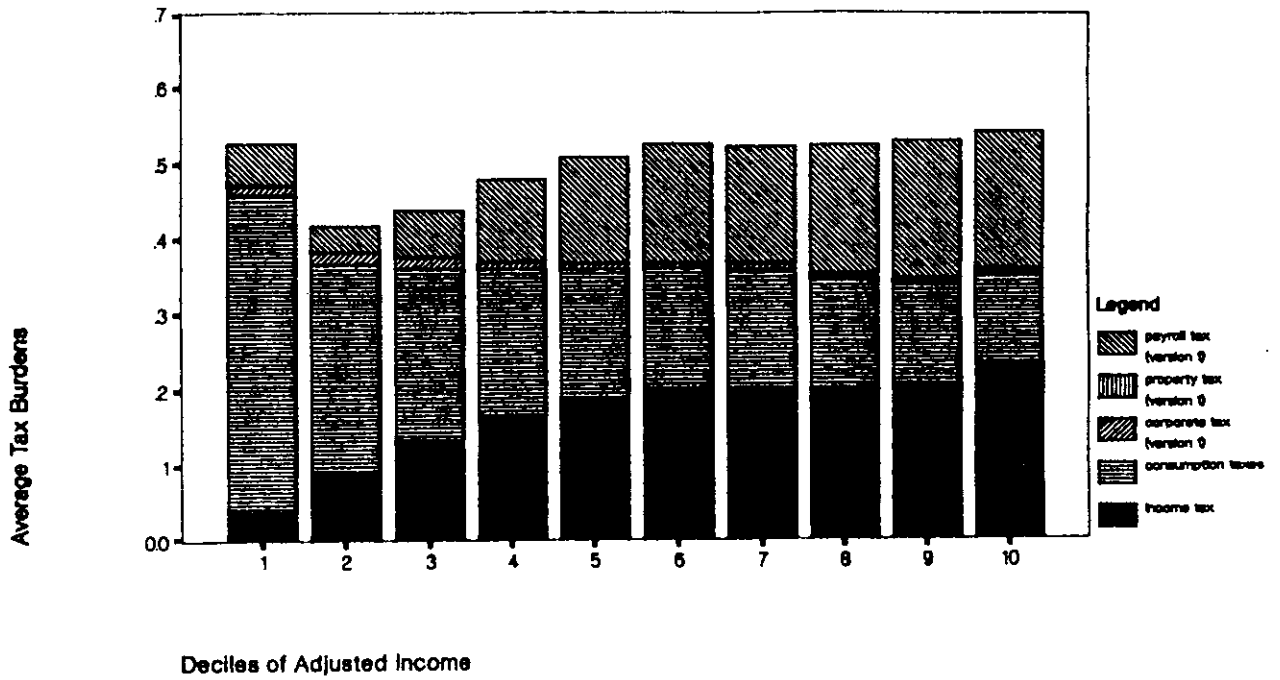
2
 Fig. 8. Distribution of Average Tax Burdens in Germany (Shifting Assumption 2)

The data for the property tax are somewhat more surprising: our most progressive assumption, in which we allocated the tax burden to capital income, proves to be slightly regressive, while the less

