ESSAYS ON FISCAL ILLUSION

by

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Thesis submitted to the University of Nottingham

for the degree of Doctor of Philosophy

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ABSTRACT

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The objective of this study is to examine the relationship between taxation an public spending in the UK, utilising public choice theories that the level o government spending should reflect voter-taxpayer's demand for public goods Such theories argue that certain features of the tax structure affect voter' perceptions of their tax burden so that they underestimate how much they ar paying for public goods. Fiscal illusion is investigated as a key issue in a time series analysis of general government expenditures, and a cross-section analysi of local government spending. Also survey data from British Social Attitudes i employed to analyse the relationship between tax perceptions and preferences fo public spending.

The time-series results show quite consistent evidence that low visibility of taxe and deficit financing are associated with increased levels of spending, but fo various reasons measures of tax elasticity and complexity performed less well Closer examination suggests that deficit financing is less an illusory plan to hid expenditure increases from voters and more a short-term necessity when shock cause (trends in) spending and revenue to diverge. The cross-section result suggest fairly strong support for the "flypaper effect" that central governmen grants increase spending by more than would an equivalent increase in loca income. Measures of local accountability appeared to have similar effects, whil evidence on renter illusion suggests different outcomes in the two alternative ta regimes (community charge and council tax). Evidence from the micro-dat analysis suggests some forms of fiscal illusion, though the influence of ta misperceptions on the demand for public spending is ambiguous.

Overall, the evidence is consistent with the tendency to use invisible taxes t support increased spending, however, the use of this evidence, *per se*, may b misleading in drawing future prospects for tax and expenditure policies. Micro data analysis of fiscal perceptions offers a potentially important means o determining policy instruments. Moreover, if governments aim at increasing loca accountability, inter-governmental fiscal relations should be reconsidered.

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ACRONYMS

ADF	: Augmented Dickey-Fuller Test
BSAS	: British Social Attitudes Survey
CC	: Community Charge
CIPFA	: Chartered Institute of Public Finance and Accountancy
CIT	: Corporate Income Tax
CSO	: Central Statistical Office
CT	: Council Tax
CV	: Critical Values
DF	: Dickey-Fuller Test
ECM	: Error-Correction Mechanism
ET	: Expenditure Tax
FES	: Family Expenditures Survey
GDP	: Gross Domestic Product
HER	: Herfindahl Index
IFS	: Institute for Fiscal Studies
IRS	: Inland Revenue Statistics
IT	: Income Tax
LGE	: Local Government Expenditure
LL	: Log-Likelihood Function
LR	: Likelihood Ratio
MB	: Marginal Benefit
MLE	: Maximum Likelihood Estimation
MWP	: Marginal Willingness-to-Pay
NDR	: Non-Domestic Rates
NTR	: Non-Tax Revenues
OLS	: Ordinary Least Squares
PIT	: Personal Income Tax
RSG	: Revenue Support Grants
SCPR	: Social and Community Planning Research
SSA	: Standard Spending Assessments
SSC	: Social Security Contributions
VAR	: Vector Auto-Regressive
VAT	: Value-Added Tax

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CHAPTER 1 INTRODUCTION

1.1 BACKGROUND OF THE STUDY

There has long been observed a tendency for the public sector to grow faster than the economy as a whole in many countries. More than a century ago, Wagner asserted that this tendency was inevitable. With the increasing availability of time series data, many writers have tested Wagner's Law, narrowly defined as asserting that the income elasticity of demand for government output is greater than unity; there is little empirical support for this strict definition (Diamond, 1989; Gemmell, 1990a, 1993). Other explanations for public sector growth contend that this tendency is not inevitable. Peacock and Wiseman (1961) argued that external shocks, such as wars, caused sudden increases in public spending which did not revert back to its pre-shock level once the shock had passed; during 'non-shock' periods there was no necessary tendency for public sector share of national income to increase, rather it tended to hover around its existing share.

Alternative approaches have been developed within the public choice theory. Such theories emphasize particularly the importance of political process and other institutions, such as bureaucracy. A distinction is made between the demand and supply sides of public goods, which are produced by governments, the volume being an outcome of the political decision making process based on the interactions between voters, politicians, and bureaucrats. It has been argued that the level of government spending should reflect voter-taxpayer's demand for public goods (Downs, 1957; Buchanan, 1960), however, the suppliers of public goods (politicians, bureaucrats etc.) may have their own agenda, which

may not necessarily follow voter-taxpayers' demand (Niskanen, 1971). It has also been argued that certain features of the tax structure (perhaps imposed by self-interested agenda setters) may distort voters' tax perceptions (fiscal illusion), since explicit (market) prices for publicly-provided goods do not exist, and voter-taxpayers make choices based on perceptions (Buchanan, 1960). Under these conditions, actual government output will not be at the optimum level; this questions the precision of the democratic process with respect to the provision of government-provided goods.

The key concept of fiscal illusion is based on the seminal study of Puviani (1903), and refers to systematically biased perceptions of costs and benefits of government activity. Assessments of the benefits of the publicly-provided goods are argued to be 'intrinsically subjective and highly personal' (Goetz, 1977: 177), and hence the empirical studies have been devoted almost exclusively to the revenue side of government activity. It is hypothesised by public choice scholars that complex tax structures induce *under*estimation of the tax-prices of publicly-provided goods, and therefore lead voter-taxpayers to favour relatively higher levels of public spending. Proposed sources of fiscal illusion are: revenue complexity (and the degree of visibility of taxes); tax elasticity; and the extent of deficit finance. Two other forms of fiscal illusion are the flypaper effect and renter illusion, both with particular relevance to local government finance.

The Herfindahl index (the sum of squares of revenue shares) was used to measure the complexity of tax structure in the seminal study of Wagner (1976). This index has been criticised that it treats various taxes as the same, while

those taxes may not be equally visible. Pommerehne and Schneider (1978) found that the impact of complexity was even higher when the taxes were weighted for the degree of visibility, and the share of 'less visible' taxes have also been used as a proxy for the invisibility hypothesis. The inclusion of tax elasticity as a determinant of public expenditure derives from Oates (1975) who found a positive and significant relationship between the share of personal income taxes (a proxy for tax system elasticity) and general government expenditures. Early empirical studies of debt illusion were based on cross-section analysis of US data, and the results were ambiguous. A more direct test was pioneered by Niskanen (1978) in a time-series analysis of the effect of budget deficits on government expenditures. The measures of fiscal illusion in local government level have been more straightforward; per capita central grants and the percentage of local residents who live in rented accommodation have been used to proxy the 'flypaper effect' and renter illusion, respectively.

1.2 THE BRITISH TAX SYSTEM

For the purpose of this study, we provide a short survey of the British tax system. The concerns here are the main categories of government revenues (i.e. personal income tax, corporate tax, social security contributions, and expenditure tax), and the sources of local government finance (i.e. local tax and central grants).[1] The income tax structure of the UK operates via a system of allowances and bands. All individuals are entitled to a personal allowance which is deducted from total income before tax to derive taxable income. Additional allowances are available to those over 65, to married couples. and in

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[1] We refer to Meade (1978) for more details of direct taxation, and to Kay and King (1990) for the whole tax system. Dilnot and Stears (1997) also provide a useful survey of British tax system, including recent reform.

some other cases. Taxable income is subject to different tax rates depending on the tax band that income falls. Currently, low income earners pay a lower rate of 20%, compared to the basic rate of 24%; a higher rate of 40% is payable on additional income above the basic rate limit.

Social Security Contributions (SSC)- previously known as National Insurance Contributions (introduced in 1948) are the other major tax on personal income. This is the only pay-roll tax in the UK, and entitles individuals to receipt of certain social security benefit. SSCs were originally introduced as a flat-rate tax, payable by all those in work and by their employers. As social security expenditure grew, the flat-rate contribution needed to finance the scheme became an increasingly large proportion of earnings. This brought a heavy burden on the low paid and, in 1961, earnings-related contributions were introduced. The share of earnings-related contributions has increased steadily and, since 1975, SSCs have been wholly earnings-related.

Corporate tax is charged on profits made by UK resident companies, public corporations and unincorporated associations, and it is a relatively modern development (introduced in 1947). Before the Second World War, it was integrated with the personal income tax, and special taxes on profits were used only as wartime measures to raise extra revenue. When the War ended, the system was rationalised by increasing the rate of profits tax and exempting individuals and partnerships from this additional tax. The system of corporate tax has subsequently changed at regular intervals. The standard rate of corporation tax is currently 33%, although there is a reduced rate for small companies.

Indirect taxes are the other major source of government revenue. The structure of commodity taxes in the UK is characterised by one general sales tax (value added tax - VAT), and heavy duties on three products, tobacco, alcoholic drinks and petrol. VAT replaced the purchase tax (a single-stage wholesale sales tax) in the early 1970s. The basic principle of VAT is that it is a sales tax chargeable to the sellers of all output, and firms are allowed to deduct any VAT that has been levied on inputs into their products. The main advantage of VAT is that it is a method of levying a tax on all commodities that enter consumption while effectively exempting all intermediate goods (those who buy goods for further processing receive a refund of the tax that they have been charged, and only those who are the final consumers of the goods actually pay tax). The standard rate of VAT in the UK is 17.5%, although a lower rate of 8% is applied to domestic fuel. Various categories of goods are either zero-rated or exempt. Around the world, VAT has been more and more widely introduced and the proportion of revenue obtained from it has tended to increase in recent years.

The local authorities in Britain have traditionally financed their expenditure by levying taxes on the property within their area of jurisdiction, and by additional grants from the central government. A distinguishing feature of British local government finance over the past ten years or so has been the series of major changes to the form of local tax. A domestic property tax was replaced in April 1990 by an essentially flat rate Poll Tax (the Community Charge) which in turn was replaced by a mildly progressive tax based on property value bands (the Council Tax). Central grants were initially mainly related to spill-overs

(services which benefited the population at large instead of. or as well as, the residents of a particular locality). Subsequently, fiscal imbalance became a more important element in government grants, tax collection has become more centralised than expenditure decisions, and the grants have been used to offset these local differences. As a consequence, decision making at the local level is highly influenced by the system of central grants (we relate these to fiscal illusion theories below).

1.3 AIMS OF THE STUDY

The importance of taxation, as a major policy tool of governments, cannot be questioned. However, the issues of measuring the voter-taxpayers' perceptions and reflecting their preferences in public policy remain debatable. This thesis will be concerned with fiscal illusion and the demand for general and local public spending in the UK. We observe that general government expenditure tended to rise steadily in the post-second World War period, and despite a marked reduction in the expenditure/GDP ratio in the Thatcher era, this trend has continued in the 1990s (see Figure 1.1). The entire period of 1955-94 can be characterised by quite volatile budget deficits. Revenue tended to keep pace with spending until the late 1960s (running ahead in 1968-71), a deficit emerged following the oil crisis, which peaked in 1974, was reduced significantly in the early 1980s, re-emerged, was eliminated in 1987-88 and re-emerged again. Revenue and expenditure tracked fairly closely over 1955-72; although a deficit wedge was inserted, revenue and expenditure still tended to track over 1973-1989; however, since 1990, the two have diverged, with revenue falling while spending rose, implying a steadily increasing deficit.

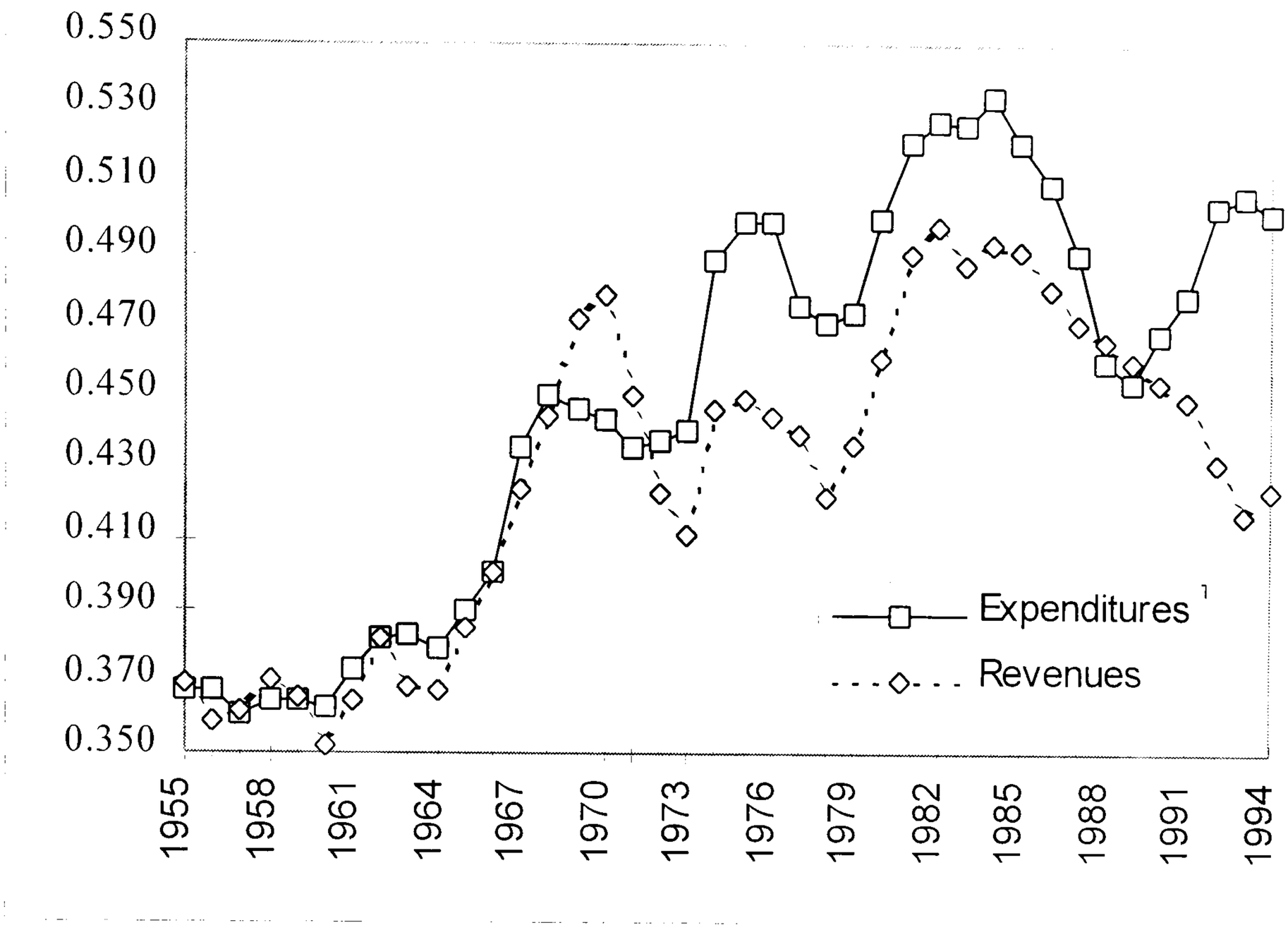

Figure 1.1 Government Expenditures and Revenues in the UK, 1955-94 (as a proportion of GDP)

The elements of fiscal illusion which we focus on may offer insights into these trends in at least two ways. First, government can avail itself of fiscal illusion to increase spending, either by allowing the deficit to increase or by use of an appropriate tax structure, such as more reliance on less visible taxes. Second, faced with a sudden need to increase spending (e.g. a Peacock-Wiseman effect), governments may have recourse to fiscal illusion to disguise from voters the need to finance the increase. Thus, an increased deficit is an obvious response to an external shock which immediately increases the demand for spending (while it is difficult to adjust tax revenue quickly, and may be politically difficult to cut spending). One fiscal illusion hypothesis would be that over time, to maintain spending and reduce the deficit (because of its

macroeconomic effects), the tax structure will evolve in an 'expenditure-supporting' manner.

Regarding the British local government finance, although the introduction of the Poll Tax was presented as a measure to reduce fiscal illusion and thereby increase local accountability, Cullis *et al* (1991) argued that if median voters have imperfect knowledge of how grants and local taxes interact, public perceptions of the Poll Tax would even induce increased fiscal illusion. We test for fiscal illusion evidence under both the community charge and council tax regimes.

It should be noted that aggregated data offers only a crude means of testing fiscal illusion, and direct testing is best achieved by using survey evidence to assess which misperceptions prevail, and how those misperceptions influence the demand for public spending. We utilise a recent British Social Attitudes Survey (1995) to do this.

1.4 OUTLINE OF THE STUDY

The outline of the thesis is as follows. A brief literature survey of public sector growth and fiscal illusion is provided in Chapter 2 focusing on structural and public choice approaches. The former set of explanations is essentially based on the economic and social structure of societies, and includes the long-standing Wagner's Law and Musgrave's hypotheses, the relative price effect and Baumol Hypothesis, and the Peacock-Wiseman Hypothesis; the latter set is associated with the decision-making process in the public sector, and includes more recent theories of distributive politics, bureaucracy, pressure groups, and

fiscal illusion. Most of those hypotheses concerning the demand for government-provided goods are tested in the subsequent chapters.

In Chapter 3, we adopt a public choice approach, incorporating fiscal illusion, to explain trends in public expenditure in the UK for the period of 1955-94. The incorporated fiscal illusion variables are the complexity and elasticity of the British tax system, the relative visibility of various revenue categories, and deficit finance. It should be noted that the measures of these variables closely interact, and therefore, we use cointegration techniques to test the relative significance of each variable. The results obtained are consistent with comparable studies of public expenditure. We find quite consistent evidence that invisible taxes and deficit financing were associated with increased levels of spending, but other measures of fiscal illusion perform less well.

In Chapter 4, a similar approach is applied to local government spending in the UK, using data for two fiscal years, 1991/92 and 1993/94, reflecting two very different local tax regimes - a community charge (poll tax) in 1991/92 and a property tax (council tax) in 1993/94. An important distinction between the two is that the former was levied on individuals at a flat rate payable by almost all adults, while the latter was levied on households using different tax rates. We incorporate measures of the flypaper effect (per capita grants), accountability (the ratio of local non-taxpaying voters to local tax-payers), and renter illusion (the ratio of households in rented accommodation to local households) to a public choice model of demand for publicly-provided goods. Measures of fiscal illusion appear to have similar effects under both the community charge and

council tax regimes, though the one for renter illusion produces different outcomes.

In Chapter 5, we use the BSAS-1995 to test some of the fiscal illusion hypotheses. An interesting feature of this chapter is the attempt to compare the survey responses with the respondents' 'actual' situation. Some forms of fiscal illusion - in the sense that tax-payers appear to be inconsistent in their responses regarding tax perceptions - find support, and this inconsistency occurs most frequently for VAT. We also use some microeconometric techniques (the probit and the ordered probit models) to model attitudes to taxation and public spending. We find some interesting results regarding tax preferences and perceptions, while the influence of tax perceptions on the demand for public spending is ambiguous.

Finally, the main findings of the thesis are summarised, and some conclusions are drawn in Chapter 6. Despite the consistency of the results obtained in the time-series and cross-section analyses with comparable studies of public spending, our attempt to analyse fiscal illusion in a more complete specification is forced by the aggregated nature of data to use crude measures of fiscal illusion. The micro-data analysis provides more direct evidence for fiscal illusion.

CHAPTER 2 LITERATURE SURVEY

2.1 INTRODUCTION

Variety of theories have been proposed to explain the long-standing tendency of public sector growth. A set of theories based on Wagner's Law are variants of the argument that the income elasticity of demand for government output is greater than unity. Alternative theories argue that shocks cause sudden increases in the size of governments, which never falls back to the previous level. Another explanation for growth of government is the relative price effect that prices of public sector goods rise relative to private goods.

Alternative approaches have been developed within public choice theory, assuming that the level of government spending should reflect voter-taxpayer's demand for public goods. On the other hand, the supply side of government (politics, bureaucracy etc.) has been argued to have its own agenda, which may not necessarily follow voter-taxpayers' demand. It has also been argued that certain features of tax structure may distort voters' tax perceptions, and government agents may behave with self-interest: both cases may produce an actual government output which differs from the optimum level.

These theories are reviewed in this chapter. Section 2.2 summarises structural and public choice approaches to government growth; Section 2.3 reviews the studies of fiscal illusion and public spending; and finally some conclusions are drawn in Section 2.4.

2.2 THE GROWTH OF THE PUBLIC SECTOR: AN OVERVIEW

This section overviews the theories of public sector growth under two sets of explanations: structural approaches and public choice approaches. The former set of explanations is essentially based on the economic and social structure of societies, and includes the long-standing Wagner's Law and Musgrave's hypotheses, the relative price effect and Baumol Hypothesis, and the Peacock-Wiseman Hypothesis; the latter set is associated with the decision-making process in the public sector, and includes more recent theories of bureaucracy, pressure groups, and fiscal illusion.[1]

2.2.1 STRUCTURAL APPROACHES

The early attempts to explain the tendency of the public sector to grow faster than the economy, particularly in western industrialising countries, are essentially based on the economic and social structure of societies. Increasing national income, and changes in the composition of social and economic structure are regarded as causal factors for the growth of the public sector.

Wagner's Law and Musgrave's Hypotheses

One of the first attempts to explain the relative growth of public sectors in industrialising countries was by German Economist Adolf Wagner (1883), which was introduced to the English-speaking world at the end of the 1950s.[2] This tendency, termed by Wagner the 'law of increasing expansion of public, and particularly state, activities', and subsequently known as 'Wagner's Law', is noted in the original text as follows:

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[1] For useful surveys of government growth, see Borcherding (1977a) and Mueller (1987).
[2] A translation of Wagner's work can be found in Musgrave and Peacock (1958).

> ...in considering the absolute and relative level of expenditure for any public service... The following may be taken as a rule: State expenditure may be higher, in absolute terms and as a percentage of national income, in proportion as the immediate economic value (taken in the widest sense) of a public service is greater, its contribution to general productivity is greater as well as the 'free' national income (i.e. ...that part of national income which is left after the satisfaction of the people's essential material needs), and finally, in proportion as the part of State revenue derived from sources other than taxation, i.e. from the State's business activities, is larger (Wagner, 1883: 7).

It is clear that Wagner pointed to the growing importance of government activity and expenditure as an inevitable feature of a 'progressive' state. Bird (1971) summarised three reasons why this development will take place: One reason is that the administrative and protective functions of the state would emerge as new requirements in industrialised societies; a second reason is that a considerable relative expansion of 'cultural and welfare' expenditures, especially with respect to education and income distribution, would take place; finally, the inevitable changes in technology and the increasing scale of investment would create large private monopolies which would have to be either regulated or taken over by the state in the interests of economic efficiency. All these developments would have to be financed by the state, and hence would require more economic sources to be diverted to the public sector.

In fact, the emergence of private monopolies and externalities have often formed an important base for government intervention: governments either took over or regulated monopolies, and both cases created extra fiscal requirements. Urbanisation and population density emerged as other considerable problems of industrial societies. Since the seminal work of

Samuelson (1954), the scale economies of publicly provided goods has been an important argument for government expenditures.

A number of subsequent writers introduced more detailed hypotheses of public sector growth based on Wagner's Law. Musgrave (1969) is one of the best-known, whose work is referred as 'Musgrave's hypotheses' (see Gemmell, 1993: 106). An important characteristic of Musgrave's work is that government expenditures are disaggregated into consumption, investment and transfers, and these are considered to change at different stages of economic progress.

According to Musgrave, public investment is likely to form a large share of total investment at early stages of development but fall thereafter, however, it is not clear whether the increasing or decreasing tendencies of public investment are permanent. On government consumption, Musgrave argues that demand for 'secondary needs' will increase in later stages of development, increasing private goods consumption will need complementary public goods, and state regulatory activities will be required for the growing complexity of an economy. Musgrave also argued that redistributional objectives motivate transfers, and whether public transfers will rise or fall depends on society's concern with equality, and changing social, cultural, and political factors (Gemmell, 1993: 106-8).

Unlike Wagner, Musgrave is too cautious to impose a 'law', and regards the theory of expenditure growth as an elusive problem:

> Even if economic factors only are considered, it is difficult to arrive at an expenditure law. Inferior goods are the exception in the public as well as in the private sphere, so

> that there is every reason to expect a positive association between levels of public outlay and per capita income. But matters are far from obvious once the ratio of expenditure to GNP is considered (Musgrave, 1969: 122).

Wagner's Law has been subject to various debates in terms of interpretation and testing. Per capita income is almost universally accepted as a measure of social progress, and government expenditures (and particular expenditure categories) are used to measure government size, but the empirical testing of Wagner's Law remains controversial. Gemmell (1993: 109-10) pointed out three interpretations of Wagner's Law in empirical testing:

> 1. narrow/absolute: government goods are 'normal' (have a positive income elasticity of demand), causing an absolute rise in government expenditure as per capita income rises.
> 2. narrow/relative: government goods are 'superior' (have an income elastic of demand greater than unity), causing the ratio of government expenditure to national income to rise as per capita income rises.
> 3. wide/relative: an increase in per capita income *will be associated with* a rise in the ratio of government expenditure to national income.

Tests of the first interpretation have generally found support, confirming that the income elasticities of government-provided goods are positive; tests of the second interpretation have produced mixed results, while tests of the third have found strong support (see Gemmell, 1993: 115-18).

The Relative Price Effect and Baumol Hypothesis

One explanation for increasing government expenditures is associated with the relative prices of public and private sectors. Despite the regular and persistent rise in the 'relative price of government', the term 'relative price' represents a

measure of public sector input prices relative to output prices in the economy as a whole, because public goods are non-marketed where prices (and sometimes output) cannot be observed directly. This type of definition implies that the ratio of public expenditures to GDP in nominal terms will tend to rise over time without an analogous increase in the real size of the public sector.

A possible explanation for the faster increase in the unit cost of government outputs is offered by Baumol (1967), who hypothesised that productivity rises in public sector are likely to be smaller compared to those in private sector, because governments mainly provide services which are labour intensive. Gemmell (1987: 264) also noted that 'the relative growth in public or non-market sectors appears to result primarily from rising relative costs'. Another explanation is the rigid nature of government expenditure commitments.

Assuming that public sector prices are accurately measured, the price effect can still be in two opposite directions: there will be less demand for public goods at higher prices (price elasticity of demand); and public expenditures will increase due to higher production costs (supply effect). The net effect depends on whether public sector prices can explicitly be determined, and how far voters can observe and react to them (see below).

Although, it has been argued that military services have become fairly capital-intensive in recent years, while computers and other innovations have enhanced productivity in services, it is still not clear that productivity in public services (such as education and police protection) will keep pace with that in the private sector. Testing of productivity in public sector is also a troublesome issue,

though some indirect evidence suggests that public sector productivity lags behind private sector productivity (Mueller, 1987).

Pommerehne and Schneider (1982) found some indirect evidence for the relative price effects, and Borcherding (1985), evaluating previous findings, noted some positive net effects of relative prices for US data. Gemmell (1990a), using some cross-country data, found that 'relative price changes do affect the real size of the government sector, though the mechanisms by which this occurs may differ' (p.376). A relative price variable was used by some other scholars in recent empirical studies (see, for instance, Diamond, 1989; Tridimas, 1992; Ashworth, 1995), however, any direct evidence of productivity lags in the public sector has not been found.

The Peacock-Wiseman Hypothesis

Another contribution to explanations of government growth was by Peacock and Wiseman (1961) who argue that shocks cause sudden increases in the size of governments, which never falls back to the previous level. They noted, in their well-known study of the growth of public expenditure in the UK, that

> People will accept, in a period of crisis, tax levels and methods of raising revenue that in quieter times they would have thought intolerable, and this acceptance remains when the disturbance itself has disappeared (Peacock and Wiseman, 1961: 27).

In fact, citizens' resistance to high tax burdens was also mentioned in Wagner's work (see Gemmell, 1993: 105). However, Peacock and Wiseman introduce the important notion of 'suppliers' into the public expenditure determination process (Henrekson, 1993: 54; Rowley and Tollison, 1994: 125). They derived

the key concept of a 'tolerable tax burden' relying on the political propositions that governments desire to spend more (for political profit; ie. votes), while citizens do not like to pay more taxes:

> In 'normal' times, the existence of a customary notion of 'tolerable burden' is likely to constrain the rate of implementation of government expenditure plans. But this constraint will be weakened or destroyed during periods of social upheaval, when such notions of taxation are more easily broken down, and the gap between a 'desirable' growth of public expenditures and a 'tolerable' tax burden may be narrowed (Peacock and Wiseman, 1961: viii).

Two notions have been derived from the analysis of Peacock and Wiseman: One is the 'displacement effect' which argues that in periods of social upheaval, such as wars, some on-going government spending (related to normal times) are displaced upwards by war-related spending. Government expenditure does not fall to its original level, following the crisis period, because a war, for instance, is not fully financed by taxation due to limited taxable capacity. Therefore, nations have to repay debts and related charges after the event. The other is the 'inspection effect' which points to the previously unidentified government spending brought into focus by crisis. This arises from 'citizens' keener awareness of social problems' during the period of crisis, which allows governments to expand their scope of services to improve those social conditions (Brown and Jackson, 1990: 124).

Peacock and Wiseman originally derived this hypothesis from an evaluation of UK public expenditure data. Despite many references to the hypothesis, its interpretation and testing have always been debatable. Henrekson (1993) derived the following testable versions of the hypothesis:

> *the strong version*: real absolute government expenditure per capita evolves in a steplike pattern, where the movement from one step to another coincides with major social disturbances, such as wars; ...*the semi-strong version*: government expenditure as a share of national income evolves in this same fashion. ...*the weak version*: the ratio of government expenditures to GDP follows an upward-sloping trend in normal times, and this trend is shifted permanently upward following a social upheaval. ...*the amorphous version*: the values of the parameters of the relevant model explaining the development of government expenditures will change following a social upheaval (pp.56-7).

One of the early attempts to test the Peacock-Wiseman Hypothesis was by Gupta (1967), who used intercept and slope dummies in a simple public expenditure-GNP (both in per capita terms) specification, and found significant displacements after the world wars in most countries, and after the Great Depression in the case of US and Canada. On the other hand, Bonin *et al.* (1969), who follow a similar method to Gupta's, found mixed results for the UK, because the results were sensitive to data definitions. Rowley and Tollison (1994) suggested the cold war period of 1946-89, and argued that US data strongly supported the Peacock-Wiseman hypothesis as reductions in defense expenditure were systematically diverted into transfer programs, while Holcombe (1993), examining federal government spending in the US since 1800, found no support for the permanent increase in public spending.

More systematic methods have been suggested in recent years to test the time pattern of economic variables. Henrekson (1993) argued that previous empirical studies suffer from methodological shortcomings, and suggested that the most straightforward way to model the time pattern of public expenditures growth is by means of an ARIMA (Autoregressive-Integrated-Moving

Average) model. This requires an appropriate data set, which is available only to analyse the Second World War as an upheaval. The model around a deterministic trend was identified for the log of real total government expenditure per capita and total nominal government expenditures as a share of nominal GDP for the post-war period, 1947-87. The deterministic trend was included to account for the long-run growth, whereas the ARIMA components was included to capture the deviation of the series from their trend value. The results by Henrekson disproved any upward displacement, and instead a permanent downward shift in government spending was found after the Second World War for the UK and Sweden. Overall, the results vary according to the interpretations of the hypothesis, the data set, and the applied methods.

2.2.2 PUBLIC CHOICE APPROACHES

The explanations of government growth summarised earlier are essentially based on the organic view of state which argues that government exists to provide public goods and eliminate externalities, except the Peacock-Wiseman Hypothesis which acknowledges some political elements. It has been argued by recent public choice analysts that this is essentially a normative definition of government, and in reality, government does not always do what they ought to do. So, the question should be what government actually does. The traditional approach of organic state is rather a proposition to the initial creation of the state. However, problems arise when the state goes beyond its initial purpose, and the tools of analysis also have to be modified.

In fact, the theories previously explained are also positive, however. they are based on different assumptions: It is assumed in standard (normative) theories

of public finance that the state is a single decision-making unit acting for society as a whole, and government's objective is to maximise social welfare. Since the 1950s, studies of the decision making process accelerated and 'public choice theory' emerged as a systematic approach to the economics of the political processes by the pioneering studies of Buchanan. Buchanan (1960) argued that governmental decisions have also some endogenous elements as private economic decisions, and analysis of public economy will be unsatisfactory unless examined in a collective decision making framework. Public goods are produced by governments the level of which is an outcome of the political process in a typical representative democracy. Thus, the level of public goods is an outcome of the political decision making process based on the interactions between voters (and groups of voters; ie. pressure groups), politicians, and bureaucrats. In this framework, governments are ruled by individuals (ie. politicians, bureaucrats, etc.) who are not necessarily benevolent, and whose self-interest is no less important than any other individual.

The Median Voter Hypothesis

Public Choice theory, as a new stream of political economy, departs from the assumption that social welfare is maximised by governments, and sticks by the standard assumption of individual utility maximisation in economics. The question whether individual preferences can be aggregated, posed by Arrow (1951), received a positive answer from public choice theorists: in a majority decision model for which preferences are single-peaked it is the median voter's preferences that produce the minimum welfare loss for the whole group. This is demonstrated by Black (1958) for committee type majority rule decisions, by

Bowen (1943) in a referendum setting, and by Downs (1957) under a representative democracy. The Downsian model is the one which this study will concentrate on.

