

## Summary Liability Progression and Tax Revenue Elasticity

A *progressive tax system* is defined as a system in which the average rate of taxation increases with income. However, the *degree of progression* is often ambiguous in political debates and in economic literature. The ambiguity of the latter concept - identified in the well-known article of Musgrave and Tun Thin (1948)<sup>1</sup> - stems from different perceptions and various definitions employed in empirical research. Although different local measures of the degree of progression are compatible with the basic definition of a progressive tax system, we employ one measure, the income elasticity of the tax system, in our analysis. The income elasticity of the tax system or the tax revenue elasticity is defined as the ratio of the percentage change in tax revenue to the concurrent percentage change in income.

Tax progressivity is determined by both the rate structure and the tax base. Accordingly, changes in the degree of progression will result from changes in either aspect of tax policy. We focus on two determinants of the tax revenue elasticity: the effect of deductions and tax policy. First, it appears that the availability and use of most deductions - and the associated behavioral effects - significantly diminish the redistributive effect of taxation through rate structure in The Netherlands. Secondly, while many OECD countries implemented tax reforms in the 1980's - in effect base broadening, reduction of tax rates, and flattened rate structure - remarkably little attention was given to the effect on tax revenue elasticity. Understanding the causes of change in tax revenue elasticity can reduce errors in revenue projections estimated by or for the Treasury (Auerbach 1995).

The revenue elasticity of the (income) tax with respect to income has been analysed in prior research. Most authors have estimated elasticities with historical, macro, or cross-section data.<sup>2</sup> In this study, we first estimate revenue elasticities with a micro model. This approach allows us to identify determinants of changes in revenue elasticity (in line with work of Fries *et al* 1982).

The objective of this study is to answer the following theoretical and empirical questions:

- What is the meaning of *the* income elasticity of a tax system?
- What is the relevance of this measure?
- Are micro calculations of the income elasticity superior to macro calculations?
- What are the most important causes of changes in tax progressivity?
- Can our analysis be used to improve the quality of tax revenue forecasts?
- What is Dutch tax revenue elasticity for the coming years?

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<sup>1</sup> Literature referred to in this summary is listed in 'Geraadpleegde literatuur'.

<sup>2</sup> Hageman (1968), Tanzi (1969 and 1976), Mansfield (1972), Studiegroep Begrotingsruimte (1974), Wellink (1974 and 1975), Hutton and Lambert (1980 and 1982), Fries *et al* (1982), Ram (1991), Lambert (1993a).

### Theoretical Analysis: Income Elasticity in a Progressive Tax System

Literature on tax progressivity is analysed in chapters 2 and 3. Tax progressivity is related to the theories of income distribution, built-in flexibility and fiscal dividend. Accordingly several interpretations of 'tax elasticity to income' can be identified. The most common definition is the endogenous percentage change in tax revenue resulting from a one percent change in income. The literature presents a variety of tax revenue elasticities, including micro or local, global and macro-time-series estimates. Most analyses start on a micro level. This micro elasticity concept, also referred to as liability progression, is commonly used in the literature on income tax progression and redistribution. Liability progression is the elasticity of tax liability with respect to income before tax (Jakobsson 1976 p.161). Macro-time-series are mainly used for the measurement of automatic response of total tax revenue to national income. Estimating these elasticities with annual macro data requires the adjustment of total tax revenue series for the effects of discretionary changes in policy. These so called 'autonomous' tax revenue data' are provided by the Treasury of The Netherlands. Nevertheless there is uncertainty about the interpretation of these data. For example, should the adjustment of tax brackets and personal exemptions for inflation be considered discretionary policy?

Micro and global tax elasticities are related. Global income tax elasticity is defined as the aggregate weighted average of all individual income elasticities (weighted by their share in total tax liability). A global tax elasticity can be used as a measure of the macro revenue elasticity of a tax system as well (OECD 1984). The aggregation method employed in securing a global estimate is a useful tool in our analysis because an attractive formula for liability progression can be used to identify relevant determinants.<sup>3</sup> Tax elasticities, calculated from macro time-series data - using growth in national income as denominator - are less suitable for identifying annual changes in tax elasticity. Such estimates are useful for identifying built-in flexibility and trends in tax revenue elasticity.