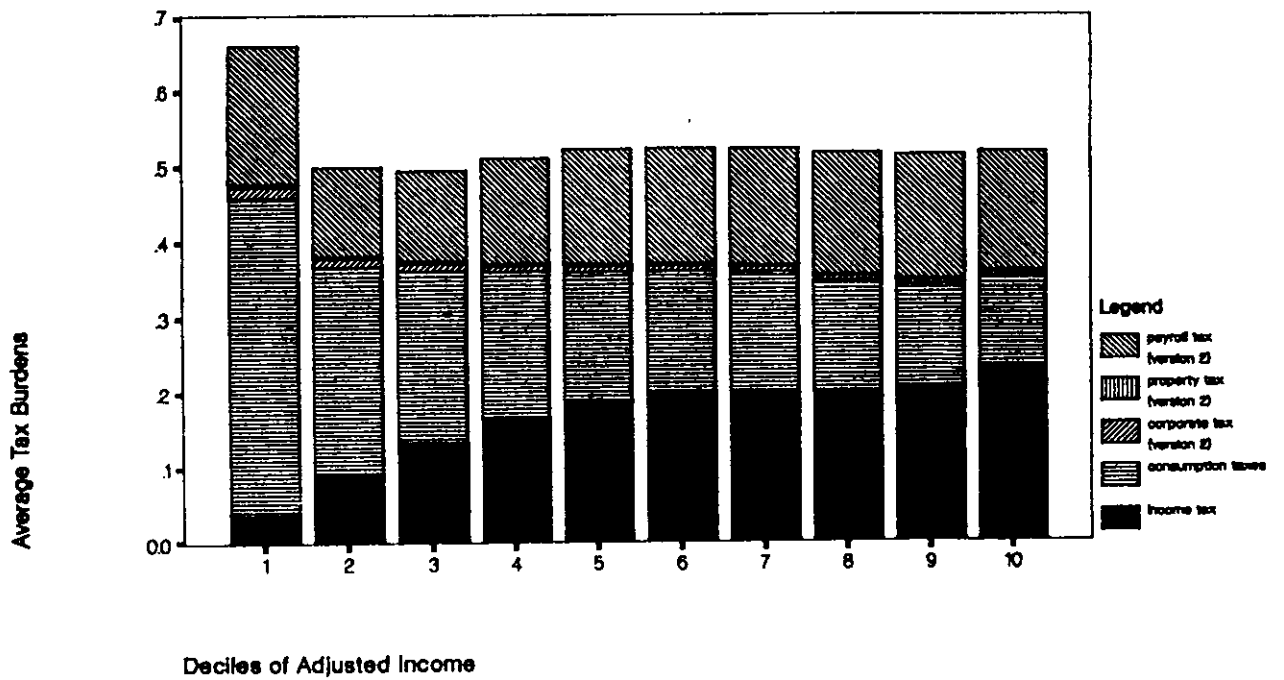
progressive version is fairly proportional. This indicates that there are more capital earners in the lowest deciles of our dataset than we had expected. This should not worry too much, however, since the overall relevance of this tax is very low. The result for the payroll tax is again consistent with the conventional theory: the part shifted to consumers in version 2 clearly burdens the poor, who spend a higher portion of their income. Under both sets of incidence assumptions, however, the payroll tax is all in all progressive.

The overall structure of the German tax system is progressive, ranging from a tax burden of about 22% for the lowest income decile to almost 50% for the highest decile.

The results for Sweden are displayed in figures 3 and 4. At the first glance they already show that the personal income tax is again progressive, while sales and excise taxes are regressive. Note the very high burden of consumption taxes in the first income decile. This is due to the high consumption propensity of over 200% in this group and the very high overall rate of about 20%. Since transfers do not play such an important role for the poor as in Germany, there is an income tax burden in the lowest income deciles. For the corporate and the property tax we obtain similarly surprising results as for Germany. Again there seem to be remarkably high capital earnings in the bottom deciles, contradicting our presumption that a tax partly allocated to consumption tends to be regressive. The "expenditure effect" seems to be only relevant in the upper half of the income scale.



