TOPICS IN THE ANALYSIS OF GOVERNMENT EXPENDITURE AND INTERVENTION: A PUBLIC CHOICE APPROACH

by

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This thesis is dedicated to my parents.

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DECLARATION

Parts of this thesis have appeared in print and parts are the result of joint work.

Chapter 1 has not been previously published. Its two appendices are based on P.A. Watt, "Econometric Testing of the Displacement Effect: A Note", Finanzarchiv, 36(3), 1978 and P.A. Watt, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions when Disturbance Variances are Unequal: Some Small Sample Properties", Manchester School, December 1979, pp. 391-396.

Chapters 2 and 4 are based upon J.G. Gibson and P.A. Watt, The Effect of GREs on Education Expenditure and Budgetary Decision-making by Local Authorities, Report to the Department of Education and Science, INLOGOV, April 1987. Gibson and Watt assess their contribution to these chapters of the report as equal. Some components of Chapter 4 are used in J.G. Gibson and P.A. Watt, "A Model of Education Expenditure Change in English Local Authorities", in Thomas, H. and Simpkins, T(Eds), Economics and the Management of Education: Emerging Themes, Falmer Press, Lewes 1987. Chapters 2 and 4 make use of concepts of fiscal pressure discussed in more length in J.G. Gibson, P. Smith and P.A. Watt "Measuring the Fiscal Pressure on English Local Authorities under the Block Grant System", Environment and Planning C: Government and Policy, 1987,(5) pp 157-170. Discussion of the block grant builds on P.A. Watt, "The New Block Grant and Controls over Local Authority Capital Payments", Local Government Studies, March/April 1980, pp 27-30, and P.A. Watt, "The 1981/82 Block Grant Settlement for England", Local Government Studies, March/April 1981, pp12-14.

Chapter 3 is partly based upon P.A. Watt, "The Control of Local Authority Capital Expenditure" Local Government Studies, 8 (3), May/June 1982 pp 91-95.

Chapter 5 is based upon R.J. Nicholson, N. Topham and P.A.Watt, "Housing Investment by Different Types of Local Authority", Bulletin of Economic Research, II November 1975, pp 65-86, and Chapter 6 is based upon K. Hartley and P.A. Watt, "Profits, Regulation and the UK Aerospace Industry", Journal of Industrial Economics, XXIX, June 1981, pp413-428. Watt was principal researcher for both of these pieces of work. The appendices to Chapter 5 were written by Watt.

Chapter 7 is based upon P.A.Watt "Economies of Scale in Schools: Some Evidence from the Private Sector", Applied Economics, 12, 1980, pp 235-242.

Finally, Chapter 8 is based upon chapters and appendices contributed by Watt to J. Doling, V.A. Karn and P.A. Watt, The Reform of Housing Finance: Its Impact on Low Income Owner-Occupiers, Report to the Rowntree Charitable Trust, 1984, and also draws on sections written by Watt of J. Doling, and P.A. Watt, "Housing Finance and the Owner-Occupied Sector" in Lundqvist, L.J. and Wiktorin, M. (eds), Current Trends in British Housing, Bulletin M83: 17, National Swedish Institute for Building Research, Gavle.

All empirical work in this thesis has been carried out by Watt.

ABSTRACT

This thesis examines aspects of government expenditure and intervention the UK. The first five chapters focus on different aspects of government expenditure. The last three concern other aspects of government intervention. Chapter 1, which also examines six other developed nations: France, Germany, Japan, the Netherlands, Sweden, and the USA, is concerned with the growth of government expenditure since World War Two. Chapter 2 examines the current expenditure of local government and develops and estimates a model of local authority current expenditure change. Chapter 3 examines central government's motives and record in controlling local government capital expenditure. Sub-branches of the local authority current expenditure and capital expenditure budget are considered in Chapters 4 and 5 which examine the education branch of current expenditure and the housing branch of capital expenditure. The last three chapters of the thesis look at aspects of government intervention in the private sector. Chapter 6 concerns government intervention in the aerospace industry and its effect on profits in the industry. Chapter 7 concerns the government's payment of grants to schools in the private sector under the Direct Grant system abolished in 1976 (but currently relevant to Government education policy proposals) and estimates cost curves for these schools. Lastly Chapter 8 concerns tax expenditures the government makes on owner-occupiers. Alternative definitions of the subsidy to owner-occupiers, arising from viewing the house as an investment good or alternatively as a consumption good are explored and some estimates of subsidy under these definitions are made.

INTRODUCTION

The overall theme of this thesis is the intervention of government in the economy. It is based on papers written over a number of years, examining government expenditure and intervention. The rapid growth in government expenditure and intervention in the economy is one of the more striking economic facts of the century(1) In the UK, government expenditure has grown from about 40% of national income in the 1950s to about 60% of national income in the 1980s.(2)

There are a number of ways the government can act in an economic context. It can exchange money for goods and services. It can make transfer payments with no goods or services passing in the opposite direction. It can pass regulations that affect the actions of economic agents, and it can pay subsidies and levy taxes.

Philosophically more troublesome perhaps, a government can be seen to "act" by failing to tax. This yields the concept of a tax expenditure, which is said to be incurred when the government fails to apply taxation consistently. The thesis examines examples of all the above modes of government action.

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(1) See for example Head (1974, p vii): "The vast extent and growth of the public sector have been perhaps the most important fiscal phenomena of the post-war period.", or Tullock (1980, p xv): "The growth of the government sector in almost all western countries is one of the most conspicuous phenomena of the present day."

(2) See Table 7, Chapter 1, p. 13, below.

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PLAN OF CHAPTERS

Chapter 1 investigates the growth of general government expenditure on transfers and in return for goods and services in developed nations. In Chapter 2 attention is turned to local government expenditure in England, and an expenditure change model for the current expenditure of English local government is developed and estimated. Chapter 3 considers the control by central government of the capital expenditure of local government.

Next, two branches of the local authority budget, education and housing, are examined in detail. In Chapter 4 a model of local authority education expenditure change is developed, based on the model of total local authority expenditure change set out earlier in Chapter 2, and in Chapter 5 a study of the determinants of local authority housing investment is carried out.

Chapters 6, 7 and 8 are concerned with aspects of government intervention in private market activity. In Chapter 6, government attempts to regulate the profits of the aerospace industry are examined. Chapter 7 looks at the cost structure of the former Direct Grant schools, which received a direct grant from the government for each pupil on the school roll. Chapter 8 examines government intervention in the housing market in the form of the tax expenditures it makes in the owner-occupied housing sector. Lastly, Chapter 9 sets out the conclusions.

THE THEORETICAL APPROACH

The unifying theoretical standpoint that is to be distinguished in these chapters is a Public Choice approach. Essentially the approach of the public choice school is to apply the methods of eco-

nomics to the analysis of government.(1) Before the rise of public choice theory, the positive theory of government action was a comparatively unexplored area for economics. Economists' energies were largely absorbed by the tasks of coming to an understanding of the market for goods and identifying and analysing situations in which it was expected to "fail". Economists' prescriptions for the market failures they identified were added as something of an afterthought, along the lines that the government should step in and "correct" them. Implicit in such policy prescriptions is a view of the government as a disinterested agent of the public good, able and willing to correct sub-optimal market outcomes.

Although doubts had been raised early on over the government's suitability for this idealised role - for example Wicksell writing in 1896:

> Even the most recent manuals on the science of public finance frequently leave the impression, at least upon me, of some sort of philosophy of enlightened and benevolent despotism(2)

or, again, Henry Sidgwick, writing in 1887:

> It does not follow that whenever <u>laisser faire</u> falls short government interference is expedient; since the inevitable drawbacks of the latter may, in any particular case, be worse than the shortcomings of private enterprise(3)

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(1) The Public Choice Society began as a group called the Committee for non-Market Decision Making at the University of Virginia, co-founded by James Buchanan and Gordon Tullock and attended by John Rawls, James Coleman, Duncan Black, William Riker, Roland McKean and Vincent Ostrom (See Tollison, 1984) In later years the school's main embodiment was the Center for Study of Public Choice at the Virginia Polytechnic Institute and later at George Mason University.

(2) See Wicksell (1896), p. 82

(3) See Sidgwick (1887, p. 414), quoted in Wolf (1988)

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it is only comparatively recently that this more realistic view of the government's role: "politics without romance"(1) has informed analysis of government behaviour. Public choice has shown that the government as "benevolent despot" is not an alternative to be set against market failure. Market failure is therefore joined by the concept of government failure as deserving of economists' attention. The insights of public choice theory have been gained by the application of the same utility maximisation calculus to the public sector that economists have applied to the private sector. The standpoint is one of individual utility maximisation, and public choice theorists assume that the utility functions that those in government seek to maximise are essentially no different from the utility functions of other individuals. Thus, it is argued, individuals who move from the private to the public sector are not radically altered by the process, but retain the largely self interested behaviour that has been assumed to drive economic actors since Adam Smith. Government action is explained in terms of rational choice based on the desire of voters, bureaucrats and politicians to maximise utility.

SUMMARY AND REVIEW

This section summarises the findings of the thesis. However, it is important to note that much of the work of this thesis is based upon papers published some time ago. The paper that Chapter 5 is based on, for instance, was published in 1975. Over such a time span the ideas of the author and of economics generally have changed. Although some revisions and re-writing of these papers has been carried out, in many

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(1) See Buchanan (1979)

cases this is relatively minor, and a complete re-writing has not been attempted. In some chapters the data on which the original computations had been performed are no longer available.(1) For the same reason, the extent to which a public choice standpoint is apparent varies greatly from chapter to chapter. In addition to providing a summary therefore, this section will seek to emphasise the public choice elements of the thesis and to provide a review of the work set out in the older chapters.

The main concern of Chapter 1 is the growth of government expenditure. The pattern of government expenditure growth since the Second World War is examined in seven developed nations: France, Germany, Japan, the Netherlands, Sweden, the United Kingdom and the USA and a statistical picture of the growth of government in these countries is presented. This builds on the work of Warren Nutter, who monitored the growth of government in an earlier study,(2) tabulating government expenditure from 1950 to 1972. Nutter's tabulations are extended forwards another ten years to 1982, using data constructed from OECD (1984).

Analysis of these statistics shows that Government expenditure has grown both as a percentage of the national income, and at an increasing rate over time. Government expenditure can be divided into expenditure on transfers and expenditure on goods and services. The proportion of transfers in this total of expenditure is found to have been increasing, as has public employment in the countries studied

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(1) The local authorities used in the data set for Chapter 5 no longer exist, for instance.

(2) Nutter (1978)

except the United States(1)

Across the sample of nations there is a considerable difference in the ratio of government expenditure to national income. In 1982, for example, it ranges from 42 % in Japan to 87 % in Sweden. An explanation for this is found to be the political orientation of the country; right-wing orientation being associated with lower levels of government activity, though this leaves the political orientation itself to be explained.

The second part of Chapter 1 examines theories of the growth of government. Starting with Wagner's Law,(2) a great number of theoretical explanations of government expenditure growth have been proposed. Amongst the theories discussed are Peacock and Wiseman's "Displacement Effect", Baumol's Disease, Parkinson's Disease (as set out by Niskanen), Tullock's "Dynamic Hypothesis on Bureaucracy" and Meltzer and Richard's and Peltzman's median voter models, as well as rent-seeking models and interest group theories.

Many of these theories have been developed by the public choice school of analysis. Thus Niskanen's bureaucratic maximisation hypothesis is based upon the assumption that a bureaucrat derives utility from the size of his bureau, and uses an assumed monopoly of information as a tool in achieving a size-maximisation objective. Tullock's Dynamic Hypothesis on Bureaucracy suggests that bureaucrats vote for larger bureaus, and that this effect is likely to snowball. In Meltzer and Richard's model, the median voter in an expanding franchise, and in Peltzman's model a coalition for a "politically domi-

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(1) However see Bennett and Johnson (1980, p54)

(2) Wagner (1883), translated in Musgrave and Peacock (1958)

nant" policy, will vote for increased government activity of a redistributive nature.