The relevance of tax elasticity in three areas is analysed in chapter 3: income distribution, automatic stabilisation of the economy and estimations of tax revenue by the Treasury.

- Kakwani (1977b p.723) showed how a change in the tax schedule, holding pretax income distribution fixed, affects the redistributive effect of taxation: 'If there are two tax functions yielding the same average tax rate, the tax function with the uniformly higher tax elasticity will give the post-tax income distribution more equal than the tax function with lower tax elasticity'. However, this theorem is not valid for most tax systems because of piecewise linearity (due to more than one tax rate, allowances and deductions). Furthermore, tax systems are generally *not* comparable because of differences in average tax rates. Moreover, as Jakobsson (1976) and Khetan and Poddar

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<sup>3</sup> See Caminada and Goudswaard (1996) for details.

(1976) have pointed out, there is a clear distinction between redistribution and tax progressivity. Some argue that other measures of global tax progression such as Gini-, Suits- or Theil-indices are more reliable indicators of the redistributive effect of a tax system (Kiefer 1984 and Formby *et al* 1990). It is difficult to draw conclusions in this field of research, that is to predict the influence of growth of pretax incomes on the redistributive effect, or on tax progressivity. This influence is inherently ambiguous for real world taxes (Lambert and Pfähler 1992).

- Following general economic theory, a progressive tax system would stabilise economic fluctuations automatically without government intervention. This stabilising effect will be larger if the value of tax revenue elasticity is larger (given the average tax rate). However, the quantitative effect appears to be small for The Netherlands.<sup>4</sup> The cyclical component in Dutch government budget is almost negligible and too modest for significant stabilisation (Wolswijk 1991).
- Understanding tax elasticity is especially relevant for decision-making with regard to the government budget. More accurate estimates can increase the quality of revenue forecasting, especially when policy has a rather long time horizon (structural budget policy or SBP). Experience with the use of SBP in the Netherlands in the period 1960-1979, shows that overestimates of both economic growth and tax elasticity will frustrate this policy. During SBP, the structural value for the tax elasticity was solely calculated with macro time-series data. Changes in its level and causes of change could therefore not be recognised in a timely fashion. Forecasting the tax revenue (elasticity) with macro time-series data is rather difficult. This is an useful lesson for the present budget policy in The Netherlands. Small changes in tax elasticity, caused by fiscal policy or otherwise, will have a substantial effect on automatic growth in tax revenue.

#### **Empirical Analysis: Macro Time-Series, Micro Model and Cross-Section Data**

##### ● *Macro Time-Series 1960-1994*

As follows from the empirical analysis for The Netherlands in chapter 4, annual time-series are useful for recognising trends in tax revenue elasticity. Automatic growth of tax revenue is calculated using detailed data from the Treasury. Revenue elasticities are estimated in two ways. First, for the whole period 1960-1994 we incorporated the carry-over-effect of annual discretionary policy measures on tax revenue in the calculations. Using the proportional adjustment method from Prest (1962), we adjust tax revenue time-series for both the annual effect of discretionary policy measures on tax revenue, and the automatic growth of discretionary policy measures taken in the past (the carry-over; 1960 is used as the reference-year). Secondly, an average of tax revenue elasticities on an

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4 According to Fase and Wellink (1990), this appears to be true for a large number of OECD countries.

annual basis is calculated (with no such carry-over). Although both approaches differ significantly, they result in rather similar historical averages (1.17 respectively 1.15). The computed levels of the revenue elasticities for different taxes were more or less as expected: income tax (1.53 and with no such carry-over: 1.62) and value-added tax (0.94 and with no such carry-over: 0.99). When inflation adjustment is considered as part of the tax system, elasticity of total revenue for the entire system is 1.