3
 Fig. 10. Distribution of Average Tax Burdens in Sweden
 (Shifting Assumption 1)



4
 Fig. 11. Distribution of Average Tax Burdens in Sweden
 (Shifting Assumption 2)

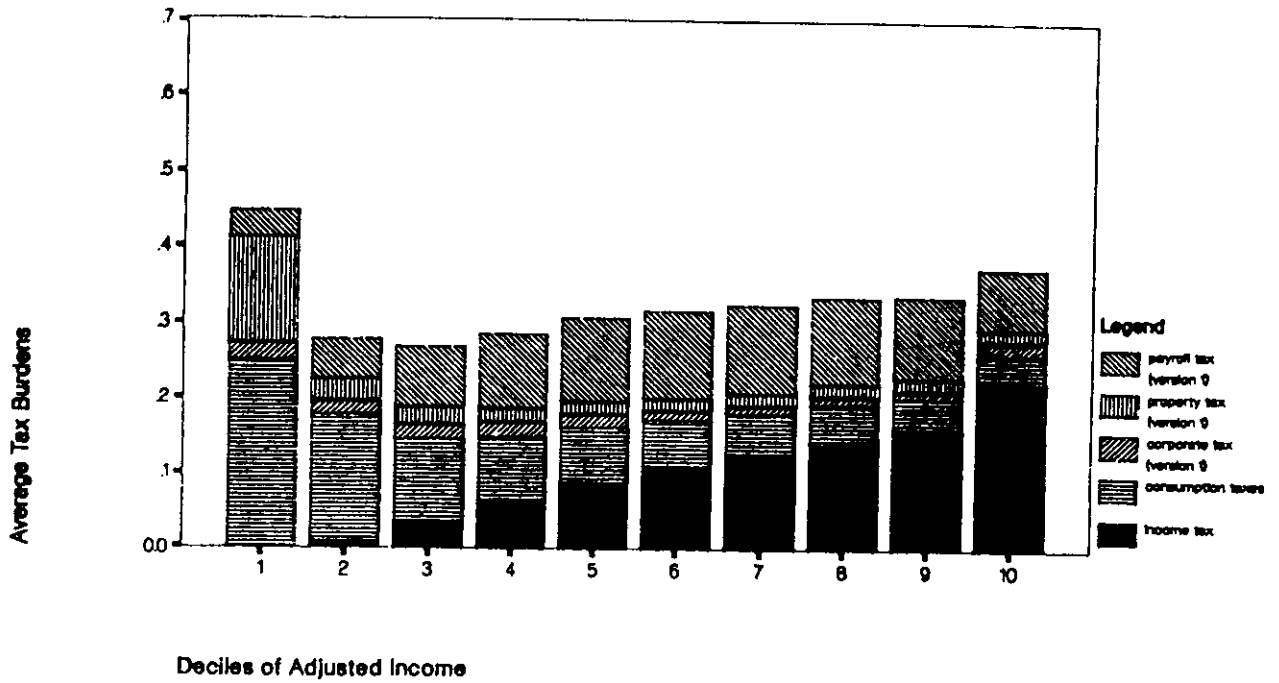
Payroll taxes prove to be very high in Sweden. While in version 1, where the entire tax was allocated to wage earnings, the payroll tax is highly progressive, version 2 comes to an opposite result. Here the tax

was partly burdened to consumption and hence, due to the big differences in expenditure patterns between income classes in Sweden, is clearly regressive.