The theories discussed in Chapter 1 suggest reasons why the public sector may be too large, but are less successful in explaining the continuous <u>increase</u> in the share of public expenditure in National Income observed this century. An unresolved issue is whether movement is still proceeding slowly to a high equilibrium level of public expenditure, or whether nations are already at an equilibrium.

Furthermore there has been little success, as yet, in discriminating between these competing theories empirically. The position has been summed up by Peacock as follows:

> At the moment the debate on the size of the public sector rather resembles a Turkish wrestling match in which all the contestants battle with one another until one is left the winner, but with the crucial difference that every contestant claims victory.(1)

In common with other surveys of the growth of government literature, this chapter does not succeed in isolating the winning theory, or combination of theories, to explain the statistical facts. Progress in this field awaits improved statistical data to enable a more searching examination of competing hypotheses.

One theory of the growth of government that has attracted much empirical work is Peacock and Wiseman's Displacement Effect. Appendix I to Chapter 1 is concerned with the econometrics of testing for the Displacement Effect and Appendix II suggests a testing procedure that has proved to be quite important and has stimulated a number of technical investigations (see footnote 1 on page xvii). The purpose of

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(1) Peacock (1983, p. 2)

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Appendix I(1) is to demonstrate an econometric error in Diamond (1976/77). Diamond argued that, when testing for the Displacement Effect using ordinary least squares regression analysis, equality of the error variances before and after the displacement must not be assumed as part of the null hypothesis. His view rules out the Chow test which <u>does</u> assume equality of error variance. However, as it turns out, it <u>is</u> in fact the standard Chow test that Diamond applied in practice, although he was not aware of it.(2)

In Appendix I, Diamond's data are therefore re-tested using a Jayatissa (1977) test which does not constrain error variances to equality.(3) This work stimulated the investigation of a number of technical questions concerned with the testing of change of structure. The resulting study appears as Appendix II(4) which discusses the

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(1) This Appendix is based on Watt, 1978.

(2) This can be explained as follows. Because Diamond uses separate regressions rather than a number of dummy variables within a single regression to perform the estimations for his test, he believes that the error variances will <u>not</u> be constrained to be equal in the pre- and post-displacement regressions. Whilst this is true in the estimations he performs, the distribution of the Chow statistic he uses to <u>test</u> for the displacement effect is obtained under an assumption in the null of equal error variance in the two populations (pre- and post-displacement) so his own empirical work suffers from the same assumption of equality of error variance for which he criticises others.

(3) Of the two of Diamond's tests which were re-run (a third was not re-run because equality of error variance was not rejected in a pre-test), the null was not rejected in Diamond's tests in the first, but very strongly rejected in the second. Essentially the effect of re-running the tests using Jayatissa's statistic is to reduce the power of the testing procedure and this reduction in power makes the null more likely to be accepted. Thus when the tests were re-run, Diamond's first test result - acceptance of the null - was strengthened, whereas his second result was unaltered because the reduction in power was not enough to counteract Diamond's finding of a strong rejection of the null.

(4) Appendix II is partly based on Watt (1979).

whole subject of testing for change of structure in some depth - a subject that also of relevance to Appendix I of Chapter 5. The paper it is based on (Watt, 1979), suggested an asymptotic Wald test for change of structure. This test has been widely cited(1) and the terms empirical power and empirical size introduced by the paper have been adopted in later discussion.(2)

The concern of Chapters 2, 3, 4 and 5 is local government expenditure, a major component of general government expenditure, forming more than a quarter of the public expenditure planning total. The chapters deal with different aspects of local government expenditure. Chapter 2 is concerned with current expenditure, which forms over 75% of the total. The chapter begins with an examination of the overall pattern of local government expenditure over recent years. The picture is one of cuts in housing expenditure and increases in expenditure on social security and law and order. Another feature that emerges is a tendency for the government to propose large cuts in local authority expenditure in White Papers that are not realised in subsequent budgets. One reason for this is that, with the exception of rate-capped authorities, central government has no direct powers of control over local authority spending. It does however have a powerful indirect influence over local government spending in its ability to determine the parameters of the block grant system.

It seems likely that one of the reasons for the divergence between

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(1) See Buse (1981), Dufour (1982), Honda (1982), Erlat (1984), Ohtani (1985), Ohtani and Toyoda (1985a), Ohtani and Toyoda (1985b) Pesaran, Smith and Yeo (1985), Honda (1986), Toyoda (1986), Patterson (1986), Ohtani (1986), Kobayashi (1986)

(2) See Honda (1982), Ohtani and Toyoda (1985a), Toyoda and Ohtani (1986), Ohtani (1986)

plans and outturns for local government expenditure in the White Papers is a lack of understanding of the linkages between block grant changes and the changes these may induce in local government expenditure. The major purpose of Chapter 2 is therefore to explore the nature of such relationships with the aid of a model of local authority expenditure determination that includes reference to the features of the block grant system.(1) The chapter reviews existing expenditure determination models before turning to analyse in detail the budget constraint inherent in the block grant system.

The chapter's method reflects a public choice approach of examining the constraints and incentives that public decision-makers face. It is suggested that differences between authorities in how tightly their decision-makers are constrained by the financial circumstances of the authority will affect their expenditure decision-making.

How can these different feelings of financial constraint be related to some operationally meaningful measure of financial constraint? The measure developed in Chapter 2 is called <u>fiscal pressure</u> (Gibson, Smith and Watt, 1987). The fiscal pressure measure answers the question: "what are the rate increases for each authority implied by some equal level of increase in expenditure for every authority?" Fiscal pressure is measured by these rate increases. The hypothesis is that the higher the fiscal pressure, the more reluctant will be the decision-makers of an authority to increase expenditure.(2)

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(1) The model is a development of that set out in Gibson and Watt (1987a)

(2) Suppose this hypothesised expenditure increase is set at three per cent. The fiscal pressure measure may be one per cent for authority a, seven per cent for authority b and ten per cent for authority c. These three different percentages are the rate rises that

In practice the local authority budget constraint is a far more complicated construction than can be expressed by this simple approximate measure, and the most recent research in expenditure modelling has been able to take its full form explicitly into account.(1) However, the fiscal pressure approximations used in Chapter 2 are found to work quite well in the expenditure change models estimated.

A section of the chapter is devoted to reviewing existing local government expenditure models before a cross-section model of year-on-year expenditure change is developed. Expenditure change rather than the level of expenditure is modelled because it is expenditure change that has been the major policy interest for central government. In the empirical results of the expenditure modelling, a firmly established negative link is found between expenditure increases and fiscal pressure. As overall fiscal pressure can be determined by adjustment of the parameters of the grant system, the results of this chapter have implications for the control of local authority current expenditure by central government.

Since this chapter was written the government has announced its intention to replace the present system of local rating with a poll tax.(2) A public choice analysis of this policy suggests that the introduction of this tax is likely to be a very unpopular measure

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local politicians would have to impose on local ratepayers for the same three per cent increase in expenditure. The hypothesis is that ceteris paribus the decision-makers of authority c will feel more reluctant to increase expenditure than the decisaion-makers of authority a, and fiscal pressure will express this.

(1) See Barnett et al. (1988) and Moffit (1986)

(2) Department of the Environment (1986)

because of its redistributive impact.(1)

In public choice theory the redistributive effects of a prospective item of legislation are of vital importance to its success or failure in the political marketplace. Karl Brunner (1978) argues that

> The essence of politics is redistribution and political conflicts center on matters of redistribution.

The political success of redistributive policies is strongly connected with interest group support.(2)

The introduction of the poll tax will have redistributive effects and hence the change will create gainers and losers. Gainers and losers thus form potential members of interest groups with diametrically opposed objectives. Which interest group prevails partly depends upon which interest group is the stronger, and this in turn depends upon whether the gainers or the losers have the better combination of characteristics favourable to success as an interest group. In forming a viable interest group, several factors are important. Firstly, other potential members should be clearly identifiable, secondly the larger and more easily predictable the potential gains to the group the better, thirdly it is helpful if the self-interest of potential members is not too transparent and can be concealed effectively by a convincing "cover story", and fourthly it helps if gains are not too thinly diffused over very large numbers but concentrated over smaller numbers.(3)

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(1) See Watt (1986)

(2) See for example Tollison (1982)

(3) As an illustration consider recent privatisations. The privatisation of public sector monopolies without introducing competition has been judged a political success. One way that this can be interpreted is to say that the gainers are a more success-

How then does the introduction of the poll tax look when analysed in this way? First of all, both the gainers and the losers are fairly clearly established. Other things being equal, the gainers will be those in small households in houses with a high rateable value and in authorities that are low spenders and the losers will be those in large households in houses with a low rateable value and in authorities that are high spenders. At first sight it appears that both the gainers and the losers show rather equal interest group forming potential.

Which group then is likely to succeed? Poll tax is already on the statute books. However this is not likely to be the end of the story. In all recent Rate Support Grant Settlements one principle that has thrived strongly in the political arena is that of using safety nets to limit the magnitude of gains or losses in year-on-year change. The explanation of this, it is argued, is that gains and losses in this context create an asymmetrical effect where great political strife is generated by the losers, whilst little is heard from the gainers.. Accordingly, the greater the gains and losses the greater the politi-cal strife. The continuing story of political strife under the block grant is likely to be far from over with the introduction of poll tax.

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ful interest group than the losers. The gainers have been those members of the public who have chosen to buy shares at the low offer price, and probably the employees of the privatised concerns. This forms a fairly concentrated potential interest group in comparison with the losers. The losses are incurred by everyone else and the size of loss to each individual is low because of the numbers involved. Moreover the losses, springing from absence of competition, with its effects on reducing prices and stimulating innovation, and from the reductions in taxation that could have been financed by a higher offer price, are not readily identifiable and much more easily disputed than the over-night capital gains to share buyers.

Much of the interest in the properties of the grant system analysed in Chapter 2 arises from its relevance to the Government's desire to control local authority current expenditure. However, supposing this problem were solved the question of controlling capital expenditure would remain.

If central government successfully controlled local authority current expenditure, this would still leave out of account the whole of local authority capital expenditure. The control of local authority capital expenditure is the subject of Chapter 3, which is based in part on Watt (1982). The chapter takes a public choice approach to the question of why the government might want to control local government capital expenditure.

Why central government should wish to control local government expenditure can be explained by public choice theory. As the question is relevant to both Chaptr 2 and 3 it is worth summarising here. It may be asked why individuals who vote in local elections do not vote directly for the local expenditure control policies that they appear to vote for in general elections. The answer lies in the different distributions of costs and votes. It is argued that central government's desire to control local government capital expenditure derives fundamentally from issues of accountability.

The idea of accountability is well summed up by the expression "He who pays the piper calls the tune". If local ratepayers entirely paid for local government expenditure, then, it might reasonably be argued, it would be entirely a matter for them how much expenditure their local authority incurred each year. Currently, however, much of local expenditure is paid for from central grants, and more than half of rate income comes from business and commercial rates which do not con-

fer voting rights.(1) Hence these otherwise disenfranchised taxpayers are likely to seek influence through central government elections. Of course, central taxes are paid by individuals, and individuals will in general live in some local authority area. Hence the total of local expenditure will be paid for by the total of the local electorate. However, if one local authority expands its expenditure, the finance will be largely spread across all authorities and the cost will not be fed back to these particular local voters.(2)

Analytically the most satisfactory solution would be to revise the institutional framework to make the lines of accountability more direct, and this rationale has been advanced for the introduction of the poll tax.(3) However, for capital expenditure, the form of the present institutional framework serves to explain why central government should wish to exercise control.

Although central government is, on this analysis, seen to have a motive to control local government capital expenditure in total, it is not clear why it should wish to examine the content of these plans in any great detail. The capital expenditure plans of local authorities are, however, examined in detail by civil servants, and, it is argued in Chapter 3 that a bureau maximisation motive on the part of civil servants is the explanation.

Chapter 3 also contends that the control of capital expenditure as exercised has been destabilising in the sense argued by Friedman

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(1) See the discussion in Paying for Local Government (1986, pp. 5-7)

(2) "Restraint in expenditure" can be seen as a public good subject to free-riding.

(3) Department of the Environment, 1986

(1953, p 145) for monetary policy.