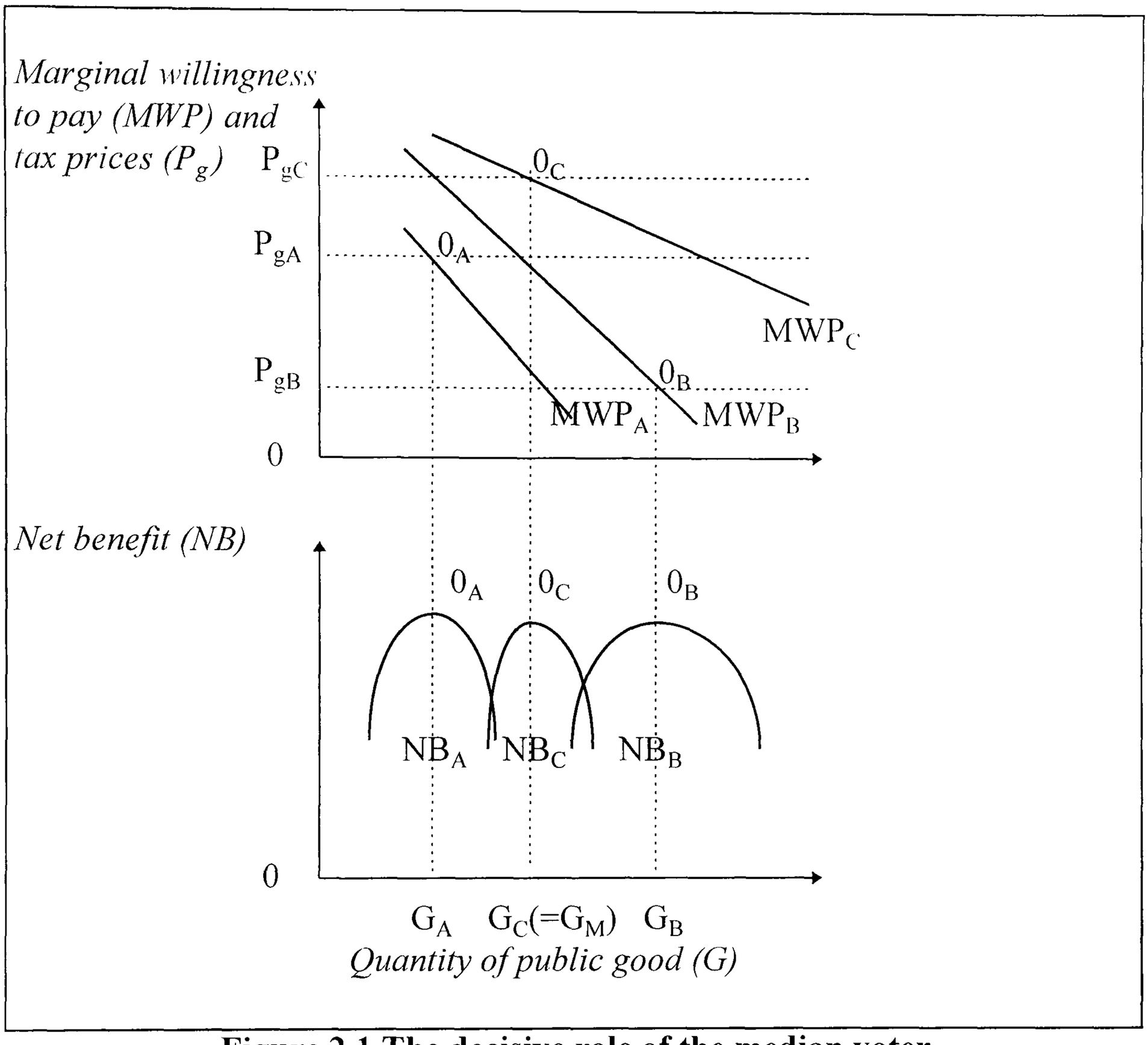

Figure 2.1 The decisive role of the median voter

Figure 2.1 illustrates how the median voter, who is in the centre of the voters' range of preferences, converts a minority to a majority under simple majority rule. Following Frey (1978), let three voters (A, B, C) constitute the whole population, and one good (G) is produced/supplied by the government (the analysis may be extended to any number of voters and goods without altering the basic result). The three voters must agree on a joint volume of

consumption, and this is determined by simple majority vote. Each voter has a different evaluation of G. The curves of marginal willingness to pay (MWP) and net benefit (NB) are shown at the top and in the bottom parts of Figure 2.1. respectively. Voter A has little interest in the consumption of G and correspondingly has a low MWP for all quantities. Voters B and C are assumed to have a medium and a high MWP respectively.

The total production cost of G must be covered by corresponding tax receipts. In contrast to private goods, each consumer (voter) pays a different tax-price (unless a lump-sum tax is introduced) for an amount of G determined by a simple majority, and the sum of tax-prices of consumer-voters (P_{gA}, P_{gB}, P_{gC}) must thus be equal to the marginal production cost of G.[3] As shown in the upper half of the Figure 2.1, the individual optima of the three voters (0_A, 0_B, 0_C) are determined by the equality of MWP and marginal tax-prices. Voter A experiences a positive net marginal utility up to quantity G_A and beyond that point a negative net marginal utility, and so on.

A step-wise procedure is used to reach a collective decision about the amount of G. Start from G_C: G_A is supported by voter A only while B and C have a higher net utility with a larger amount of G. The same happens to all motions proposing an amount below G_C because in each case the first voter is in the minority. All motions proposing an amount beyond G_C will be supported by voter B but rejected by the majority. For voters A and C an amount larger than G_C means a loss of net utility in comparison with amount G_C. The proposition

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[3] This assumption is relaxed in practice when the voters' exact tax-prices cannot be identified. We do this in the time-series analysis of government expenditures in Chapter 3.

to produce G_C is the only one to reach a majority. Voter C is in this case the median voter because his optimal demand for G is in the centre (median) of all voters (indicated by G_M in the figure). Thus, the median voter is the marginal voter who establishes a majority.

This outcome is possible under the assumptions of a single dimensional vector of public goods and single-peaked voters' preferences in that one dimension. Single-peakedness refers to a homogeneous preference ordering where the paradox of voting does not occur. It should be noted that preference orderings such as these can lead to cycles. If voters A and B are not satisfied with the outcome of the election in so far as they are not at their individual optimum given the tax-prices, they will make an effort to change tax-prices, and will be successful if this decision also is taken by simple majority rule (For more discussion of majority rule and multidimensional issues, and a proof of the median voter hypothesis under multidimensional case, see Mueller, 1989: 67-74).

The median voter model was heavily criticised by Niskanen (1971), who analyses the role of bureaucracy in a representative government; and Romer and Rosenthal (1978) who argued that a budget maximising agenda setter can manipulate the alternatives in such a manner as to produce an outcome larger than would be most preferred by the median voter. The median voter hypothesis refers to the demand side of the provision of public goods, while studies of vote maximising politicians and budget maximising bureaucrats explain the supply side. Indeed, under the light of these discussions, the

distinction of supply and demand sides has been introduced to public choice models of public goods in recent studies.

A distinct characteristic of public choice theory is the emphasis on political process. However, this does not necessarily deny the role of economic and social structure of societies. It rather analyses their impact through political process, investigating how the changes in socio-economic settings affect the agents' (voters, politicians etc.) behaviour in the political process. In this section, the demand and supply side explanations of government size will be summarised. The relevant theories are income distribution, pressure groups, bureaucracy, and fiscal illusion.

Income Distribution

This group of studies was pioneered by the *rational theory of the size of government*, which argues that politicians' competition for votes and voters' demand for income distribution is one of the most important reason for government growth (Meltzer and Richard, 1978).

> With nearly universal suffrage, the median voter has less income than the average earner. The voter with an income below the median can gain if incomes above the average are taxed, and the benefits are distributed to himself and others. Large government thus results from the difference between the distribution of votes and the distribution of income (Meltzer and Richard, 1978: 116).

A more systematic theory of the size of government was developed by Meltzer and Richard (1981), and then was empirically tested (see Meltzer and Richard, 1983). The reasons for government growth suggested were: extensions of the franchise which change the position of the decisive voter, and changes in

relative productivity which leads the skilled individuals to earn more than the unskilled and then this greater inequality results in voting for redistribution. The empirical results show that the share of distributed income increases with income, but the size of the response depends on the level of median income, and also, as income rises, people choose relatively more distribution in cash, which permits them to maintain consumption with less work. Overall, their findings support the argument that a substantial part of government growth is a response to voters` demand.

Brunner (1978), pointing out a wide range of social, political, and economic reasons for the existence and behaviour of government, also focused on the distributional character of politics. In addition to the extension of the franchise, Brunner also noted the self-interested behaviour of politicians and bureaus, who find, as 'political entrepreneurs', that offering new programs or variations on existing themes assures a higher survival value in the 'political market`.

It is also argued by Peltzman (1980) that, in a median voter framework of public goods analysis, the ratio of public spending to GNP ought to be roughly constant across space and time. In fact, this ratio has grown over time and varied considerably across countries. Thus, Peltzman (1980: 221) noted that incentives to redistribute wealth politically are important determinants of the relative size and growth of public sector, though did not deny the importance of the public good aspects of government activity. Unlike Meltzer and Richard, Peltzman argued that special interest groups should be the focus of voting models. It is argued by Peltzman (1980:272) that the early twentieth-century expansion of government coincides with the emergence of broad-based interest

groups which successfully strained influence on the political process, and concluded that governments grow where groups which share a common interest in that growth and can perceive and articulate that interest become more numerous (for more discussion on interest groups, see below).

Pressure Groups

The effect of pressure groups on government size is a special case of the distributional nature of political processes, based on the logrolling under majority rule model of Tullock (1959). Tullock argued that majority rule might lead to an excessive level of government expenditures for two reasons: one is that governments spend more on publicly provided goods than they would spend under the unanimity rule, and the other is that there would be no incentive to have governments to produce a certain public good, if the unanimity rule were in use.

More systematic explanations came from Olson (1982), in his well-known *the rise and decline of nations*, who argued that 'the accumulation of distributional coalitions increases the complexity of regulation, the role of government, and the complexity of understandings, and changes the direction of social evolution' (p.73). Becker (1983) developed a model of the influence of pressure groups, specifying Olson's hypothesis, and argued that taxes, subsidies, regulations, and other political instruments were used to raise the welfare of more influential pressure groups.

The direct effect of pressure groups on the size of government has been analysed more specifically by Mueller and Murrell (1986), and a positive

relationship was found between the number of interest groups and government size for OECD and some other democratic countries (see also, Murrell, 1984; Coughlin *et al.*, 1993; Tullock, 1993). The empirical studies of this subject are quite limited, because of the implicit difficulty of measuring political variables.

Bureaucracy

Considerable attention has been devoted to the positive relationship between bureaucracy and government size. Niskanen (1971) argued that 'pay, prestige, power, and promotion' are all positive utility sources, and are direct functions of bureaucrat's budget. Therefore, bureaucrats have particular reasons to maximise budgets.

Romer and Rosenthal (1978) argued that a budget maximising agenda setter can manipulate the alternatives in such a manner as to produce an outcome larger than would be most preferred by the median voter. The empirical results are generally in line with their arguments (see Romer and Rosenthal, 1979a, 1979b, 1982). Borcherding *et al.* (1977) also reports evidence that suppliers of public services charge higher prices if they have monopoly power.

Another stream of studies addresses the behaviour of public employees who will typically wish to protect and expand their own sector (see, for instance, Bush and Denzau, 1977; Borcherding *et al*, 1977; Gemmell, 1990b; and Libecap and Johnson, 1991). Borcherding et al (1977) found evidence that public employees are able to expand their budgets through representation by unions, while Libecap and Johnson (1991) found no evidence that voter participation is higher for federal workers than for private workers.

Mueller (1987) noted that both Niskanen's and Romer and Rosenthal's models were static, because they explain why government will be larger than optimal, but they do not directly explain how government grows. In recent work, Cullis and Jones (1993) used UK data for post-war period in a dynamic analysis, and did not find support for the hypothesis that bureaucrats could drive relative public sector growth. It is clear that these studies analyse different cases: it might well be possible that agenda setters and/or public employees have the ability to drive a greater government budget under certain circumstances, however, this may not be persistent over time.

Some studies of bureaucracy, such as Romer and Rosenthal (1979a), were regarded as assaults on the median voter approaches. Although similar arguments were used to invalidate the hypothesis, in fact, they are complementary rather than rival. For instance, in *their rational theory of the size of government*, Meltzer and Richard (1983) recognised that their analysis neglected most features of the political process, and a useful extension of their model would have incorporated supply factors, such as bureaucracy. The median voter hypothesis refers to the demand side of the provision of public goods, while studies of vote maximising politicians and bureaucracy explain the supply side.

2.3 FISCAL ILLUSION AND PUBLIC SPENDING

Fiscal Illusion, as a normative consideration, goes back to early scholars such as Mill (1848), and McCulloch (1851). However, the positive theory of fiscal illusion dates to the Italian economist Puviani (1903). The idea is based on the

information asymmetry between the suppliers (such as bureaucrats) and consumers (voter-taxpayers) of public goods. It is acknowledged in the standard economic theory that the performance of the market depends on the information maintained by economic agents in the decision making process. Similarly, the efficiency of the public goods market, in a typical democracy, depends on the available information related to costs and benefits of public goods. It is argued in recent public choice theories that government agents hold more information than voter-taxpayers do, and hence this asymmetry allows the magnitude of public spending to go beyond the voters' preferences. Although fiscal illusion may operate in evaluation of both taxes and expenditures, the related theories essentially concentrate on the revenue side, arguing that assessments of benefits from public goods are highly subjective and the cost is more certainly identified (Goetz, 1977: 177).

The budget constraint was acknowledged also by Wagner (1883) who noted that 'financial stringency may hamper the expansion of state activities, causing their extent to be conditioned by revenue'. Peacock and Wiseman (1961) argued that 'people will accept, in a period of crisis, tax levels and method of raising revenue that quieter times they would have thought intolerable'. The implicit assumption behind these arguments is that taxpayers are aware of their 'actual' tax burdens. Fiscal illusion theories go beyond the circumstances which allow the government to raise taxes, and argue that

> ...the actions of the government could best be explained by the hypothesis that the government always acts to hide the burden of taxes from the public and magnify the benefits of public expenditures... When the governing group is successful in these attempts, fiscal illusions are created which effectively modify human behavior (Buchanan, 1960: 60).

Subsequent scholars have emphasized that certain features of tax structure can affect voter's perceptions of their tax burden so that they underestimate how much they are paying for public goods; such fiscal illusion implies that actual expenditure will be greater than predicted by a simple voter demand model.

To illustrate the issues mentioned we combine the diagrammatic expositions of Wagner (1976) and Gemmell (1997b). Figure 2.2 shows the relationship between fiscal illusion and demand for public goods. Under the assumption of fully perceived tax-prices, voter-taxpayer i's (true) tax-price is P^t_{gi}, the amount consumed by i is G_{i1}, K (on U_{i1}) is the equilibrium point for i corresponding to point a which is the cross-point of the demand curve (D) and marginal cost (= average cost (AC) = P^t_{gi}). EF is the 'true' budget constraint, and EX_{i1} is the amount of tax paid by i.

Looking at the upper half of Figure 2.2, it should be noted that while i prefers G_{i2} under the perceived tax-price (P^p_{gi}), government actually extracts an amount of tax which imposes a tax-price of P^t_{gi}. Therefore, voter-taxpayer i perceives [$P^p_{gi}dG_{i2}0$] as the total cost of public goods, while the real cost is [$P^t_{gi}bG_{i2}0$], and the actual utility level is at point L which is lower than both K and M. Proposed sources of this illusion are: revenue complexity (and visibility of taxes), tax elasticity, and the extent of deficit finance. Two other sources of illusion have also been proposed with particular reference to local government finance: the flypaper effect and renter illusion.

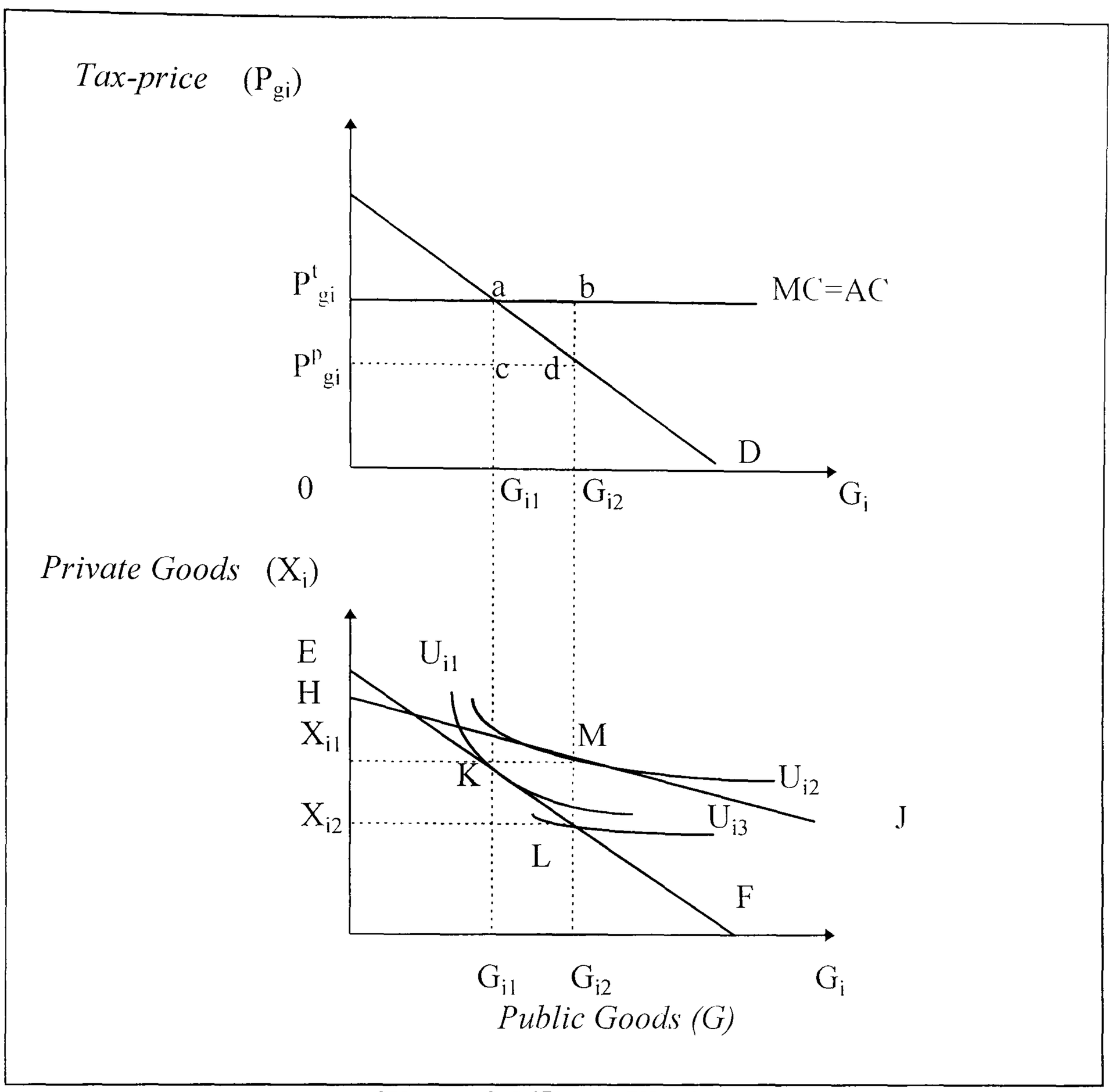

Figure 2.2 Fiscal Illusion

Revenue Complexity

The pioneering study of revenue complexity was by Wagner (1976) who asked the question whether a choice between financing public output from a single tax or from a variety of smaller taxes would affect the stock of taxpayers' knowledge about tax-prices, and hence, affect public budgetary choices. Wagner argued that the ability of fiscal institutions to create fiscal illusion depends on the ability of such institutions to influence the hypothesis a person forms about the cost of government. A tax system is characterised as

containing various 'fiscal extraction devices' (FEDs) which transfer resources from citizens to the treasury. The simplest revenue structure would be one in which all extractions during some time interval were made by one FED at one point in time, and more FEDs lead to a more complex system which make the formation of an accurate perception regarding the price of public output more difficult.

Wagner (1976) used the Herfindahl index to measure the degree of complexity, and found a positive and significant relationship between the complexity of tax system and government expenditures.[4] All subsequent empirical studies of the revenue complexity have employed this index as a measure of fiscal illusion. Some significant results were also found by Baker (1983), Breeden and Hunter (1985), and Heyndels and Smolders (1994), while Clotfelter (1976), Henrekson (1988), and Misiolek and Elder (1988) found the effect of complexity to be insignificant.

The Herfindahl index as a measure of revenue complexity have been criticised on the grounds that it does not take into account the visibility of revenue categories (Wagner himself acknowledged the deficiency of the index). The index assumes similar degrees of visibility for all revenue categories, while actually some types of revenues may not be perceived similar to others. Oates (1988), for instance, argued that user charges may be more visible than equivalent excise taxes. Pommerehne and Schneider (1978) showed that the

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[4] The following formula was used to proxy revenue complexity: $H = \sum_{i=1}^{n} (R_i)^2$, where H is the Herfindahl index, and R_i is the share of ith revenue category.

impact of complexity is even stronger when the revenue categories were weighted by visibility.

Pommerehne and Schneider (1978) also found that the share of 'highly visible' taxes has a significant negative effect (and the share of 'highly invisible' taxes has a positive effect) on expenditures. Few analysts have included measures of tax visibility: Merrifield (1991) used the share of states' own tax revenues from income or sales taxes as a proxy for the visibility hypothesis, and found negative and significant effect on per capita tax revenues, suggesting that politicians are more reluctant to increase the more visible taxes; Misiolek and Elder (1988) found no support for tax visibility having an effect; Clotfelter (1976) who uses the ratio of direct to indirect taxes as his measure, obtained insignificant results. Insignificant results were also found by Henrekson (1988) who uses the ratio of direct taxes to total tax revenues.

The alleged causal relationship has also been criticised, as the Herfindahl index may not reflect fiscal illusion, but may rather be the effect of revenue diversification. Brennan and Buchanan (1982) argued that revenue-maximising governments rely not on taxes that are obscured but rather rely on taxes that cannot be avoided: as the percentage of goods that are taxed increases, the opportunities for consumption switching are accordingly reduced, and thus citizens find it difficult to avoid the tax. Oates (1988) also argued that authorities with relatively high levels of public spending are associated with more diversified revenue structure, because governments will introduce new sources of revenue in order to prevent producer and consumer tax-related mobility across localities.

Breeden and Hunter (1985), for instance, found a positive effect of tax complexity on the revenue and spending, however, they were careful not to interpret their findings as support for information asymmetry, but as support for the more general Brennan and Buchanan model of tax structure: the greater the proportion of commodities or services that is taxed, the larger are the per capita tax revenues. Misiolek and Elder (1988) found that the evidence for tax diversification as a result of the need for revenue stabilisation was stronger than the evidence for fiscal illusion caused by tax diversification-induced information asymmetry.

Tax Elasticity

The tax elasticity hypothesis is another form of fiscal illusion argued by Buchanan (1967) that the more elastic the tax system the more responsive is revenue to growth in national income, hence it is easier to sustain a higher volume of public spending if income is growing. The empirical study of the relationship between tax elasticity and public spending was pioneered by Oates (1975) who regressed US state expenditures against various socio-economic variables, along with a measure of tax elasticity, and found a positive and significant relationship between tax elasticity and public expenditures. Oates used a crude measure of elasticity represented by the ratio of income tax revenues to total revenues, and the same measure was also employed by Baker (1983), Feenberg and Rosen (1987), and Heyndels and Smolders (1994) whose findings did not support the elasticity hypothesis (Feenberg and Rosen also calculated different elasticities of personal income and sales tax, and the results were also insignificant). Misiolek and Elder (1988) found a positive and

significant effect of tax elasticity on tax revenues, and the elasticity measure appeared to be insignificant when expenditures were used as a dependent variable. Some significant results were also found by Craig and Heins (1980) who used Advisory Commission on Intergovernmental Relations elasticity estimates instead.

DiLorenzo (1982) tested the fiscal illusion hypothesis *versus* Tiebout mobility, and found significant but negative effect of the share of income tax on public spending. Those results were interpreted by DiLorenzo as a support for the presence of Tiebout mobility: "In a system of competing local governments those jurisdictions with more income-elastic tax structures and, consequently, higher tax burdens, may experience outmigration as a result, as citizen-taxpayers vote with their feet. Such migration would diminish the demand for governmental services and lead to lower rates of expenditure growth" (p.391). Despite these explanations, DiLorenzo did not deny the validity of the fiscal illusion hypothesis, and noted that the effects of Tiebout mobility might have outweighed the fiscal illusion effect. Negative results were also found by Merrifield (1991) who concluded that voters seemed to be aware of and sensitive to more income elastic taxes, and legislators were under greater pressure to periodically re-evaluate the tax rates of the most income elastic taxes.

Hunter and Scott (1987) and Greene and Hawley (1991) used an alternative approach, and tested the elasticity hypothesis by estimating the effect of income tax progressivity on the probability of a state enacting a statutory income reduction. Their findings provided some indirect support for a negative

relationship that states with a higher degree of income elasticity have a higher probability of cutting tax rates, and they concluded that there was a limit beyond which automatic tax increases built into a system through progressive income taxation could serve the budget maximisers.

Debt Illusion

It is argued that the greater the share of deficit finance relative to spending, the greater the likelihood that taxpayers underestimate the tax-price and vote for higher levels of government expenditure (Goetz, 1977). Buchanan (1967) proposed two types of debt illusion: one is based on Puviani's Approach where the subjective assessment of the alleviation of the value of assets is not treated in the same manner as a lump-sum tax; and the other is based on Vickrey's (1961) approach where consumers' subjective assessment of future tax liabilities (compared with current debts) are undervalued. In both cases, subjective criteria dominate at the time of the selection of debt, and the objective costs are recognised only in subsequent time-periods.

Early empirical studies of debt illusion by Oates (1969) and Epple and Schipper (1981) tested the impact of taxes and expenditures on capitalisation. The former attempted to examine the effect of local expenditure programs and property taxes on property values, using US cross-sectional data, and the results showed that housing values are negatively related to tax rates and positively related to expenditures. This has been interpreted as indirect evidence for the absence of debt illusion. The latter included a more direct proxy of debt illusion (unfunded pension liabilities), and their findings did not support the debt illusion either.

Dalamagas (1993, 1994a, 1994b) undertook a different approach. and tested the Keynesian view (stimulatory effect of debt financed tax-cuts) *versus* the Ricardian view (the equivalence of tax and debt finance) of the impact of debt illusion on private consumption. Dalamagas concluded that the presence of debt illusion 'irrationalises' individuals, who tend to interpret the substitution of debt for taxes as a net addition to their wealth, and this effect diminishes when the level of indebtedness rises. The relevance of these studies here is limited, because their concern is the impact of debt illusion on private consumption rather than public expenditure.

Time-series studies of the effect of budget deficits on government expenditures were pioneered by Niskanen (1978), who found a positive and significant relationship. Subsequent studies by Diamond (1989), Tridimas (1992), and Ashworth (1995) have also found supportive evidence. Using UK data for the period of 1955-88, Tridimas (1992) found a significantly positive effect of budget deficits on the demand for government expenditures, and some evidence for the presence of deficit illusion 'in the sense that the deficit changes the perception of true price of government services'. Following a slightly different approach, Ashworth (1995) also found supportive evidence for the positive relationship between budget deficits and government expenditures.

The Flypaper Effect

Recent public choice approaches to local government finance have emphasised that the combination of local taxes and central grants is likely to give rise to

voter misperceptions of the tax-price of local public goods (Goetz, 1977). The form of fiscal illusion caused by central grants is called the 'flypaper effect': lump-sum grants increase public expenditure more than an equivalent increase in income. The term 'flypaper effect' originated in studies by Courant *et al.* (1979) and Oates (1979) who argued that budget-maximising political agents (politicians and bureaucrats) camouflage the lump-sum nature of grant revenues: instead of the income being returned to tax-payers, either directly via a rebate or indirectly via a reduction in tax contributions, the grant is used to expand the public budget, and this causes voter-taxpayers to underestimate the tax-price and vote for higher levels of government expenditures.

A group of studies incorporate the effect of grants into general studies of fiscal illusion; and the empirical results showed that intergovernmental grants are an important determinant of the level of local public spending. Wagner (1976), for instance, included intergovernmental revenue as an explanatory variable in addition to other socio-economic and tax structure related variables, and found positive impact on local expenditures. Similar evidence was also found by Munley and Greene (1978), Craig and Heins (1980), DiLorenzo (1982), and Breeden and Hunter (1985).

Other studies directly tested for the flypaper effect. Winer (1983), utilising Canadian provincial data, regressed provincial expenditures on income, federal grants and interprovincial grants, and found that the grant system did increase expenditure and that the elasticity of grants with respect to expenditure for 'poor' jurisdictions (recipient) was roughly twice as large as for 'rich' jurisdictions (donor). Logan (1986) also made a distinction between recipient

and grantor, and tested the two effects of grant-induced illusion: an increase in recipient output and a decrease in grantor output. The results from US time-series support the fiscal illusion hypothesis in the sense that tax-prices were modified in the opposite direction for recipient expenditures (Logan, 1986). Grossman (1990), using various categories of grants (conditional/unconditional and federal/state), also found evidence for the stimulatory effects of grants. Significant results were also provided by Nelson (1986), Heyndels and Smolders (1994) and Turnbull and Djoundourian (1994). On the other hand, Turnbull (1993) found a positive effect of grants on expenditure demand; however, the elasticity values revealed that a marginal grant's impact on expenditure was less stimulative than that of income. Becker (1996) also argued that the flypaper effect was sensitive to model specification; using US data, she found no evidence of a flypaper effect.

Renter Illusion and Accountability

The notion of renter illusion hypothesis is based on the fact that the primary source of local government revenue is the property tax, and it is argued that only those voters directly liable (homeowners) will correctly perceive the tax-price of the local public good (Bergstrom and Goodman, 1973). Barr and Davis (1966) found that property holding was an important determinant of expenditure decisions, and Bergstrom and Goodman (1973) found a negative and significant relationship between the percentage of owner occupied properties and public spending. Peterson (1975) also found that renters do not think that they bear the full cost of property taxes.

Martinez-Vazquez (1983) criticised the theoretical foundations of renter illusion, and proposed 'renter rationality' instead. Apart from the different household characteristics of renters (having lower incomes and more school age children, for instance), Martinez-Vazquez argued that the renters' voting behaviour will vary because, given their income level, they have lower housing consumption, and any increase in local expenditures will entail larger net benefits to renters than homeowners of the same income level. The empirical results found by Martinez-Vazquez confirmed the positive relationship between local expenditures and the percentage of renters; however, when net benefits was used as a dependent variable, a positive relationship was also found. This was considered as support for the hypothesis of renters' rationality, yet does not necessarily exclude some degree of fiscal illusion. Carroll and Yinger (1994) also found supportive evidence for renter rationality, as property tax increases were exactly offset by increases in rents. Heyndels and Smolders (1994), who includes the percentage of residences that are non-owner occupied as an explanatory variable to Flemish municipal expenditures, found no evidence for renter illusion. It should be noted that most of these studies used data from US local governments, and the assumptions are based on US property tax practices. The hypothesis of renter illusion is essentially based on the renters' status with respect to local tax, and this may change under different local tax systems.

UK local government has experienced major changes to the form of local tax over the past ten years or so. A domestic property tax was replaced in 1990 by an essentially flat rate Poll Tax (the Community Charge) which in turn was replaced by a mildly progressive tax based on property value bands (the

Council Tax). The notion of 'local accountability' entered local tax debates. Cullis *et al.* (1993b) argued that while the introduction of the Poll Tax was presented as a measure to reduce fiscal illusion and thereby increase local accountability, a careful analysis of the equity and efficiency implications of the Poll Tax combined with the mechanism of allocating Central Grants suggests that fiscal illusion persists. In fact, Cullis *et al* (1991) argue that if median voters have imperfect knowledge of how grants and local taxes interact, public perceptions of the Poll Tax would induce increased fiscal illusion. In neither paper, however, did they explicitly test for fiscal illusion. Barnett and Knox (1992) tested two hypothesis for Northern Ireland: individual accountability (all those who are eligible to vote in local elections should be liable to pay taxes), and collective accountability (the full marginal cost of a local government expenditure should be borne by local tax-payers). The empirical findings showed that individual accountability was not significant, while collective accountability was found to significantly influence local government expenditure *per capita*. There has been very little research on this issue because of the difficulty in driving an empirical measure for accountability.

2.4 CONCLUSIONS

The review of the literature on the factors identified as contributing to the long-standing tendency of public sector growth reveals a variety of approaches ranging from the highly aggregated analysis of socio-economic factors to the micro-analysis of public choice economists who model those factors which influence the demand for, and supply of, public spending. It should be noted that the relatively new public choice approaches are complementary rather than

rival theories of the 'structural' approaches. It might well be possible that a stable set of political procedures deliver expenditure growth as a result of changes in the economic setting in which they operate, and it might also be the case that the changes in the political realm delivered a relatively stable economic conditions with growth of expenditure.

Taken on their own, none of those factors could be sufficient to explain the growth of public spending. There is progress in the tools of analysis along with economic and democratic progress. The social, economic and political differences across the countries also force analysts to alter their methods in different cases. The review of the empirical studies shows that evidence for specific factors is mixed. This might be because of the socio-economic changes over time and/or the differences across countries. In addition, the methods employed to test majority of those theories are sensitive to data sets, and the increasing availability of more appropriate data also may cause those differences.

Regarding the effect of fiscal illusion on government size, a number of writers have identified some variables, but few have rigorously tested them. There are many conceptual and practical difficulties to test for fiscal illusion. The difficulty to measure the public output and tax-prices, and the crude nature of aggregate data in terms of measuring fiscal illusion do not allow appropriate empirical testings. In subsequent chapters, we relate the tax structure of the UK to those illusions summarised in this chapter, and incorporate them to a public choice model of demand for public spending: in Chapter 3 for a time-series analysis of general government expenditures; in Chapter 4 for a cross-section

analysis of local public spending; and in Chapter 5 for a micro-data analysis of voter-taxpayers' attitudes to taxation and public spending.

CHAPTER 3

TAXATION AND THE DEMAND FOR GOVERNMENT EXPENDITURES IN THE UK: A TIME-SERIES ANALYSIS

3.1 INTRODUCTION

There has long been observed a tendency for the public sector to grow faster than the economy as a whole. More than a century ago, Wagner asserted that this tendency was inevitable. With the increasing availability of time series data, many writers have tested Wagners Law, narrowly defined as asserting that the income elasticity of demand for government output is greater than unity; there is little empirical support for this strict definition (Diamond, 1989; Gemmell, 1990a and 1993). Alternative explanations for public sector growth contend that this tendency is not inevitable. Peacock and Wiseman (1961) argued that external shocks, such as wars, caused sudden increases in public spending which did not revert back to its pre-shock level once the shock had passed; during 'non-shock' periods there was no necessary tendency for public sector share of national income to increase, rather it tended to hover around its existing share.

We adopt an alternative approach to trying to explain trends in British government expenditure (as a measure of the size of the public sector). Public choice theorists have argued that the level of government spending should reflect voter-taxpayer`s demand for public goods; in this vein models of the demand for public expenditure have been developed by Borcherding and Deacon (1972) and Bergstrom and Goodman (1973). Puviani (1903) observed

that certain features of the tax structure affect voter`s perceptions of their tax burden so that they underestimate how much they are paying for public goods; such fiscal illusion implies that actual expenditure will be greater than predicted by a simple voter demand model. To develop this we add a number of fiscal illusion variables to a model of the demand for public goods in order to try and explain trends in public expenditure using UK data for the period of 1955-94.

Section 3.2 discusses the public choice literature on fiscal illusion to identify which features of tax structure are likely to affect perceptions. and then presents trends in tax structure in the UK. Section 3.3 presents our model, in which fiscal illusion is represented by the visibility of taxes, the extent of deficit finance, revenue complexity and tax elasticity. Section 3.4 discusses the data and fiscal illusion measures used in the study, and Section 3.5 presents the empirical results. The conclusions are in Section 3.6.