Changes in tax elasticity are considerable on a year-to-year basis. This is due to both the endogenous growth in total tax revenue (numerator) and growth in national income (denominator). Rolling five-year averages were calculated, and it was noted that the value used during 1961-1979 under SBP was overestimated for most years. This five-year average increased in the 1980's, but has declined sharply since 1990. The value for 1990-1994 is barely 0.73. Summarising, macro time-series are useful recognising trends in total tax revenue elasticity; using these, we found the main cause of change is the income tax. However, macro data are too crude, and therefore do not provide a sufficient basis for conclusive budget policy. This conclusion was confirmed by comparing other research, where results vary substantial although in most surveys the same data is used and identical methods are applied.

#### ● *Micro model simulation 1988-1995*

As follows from the micro analysis in chapter 5, a revenue neutral tax reform characterised by base broadening in exchange for a uniform proportionate rate reduction tends to reduce income tax revenue elasticity (liability progression). This decrease will be larger if the deductions to be eliminated are less income-elastic (Caminada and Goudswaard 1996). For example, the elimination or reduction of personal exemptions causes a relatively sharp drop in the income tax elasticity. The intuitive reasoning is quite simple. If deductions are income-elastic, pretax income growth causes a smaller increase in taxable income compared to the case that deductions are income-inelastic. Income-inelastic deductions, such as personal exemptions, imply a higher liability progression and thus, if eliminated, a larger reduction in liability progression. However, this effect can be partially compensated for by either a positive effect on the tax elasticity of people being taxed in higher income brackets because of the elimination of deductions (the so called 'threshold effect'), or by behavioral effects. If revenue elasticity decreases, the reformed system generates less additional revenue after pretax income growth than the old system would have. Such a tax reform then implies a reduction in future revenue as compared to that generated by the old system.

The empirical analysis of a major tax reform in The Netherlands in 1990 indeed showed such an effect. Using the microtax model of the Dutch Central Planning Bureau, we calculated income tax revenue elasticities before and after the tax reform by simulating a marginal equi-proportional growth in all pretax incomes. The global elasticity of the income tax including social-security contributions falls by 17%. Approximately 85% of

this decline can be explained by a broadening of the tax base, while 15% is caused by the flattening of the rate structure. Especially the reduction of the personal exemptions has had a significant impact. The threshold effect appears to be relatively small. Because of the lower revenue elasticity, the increase in revenue after income growth is smaller than it would be without the tax reform (revenue loss in addition to the tax reduction at the introduction of the new legislation). The simulations indicate a decrease in revenue by 0.6% in 1990, rising to almost 3.8% in 1993. This substantial revenue loss was overlooked when the tax reform was implemented.

During 1990-1995, the income tax elasticity increased smoothly up to 1.32 (+7.8%); when legal adjustment for inflation is incorporated in the calculations it increased to 1.19 (also +7.8%). This rise is solely caused by changes in the tax base (higher basic exemption and higher standard deduction for cost of working).

A micro model is well suited for the comparison of tax elasticities between countries. Calculations for 1989/1990, that is after the tax reforms in most OECD countries, showed little variation in the level of liability progression, both between countries and income levels. Liability progression is relatively low in The Netherlands, The United Kingdom and Germany compared with France, Denmark, Sweden, Belgium and The United States of America. Unfortunately, we were not able to calculate global tax revenue elasticities for each country because data on the distribution of gross incomes has not yet been included in the International Micro Tax Model.<sup>5</sup>

#### ● *Detailed Cross-Section Data 1989 and 1990*

The income tax elasticity including social-security contributions is analysed in chapter 6 with cross-section data for 1989 and 1990 of the Dutch Central Bureau of Statistics (CBS). Because these data contain detailed information about pretax income, tax payments, deductions and the distribution between socio-economic groups, additional insight can be obtained about income tax elasticity. Furthermore, these data can be used to simulate the effects of hypothetical tax reforms.