Since Chapter 3 was written, the Government has published a consultation paper on the control of capital expenditure(1) It confirms the view advanced in Chapter 3(2) that capital expenditure "is not strictly being controlled", stating that

> [The current system of capital expenditure control] has failed to bring about net capital expenditure consistent with the Government's public expenditure plans (DOE 1988, p7)

The consultation paper also refers to the problem of the "cascade" described in Chapter 3 whereby capital receipts may eventually all be spent on future capital projects. The government only allows a proportion of capital receipts to be spent, but the unspent part can be carried forward and a proportion of this spent in the next year, and so on in a cascade until all is spent. Spending of capital receipts was originally allowed as an incentive to asset disposal. However, until receipts are spent, net capital expenditure is reduced.

Chapter 3 suggests that, the government would like very little of the receipts spent, but finds difficulty in reconciling this with the need to provide an incentive for asset sales to generate the same capital receipts. This suggestion finds endorsement in the language of the consultation paper.

> In deciding what allowances should be made [for spending of receipts] the Secretary of State will wish to strike an appropriate balance between the efficient distribution of spending power and the incentive to dispose of assets.(DOE 1988, p22)

The next two chapters of the thesis move to examine two branches of the local government expenditure budget. Chapter 4 examines local

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(1) Department of the Environment, 1988.

(2) See page 153, and Table 1, page 152.

authority education expenditure - a branch of the revenue budget, and Chapter 5 examines local authority housing expenditure - a branch of the capital expenditure budget.

Chapter 4, based on Gibson and Watt (1987), applies the expenditure model developed in Chapter 2 to explain year-on-year changes in a local authority's revenue expenditure, to modelling local authority education expenditure. Here the same fiscal pressure variables used in modelling changes in total current expenditure in Chapter 2 are used to explain changes in education expenditure. Whilst the model is very similar to the model estimated in Chapter 2, a new variable, ALIGN, is introduced. This variable measures for each authority the change to the education budget that would move the education budget's share of the total budget into line with education GRE's share of total GRE.(1) When these are out of line the disparity can be made use of in inter-bureau budget-making debate. Empirical estimation of the model shows the effect of ALIGN to be well established, with authorities on average adjusting their budgets to remove one third of the divergence each year.

Chapter 5 examines capital expenditure on housing by the four types of pre-reorganisation local authorities engaged in housing investment: County Boroughs, Non-County Boroughs, Urban District Councils and Rural District Councils. In this work the determination of local authority housing investment was assumed to be analogous to investment

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(1) GREs, short for Grant-Related Expenditure Assessments, are levels of expenditure that each authority is considered to "need" to spend for the purposes of grant calculation. Clearly the concept of GREs begs many questions, and the calculation of GREs - an annual process - gives rise to much debate and dispute between central government and the local authority associations every year.

determination in the private sector, occurrring at equilibrium between the Social Marginal Efficiency of Investment, and the Social Marginal Cost of Funds.

Because the rate of interest charged to local authorities, who then borrowed from the Public Works Loans Board, was the same for all, the simultaneous equation model of housing investment and interest rate determination could not be identified and therefore the results were restricted to an estimation of the reduced form coefficients.

The model does not take account of the private sector housing market, although in practice there is likely to be significant interaction between the private and public sector markets. However, in the situation where below equilibrium rents are charged for local authority housing, with quantity rationing, the effects are more likely to flow from the local authority housing market to the private market rather than vice versa. The study finds the most important determinants of housing investment to be a variable called IMPETUS, measuring recent pre-sample period additions to the housing stock as a percentage of each authority's post-war housing investment, and variables indicating the condition of the housing stock - the percentage of houses declared unfit for instance, and the percentage of households without hot water.

Rather surprisingly, political variables were not found to be important although the multicollinearity between the political variables and indicators of condition of the housing stock may explain this result.

This chapter is the oldest piece of work in this thesis, and some comments made with the benefit of hindsight are in order. A contribution of public choice theory has been to raise question marks whenever

the maximisation of "society's" welfare is discussed. The problem is that of the link between self-interested behaviour of individuals and the maximisation of society's welfare.(1)

Seen in this light, Chapter 5 is somewhat cavalier in its invocation of a Social Marginal Efficiency of Investment function. Le Grand and Winter (1977) identify the following groups whose preferences may interact to produce observed local government decisions: (a) the electorate, (b) pressure groups, (c) councillors, (d) local officers and (e) the central government. Chapter 5 takes some steps towards examining the different sources of preferences by classifying variables as relating to central government preferences, local government preferences, and implicitly, with the variable IMPETUS, bureaucratic preferences. However, the paper on which theis chapter is based would have benefitted from a more explicit approach to examining the interests that combine to yield decisions.

A finding of Chapter 5 that has been made mention of in the subsequent literature is the apparent lack of influence on housing investment of the political control of local authorities. Hoggart (1984) cites the paper Chapter 5 is based upon(2) and has performed a further study on similar data, finding that a disaggregation of the sample into groups according to political control, similar to that carried out in the current expenditure models of Chapter 2 of this thesis, did reveal significant party differences. This would be an interesting line of investigation to pursue in future work on housing investment.

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(1) Adam Smith's insight was to see the "invisible hand of market forces" as being the link in the private sector.

(2) Nicholson, Topham and Watt (1975)

Eastall and Kleinman (1988) also cite the work of Chapter 5 and have estimated a similar model. They find this model "fits the data fairly well", but they also find political effects to be important. However in their work, which is preliminary, the political effects are estimated in a separate politics-only regression and specification error is likely to be a problem. The issue of the importance of politics is very difficult to resolve. The central question is whether environmental factors such as overcrowding, unfitness of the stock, and absence of hot water which cause housing investment also "cause" Labour control of the authority, or whether, alternatively, Labour control exerts an independent effect. The high correlation between indicators of need and Labour control currently prevent a decisive answer to this question.

The Appendix to Chapter 5 uses some of the methodology set out in Appendix II to Chapter 1 to establish that the housing investment functions estimated in Chapter 5 for the different tiers of authority then in existence were not homogeneous across the tiers.

In Chapters 6, 7 and 8 the thesis turns from examining questions of government expenditure to examining government intervention in the private sector. Chapter 6 examines government intervention in the UK aerospace industry and is based on Hartley and Watt (1981). It examines some of the ways other than by means of expenditures in which the government can affect the private economy: the use of regulation, the threat of regulation and the use of market power.

During the period studied, the aerospace industry was closely involved with the Government which was its major customer. Between 1958 and 1960 the Government induced a number of mergers in the indus-

try(1) by using its monopsony power to cause firms in the industry to merge.(2) As well as government influence over industry structure, another feature of the close relationship between the government and the aerospace industry is the formula-related return on capital incorporated in contracts, with development work being paid for by cost plus contracts and production work by fixed cost contracts. From 1968 onwards the operation of profit formulae was monitored by the newly formed Review Board for Government Contracts. The chapter specifies and tests an econometric model of the profits of the aerospace industry. Amongst the findings are that the government-induced mergers appeared to have a well established negative effect on profits, whereas, less conclusively, the Review Board for Government Contracts was not found to have had a significant negative effect on profits.

If the study were to be repeated now, the work would benefit from a more extensive emphasis on the the theory of regulation, based on the seminal work of Stigler (1971) and Peltzman (1976), which has achieved a greater prominence since this chapter was written. Stigler and Peltzman's work, which can be considered a part of the public choice literature, rejects the public benefit theory of regulation, a sub-species of the benevolent despot model of government. Stigler considers the motivation of both the actors in the regulated industry and the regulators and argues that

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(1) See Hartley (1965)

(2) Thus Mr Duncan Sandys stated in parliament after the mergers had been completed that:

> Except where specialised requirements or public policy made it necessary to do otherwise, the Government intends to concentrate its orders on the five major groups. (Hansard, 15 February, 1960, quoted in Hartley, 1965, p848)

> as a rule regulation is acquired by the industry and is designed and operated primarily for its benefit(1)

Under this view of regulation, the finding of Chapter 6 that regulation by the Review Board for Government Contracts did not reduce the profits of aerospace manufacturers is not unexpected.

Chapter 7, which is based on Watt(1980b), is concerned with the cost structure of direct grant schools which attracted government intervention in the form of a "direct grant" subsidy. Before the direct grant system was abolished in 1976, government intervention in this market took the form of grants paid to the direct grant schools of £84 per sixth-former and £52 for other pupils. In return for this capitation fee the Government had powers to regulate certain features of the school such as the income scale for fees charged to parents. The study found that on average the level of fees was inversely related to the proportion of pupils in the school whose fees were paid by the local authority, although the reason for this effect is not clear. No significant economies of scale in provision were found.

Since this work was published it has been cited by Kumar (1983) and Bee and Dolton (1985) whose studies are based on the same approach and use a similar form of cost function in their estimation. Kumar's study is for data on Ontario schools, and as in Chapter 7 here no clear evidence of economies of scale is found. Bee and Dolton's model uses data for secondary schools in the independent sector. In contrast to the findings of Kumar and Chapter 7 of this thesis, Bee and Dolton find significant evidence of the existence of economies of scale. A second finding for their study is the lack of significant

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(1) Stigler, 1971, p. 3, quoted in Utton (1986)

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effect on costs of the quality of output, as measured by "A" level passes - a variable not available when Chapter 7 was written. Since then there has been a great improvement in the availability of data. Thus data for individual school costs are now available in many local authority areas and examination results have been published for a number of years. The current cost structure of UK public sector schools would make an interesting study. One study currently exists (Hough 1981) which found significant economies of scale but the issue cannot be regarded as sèttled at present.

Chapter 8 is concerned with government intervention in the owner-occupied housing market in the form of a subsidy to owner-occupiers. It is argued that, the precise form of this subsidy depends upon whether a house is seen as a consumption good or an investment good. On the more logical view that a house is an investment good, government intervention lies in the implicit subsidy to owner-occupiers that results from its failure to tax their imputed rental income and capital gains. The theoretical arguments surrounding the definition and measurement of this subsidy are set out and a survey is made of existing work in the area.

There is general agreement amongst the works on housing subsidy surveyed that this subsidy leads to welfare loss and should be removed. A public choice issue of why the government does not remove the subsidy to owner-occupiers therefore arises.(1) Chapter 8 argues that the losers under such a reform, the owner-occupiers, form a substantial and relatively concentrated interest group of considerable

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(1) See page 313 below.

political importance who are likely to prevail over those who stand to gain: taxpayers in general, whose gains, though putatively greater in sum, are more diffused and less widely recognised. The Chapter concludes with some estimates of the subsidy to owner-occupiers in inner-city Birmingham and an Appendix sets out an estimation of a hedonic model of price change used to obtain house price inflation rates for estimating the value of home-owners' exemption from capital gains taxation.

To summarise, this thesis presents work that has been written over a number of years. The overall theme of is government expenditure and intervention, and the unifying theoretical standpoint is that of public choice analysis. This introduction has summarised the main findings and reviewed the work of the older chapters in the light of recent developments. In the next chapter the growth of government expenditure is examined.

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CHAPTER ONE

TOTAL GOVERNMENT EXPENDITURE IN SELECTED DEVELOPED NATIONS

INTRODUCTION

This chapter examines the overall pattern of government expenditure. In the first part a statistical picture of general government expenditure is built up for seven selected developed nations. In the second part some competing hypotheses to explain the growth of government are surveyed.

The sustained growth of government during the twentieth century has attracted comment from many economists. According to Borcherding (1977, p. 33)

> a pattern completely contrary to the nineteenth century experience emerges for this century: an expansion of the public sector relative to the private sector.

Nutter (1978) reflects that

> Government, it seems safe to say, is one thing that has been growing rapidly in the West. Wherever governments were once small they have become big, and wherever they were big they have become bigger. Nothing is so rare as a shrinking government.

and Peltzman (1980, p 210) finds for the USA, UK, Germany and Sweden that the data

> show that government budgets have grown faster than GNPs since at least 1900, and that they may have grown more slowly before.

CHAPTER ONE: TOTAL GOVERNMENT EXPENDITURE IN SELECTED DEVELOPED NATIONS

Peltzman, in the most recent of these studies, considers data extending to 1974. Has this pattern of growth of government continued since then? In the next section a statistical picture of the pattern of growth of government from the most recently available OECD accounts is set out.