3.2 FISCAL ILLUSION AND GOVERNMENT EXPENDITURES

Fiscal illusion arises if certain features of tax structure lead taxpayers to underestimate how much tax they truly pay and thus creates 'excess' demand for government-provided goods, ie. more public expenditure is demanded than would be in the absence of fiscal illusion (for detailed reviews see Oates, 1988; Dollery and Worthington, 1996). Proposed sources of fiscal illusion are: the degree of visibility of taxes; the extent of deficit finance; revenue complexity; and tax elasticity. The greater the share of 'less visible' taxes in tax revenue (Pommerehne and Schneider, 1978), and of deficit finance relative to spending (Goetz, 1977), the greater the likelihood that taxpayers underestimate the tax-

price and vote for higher levels of government expenditure. A more complex tax system will make it more difficult for voter-taxpayers to identify their true tax burden hence increases the likelihood of underestimating the tax-price of government-provided goods (Wagner, 1976). The more elastic the tax system the more responsive is revenue to growth in national income, hence it is easier to sustain a higher volume of public spending if income is growing (Buchanan, 1967).

Table 3.1 summarises the results of a number of studies that have included fiscal illusion in time series studies of public expenditure (there are also many cross-section studies including fiscal illusion variables to help explain variations in local authority spending; we refer to some of these below). The most commonly included variable, in five of the nine studies, was deficit illusion; the estimated coefficient was significant and associated with excess spending in all five studies. The second most common illusion variable was some measure of elasticity, but the results were mixed: the estimated coefficient was negative (the wrong sign) in two of the three studies in which it was significant; this could reflect the use of an inappropriate measure of elasticity, a point we return to below. Of these time-series studies only Henrekson (1988) included variables for visibility and complexity, neither of which was found to be significant.

Table 3.1 Time-Series (and Pooled Time-Series) Studies of Government Expenditures and Fiscal Illusion

Author(s)	Case Study	Fiscal Illusion	Evidence
Niskanen (1978)	U.S. (1947-67; TS)	Deficit Illusion (R/E)	- (*)
Craig and Heins (1980)	U.S. (1970 and 1975; PTS)	Tax System Elasticity[2]	+(*)
Feenberg and Rosen (1987)	U.S. (1978-83: PTS)	Tax System Elasticity	-[3]
Hunter and Scott (1987)	U.S. (1976-83; PTS)	Tax System Elasticity[4]	- (*)
Henrekson (1988)	Sweeden (1950-84; TS)	Tax System Complexity (H)	-
		Visibility (DRT/TT)	-
		Deficit Illusion (E/R)	+[1]
Diamond (1989)	Canada, France, Germany (F.R.), Italy, Japan, U.K., U.S. (1955-85; TS)	Deficit Illusion (R/E)	- (*)
Greene and Hawley (1991)	U.S. (1977-84; PTS)	Tax System Elasticity[4]	- (*)
Tridimas (1992)	U.K. (1955-88; TS)	Deficit Illusion (R/E)	- (*)
Ashworth (1995)	U.K. (1955-91; PTS)	Deficit Illusion (R/E)	- (*)

[1]Found to be significant for government investment expenditures.

[2]Use Advisory Commission on Intergovernmental Relations (ACIR) elasticity measure instead of Oates (1975).

[3]Oates (1975) measure and their own measures all found negative.

[4]Use tax cuts as dependent variable which is affected positively by tax progressivity.

Key: TS: Time-series; PTS: Pooled Time-series. R: Government Revenues,
E: Government Expenditures, H: Herfindahl Index,
DRT: Direct Taxes, TT: Total Tax Revenues.
(*) refers to the significant results.

The evidence for deficit illusion is contrary to the Ricardian Equivalence Theorem, which holds that individual consumers recognise the government's intertemporal budget constraint and are thus aware that any change in current taxes must be offset by a change in future taxes. If this holds, we would expect

government expenditures to be negatively related to deficits, as voter-taxpayers will be reluctant to incur future tax liabilities. Buchanan and Wagner (1977) argued that voters tend to discount future liabilities, so budget deficits can support excess government spending because they reduce the perceived price of public services to the current generation of voters. The evidence in Table 3.1 supports this more myopic view.

The inclusion of tax elasticity as a determinant of public expenditure derives from the seminal study of Oates (1975) who found a positive and significant effect of a measure of tax elasticity on general government expenditures. Subsequent empirical evidence has been mixed: Craig and Heins (1980) found support for Oates; Misiolek and Elder (1988) found a positive and significant relation between tax elasticity and tax revenues, but the effect on government expenditures was not significant; Baker (1983), Feenberg and Rosen (1987), and Heyndels and Smolders (1994) did not find significant results for elasticity; DiLorenzo (1982), Greene and Hawley (1991) and Hunter and Scott (1987) all found a negative but significant relationship between elasticity and government expenditures.

The pioneering study of the effect of revenue complexity on government expenditure is Wagner (1976) who found a negative relationship between the simplicity of the revenue structure and total expenditures. The Herfindahl index, suggested by Wagner, has subsequently been used by others as a measure of revenue system complexity: Baker (1983), Breeden and Hunter (1985), and Heyndels and Smolders (1994) found a positive and significant

effect of revenue complexity, while Misiolek and Elder (1988) and Henrekson (1988) found no support for the significance of complexity.

Few analysts have included measures of tax visibility, and those that have obtained mixed results: Pommerehne and Schneider (1978) found that the share of 'invisible' taxes has a significant positive effect on expenditures: Misiolek and Elder (1988) found no support for tax visibility having an effect; Clotfelter (1976) who uses the ratio of direct to indirect taxes as his measure, obtained insignificant results. Insignificant results were also found by Henrekson (1988) who uses the ratio of direct taxes to total tax revenues. It is clear that the empirical evidence for the influence of fiscal illusion on public expenditure, however measured, is ambiguous.[1]

Trends in Tax Structure in the UK

Figure 1.1 shows that government expenditure tended to rise steadily from 1955 until the early 1980s; the Thatcher era witnessed a marked reduction in the expenditure/GDP ratio, although this has been largely reversed in the 1990s. Revenue tended to keep pace with spending until the late 1960s (running ahead in 1968-71); a deficit emerged in the light of the oil crisis which peaked in 1974, was reduced significantly in the early 1980s, re-emerged, was eliminated in 1987-88 and re-emerged again. One could identify three broad patterns from Figure 3.1: revenue and expenditure tracked fairly closely over 1955-72; although a deficit wedge was inserted, revenue and expenditure still tended to track over 1973-1989; however, since 1990, the two

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[1] More details can be found in Chapter 2.

have diverged, with revenue falling while spending rose, implying a steadily increasing deficit.

The elements of fiscal illusion identified above may offer insights into these trends in at least two ways. First, governments can avail of fiscal illusion to increase spending, either by allowing the deficit to increase or by an appropriate tax structure, such as more reliance on less visible taxes. This type of relationship may be observed over the long-run. Second, faced with a sudden need to increase spending (eg. a Peacock-Wiseman effect), governments may have recourse to fiscal illusion to disguise from voters the need to finance the increase. Thus, an increased deficit is an obvious response to an external shock which immediately increases the demand for spending (while it is difficult to adjust tax revenue quickly, and may be politically difficult to cut spending). The fiscal illusion hypothesis would be that over time, to maintain spending and reduce the deficit (because of its macroeconomic effects), the tax structure will evolve in an 'expenditure-supporting' manner. This second set of effects should be apparent over the short-run.

If one considers the entire period 1955-94, the UK tax structure is remarkably stable, as shown in Figure 3.1. Taxes on expenditure, conventionally referred to as indirect taxes and, in the UK context, the relatively invisible taxes (as the amount paid is not always known at the point of spending), were some 40-45 per cent of total revenue over 1955-72 and 1978-94. Direct taxes on personal income, the relatively visible taxes in the UK context (as the amount paid is printed on pay slips and tax returns), showed more movement: rising steadily

from about 20 per cent of revenue in 1955 to 25 per cent in 1961 and 30 per cent by 1973, and remaining within a band of about 25-30 per cent over 1977-94. During the crisis of 1974-78, both these taxes moved 'out of their bands' but that period can be considered an aberration.

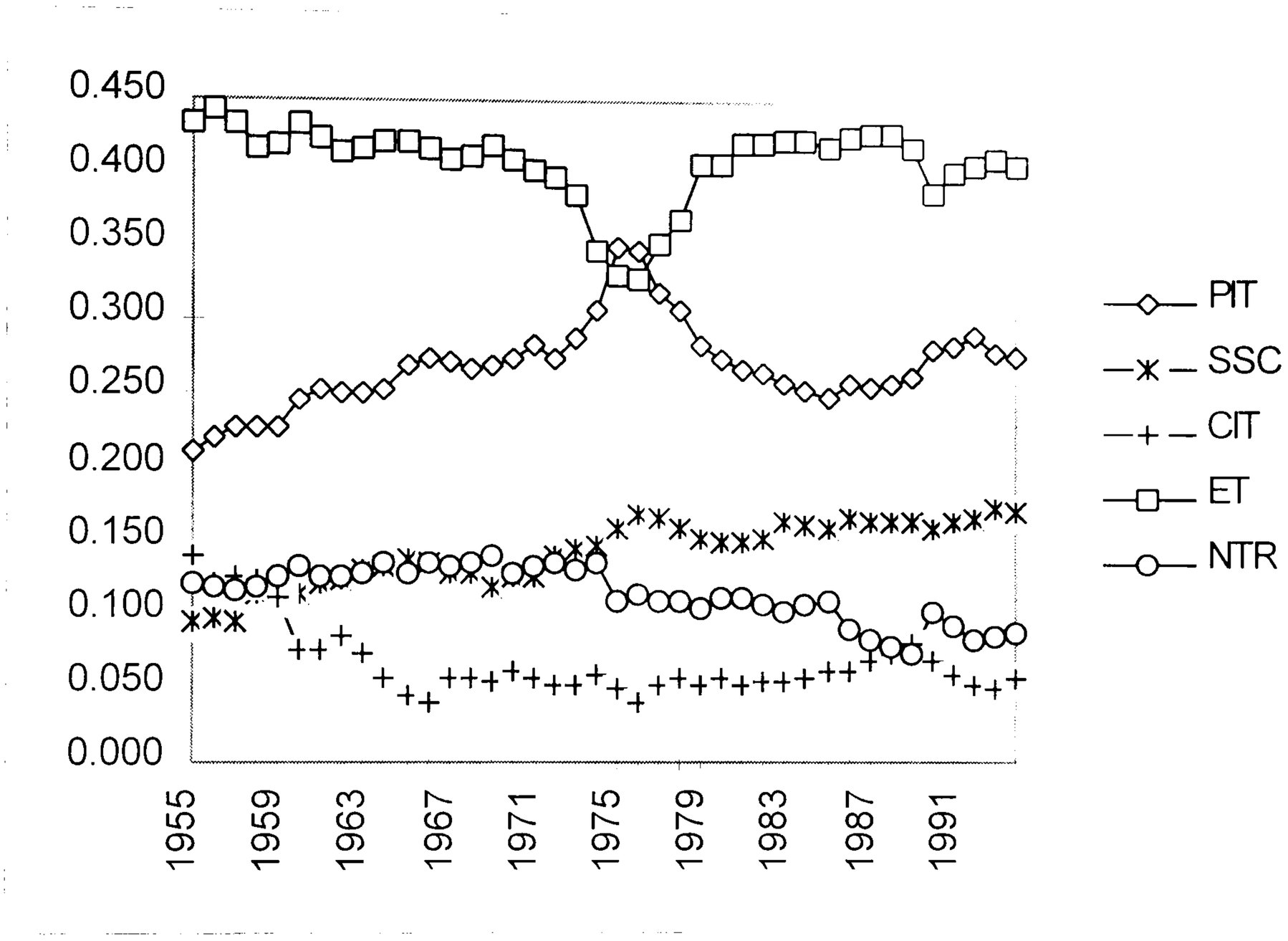

Figure 3.1 Government Revenues (as % of total revenues)

The other major revenue sources exhibit gentle trends. Social Security Contributions (SSCs, the relative visibility of which is questionable) rose from a share of about ten to over 15 per cent. Corporate income taxes, which are not paid directly by voters and therefore should be considered invisible to individuals, moved around pretty much within a 5-10 per cent band. Non-tax revenues, which are also in principle 'invisible' (from the fiscal illusion

perspective) declined slightly in importance from about twelve to eight per cent of total revenue. An examination of Figure 3.1 does not reveal an influence of fiscal illusion, in the sense that it is not clear that the share of less visible taxes rose as expenditure increased, but our empirical analysis will address the question with greater rigour.

The observation of remarkable stability in tax structure is consistent with the literature on party political influences on British taxes. Rose (1984) argued that the impact of parties on trends in the economy is minimal compared with secular forces, and that similarly, contrary to their rhetoric, parties have no partisan influences on trends in the level and composition of taxation. Karran (1985) found no evidence for a significant impact of parties on taxation: although, at least prior to Blair, Labour were perceived to be a higher tax party than the Conservatives, the evidence was that taxes tended to rise and the composition remained stable irrespective of which party was in power. Morrissey and Steinmo (1987) argue that the impact of parties is on the distribution of the burden within taxes: Conservative governments tended to levy lower tax rates on the rich, increased nominal rates of consumption tax, and encouraged corporations to distribute their profits to shareholders: Labour governments were more likely to increase income tax rates on the rich and consumption tax rates on luxury goods, and encouraged corporations to reinvest.

If the propensity to utilise fiscal illusion is stronger among some parties than others, for example if one posited that Labour will wish to increase expenditure by more than the Conservatives would, use of data based on tax categories

rather than the distribution of the burden within tax categories may not be able to pick up some effects of fiscal illusion. However, the more general implication of the partisan influence literature is that the party in power does not affect general trends in revenue or its composition, and we do not need to test for partisan influences in our empirical work.[2]

3.3 A MODEL OF EXPENDITURE AND FISCAL ILLUSION

The demand for government-provided goods can be modelled following Borcherding and Deacon (1973) and Bergstrom and Goodman (1973):

$$G_i = a\, Y_i^{\alpha}\, P_{gi}^{\beta}\,,\ i=1,2,...,N \tag{3.1}$$

where G_i is voter-taxpayer i's consumption of government provided goods, Y_i is i's income, P_{gi} is i's tax-price paid for G_i. The coefficients α and β capture income and price elasticities of demand for government-provided goods, respectively.

The tax-price is specified as $P_{gi} = T_i\, C\, N^{\eta}$, where T_i is i's tax share, C is the unit cost of G, and N is population with the degree of publicness η. Borcherding and Deacon (1972) assume nondiscrimination in taxation and specify the tax-price as $P_{gi} = C\, N^{\eta-1}$ as all pay the same amount of tax.[3] Eliminating P_{gi} from the model, the following specification is obtained:

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[2] We did test for this, but party dummies were not significant.

[3] If the same amount of tax is paid by every voter-taxpayer, then the tax share is computed by the following formula: $T_i=(T/N)/T= N^{-1}$, where T is total tax revenue, and (T/N) is i's tax bill.

$$G_i = a\, Y_i^{\alpha}\, C^{\beta}\, N^{\beta(\eta-1)} \tag{3.2}$$

In a time-series context, if there is a productivity lag in the public sector. the implied difference between private and public sector prices should be taken into account: government expenditures must be appropriately deflated as the variables in the model are defined in real terms, and a measure of public-private price differences should be included in (3.2). Using relative prices and aggregating to express demand in terms of total expenditures:

$$G = a\, Y^{\alpha}\, P_r^{\beta}\, N^{\phi} \qquad \text{where } \phi = (\beta+1)(\eta-1)+\eta-\alpha \tag{3.3}$$

where G and Y are total government expenditures and gross domestic product, respectively, both in real terms, and P_r $(=C/P_x)$ is the relative price where P_x is price of private sector goods.[4] Obviously, the relative price measures the demand responses to a combination of the public and private sector prices. Specification (3.3) is the standard model of demand for government-provided goods used in previous empirical studies.

Such a specification adopts the theory of democratic process in which it is assumed that citizens are fully aware of the costs and benefits of government-

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[4] It should be noted that $G_i\, P_{gi}\, N^{\eta}$ $(=E)$ is nominal total government expenditures where G_i $=G/N^{\eta}$. To compute the real government expenditures (G), ideally E should be divided by the tax-price (P_{gi}). However, since the degree of publicness is not known, it is divided by the unit cost of the government-provided goods (C), and for the model to capture this, the coefficient for population is modified accordingly (see Appendix 3.1).

provided goods. However, as noted above, recent studies within the public choice field have challenged this assumption, suggesting that voter-taxpayers may not be aware of their 'true' tax-prices because of some features of tax structure. The relevant arguments in the case of central government expenditures are deficit illusion (D), the invisibility of indirect taxes (V), the complexity of the tax system (H), and the tax elasticity (L). D is typically proxied by the ratio of government revenues to government expenditures, V by the ratio of 'less visible' taxes to government revenues, H by a Herfindahl concentration index, and L by the ratio of income taxes to government revenues.

Let the perceived tax price be a function of the perception parameter (Π) and the 'true' tax-price, as $\hat{P}_{gi} = \Pi P_{gi}$, where Π is a function of D, V, H, and L as follows:

$$\Pi = D^{\pi 1} V^{\pi 2} H^{\pi 3} L^{\pi 4} \tag{3.4}$$

Replacing P_{gi} by $\hat{P}_{gi}$ in (3.1), and substituting (3.4), the model (3.3) can be written in the following logarithmic form:

$$\begin{aligned} lnG = {} & lna + \alpha\, lnY + \beta\, lnP_r + \phi\, lnN \\ & + \delta_1\, lnD + \delta_2\, lnV + \delta_3\, lnH + \delta_4\, lnL + u \end{aligned} \tag{3.5}$$

where δ_1, δ_2, δ_3, and δ_4 represent $\pi_1\beta$, $\pi_2\beta$, $\pi_3\beta$, and $\pi_4\beta$ respectively. The coefficients δ_1 and δ_3 are predicted to be negative while δ_2 and δ_4 to be positive. This is the model we estimate.

3.4 DATA AND ILLUSION MEASURES

Data for UK general government expenditure and revenue for the period of 1955-94 are used in our analysis. Government expenditure (G) in real terms is the sum of three categories: government final consumption at 1990 prices, about half of total government outlays; government gross domestic fixed capital formation, deflated by the private sector deflator for that expenditure category; and transfers, consisting of current grants and subsidies, capital transfers and debt interest, deflated by the consumer price index.[5] Gross domestic product (Y) is also at 1990 prices, while the relative price (P_r) is approximated by the ratio of the public sector deflator to the GDP deflator; the public sector deflator is computed as the weighted average of the three government expenditure deflators mentioned above.

As identified in equation (3.4), four measures are used to capture fiscal illusion. Deficit illusion (D) is captured by the ratio of revenue to expenditure: a value greater than unity implies a budget surplus, and the lower the value below unity the greater the deficit, thus the anticipated coefficient is negative. The value for D is plotted on Figure 3.2. In line with our discussion of Figure

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[5] Public sector deflators would, ideally, be used for all categories. However, general government fixed capital formation (GGFCF) data at constant prices is available from 1962, and the last category at constant prices is not available in the UK national accounts. Hence the private sector deflators for the same categories were used for the last two categories for the consistency in the data set. The deflator for the GGFCF for the period of 1962-94 was also calculated, and the correlation between the deflators for government and private sectors was found very high (0.98).

1.1, one can identify four distinct periods: 1955-1968, when the deficit tended to move around zero (i.e. D = R/E moves around unity): 1968-73, a period of turmoil; 1974-89, when the deficit was steadily reduced; and post-1989, when the deficit has increased dramatically. We acknowledge now, and will return to this in discussing results, that these movements in the deficit are more likely to reflect secular trends and macroeconomic shocks than any government intention to use the deficit as part of an illusory plan to increase spending beyond the level that would be supported by fully informed voters.

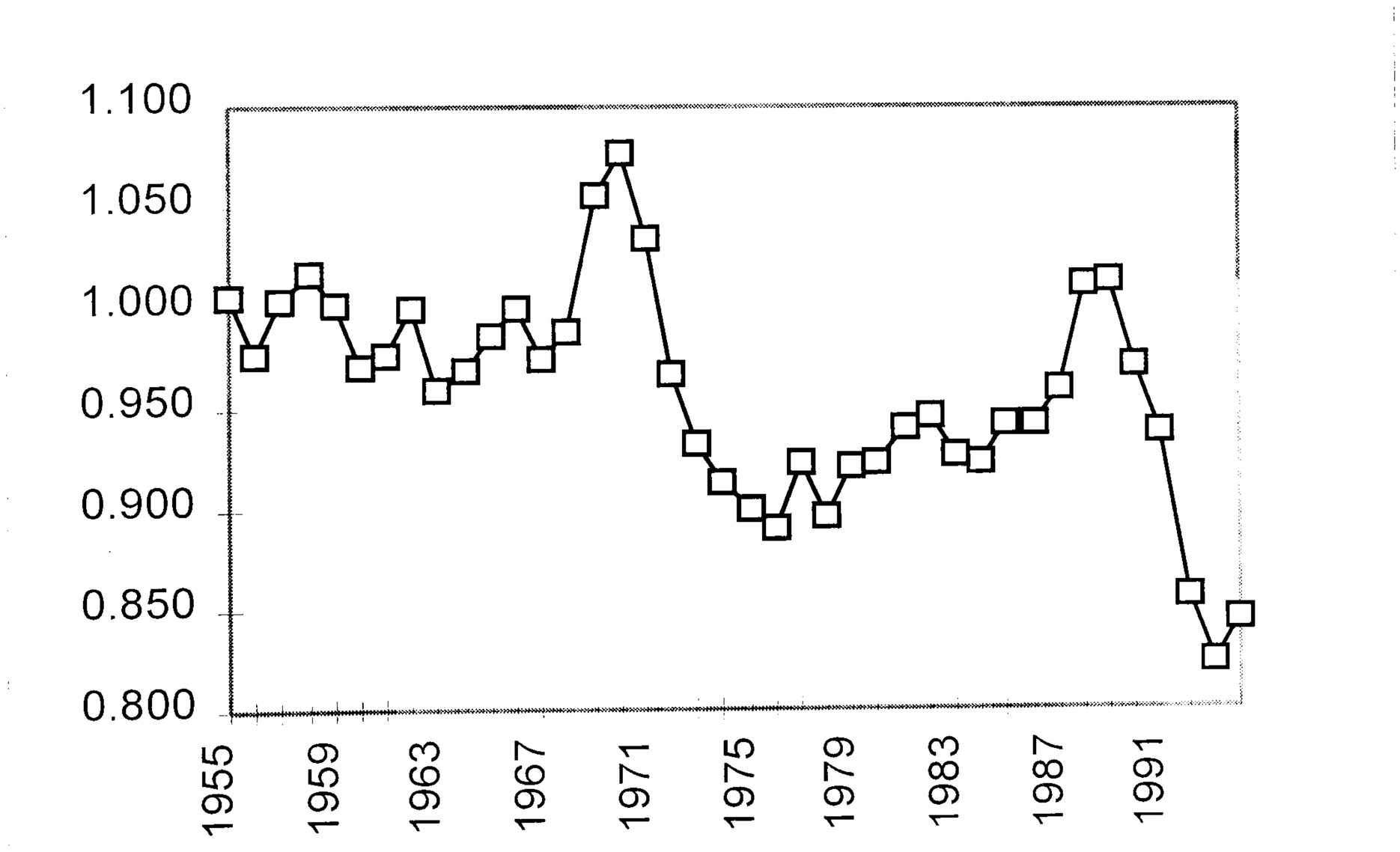

Figure 3.2 Tax Revenue/Expenditure Ratio

The second measure of fiscal illusion is the visibility of taxes. In the UK, although the standard rate of VAT is generally known, taxes on expenditure are hidden in market transactions (some goods are zero rated for VAT, and

consumers are typically unaware of how much excise duty they pay on certain goods) and can be considered relatively invisible. On the other hand, taxpayers can know what they pay in income tax, so this is relatively visible (for most employees, tax paid is printed on their pay statement: voters fill in their income tax return). The ratio of expenditure taxes to total government revenues (V) provides one measure of the invisibility of taxes. Corporate income tax and non-tax revenues are not paid directly by individuals and could therefore be considered as 'invisible' sources of revenue; similarly, it is less obvious whether taxpayers correctly perceive the amount of SSCs paid. We explicitly test for which revenue categories should be included in V.

To measure tax system elasticity we follow Oates (1975) and use the ratio of personal income taxes to total government revenues (L). It should be noted however that L will reflect more than simply the 'automatic effects' (elasticity) of the tax system. Firstly, *discretionary* changes in tax rates, thresholds etc. will also affect L; indeed Gemmell (1997a) estimates that the elasticity of income taxes has fallen since the 1960s so that the revenue share of total income taxes may be an increasingly poor proxy for tax system elasticity. Secondly, to the extent that income taxes are relatively elastic, fiscal illusion arguments suggest that an increased income tax share will be associated, *ceteris paribus*, with increased expenditures. However, to the extent that income taxes are relatively visible, fiscal illusion arguments suggest an increased share will *reduce* expenditures. Thirdly, in the UK tax system, where personal income and expenditure taxes are the dominant revenue sources, changes in the expenditure tax share, tend to mirror changes in income taxes (see Figure 3.2). Indeed, since the two are highly negatively correlated (r

= -0.86) we must be cautious about using both fiscal illusion variables in our regressions (see below).[6]

The complexity of the tax system (H) is measured by the Herfindahl concentration index: the sum of squares of the shares of various tax categories. Twelve categories of government revenues are available to compute H: (i) income tax on the personal sector, (ii) income tax on companies, (iii) income tax on non-residents, (iv) social security contributions, (v) expenditure tax on durable goods, (vi) expenditure tax on tobacco, (vii) expenditure tax on alcoholic drinks, (viii) expenditure tax on petrol&oil, (ix) expenditure tax on food, clothing, and fuel&power, (x) expenditure tax on services (vehicle excise duty and other services), (xi) other expenditure taxes (on capital formation, companies and public corporation, and overseas sector), (xii) other government revenues. In fact, we experiment with two alternative computations of H: (i) using all twelve taxes, and (ii) aggregating the various expenditure taxes into a single expenditure tax category and calculating H from the resulting five taxes.

In a time-series context, where the number of revenue categories does not change much in the period of this study, H essentially relfects the relative magnitudes of major revenue categories, and consequently is highly correlated with both V and L. When the twelve categories mentioned above are used, H reflects the trends in L (the ratio of personal income tax) and r(H, L) = 0.99. On the other hand, when the various expenditure taxes are aggregated, H primarily reflects the trends in V (the ratio of expenditure taxes) and r(H, V) = 0.65.

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6 Partly for this reason, our preferred classification of invisible taxes includes additional revenue sources yielding a lower correlation between V and L.

Thus, in a time-series context with a fixed number of taxes as in the UK, the complexity of the tax system (as measured by a Herfindahl index) cannot readily be separately identified from invisibility/elasticity aspects. We are therefore unable to explore the effects of tax complexity in our regressions analysis below. The sign predictions for our variables in equation (3.5) are:

income (Y)	positive;
population (N)	positive;
relative price (P_r)	negative;
deficit (D)	negative;
invisible taxes (V)	positive.

The coefficient on income taxes (L) is expected to be positive if 'elasticity' effects dominate, but is predicted to be negative if the measure primarily reflects the visibility of direct taxes.

3.5 EMPIRICAL RESULTS

Prior to Tridimas (1992) and Ashworth (1995) most time-series studies used OLS techniques to analyse government expenditures. However, as these techniques assume the data generating process to be stationary (which it is not), it is now known that standard diagnostic tests may fail, and the results may not be interpreted confidently. An *ad hoc* partial adjustment mechanism and a first order autoregressive structure is used by Tridimas (1992) to analyse data from the UK for the period 1955-88. Although previous empirical specifications are rejected by Tridimas' findings, it is argued by Ashworth (1995) that the *ad hoc* dynamic specifications may still be misleading. Instead, Ashworth uses cointegration techniques, and extends the period of analysis to 1991. However, the only fiscal illusion variable included in either study is the deficit illusion measure, D. We follow a similar approach to Ashworth in this

paper, extending the period under investigation further. to 1994. and exploring a range of fiscal illusion variables.

The two methods used to test for cointegration are the Engle-Granger and Johansen approaches. The former approach essentially assumes unique cointegrating vector and requires a stationarity test for a linear combination of the variables. It is argued that assuming only one cointegrating vector. when in fact there are more, leads to inefficiency in the sense that only a linear combination of these vectors can be obtained when estimating a single equation model. The drawbacks of this approach extend beyond its inability to estimate validly the long-run relationships between the variables: Even if there is only one cointegrating relationship, estimating a single equation is potentially inefficient, i.e. it does not lead to the smallest variance against alternative approaches.[7] Thus, the Johansen procedure is preferred in a multivariate system (for more details of time-series analysis, see Appendix 3.2). As mentioned in the previous section, the proxies used to capture fiscal illusions are closely related, and the Johansen procedure allows us to perform the likelihood ratio tests to identify the relative significance of those proxies.

The variables in the model developed in Section 3.3 are first tested for stationarity both in levels and first differences, as seen in Table 3.2, where all the variables were found to be I(1).[8] The next step is to test these variables for

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[7] For more discussion see Hall (1991) and Harris (1995: 62-66).

[8] The first difference of *lnN* was found to be stationary only when 12 lags were included in the regressions. For *lnD*, our earlier discussion of various deficit 'episodes' (see Figure 3.3) might suggest that *lnD* is stationary but with one or more structural breakes. However, despite investigating several candidates for such breakes (1969-71; 1988-89; 1992-94), ADF tests continue to support an I(1) conclusion for *lnD*.

cointegration; we use the Johansen procedure applied to equation (3.5), omitting ln$H$ for the reasons discussed earlier. In specifying invisible taxes, V, we noted earlier that expenditure tax (ET), corporate income tax (CIT), and non-tax revenues (NTR) may each be considered relatively invisible, and can create illusion. In the UK, SSCs could also be considered in this category. Further tests show that the CIT/Revenue ratio is stationary [ie. I(0)] so that it cannot cointegrate with I(1) variables.[9] We therefore initially include three revenue categories (expenditure tax, non-tax revenues, and SSCs) in our definition of V, examining sensitivity to the definition later.

Table 3.2 Stationarity of the Variables

Variable	**Levels (ADF)**	**number of lags**	**First Differences (ADF)**	**number of lags**
lnG	-1.14	0	-4.18***	0
lnY	-1.05	1	-4.90***	1
lnD	-2.37	1	-4.46***	0
$\ln P_r$	-2.23	3	-5.73***	1
lnN	-1.85	1	-3.42**	12
lnH	-1.50	0	-3.59***	0
lnV	-2.20	1	-4.02***	0
lnL	-2.33	1	-4.14***	0
lnR	-1.73	1	-3.81***	1

The critical values are -2.93 at 5%, and -3.58 at 1% level, quoted as ** and *** respectively. All the tests were also run including the time trend, however, none of the variables was found trend stationary.

Notwithstanding the fairly high negative correlation between ln$L$ and ln$V$ noted earlier, we begin by including both variables in our search for a cointegrating vector, and also excluding each in turn. The trace and maximum eigenvalue statistics, using maximum likelihood estimation, are reported in Table 3.3. The

[9] The ADF statistics for *ln(CIT/R)* and *ln(SSC/R)* are -3.14 and -2.18 respectively.

null hypothesis of "no cointegration" is rejected in all cases, suggesting that there exists at least one cointegrating vector.

Table 3.3 Cointegration tests by Johansen Approach

Rank=r	**λ_{max}**	**λ_{max} (T-nm)**	**CV(5%)**	**λ_{trace}**	**λ_{trace} (T-nm)**	**CV(5%)**
Variables in the Model: *lnG, lnY, lnP$_r$, lnN,lnD,lnV,lnL.*						
r=0	73.3	60.1	45.3	166.5	136.6	124.2
r<=1	39.8	32.7	39.4	93.25	76.5	94.2
r<=2	24.4	20.0	33.5	53.5	43.9	68.5
Variables in the Model: *lnG, lnY, lnP$_r$, lnN,lnD,lnL.*						
r=0	62.6	53.0	39.4	123.6	104.6	94.2
r<=1	32.3	27.3	33.5	61.0	51.6	68.5
r<=2	17.04	14.4	27.1	28.7	24.3	47.2
Variables in the Model: *lnG, lnY, lnP$_r$, lnN,lnD,lnV.*						
r=0	71.42	60.43	39.4	139.4	118.0	94.2
r<=1	34.96	29.58	33.5	67.98	57.52	68.5
r<=2	18.73	15.85	27.1	33.02	27.94	47.2
Variables in the Model: *lnE, lnY, lnP$_r$, lnN,lnD,ln(ET/R),ln(SSC/R),ln(NTR/R).*						
r=0	74.26	59.03	51.4	202.4	160.9	156.0
r<=1	44.02	34.99	45.3	128.2	101.9	124.2
r<=2	36.69	29.17	39.4	84.13	66.88	94.2

** Significant at 1%, * Significant at 5%. CV: critical values. λ_{max} is the maximal eigenvalue statistic, λ_{trace} is the trace statistic. The (T-nm) version is the corrected statistic for the small samples suggested by Reimers (1992). The critical values are from Osterwald-Lenum (1992). The restricted constant is rejected in all cases. The Regressions include one lag (see Hall, 1991).

On the question of whether ln*L* and/or ln*V* should be included in the cointegrating vector, when both are included coefficient estimates of 2.35 and 0.36 are obtained respectively suggesting, plausibly, that there are strong 'invisibility' effects from expenditure taxes. When *lnV* is omitted from the cointegrating vector the parameter on *lnL* becomes -0.47, suggesting that 'visibility' effects from direct taxes dominates any 'elasticity' effects. When only *lnL* is included in cointegrating regressions however, other parameters are

often wrongly signed (population becomes negative or relative prices become positive). This is not the case for *lnV*. To test more formally for the inclusion of *lnV* and *lnL* in the cointegrating relationship, we conducted the Likelihood Ratio tests suggested by Johansen and Juselius (1992). testing the null hypothesis: $\delta_i = 0$ (i = 2,4) in equation (3.5). These strongly supported the inclusion of *lnV* in the regression but the *exclusion* of *lnL*.[10] We therefore prefer the vector excluding ln*L*. Further analysis supports the null hypothesis of a "unique cointegrating vector" from both trace and maximum eigenvalue statistics.[11] The preferred cointegrating regression is:[12]

$$lnG = 0.81\ lnY - 0.58\ lnP_r + 1.65\ lnN - 0.44\ lnD + 1.67\ lnV$$

The positive signs on the coefficients for income and population, are in line with the previous findings of Diamond (1989), Tridimas (1992), and Ashworth (1995), though direct comparison can be made only with Ashworth (1995) who uses a similar method. The income coefficient here is somewhat lower than obtained by Ashworth (who obtains values of 0.89 and 0.97 in alternative specifications) though, like Ashworth (1995), a likelihood ratio test suggests that we cannot reject the null hypothesis that the coefficient on income equals

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[10] LR-ratios (probabilities) of 1.26 (0.26) and 34.04 (0.00) were obtained for *lnL* and *lnV* respectively.