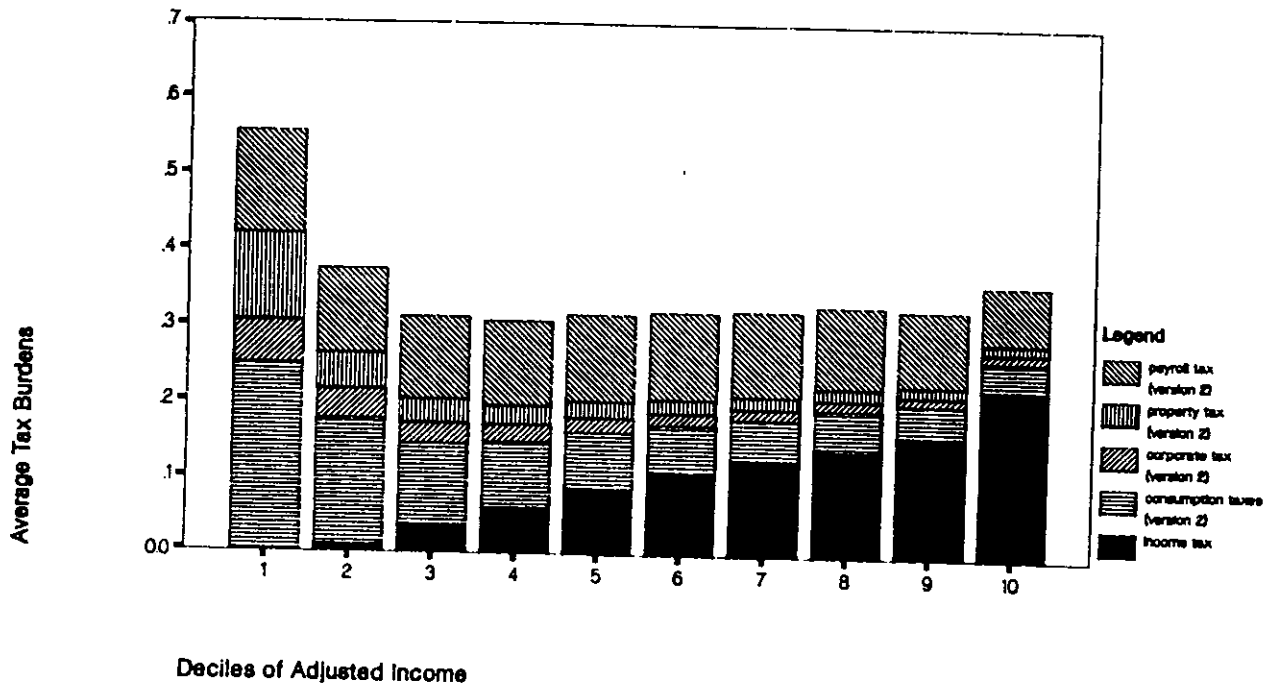
The structure of the Swedish tax system as a whole appears to be fairly proportional with a heavy burden on the lowest deciles. It certainly is not -- as often maintained -- progressive.

Finally, the average tax burdens in the U.S. shall be examined. Income and consumption taxes show the already familiar pattern. Consumption taxes impose a heavy burden on the lowest income decile. One should also keep in mind that especially in the United States there are great local and regional differences in taxation. The distribution of the corporate tax burden is not surprising either: under the least progressive assumption the burden decreases steadily with higher income. In the more progressive version the average tax rate is all in all fairly proportional.

Most striking result of the calculations for the U.S. is the enormous property tax burden in the first income decile. We already observed this remarkable feature in the German and Swedish data, although by far not to such an extent. There are some possible general reasons, which will be presented later; but why is the incidence of the property tax on low-income households particularly so high in the U.S.? The answer would require some detailed examination of the demographic variables. We suspect, however, that many elderly families can be found in



5
 Fig. 5. Distribution of Average Tax Burdens in the United States (Shifting Assumption 1)



6
 Fig. 6. Distribution of Average Tax Burdens in the United States (Shifting Assumption 2)

the bottom decile. In the U.S., where there is a comparatively weak system of old-age and disability pensions, many of these households depend on their savings and live in their own houses. Hence they are heavily struck by local property taxation, which is on average quite high in the U.S. The payroll tax again shows the expected distribution. Version 2, where the tax is partly allocated to consumption, is

almost proportional for the most part of the income distribution, but plunges drastically in the last decile.

All in all our findings are in accordance to Pechman.¹⁸ Under both shifting assumptions the burden distribution is U-shaped with some more regressivity for the bottom deciles under shifting assumption 2. Comparison of figure 5 and 6 with Pechman's plots for 1966 and 1985 show that our findings for 1979 are much more similar to the tax burden distribution of the late 60ies.