MEASURING THE GROWTH OF GOVERNMENT

Measurement of the size of government is subject to some severe conceptual and practical problems. The focus in this chapter is the extent to which government is involved in the economy. The level of government <u>expenditure</u> is only a partial measure of government's involvement in the economy. Quantification of government expenditure leaves totally out of account the effect of government regulation of private enterprise. Such effects may well be considerable: Wiedenbaum and De Fina (1978, p3) have estimated that the compliance costs incurred by the private economy as a result of federal regulatory agency activity in the USA reached $66 billion in 1976, equivalent to $307 per head or over one-third of all US private investment in new plant and equipment. Peacock (1984) raises the question of the cost of regulation in the UK but makes no overall estimates in what is primarily a preliminary investigation. Mohammad and Whalley (1984, p387) estimate the welfare cost of government price and quantity controls in India at between <u>thirty</u> and <u>forty-five</u> per cent of GNP per year.

Other kinds of government involvement in the economy may have major effects but not be reflected in expenditure statistics. Thus, to take an example discussed in Chapter 6, the UK Government caused a major series of mergers in the aircraft industry between 1958 and 1960 by making suggestions about its future purchasing policy to the firms

concerned.(1) A further example is the use of "moral suasion" by central banks. Crockett (1973) argues that:

> Moral suasion is normally employed when it is felt that the ordinary market mechanism does not, and cannot easily be made to, take full account of the public interest. Under these circumstances, allocation of resources to the bidder prepared to pay the highest price does not necessarily secure the best distribution. If the monetary authorities are capable of improving the allocation of financial resources - say by directing lending to activities where there are "spin-off" advantages to other sectors of the economy - then the community's economic welfare will benefit if the banks can be induced to follow the authorities' wishes. The advantage of moral suasion over direct controls ... is that it is a highly flexible control and does not need legal implementation. Because of this, there is less need for detailed and costly administrative regulation and, if the national interest is clear, then there should be less trouble about a divergence between observing the letter and the spirit of the guidelines.

Crockett points out that competitive pressures may lead to the breakdown of the effectiveness of moral suasion, and direct controls may be necessary:

> Moral suasion is therefore best applied as a temporary weapon. But even if moral suasion is changed into direct legal controls in order to prevent backsliding, problems still exist. The fact that controls have to be used to induce banks to act in a certain way means, in essence, that the monetary authorities are assuming that they can ensure a better allocation of resources than would occur as a result of the play of market forces. It is possible that in some circumstances this may be the case; but since the use of such controls is inevitably subject to political pressure, it is by no means likely that this will always be so.

These quotes are revealing. Crockett, a former member of staff of the Bank of England, envisages situations where the monetary authorities know better than both the market and the political process. Whether or not such situations do exist, the absence of any robust mechanism to ensure that it is the public interest rather than the monetary authorities' interest that is advanced is a cause for

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(1) See Hartley (1967, p. 19)

some concern.

In the public expenditure process, resource allocation changes induced by Government spending relate directly to expenditure budgets, and political accountability is able to operate in the light of this information. Moral suasion may, however, be equally effective in inducing resource allocation changes, whilst not showing up in any expenditure budget.

Also excluded from the government expenditure approach to measuring the influence of government on the economy are the effects of government participation in lending, loan insurance and guarantee programmes and tax expenditures incurred by the government.(1) Tax expenditures are "departures from the normal tax structure ... designed to favour a particular industry, activity or class of persons"(2) The level of tax expenditures, of course, is very dependent on how the normal tax structure is defined, but it is clear that tax expenditures can be of significance. In Chapter 8 study is made of British tax expenditures on owner-occupied housing. Table 1 gives some indication of levels of tax expenditures for Japan, the Netherlands and the UK.

TABLE 1: COMPARATIVE TAX EXPENDITURES

	Tax Expenditure 1975		Corporations	Individuals	Other	Tax Expenditure as a % of NI
Japan	796bn	Yen	468	304	24	0.7
Netherlands	27910m	Guilders	6960	20950	..	13.3
UK 1974-5	13189m	Pounds	7748	5442	..	19.7

Source: International Fiscal Association (1976)

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(1) Break (1982)

(2) Surrey and McDaniel (1985, p3)

CHAPTER ONE: TOTAL GOVERNMENT EXPENDITURE IN SELECTED DEVELOPED NATIONS

The statistical analysis of this chapter focusses on government expenditure and the growth of regulation in the economy is not examined further here. However, other studies(1) suggest that this arm of government is growing. Reasons for its growth will be considered below under the general discussion of theoretical explanations of government expenditure growth.

THE RECENT PATTERN OF GOVERNMENT EXPENDITURE

Tables 2 to 8 show the relation between National Income (net national income at factor cost), total government expenditure (including transfers) and government transfers for France, Germany, Japan, Netherlands, Sweden, UK and USA for, subject to data availability, the years 1950 to 1982. These tables are an extension and simplification of Nutter's (1978) study of government growth.

As Brown and Jackson (1982) point out there are a number of choices to be made in defining both public expenditure and national income, with consequent Implications for the ratio of government expenditure to national income. For instance, should transfers be included in the definition of public expenditure? Transfers, it is argued, do not represent government consumption of resources but their redistribution. If transfers are included in the definition of public expenditure it is possible, in theory, for the ratio of public expenditure to national income to be greater than one hundred per cent. This has also been true in practice for at least one country - Israel.(2) Yet it has been generally reported that transfers are the

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(1) OECD (1985) surveys work on this question

(2) Peltzman (1980 p 287)

most rapidly growing part of public expenditure(1) and to leave transfers out of a measure of public expenditure because they do not indicate government resource use would neglect one of the most important features of government intervention in the economy. In this chapter transfers are included in the total of government expenditure shown in Tables 2 to 8 on the basis that the total acts as an indicator of government intervention. However, the part transfers play in this total is also shown separately.

In defining a denominator for constructing government expenditure to national income ratios, a wide range of choices is available. Brown and Jackson (1982, p. 130) point out that dividing public expenditure by net national product at factor cost leads to the highest ratio and will "obviously be chosen by those who wish to argue that the size of the public sector is too large". Warren Nutter's views placed him in this camp, so it is perhaps no accident that this is the measure he chooses to construct his public expenditure/national income ratios.(2) However Nutter does argue a strong case for selecting this particular ratio for examination, and because this paper presents tables which are an extension of Nutter's tabulations to 1982, it is worth summarising his case here.

Nutter argues that although capital depreciation is difficult to measure, on balance a truer measure of the nation's income is given if allowance is made for this. He favours measuring prices at factor cost as most government purchases do not occur on the market. Further - as Brown and Jackson (1982) discuss - measuring net national product

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(1) Brown and Jackson (1986, p133), Musgrave (1981, p 81)

(2) Nutter (1978)

at market prices has the drawback that by this measure, national income can be raised spuriously by a shift from direct to indirect taxation.

GROWTH OF GOVERNMENT IN SELECTED DEVELOPED NATIONS

Tables 2 to 8 show the growth of government expenditure as a percentage of net national product at factor cost from (where available) 1950 to 1982 for seven selected developed nations. These data are perhaps most easily appreciated from the graphs of Figure 1.

In each graph, the upper line shows total government expenditure as a percentage of Net National Product at Factor Cost, and in each case this line shows a steady upward trend with no signs of decline in recent years. Overall the graphs are rather surprisingly similar in the sense that, given the steady rise in National Income that has occurred for all these countries, the casual observer might be forgiven for expecting the possibility of a fall in the ratio of government expenditure to National Income in at least one of these nations. In fact this is not the case. However, some broad differences can be distinguished. Sweden's ratio of government expenditure to National Income is markedly higher and rises more rapidly than other countries, whilst Japan and the USA's ratios are lower.

By visual inspection an upward kink in the government expenditure/net national product ratio can be observed for most countries starting in 1973 - the year of the Arab-Israeli war and the oil price shock and resultant recession.(1) The ratios are expected

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(1) Downward kinks for 1972-73 for most especially the Netherlands, but also for Sweden and the USA result from the joining of two statistical series, and should be ignored. See the Note at the foot of Table 2 for further detail.

TABLE 2, FRANCE: NATIONAL INCOME AND GOVERNMENT EXPENDITURES IN MILLIONS OF FRENCH FRANCS

	(a)	(b)	col b	Government Transfers:		
		Total	as a		as a	as a
	National	Government	% of		% of	% of
Year	Income	Expenditure	col a	Amount	col a	col b
1950	76470	28500	37.27	11780	15.40	41.33
1951	91980	36080	39.23	14900	16.20	41.30
1952	106900	46270	43.28	17920	16.76	38.73
1953	111820	49650	44.40	19610	17.54	39.50
1954	119310	50880	42.65	21160	17.74	41.59
1955	129580	54900	42.37	23630	18.24	43.04
1956	143810	64560	44.89	26680	18.55	41.33
1957	160840	72490	45.07	30220	18.79	41.69
1958	185110	80700	43.60	34260	18.51	42.45
1959	208130	90290	43.38	39760	19.10	44.04
1960	227060	98090	43.20	43930	19.35	44.79
1961	247450	110540	44.67	49950	20.19	45.19
1962	277360	128360	46.28	58800	21.20	45.81
1963	310390	146720	47.27	68370	22.03	46.60
1964	342630	162680	47.48	76730	22.39	47.17
1965	367760	176840	48.09	84120	22.87	47.57
1966	399760	191260	47.84	91770	22.96	47.98
1967	433340	210100	48.48	100580	23.21	47.87
1968	482760	236660	49.02	111420	23.08	47.08
1969	551640	266990	48.40	127960	23.20	47.93
1970	588420	294440	50.04	142320	24.19	48.34
1971	654600	325370	49.71	161050	24.60	49.50
1972	736230	365250	49.61	184360	25.04	50.48
1973	868068	424512	48.90	213148	24.55	50.21
1974	991337	501406	50.58	249527	25.17	49.77
1975	1122435	624610	55.65	313037	27.89	50.12
1976	1278617	721771	56.45	364766	28.53	50.54
1977	1460890	825741	56.52	424004	29.02	51.35
1978	1651652	961055	58.19	505258	30.59	52.57
1979	1872569	1102903	58.90	581957	31.08	52.77
1980	2110308	1272690	60.31	672584	31.87	52.85
1981	2364379	1518609	64.23	802397	33.94	52.84
1982	2684476	1783376	66.43	958233	35.70	53.73

Notes for Tables 2 to 8: the series in these tables are from Nutter (1978) up to 1972. From 1973 onwards (1974 in the case of the UK) the entries are computed from OECD (1984). Some discontinuity is introduced in the changeover year as a result. Thus the disparity between the OECD (1984) figures for, for instance Total Government Expenditure as a percentage of National Income are as follows: (OECD - Nutter) France -.84, Germany +.33, Japan -.57, Netherlands -11.39, Sweden -1.68, UK -.33, USA -1.24. These disparities are judged to be minor except for the case of the Netherlands, where the change is very large. The entries for the Netherlands are further impaired by a substantial revision of the methods used by the Dutch for constructing the accounts for 1977 and onwards.