[11] There is some weak evidence from the maximal eigenvalue test that there are two cointegrating vectors in the VAR model. However, this is rejected by other diagnostics; the null hypothesis of a 'unique cointegrating vector' is accepted by the LR-test (= 0.28; CV[10, 5%]=18.3). Furthermore, Reimers (1992) suggests that in case of small samples, the Johansen procedure over-rejects when the null is true. Thus, the number of parameters to be estimated in the model are also taken into account, and an adjustment is made for degrees of freedom by replacing T by $T\text{-}nm$, where n is the number of variables in the model and m is the number of lags in the model. A unique cointegrating vector is accepted by the modified statistics (see Table 3.3).

[12] The vector has been normalised on *lnG*, and the weak exogeneity is rejected by LR-test (LR= 20.66, prob.= 0.0009).

unity. Nevertheless, since government expenditures appear to increase proportionately (or less than proportionately) with national income the simple Wagner's Law hypothesis is clearly rejected.[13]

Regarding the degree of publicness, η, this must be extracted from ϕ in equation (3.5) using the expression $[(\beta+1)(\eta-1)+\eta-\alpha]$ from equation (3.3). This yields $\eta = 2.03$ which is outside the expected range between zero and unity. Nevertheless, similarly large values have been found in previous studies (see Gemmell, 1990; Ashworth, 1995) and the results here tend to support the evidence of previous studies that, overall, government-provided goods are highly 'private' in nature.[14]

The effect of relative prices is found to be negative and *price-inelastic* demand for government-provided goods is supported. The negative sign confirms both Diamond and Ashworth's findings, while Tridimas found a positive sign. It is well known that the relative price of government-provided goods demonstrates a secular upward trend over time in the UK (as in many other countries), whether due to 'real' or purely statistical reasons. The evidence here would appear to suggest that, *ceteris paribus*, this has had a reductive effect on public expenditure presumably because resistance from voters against rising (nominal) public expenditures forces governments to respond with compensating reductions in real government output, in order to minimise these expenditure increases.

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[13] The restriction imposed on the β matrix is rejected at 1% level (LR-Test = 35.1, CV(10, 5%)=18.3).

[14] Since η is determined by a combination of the coefficients on P_r and N, both of which show some evidence of non-robustness across specifications, the calculated value of η probably has a large associated standard error.

The negative effect of the tax ratio, *D*, is also in line with previous findings. and appears to support the public choice argument for deficit illusion: over the long-run there is a higher demand for government expenditures when a lower proportion is financed by taxes. This is consistent with the argument that voter-taxpayers do not fully perceive their future tax liabilities, posing a challenge to Ricardian Equivalence.

The proxy for (in)visibility, *lnV*, has the predicted positive sign, being consistent with the fiscal illusion hypothesis that voter-taxpayers demand more government expenditure when tax structure shifts towards a higher share of indirect taxes (plus other less visible taxes). Investigating the relative roles of the components of *lnV* suggests that it is expenditure taxes which have the strongest revenue effects. The cointegrating vector with the three separate revenue components is (diagnostics are reported in Table 3.3):

$$lnG = 0.72\ lnY - 0.59\ lnP_r + 1.70\ lnN - 0.44\ lnD + 0.98\ ln(ET/R) + 0.43\ ln(SSC/R) + 0.23\ ln(NTR/R)$$

The long-run impact on expenditures of switching tax structure towards expenditure taxes (and implicitly away from direct taxes) appears to be more than twice the effect of increasing social security contributions and roughly four times the effect of increasing non-tax revenues. That is, in public choice terminology, expenditure taxes are particularly 'invisible' and appear to be able to support 'excess' expenditure.

Oates (1975) and Baker (1983) have argued that the structure of the tax system may be endogenous and public officials (politicians, bureaucrats) may prefer a higher level of government spending, and so design a complex tax system or focus on those 'less visible' and 'elastic' taxes in order to obtain more revenues with less public reaction. Whatever the direction of causality it seems that in the UK case, governments relying more on indirect taxes than direct taxes have, other things equal, been able to sustain higher government expenditures. Notice also that this is not merely an association of a rising indirect tax share over time with rising expenditures; despite the introduction of VAT in mid-1970s, the share of indirect taxes has *not* been increasing over our period of investigation (the introduction of VAT appeared to halt a prior long-term *decline* in the expenditure tax share).

Though it can be argued that switches to invisible (ie. indirect) taxes have permitted increased expenditures (compared to what they otherwise would have been), this should not be interpreted as indicating substantial scope for additional government spending by further moves towards indirect taxation. Clearly the *marginal* expenditure impact of raising V above its current share of around 43 per cent could be substantially less and could be expected to fall further as V approaches its limit of unity

We would not be equally confident to interpret lnD as support for fiscal illusion. This could probably be explained by the determination of expenditures and revenues simultaneously, and is consistent with the observation that a shock leads to an increase in the deficit as revenue cannot quickly be increased while expenditure is not easily reduced quickly. Of

course, as noted earlier, higher levels of expenditures, if not matched by revenue adjustments in the current period, imply a lower tax ratio ($D = R/G$) which may appear as an inverse (contemporaneous) relationship between expenditures and tax ratio (due to a direct 'accounting' effect, as distinct from an 'economic' or 'fiscal illusion' effect, on the budget deficit). Governments do utilise budget deficits, and this may imply a lower political risk, but usually in response to a shock which increases expenditure (or suddenly reduces revenue).

In testing for fiscal illusion using equation (3.5) in a time series context, we have required that adjustments in tax or deficit variables *precede* adjustments to government expenditures, as a necessary condition for those to be regarded as capturing fiscal illusion effects.[15] It could be argued of course that governments which are aware that it is easier to increase expenditures when the financing can be 'hidden' in deficits or indirect taxes, are not bound by such temporal precedence. Thus governments may increase expenditures today, knowing that a combination of increased deficits and/or increased use of indirect taxes in the future can finance this. That is, if voters are relatively unaware of increases in deficits and indirect taxes they are also likely to be unable to associate these with expenditure increases in *particular* years. While this argument would allow us to interpret the deficit-expenditure interactions as *consistent with* the fiscal illusion hypothesis, it is also the case that the evidence is consistent with governments using deficits in a standard 'consumption smoothing' manner analogous to a private individual with no

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[15] In fact, the weak exogeneity for both *lnD* and *lnV* is accepted by LR-test (the LR ratios and probabilities are 9.57 [0.088] and 5.087 [0.405], respectively).

money illusion but volatile income levels. Since the present approach cannot discriminate between these alternative hypotheses, we are reluctant to interpret our results (on deficits) as evidence of fiscal illusion.

Finally, we noted earlier that some commentators have argued that the political party in government may influence expenditure levels. We have investigated this by adding dummies to equation (3.5) for periods of Conservative and Labour governments. Consistent with the arguments and evidence of Morrissey and Steinmo (1987), we find no support for the view that, *ceteris paribus*, expenditure levels differ between party political regimes.[16]

3.6 CONCLUSIONS

This chapter approached an explanation trends in British government expenditure utilising public choice theories that the level of government spending should reflect voter-taxpayer's demand for public goods. Such theories argue that certain features of the tax structure affect voter's perceptions of their tax burden so that they underestimate how much they are paying for public goods; such fiscal illusion implies that actual expenditure will be greater than predicted by a simple voter demand model. Previous public choice based studies of the demand for public expenditure have found mixed evidence for the impact of fiscal illusion, though none use the range of specifications of illusion variables employed here.

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16 When a dummy for Labour governments is included in the cointegrating regression, a coefficient of 0.02 is obtained, and the Likelihood Ratio test rejects the inclusion of the dummy (LR-test= 0.37; prob.= 0.54). The coefficient on the first difference of the dummy appears to be 0.001 in ECM (and insignificant).

To test these theories we add fiscal illusion variables to a model of the demand for public goods using UK data for the period of 1955-94. The included sources of fiscal illusion are: the visibility of taxes; the extent of deficit finance; revenue complexity; and tax elasticity. The greater the share of 'less visible' taxes in tax revenue, and of deficit finance relative to spending, the greater the likelihood that taxpayers underestimate the tax-price and vote for higher levels of government expenditure. A more complex tax system will make it more difficult for voter-taxpayers to identify their true tax burden hence increases the likelihood of underestimating the tax-price of government-provided goods. The more elastic the tax system the more responsive is revenue to growth in national income, hence it is easier to sustain a higher volume of public spending (if income is growing) without generating public reaction.

The results obtained are consistent with comparable studies of public expenditure. Our innovation was in a more complete specification of sources of fiscal illusion. We found quite consistent evidence that invisible taxes and deficit financing were associated with increased levels of spending, but for various reasons the measures of elasticity and complexity performed less well (largely because they were highly correlated with the measure of visibility). Closer examination suggests that deficit financing is less an illusory plan to hide expenditure increases from voters and more a short-term necessity when shocks cause (trends in) spending and revenue to diverge. The support for illusion due to invisible taxes is stronger. We found some evidence that governments relying more on indirect taxes than direct taxes have, other things equal, been able to sustain higher government expenditures. This is consistent

with the fiscal illusion hypothesis that where public officials prefer a higher level of government spending they can focus on less visible taxes in order to obtain more revenues with less public reaction. We would not, however, argue that this necessarily offers a means to increase future expenditure beyond the levels supported by voter-taxpayers. The current indirect tax share is at the upper end of the historical range of observed values and it remains unclear whether still higher rates of indirect tax would allow these taxes to remain relatively 'invisible'. Our evidence would suggest however, that future governments pursuing a policy of switching the mix of taxes *away from* indirect taxes may find it more difficult (over the long-run) to sustain political support for a given *aggregate* level of tax revenues and expenditures.

CHAPTER 4

FISCAL ILLUSION AND THE DEMAND FOR LOCAL PUBLIC SPENDING IN ENGLAND AND WALES: A CROSS-SECTION ANALYSIS

4.1 INTRODUCTION

A distinguishing feature of British local government finance over the past ten years or so has been the series of major changes to the form of local tax. A domestic property tax was replaced in April 1990 by an essentially flat rate Poll Tax (the Community Charge) which in turn was replaced by a mildly progressive tax based on property value bands (the Council Tax). These 'experiments' proved fruitful for testing Public Choice theories. Cullis *et al* (1993a) argued that while the introduction of the Poll Tax was presented as a measure to reduce fiscal illusion and thereby increase local accountability, a careful analysis of the equity and efficiency implications of the Poll Tax combined with the mechanism of allocating Central Grants suggests that fiscal illusion persists. In fact, Cullis *et al* (1991) argue that if median voters have imperfect knowledge of how grants and local taxes interact, public perceptions of the Poll Tax would induce increased fiscal illusion. In neither paper, however, did they explicitly test for fiscal illusion. In this paper we use a median voter model and test for the existence of fiscal illusion under the Community Charge regime.

The Community Charge generated considerable voter opposition, largely because it was seen as an affront to equity. This is detailed in Cullis *et al*

(1993a), who use a model of central government rent-seeking to provide an explanation of why the Conservative Government chose to implement such a reform, and combine this with a politico-economic model of voter behaviour to offer an explanation of why the reform failed and why opposition was so great as to induce a policy 'U-Turn' with the introduction of the Council Tax. This is consistent with the cogent argument of Hudson and Jones (1994) that the revealed preferences of voters will display some altruism, ie. there are 'ethical voters' who will place the public interest before self-interest, hence the opposition to a tax perceived as inequitable. The Council Tax has not attracted strong public opposition, perhaps because it embodies some equity. But commentators have not investigated the implications for the (stated) desire for local accountability: fiscal illusion erodes accountability as it implies tax burdens are misperceived, and we test for fiscal illusion in a median voter model of the Council Tax regime. Though accountability is difficult to measure, if the degree of illusion is greater under the Council tax, accountability is probably lessened (see also Barnett and Knox, 1992); we also however attempt to incorporate a more direct measure of accountability.

A source of fiscal illusion commonly proposed in local finance of relevance to the British case is renter illusion. If the local tax is property based then it has been argued that only those who pay it are likely to correctly perceive the local tax-price, so renters may feel they do not pay the full tax price and therefore vote for higher expenditures (Goetz, 1977). Such an argument was made to justify the introduction of the Community Charge: only the heads of owner-occupied households were liable for property rates, hence more than half of voters were not liable. Cullis *et al* (1993b) reject this claim on the basis that the

tax will be perceived as a household tax (thus concerning members other than the head) and is built into rents (which the landlord must pay). In their study of Belgium, Heyndels and Smolders (1994) found no evidence of renter illusion, although evidence has been found for the US (Bergstrom and Goodman, 1973). We test for the possibility of renter illusion under both the Community Charge and the Council Tax regimes, by including the ratio of renters to local population as an explanatory variable. If, as we suspect, both types of local taxes are paid by dwellers, no matter whether they are homeowners or renters, this variable should not be significant. However, the difference in the tax base of the two local tax regimes may produce different outcomes.

A potential source of illusion that has attracted a certain amount of interest is the 'flypaper effect' which hypothesises that central grants 'stick where they hit'. If the median voter (correctly) perceives a grant as equivalent to an increase in the voter's income, the effect of the grant should be the same as that of an increase in income - the 'equivalence theorem' (Bradford and Oates, 1971). However, much empirical evidence suggests that the effect of grants on spending is much greater than that of income - the flypaper effect (Barnett, 1993; Oates, 1979). While evidence supports this flypaper effect in British local government, interpretations differ: Barnett *et al* (1991) demonstrate that the effect can be observed even if voters correctly perceive the budget constraint, whereas Cullis *et al* (1991, 1993a) argue that the effect arises because voters misperceive the budget constraint. Testing these interpretations directly is best achieved by using survey evidence, which is beyond the scope of this study. However, our findings are generally in line with Preston and Ridge (1995), who use survey data.

In outline, the remainder of this chapter is structured as follows. A brief theoretical background of the recent public choice studies of local spending will be discussed in Section 4.2. Section 4.3 presents our public choice model of the demand for locally provided goods and services, which incorporates representations for a number of possible sources of fiscal illusion. Section 4.4 then presents our data for 54 local authorities in England and Wales, covering the fiscal years 1991/92 (when the Community Charge was in place) and 1993/94 (when the Council Tax had been introduced). The empirical results are set out in Section 4.5, and Section 4.6 provides a summary with concluding comments.

4.2 LOCAL PUBLIC SPENDING AND FISCAL ILLUSION

Recent public choice approaches to local government finance have emphasised that the combination of local taxes and central grants is likely to give rise to voter misperceptions of the tax-price of local public goods (Goetz, 1977). This fiscal illusion causes voter-taxpayers to underestimate the tax-price and vote for higher levels of government expenditures (Oates, 1988, provides a review). This has spawned numerous empirical studies of fiscal illusion and the demand for locally provided public goods (an extensive review is provided by Dollery and Worthington, 1996). The early studies applied standard demand theory with voter-taxpayers assumed to maximise utility from private and (local) public goods subject to a budget constraint (Borcherding and Deacon, 1972; Bergstrom and Goodman, 1973).

The majority of studies take the decisive voter as being the voter with median income (see Holcombe, 1989). While a number of authors have compared results using mean and median income (Inman, 1978; Pommerehene and Frey, 1976; Turnbull and Djoundourian, 1994), these studies did not specifically relate to fiscal illusion. In an attempt to assess which is the more appropriate to represent the decisive voter, we compare results based on both median and mean income.

Thus far empirical studies of fiscal illusion effects on the demand for local government-provided goods have yielded mixed results. The flypaper effect has generally had strong empirical support in median voter models (see, for instance; Nelson, 1986; Grossman, 1990; Turnbull and Djoundourian, 1994; Heyndels and Smolders, 1994), while the evidence for renter illusion has been weaker. Renter illusion was first modeled by Bergstrom and Goodman (1973), and a negative and significant effect was found between the percentage of owner occupied households and the level of local government expenditures. On the other hand, studies which find no significant impact of renter illusion include Heyndels and Smolders (1994).[1]

4.3 MODELLING FISCAL ILLUSION IN LOCAL LEVEL

Following standard practice, the voter-taxpayer *i*'s demand for local government provided goods is hypothesised to depend on *i*'s income, *i*'s tax-price, and a vector of local taste variables as follows:

$$G_i = a\, Y_i^{\alpha}\, P_{gi}^{\beta}\, Z^{\lambda},\ i=1,2,\ldots,N \qquad (4.1)$$

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[1] More details can be found in Chapter 2.

where G_i is i's consumption of government-provided goods, Y_i is i's disposable income, P_{gi} is i's (true) tax-price for G_i, and Z is a vector of taste variables. The price of private goods is assumed to be similar across localities and is normalised at unity. Multiplying both sides by P_{gi}, the following specification is obtained:

$$E_i = a\, Y_i^{\alpha}\, P_{gi}^{\beta+1}\, Z^{\lambda} \tag{4.2}$$

where E_i ($=P_{gi}\, G_i$) is i's demand for local government expenditures.

The tax-price is defined by Borcherding and Deacon (1972) and Bergstrom and Goodman (1973) as '$P_{gi} = T_i\, C\, N^{\eta}$', where T_i is i's tax share, C is the unit cost of G, and N is population with the degree of publicness measured by η. Substituting for P_{gi} in (4.2), yields:

$$E_i = a\, Y_i^{\alpha}\, (T_i C)^{\beta+1}\, N^{\eta(\beta+1)}\, Z^{\lambda} \tag{4.3}$$

An important issue is the measurement of the tax-price. Due to an absence of data on C, Bergstrom and Goodman (1973) were forced to assume that the ratio of prices of public to private goods differs little between local governments. Thus, implicitly C=1, and the tax-price becomes

$$P_{gi} = T_i\, N^{\eta}$$

They then compute the tax bill on the house of median value. This is divided by total property tax revenue for the municipality to produce an estimate of the share of the real property taxes paid by the consumer with median income, T_i.[2]

Such a specification adopts the theory of democratic process in which it is assumed that citizens are fully aware of the costs and benefits of government-provided goods. However, as noted above, recent studies within the public choice field have challenged this assumption, suggesting that voter-taxpayers may not be aware of their 'true' tax-prices because of some features of local finance. Thus, if voter-taxpayers are subject to fiscal illusion due to some characteristics of the local taxation, their demand for local public spending will depend on the perceived tax-price rather than the "true" tax price. The perceived tax-price may be defined as $\hat{P}_{gi} = \Pi_i P_{gi}$, where Π_i is a 'perception parameter' for individual i, which is hypothesised to be a function of the local fiscal structure. In this paper, three relevant features are considered: the flypaper effect, renter illusion, and local accountability. Let Π_i be a function of those features as follows:[3]

$$\Pi_i = (FLY)_i^{\pi 1} (REN)^{\pi 2} (ACN)^{\pi 3} \qquad (4.4)$$

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[2] The case of the UK will be discussed in the next section. It is also assumed that the consumer with the median income pays the same share of other municipal revenues as s/he does of the property tax. This is purely an assumption of convenience which should be modified wherever better information is available.

[3] Other fiscal illusion arguments, such as tax elasticity, tax complexity and the invisibility of indirect taxes are not included here because they are irrelevant in the case of local governments in the UK.

where FLY_i is the per capita central grants, *REN* is the ratio of renters to the local population, and *ACN* is the ratio of local non-taxpaying adults to local taxpayers. These three variables are proxies for the flypaper effect, renter illusion, and local accountability, respectively. Substituting the perceived tax-price ($\hat{P}_{gi}$) for the tax-price (P_{gi}) in equation (4.2), the model to be estimated becomes:

$$lnE_i = lna + \alpha\, lnY_i + (\beta+1)\, ln(T_iC) + \eta(\beta+1)\, lnN$$
$$+\delta_1\, lnFLY_i + \delta_2\, lnREN + \delta_3\, lnACN + \sum\lambda Z + u \qquad (4.5)$$

where $\delta_1 = \pi_1(\beta+1)$, $\delta_2 = \pi_2(\beta+1)$, and $\delta_3 = \pi_3(\beta+1)$.

The sign predictions for our variables are as follows: Income per capita (Y_i) is expected to have a positive effect on the demand for local public spending, while a combination of the coefficients for tax share (T_i) and population (N) will provide some measure of the degree of publicness. FLY_i, *REN*, and *ACN* are expected to have positive effects if the alleged fiscal illusions operate. Furthermore, a coefficient on FLY_i greater than that on Y_i is expected if the flypaper effect exists.[4]

4.4 DATA AND MEASURES FOR FISCAL ILLUSION

The data for the local governments used in this paper are for England and Wales in 1991/92 and 1993/94. Relevant data are available for 39 non-

[4] If the equivalence theorem is true, as explained in Section 4.2, we would expect to obtain equal coefficients on both variables, meaning that the receipt of an additional £ of central grant by a local authority is analogous, in expenditure effects, to the receipt of an additional £ by the median income earner.

metropolitan counties and 7 metropolitan counties in England, and 8 non-metropolitan counties in Wales.[5]

Table 4.1 The Local Government Expenditures and Personal Income

(£, per capita)	Local Expenditures		Mean Income		Median Income	
	1991/92	1993/94	1991/92	1993/94	1991/92	1993/94
Full Sample	602.5	667.2	13,260	13,796	10,417	10,813
England (Non-metr.)	560.8	622.6	13,644	14,100	10.670	10,960
Wales (Non-metr.)	701.3	711.6	11,728	12,563	9,290	10,133
Metropolitan Counties	722.2	865.0	12,871	13,514	10,294	10,770

Local government expenditures (LGE) per capita are computed by dividing the total local government expenditures by local population. Table 4.1 shows that the mean of the per capita local government expenditures in all counties is about £602 in 1991/92. Greater London is the (metropolitan) county with the highest per capita LGE at about £975, while Dorset has the lowest per capita LGE at about £557. The figures exhibit a similar pattern in 1993/94. Metropolitan counties have substantially higher LGEs on average than all counties in England and Wales as a whole. As expected, the county average for median income is lower than the county average for mean income both in 1991/92 and in 1993/94. There is a substantial range of mean (and median)

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[5] *The metropolitan counties in England* are Greater London, Greater Manchester, Merseyside, South Yorkshire, Tyne and Wear, West Midlands, and West Yorkshire; *the non-metropolitan counties in England* are Avon, Bedfordshire, Berkshire, Buckinghamshire, Cambridgeshire, Cheshire, Cleveland, Cornwall, Cumbria, Derbyshire, Devon, Dorset, Durham, East Sussex, Essex, Gloucestershire, Hampshire, Hereford & Worcester, Hertfordshire, Humberside, Isle of Wight, Kent, Lancashire, Leicestershire, Lincolnshire, Norfolk, Northamptonshire, Northumberland, North Yorkshire, Nottinghamshire, Oxfordshire, Shropshire, Somerset, Staffordshire, Suffolk, Surrey, Warwickshire, West Sussex, Wiltshire; *the non-metropolitan counties in Wales* are Clwyd, Dyfed, Gwent, Gwynedd, Mid Glamorgan, Powys, South Glamorgan, West Glamorgan.

income values across local authorities, the highest mean income in 1991/92 for example being Surrey with £18,700, and the lowest Dyfed with £9,920.

Table 4.2 The Local Government Revenues in England and Wales

(£ million)	Full Sample		England (Non-metrop.)		Wales (Non-metrop.)		Metropolitan Counties	
	1991/92	1993/94	1991/92	1993/94	1991/92	1993/94	1991/92	1993/94
Total Expenditures[1]	605.2	684.1	432.5	482.8	251.5	255.7	1971.4	2294.9
CC (CT)[2]	164.7 (0.27)	171.0 (0.25)	139.7 (0.32)	142.1 (0.29)	31.5 (0.13)	38.6 (0.15)	456.4 (0.23)	483.5 (0.21)
NDR	239.5 (0.40)	198.3 (0.30)	200.0 (0.46)	158.5 (0.33)	65.6 (0.26)	47.8 (0.19)	658.1 (0.33)	592.7 (0.26)
RSG	201.0 (0.33)	314.7 (0.46)	92.8 (0.21)	182.3 (0.38)	154.4 (0.61)	169.3 (0.66)	857.0 (0.43)	1218.7 (0.53)

CC:Community charge, CT:Council tax, NDR:Non-domestic rates, RSG:Revenue support grants.
[1] These are the expenditures met by local tax, non-domestic rates, and revenue support grant.
[2] The figures in parentheses are the ratio of each category of revenues to total expenditures.

The three major categories of local government revenues in the UK are local taxes (community charge (CC) in 1991/92 and council tax (CT) in 1993/94), non-domestic rates (NDR), and revenue support grants (RSG). As seen in Table 4.2, about 27% of local government expenditure was financed through the CC in 1991/92, while the CT ratio was about 25% in 1993/94. The ratio of NDR is around 40% in 1991/92, and there is a substantial decrease in 1993/94 to 30%. Conversely about 33% of local government expenditure was financed by the RSG in 1991/92, and this ratio had increased to around 46% in 1993/94.

In English non-metropolitan counties, the highest proportion of local government expenditures is financed by NDR in 1991/92. The CC is the

second largest, while RSG provides the lowest share. On the other hand, in Wales the highest proportion of the local government expenditures is financed by RSG followed by NDR and CC. The relative shares of the three categories of local government revenues remain roughly the same in 1993/94 for Wales, while the RSG becomes more important in England.

For voter-taxpayers, the only local tax is the community charge in 1991/92 and the council tax in 1993/94. The former is a flat rate tax on all adults with a few exemptions and reductions, and the latter is a tax on households (also with some reductions). The 1991/92 mean tax share (for the community charge) is computed by dividing the average (per person) CC by total CC revenues as follows:

$$T_{i,\ poll\ tax} = (TCC/NLTP) / TCC = 1/ NLTP$$

where *TCC* is total community charge revenues, and *NLTP* is the number of taxpayers. This is also used for the median voter-taxpayer since it seems reasonable to assume similar mean and median tax shares for a tax levied at a common per-adult rate.

The computation of the mean and the median tax shares in the case of the council tax (CT) is not so straightforward. Firstly the CT is levied on households rather than individuals, and secondly the level of council tax paid by a household depends on the CT 'band' to which a property is allocated (depending on its estimated market value). The CT bill for the households therefore has to be modified to obtain the individual tax shares which must take

into account the composition of households. Assuming that the council tax bill is equally shared by each adult within a household, the 1993/94 mean tax share (for the council tax) is computed by dividing the average (per person) CT by total CT revenues (that is, similar to the CC case).

A similar complication exists for the median individual council tax share. The median individual in terms of council tax payments may not be the same as the individual who lives in a household with a median council tax band. A comparison of the number of adults per household (from census 1991) shows that the individual with median tax share is the one who lives in a household with two adults. Therefore, the median individual tax share is computed by dividing the average council tax bill per household by two, and then dividing by total council tax revenue in each county as follows:

$$T_{i,\ council\ tax} = (TCT/NDH/2)/TCT \approx 1/NDH$$

where *TCT* is total council tax revenues, and *NDH* is the number of households. That is statistically equivalent to the ratio of the average CT per household to total CT revenue.[6]

As noted earlier, the variable *C* measures the unit cost of local publicly-provided goods relative to the prices of private sector goods. While the latter probably do not vary substantially across localities in Britain. differences in local public sector wage rates could create substantial differences in local

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[6] Despite these differences, the computed mean and median tax shares are highly correlated (around 0.97). A similar pattern also emerges when council tax per household is used instead of per adult. Using any of these proxies produced similar regression outcomes below.

public sector marginal costs. Data on local public sector wages specifically are not available, but employment income (for public and private sectors combined) by local authority are available. We use these data to proxy local differences in public sector marginal costs.

To compute a C index for our purposes, the employment income in each county is divided by the average for all counties. If the employment income is around the average of all the counties, the index is close to unity, and there is a negligible effect on the tax-price. However, if the employment income in a county is significantly below (above) the average, the index will be significantly lower (higher) than unity, and the tax-price will similarly be lower (higher). The tax-price measure which we use is therefore a function of the individuals' tax share, the unit cost of local government-provided goods, and population, such that:

$$P_{gi} = [(R_i / R] \, C \, N^{\eta}$$

where R_i is individual i's community charge (or council tax) bill, and R is total receipts from the community charge (or council tax).

The two major components of central grants are Revenue Support Grants (RSG) and non-domestic rates (NDR). The former is a proportion of standard spending assesment (SSA) determined by the Consultative Committee on Local Government Finance in annual meetings, and the latter. also known as the "uniform business rate", is collected from local business. placed in a national NDR pool. and are distributed in a similar way to the RSG. Both

forms of grants can be treated as lump-sum unconditional grants.[7] Therefore, FLY_i is computed as follows:

$$FLY_i = (RSG+NDR)/N$$

The data from the 1991 census are used to compute the proxy for renter illusion (*REN*). Around 30% of local population, on average, live in rented houses, with the percentage substantially higher in metropolitan counties (around 39%). The following formula is used to compute the proxy for local accountability (*ACN*):

$$ACN = (NOA - NLTP)/NLTP$$

where *NOA* is the number of adults, and *NLTP* is the number of local taxpayers. The ratio is only around 0.03 on average in 1991/93, because, there are only few exemptions under the community charge.[8] For the 1993/94, an additional proxy was calculated as:

$$ACNH = (NOA - NDH)/NDH$$

where *NDH* is the number of households. The intuition behind this proxy is the argument that the council tax is paid by the head of the household and only one

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[7] Many of the specific grants have been replaced by lump-sum grants in the UK, except some payments such as mandatory student awards, rent allowance, and some other services such as in-service teacher training, education support, urban development, mental illness, alcohol and drug abuse etc. These are mainly non-discretionary and subject to separate arrangements.

[8] These are resident hospital patients, those being looked after in residential care, the severely mentally handicapped, members of religious communities, people staying in some night shelters or short-stay hostels, those with no homes etc.

of the adults is responsible for it, such that, the remaining adults in the household may not be aware of the local tax.

Finally we include a number of other variables in our regressions to allow for some 'taste' effects. One is the population aged 5-15 years, which may have stimulative impacts on some forms of expenditure such as housing, education etc. A dummy variable (D_{labour}) is used to capture the impact of the party politics, where D_{labour}=1 if the Labour Party holds the majority of the seats in the county, and D_{labour}=0 otherwise. The Labour Party is often argued to spend more on public services, *ceteris paribus*, so D_{labour} is expected to have positive impact. Furthermore, dummies for counties in Wales (D_{wales}) and for the metropolitan counties in England ($D_{metropolitan}$) are included in some regressions to allow for possible effects of urbanisation on expenditures. These are expected to be positive in metropolitan authorities and negative in Welsh authorities which are predominantly rural. Welsh authorities also benefit from (central government) spending by the Welsh Office which potentially allows reductions in Welsh local authority spending.

4.5 EMPIRICAL RESULTS

In this section we estimate the model outlined in Section 4.3. We begin by estimating equation (4.5) by OLS for the median voter (ie. using median income) separately for the 1991/92 and 1993/94 tax regimes. Results are shown in Tables 4.3 and 4.4, and these suggest that the model overall performs fairly well - coefficients obtained generally have the expected signs, and F-ratios and adjusted R^2s are high.

Table 4.3 Local Government Spending per capita-1991/92 (Median Income)

	England (non-metropolitan)	England (non-metropolitan)	England (inc. metropolitan)	England &Wales
Constant	1.58**	1.38**	1.0**	1.20**
	(0.61)	(0.59)	(0.45)	(0.39)
$\ln Y_{median}$	0.16**	0.16**	0.15**	0.11**
	(0.06)	(0.06)	(0.06)	(0.05)
$\ln T_i$	0.026**			
	(0.0125)			
lnN		-0.027**	-0.024*	-0.021
		(0.0127)	(0.013)	(0.013)
ln(FLY)	0.67***	0.67***	0.73***	0.74***
	(0.06)	(0.06)	(0.04)	(0.04)
ln(ACN)	0.01*	0.011**	0.008	0.002
	(0.005)	(0.005)	(0.005)	(0.004)
ln(REN)	-0.022	-0.023	-0.035	-0.01
	(0.04)	(0.04)	(0.04)	(0.04)
ln(P515)	-0.12	-0.12	-0.09	-0.06
	(0.08)	(0.08)	(0.07)	(0.07)
D_{Labour}	0.06***	0.06***	0.05***	0.04***
	(0.014)	(0.014)	(0.014)	(0.012)
$D_{Metropolitan}$			-0.008	-0.013
			(0.03)	(0.03)
D_{Wales}				-0.15***
				(0.02)
F-ratio	35.9	36.2	86.6	108.3
χ^2 (Het)	1.52	1.54	4.12	7.88
R^2 (adjusted)	0.87	0.87	0.94	0.95

F-ratio is a joint significance test for the set of variable included in the regressions, and it is highly significant in all cases. χ^2 (Het) is the Breusch-Pagan test for heteroscedasticity: all the regressions pass this test.

Results are reported for non-metropolitan authorities in England, all authorities (including metropolitan) in England, and all authorities in England and Wales. In the last two cases shift dummy variables are included to allow for the possible differences discussed in Section 4.4 between Welsh (D_{Wales}) and metropolitan ($D_{metropolitan}$) authorities compared to English non-metropolitan

authorities. Results for these dummies confirm that, *ceteris paribus*, Welsh authorities have lower local expenditure levels in both fiscal years, while the dummy for metropolitan counties is significant only in 1993/94.[9]

Looking first at the results for median income, regression coefficients are all positive and significant as expected, suggesting that local government-provided goods are normal goods. The income elasticity of demand for local government-provided goods is an issue which is frequently discussed and all regression estimates suggest that this is substantially lower than unity, and significantly so as confirmed by Wald test statistics in Table 4.5.

Regarding the tax-price elasticity, the nature of the computations of tax shares and unit cost does not allow us to draw clear-cut conclusions. As mentioned in Section 4.4, alternative tax-price specifications include measures of tax shares which are highly (negatively) correlated with population, while the measure of unit cost (C) is highly (positively) correlated with income (over 0.9 in all cases).

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[9] Expenditure appears to be about 15% lower in Welsh Authorities in 1991/92, while it is around 10% lower in 1993/94. Metropolitan counties seem to have higher expenditures (around 5%) in 1993/94, while there is no evidence in 1991/92. This may well reflect the variability of mandatory payments for some specific services which are particularly high in metropolitan counties. However, our expenditure data does not include those specific grants which are non-discretionary and subject to different arrangements. A dummy for Greater London was also tested, and it was found to be positive and significant (at 10%) in 1993/94, while insignificant in 1991/92.

Table 4.4 Local Government Spending per capita-1993/94 (Median Income)

	England (non-metropolitan)	England (non-metropolitan)	England (inc. metropolitan)	England &Wales
Constant	1.52***	1.34***	1.07**	0.97**
	(0.43)	(0.44)	(0.45)	(0.45)
$\ln Y_{median}$	0.16**	0.17***	0.18***	0.17***
	(0.04)	(0.04)	(0.04)	(0.04)
$\ln T_i$	0.023***			
	(0.008)			
lnN		-0.025***	-0.021***	-0.021***
		(0.008)	(0.007)	(0.007)
ln(FLY)	0.67***	0.66***	0.71***	0.74***
	(0.05)	(0.06)	(0.04)	(0.04)
ln(ACN)	0.0064*	0.007**	0.006	0.0007
	(0.0035)	(0.003)	(0.004)	(0.004)
ln(REN)	-0.08***	-0.08***	-0.08***	-0.07**
	(0.03)	(0.03)	(0.03)	(0.03)
ln(P515)	-0.16*	-0.15*	-0.20***	-0.20***
	(0.085)	(0.08)	(0.06)	(0.06)
D_{Labour}	0.025**	0.025**	0.022*	0.013
	(0.012)	(0.011)	(0.011)	(0.01)
$D_{Metropolitan}$			0.05**	0.04*
			(0.02)	(0.02)
D_{Wales}				-0.10***
				(0.02)
F-ratio	36.4	37.5	175.2	165.4
χ^2 (Het)	8.58	8.70	7.94	7.33
R^2 (adjusted)	0.87	0.87	0.97	0.97

F-ratio is a joint significance test for the set of variable included in the regressions, and it is highly significant in all cases. χ^2 (Het) is the Breusch-Pagan test for heteroscedasticity: all the regressions pass this test.