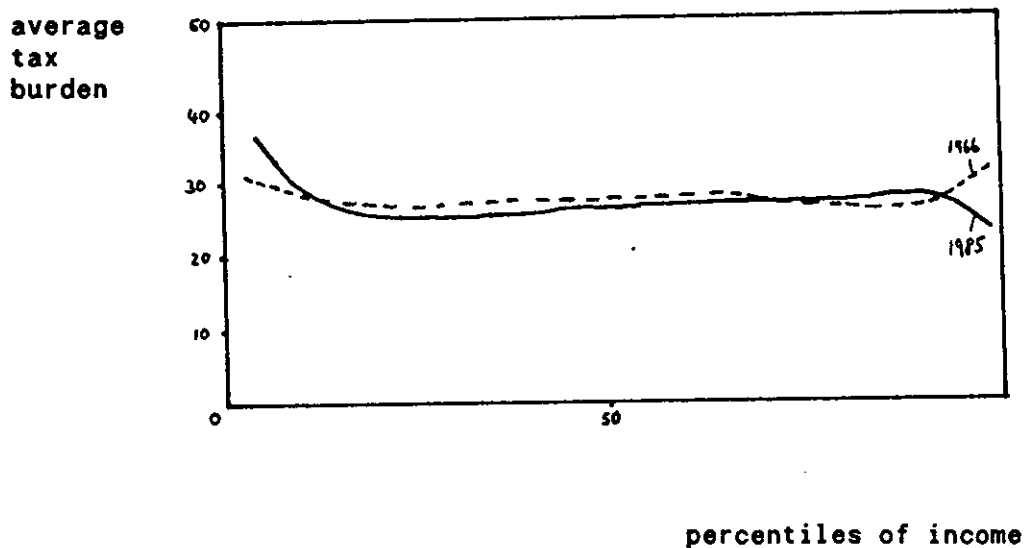


Fig. 7. Distribution of Average Tax Burdens in the U.S. according to Pechman (least progressive shifting assumption). Source: Pechman (1985), p. 9.

¹⁸Pechman (1985), pp. 3-10.

Under the least progressive incidence assumption Pechman calculated for the mid-80ies a drop of the tax rate for households with very high incomes. This is an indicator for the decisive qualitative modifications of the U.S. tax system in the Reagan era. Between 1979 and 1985 the upper tail of burden distribution changed from progressive to regressive.¹⁹

What are the conclusions we can draw from the comparison of average tax burdens in our three countries? First of all, with the exception of the property tax, the distributive effects of every single tax is in accordance to the theory and the underlying shifting assumptions. It is the mix of different kinds of taxes that redistributes incomes or does not. If, for example, a government like in Sweden relies heavily on (progressive) income and payroll taxes, it redistributes income from the rich to the poor.²⁰ This effect can, of course be countervailed by high (regressive) consumption taxes, as Sweden proves as well.

Second striking finding of our calculations is the regressivity of the property tax in low income deciles, which can be observed in all three countries, but especially in the United States. One possible reason for this phenomenon was already mentioned above, namely the

¹⁹Since the households in our dataset are grouped by decile, a direct comparison with Pechman's plot, where households are ranked by percentile, is actually not possible. Progressivity at the very top of income distribution, as computed by Pechman for 1985, is theoretically possible in the 10th decile.

²⁰This assumes a proportional or even regressive distribution of direct government transfers.

dependence of elderly impoverished families on their savings as only source of income and the fact that many members of this group live in their own houses. Another explanation is that taxes are not all redistributed as direct transfers to households, but are often spent for general welfare programs like national health service.²¹ Since such in-kind benefits are not captured in our data, households in the bottom deciles, who primarily benefit from such programs, appear to have a lower income. This departure from the Haig-Simon income definition thus leads to unrealistic high tax burdens, because the denominator of the tax-income ratio is smaller than it should be. A third possible reason are inconsistencies in our data, due to underreporting in lower income classes, statistical errors or lack of representativeness.

All in all our estimates show that the U.S. tax system is likely to be fairly proportional (with some regressivity in the lower and some progressivity in the higher income classes). The Swedish burden distribution looks quite similar, but a significant increase in the burden of the highest income decile is missing. The German tax system is clearly the most progressive.

One pattern is more or less significant in all three countries: the poorest households of the society bear a higher burden of taxes than families in the second and third decile. This is mainly due to consumption taxes, and -- depending on the incidence assumption --

²¹This is particularly the case for the medicare and medicaid program in the U.S. and the national health service in Sweden. See Bosworth (1987), pp. 263 ff.

property and payroll taxes. In the public opinion this aspect is often neglected because the incidence of such taxes, unlike income taxes, is not directly observable. Nevertheless, using the tools of economic tax incidence theory, this study has identified this phenomenon as a common problem in Western societies.