TABLE 3, GERMANY: NATIONAL INCOME AND GOVERNMENT EXPENDITURES IN MILLIONS OF DEUTSCHMARKS

Year	(a) National Income	(b) Total Government Expenditure	col b as a % of col a	Government Transfers: Amount	Government Transfers: as a % of col a	Government Transfers: as a % of col b
1950	75160	29520	39.28	12630	16.80	42.78
1951	91080	35880	39.39	14530	15.95	40.50
1952	103770	42580	41.03	17300	16.67	40.63
1953	112130	45500	40.58	19720	17.59	43.34
1954	121080	48020	39.66	20840	17.21	43.40
1955	139460	53580	38.42	23300	16.71	43.49
1956	154370	59200	38.35	25990	16.84	43.90
1957	168290	67750	40.26	31700	18.84	46.79
1958	180140	75720	42.03	35630	19.78	47.05
1959	193970	82150	42.35	37500	19.33	45.65
1960	235730	94920	40.27	39670	16.83	41.79
1961	258060	106200	41.15	43710	16.94	41.16
1962	277490	120660	43.48	47890	17.26	39.69
1963	295780	132920	44.94	50870	17.20	38.27
1964	324270	144450	44.55	55700	17.18	38.56
1965	355270	161510	45.46	62230	17.52	38.53
1966	377120	174310	46.22	67000	17.77	38.44
1967	376010	184230	49.00	73980	19.68	40.16
1968	416890	197030	47.26	79250	19.01	40.22
1969	460640	217830	47.29	85930	18.65	39.45
1970	529190	246460	46.57	92090	17.40	37.37
1971	585620	281730	48.11	103160	17.62	36.62
1972	639140	315520	49.37	118500	18.54	37.56
1973	721890	364730	50.52	140600	19.48	38.55
1974	772960	419630	54.29	161870	20.94	38.57
1975	803060	482550	60.09	200680	24.99	41.59
1976	879230	514170	58.48	216700	24.65	42.15
1977	935980	548290	58.58	232320	24.82	42.37
1978	1009310	588580	58.32	244920	24.27	41.61
1979	1086940	635540	58.47	261240	24.03	41.11
1980	1139380	687020	60.30	278230	24.42	40.50
1981	1185370	732620	61.81	310360	26.18	42.36
1982	1224300	761440	62.19	319410	26.09	41.95

TABLE 4, JAPAN: NATIONAL INCOME AND GOVERNMENT EXPENDITURES IN BILLIONS OF YEN

Year	(a) National Income	(b) Total Government Expenditure	col b as a % of col a	Government Transfers: Amount	Transfers as a % of col a	Transfers as a % of col b
1952	5275	906	17.18	158	3.00	17.44
1953	5896	1104	18.72	201	3.41	18.21
1954	6465	1261	19.51	303	4.69	24.03
1955	7078	1331	18.80	365	5.16	27.42
1956	7977	1384	17.35	369	4.63	26.66
1957	9115	1503	16.49	399	4.38	26.55
1958	9410	1725	18.33	536	5.70	31.07
1959	10482	1837	17.53	546	5.21	29.72
1960	12596	2818	22.37	614	4.87	21.79
1961	15523	3317	21.37	704	4.54	21.22
1962	17109	4003	23.40	827	4.83	20.66
1963	19736	4715	23.89	1005	5.09	21.31
1964	23336	5497	23.56	1194	5.12	21.72
1965	25684	6373	24.81	1448	5.64	22.72
1966	29565	7432	25.14	1685	5.70	22.67
1967	35214	8378	23.79	1943	5.52	23.19
1968	41644	9921	23.82	2238	5.37	22.56
1969	47700	11444	23.99	2542	5.33	22.21
1970	56599	13633	24.09	3106	5.49	22.78
1971	63662	16360	25.70	3544	5.57	21.66
1972	72535	19739	27.21	4392	6.06	22.25
1973	91522	23971	26.19	6065	6.63	25.30
1974	108705	31330	28.82	8666	7.97	27.66
1975	120362	38731	32.18	11996	9.97	30.97
1976	135770	44490	32.77	14732	10.85	33.11
1977	148498	51797	34.88	17219	11.60	33.24
1978	163559	59648	36.47	20061	12.27	33.63
1979	175685	66994	38.13	22688	12.91	33.87
1980	190767	74629	39.12	25186	13.20	33.75
1981	201165	82497	41.01	28276	14.06	34.28
1982	209813	87858	41.87	30976	14.76	35.26

TABLE 5, NETHERLANDS: NATIONAL INCOME AND GOVERNMENT EXPENDITURES IN MILLIONS OF GUILDERS

Year	(a) National Income	(b) Total Government Expenditure	col b as a % of col a	Government Transfers: Amount	as a % of col a	as a % of col b
1950	14926	5085	34.07	1272	8.52	25.01
1951	16917	5857	34.62	1483	8.77	25.32
1952	17689	6115	34.57	1656	9.36	27.08
1953	19110	6985	36.55	1788	9.36	25.60
1954	21565	7755	35.96	2017	9.35	26.01
1955	24525	8680	35.39	2247	9.16	25.89
1956	26493	10530	39.75	2440	9.21	23.17
1957	29044	12530	43.14	3238	11.15	25.84
1958	29560	12916	43.69	3829	12.95	29.65
1959	31444	13150	41.82	3973	12.64	30.21
1960	35149	14639	41.65	4428	12.60	30.25
1961	37045	15718	42.43	4855	13.11	30.89
1962	39591	17346	43.81	5532	13.97	31.89
1963	43130	19983	46.33	6622	15.35	33.14
1964	51079	24102	47.19	7990	15.64	33.15
1965	56949	27730	48.69	9801	17.21	35.34
1966	61568	31732	51.54	11507	18.69	36.26
1967	67759	36248	53.50	13365	19.72	36.87
1968	73320	38220	52.13	15813	21.57	41.37
1969	84113	43782	52.05	18552	22.06	42.37
1970	93704	50921	54.34	21646	23.10	42.51
1971	104720	60370	57.65	27070	25.85	44.84
1972	118550	69170	58.35	32300	27.25	46.70
1973	171870	81010	47.13	40540	23.59	50.04
1974	192620	96250	49.97	48290	25.07	50.17
1975	209480	115420	55.10	60750	29.00	52.63
1976	241090	132930	55.14	70050	29.06	52.70
1977	271160	149775	55.23	76650	28.27	51.18
1978	299290	163620	54.67	83050	27.75	50.76
1979	316110	178840	56.58	90810	28.73	50.78
1980	335340	193020	57.56	97850	29.18	50.69
1981	349360	207210	59.31	106120	30.38	51.21
1982	361390	224990	62.26	117010	32.38	52.01

TABLE 6, SWEDEN: NATIONAL INCOME AND GOVERNMENT EXPENDITURES IN MILLIONS OF KRONER

Year	(a) National Income	(b) Total Government Expenditure	col b as a % of col a	Government Transfers: Amount	as a % of col a	as a % of col b
1960	58999	22692	38.46	6185	10.48	27.26
1961	63818	24662	38.64	6712	10.52	27.22
1962	68029	27696	40.71	7415	10.90	26.77
1963	73249	31747	43.34	8574	11.71	27.01
1964	82093	35609	43.38	9570	11.66	26.88
1965	89914	40503	45.05	11194	12.45	27.64
1966	97097	46563	47.96	12676	13.05	27.22
1967	104908	53042	50.56	14781	14.09	27.87
1968	110859	59252	53.45	16654	15.02	28.11
1969	121617	64799	53.28	18980	15.61	29.29
1970	135286	73341	54.21	21090	15.59	28.76
1971	141509	82706	58.45	24995	17.66	30.22
1972	153223	92163	60.15	28726	18.75	31.17
1973	176804	102410	57.92	31023	17.55	30.29
1974	202342	124158	61.36	41210	20.37	33.19
1975	238642	148619	62.28	48392	20.28	32.56
1976	269577	177383	65.80	57979	21.51	32.69
1977	287630	212977	74.05	69858	24.29	32.80
1978	324800	243720	75.04	81377	25.05	33.39
1979	367036	257624	70.19	91960	25.05	35.70
1980	412961	302054	73.14	105135	25.46	34.81
1981	439629	344978	78.47	119199	27.11	34.55
1982	475022	411744	86.68	129446	27.25	31.44

TABLE 7, UNITED KINGDOM: NATIONAL INCOME AND GOVERNMENT EXPENDITURES IN MILLIONS OF POUNDS STERLING

Year	(a) National Income	(b) Total Government Expenditure	col b as a % of col a	Government Transfers: Amount	as a % of col a	as a % of col b
1950	10781	4217	39.12	746	6.92	17.69
1951	11845	5044	42.58	785	6.63	15.56
1952	12762	5782	45.31	905	7.09	15.65
1953	13760	6044	43.92	995	7.23	16.46
1954	14576	5974	40.99	1014	6.96	16.97
1955	15515	6139	39.57	1105	7.12	18.00
1956	16850	6647	39.45	1179	7.00	17.74
1957	17871	6936	38.81	1244	6.96	17.94
1958	18682	7330	39.24	1484	7.94	20.25
1959	19618	7778	39.65	1637	8.34	21.05
1960	20778	8191	39.42	1663	8.00	20.30
1961	22186	9176	41.36	2046	9.22	22.30
1962	23255	9886	42.51	2251	9.68	22.77
1963	24802	10548	42.53	2529	10.20	23.98
1964	26913	11342	42.14	2699	10.03	23.80
1965	28754	12492	43.44	3079	10.71	24.65
1966	30365	13599	44.79	3351	11.04	24.64
1967	31994	15323	47.89	3749	11.72	24.47
1968	34171	16818	49.22	4265	12.48	25.36
1969	35817	17596	49.13	4547	12.70	25.84
1970	39275	19359	49.29	4990	12.71	25.78
1971	44182	21389	48.41	5527	12.51	25.84
1972	49432	24753	50.07	6703	13.56	27.08
1973	57181	28560	49.95	7540	13.19	26.40
1974	67021	36807	54.92	8902	13.28	24.19
1975	83655	47860	57.21	11617	13.89	24.27
1976	99002	56322	56.89	14882	15.03	26.42
1977	111690	61883	55.41	17707	15.85	28.61
1978	128392	70280	54.74	21366	16.64	30.40
1979	147995	82281	55.60	25020	16.91	30.41
1980	168882	100935	59.77	29867	17.69	29.59
1981	183413	114484	62.42	36036	19.65	31.48
1982	200956	126230	62.81	41598	20.70	32.95

TABLE 8, U.S.A: NATIONAL INCOME AND GOVERNMENT EXPENDITURES IN MILLIONS OF DOLLARS

Year	(a) National Income	(b) Total Government Expenditure	col b as a % of col a	Government Transfers: Amount	Government Transfers: as a % of col a	Government Transfers: as a % of col b
1950	242167	63634	26.28	17717	7.32	27.84
1951	279232	82761	29.64	14482	5.19	17.50
1952	293180	97508	33.26	13421	4.58	13.76
1953	306635	105021	34.25	14150	4.61	13.47
1954	304918	100615	33.00	15699	5.15	15.60
1955	332175	101998	30.71	16865	5.08	16.53
1956	352832	108633	30.79	18246	5.17	16.80
1957	368187	120167	32.64	21037	5.71	17.51
1958	369962	133270	36.02	25314	6.84	18.99
1959	402355	136813	34.00	26146	6.50	19.11
1960	417093	143848	34.49	27829	6.67	19.35
1961	430129	157187	36.54	31752	7.38	20.20
1962	460613	168112	36.50	32540	7.06	19.36
1963	485264	175472	36.16	34179	7.04	19.48
1964	521739	184979	35.45	35231	6.75	19.05
1965	568423	193889	34.11	38019	6.69	19.61
1966	625128	218792	35.00	41799	6.69	19.10
1967	658468	251869	38.25	49177	7.47	19.52
1968	706210	277468	39.29	61123	8.66	22.03
1969	756002	295105	39.03	64493	8.53	21.85
1970	788158	330644	41.95	77088	9.78	23.31
1971	849574	356812	42.00	91273	10.74	25.58
1972	936503	388760	41.51	101861	10.88	26.20
1973	1078661	420243	38.96	121697	11.28	28.96
1974	1154526	477716	41.38	144113	12.48	30.17
1975	1234137	553728	44.87	180406	14.62	32.58
1976	1376787	597882	43.43	194531	14.13	32.54
1977	1542393	645548	41.85	207645	13.46	32.17
1978	1743718	711072	40.78	222985	12.79	31.36
1979	1948020	796015	40.86	250278	12.85	31.44
1980	2102822	923105	43.90	298631	14.20	32.35
1981	2358383	1048095	44.44	338442	14.35	32.29
1982	2437414	1158576	47.53	375870	15.42	32.44