The regressions suffer from multi-collinearity problems when these variables (lnN, lnT_i, and lnT_iC) are all included. To accomodate this, we drop C, and test each of the other variables separately in our estimates, as seen in the first and second columns of Tables 4.3 and 4.4.[10] lnN has a negative effect while lnT_i is

[10] Despite the fact that C appears in the theoretical model, and it is often measured by wage rates, we can confidently assume that the unit cost of local public services does not vary much between the local authorities in UK.

positive. The former implies some degree of publicness in the provision of local public services. The positive sign on the tax share also confirms this: we would expect a negative sign, if lnT_i captured any price effect: However, the positive sign implies that either of those variables essentially capture the impact of scale economies.

Table 4.5 Hypothesis Testings

	1991/92		
Null Hypothesis	England (non-metropolitan)	England (inc. metropolitan)	England &Wales
$\alpha=1$ (Income Elasticity)	110.7 (0.000)	135.9 (0.000)	203.9 (0.000)
$\eta=1$ (Degree of Publicness)	5.25 (0.022)	3.88 (0.049)	3.28 (0.070)
$\alpha=\delta_1$ (Equivalence Theorem)	35.01 (0.000)	41.39 (0.000)	64.24 (0.000)
	1993/94		
$\alpha=1$ (Income Elasticity)	239.6 (0.000)	281.6 (0.000)	316.4 (0.000)
$\eta=1$ (Degree of Publicness)	6.16 (0.013)	5.20 (0.023)	5.57 (0.018)
$\alpha=\delta_1$ (Equivalence Theorem)	55.15 (0.000)	70.14 (0.000)	64.24 (0.000)

The figures in the cells are χ^2-statistics for the Wald test, and the figures in parantheses are the associated probabilities. The critical values are 3.84 at 5%, and 2.71 at 10%. η is the degree of publicness, α and δ_1 are the coefficients for income and lump-sum grants respectively. The null hypotheses are rejected in all cases.

Further tests (see Table 4.5) show that the null hypothesis of $\eta=1$ (that local government services are purely private) is rejected in all cases,[11] but the degree of publicness (η) is around 0.97 in English non-metropolitan counties, and slightly higher in metropolitan and Welsh counties (around 0.98).[12] These

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[11] The coefficient for population will simply be (η-1) by the exclusion of T_i and C. Therefore, an empirical findings of "η-1=-0.02", for instance, implies that η=0.98.

[12] This difference may be an outcome of tax shares which behave slightly different in those counties. The tax share is substantially lower in metropolitan counties due to higher number of

results lead us to accept the hypothesis that the degree of publicness is uniform across all authorities and, though we confirm that η is less than unity, there appear to be only small sharing economies (at most) associated with local authority expenditures.

Fiscal Illusion

As mentioned earlier, both revenue support grants (RSG) and non-domestic rate revenues (NDR) can be used to test for 'grant illusion' - the flypaper effect. When the RSG only was used to test for this effect, positive and significant results were obtained. When the NDR is treated similarly to the RSG and the sum of the two included in the estimation, results continue to be positive and significant (with higher F-ratios and R^2s), suggesting that both NDR and RSG have similar influences on voter-taxpayers' perceptions. Further investigations are required to test for the flypaper effect. The argument that the lump-sum grants are income equivalent and likely to have a similar stimulative effect on the voter-taxpayer's demand may also be tested. When the restriction $\alpha = \delta_1$[13] was imposed on the estimated equations, it can be seen in Table 4.5 that the computed statistics are substantially higher than critical χ^2 values, suggesting that the null hypothesis of equality is rejected. It would seem therefore that the impact of lump-sum grants on expenditure is not equivalent to the impact expected when the median voter's income is similarly boosted. Moreover, the coefficients for Y_i and FLY_i show that a one percent increase in lump-sum grants stimulates around four times greater increase in local public spending

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tax-payers, and only a small amount of local spending is financed through local taxes in Wales. However, any explicit impact cannot be observed due to the limitations of the existing specifications.

[13] α and δ_1 are the coefficients for Y_i and FLY_i respectively.

than does an increase in the median voter's personal income by the same amount.

ACN measures the proportion of non-taxpaying voters to taxpayers, proxying local accountability, and it appears to be positive in all cases, as expected, but significant only for non-metropolitan counties in England. The positive and significant results suggest that non-taxpaying voters support higher demand for local spending, or equivalently voters who face the direct local tax burden demand less local spending, providing some support for accountability. It also seems to be slightly lower under CC than CT.[14]

This effect is not significant when metropolitan and Welsh counties are included in regressions (the coefficients are still positive while t-statistics are lower). The reason may be that the number of taxpayers in metropolitan counties is higher on average, and the ratio of local taxes to local spending is substantially lower in Wales. It should be noted that *ACN* captures the effect of non-taxpaying/taxpayer voters, and it is not clear how different ways of sharing a given tax bill between the electorate would affect the level of local spending. This also applies to "non-taxpaying" adults in council tax paying households. Despite the fact that the results do not provide strong support for less accountability under the council tax, it is not clear, either, how far the "non-

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[14] As mentioned earlier, households also were considered as tax paying units under the council tax (1993/94), and *ACNH* was used to proxy accountability in regressions. The results were insignificant, giving support to Cullis *et al.* (1991, 1993b) who challenge the view that property tax was less visible than the community charge to taxpayers. We are therefore inclined to concur with Cullis *et al.* that, though only a proportion of the electorate are *legally* liable for local taxes, directly non-taxpaying voters are not necessarily unconcerned about local taxes and spending.

taxpaying" adults in a council tax paying household are aware of their local tax burdens. This would require more detailed investigation of intra-household behaviour.

As a further check for fiscal illusion, we include an additional 'renter illusion' proxy (*REN*) - the ratio of renters to total households. This appears with a negative sign in all cases suggesting that renters are not subject to any illusions due to their tenancy status. As noted earlier, this is as we expected in the case of British local taxes (either community charge or council tax), because the local tax is often paid directly by tenants or added explicitly to rents. Furthermore, the coefficient is negative and significant under council tax. This is consistent with renters being more strongly opposed to local spending than homeowners (perhaps because, they can reap the benefits of local spending less readily than equivalent homeowners. This would be reinforced if tenants are less permanent residents in a locality compared the homeowners).

Other 'Taste' Variables

We included a number of other taste variables which might account for differences across local authorities in the demand for local expenditures. We noted earlier that more children could give rise to demands for higher expenditures on such things as education and housing. Testing the ratio of population aged 5-15 to total population (*P515*) in our regressions did not suggest any positive influence on local government expenditures in either year. In fact the coefficient on *P515* is negative and significant for 1993/94 which

may reflect the tendency for expenditure cutbacks in that year to fall most heavily on authorities with large education budgets.[15]

The other taste variable is a 0-1 dummy which takes the value 1 for Labour dominated county councils and 0 otherwise. It is often argued that the Labour Party has a tendency to tax and spend more than Conservative Party, and the positive and significant signs in most cases support this: *ceteris paribus*, the level of local spending in Labour dominated counties is higher than those in other authorities. The positive effect is weaker (smaller estimate, and/or insignificant) when the Welsh counties are included in the sample. This is probably because the majority of the county councils in Wales are dominated by independent councillors, so reducing the positive effect when those counties are included in regressions.[16]

Mean Versus Median Income

Finally, we use our data on *mean* income differences across local authorities to see whether the power of the decisive voter on the local government budget process, is particularly associated with the *median-income*, rather than *mean-income*, individual. Table 4.6 reports similar regressions to those given in tables 4.3 and 4.4 in order to compare the performance of mean and median income as representing the decisive voter. It is immediately obvious that the 'mean-voter' model behaves very similarly to the 'median-voter' model in the

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[15] The average ratio of education expenditures to total local expenditures is 46.7% in 1991/92 and 42.6% in 1993/94. Clearly the expenditure cuts fell especially heavily on education.

[16] The slightly lower significance level when metropolitan counties are included in the sample in 1993/94 may be a consequence of the separate inclusion of the dummy for metropolitan counties ($D_{metropolitan}$). The majority of the seats in those county councils are held by Labour, and some of the effect is captured by $D_{metropolitan}$. However, when the two dummies (D_{labour} and $D_{metropolitan}$) are included separately, consistent results were obtained.

two years, and the results are very much in line with those found for median income. As with our accountability variables, this approach only capture the 'average' effect of personal income (either mean or median) levels on expenditures.

Table 4.6 Mean versus Median Income

Full Sample	1991/92		1993/94	
Constant	1.20**	1.36***	0.97**	0.71*
	(0.39)	(0.35)	(0.45)	(0.39)
$\ln Y_{median}$	0.11**		0.17***	
	(0.05)		(0.04)	
$\ln Y_{mean}$		0.09**		0.18***
		(0.04)		(0.03)
lnN	-0.021	-0.021	-0.021***	-0.023***
	(0.013)	(0.014)	(0.007)	(0.007)
ln(FLY)	0.74***	0.74***	0.74***	0.76***
	(0.04)	(0.04)	(0.04)	(0.03)
ln(ACN)	0.002	0.003	0.0007	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
ln(REN)	-0.01	-0.001	-0.07**	-0.06**
	(0.04)	(0.04)	(0.03)	(0.03)
ln(P515)	-0.06	-0.04	-0.20***	-0.20***
	(0.07)	(0.07)	(0.06)	(0.06)
D_{Labour}	0.04***	0.04***	0.013	0.017*
	(0.012)	(0.012)	(0.01)	(0.009)
$D_{Metropolitan}$	-0.013	-0.017	0.04**	0.04**
	(0.03)	(0.03)	(0.02)	(0.02)
D_{Wales}	-0.15***	-0.15***	-0.10***	-0.10***
	(0.02)	(0.02)	(0.02)	(0.01)
F-ratio	108.3	106.9	165.4	187.2
χ^2 (Het)	7.88	9.38	7.33	10.0
R^2 (adj.)	0.95	0.95	0.97	0.97

F-ratio is a joint significance test for the set of variable included in the regressions, and it is highly significant in all cases. χ^2 (Het) is Breusch-Pagan test for heteroscedasticity: all the regressions pass this test.

4.6 CONCLUSIONS

This chapter has examined a public choice model of demand for local government-provided goods incorporating a number of representations of fiscal illusion, and applied this to local government expenditures in the UK. Data for

two fiscal years, 1991/92 and 1993/94, have been used, reflecting two very different local tax regimes - a community charge (poll tax) in 1991/92 and a property tax (council tax) in 1993/94. An important distinction between the two is that the former was levied on individuals at a flat rate payable by almost all adults, while the latter was levied on households using different tax rates.

Our empirical results suggest a positive impact of median income on the demand for local government expenditures with an elasticity lower than unity. The price elasticity of demand for local public services could not be addressed explicitly; however measures of fiscal illusion appeared to have similar responses for both the community charge and council tax. The results for a proxy for local accountability show that though only a proportion of the electorate are *legally* liable for local taxes, directly non-taxpaying voters are not necessarily unconcerned about local taxes and spending. Renter illusion finds no support under either of the local tax regimes. However, there is some evidence that voter-taxpayers in rented accommodation demand lower spending under the council tax compared with the community charge. The results also suggest only very small sharing economies associated with local authority spending: local publicly-provided goods are quasi-private in nature.

We also investigated the possibility of fiscal illusion resulting from central government grants and business rate revenues. Significant support was found for the so-called flypaper effect associated with government grants, which appeared to apply equally to (direct) grant and business rate revenues. Further evidence suggested that the receipt of an additional £ of central government grant by a local authority was much higher, in its expenditure effects, to the

receipt of an additional £ by the median income earner. The results show that such illusion persists under both local tax regimes, supporting Cullis *et al* (1991) who argue that if median voters have imperfect knowledge of how grants and local taxes interact, public perceptions of the Poll Tax would not reduce fiscal illusion.

Finally, comparing mean and median income, it was found that the 'mean-voter' model behaves very similarly to the 'median-voter' model in both years, suggesting that mean and median income work equally well to represent the decisive voter. The effect of income distribution on the demand for public spending, and different ways of sharing a given local tax bill among electorate are interesting areas for further research.

CHAPTER 5

TAX PERCEPTIONS AND THE DEMAND FOR PUBLIC SPENDING IN THE UK: A MICRO-DATA ANALYSIS

5.1 INTRODUCTION

The standard approach adopted to analyse the demand for publicly provided goods generally assumes that individuals (or households) maximise their utility by consuming private and public goods. Most early empirical studies of public good provision use macro-data where individual choices are aggregated, as individual demand for publicly provided goods cannot easily be determined. In the absence of explicit (market) prices for public goods and services, voter-taxpayers make choices based on perceptions. Using a median voter framework from public choice theory, aggregated data has been used in the literature to estimate the demand for government expenditures, and the effect of possible tax-price misperceptions on the outcome (see, for instance, Borcherding and Deacon, 1972; Bergstrom and Goodman, 1973; Wagner, 1976; Henrekson, 1988; Heyndels and Smolders, 1994).

An important shortcoming of these studies is that individual tastes are either omitted or roughly represented in the models. In the case of voters' perceptions, a similar problem arises as various 'aggregate' proxies are used to pick up these perceptions while the actual source of the relevant information is the individual. Other approaches, such as surveys and budget games. may be helpful to overcome these failings and provide more direct information about individual preferences. A considerable difference between these two

approaches is that the former is quantitative while the latter is mainly qualitative in nature. An important feature of qualitative data is that the nature of the data and collection procedures has a substantial influence on the accuracy and stability of responses (see Throsby and Withers, 1986: Groot and Pommer, 1989), hence, specific techniques are required to generate data which are 'truthful' and appropriate for statistical analysis (a brief survey is provided in Section 2).

In this chapter, we use the British Social Attitudes Survey (BSAS)-1995 to analyse tax perceptions and their impact on preferences for government spending. The outline of the chapter is as follows. A brief literature survey of micro-data studies of public goods and fiscal illusion hypotheses is provided in Section 5.2. Descriptive statistics are discussed in Section 5.3, whereas empirical results are discussed in Section 5.4. Section 5.5 draws some conclusions.

5.2 MICRO-DATA STUDIES OF PUBLIC GOODS AND FISCAL ILLUSION

The micro-study of individual preferences for fiscal issues was pioneered by Mueller (1963) who examined public attitudes to taxation and spending.[1] She uses data collected by the Survey Research Center of the University of Michigan on an experimental basis, and evaluates the responses related to various fiscal issues. The *rank ordering* of public preferences showed that people judge fiscal programs from the point of view of both national and

[1] A useful literature survey is provided by Lewis (1982:39-65).

personal benefit. The relationship of fiscal preferences to personal benefit is more pronounced, yet it appears to be only a partial determinant.

Regarding attitudes toward public debt and taxes, Mueller (1963) found that the status quo was accepted by the majority of people, though opinions were dependent on individual circumstances. Despite evidence of strong support for the extension of a number of government programs, only a minority of respondents favoured tax increases, and hardly anyone wanted to see those expenditures financed by deficits. Comparisons of the answers by different subgroups of the population showed that upper income groups were not less favorably disposed toward the extension of government programs than lower income groups. It was also found that party identification had only a weak relationship to fiscal policy attitudes.

Some recent studies have also used survey data and budget games to evaluate the demand for publicly provided goods and fiscal illusion. Cullis and Lewis (1985) used data from a survey of public awareness of economic affairs in Britain. The survey was based on a sample of people aged over 18 from various social classes, and questions were asked concerning beliefs about the sources of government revenue to pay for services. The *cross-tabulations* of various responses showed that the majority of respondents preferred to keep the level of taxation and expenditure at present levels, but if taxes had to be increased these should be levied on goods rather than incomes. The overall results showed widespread ignorance of government sources of revenue. Utilising some questions in the same survey, Cullis and Jones (1987) showed that it was

income tax that had high visibility, and also revenue was more visible than expenditure.

Strauss and Hughes (1976) argued that individuals' stated preferences may not represent their maximum utility if they do not face a budget constraint, and they develop a *coupon scale* method to measure the demand for public goods. This method allows respondents to make hypothetical expenditure and tax recommendations with moveable penny coupons, which can be 'spent' on expenditure increases in any of the programs and/or reductions in the major taxes. The method was applied to a random sample of residents of North Carolina, and the responses were used to investigate the qualitative demand functions for public goods. The qualitative nature of the data forced them to use a *multinomial logit model*. The results showed that personal characteristics systematically affect the preferences for public goods: Elderly people preferred to reduce taxes rather than to increase spending; higher income was associated with a greater desire for more public goods; parents living with children desired more post-secondary education. Groot and Pommer (1987) apply a similar method to a representative sample of the Dutch population, and the results showed that the largest marginal social demand was for public services for the elderly, followed by mental health care, primary and secondary education and higher education. Apart from 'right-wing' voters who favoured defense, general government, police and justice services, no strong dependence on political orientation was found.

Willingness-to-pay is another method which seeks to establish individual demand prices for public goods by experimental or survey techniques, and has

been used to measure demand for pure public goods, such as environmental quality and mixed goods (Throsby, 1984). A sample of adults (aged 18 years and above) in Sydney was asked about their preferences for the arts as a public good and about their willingness to pay for arts support out of taxes. In addition to questions about personal characteristics, one question was 'what is the maximum you would want paid out of your taxes each year to support the arts at their current level', and it was asked under the two assumptions that the respondents' total taxes would have to change and not to change. Standard OLS was then applied: the empirical results showed that an incentive might exist for individuals to overstate their willingness to pay if they perceive the possibility of an improvement in their private consumption that outweighs the tax costs involved, and in this case, private good demand is a significant determinant of willingness to pay.

A further group of studies apply microeconometric techniques to survey data to analyse the demand for local public services (see, for instance, Gramlich and Rubinfeld, 1982; Bergstrom *et al*., 1982; Preston and Ridge, 1995). Evidence generally supports the findings from aggregate data for demand elasticities, and significant socio-economic differences in preferences for particular spending and tax categories have been found. However, the majority of those studies do not incorporate fiscal illusion; an exception being Preston and Ridge (1995) who use data from BSAS-1990 to analyse local public spending in the UK. Applying the *ordered probit model* to the essentially qualitative data, they found a price elastic demand for local public goods which appear to be imperfectly congested, while there is also evidence for income elastic demand and voters' tax-price misperceptions due to lump-sum grants.

Most previous studies, such as Cullis and Lewis (1985) and Cullis and Jones (1987), only considered responses to a few survey questions, where the respondents' income level, for instance, was not available. Another limitation is that they used non-discrete data which did not allow more rigorous statistical analysis. On the other hand, though Gramlich and Rubinfeld (1982) and Bergstrom *et al.* (1982) used discrete data, they did not incorporate fiscal illusion. One advantage of this paper is that the BSAS-1995 contains more detailed information about tax and expenditure preferences to allow us to explore fiscal illusion more fully, while the discrete nature of the data allows more sophisticated statistical analysis and modelling of preferences for tax and expenditure.

The two central questions to be addressed are: (i) how do voter-taxpayers perceive tax-cost?; and (ii) how do these perceptions influence their preferences for public spending? To answer these, we have utilised relevant questions in BSAS-1995, which allow us to investigate both overall tax-cost perceptions and the relative visibility of certain taxes. Fiscal economists have often been curious about whether tax-payers perceive their tax burdens accurately, and when the source of this information is the tax-payers themselves, their responses, *per se*, are not always sufficient to answer this question. Therefore, wherever possible, a comparison of responses with actual situations are especially helpful. We attempt to investigate this, firstly, for the *tax-cost perceptions* for income tax and VAT, and secondly, for the relative visibility of these two taxes.

5.3 BSAS-1995 AND TAX PERCEPTIONS

BSAS-1995 covered 3,633 adults in the UK; 1,234 were selected for the particular questions about tax and expenditure preferences; 813 of which are suitable for statistical analysis (those who did not answer *none*, *don't know*, and *refusal/NA*). The survey contains questions about individual characteristics and tastes (including income levels), and questions about tax and expenditure preferences.[2] Some personal characteristics of respondents are as follows: 46.6% male, 52.2% married, 24.5% with at least one school aged (5-15) child, 20.2% retired, and 6.5% unemployed. Respondents were asked to place their households within one of sixteen income groups (as seen in Appendix 1). We have divided the sample into four income sub-groups[3]: the percentage of households within each are: 10.5% low income, 46.9% lower middle income, 21.2% upper middle income, and finally 21.5% high income.

Tax-Cost Perceptions

The two questions placed in the survey concerning the income tax (IT) and value-added tax (VAT) costs are as follows:

-About how much do you think that an extra one penny in the pound on the basic rate of income tax would cost your household?
-About how much do you think that a one percentage point increase in the rate of VAT (that is from 17.5 percent to 18.5 percent) would cost your household?

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[2] The questions selected from BSAS-1995 for the purpose of this study are given in Appendix 5.1. For the details of the survey see Jowell *et al.* (1996).

[3] These groups are chosen with respect to income tax liabilities: Households with low income (< £3,999) are not liable for income tax; households with lower middle income (£4,000-£14,900) pay a lower rate of 20%; households with upper middle income (£15,000-£25,999) pay a marginal rate of 25% (basic rate); households with high income (£26,000+) pay a marginal rate of 40% (higher rate). These are approximate boundaries, because allowances may alter individuals' status.

Five options were offered to respondents (as seen in Appendix 1): (1) nothing, (2) <£1 per week or <£50 per year, (3) £1-2 per week or £50-100 per year, (4) £2-3 per week or £100-£150 per year, (5) >£3 per week or >£150 per year. One way to identify any possible misperceptions is to compare the survey responses with the actual situation (where known). The nature of those questions allow us to estimate "actual" tax-cost for individuals and compare these to their responses. We have calculated the "actual" cost of one extra penny on the basic rate of IT, and one extra percentage point on the rate of VAT for each income group, and coded each household into one of the five options given for the two questions. Data for the 1994-95 fiscal year are used in those computations (see Appendix 5.2).

The extra cost from IT is firstly computed for a single person (aged under 65) as seen in Table 5A.1. The average income within each income band is used in computations, except the first band.[4] The income level for the first band is the upper bound of the group, though this does not affect results because it is below the lower tax band, and the concern here is with an increase in the basic rate of income tax. The extra costs for other groups of income taxpayers with married couple's and age allowances are computed similarly and shown in Table 5A.2. The cost for high income groups does not change a lot, as the higher IT rate remains the same. The major difference between the various groups is that some taxpayers who benefit from age or married couple's

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[4] It should be noted that by taking mid-point estimates within income bands, the tax payments of some are underestimated whilst overestimated for others. It is assumed that these cancel out, for the convenience of analysis, because the exact income level of each individual is not known (we also test for sensitivity; see tables 5A.6 and 5A.7).

allowances shift to a lower code (codings for various groups are shown in Table 5A.2).

The extra cost from a one percentage point increase in the rate of VAT is computed using data from the Family Expenditure Survey (FES). The household expenditures are provided for ten income deciles in the FES, while BSAS-1995 is based on sixteen groups. Our approach is that, firstly, household expenditures are estimated for each income group according to the income boundaries given in the FES (see Table 5A.3).[5] Then VAT is computed for both rates (17.5% and 18.5%). The expenditures on housing, food and non-alcoholic drinks are excluded because they are either zero-rated or exempt.[6] It appears from the computations, as seen in Table 5A.4, that every household pays some amount of VAT (none of the households appears in Code 1). So, it is unlikely for a household not to experience any additional cost when the rate of VAT is increased from 17.5% to 18.5%.

Using the responses to those questions (Q589-Q590) and the 'actual' tax-costs, taxpayers' (mis)perceptions (*PERC*) for each tax category is computed as follows:

$$PERC = CODER - CODEC$$

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[5] We have tried to match the income groups as accurate as possible. There are slight differences in the boundaries given in the two survey (i.e. FES and BSAS-1995), however, this does not affect the results much. We also test for sensitivity of our estimations (see below).

[6] Previously, VAT on domestic fuel and energy was also zero-rated, and a lower rate of 8% was imposed in 1993. However, the question regarding the VAT cost explicitly pointed to the increase (from 17.5% to 18.5%), and this does not make any difference for this question (for further discussion, see below). Children's clothing is zero-rated, however it does not appear separately in the FES.

where *CODER* is the code chosen by respondents (from the options provided for those questions), and *CODEC* is the code assigned from the computations for each respondent. *PERC*=0, if a respondent 'truly' estimated his/her tax-cost in the sense that both 'actual' and perceived tax payments fall within the same range (code). *PERC*<0, if the tax-cost was underestimated, and *PERC*>0, if the tax-cost was overestimated. Finally, the extent of divergence of *PERC* from zero provide a crude measure of the degree of misperception.

The frequency distributions of *PERC* for IT and VAT are reported in tables 5.1 and 5.2, respectively. It appears from Table 5.1 that about 40% of respondents 'truly' perceived the IT-cost ($PERC_{IT}$ =0), about 28% of them underestimated ($PERC_{IT}$ <0), while about 32% overestimated ($PERC_{IT}$ >0). If we allow for some possible inaccuracy in our estimates of 'actual' tax-cost by aggregating the middle bands (-1 ≤ $PERC_{IT}$ ≤ 1), it is still the case that only about 75% of respondents appeared to have either 'truly' perceived (or slightly misperceived) the IT-cost. Inspecting Table 5.2, about 30% of respondents seem to have 'truly' perceived VAT-cost ($PERC_{VAT}$ =0), while about 22% underestimated ($PERC_{VAT}$ <0) and about 48% overestimated ($PERC_{VAT}$ >0). Again, aggregating the middle bands (-1 ≤ $PERC_{VAT}$ ≤ 1) shows that about 72% of respondents appeared to have 'truly' perceived (or slightly misperceived) the VAT-cost.There seems to be a tendency for tax-cost overestimation both for IT and VAT, however, the descriptive statistics show that the mean of IT-cost perceptions is almost zero, while the mean of VAT-cost perceptions is substantially higher (see Table 5A.6, and figures 5.1 and 5.2).

Table 5.1 Income tax-cost perceptions (1p increase in the basic rate)

$PERC_{IT}$*	All Income Groups	Low Income	Lower Middle Inc.	Upper Middle Inc.	High Income
-4	5 (0.6)	-	-	1 (0.6)	4 (2.3)
-3	26 (3.2)	-	-	4 (2.3)	22 (12.6)
-2	64 (7.9)	-	3 (0.8)	35 (20.3)	26 (14.9)
-1	131 (16.1)	-	35 (9.2)	42 (24.4)	54 (30.9)
0	322 (39.6)	61 (71.8)	145 (38.1)	47 (27.3)	69 (39.4)
1	155 (19.1)	13 (15.3)	105 (27.6)	37 (21.5)	-
2	70 (8.6)	7 (8.2)	57 (15.0)	6 (3.5)	-
3	31 (3.8)	3 (3.5)	28 (7.3)	-	-
4	9 (1.1)	1 (1.2)	8 (2.1)	-	-
Total	813 (100)	85 (100)	381 (100)	172 (100)	175 (100)

*$PERC_{IT} = CODER_{IT} - CODEC_{IT}$, where $CODER_{IT}$ is the code chosen by respondents (Q589) and $CODEC_{IT}$ is the code assigned from the computations for each respondent (both are ordered from 1 to 5). $PERC_{IT}=0$, $PERC_{IT}<0$, and $PERC_{IT}>0$ imply 'true' perception, underestimation and overestimation, respectively.

Table 5.2 VAT-cost perceptions (an increase in VAT from 17.5% to 18.5%)

$PERC_{VAT}$*	All Income Groups	Low Income	Lower Middle Inc.	Upper Middle Inc.	High Income
-3	13 (1.6)	-	-	1 (0.6)	12 (6.9)
-2	38 (4.7)	-	5 (1.3)	11 (6.4)	22 (12.6)
-1	125 (15.4)	10 (11.8)	55 (14.4)	24 (14.0)	36 (20.6)
0	247 (30.4)	28 (32.9)	96 (25.2)	48 (27.9)	75 (42.9)
1	216 (26.6)	24 (28.2)	106 (27.8)	56 (32.6)	30 (17.1)
2	125 (15.4)	13 (15.3)	80 (21.0)	32 (18.6)	-
3	49 (6.0)	10 (11.8)	39 (10.2)	-	-
Total	813 (100)	85 (100)	381 (100)	172 (100)	175 (100)

*$PERC_{VAT} = CODER_{VAT} - CODEC_{VAT}$, where $CODER_{VAT}$ is the code chosen by respondents (Q590) and $CODEC_{VAT}$ is the code assigned from the computations for each respondent (both are ordered from 1 to 5). $PERC_{VAT}=0$, $PERC_{VAT}<0$, and $PERC_{VAT}>0$ imply 'true' perception, underestimation and overestimation, respectively.

For further analysis, we have performed a t-test, and the results show that the mean of IT and VAT under- and over-estimations are significantly different, confirming the VAT overestimation (further details of the test are provided in

Appendix 5.3).[7] It should be noted that the mid-point of each income range was used in calculations. To test the sensitivity of choosing mid-points and other personal characteristics which might have not been accurately captured in the survey, we have recalculated the extra costs from IT and VAT by adding and substracting 10% (see Table 5A.7). Despite some respondents shifting to higher and/or lower codes, the results do not seem to be sensitive to these calculations (for descriptive statistics, see Table 5A.6). A t-test was also performed for these calculations, and in each case the results confirm the difference between IT and VAT cost perceptions.[8]

As seen in tables 5.1 and 5.2, income level seems to be an important determinant of tax-cost perceptions. Furthermore, those two questions (concerning IT and VAT cost perceptions) are different by nature. The question concerning IT asks respondents to consider the extra cost from an increase in the basic rate, while clearly some respondents are not liable for this rate at the margin (around 19% of the sample). As a result, it appears from Table 1 that none of the respondents in the low income level underestimated the IT-cost, while none of the respondents in high income level overestimated it.

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[7] We have performed the t-test for $PERC < -1$ (underestimation) and $PERC > 1$ (overestimation). The t-ratios are 4.99 for underestimations and 5.01 for overestimation (the degree of freedom=812, and both are significant at 1%).

[8] The t-ratios are 5.54 and 6.27 for -10% computations, and 4.78 and 4.27 for +10% computations.