First, we compared the distribution of the tax burden for 1989 (before tax reform) and 1990 (after tax reform). In both years, tax progression from rate structure is substantially reduced by income-elastic deductions. The distribution of the 1990 tax burden is flattened compared to 1989 because overall tax reduction was biased in favour of high income earners. Global tax elasticity (for socio-economic groups) has been calculated by aggregating the estimated tax elasticities for each income classes weighted by their share in total tax liability (*cf.* OECD 1984). In both years, the highest tax elasticities are found for old-age income earners (as a result of lower contributions to national insurance) and for self-employed (due to the specific income-inelastic deduction available to them). Tax elasticities for other socio-economic groups do not vary to a great extent. Global income

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<sup>5</sup> See two working papers of the Central Planning Bureau (1993b and 1995) for details.

tax elasticity for all income earners declined from 1.44 in 1989 to 1.21 in 1990. This result is similar to that obtained in chapter 5, although certain deductions were not incorporated in the micro model used in that chapter.

Recent comparable international results are not available because appropriate cross-section data have a time lag of several years. For example, shortly after the most recent data year (1987) included in the extended Luxembourg Income Study of Atkinson *et al* (1995), several European countries significantly reduced their top marginal income tax brackets.

Finally, we performed two simulations with the CBS-data. First, we simulated the effect of broadening the tax base by eliminating the deduction of mortgage interest in exchange for rate reduction, thus leaving the budget *ex ante* in balance. As expected, the positive change in income tax elasticity was small, because the deductions eliminated are considerably income-elastic. If, however, the tax base is broadened the same amount by reducing the fixed personal exemption, the effect on the income tax elasticity is much larger, and negative. The second simulation illustrates the effect of the introduction of a flat rate tax in the Netherlands on the income tax elasticity. Under a flat tax, a uniform proportional rate is levied on a broad tax base: only a fixed personal exemption is deductible from gross income. The simulated base broadening for 1990 is over 66 billion guilders (26%), and one proportional rate of 31,5% balances the budget (*ex ante*). Surprisingly, income tax progression decreases just slightly under a flat rate tax. The reason is, nevertheless, quite simple. Progression in the current tax system results from the rate structure, but is neutralised almost completely by the effect of income-elastic deductions. Liability progression is mainly caused by the fixed personal exemption, which was maintained in the simulated flat rate tax.

### Projection for Near Future

Empirical findings and conclusions are reported in chapter 7. The calculated values of different tax revenue elasticities are multiplied by current weights of the corresponding taxes. Using this procedure, the revenue elasticity of the Dutch tax system is estimated to be 0.99.<sup>6</sup> Progression from the wage and income tax including social-security contributions (1.20) is compensated by other taxes, such as the value-added tax (0.95) and other regressive taxes (0.55). On a macro level, the Dutch system as a whole operates proportionally.

Although the aggregate current value of the elasticity of total revenue for the entire system is 1.0, this level will probably change. What can we expect for the near future? It seems likely that tax revenue elasticity will be constant at about 1.0 in the absence of tax reforms

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<sup>6</sup> Following the Ministry of Finance, we do not consider the adjustment of the income ceilings of tax brackets and of personal exemptions for inflation to be a discretionary policy measure. The inflation correction ought to be fulfilled since the new legislation was implemented in 1990.

or fundamental changes in the tax mix. If fiscal policy of the last years continues, that is both the standard income-inelastic deduction for cost of working and the fixed basic exemption are increased, however, it is likely that tax revenue elasticity will rise further. However, for two reasons a decrease of tax revenue elasticity might occur. First, pension contributions (which is a very income-elastic deduction) are expected to increase, and, second, some recent special tax regulations will encourage high income earners to increase deductions from gross income.

On the other hand, base broadening could return to the tax policy agenda to finance lower marginal tax rates. In that case, the direction of change in tax revenue elasticity is not clear, and will depend on the specific deductions eliminated. The change in tax revenue elasticity is negligible when *all* deductions are eliminated to implement one uniform and balanced-budget tax rate. Although not clear at first sight, the rate structure and changes in the rate structure have minor effects on the revenue elasticity of a tax system.

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