Finally, a strong caveat should be emphasized once again: our calculations only reflect a "snapshot" of the income distribution at a certain point in time. Many households in the lowest income decile will presumably move up the income scale. Or, if they are elderly impoverished individuals, they probably had higher earnings earlier in their life. The "true" lifetime-incidence of the tax system could only be captured in a panel-study.

Marginal Tax Burdens

This section presents a brief examination of marginal tax burdens in the three countries. Table 3 shows our results for all taxes based on pre-tax income. A similar calculation for marginal income tax rates only can be found in Aguilar's and Gustafsson's (1987) paper.²²

²²Aguilar/Gustafsson (1987), p. 13. They use the LIS-dataset.

The more progressive shifting assumption 1 naturally implies a higher marginal tax rate because it simply measures the steepness of the tax function. In all three countries the marginal tax rates of both versions are fairly close and are increasing with higher incomes. Nevertheless the range of rates varies very much between countries. While the difference of marginal tax burdens between the lowest and the highest decile is only about 4% in Sweden, it is approximately 10% in the U.S and even 40% in Germany. All in all the marginal burden is the highest in Sweden, where the mean marginal tax rate lies somewhere between 44.7% and 46.7%. This is not new and is often discussed in the literature as "Sweden's marginal tax problem".²³

Marginal tax rates are believed to have a major impact on economic incentives. From the above findings it can be concluded that such incentives are likely to be the lowest in Sweden, where households at every income level face a high tax payment for every additional Kroner earned. In the U.S., and particularly in Germany, the willingness to enter the labour market, engage in some kind of entrepreneurship or to accumulate capital is presumably higher in the lower income deciles.

²³King and Fullerton (1984), p. 89 and Bosworth (1987), pp. 195 ff.

TABLE 3

MARGINAL TAX RATES IN GERMANY, SWEDEN, AND THE UNITED STATES

Income Decile	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Mean
<u>Germany</u>											
Vers. 1	.183	.213	.241	.274	.310	.341	.373	.415	.457	.591	.3394
Vers. 2	.219	.241	.262	.282	.305	.327	.349	.379	.408	.504	.3262
<u>Sweden</u>											
Vers. 1	.454	.456	.459	.461	.463	.466	.469	.474	.478	.491	.4672
Vers. 2	.443	.444	.445	.445	.446	.447	.448	.449	.451	.454	.4471
<u>U.S.A.</u>											
Vers. 1	.274	.277	.281	.286	.291	.296	.302	.310	.320	.353	.2990
Vers. 2	.255	.258	.262	.266	.270	.276	.281	.288	.298	.329	.2782

When focusing on behavior patterns it is certainly more appropriate to look at marginal income tax burdens (for work incentives) or at the marginal capital tax burden (for saving incentives). Our study which only captures all taxes in relation to pre-tax (but not pre-transfer) income can only serve as an imprecise indicator for effects of the fiscal system on such economic incentives.

Note, also, that looking at the marginal increase of the tax burden only, captures just part of the real marginal burden. A more detailed examination should also include the marginal decline of transfers that usually occurs when a household moves into a higher income brac-

ket. This phenomenon, often called "poverty trap", is known to be quite common in Western societies. Karrenberg and Kitterer (1979), for example, discovered for Germany that such "total" marginal burdens are extremely high in the lower income deciles.²⁴ Since the redistributive effects of transfers are obviously the highest in Germany, it is likely that the "poverty trap" is more significant than in Sweden or the U.S.

Overall Progressivity of the Tax System

In this section we present some general progressivity indicators. They do not necessarily have to be in accordance with the more detailed picture we obtained by examining taxes and transfers per decile.