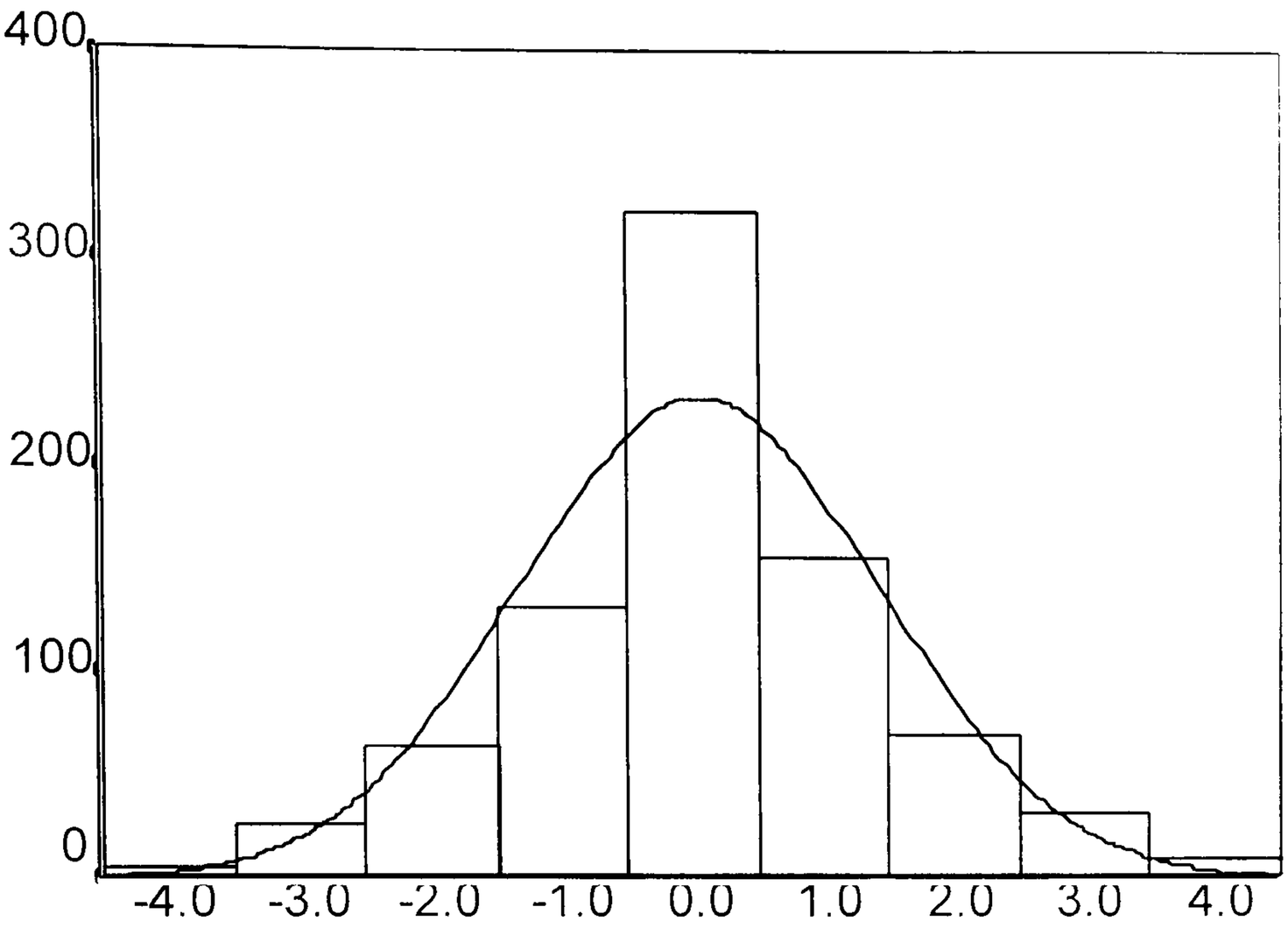

Figure 5.1 IT-cost perceptions

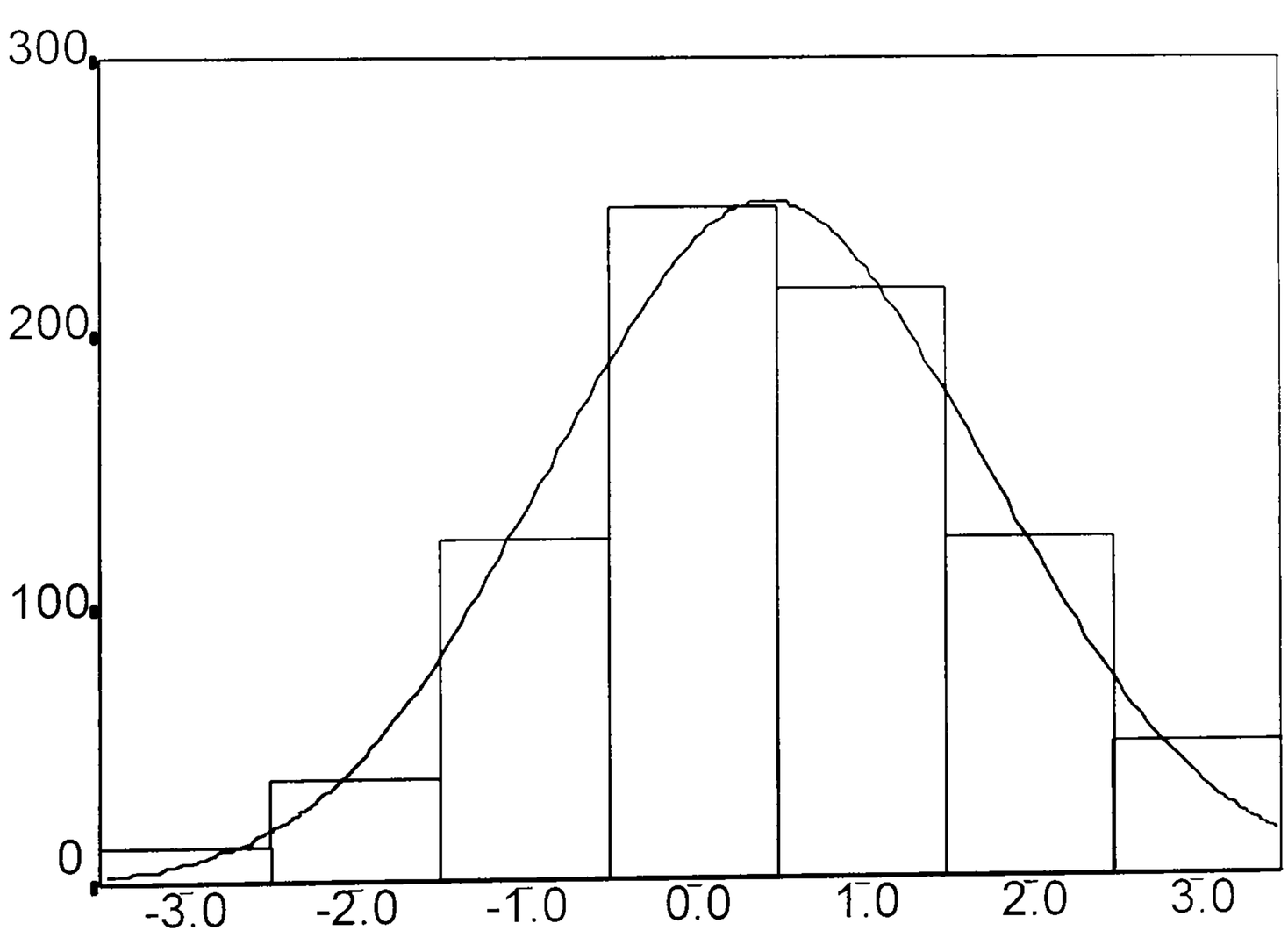

Figure 5.2 VAT-cost perceptions

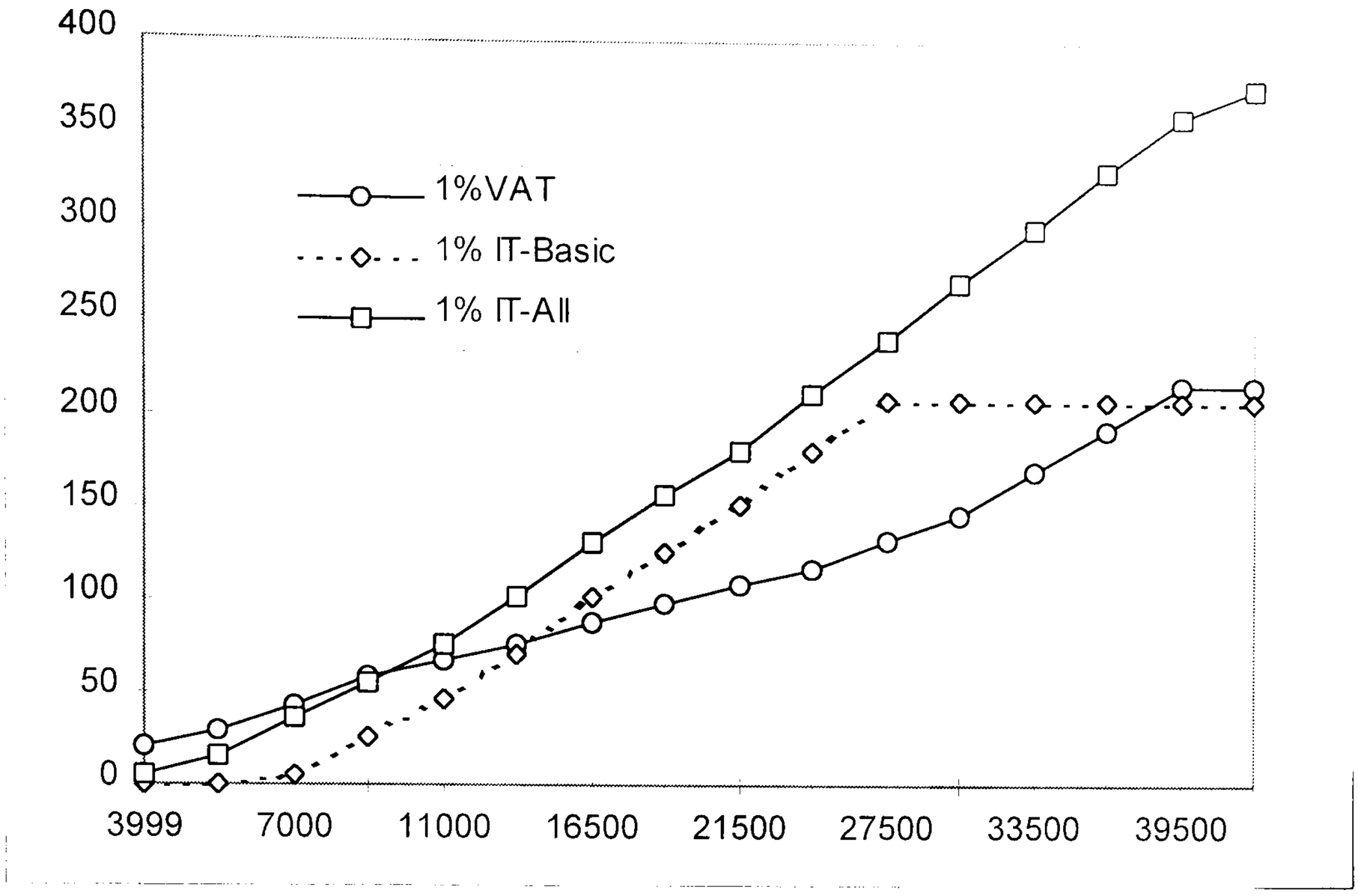

Figure 5.3 Tax-costs from 1% VAT, 1p IT on the basic rate, and 1p IT for all

This is a consequence of the data, as the lowest option to be chosen by respondents and the assigned code for the low income group is 1. Thus, in this method, it is technically impossible for this income group to underestimate IT-cost. A similar problem arises for the high income group (around 31% of the sample) who are not technically 'allowed' to overestimate IT-cost by this method. In the case of VAT, low income groups can underestimate tax payments (actually about 12%, because none of the respondents appeared in Code 1), and high income groups can overestimate (actually about 17%). As seen in Figure 5.3, an increase in the basic rate of income tax does not affect some respondents in low and high income groups, while this is not true for VAT. Other questions may allow more direct comparisons of the two taxes (see below).

Relative Visibility of IT and VAT

Comparing IT and VAT perceptions can be further assessed using other BSAS questions which ask respondents to choose one of the taxes. Those questions are:

-If these were the only options for the government, which do you think that it should choose?
1. A penny in the pound for all [income] taxpayers
2. Five pence in the pound for higher [income] taxpayers
3. Raise VAT by one per cent

The cross-tabulation of responses (see Table 5.3) shows that about 58% of respondents preferred '5p for high income' as the first tax priority, while about 30% preferred '1p for all' and about 10% preferred 'VAT by 1%`. Another question asks for the second preference, and the responses show that about 49% of respondents preferred '1p for all', while about 29% preferred `5p for high income' and about 19% preferred 'VAT by 1%'. These questions concern the general preferences which may not be based purely on self-interest. In fact, other questions ask for the respondents' perceptions regarding whether those taxes will make the respondent's family best off and worst off. The responses to those questions, as seen in Table 5.3, show that an even higher percentage (about 67%) of respondents thought '5p for high income` will make their family best off, while 7% of respondents (that is lower than the one for general preferences) thought 'VAT by 1%' will make their family best off. This difference, ie. the evidence that some respondents preferred the VAT option even though they did not believe it was best for them, might be explained by some other preferences and perceptions (for further empirical analysis, see Section 5.4).

Table 5.3 Tax preferences and perceptions

	Tax Preferences		Tax Perceptions	
Tax categories	First (Q626)	Second (Q629)	Best for the family (Q632)	Worst for the family (Q635)
	All income groups			
1p for all	246 (30.3)	400 (49.2)	192 (23.6)	180 (22.1)
5p for high inc.	470 (57.8)	237 (29.2)	542 (66.7)	60 (7.4)
VAT for 1%	84 (10.3)	155 (19.1)	57 (7.0)	565 (69.5)
Others	13 (1.6)	21 (2.5)	22 (2.8)	8 (0.9)
Total	813 (100)	813 (100)	813 (100)	813 (100)
	Low income group			
1p for all	17 (20.0)	45 (52.9)	25 (29.4)	8 (9.4)
5p for high inc.	56 (65.9)	22 (25.9)	49 (57.6)	4 (4.7)
VAT for 1%	11 (12.9)	14 (16.5)	4 (4.7)	72 (84.7)
Others	1 (1.2)	4 (4.8)	7 (8.3)	1 (1.2)
	Lower middle income group			
1p for all	128 (33.6)	181 (47.5)	93 (24.4)	75 (19.7)
5p for high inc.	220 (57.7)	116 (30.4)	257 (67.5)	9 (2.4)
VAT for 1%	25 (6.6)	74 (19.4)	18 (4.7)	292 (76.6)
Others	8 (2.0)	10 (2.6)	13 (3.3)	5 (1.3)
	Upper middle income group			
1p for all	47 (27.3)	93 (54.1)	24 (14.0)	50 (29.1)
5p for high inc.	105 (61.0)	48 (27.9)	137 (79.7)	8 (4.7)
VAT for 1%	17 (9.9)	29 (16.9)	11 (6.4)	113 (65.7)
Others	3 (1.7)	2 (1.2)	-	1 (0.6)
	High income group			
1p for all	54 (30.9)	81 (46.3)	50 (28.6)	47 (26.9)
5p for high inc.	89 (50.9)	51 (29.1)	99 (56.6)	39 (22.3)
VAT for 1%	31 (17.7)	38 (21.7)	24 (13.7)	88 (50.3)
Others	1 (0.6)	5 (2.8)	2 (1.1)	1 (0.6)

Q626. If these were the only options for the government, which one do you think that it should choose?
Q629. And which one do you think should be the government's second choice?
Q632. Which one these three would leave you and your family best off?
Q635. Which one these three would leave you and your family worst off?

We concentrate on the options 'income tax by 1p for all' and 'VAT by 1%' to compare the relative visibility of these taxes. Even if the respondents perceived the option '5p for high income' as the best for their family, they may still prefer either '1p income tax for all' or 'VAT by 1%'. This can be determined for the first and second preferences, because the relevant questions appear in

the survey. We combined the two questions asked separately (the first and second preferences for tax increases) to identify the respondents whose first or second preference is either IT (1p for all) or VAT. The frequency distribution of the two questions shows that about 75% of respondents preferred IT to VAT (and about 23% of them preferred VAT to IT).

The information about the perceptions is limited: we know which option of tax increases is best (or worst) for the respondents' families but we do not know which they regard as second choice for their families. Nevertheless we use the responses to those questions to test the relative visibility of IT and VAT. Firstly, we have calculated the costs of '1p income tax for all' and 'VAT by 1%' for various income groups (see Table 5A.4).[9] Our results show that the IT-cost exceeds VAT-cost for about 46% of respondents (371), and VAT-cost exceeds IT-cost for about 44% of them (355), while the costs from those taxes are not substantially different for about 11% (87).[10]

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[9] The domestic fuel and energy is included in the expenditures subject to VAT, though a lower rate is paid, because the question is general.

[10] Any difference between IT and VAT costs up to £10 is ignored; only differences higher than £10 are chosen. The intuition behind this is that the mid-point of each income range is used in calculations, and a respondent with an income about the lower bound (about £1,000 less) will pay £10 less, while a respondent with an income about the upper bound (about £1,000 more) will pay £10 more income tax when an extra income tax is imposed for '1p in pound'. A similar situation applies to the VAT increases by 1%.

Table 5.4 IT (1% flat-rate) and VAT (1% increase) misperceptions

	IT-cost<VAT-cost*	IT-cost>VAT-cost*	Total
	Best for the family (Q632)		
IT for 1p/£ for all	95 (54.9)	78 (45.1)	173(100)
VAT for 1%	16 (31.4)	35 (68.6)	51(100)
	Worst for the family (Q635)		
IT for 1p/£ for all	53 (33.1)	107 (66.9)	160(100)
VAT for 1%	289 (57.5)	214 (42.5)	503(100)

* IT- and VAT-cost (a flat-rate of 1p and 1%, respectively) computed for individuals with respect to their incomes, expenditures subject to VAT, and personal characteristics, and the differences more than £10 are considered.
Q632. Which one these three would leave you and your family best off?
Q635. Which one these three would leave you and your family worst off?

These are cross-tabulated with the IT and VAT perceptions in Table 5.4. Allowing that the majority of respondents choose `5p for high income` as first preference, we concentrate only on the two residual responses to compare directly '1p on income' *versus* '1% VAT increase'. The results show that about 55% of respondents seem to be consistent: they thought IT was the best for their family, and their actual VAT-cost did exceed IT-cost. On the other hand, about 67% of respondents who thought VAT was the best for their family were consistent as their actual IT-cost did exceed VAT-cost. Regarding the visibility of IT and VAT, the nature of those questions (and the responses) do not allow us to evaluate each tax, because only about 28% of respondents thought either IT or VAT is the best for their family, but the second best is not known. However, it appeared from the responses that a higher percentage of respondents was inconsistent when choosing IT as the best option, either because they underestimated IT or overestimated VAT. Other responses show that about 67% of respondents seem to be consistent: they thought IT was the worst for their family, and their actual IT-cost did exceed VAT-cost. On the other hand, about 58% of respondents who thought VAT was the worst for

their family faced an actual VAT-cost which did exceed IT-cost. Responses to this question may be more representative, as about 82% of respondents thought either IT or VAT is the worst for their family. The responses show that a higher percentage of responses was inconsistent when choosing VAT as the worst option, either because they underestimated IT or overestimated VAT.

We use these responses to derive proxies of IT and VAT visibilities (VIS_{IT} and VIS_{VAT}) to test for the consistency of tax-cost perceptions discussed earlier. The respondents who thought IT was the best for their family and whose IT-cost did exceed VAT-cost are considered to have underestimated IT ($VIS_{IT} = -1$); on the other hand, the respondents who thought IT was the worst for their family but whose VAT-cost did exceed IT-cost are considered to have overestimated IT ($VIS_{IT} = 1$); and $VIS_{IT} = 0$ otherwise (a similar approach was applied to VIS_{VAT}). The frequency distributions of VIS_{IT} and VIS_{VAT} show that about 10% of respondents underestimated IT, and about 7% overestimated; on the other hand, 2% underestimated VAT, and about 26% overestimated.[11] These results are generally consistent with the tax-cost perceptions ($PERC_{IT}$ and $PERC_{VAT}$).

It appears from this evidence (obtained from both proxies of tax-cost perceptions and relative visibility of taxes) that IT is more accurately perceived (in the sense that more people are consistent in their responses), while tax-payers are confused more about VAT, and frequently overestimate their VAT liabilities. The visibility of IT is generally in line with the previous findings by Cullis and Lewis (1985) and Cullis and Jones (1987) who showed that a large

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[11] The mean of VIS_{IT} appeared to be almost zero (-0.031), while the mean of VIS_{VAT} was substantially higher than zero (0.244).

majority (93%) of people mentioned IT as a revenue source. while a small majority (56%) did for VAT. Our evidence indicates that there is both a higher degree of confusion about VAT liabilities and frequent VAT overestimation. One reason might be the changes in voter-taxpayers' preferences over time. The earlier survey was carried out in 1981, while we use a 1995 survey. The time-gap and the changes in the fiscal climate of this period might have caused this difference. In fact, the time-series analysis of taxation and public spending in the UK shows that governments have relied more on indirect taxes over the 1981 to 1995 period. Furthermore, prior to the BSAS-1995, there have been some important changes concerning VAT. In 1991 the VAT rate was raised from 15% to 17.5%. In 1993 a decision was taken to impose VAT on domestic fuel and energy which was previously zero-rated, and the proposal was to impose an initial rate of 8% and one year later move to the full rate of 17.5%. Considerable publicity and political debate followed this proposal, leading to it being overturned in parliament. This might have induced citizens' reactions against VAT, and it is consistent with the view that there is a limit on the governments' ability to utilise fiscal illusion. We relate these perceptions to expenditure preferences in Section 5.4.

5.4 MODELLING ATTITUDES TO TAX AND SPENDING

Tax preferences and perceptions have been generally discussed in the previous section. A further question is what determines the attitudes to taxes, and whether those attitudes have any influence on spending preferences. A number of personal characteristics, such as income level, political affiliation and other tastes, are used in the statistical analysis in this section.

Tax Preferences and Perceptions

Firstly, the tax preferences (5p/£ for high incomes, 1p/£ for all taxpayers, and 1% VAT) and perceptions ($PERC_{IT}$ and $PERC_{VAT}$) have been regressed on a number of variables, including some taste variables. For a purely self-interested tax-payer, a negative relationship is expected between income (*INCOME*) and '5p/£ for high incomes' option. Reverse expectations apply to the '1% VAT' option; for a purely self-interested tax-payer, a positive effect of income is expected. The situation for '1p/£ for all taxpayers' option is less clear, since the outcome depends on the respondents' perceptions about those alternative options. Respondents are, *ceteris paribus*, expected to prefer the taxes they underestimate: we test this by using proxies of relative visibility of IT and VAT in the regressions (VIS_{IT} and VIS_{VAT}).

Other personal characteristics and tastes were also used in the regressions, and the expected relationships are as follows: marital status (*MARRIED*) may influence respondents' preferences and perceptions, due to either the allowances they get or the method they pay taxes (whether they are taxed together or separately); respondents who are engaged in different economic activities[12] may have different tax perceptions (eg. the respondents in a paid work may realise IT more directly than others); variables such as having school age children (CHILDREN) may influence tax-payers' perceptions because of

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[12] These variables are as follows: unemployed (*UNEMP*), wholly retired (*RETIRED*), full-time students (*STUDENT*), permanently sick or disabled (*SICK/DISAB*), looking after home (*HOME*), working at least ten hours a week (*WORK*). We included dummies for each category except *WORK* which acts as a base from which the other categories differ. The reason we have chosen this category is that it covers about 50% of respondents, and those respondents are the ones who directly face IT. The situation is less clear for VAT, as almost all the respondents face it.

zero-rated children's clothing. A dummy is used to capture the impact of political affiliation: the respondents intending to vote for Labour (*LABOUR*) would be expected to prefer a more progressive tax.

One BSAS question concerned the overall tax burden as follows:

-Generally, how would you describe levels of taxation? (...for those with high incomes, middle incomes and low incomes).
1. Much too low, 2. Too low, 3. About right, 4. Too high, 5. Much too high.

This question was asked separately for different income groups, and then the respondents were asked to place themselves in one of those income groups. We have derived the self-assessed tax burden (*TAX BURDEN*) from those questions, and include this in our regressions.

The empirical results for tax preferences are reported in Table 5.5.[13] The constant term is significant in all cases, and it is positive for '5p/£ for high incomes', and negative for other options. We infer from this that the majority of respondents prefer more progressive taxes to the less progressive ones, which is consistent with the descriptive statistics discussed earlier. Income level has a significant influence on the preferences for '5p/£ for high incomes' and VAT, being negative in the former, and positive in the latter. This implies that taxpayers are generally aware of the effect which the progressivity (or regressivity) of those taxes has on themselves. The respondents with lower income are more likely to prefer extra tax for high incomes, and *vice versa*.[14]

We have also included a dummy for "high income earners", but the results

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[13] The probit model was used, because the responses are binary [0, 1] (see Appendix 5.4).
[14] The coefficient on income is insignificant when the dummy for Labour is included, perhaps because lower income groups have tendency to vote for Labour, and the negative income effect is partly captured by this dummy.

appeared to be insignificant (not reported here). The positive effect of income on VAT preferences shows that, controlling for the general aversion to VAT (as captured by the negative constant), respondents with higher income are more likely to prefer VAT. These results suggest that the self-interest is the principal determinant of tax-payers` preferences.

Table 5.5 also shows that the respondents with a tendency to overestimate a flat-rate income tax and VAT preferred '5p/£ for high incomes`, while the ones who tend to underestimate the VAT-cost preferred VAT. Income level does not seem to be a significant determinant of preference for a flat-rate (1p for all) income tax, perhaps because this tax concerned everybody rather than a certain income group. The evidence shows that the respondents, who preferred a flat-rate income tax, are also those who underestimated that tax. Regarding taste variables, the respondents intending to vote for Labour, *ceteris paribus*, preferred a more progressive tax. On the other hand, they opposed the more regressive ones, though the result is only significant for a flat-rate tax at 10%, and insignificant for VAT. Permanently sick or disabled people appeared to prefer a more progressive tax relative to the economically active people.

Table 5.5 Tax preferences (probit model)

	5p for high incomes		1p for all		VAT for 1%	
CONSTANT	0.44***	0.19	-0.43***	-0.14	-2.12***	-2.14***
	(0.16)	(0.21)	(0.17)	(0.22)	(0.23)	(0.30)
INCOME	-0.14**	-0.09	-0.05	-0.11	0.40***	0.38***
	(0.06)	(0.07)	(0.06)	(0.07)	(0.08)	(0.09)
TAX	0.06	0.05	0.01	0.03	0.01	-0.01
BURDEN	(0.08)	(0.08)	(0.08)	(0.09)	(0.12)	(0.12)
VIS_{IT}	0.23*	0.21*	-0.30**	-0.30**	0.01	0.06
	(0.13)	(0.13)	(0.13)	(0.13)	(0.17)	(0.17)
VIS_{VAT}	0.40***	0.40***	0.09	0.09	-1.20***	-1.19***
	(0.11)	(0.12)	(0.12)	(0.12)	(0.19)	(0.19)
MARRIED		-0.05		0.06		0.10
		(0.10)		(0.10)		(0.14)
CHILDREN		-0.06		-0.07		0.16
		(0.11)		(0.12)		(0.15)
LABOUR		0.22**		-0.17*		-0.17
		(0.09)		(0.10)		(0.13)
UNEMP.		0.07		-0.16		0.40
		(0.20)		(0.21)		(0.25)
RETIRED		0.15		-0.10		-0.20
		(0.14)		(0.14)		(0.21)
STUDENT		0.14		0.002		-0.25
		(0.29)		(0.29)		(0.43)
SICK/DISAB		0.43*		-0.41*		-0.07
		(0.22)		(0.24)		(0.33)
HOME		0.05		0.22		0.25
		(0.15)		(0.16)		(0.20)
LL1	-544.7	-538.8	-494.7	-490.7	-238.0	-232.0
LL2	-553.6	-553.6	-498.4	-498.4	-270.2	-270.2
χ^2	17.7	29.5	7.5	15.5	64.3	76.3
	(0.001)	(0.003)	(0.113)	(0.216)	(0.000)	(0.000)

LL1: The maximised value of the log-likelihood function
LL2: The restricted log-likelihood function (computed with only the constant term)
χ^2 : A test of joint significance of all the coefficients in the regressions (probabilities in parantheses).

Table 5.6 shows the empirical results for IT- and VAT-cost perceptions.[15] Respondents' income seems to be a highly significant determinant of tax-cost perceptions. The results suggest that tax-payers with higher incomes tended to underestimate the tax-costs, while the lower income groups tended to

[15] The ordered probit model is used, because the dependent variable is ordered [-1, 0, 1] (see Appendix 4).

overestimate. Clearly, respondents with higher incomes feel less burden from IT and VAT, and *vice versa*. The perception regarding tax burden is insignificant, perhaps because the income variable already captures that effect.[16] There is a positive association between overestimating IT and perceived IT-cost, and between overestimating VAT and VAT-cost perceptions; we regard this as evidence for the consistency of responses. Those overestimating VAT appear to underestimate IT-cost, suggesting that these two taxes are regarded as alternatives to each other. However, the case of VAT-cost perceptions does not support this, perhaps because all respondents are, more or less, concerned with VAT, while this may not be true for IT (actually around half of the respondents appeared to be in a paid work). Therefore, the IT tax-payers are likely to have more chance to compare the two taxes.

Some interesting results come out of taste variables. Married respondents appear to overestimate both IT- and VAT-cost. Taxing the incomes of couples was changed in 1990, and husbands and wives have been taxed separately since then. Although the retained allowances reduced those households' tax bill, the structure of allowances and rapid changes created some confusion. The empirical results show that married couples overestimate IT-cost, probably because they think about the total amount they pay, and the allowances are not very visible. The VAT-cost overestimation might be a consequence of a higher propensity to consume by married couples, though the evidence is weak.

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[16] About 70% of respondents with low income thought their tax burden was too high, and more than 60% of respondents with high or upper middle income thought their tax burden was either too low or about right. The correlation coefficient between incomes and tax burden perceptions is -0.28 (pr.=0.000).

Table 5.6 Tax-cost perceptions (ordered probit model)

	IT-cost perceptions		VAT-cost perceptions	
CONSTANT	2.12***	2.51***	1.84***	1.86***
	(0.20)	(0.23)	(0.15)	(0.20)
INCOME	-0.51***	-0.63***	-0.44***	-0.50***
	(0.07)	(0.08)	(0.06)	(0.06)
TAX BURDEN	-0.01	-0.002	0.06	0.05
	(0.07)	(0.07)	(0.07)	(0.08)
VIS_{IT}	0.28**	0.26**	0.01	-0.02
	(0.11)	(0.11)	(0.12)	(0.12)
VIS_{VAT}	-0.44***	-0.47***	0.32***	0.30***
	(0.10)	(0.10)	(0.11)	(0.11)
MARRIED		0.27***		0.17*
		(0.09)		(0.09)
CHILDREN		-0.12		0.18*
		(0.11)		(0.11)
LABOUR		-0.13		0.09
		(0.08)		(0.09)
UNEMP.		-0.01		-0.01
		(0.17)		(0.18)
RETIRED		-0.19		-0.19
		(0.13)		(0.12)
STUDENT		-0.08		0.37
		(0.25)		(0.27)
SICK/DISAB		-0.52***		0.11
		(0.19)		(0.21)
HOME		-0.33**		-0.06
		(0.14)		(0.14)
μ	1.29***	1.31***	0.90***	0.91***
	(0.07)	(0.07)	(0.05)	(0.05)
LL1	-761.3	-750.6	-808.4	-799.9
LL2	-884.6	-884.6	-850.1	-850.1
χ^2	246.6	268.0	83.3	100.4
	(0.000)	(0.000)	(0.000)	(0.000)

LL1: The maximised value of the log-likelihood function
LL2: The restricted log-likelihood function (computed with only the constant term)
χ^2 : A test of joint significance of all the coefficients in the regressions (probabilities in parantheses).
μ : The estimated parameter of the boundaries of responses.

Households with school aged children appear to have overestimated VAT. As mentioned earlier, we have not been able to take into account the zero-rated children's clothing in our computations. So, the positive sign might capture a

slightly overestimated VAT bill for those who have children.[17] The dummies for economic activity all seem to be negative in explaining IT-cost perceptions, suggesting that those respondents underestimate IT when compared with the respondents who are in paid work for more than ten hours a week (or those in paid work tend to overestimate compared with others, perhaps because they are the ones who face IT more directly). Regarding the VAT-cost perceptions. the respondents' economic activities had no significant effect.

Spending Preferences

Another question concerns whether misperceptions distort voter-taxpayers' preferences for public spending. Given a budget constraint, the fiscal illusion hypothesis argues that respondents who underestimate tax burdens are expected to demand higher public spending, and respondents who overestimate tax burdens are expected to demand less public spending. Of course, some respondents may think that they will not bear the cost of extra spending. Thus, expecting others to pay the extra cost, they may desire more spending even when they overestimate tax burdens.

A question in the BSAS asks respondents preferences for tax and spending as follows:

-Suppose that government had to choose between the three options on this card. Which do you think it should choose?
1. Reduce taxes and spend less on health, education and social benefits
2. Keep taxes and spending on these services at the same level as now
3. Increase taxes and spend more on health, education and social benefits

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[17] The dummies for married couples and children are positively correlated, however, when each dummy was put separately, both appeared to be significant by slightly higher levels. Since only 33% of married couples appeared to have school age children, these two dummies capture different effects.

Table 5.7 Spending Preferences (Q65)

Order	All Income Groups	Low Income	Lower Middle Inc.	Upper Middle Inc.	High Income
1	35 (4.3)	6 (7.1)	16 (4.2)	6 (3.5)	7 (4.0)
2	244 (30.0)	19 (22.4)	125 (32.8)	53 (30.8)	47 (26.9)
3	534 (65.7)	60 (70.6)	240 (63.0)	113 (65.7)	121 (69.1)
Total	813 (100)	85 (100)	381 (100)	172 (100)	175 (100)

Q65. Suppose the government had to choose between the three options on this card. Which do you think it should choose?
1. Reduce taxes and spend less on health, education and social benefits
2. Keep taxes and spending on these services at the same level as now
3. Increase taxes and spend more on health, education and social benefits

The frequency distribution of responses, as seen in Table 5.7. shows that about 4% of respondents chose the first option (tax and spend less). while 30% of them chose the second (keep taxes and spending), and about 66% chose the third (increase taxes and spending).[18] The frequencies for various income sub-groups do not seem to be substantially different, though slightly higher percentages of respondents with low and high incomes desired more tax and spending, while a slightly higher percentage of respondents with low income also desired less tax and spending.[19] These responses are treated as expressions of demand for public spending which are assumed to be determined by respondents' income level, tax preferences (and perceptions). and personal characteristics. Let G_i be i's demand for public spending as follows:[20]

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[18] Responses to other questions show that the first priority for extra spending is health while education appears to be the second.

[19] The tax consequences of higher spending are spelled out in this question. The previous BSAS surveys showed that the popularity of increases in public spending fell markedly, in some cases by up to one half, when the tax consequences were spelled out (see Brook *et al.*, 1996).

[20] We are going to use an *ad hoc* modelling in this study. Although an explicit modelling of demand for publicly provided goods, which incorporates tax-price misperceptions. is provided by Gemmell (1997b), our study is limited by the scope of the BSAS-1995, and various forms of tax-price misperceptions cannot explicitly be determined. Instead. we utilised some questions related to tax preferences and perceptions.

$$G_i = \alpha X_i + u_i$$

where X_i is a vector of explanatory variables, and u_i is the error term. It should be noted that G_i is not known, instead the expressed preferences are used in the analysis. Those choosing the first option (reduce taxes and spending) or third option (increase taxes and spending) are taken to have a desired level of spending differing from current, actual spending, whereas those choosing the second option (keep the level of taxes and spending) are taken to have a desired level of spending not differing from the actual level sufficiently.[21]

The explanatory variables are income, perceived tax burden, IT- and VAT-cost perceptions, and other taste variables, such as school aged children, political affiliation etc. The sign predictions for our variables are as follows: The respondents' income level is expected to have a positive effect on the demand for public spending, however, in our regressions the situation is less clear becasue taxes are not held constant.[22] The perceived tax burden (too high, too low etc.) is expected to have a negative effect.[23] Given the tax burden, the IT- and VAT-cost perceptions are expected to have negative impacts, if they are visible: the respondents who have tendency to overestimate those taxes are

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[21] This is represented by a treshold parameter, μ (for more details, see Appendix 5.4).

[22] Assuming that the publicly provided goods are normal goods, a positive effect of income on the demand for public spending would be expected. However, the respondents are warned that the taxes would also increase if they prefer a higher level of spending. So, the coefficient for income will be a combination of positive effect of income and negative effect of the tax-price.

[23] If the respondents think that the level of taxation is too high, it can be assumed that the marginal cost of the current tax level is higher than the marginal benefit of current public expenditure, and they are expected to vote for a lower level of taxes and expenditures. On the other hand, the marginal cost of the current tax level is assumed to be lower than the marginal benefit of current public expenditure for those respondents who think that the level of taxation is too low, and they are expected to vote for even higher level of taxes and expenditures.

expected to demand less public spending, while the ones who tend to underestimate them are expected to demand more. Other personal characteristics and tastes were also used in the regressions: A dummy is used to capture the impact of political affiliation, and the respondents intending to vote for Labour would be expected to prefer more public spending. The marital status, having school age children, employment status, and age will also be included in the regressions. The unemployed people and the households with school aged children may also demand more of those public services. The respondents' age is another variable which might have significant effect on the demand for public spending, e.g. via health demands.

The results from the ordered probit model are reported in Table 5.8. The coefficient μ support the specification of ordered preferences, and the χ^2-ratio, which tests for the joint significance of all variables, is significant. The income level is insignificant, while the impact of tax buden is negative and highly significant. Other things being equal, the respondents who think their tax level is too (or much too) high prefer spending (and taxes) to be cut.