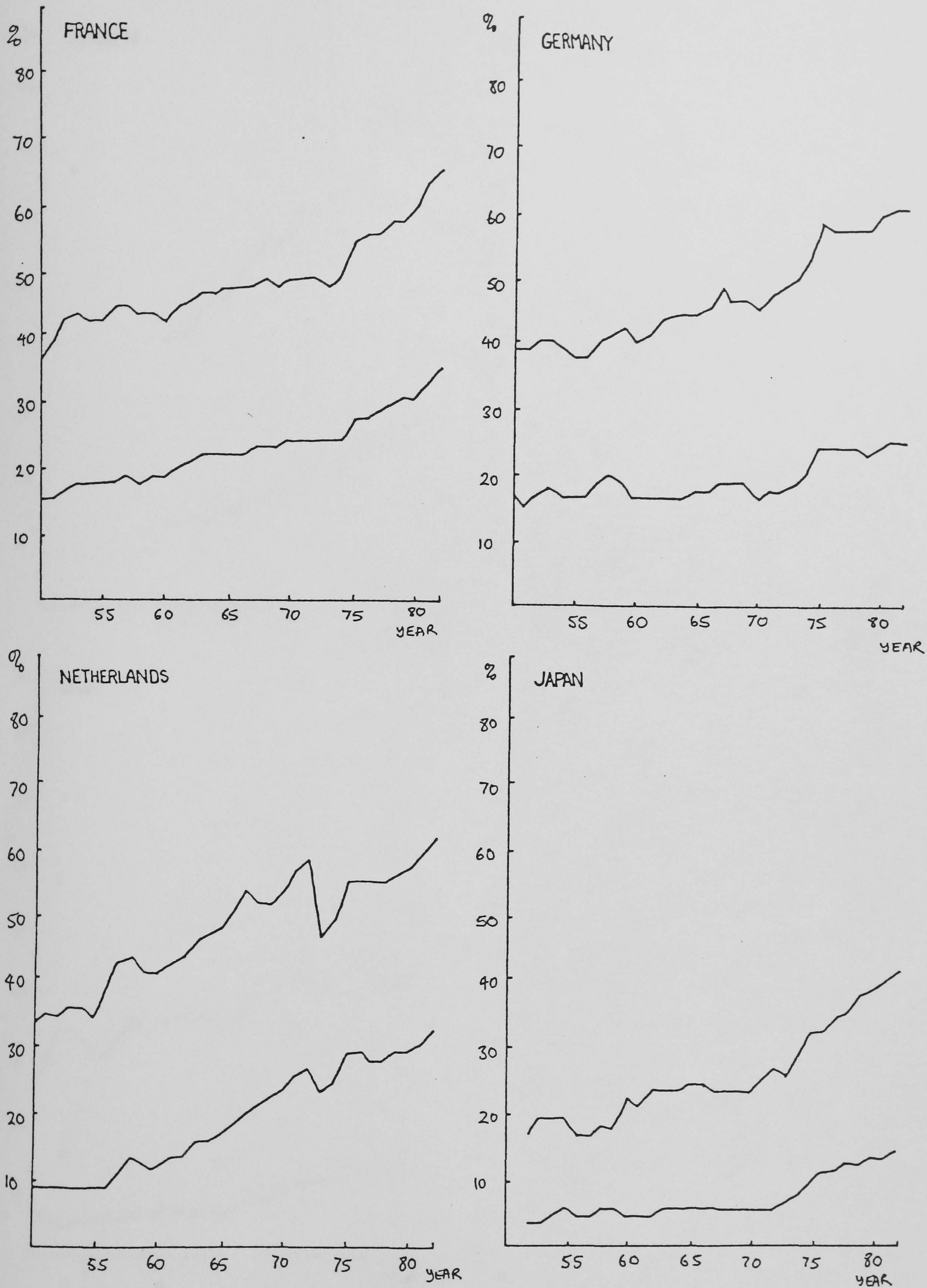
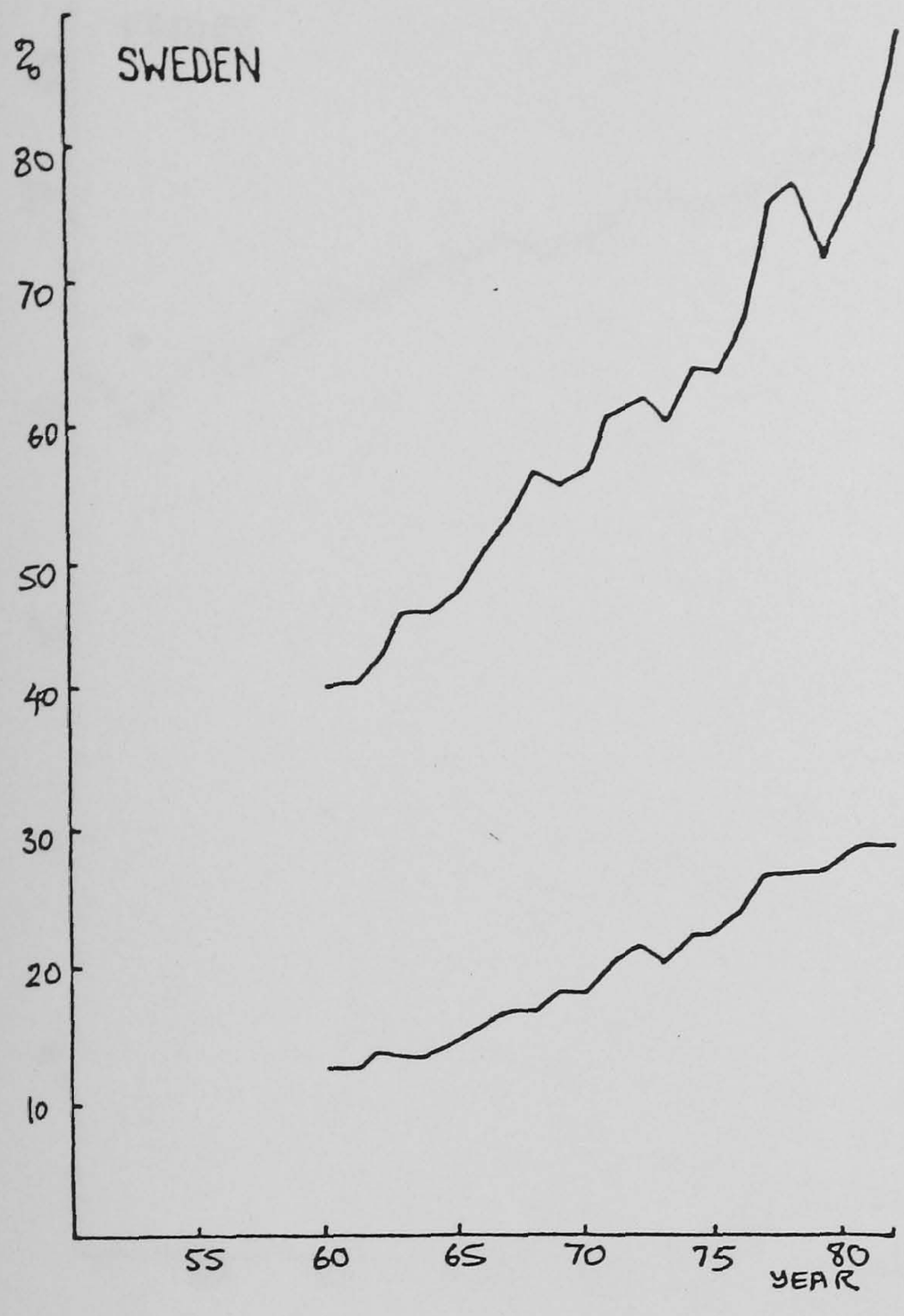


FIGURE 1 TOTAL GOVERNMENT EXPENDITURE AND TRANSFERS AS A PERCENTAGE OF NET NATIONAL PRODUCT AT FACTOR COST



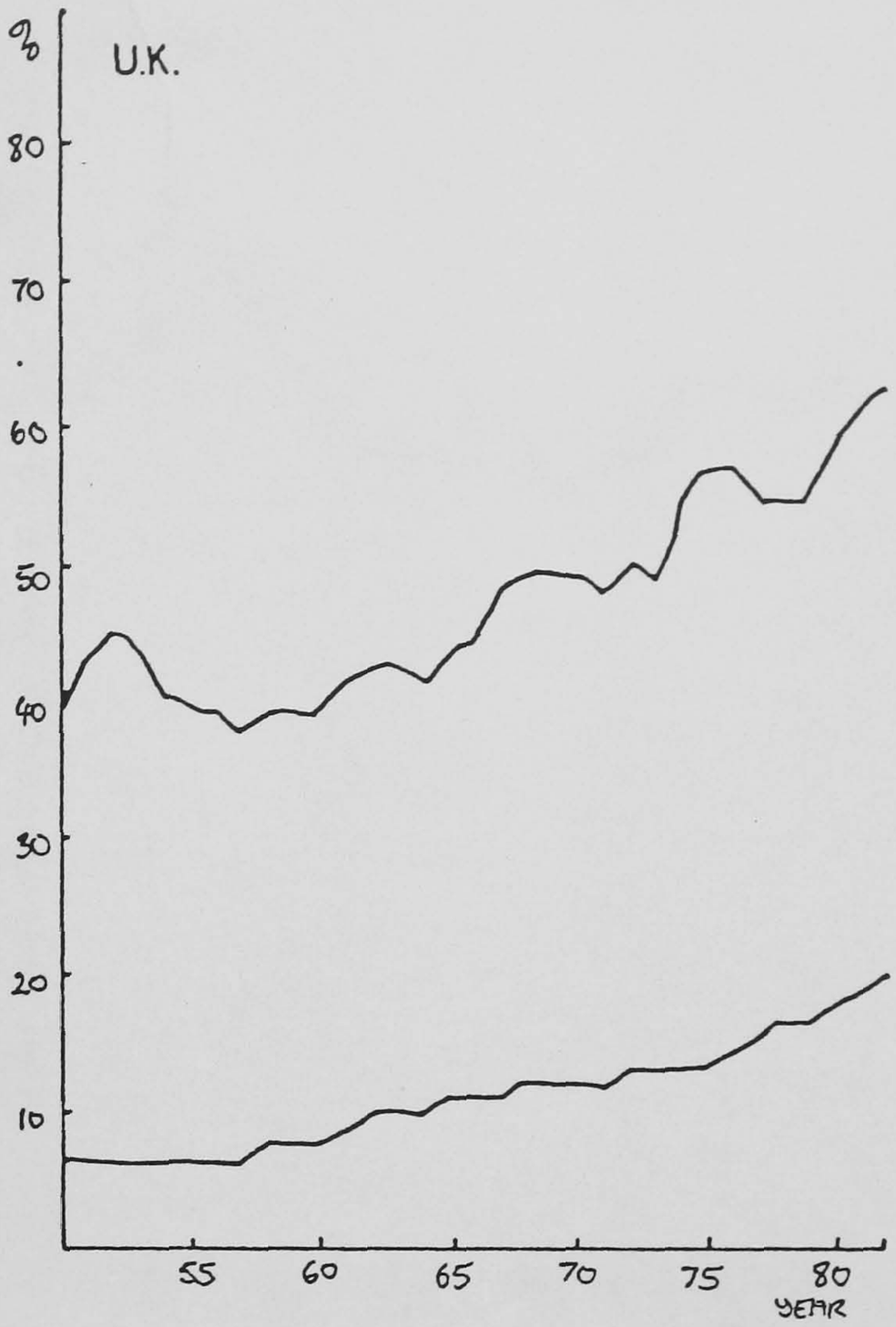


FIGURE 1 [CONTINUED]