TABLE 4

PROGRESSIVITY INDICES FOR GERMANY, SWEDEN, AND THE UNITED STATES

Index	K	S	G _b	G _a	% change in G
<u>Germany</u>					
Version 1	.072	.078	.376	.332	- 11.70
Version 2	.055	.059	.357	.334	- 11.17
<u>Sweden</u>					
Version 1	.019	.025	.360	.189	- 47.93
Version 2	.009	.014	.358	.190	- 47.36
<u>U.S.A.</u>					
Version 1	.069	.119	.482	.323	- 15.55
Version 2	.037	.081	.482	.332	- 13.18

²⁴Karrenberg and Kitterer (1979), pp. 230-250.

The three progressivity indices we apply come to quite contradicting different results. The only conclusion we can draw when looking at all of them is that the tax systems of our countries are all progressive. Naturally the second shifting version is always less progressive than the first set of assumptions. To what extent there is progressivity and how countries should be ranked depends on the measurement coefficient one looks at.

The Kakwani index K suggests that Germany has the most progressive pattern, followed closely by the U.S. The coefficient for Sweden is almost zero, which implies a fairly proportional scheme. Nevertheless the values for all three countries do not differ very much, given that the index theoretically ranges from -1 to $+1$. We conclude therefore that there are relatively low distributive effects of taxation.

Suits' index S changes the picture slightly. Now the U.S. have the most progressive tax system, followed by Germany and Sweden. Applying this measure, which theoretically ranges from -1 to $+1$ as well, the differences between the countries seem more significant.

The Gini coefficient comes to completely the opposite result. The percentage change between pre- and post-tax G suggests a high degree of progressivity for Sweden and a close to proportional tax pattern for Germany. While the results for S and especially K are in accordance to our findings from the detailed examination of average tax burdens per

decile, the Gini-coefficient is "completely off the line". This clearly shows the limitations of the existing measures of progressivity as well as the fact that different indexes do not measure the same concepts. Given our overall findings and the basic problems of Gini-coefficients mentioned above, we tend to reject the results of this measure. At least they should not be overestimated.

IV. Conclusion

Keeping in mind the basic problems of every empirical tax incidence study, some major conclusions for the redistributive effects of the tax system in Western societies can be drawn from this study:

- (1) The overall pattern of taxation is slightly progressive.
- (2) Germany has the most redistributive fiscal system. This can be seen from a high transfer intensity and a negative net tax rate in the lower income classes, increasing average tax burdens, a steeply inclining marginal tax rate and high values for the progressivity indices K and S. Sweden, in contrast to common beliefs, does not redistribute incomes very much by its tax and transfer system. It has clearly the least progressive tax scheme with slight regressivity for the poorest and an almost proportional (but very high) pattern for the rest of the society. The high degree of equality, expressed in a low Gini-coefficient seems to be caused by non-fiscal factors like wage policies.
The United States hold a middle-position with a U-shaped distribution of average tax burdens and a small overall degree of progressivity.
- (3) In all three countries the lowest income decile is heavily burdened by the "hidden" incidence of consumption, property and payroll taxes. The extent of this phenomenon depends, however, largely on the shifting assumption applied. Direct transfers partly cancel out the effect in Germany, but not in the other two countries.

(4) Marginal tax burdens, which are an indicator for economic incentives to work and to save, are increasing with income in all three countries. While they are almost proportional on a high level in Sweden, the United States and particularly Germany show significant differences between income classes.

Note, however, that this study is based on data from 1979 and 1981. Meanwhile there have been major tax reforms in all three countries. When comparing our results with Pechman's for 1985 we saw how new policies can fairly quickly change the overall pattern of the tax system. Like the U.S., Sweden, and Germany have recently lowered the marginal and average income tax rates in the highest earning brackets. This will presumably make their tax systems less progressive than our findings.

Finally, it should be emphasized once again that the numerous theoretical problems of our approach make our findings only valid within the framework of the chosen assumptions. Basic difficulties like the fact that we only take a "snapshot" of an individual household's lifetime-income, our comparison with a hypothetical "taxless state", or the omission of excess burdens could not be resolved.

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