Table 5.8 Spending (and tax) preferences (ordered probit model)

	The dependent variable= Responses to Q65			
CONSTANT	1.87***	1.77***	1.66***	1.56***
	(0.17)	(0.17)	(0.23)	(0.18)
INCOME	-0.03	0.02	-0.001	0.02
	(0.06)	(0.05)	(0.07)	(0.06)
TAX BURDEN	-0.20**	-0.20**	-0.24***	-0.21***
	(0.08)	(0.08)	(0.08)	(0.08)
VIS_{IT}	0.06			
	(0.12)			
VIS_{VAT}	0.20*			
	(0.11)			
$PERC_{IT}$		-0.06	-0.04	-0.04
		(0.07)	(0.07)	(0.07)
$PERC_{VAT}$		0.14**	0.10*	0.10*
		(0.06)	(0.06)	(0.06)
MARRIED			0.11	
			(0.10)	
CHILDREN			0.05	
			(0.12)	
LABOUR			0.40***	0.42***
			(0.09)	(0.09)
UNEMP.			0.03	
			(0.20)	
RETIRED			-0.11	
			(0.13)	
STUDENT			0.31	
			(0.33)	
SICK/DISAB			0.39	
			(0.24)	
HOME			-0.24*	
			(0.14)	
AGE 18-24				-0.29*
				(0.16)
25-34				-0.07
				(0.14)
35-44				0.33**
				(0.15)
45-54				0.33**
				(0.15)
55-59				0.26
				(0.23)
60-64				0.12
				(0.20)
μ	1.33***	1.33***	1.37***	1.38***
	(0.08)	(0.08)	(0.09)	(0.08)
LL1	-623.2	-622.0	-606.2	-601.3
LL2	-628.2	-628.2	-628.2	-628.2
χ^2	9.95	12.3	43.9	53.7
	(0.041)	(0.015)	(0.000)	(0.000)

LL1: The maximised value of the log-likelihood function; LL2: The restricted log-likelihood function (computed with only the constant term); χ^2 : A test of joint significance of all the coefficients in the regressions (probabilities in parantheses); μ : The estimated parameter of the boundaries of responses.

To test the influence of tax (mis)perceptions on the spending preferences, the proxies of both relative visibility of IT and VAT (VIS_{IT} and VIS_{VAT}), and those of IT- and VAT-cost perceptions ($PERC_{IT}$ and $PERC_{VAT}$) have been included in the regressions. The results from both proxies are consistent. IT perceptions being insignificant, and VAT perceptions being significantly positive. We are still cautious to interpret this as support for the invisibility of VAT. The previous analysis of the descriptive data showed that VAT was less accurately perceived, but frequently overestimated. This evidence completes the story about the tax and spending preferences (and perceptions): The heavy reliance on indirect tax in recent years, and the intention to introduce more VAT on other goods (such as domestic fuel and energy), provoked public reaction against VAT. The VAT-cost mainly fell on the low incomes due to its less progressive nature. Therefore, even though VAT-cost is overestimated by the majority of respondents, they still demand a higher public spending, and they expect that extra spending to be financed by other taxes (and probably by other tax-payers).

Regarding the taste variables, the dummy for the respondents intending to vote for Labour is the only significant one, and it appeared to be positive as expected.[24] Others, such as marital status, school aged children etc., are not significant (there is weak evidence that respondents who look after home desire less public spending). We included the dummies for age instead, the

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[24] The respondents who do not intend to vote for Labour, may not necessarily intend to vote for the Conservative (they may be undecided or intending to vote for another party). Thus, a dummy for the respondents intending to vote for Conservative was also included, and a significantly negative coefficient was obtained.

respondents aged 35-54 seem to have relatively higher demand for public services.[25] These are the respondents who are likely to be the ones with school aged children (actually about 63% of school aged children). and hence. this may be capturing that effect too. The respondents aged 18-24 seem to demand relatively lower public services. This may be because they may not be too concerned with the secondary education and health services (further examination show that only 3% of those respondents have school aged children).

5.5 CONCLUSIONS

This chapter used the British Social Attitudes Survey-1995 to evaluate tax preferences (and perceptions), and their influence on the demand for public spending. Firstly, the respondents' perceptions of various taxes were compared with the actual tax-costs to identify any misperceptions using some descriptive statistics, and secondly, using microeconometric techniques, those misperceptions were related to the tax and expenditure preferences to test whether they have any distortionary impact on the voter-taxpayers attitudes. The empirical analysis also incorporated other taste variables, such as marital status, school aged children, and political affiliation etc.

Evidence showed that the tax preferences were essentially influenced by self interest, and the majority of respondents preferred a more progressive tax to other options. Regarding the high income earners, the results appeared to be ambiguous because no evidence was found whether they prefer a regressive or

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[25] We included dummies for each age category from 18 to 64, while excluded the category 65 and over, and this category acts as a base from which the other categories differ.

a progressive tax. Respondents intending to vote for Labour, *ceteris paribus*, preferred a more progressive tax. Regarding the IT- and VAT-cost perceptions, respondents with higher income tended to underestimate tax-costs. Both taxes were overestimated by married couples, perhaps because of their higher aggregate IT tax bill, and higher propensity to consume. Respondents other than the ones in paid work tended to underestimate IT, probably because the majority of them are not IT-payers.

Further evidence suggests some forms of fiscal illusion, in the sense that tax-payers appeared to be inconsistent in their responses regarding tax perceptions, and this inconsistency occured more frequently in VAT, conforming the argument that VAT (liability) is less visible. However, VAT is overestimated rather than being underestimated as argued in the fiscal illusion theory. We explain this by two particular reasons. One is the governments' heavy reliance on indirect taxes over the 1981 to 1995 period; and the other is the important changes concerning VAT prior to the BSAS-1995. In 1991 the VAT rate was raised from 15% to 17.5%; in 1993 a decision was taken to impose VAT on domestic fuel and energy which was previously zero-rated, and the proposal was to impose an initial rate of 8% and one year later move to the full rate of 17.5%. Considerable publicity and political debate followed this proposal, leading to it being overturned in parliament. This might have induced citizens' reactions against VAT, and it is consistent with the view that there is a limit on the governments' ability to utilise fiscal illusion.

Finally, a negative relationship found between the perceived tax burdens and spending preferences, while the impact of tax perceptions is ambiguous. IT-

perceptions did not have a significant influence on the demand for public spending, and a positive relationship found between VAT-perceptions and public spending. These results suggest that even though VAT-cost is overestimated by the majority of respondents, they still demand a higher public spending, and they expect the extra spending to be financed by other taxes (and probably by other tax-payers). The dummy for the respondents intending to vote for Labour is the only significant one, and it appeared to be positive. The respondents aged 35-54 seem to have relatively higher demand for public services, and the ones aged 18-24 tended to demand less public services.

CHAPTER 6 SUMMARY AND CONCLUSIONS

6.1 SUMMARY OF THE STUDY

The Objective of this study has been to examine fiscal illusion and the demand for public spending in the UK. As summarised in Chapter 2, many factors have been identified as contributing to the long-standing tendency of public sector growth in industrial countries, although empirical evidence for specific factors is mixed. We approach explaining public spending in the UK utilising public choice theories, and concentrate particularly on demand-side factors. It has been argued by public choice theorists that the level of government spending should reflect voter-taxpayer's demand for public goods, however, certain features of tax structure may distort voters' tax perceptions, so that voter-taxpayers underestimate how much they are paying for public goods; such fiscal illusion implies that actual expenditure will be greater than predicted by a simple voter demand model.

UK general government expenditure tended to rise steadily from 1955, and despite a marked reduction in the second half of the 1980s, this trend has continued in the 1990s. The entire period of 1955-94 can be characterised by quite volatile budget deficits, though the composition of tax structure is relatively stable. Taxes on expenditure, the relatively invisible taxes in the UK context, were some 40-45 per cent of total revenue over 1955-72 and 1978-94. Personal income taxes, the relatively visible taxes in the UK context, showed more movement. The other major revenue sources exhibit gentle trends. Social Security Contributions, the relative visibility of which is questionable, rose from a share of about ten to over 15 per cent. Corporate income taxes, which

are not paid directly by voters and therefore should be considered invisible to individuals, moved around pretty much within a 5-10 per cent band. Non-tax revenues, which are also in principle 'invisible' (from the fiscal illusion perspective) declined slightly in importance from about twelve to eight per cent of total revenue.

We related those trends to the fiscal illusion hypotheses (explained in Chapter 2), and in Chapter 3, adopted a public choice approach, incorporating those hypotheses, to explain trends in public expenditure in the UK for the period of 1955-94. The included sources of fiscal illusion were: revenue complexity; tax elasticity; the visibility of taxes; and the extent of deficit finance. The results obtained are consistent with comparable studies of public expenditure; income and population have positive signs, however, further tests reject the null hypothesis that the coefficient on income equals unity, confirming that government expenditure increases less than proportionately than national income, and therefore rejecting the simple Wagner's Law hypothesis. Evidence on the degree of publicness does not seem to be conclusive since the calculated coefficient is outside the expected range between zero and unity, however, the value substantially higher than unity supports the evidence of previous studies that, overall, government-provided goods are highly 'private' in nature. The effect of relative prices is found to be negative and *price-inelastic* demand for government-provided goods is supported. The evidence here suggest that, *ceteris paribus*, relative prices have had a reductive effect on public expenditure presumably because resistance from voters against rising (nominal) public expenditures forces governments to respond with

compensating reductions in real government output, in order to minimise these expenditure increases.

Our innovation was in a more complete specification of sources of fiscal illusion. We found quite consistent evidence that invisible taxes and deficit financing were associated with increased levels of spending, but for various reasons the measures of elasticity and complexity performed less well. In a time-series context with a fixed number of revenues as in the UK, the complexity of the tax system (as measured by a Herfindahl index) cannot readily be separately identified from visibility/elasticity aspects. The share of personal income taxes was found to primarily capture the visibility of direct taxes. The negative effect of the tax/expenditure ratio is also in line with previous findings, and appears to support the public choice argument for deficit illusion: over the long-run there is higher demand for government expenditures when a lower proportion is financed by taxes. This is consistent with the argument that voter-taxpayers do not fully perceive their future tax liabilities, posing a challenge to Ricardian Equivalence. It seems that in the UK case, governments relying more on indirect taxes than direct taxes have, *ceteris paribus*, been able to sustain higher government expenditures.

In Chapter 4, a public choice model of demand for public goods was applied to local government spending in the UK, using data for the community charge (poll tax) in 1991/92 and property tax (council tax) in 1993/94. We incorporated three measures of fiscal illusion; the flypaper effect, local accountability, and renter illusion. Our empirical results suggest a positive impact of median income on the demand for local government expenditures,

suggesting that local publicly-provided goods are normal goods, while the income elasticity is substantially lower than unity in all regression estimates. The price elasticity of demand for local public services could not be addressed explicitly, however, there is evidence for scale economies: local publicly-provided goods are quasi-private in nature.

Measures of fiscal illusion appeared to have similar responses for both the community charge and council tax. The results for a proxy for local accountability show that though only a proportion of the electorate are *legally* liable for local taxes, directly non-taxpaying voters are not necessarily unconcerned about local taxes and spending. Renter illusion finds no support under either of the local tax regimes. However, there is some evidence that voter-taxpayers in rented accommodation demand lower spending under the council tax compared with the community charge. This is consistent with renters being more strongly opposed to local spending than homeowners. Significant support was found for the so-called flypaper effect associated with government grants, which appeared to apply equally to (direct) grant and business rate revenues. The results show that such illusion persists under both local tax regimes, supporting the argument that if median voters have imperfect knowledge of how grants and local taxes interact, public perceptions of the Poll Tax would not reduce fiscal illusion.

In Chapter 5, we used the BSAS-1995 to analyse tax perceptions and their impact on preferences for government spending. An important contribution of this chapter was measuring tax perceptions by comparing the responses with the 'actual' tax-costs. Evidence suggests some forms of fiscal illusion, in the

sense that tax-payers appeared to be inconsistent in their responses regarding tax perceptions, and this inconsistency occurred more frequently in VAT. However, VAT is overestimated rather than being underestimated as argued in the fiscal illusion theory (see below).

We also related those misperceptions to the tax and expenditure preferences, using microeconometric techniques, to test whether they have any distortionary impact on the voter-taxpayers attitudes. Evidence showed that the tax preferences were essentially influenced by self interest, and the majority of respondents preferred a more progressive tax to other options. A negative relationship found between the perceived tax burdens and spending preferences, while the impact of tax perceptions is ambiguous. IT-perceptions did not have a significant influence on the demand for public spending, and a positive relationship found between VAT-perceptions and public spending. These results suggest that even though VAT-cost is overestimated by the majority of respondents, they still demand a higher public spending, and they expect the extra spending to be financed by other taxes (and probably by other tax-payers).

6.2 POLICY IMPLICATIONS

The three analysis summarised above have tested different types of fiscal illusions. The time-series analysis tests for the invisibility and elasticity hypotheses, and deficit illusion. There is strong evidence for invisibility of indirect taxes, in the sense that higher percentages of indirect taxes were associated with higher level of government expenditures: The governments' reliance on 'invisible' taxes provide an indirect evidence for the tolerance of

tax-payers to those particular taxes, since a public policy cannot be sustained against voters' preferences for long. It is also true that the share of indirect taxes has not been increasing over our period of investigation, and though we were unable to test explicitly, the marginal expenditure impact of raising 'invisible' taxes could be expected to fall further as the share of these taxes approaches its limit of unity.

Empirical results also support the argument that deficit finance is not quite visible to voters. However, a closer examination show that budget deficits are quite volatile over time, and the positive effect might be a utilisation of budget deficits in response to a shock which increases expenditure or reduces revenue. As the budget deficits have to be eventually compensated, we are wary to interpret the positive effect of budget deficits as a support for fiscal illusion. However, we do not deny it's extensive use by governments, particularly in response to short-term necessities.

The other type of fiscal illusion that we have attempted to test is the elasticity hypothesis. The empirical examinations of this hypothesis showed that the negative effect of the visible nature of income tax outweighs it's positive effect of the elastic nature. Despite that the personal income tax is generally assumed to be elastic, the empirical test (probably because of the limitation of the measure used in the regressions) did not support the elasticity hypothesis. The evidence rather support the argument that direct taxes are more visible to tax-payers, and may have a reductive effect on the demand for government expenditures. However, the evidence is weak.

We have been able to test the visibility hypothesis more directly by using survey data. The micro-data analysis supported some type of fiscal illusion, in the sense that tax-cost were misperceived, however, the nature of misperceptions were inconsistent with the public choice arguments that indirect taxes would be expected to be underestimated. This conflict may be explained by various reasons. Firstly, it may be argued that the fiscal illusion measures used in the time-series analysis were crude in nature, and testing fiscal illusion directly is best achieved by using survey evidence. In the former analysis, we have used some proxies to capture fiscal illusions, and this method did not allow us to test tax misperceptions directly. In the latter analysis, we have been able to compare the respondents' perceptions with their actual situations. On the other hand, the limitations of surveys cannot be denied either. Despite that the BSA surveys provide valuable sources of citizens' preferences and perceptions, the type of the questions asked in those surveys have considerable shortcomings (which we further discuss below).

Secondly, the BSA survey may not necessarily be representative for the whole period examined in the time-series analysis. There are reasons that voters' perceptions might have temporarily changed. One is the governments' heavy reliance on indirect taxes over the 1981 to 1995 period; and the other is the important changes concerning VAT prior to the BSAS-1995. In 1991 the VAT rate was raised from 15% to 17.5%; in 1993 a decision was taken to impose VAT on domestic fuel and energy which was previously zero-rated, and the proposal was to impose an initial rate of 8% and one year later move to the full rate of 17.5%. Considerable publicity and political debate followed this proposal might have induced citizens' reactions against VAT.

The combination of evidence from those different approaches seems to support the argument that there is a limit on the governments' ability to utilise fiscal illusion. We could argue that voters' perceptions may change over time under various policy instruments (e.g. increasing tax rates or imposing new taxes). Recent policies have apparently changed voters' perceptions, and reduced their tolerance to indirect taxes. It may also be argued that voters would be more reactive to current policies, and this intolerance may also diminish over time. Our evidence suggests that the sustainability of an aggregate level of tax revenues and expenditures depends on the nature of public policies, and voters' perceptions regarding those policies.

The cross-section analysis of local public spending provides quite strong support for the 'flypaper effect': Central grants, by obscuring perceptions of full costs of locally provided services, may lead local tax-payers to underestimate true tax-prices and therefore to increase demands for local spending. We have not be able to test this type of fiscal illusion by survey data, because the part of the BSAS-1995 concerning local tax and spending was not available at the time this thesis was completed. However, our findings regarding the flypaper effect are in line with Preston and Ridge (1995) who use the BSAS-1990 to analyse local public spending, though we apply different approaches.

Other types of fiscal illusions under the local government finance have not found support, and it seems that the introduction of poll tax to increase accountability did not work under the current grant system. One reason is that

the grant-induced fiscal illusion is quite strong, and any changes in the local tax regime without any reform of central grant regime does not seem to be effective. The other reason is the Standard Spending Assessment (SSA) which restricts local governments to increase spending beyond a limit. The current government's plan to give more flexibility to local governments over the local spending might induce higher local accountability, provided that they pay for the 'excess' amount (of spending beyond SSA) by local taxes.

6.3 FURTHER RESEARCH

This study has concentrated on fiscal illusion and public spending in the UK using a variety of tools of analysis. However, some interesting research topics have remained outside the scope of this work. One is the micro-data analysis of fiscal illusion at the *local* level. This would allow a useful comparison of aggregated and survey data when the survey results become available. We have limited our analysis to examining the effect of fiscal illusion across localities for two cross-sections (1991/92 and 1993/94). The issue of accountability under various local tax regimes could further be analysed using panel data for local governments to the extent that data availability permits.

Although the BSA survey conducted in 1995 have provided quite useful information of voters' tax preferences and perceptions, we also observe considerable limitations of the questions asked in the survey. One is that the questions regarding the respondents' *perceptions* of the best and worst tax (for their households) were incomplete. It would be useful to know the second choice or a fuller *ranking* of respondents' perceptions, so that their relative

perceptions of various tax categories could be identified (A second choice was asked for in the question regarding their *preferences*).

A second limitation is that the questions contained the options of 'a basic rate' and 'a flat rate' income tax were liable to be confused by respondents. It would be useful to know the respondents' view on these options, because the consequences of an increase in those rates would be different for each respondent. Other questions regarding the respondents' tax-paying status could be included. The options for the questions regarding tax-costs were also limited, and similar options were offered both for income tax and VAT. However, those two taxes may not be (in fact they are not) identical for all respondents. These limitations constrained our analysis. Future surveys devoted to 'attitudes to taxation and public spending' could be improved by asking more accurate questions to extract data which is better comparable to the respondents' actual status.

In conclusion, the time-series analysis of general government expenditure and the cross-section analysis of local public spending produced interesting evidence of fiscal illusion. It also appeared, however, that the use of this evidence, *per se*, may be misleading in drawing future prospects for tax and expenditure policies. Micro-data analysis of fiscal perceptions is a potentially important means of determining policy instruments.

APPENDIX 3.1

The Derivation of Equation (3.3)

$$G_i = a\ Y_i^{\alpha}\ Pgi^{\beta}\ ,\ i=1,2,...,N \qquad (3A1.1)$$

where $G_i = G/N^{\eta}$. Replacing G_i,

$$G = a\ Y_i^{\alpha}\ Pgi^{\beta}\ N^{\eta} \qquad (3A1.2)$$

Multiplying both sides by P_{gi},

$$E = a\ Y_i^{\alpha}\ Pgi^{\beta+1}\ N^{\eta} \qquad (3A1.3)$$

where E is the demand for government expenditures in nominal terms, and P_{gi} is defined as $T_i\ C\ N^{\eta}$.

$$E = a\ Y_i^{\alpha}\ (T_i\ C\ N^{\eta})^{\beta+1}\ N^{\eta} \qquad (3A1.4)$$

$$E = a\ Y_i^{\alpha}\ T_i^{(\beta+1)}\ C^{(\beta+1)}\ N^{\eta(\beta+1)}\ N^{\eta} \qquad (3A1.5)$$

Introducing the aggregated income into 3A1.5,

$$E = a\ (Y_iN)^{\alpha}\ \ Ti^{(\beta+1)}\ C^{(\beta+1)}\ N^{\eta(\beta+1)}\ N^{\eta}\ N^{-\alpha} \qquad (3A1.6)$$

where $T_i = 1/N$. Substituting T_i in 3A1.6,

$$E = a\ Y^{\alpha}\ \ N^{-(\beta+1)}\ C^{(\beta+1)}\ N^{\eta(\beta+1)}\ N^{\eta}\ N^{-\alpha} \qquad (3A1.7)$$

Rearranging 3A1.7,

$$E = a\ Y^{\alpha}\ \ C^{(\beta+1)}\ N^{\eta(\beta+1)-(\beta+1)+\eta-\alpha} \qquad (3A1.8)$$

Deviding E by C,

$$G = a\ Y^{\alpha}\ \ C^{\beta}\ N^{(\beta+1)(\eta-1)+\eta-\alpha} \qquad (3A1.9)$$

This is criticised for being inconsistent with the underlying demand-theoretic formulation, and it is argued that an appropriate application of demand theory would require an appropriate explanatory price variable, which is the relative price ratio $P_r\ (= C/P_x)$. Inserting P_r into 3A1.9.

$$G = a\ Y^{\alpha}\ P_r^{\beta}\ N^{(\beta+1)(\eta-1)+\eta-\alpha} \qquad (3A1.10)$$

This is the model appeared in Chapter 3 as (3.3).

APPENDIX 3.2

Time-series Analysis

The standard ordinary least squares (OLS) estimation assumes a stationary data generating process. However, if the stationarity of data is not held, the standard diagnostic tests may fail, and the results may not be interpreted confidently. As Granger and Newbold (1974) argued, the dependent variable and one or more of the independent variables are non-stationary, then the results may be spurious, and the standard tests may not be reliable. Since the mid-1980s, time-series analysis has required testing the order of integration of variables.

Stationarity of the Variables

A time series is stationary, briefly, if its mean, variance and autocovariances are independent of time. If these properties are changing over time, it is said that the time series has a unit root. In other words, a "shock" or "innovation" has a sustained effect in the unit root case and an effect that diminishes with time in the stationary case (see Holden and Perman, 1994: 53).

Let a first order autoregressive process [AR(1)] start at $t=0$:

$$Y_t = r\, Y_{t-1} + u_t\,,\ t=1,2,... \qquad (3A2.1)$$

If $r<1$, Y_t is a stationary series, otherwise Y_t is said to have a unit root, meaning that it is a non-stationary series. Dickey and Fuller (1979) show that in a process such as (3.1), the standard critical values may be misleading for unit root tests[1], and propose Dickey-Fuller (DF) critical values. In practice, subtracting Y_{t-1} from both sides of (3A2.1), and adding constant, time trend and lagged dependent variables to the right, the following specification is estimated to determine stationarity:

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[1] This is because of the standard assumption of normality collapses when the series has a unit root.

$$\Delta Y_t = r_0 + r_1 Y_{t-1} + r_2 T + \sum r_{3i} \Delta Y_{t-i} + u_t, \; t=1,2,\ldots \; and \; i=1,2,\ldots n \qquad (3A2.2)$$

where T is a time trend, and n is the number of lags for the dependent variable. Using ADF[2] critical values, if $r_1=0$, then Y_t is said to have a unit root (non-stationary). The alternative hypothesis is $r_1<0$, meaning that the series is stationary. This is a one sided test, as the sign is expected to be negative and significantly different from zero. The number of lags (n) is determined by including sufficient lagged values of dependent variable to obtain white noise residuals[3]. The time trend is included to control for trend stationary variables. Sometimes a variable may be stationary around a time trend although non-stationary by itself.

If the series in question are stationary, they can be used in any standard econometric estimation. However, if they are non-stationary, any empirical analysis with those series may suffer from the problem of spurious regressions. A solution is to formulate the regressions in sufficiently differenced series to obtain stationary series[4]. Although using first differences tends to induce a stationary process, the long-run relationships between the variables, if any exist, may not be identified appropriately; cointegration techniques have been introduced to test for a long-run relationship under these circumstances.

The two well-known methods of cointegration are Engle and Granger (1987) and Johansen (1988). In general, a vector of variables is said to be cointegrated if at least one linear combination of the variables is stationary. If so, an error

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[2] The augmented Dickey-Fuller (ADF) critical values are used when the number of lagged dependent variable is increased in the regression.

[3] The number of n is increased up to the point that the null hypothesis of "no autocorrelation" is accepted for the residuals from the regression. An LM test is generally used to test this.

[4] The first differences of an I(1) series, for instance, is likely to be stationary. This is held to be true for the majority of economic variables.

correction mechanism (ECM) may be used to identify the short-run dynamics. Engle and Granger (1987) show that all the variables have to be integrated to the same order to test for cointegration. In addition, variables which are already I(0) may be included in the ECM. The economic interpretation of this may be that there is no long-run relationship between those variables integrated to different orders. However, a short-run relation may be identified in the ECM.

The approaches by Engle and Granger (1987) and Johansen (1988) use different econometric techniques. Specifically, the former uses a single equation, assuming that there is only one endogenous variable, and all other variables are exogenous. The latter assumes that all the variables are endogenous and uses a system of equations. The two methods will be explained briefly below.

The Engle-Granger (E-G) Approach

Let Y_t be a vector of variables with dimension (n x 1), comprising series each of which may be transformed into stationary processes. The vector of variables is said to be cointegrated if there exists at least one n-element vector α_i such that a linear combination of those variables is stationary, i.e.

$$\alpha_i' Y_t = u_t \sim I(0) \qquad (3A2.3)$$

where α_i is called a cointegrating vector. Any element of α_i may be taken and equated to one, i.e. it may be normalised so that the chosen element is 1, and the outcome will look like a regression model. Let the first element be 1,

$$\alpha_i' Y_t = Y_{1t} + \alpha_2 Y_{2t} + \ldots + \alpha_i Y_{kt} = u_t$$

is a cointegrating regression. This may be rearranged as

$$Y_{1t} = - \alpha_2 Y_{2t} - \ldots - \alpha_i Y_{kt} + u_t \qquad (3A2.4)$$

meaning that Y_1 is the dependent variable in a single equation, where u_t are the residuals. This regression may be tested for cointegration using the residuals. To do that, the residuals will be tested for stationarity, using the same method explained above. The null hypothesis is that u_t has a unit root, implying no cointegration. If the null hypothesis is rejected, then u_t is said to be stationary, implying cointegration. The critical values are not the same as those applied to the raw series in unit root tests as they depend on the number of integrated regressors in the cointegrating regression[5]. Engle and Granger (1987) present some summary tabulations of this statistic for the bivariate case although more extensive tables appear in Engle and Yoo (1987).

The cointegration technique is associated with the long run or equilibrium properties posited by economic theory. Engle and Granger (1987) have also proved that if two or more series are I(1) and cointegrated then there exists an error correction mechanism (ECM) of the model that represents the dynamic process by which variables move toward equilibrium. From (3.4), the following ECM model can be identified:

$$\Delta Y_{1t} = \alpha_0 + \sum \alpha_{1i} \Delta Y_{1,t-i} + \sum \alpha_{2i} \Delta Y_{2,t-i} + \ldots + \sum \alpha_{ki} \Delta Y_{k,t-i} + \beta u_{t-i-1} + \varepsilon_t \qquad (3A2.5)$$

where i is the number of lags, and β is the speed of adjustment coefficient. If the variables are cointegrated, β and/or some of the αs should be significantly different from zero.

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[5] The problem is that the u_t is generated from a regression equation (OLS) which gives the coefficients that minimize the sum of squared residuals. Since the residual variance is made as small as possible, the procedure is prejudiced toward finding a stationary error process. Thus, the test for stationarity of estimated u_t must reflect this fact (Enders, 1995: 375).

The differenced terms in the ECM describe the short run dynamic relationship given here by α_{ki}, whereas the long run information is picked up by the error term u_t. β quantifies the extent to which the series in the cointegrating regression diverge from their long run equilibrium. The negative sign of β signifies that equilibrium in the previous period will be corrected for in the following period as the process adjusts back to equilibrium.

The Johansen Approach

The Johansen approach allows one to estimate all possible cointegrating vectors between the set of variables. Let a VAR model be:

$$Y_t = A_1 Y_{t-1} + \ldots + A_k Y_{t-k} + u_t \qquad (3A2.6)$$

where Y_t, Y_{t-1}, ..., Y_{t-k} are vectors of current and lagged values of n variables which are I(1) in the model; A_1,..., A_k are matrices of coefficients with (n x n) dimensions; and u_t is a vector of random errors. The number of lagged values, in practice, is determined in such a way that the error terms are not significantly autocorrelated. Adding Y_{t-1}, ..., Y_{t-k} and $A_1 Y_{t-2}$, ... , A_{k-1} Y_{t-k} to both sides and rearrange terms, the VAR model becomes:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \ldots + \Gamma_{k-1} \Delta Y_{t-k+1} + \Pi Y_{t-k} + u_t \qquad (3A2.7)$$

where $\Gamma_j = -(I - A_1 - \ldots - A_j)$; $(j = 1, 2, \ldots, k-1)$ and $\Pi = -(I - A_1 - \ldots - A_k)$. I is identity matrix. The rank of the matrix of coefficients, Π, gives the number of long-run relationships between the variables of the system. Three possible cases are stated by Johansen and Juselius (1990):

If the rank equals n [$r(\Pi)=n$], meaning that Π has full rank, then any linear combination of the I(1) series is stationary. If the rank equals zero [$r(\Pi)=0$, i.e. Π is a null matrix], then there is no cointegrating relationship. Hence, a long-run relationship is unlikely, although a short-run relationship may be identified by the first differences. If the rank is between zero and n [$0<r(\Pi)<n$], then there are matrices α and β with (n x r) dimension, so that it is possible to represent $\Pi=\alpha\beta'$. β is the cointegrating matrix which has the property to transform $\beta' Y_t$ into a stationary process even though Y_t is not stationary by itself. α measures the speed of the adjustment when there are disturbances in the equilibrium relationship.

The rank of Π , that is the number of cointegrating relationships r, is determined by testing whether its eigenvalues (λ_j) are statistically different from zero. Johansen (1988) and Johansen and Juselius (1990) propose using the eigenvalues of Π, ordered from the largest to the smallest, to compute the maximal-eigenvalue and trace statistics. The maximal-eigenvalue statistic (λ_{max}) is computed by the following formula:

$$\lambda_{max} = -T \ln (1-\lambda_{r+1}),\ r=0,\ 1,\ 2,\ldots,\ n-2,\ n-1.$$

where T is sample size. This statistic tests that there are r cointegrating vectors against the alternative that $r+1$ exist. The null and alternative hypotheses are:

H_0: r=0	H_1: r=1
H_0: r≤1	H_1: r=2
H_0: r≤2	H_1: r=3
...	...

The trace statistic is computed by the following formula:

$\lambda_{trace} = -T\sum ln\ (1-\lambda_j),\ \ j=r+1,\ldots,\ n-1.$

and the hypotheses are:

H_0: r=0	H_1: r≥1
H_0: r≤1	H_1: r≥2
H_0: r≤2	H_1: r≥3
...	...

The usual procedure is to begin by testing the null hypothesis that there are no cointegrating vectors. If it can be rejected, the alternative hypotheses (i.e. r≤1, r≤2,...) are to be tested sequentially. On the other hand, if $r=0$ cannot be rejected in the first place, then there is no cointegrating relationship between the variables, and the procedure stops.

Asymptotic critical values are provided in Osterwald-Lenum (1992). The maximal-eigenvalue statistic is a test of the significance of the largest λ_r, where the trace statistic tests the null against the unrestricted alternative. These two statistics do not always produce the same results. Another problem is the small samples. Reimers (1992) suggests that in the case of small samples, the Johansen procedure over-rejects when the null is true. Thus, the number of parameters to be estimated in the model are also taken into account, and an adjustment is made for degrees of freedom by replacing T by $T-nk$, where n is the number of variables in the model and k is the number of lags in the model. However, this correction is not a clear cut solution. It is also suggested that the trace test shows more robustness to both skewness and excess kurtosis in the residuals than the maximal eigenvalue test.

APPENDIX 5.1

The questions selected from British Social Attitudes Survey-1995 are given below (the answers *none, don't know,* or *refusal/NA* are ignored):

Taste Variables: Paper readers (Does the respondent normally read any daily morning newspaper: yes=1, no=0), Sex (male=1, female=0), Marital Status (married=1, others=0), Age (stated by the respondents), Occupation (stated by the respondents: in paid work for at least ten hours in week, unemployed, wholly retired, etc.), Children aged 5-15 (is derived from the members of the family and their age: it takes the value of 1 if there is at least one child aged 5-15 in the household, 0 otherwise).

Q35. If there were a general election tomorrow, which political party do you think you would be most likely to support?

1. Conservative
2. Labour
3. Others

Q1015. Which of the letters on this card represents the total income of your household from all sources before tax?

Weekly Income Before Tax	Annual Income Before Tax
Less than £77	Less than £3,999
£78-£115	£4,000-£5,999
£116-£154	£6,000-£7,999
£155-£192	£8,000-£9,999
£193-£230	£10,000-£11,999
£231-£289	£12,000-£13,999
£290-£346	£15,000-£17,999
£347-£385	£18,000-£19,999
£386-£442	£20,000-£22,999
£443-£500	£23,000-£25,999
£501-£558	£26,000-£28,999
£559-£615	£29,000-£31,999
£616-£673	£32,000-£34,999
£674-£730	£35,000-£37,999
£731-£788	£38,000-£40,999
£789 or more	£41,000 or more

Q65. Suppose the government had to choose between the three options on this card. Which do you think it should choose?

1.Reduce taxes and spend less on health. education and social benefits,
2.Keep taxes and spending on these services at the same level as know.
3.Increase taxes and spend more on health, education and social benefits.

Q575-Q577. Generally, how would you describe levels of taxation? (for those with high incomes. middle incomes, and low incomes).

1.Much too low
2.Too low
3.About right
4.Too high
5.Much too high

Q578. Among which group would you place yourself...

1.high income
2.middle income
3.low income

Q589. About how much do you think that an extra one penny in the pound on the basic rate of income tax would cost your household?

1. Nothing
2. <£1 per week - <£50 per year
3. £1-2 per week - £50-100 per year
4. £2-3 per week - £100-£150 per year
5. >£3 per week - >£150 per year

Q590. About how much do you think that a one percentage point increase in the rate of VAT (that is from 17.5 percent to 18.5 percent) would cost your household?

1. Nothing
2. <£1 per week - <£50 per year
3. £1-2 per week - £50-100 per year
4. £2-3 per week - £100-£150 per year
5. >£3 per week - >£150 per year

626. If these were the only options for the government, which one do you think that it should choose? (Q629. And which one do you think should be the government's second choice?)

1. Put up income tax for all taxpayers, by 1p in the pound to 26p,
2. Put income tax up only for higher taxpayers, but by 5p in the pound, to 45p,
3. Raise VAT by one percent to 18.5 percent on all taxable goods and services.

Q632. Which one these three would leave you and your family best off?

1. A penny in the pound for all taxpayers
2. Five pence in the pound for higher taxpayers
3. Raise VAT by one percent

Q635. Which one these three would leave you and your family worst off?