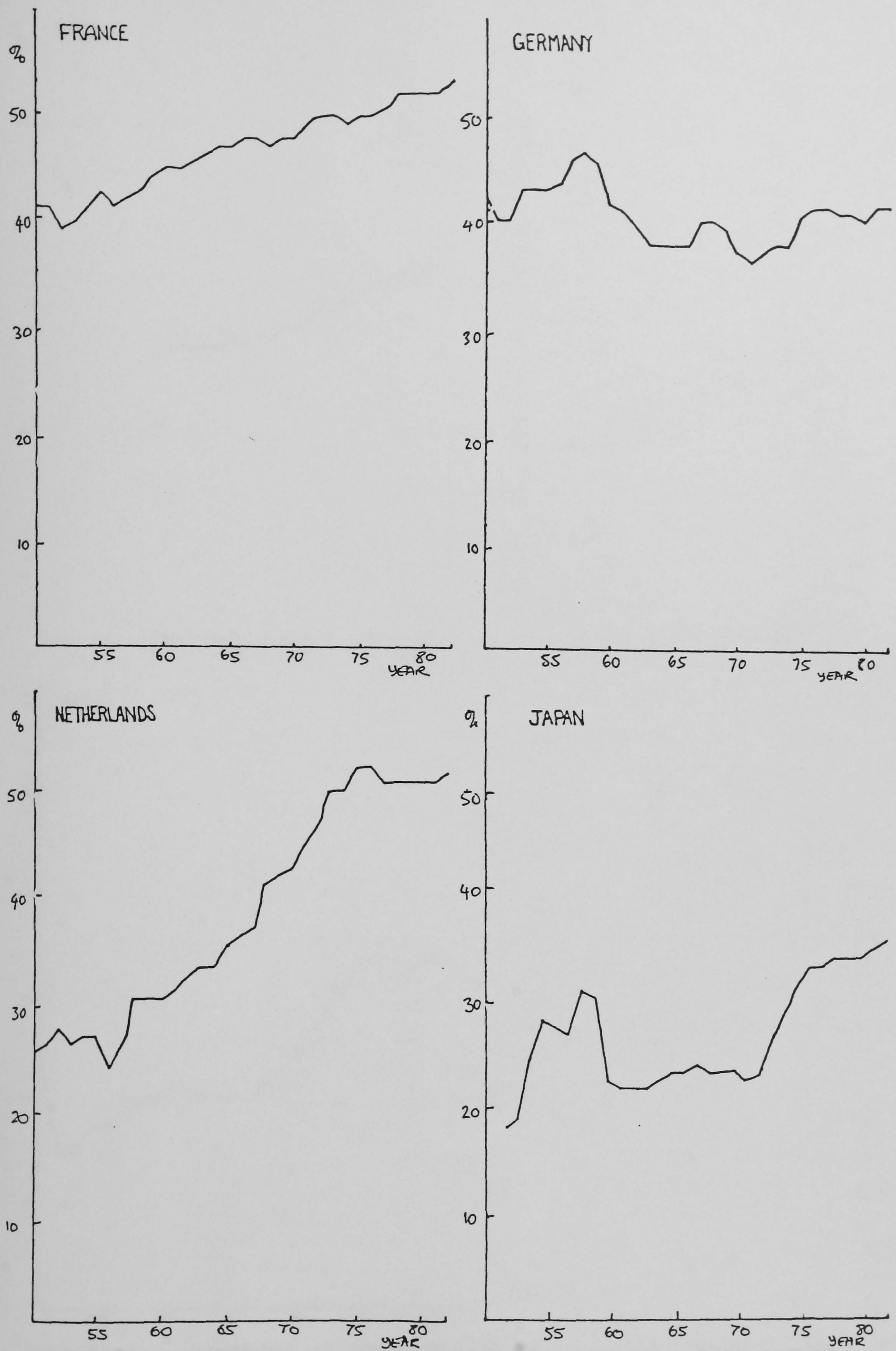
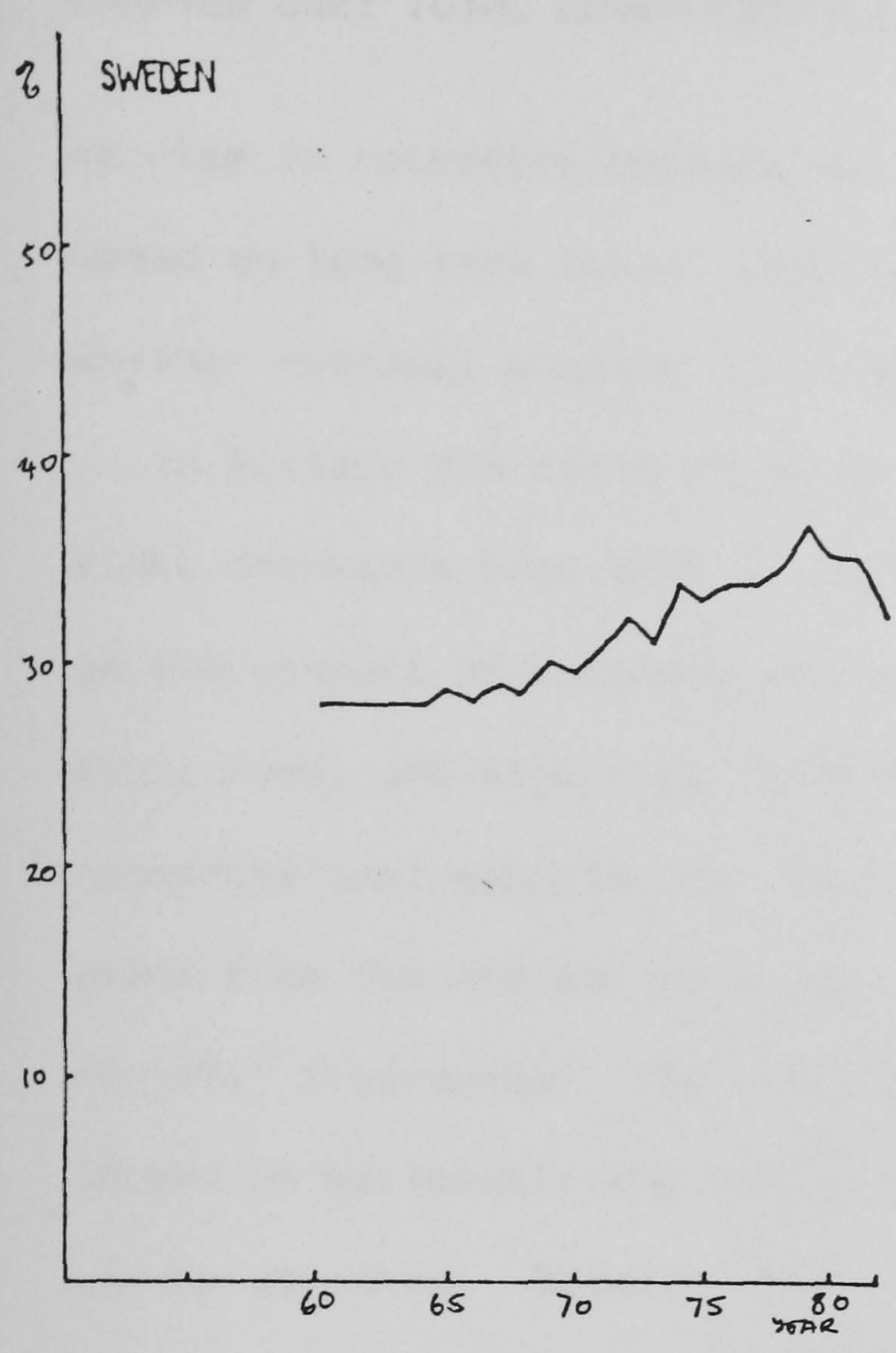
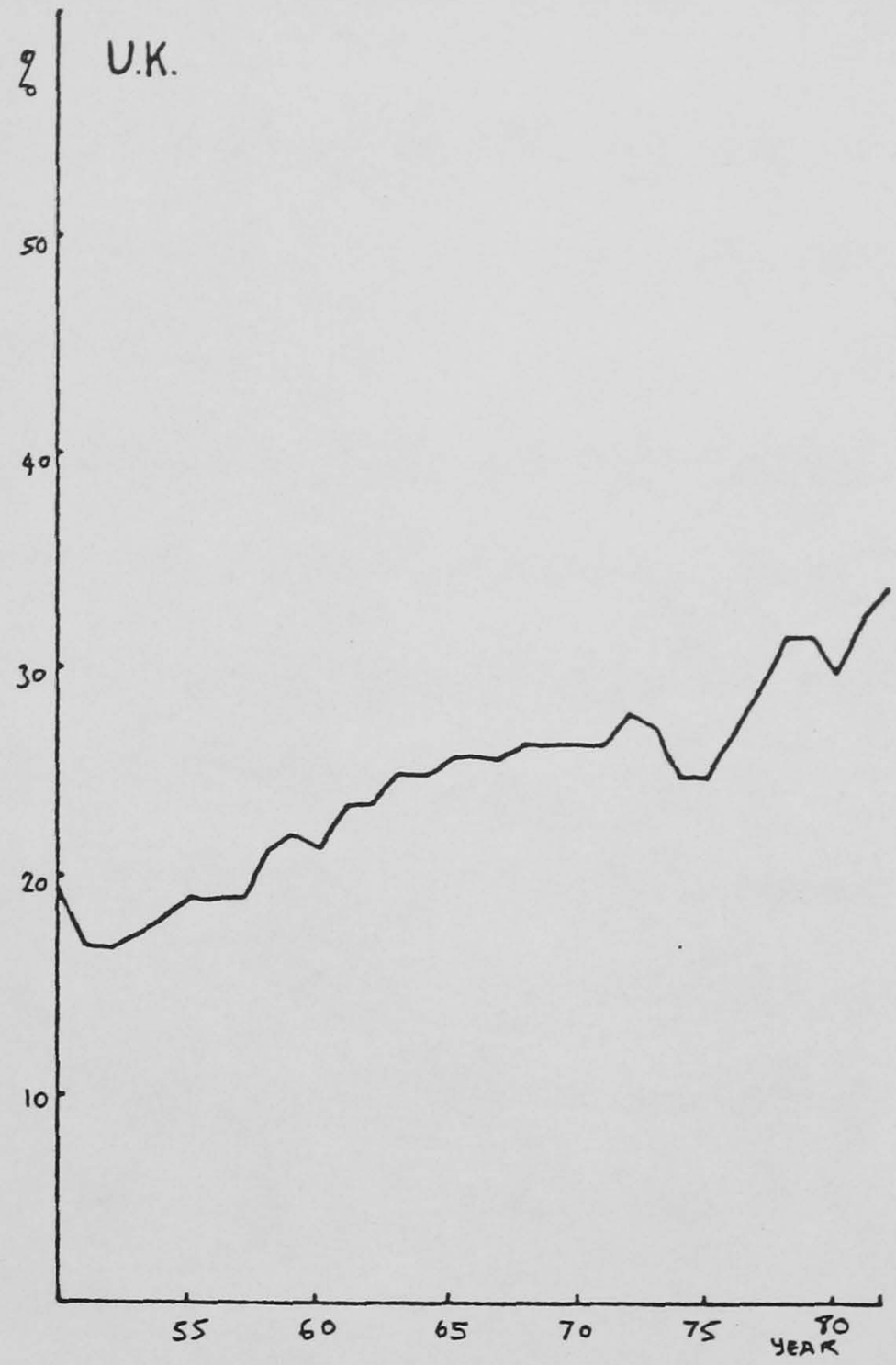