1. A penny in the pound for all taxpayers
2. Five pence in the pound for higher taxpayers
3. Raise VAT by one percent

APPENDIX 5.2

The relevant information is taken from the British Tax System for the 1994-95 fiscal year. The structure of the income tax liabilities and allowances are as follows:

Income tax bands:

1-3,000	(lower rate band)	20%
3,001-23,700	(basic rate band)	25%
23,700+	(higher rate band)	40%

Allowances:

Personal allowance	3,445
Married couple's allowance	1,720
Age allowance:	
Personal (aged 65-74)	4,200
Personal (aged 75+)	4,370
Married couple's (aged 65-74)	2,665
Married couple's (aged 75+)	2,705
Income limit for age-related allowances	14,200

Taxable Income for Various Groups

Personal Characteristics	No Income Tax	20%	25%	40%
Single	0-3,445	3,445-6,445	6,445-27,145	27,145+
Married	0-5,165	5,165-8,165	8,165-28,865	28,865+
Single (65-74)	0-4,200	4,200-7,200	7,200-27,900	27,900+
Married (65-74)	0-6,865	6,865-9,865	9,865-30,565	30,565+
Single (75+)	0-4,370	4,370-7,370	7,370-28,070	28,070+
Married (75+)	0-7,075	7,075-10,075	10,075-30,775	30,775+

Table 5A.1 The extra costs from an extra one penny in the pound on the basic rate of income tax for a single person (aged under 65)

Income Groups	IT(1) Income Tax (Basic Rate=25%)	IT(2) Income Tax (Basic Rate=26%)	Extra cost [IT(2)-IT(1)]	Coding
-3999	111	111	0	1
5000	311	311	0	1
7000	739	744	5	2
9000	1239	1264	25	2
11000	1739	1784	45	2
13500	2364	2434	70	3
16500	3114	3214	100	3
19000	3739	3864	125	4
21500	4364	4514	150	4
24500	5114	5294	180	5
27500	5917	6124	207	5
30500	7117	7324	207	5
33500	8317	8524	207	5
36500	9517	9724	207	5
39500	10717	10924	207	5
41000+	11317	11524	207	5

The average of each income band is used in computations, except the first band. The income level for the first band is the upper boundary of the group, however, this does not make any difference as it is in the lower rate band.

Table 5A.2 Coding of extra cost for various groups of taxpayers

Income	Single	Married	Single (aged 65-74)	Married (aged 65-74)	Single (aged 75+)	Married (aged 75+)
-3999	1	1	1	1	1	1
5000	1	1	1	1	1	1
7000	2	1	1	1	1	1
9000	2	2	2	1	2	1
11000	2	2	2	2	2	2
13500	3	2	3	2	3	2
16500	3	3	3	3	3	3
19000	4	4	4	4	4	4
21500	4	4	4	4	4	4
24500	5	5	5	5	5	5
27500	5	5	5	5	5	5
30500	5	5	5	5	5	5
33500	5	5	5	5	5	5
36500	5	5	5	5	5	5
39500	5	5	5	5	5	5
41000+	5	5	5	5	5	5

The extra cost for high income groups does not change a lot, as the rate higher band is assumed to rem the same while the basic rate increases one penny in pound. The major difference between the various groups of people is that some taxpayers shift to a lower rank due to age or married couple's allowance:

Table 5A.3 Income groups and expenditures subject to VAT (£)

Income (FES)	Income (BSAS-1995)	Expenditure 1 (exc. domestic fuel and energy)		Expenditure 2 (inc. domestic fuel and energy	
		FES	BSAS-1995	FES	BSAS-199
less than 4,003	less than 3,999	2,090	2,090	2,556	2,5
4,004-6,083	4,000-5,999	2,922	2,922	3,468	3,4
6,084-8,423	6,000-7,999	4,335	4,335	4,923	4,9
8,424-11,595	8,000-9,999	5,792	5,792	6,408	6,4
-	10,000-11,999	-	6,715	-	7,3
11,596-15,131	12,000-13,999	7,638	7,638	8,303	8,3
15,132-19,083	15,000-17,999	8,827	8,827	9,483	9,4
-	18,000-19,999	-	9,859	-	10,5
19,084-23,659	20,000-22,999	10,891	10,891	11,598	11,5
23,660-28,911	23,999-25,999	11,636	11,636	12,371	12,3
-	26,000-28,999	-	13,144	-	13,9
28,912-37,855	29,000-31,999	14,652	14,652	15,446	15,4
-	32,000-34,999	-	16,964	-	17,8
-	35,000-37,999	-	19,276	-	20,1
37,856 or more	38,999-40,999	21,588	21,588	22,551	22,5
-	41,000 or more	-	21,588	-	22,5

FES: Family Expenditure Survey
BSAS: British Social Attitudes survey

Table 5A.4 The extra cost from a one percentage point increase in the rate of VAT

Income	Expenditure Subject to VAT	VAT(1) (17.5%)	VAT(2) (18.5%)	Extra Cost [VAT(2)-VAT(1)]	Coding
-3999	2090	366	387	21	2
5000	2922	511	541	30	2
7000	4335	759	802	43	2
9000	5792	1014	1072	58	3
11000	6715	1175	1242	67	3
13500	7638	1337	1413	76	3
16500	8827	1545	1633	88	3
19000	9859	1725	1824	99	3
21500	10891	1906	2015	109	4
24500	11636	2036	2153	117	4
27500	13144	2300	2432	132	4
30500	14652	2564	2711	147	4
33500	16964	2969	3138	169	5
36500	19276	3373	3566	193	5
39500	21588	3778	3994	216	5
41000+	21588	3778	3994	216	5

The domestic fuel and energy is not included in expenditures.

Table A5.5 VAT and Income Tax Costs (£)

Income	One penny in the pound for all taxpayers						
	VAT 1%	Single (S)	Married (M)	S (65-74)	M (65-74)	S (75+)	M (75+
-3999	26	6	0	0	0	0	
5000	35	16	0	8	0	6	
7000	49	36	18	28	1	26	
9000	64	56	38	48	21	46	
11000	74	76	58	68	41	66	
13500	83	101	83	93	66	91	
16500	95	131	113	123	96	121	
19000	105	156	138	148	121	146	1
21500	116	181	163	173	146	171	1
24500	124	211	193	203	176	201	1
27500	139	241	223	233	206	231	2
30500	154	271	253	263	236	261	2
33500	178	301	283	293	266	291	2
36500	202	331	313	323	296	321	2
39500	226	361	343	353	326	351	3
41000+	226	376	358	368	341	366	3

The domestic fuel and energy is included in expenditures.

Table A5.6 Tax Perceptions (Descriptive Statistics)

	Mean (t-stat.)	Median	Skewness	Kurtosis
IT-Cost Perc.	0.08 (1.22)	0.000	0.04	0.
IT-Cost Perc. (-10%)	0.08 (1.22)	0.000	0.04	0.
IT-Cost Perc. (+10%)	0.05 (0.68)	0.000	0.02	0.
VAT-Cost Perc.	0.46 (7.70)	0.000	-0.12	-0.
VAT-Cost Perc. (-10%)	0.50 (8.35)	0.000	-0.14	-0.
VAT-Cost Perc. (+10%)	0.38 (6.06)	0.000	-0.11	-0.

The values in the parantheses are t-statistics for testing whether the mean is significantly different from zero. The null hypothesis (H_0: $E(Z_i)=0$) is accepted for all IT cases, and rejected for all VAT cases (for the details of the t-test, see Appendix 5.3).

Table A5.7 The stability of IT- and VAT-cost perceptions

	IT-Cost Perceptions			VAT-Cost Perceptions		
	R-C	R-C (-10%)	R-C (+10%)	R-C	R-C (-10%)	R-C (+10
-4	5 (0.6)	5 (0.6)	6 (0.7)	-	-	
-3	26 (3.2)	26 (3.2)	29 (3.6)	13 (1.6)	13 (1.6)	18 (2
-2	64 (7.9)	64 (7.9)	67 (8.2)	38 (4.7)	33 (4.1)	41 (5
-1	131 (16.1)	131 (16.1)	127 (15.6)	125 (15.4)	125 (15.4)	136 (16
0	322 (39.6)	322 (39.6)	331 (40.7)	247 (30.4)	248 (30.5)	249 (30
1	155 (19.1)	155 (19.1)	145 (17.8)	216 (26.6)	200 (24.6)	208 (25
2	70 (8.6)	70 (8.6)	68 (8.4)	125 (15.4)	145 (17.8)	112 (13
3	31 (3.8)	31 (3.8)	31 (3.8)	49 (6.0)	49 (6.0)	49 (6
4	9 (1.1)	9 (1.1)	9 (1.1)	-	-	
Total	813 (100)	813 (100)	813 (100)	813 (100)	813 (100)	813 (1

R: The code chosen by respondents; C: The code assigned from the computations

APPENDIX 5.3

The Formulation of t-Test

Let X_i and Y_i be tax-payer i's IT and VAT misperceptions, respectively, where i=1,2,...,813. The following dummy variables are derived from $PERC_{IT}$ (IT perceptions) and $PERC_{VAT}$ (VAT perceptions):

Overestimation

$X_i =$ 1 if $PERC_{IT} > 1$,

0 otherwise

$Y_i =$ 1 if and $PERC_{VAT} > 1$,

0 otherwise

Then, $Z_i = X_i - Y_i$ is computed, and the probabilities are taken as follows:

$$E(Z_i) = E(X_i) - E(Y_i)$$

and H_0: $E(Z_i) = 0$ is tested by t-statistics as follows:

$$t = \frac{\bar{Z}}{S_Z / \sqrt{n}}$$, where $n = 813$, $\bar{Z} = 1/813 \sum Z_i$, and $S_Z = [\frac{1}{812} \sum (Z_i - \bar{Z})^2]^{1/2}$.

If the null hypothesis (H_0) is accepted, then there is no significant difference between IT and VAT overestimation. On the other hand, if the null hypothesis is rejected, then the overestimation of IT and VAT are significantly different from each other. The same procedure was applied to the underestimation of those taxes ($PERC_{IT} < -1$ and $PERC_{VAT} < -1$).

APPENDIX 5.4

The Probabilistic-Choice Models:

The information about individuals demand for government-provided goods revealed through questionaire are qualitative, as mentioned before. referring only to whether the consumer would demand more, less. or the same levels of government expenditures (see Blundell, 1988). These type of dependent variables are defined by discrete values which are, in the simplest binary case, denoted by zero and unity. The dependent variable may take more than two values sometimes, such as ordered categorical variables. In microeconometric modelling, the probabilities of each outcome are examined by looking at possible explanatory factors which may effect the parameters of the distribution underlying these probabilities. Therefore, likelihood methods are used generally in microeconometric analyses.

To explain some econometric issues, let a standard regression be as follows:

$$Y_i = \beta' X_i + u_i$$

where $E(u_i)=0$. Y_i is a binary dependent variable taking the value of 1 if a certain event occurs or a certain option is chosen by individual i (and the value of 0 otherwise), and X_i is a vector of exogenous explanatory variables relating to the ith individual in the sample. In other words, the probability that Y_i will take the value of 1 given X_i is equal to $\beta' X_i$, and u_i represents the unobservable taste variables for individual i. This error term may not be random, because it

can take only two values, ie. $1- \beta' X_i$ when $Y_i=1$ and $-\beta' X_i$ when $Y_i=0$, and hence the ordinary least squares (OLS) estimates of β will not be efficient.[1]

The Probit Model

Instead, the logit and probit models are used as microeconometric techniques to overcome this problem. Let the probability of an event be a function of explanatory variables as follows:

$$P_i = p(y_i=1) = F(x'_i \beta)$$

where x_i is a vector of exogenous variables relating to the *i*th individual in the sample. In these models, F is required to lie in the interval (0,1) and be increasing in $(x'_i \beta)$, natural choices for F will be cumulative distribution functions, F being the standard normal distribution function results in the probit model, and a logistic distribution function results in the logit model (see Blundell, 1996: 513).

The Ordered Probit Model

Some multinomial-choice variables, such as opinion surveys, are inherently ordered, and although the outcome is discrete, the multinomial probit or logit models would fail to account for the ordinal nature of the dependent variable. If the responses, for example, are coded 0, 1, 2, 3, 4,... , a linear regression would treat the difference between 4 and 3 the same as that between 3 and 2, while in fact they are only rankings. The ordered probit and logit models have come into wide use as a solution for analysing such responses (see Greene, 1993: 672-6).

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[1] For more information about the discrete regression models, see Maddala (1983:13-57).

In the same manner as the binomial probit model, let a standard regression be as follows:

$$Y_i = \beta' X_i + u_i$$

where Y_i is unobserved. What we do observe is

$$\begin{aligned}
&Y_i^* = 0 && \text{if } Y_i \leq 0,\\
&Y_i^* = 1 && \text{if } 0 < Y_i \leq \mu_1,\\
&Y_i^* = 2 && \text{if } \mu_1 < Y_i \leq \mu_2,\\
&\vdots\\
&Y_i^* = j && \text{if } \mu_{j-1} \leq Y_i .
\end{aligned}$$

where μs are unknown parameters to be estimated with β. The respondents have their own intensity of feelings, which depends on certain measurable factors, X_i, and certain unobservable factors, u_i. In principle, they could respond to the questionnaire with their own Y_i if asked to do so. Given only the available answers, they choose the cell that most closely represents their own feelings on the question. We assume that u_i is normally distributed across observations. For the same reason as in the binomial probit model (which is the special case of $j = 1$), we normalise the mean and variance of u_i to zero and 1 (the model can also be estimated with a logistically distributed disturbance).

DATA ANNEX TABLE 1: DATA FOR THE UK (1955-94)

Year	E	Y	Pr	N	T	H5	H8	H12	PIT	SSC	ET	CIT	NTR	R
1955	98099	203460	0.762	50946	1.006	0.276	0.142	0.125	0.211	0.094	0.434	0.139	0.121	98727
1956	98318	206077	0.770	51184	0.978	0.282	0.144	0.126	0.221	0.098	0.442	0.122	0.118	96127
1957	97073	209566	0.778	51430	1.003	0.279	0.146	0.128	0.229	0.094	0.435	0.127	0.117	97365
1958	97585	209274	0.782	51652	1.017	0.268	0.145	0.128	0.226	0.115	0.417	0.123	0.119	99213
1959	100688	217789	0.790	51956	1.002	0.270	0.147	0.128	0.227	0.115	0.420	0.112	0.126	100894
1960	104314	230004	0.799	52372	0.971	0.284	0.155	0.134	0.246	0.113	0.432	0.076	0.133	101238
1961	109648	236204	0.804	52807	0.978	0.280	0.157	0.136	0.252	0.120	0.424	0.077	0.127	107193
1962	113104	239719	0.811	53292	1.000	0.273	0.157	0.135	0.251	0.122	0.414	0.086	0.126	113081
1963	116965	249257	0.818	53625	0.960	0.276	0.158	0.136	0.251	0.130	0.418	0.074	0.127	112282
1964	120820	263103	0.827	53991	0.969	0.282	0.161	0.138	0.253	0.133	0.423	0.057	0.135	117071
1965	126033	270756	0.839	54350	0.987	0.287	0.167	0.145	0.270	0.138	0.421	0.044	0.127	124445
1966	130432	275931	0.848	54643	1.000	0.287	0.169	0.147	0.274	0.134	0.417	0.040	0.134	130490
1967	143379	281976	0.857	54959	0.974	0.280	0.167	0.146	0.272	0.127	0.411	0.058	0.132	139721
1968	150730	294325	0.880	55214	0.988	0.279	0.168	0.145	0.268	0.128	0.411	0.058	0.136	148994
1969	150007	301610	0.899	55461	1.056	0.285	0.172	0.147	0.270	0.118	0.419	0.054	0.139	158396
1970	151167	307684	0.905	55632	1.078	0.280	0.174	0.148	0.276	0.125	0.411	0.060	0.128	162907
1971	152545	312855	0.894	55928	1.035	0.279	0.177	0.151	0.284	0.126	0.402	0.057	0.131	157958
1972	159654	321555	0.883	56097	0.967	0.274	0.174	0.149	0.275	0.139	0.398	0.053	0.136	154310
1973	169270	345816	0.902	56223	0.932	0.272	0.175	0.154	0.288	0.145	0.386	0.051	0.130	157715
1974	179872	340683	0.926	56236	0.914	0.261	0.182	0.164	0.309	0.148	0.348	0.059	0.135	164399
1975	183578	338138	0.921	56226	0.900	0.272	0.200	0.185	0.349	0.159	0.332	0.050	0.110	165232
1976	186475	347129	0.931	56216	0.890	0.273	0.201	0.186	0.348	0.168	0.330	0.041	0.113	166043
1977	180942	356101	0.937	56190	0.924	0.269	0.188	0.172	0.319	0.167	0.354	0.051	0.109	167149
1978	188795	365920	0.915	56178	0.896	0.271	0.185	0.166	0.308	0.160	0.368	0.056	0.108	169116
1979	193048	375974	0.924	56240	0.921	0.283	0.182	0.156	0.285	0.152	0.406	0.052	0.104	177892
1980	195796	368216	0.942	56330	0.922	0.279	0.178	0.151	0.275	0.150	0.406	0.056	0.112	180558
1981	198053	364055	0.960	56352	0.941	0.286	0.177	0.148	0.267	0.148	0.421	0.052	0.112	186430
1982	201733	370493	0.970	56318	0.946	0.285	0.174	0.145	0.265	0.152	0.422	0.054	0.107	190739
1983	208911	384351	0.970	56377	0.926	0.286	0.173	0.142	0.258	0.163	0.424	0.055	0.101	193533
1984	217057	392067	0.967	56506	0.923	0.283	0.171	0.140	0.252	0.161	0.423	0.057	0.107	200316
1985	219401	407844	0.972	56685	0.942	0.280	0.168	0.137	0.249	0.160	0.420	0.062	0.109	206712
1986	218676	424214	0.991	56852	0.942	0.287	0.172	0.143	0.258	0.166	0.426	0.060	0.089	205944
1987	219398	443817	0.994	57009	0.959	0.288	0.171	0.143	0.256	0.163	0.430	0.068	0.084	210390
1988	216271	465746	0.993	57158	1.012	0.288	0.173	0.145	0.258	0.164	0.428	0.073	0.077	218839
1989	218256	476228	0.992	57358	1.013	0.284	0.173	0.146	0.263	0.164	0.420	0.080	0.073	221016
1990	224194	478886	1.000	57561	0.971	0.271	0.179	0.152	0.283	0.158	0.388	0.069	0.102	217642
1991	223739	468913	1.004	57808	0.938	0.281	0.185	0.155	0.284	0.162	0.402	0.059	0.092	209936
1992	234464	466456	1.001	58006	0.856	0.289	0.188	0.159	0.292	0.166	0.408	0.052	0.082	200702
1993	242429	477125	0.996	58191	0.822	0.287	0.184	0.154	0.279	0.173	0.412	0.050	0.086	199343
1994	248217	496377	1.005	58395	0.844	0.283	0.182	0.151	0.278	0.171	0.407	0.057	0.087	209509

E: General government expenditures at 1990 prices
Y: Gross domestic product at 1990 prices
Pr: Relative price (public sector deflator/GDP deflator)
N: Population
T: The ratio of revenues to expenditures
H5, H8, H12: Herfindahl indexes computed by five, eight, and twelve revenue categories, respectively.

R: Total government revenues
PIT: Personal income tax/R
SSC: Social security contributions/R
ET: Expenditure tax/R
CIT: Corporate income tax/R
NTR: Non-tax revenues/R

Source: Economic Trends and Inland Revenue Statistics (H.M.S.O.)

DATA ANNEX TABLE 2: LOCAL GOVERNMENTS (1991/92 FISCAL YEAR)

	County	Local Spending Per Capita(£)	Mean Income(£)	Median Income(£)	Mean Tax Share	Population ('000)
1	Avon	592.2	10750	8910	0.00145	953.0
2	Bedfordshire	611.0	11910	9960	0.00269	542.7
3	Berkshire	569.4	13440	10310	0.00184	761.3
4	Buckinghamshire	590.0	14620	11480	0.00217	648.1
5	Cambridgeshire	528.8	11370	9760	0.00214	677.9
6	Cheshire	562.1	11220	8660	0.00146	968.2
7	Cleveland	753.7	10560	9210	0.00254	553.4
8	Cornwall	565.5	8910	7290	0.00284	472.3
9	Cumbria	576.9	9730	7960	0.00272	490.0
10	Derbyshire	549.4	10140	8440	0.00147	934.0
11	Devon	534.5	9840	8060	0.00133	1039.2
12	Dorset	467.8	10380	8110	0.00199	670.0
13	Durham	581.3	10140	8530	0.00230	590.7
14	East Sussex	537.6	10910	8730	0.00190	728.4
15	Essex	555.4	12090	9420	0.00088	1558.4
16	Gloucestershire	552.8	11140	9530	0.00255	533.3
17	Hampshire	531.4	11670	9300	0.00088	1553.8
18	Hereford and Worcester	515.1	10760	8690	0.00197	683.7
19	Hertfordshire	565.2	13290	10450	0.00141	997.7
20	Humberside	630.1	10540	8500	0.00157	863.5
21	Isle of Wight	541.0	9090	7160	0.01053	134.0
22	Kent	536.8	11560	9220	0.00089	1527.5
23	Lancashire	636.4	10000	8130	0.00100	1401.3
24	Leicestershire	616.5	10760	8740	0.00159	897.6
25	Lincolnshire	544.9	10320	8440	0.00224	594.2
26	Norfolk	528.4	10200	8620	0.00174	755.5
27	Northamptonshire	558.7	10800	9000	0.00238	585.3
28	Northumberland	592.8	10490	8770	0.00446	306.0
29	North Yorkshire	500.7	10940	8140	0.00191	716.4
30	Nottinghamshire	606.3	10100	8510	0.00137	1014.8
31	Oxfordshire	524.5	12140	9370	0.00251	586.9
32	Shropshire	582.8	10510	9020	0.00332	405.1
33	Somerset	556.5	10580	9190	0.00288	470.1
34	Staffordshire	537.3	10740	8840	0.00131	1046.7
35	Suffolk	538.4	11130	8830	0.00215	642.5
36	Surrey	535.3	14510	10640	0.00132	1022.9
37	Warwickshire	551.3	11450	9270	0.00276	492.3
38	West Sussex	485.2	11370	8460	0.00187	719.3
39	Wiltshire	526.8	11150	9810	0.00242	568.5
40	Clwyd	663.1	9770	8150	0.00331	417.0
41	Dyfed	669.2	8360	6580	0.00386	357.0
42	Gwent	685.9	9830	7990	0.00315	450.5
43	Gwynedd	709.1	9430	7140	0.00559	242.0
44	Mid Glamorgan	736.1	9840	8690	0.00262	534.0
45	Powys	754.1	9480	7360	0.01112	116.3
46	South Glamorgan	678.8	10400	8240	0.00362	407.5
47	West Glamorgan	713.9	10300	8620	0.00381	362.1
48	Greater London	890.9	13260	10420	0.00021	6751.8
49	Greater Manchester	706.0	10120	8360	0.00056	2581.4
50	Merseyside	793.7	10590	8450	0.00098	1430.1
51	South Yorkshire	572.0	9760	8190	0.00109	1295.8
52	West Yorkshire	648.2	10120	8460	0.00069	2069.0
53	Tyne & Wear	682.2	9690	8190	0.00125	1125.3
54	West Midlands	762.7	9890	8520	0.00055	2592.7

DATA ANNEX TABLE 2 (continued)

	County	Central Grants Per Capita(£)	The ratio of Non-taxpayers	The ratio of Renters	School Age Pop. (%)
1	Avon	361.5	0.041	0.278	12.5
2	Bedfordshire	431.7	0.048	0.260	14.6
3	Berkshire	399.7	0.018	0.271	13.9
4	Buckinghamshire	403.5	0.019	0.263	16.1
5	Cambridgeshire	362.9	0.038	0.323	13.9
6	Cheshire	348.8	0.059	0.269	13.9
7	Cleveland	530.2	0.033	0.344	15.5
8	Cornwall	391.3	0.014	0.257	12.6
9	Cumbria	385.9	0.009	0.300	12.8
10	Derbyshire	356.0	0.052	0.286	13.9
11	Devon	358.9	0.024	0.275	12.7
12	Dorset	308.2	0.001	0.243	12.9
13	Durham	399.2	0.041	0.376	13.4
14	East Sussex	359.3	0.020	0.269	11.9
15	Essex	379.2	0.020	0.254	13.4
16	Gloucestershire	353.3	0.032	0.264	13.4
17	Hampshire	374.8	0.025	0.274	13.2
18	Hereford and Worcester	341.5	0.014	0.276	13.8
19	Hertfordshire	386.1	0.050	0.308	15.0
20	Humberside	440.1	0.016	0.324	15.1
21	Isle of Wight	383.6	0.003	0.210	12.4
22	Kent	405.0	0.016	0.261	13.6
23	Lancashire	441.9	0.033	0.235	13.7
24	Leicestershire	425.2	0.039	0.275	14.2
25	Lincolnshire	385.4	0.004	0.296	12.9
26	Norfolk	350.6	0.003	0.314	12.7
27	Northamptonshire	401.0	0.027	0.288	14.5
28	Northumberland	387.6	0.032	0.378	13.7
29	North Yorkshire	351.9	0.026	0.278	13.2
30	Nottinghamshire	406.4	0.040	0.318	13.6
31	Oxfordshire	331.9	0.040	0.313	12.2
32	Shropshire	392.0	0.020	0.308	14.4
33	Somerset	364.2	0.017	0.277	13.7
34	Staffordshire	354.7	0.027	0.270	13.7
35	Suffolk	355.2	0.038	0.310	13.8
36	Surrey	336.7	0.027	0.226	13.5
37	Warwickshire	333.5	0.026	0.257	13.1
38	West Sussex	330.6	0.016	0.240	12.5
39	Wiltshire	355.0	0.029	0.301	13.9
40	Clwyd	556.8	0.026	0.290	13.5
41	Dyfed	601.7	0.016	0.281	13.3
42	Gwent	597.8	0.053	0.329	13.8
43	Gwynedd	618.2	0.002	0.298	13.4
44	Mid Glamorgan	652.8	0.054	0.265	15.0
45	Powys	682.7	0.001	0.317	14.7
46	South Glamorgan	590.7	0.066	0.288	14.0
47	West Glamorgan	623.0	0.050	0.295	13.4
48	Greater London	720.3	0.065	0.428	12.4
49	Greater Manchester	516.5	0.053	0.358	13.9
50	Merseyside	579.7	0.027	0.369	15.3
51	South Yorkshire	422.8	0.055	0.391	13.4
52	West Yorkshire	483.7	0.050	0.338	14.6
53	Tyne & Wear	500.8	0.045	0.469	13.5
54	West Midlands	565.8	0.046	0.371	14.3

urce: CIPFA, Census (1991), and Municipal Yearbooks.

DATA ANNEX TABLE 3: LOCAL GOVERNMENTS (1993/94 FISCAL YEAR)

	County	Local Spending Per Capita(£)	Mean Income(£)	Median Income(£)	Mean Tax Share	Median Tax Share	Population ('000)
1	Avon	623.5	11160	9180	0.00145	0.00263	968.0
2	Bedfordshire	665.6	12150	10320	0.00269	0.00490	545.8
3	Berkshire	641.9	13840	11470	0.00184	0.00350	758.4
4	Buckinghamshire	675.3	15160	12130	0.00217	0.00411	649.3
5	Cambridgeshire	577.8	12160	9250	0.00214	0.00386	681.2
6	Cheshire	626.3	12040	9440	0.00146	0.00267	977.9
7	Cleveland	776.0	10530	9020	0.00254	0.00462	548.9
8	Cornwall	620.3	9620	7739	0.00284	0.00533	480.1
9	Cumbria	652.6	10730	8340	0.00272	0.00508	495.0
10	Derbyshire	612.5	10800	9330	0.00147	0.00267	944.0
11	Devon	595.7	10660	8690	0.00133	0.00241	1048.0
12	Dorset	557.0	11020	9060	0.00199	0.00371	671.3
13	Durham	654.9	10360	9010	0.00230	0.00416	593.3
14	East Sussex	606.0	11130	8880	0.00190	0.00333	728.2
15	Essex	644.8	12530	9920	0.00088	0.00164	1564.0
16	Gloucestershire	628.8	11800	9320	0.00255	0.00470	528.4
17	Hampshire	572.7	12190	9820	0.00088	0.00165	1590.6
18	Hereford and Worcester	573.9	11960	9220	0.00197	0.00375	688.2
19	Hertfordshire	643.9	13560	10860	0.00141	0.00260	992.0
20	Humberside	686.0	11030	9160	0.00157	0.00288	874.4
21	Isle of Wight	641.6	9060	7310	0.01053	0.01919	128.5
22	Kent	653.7	12100	9710	0.00089	0.00166	1547.0
23	Lancashire	668.7	10300	8510	0.00100	0.00182	1410.7
24	Leicestershire	642.6	10930	9320	0.00159	0.00296	900.7
25	Lincolnshire	608.5	10280	8640	0.00224	0.00418	601.8
26	Norfolk	577.3	10770	9040	0.00174	0.00326	770.1
27	Northamptonshire	611.2	11750	9310	0.00238	0.00440	603.1
28	Northumberland	645.4	11010	8590	0.00446	0.00806	308.3
29	North Yorkshire	567.4	11500	9260	0.00191	0.00351	723.9
30	Nottinghamshire	652.9	10360	8150	0.00137	0.00248	1015.5
31	Oxfordshire	562.9	13300	10070	0.00251	0.00469	592.0
32	Shropshire	615.1	11240	9070	0.00332	0.00631	417.0
33	Somerset	589.5	10760	8950	0.00288	0.00536	477.6
34	Staffordshire	593.2	10910	9180	0.00131	0.00252	1055.7
35	Suffolk	678.2	11300	9130	0.00215	0.00388	565.1
36	Surrey	572.3	15480	11470	0.00132	0.00249	1033.6
37	Warwickshire	600.5	12040	9900	0.00276	0.00522	492.3
38	West Sussex	577.7	12540	9850	0.00187	0.00342	720.4
39	Wiltshire	587.8	12090	9800	0.00242	0.00448	580.6
40	Clwyd	688.1	10400	8780	0.00331	0.00607	418.4
41	Dyfed	730.9	10180	8210	0.00386	0.00668	355.6
42	Gwent	677.7	10770	9420	0.00315	0.00555	450.5
43	Gwynedd	708.6	10040	8400	0.00559	0.00917	243.9
44	Mid Glamorgan	716.0	9920	8510	0.00262	0.00470	541.1
45	Powys	790.2	10250	8850	0.01112	0.01949	119.1
46	South Glamorgan	679.5	11730	9060	0.00362	0.00622	410.5
47	West Glamorgan	702.1	10970	9120	0.00381	0.00680	369.3
48	Greater London	975.5	14340	11140	0.00021	0.00036	6818.2
49	Greater Manchester	840.1	10660	8950	0.00056	0.00099	2569.2
50	Merseyside	920.6	10340	8290	0.00098	0.00181	1431.2
51	South Yorkshire	761.5	10660	8980	0.00109	0.00194	1293.6
52	West Yorkshire	807.6	10960	8780	0.00069	0.00123	2072.6
53	Tyne & Wear	860.4	10270	9090	0.00125	0.00217	1120.2
54	West Midlands	888.9	10670	9170	0.00055	0.00100	2603.0

DATA ANNEX TABLE 3 (continued)

	County	Central Grants Per Capita(£)	The ratio of Non-taxpayers 1	The ratio of Non-taxpayers 2	The ratio of Renters	School Age Pop. (%)
1	Avon	421.4	0.041	0.882	0.278	13.3
2	Bedfordshire	502.4	0.048	0.909	0.260	14.9
3	Berkshire	446.7	0.018	0.935	0.271	13.3
4	Buckinghamshire	470.7	0.019	0.930	0.263	14.7
5	Cambridgeshire	422.9	0.038	0.876	0.323	14.2
6	Cheshire	431.1	0.059	0.934	0.269	14.1
7	Cleveland	593.7	0.033	0.880	0.344	15.9
8	Cornwall	434.1	0.014	0.904	0.257	13.5
9	Cumbria	461.0	0.009	0.889	0.300	12.8
10	Derbyshire	429.1	0.052	0.904	0.286	13.6
11	Devon	416.8	0.024	0.862	0.275	13.2
12	Dorset	372.7	0.001	0.865	0.243	12.9
13	Durham	486.1	0.041	0.880	0.376	13.9
14	East Sussex	412.0	0.020	0.792	0.269	12.1
15	Essex	449.4	0.020	0.908	0.254	13.6
16	Gloucestershire	420.9	0.032	0.900	0.264	13.6
17	Hampshire	415.2	0.025	0.927	0.274	13.8
18	Hereford and Worce	394.1	0.014	0.928	0.276	14.1
19	Hertfordshire	433.9	0.050	0.931	0.308	15.0
20	Humberside	509.5	0.016	0.865	0.324	13.5
21	Isle of Wight	446.7	0.003	0.829	0.210	12.3
22	Kent	471.3	0.016	0.896	0.261	14.1
23	Lancashire	485.4	0.033	0.890	0.235	14.1
24	Leicestershire	479.7	0.039	0.931	0.275	14.2
25	Lincolnshire	453.3	0.004	0.875	0.296	13.2
26	Norfolk	412.0	0.003	0.880	0.314	12.9
27	Northamptonshire	466.6	0.027	0.900	0.288	14.6
28	Northumberland	445.7	0.032	0.862	0.378	13.8
29	North Yorkshire	391.4	0.026	0.886	0.278	13.2
30	Nottinghamshire	476.3	0.040	0.883	0.318	13.4
31	Oxfordshire	381.1	0.040	0.942	0.313	14.1
32	Shropshire	436.2	0.020	0.936	0.308	13.9
33	Somerset	406.8	0.017	0.893	0.277	13.8
34	Staffordshire	436.0	0.027	0.979	0.270	13.7
35	Suffolk	488.8	0.038	0.876	0.310	13.8
36	Surrey	342.8	0.027	0.945	0.226	13.0
37	Warwickshire	395.7	0.026	0.940	0.257	12.4
38	West Sussex	379.1	0.016	0.856	0.240	13.0
39	Wiltshire	405.8	0.029	0.910	0.301	13.9
40	Clwyd	565.2	0.026	0.880	0.290	13.8
41	Dyfed	606.6	0.016	0.761	0.281	13.6
42	Gwent	581.6	0.053	0.856	0.329	14.2
43	Gwynedd	587.5	0.002	0.646	0.298	12.7
44	Mid Glamorgan	633.3	0.054	0.889	0.265	15.0
45	Powys	674.2	0.001	0.754	0.317	14.7
46	South Glamorgan	580.3	0.066	0.830	0.288	14.5
47	West Glamorgan	590.3	0.050	0.875	0.295	14.0
48	Greater London	766.0	0.065	0.873	0.428	12.4
49	Greater Manchester	656.2	0.053	0.867	0.358	14.4
50	Merseyside	737.8	0.027	0.900	0.369	14.8
51	South Yorkshire	591.5	0.055	0.885	0.391	13.7
52	West Yorkshire	640.0	0.050	0.863	0.338	14.5
53	Tyne & Wear	672.1	0.045	0.816	0.469	13.4
54	West Midlands	718.6	0.046	0.922	0.371	14.2

ɔurce: CIPFA, Census (1991), and Municipal Yearbooks.

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