FIGURE 2: TRANSFERS AS A PERCENTAGE OF GOVERNMENT EXPENDITURE





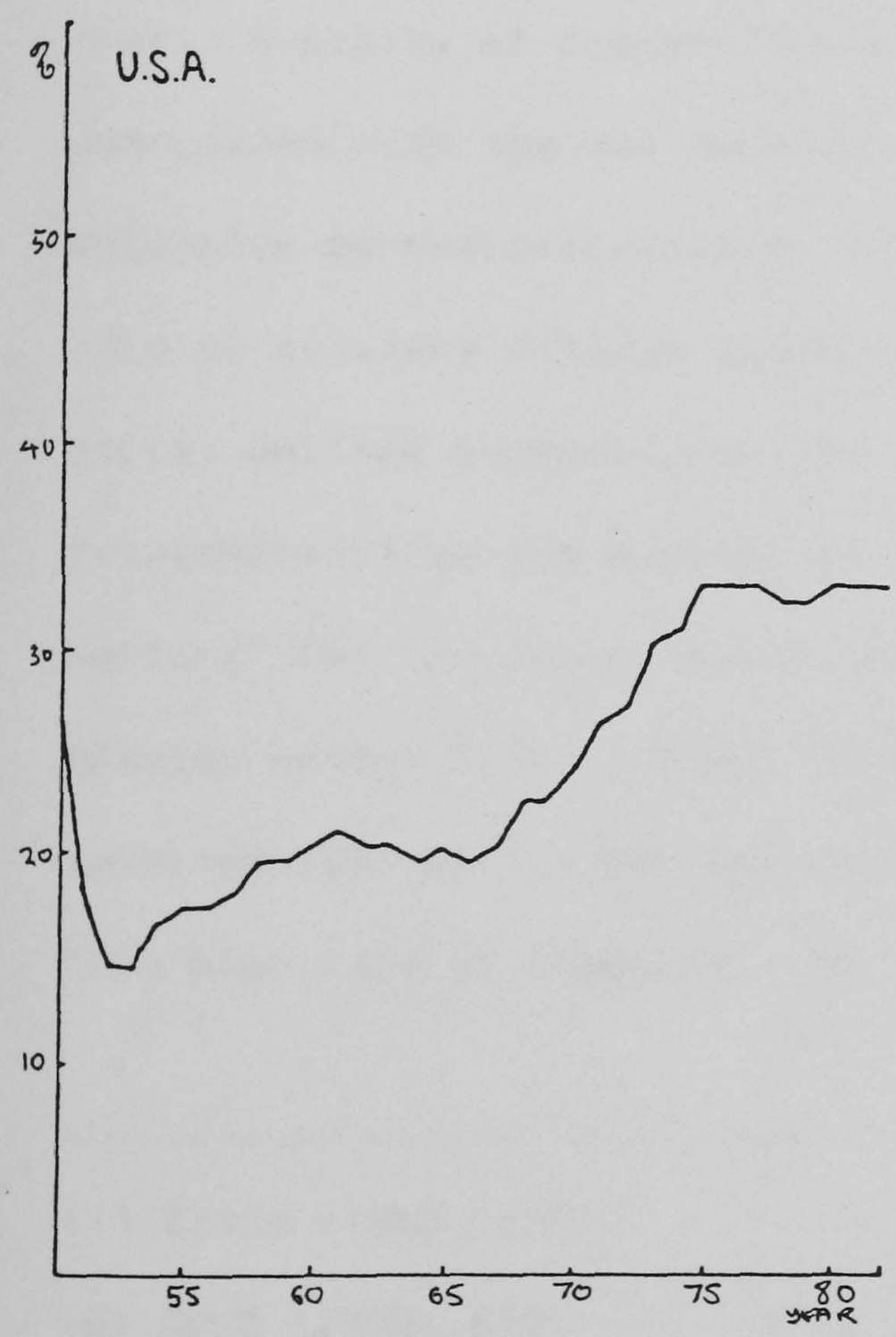


FIGURE 2: TRANSFERS AS A PERCENTAGE OF GOVERNMENT EXPENDITURE [CONTINUED]

to rise in recession because most public expenditure programs are based on long term social programs which will continue regardless of whether national product is rising or falling.(1)

In Britain the ratio of government expenditure to National Income kinks downwards from 1975 to 1977 after the imposition of conditions on the conduct of monetary and fiscal policy by the International Monetary Fund, and also from 1968 when there was an attempt to shift resources into exports.(2) In the USA, expenditures rise for several years from the mid-60s as a result of the Vietnam War and the "Great Society" programmes. The ratio of government expenditure to National Income is noticeably the lowest for Japan. Several reasons for this can be advanced. Between 1945 and 1952 Japan was under American control. A policy of dismantling all organisations that had been associated with the war machine was pursued(3) and this policy led to extensive de-nationalisation. Also important were the post-war avoidance of military outlays and the government's policy choice of keeping social welfare expenditures low in an economy where many welfare responsibilities are adopted by corporations: "neither welfare nor warfare".(4) In Japan, public expenditure is concentrated to a greater extent than in other developed economies on public investment(5) partly because of the low level of defence expenditure. This high rate of investment in turn partly explains the high growth

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(1) Eltis (1983, p73).

(2) OECD (1978, p13)

(3) Allen (1980, p. 108)

(4) Boltho (1975, p124)

(5) ibid

rate of national income, which has allowed the public sector to grow rapidly, without markedly increasing its share.(1)

As a way of summarising the information contained in Tables 2 to 8, government expenditure is regressed on a time trend. The object of doing this is not to suggest that the mere passage of time is a cause of government expenditure growth, but to derive summary figures for rate of growth over time and a projected constant for 1950. The results of these estimations are given in Table 9. The aggregate regression is derived by pooling all the observations.

TABLE 9, GOVERNMENT EXPENDITURE AS A PERCENTAGE OF NATIONAL INCOME REGRESSED ON TIME IN YEARS

Country	Constant Term	Regression Coefficient	t Statistic	R^2	Period
France	37.79	.67	14.43	.87	1950-1982
Germany	34.73	.77	16.65	.89	1950-1982
Japan	12.21	.77	14.62	.88	1952-1982
Netherlands	34.05	.82	15.85	.89	1950-1982
Sweden	14.32	1.98	23.48	.96	1960-1982
UK	35.76	.69	12.07	.82	1950-1982
USA	29.37	.48	14.07	.86	1950-1982
Aggregate	30.31	.80	11.46	.38	

Note: Regression is Y=a+bt where Y is total government expenditure divided by net national product at factor cost, a is the constant term, b is the regression coefficient and t is time in years with 1950=1.

In all cases it can be seen that there is a significant positive relationship between the passage of time and the level of government spending.(2)

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(1) ibid

(2) The critical point for a one tailed test of significance at the 1% level for the regression coefficients, with 31 degrees of freedom is 2.04 and with 21 degrees of freedom (Sweden), is 2.08.

It is noticeable that the coefficient on time for Sweden is far higher than for all other countries. At the same time the regression is over a shorter time period than for the other countries as data were not available for Sweden before 1960. Visual inspection of the graphs of Figure 1 shows that the slope of the government expenditure curve often steepens over time. It is of interest to ask whether the higher coefficient for Sweden purely a result of the data for Sweden being restricted to 1960 onwards when the slope steepens for most countries? As a way of examining this all the regressions were re-run for just the later years: 1960-1982. This re-estimation resulted in all the coefficients on time increasing markedly except those for the Netherlands and the USA.(1) However, these increased coefficients still did not approach the value for Sweden, which still stands out as having the highest rate of public expenditure growth amongst the group.

Another feature of the results for Sweden from Table 9 is that the intercept is rather low. Could it be the case that Sweden's high growth rate is a consequence of catching-up from a low start? Some doubt is cast on this explanation when it is noted that Japan also has a low intercept, but in Japan's case this goes with a low growth rate of public expenditure as a percentage of National Income.(2)

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(1) The changes were France .67 to .86, Germany .77 to 1.06, Japan .77 to .90, Netherlands .82 to .69, UK .69 to .99 and USA .48 to .47.

(2) As a way of examining the question of a possible relationship between growth rate and intercept the growth rates from Table 9 were regressed on the intercepts from Table 9 for the seven countries of the study. The estimated regression was slope = -.274 x intercept + 1.65, R^2 = .342. The t-statistic of the coefficient -.274, was -1.61 and was not significant at the .05 level in a one-tailed test.

CHAPTER ONE: TOTAL GOVERNMENT EXPENDITURE IN SELECTED DEVELOPED NATIONS

One way of explaining differences in the percentage of government expenditure to national income in different countries is the different political orientation of different countries. The hypothesis is that Conservative governments will cause the ratio of public expenditure to national income (G/NI) to be lower than non-Conservative governments. This suggests a model of the form G/N = f(CONS,T), where CONS is some measure of right-wing orientation of a nation's parliament, T is a time trend, and the expectations are o(G/N)/oCONS<0 and o(G/N)/oT>0. This leaves the political orientation itself of the countries to be explained, but if a relationship can be found between political orientation and the ratio of public expenditure to national income then the explanation is advanced one step. Castles (1986) contains a tabulation for the annual average percentage of right-wing parliamentary seats which includes the seven nations studied here. These averages are for 1951-59, 1960-74, and 1975-81.(1) To test for a relationship, Castles's data on political orientation were regressed on the data collected here for the percentage of government expenditure to national income averaged for Castles's three periods. The following result is obtained:

$$Y = 42.42 - .312*CONS + .809*YEAR \qquad R^2 = .58$$
$$\qquad\qquad (-2.727) \qquad\quad (3.936)$$

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(1) Castles's data for percentage annual average right-wing seats are as follows:

Country	1951-59	1960-74	1975-81
France	21	56	34
Germany	47	49	47
Japan	50	60	52
Netherlands	10	12	17
Sweden	15	14	17
UK	53	49	47
USA	54	46	50

where CONS is annual average right-wing parliamentary seats, YEAR is middle year of the time periods, 1950 = 1, t-statistics in parentheses, and * denotes significantly different from zero in a one-tailed test at the .01 level.

This estimation suggests that the percentage of government expenditure to national income is expected to rise by eight per cent every ten years, and reduce by three per cent for every ten per cent increase in the percentage of right-wing parliamentary seats. One way of interpreting this result is to see the size of government as being in disequilibrium, in the sense that it is growing over time, and to see the presence of Conservative parliamentary representation as tending to increase this secular growth.

Political orientation would certainly appear to have a role in the explanation of government growth for Sweden, which stands out amongst the countries examined as having the highest growth rate and level of public expenditure. Apart from one hundred days in 1936, the Social Democrats have from 1932 to 1976 had either an absolute majority or have been the main party in a coalition.

Given this well established overall pattern of growth in government expenditure it is to be expected that the growth would be reflected in an increase in the percentage of manpower employed by government.(1) Thus suppose the production function for public output is $Q = AK^{\alpha}N^{\beta}$, where Q is the value of public production - assumed as in national

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(1) Musgrave (1982) points out that there is no elegant theoretical justification for public employment analogous to the public goods argument for public expenditure. The implication of the existence of public goods is the need for government finance and hence expenditure, but the provision need not necessarily be public and hence there is no necessarily implied need for public employment. However, the major growth of public expenditure has been on private rather than public goods (OECD 1985a).

accounts calculations to be equal to the cost of inputs, K is capital in the public sector and N is employment in the public sector. The marginal value(1) product of labour $dQ/dN = \beta AK^{\alpha}N^{\beta-1} = \beta Q/N$. Assuming that employment is set at a level where the value of its marginal product is equal to the wage, w yields $w = \beta Q/N$. Rearranging, gives the demand for labour as $N = \beta Q/w$. Hence public sector employment would be expected to be positively related to the size of the public sector, Q, and negatively related to the level of public sector wages, w.(2)

International evidence on public sector employment is limited, but Table 10 reproduces some evidence gathered by the OECD for those in employment in the public sector. The public sector is defined by the OECD as covering the departments and agencies at central, state, provincial and local level that produce non-market goods and services. Thus the main exclusions are government owned firms and public corporations that produce and sell goods and services.(3) Public sector employment is seen to have absorbed an increasing proportion of the workforce for all countries considered except for Japan and the USA.

In Table 11 the time trend has been regressed on these public employment percentages and the coefficient on time is significantly positive for all countries examined except the USA. However, Bennett and Johnson (1980) have shown that this stability in numbers employed

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(1) Analogous to the marginal revenue product in the private sector, where the value of output in the public sector is assumed equal to input costs

(2) For discussions of public sector employment see Addison and Siebert (1979, Ch 2) and Ehernberg (1973)

(3) OECD (1982, p9)

TABLE 10: SHARE OF THE PUBLIC SECTOR IN TOTAL EMPLOYMENT 1960-1979

Country	1960	1965	1970	1975	1978	1979
France	12.1	11.6	12.4	13.7	14.2	n.a.
Germany	8	9.8	11.2	13.9	14.5	14.7
Japan	n.a.	n.a.	5.8	6.5	6.5	6.5
Netherlands	11.7	11.5	12.1	13.5	14.6	14.7
Sweden	12.8	15.3	20.6	25.5	29.0	29.8
UK	14.9*	15.7	18.0	21.0	21.4	21.5
USA	15.7	16.7	18.0	18.0	16.8	16.5

* 1961

Source: OECD (1982, p12)

in the USA conceals substantial qualitative shifts in the ratio of blue-collar employment to more highly remunerated white-collar employment, from one-in-three in 1959, to less than one-in-five in 1978. They also argue that there has been a dramatic increase in the employment of contractors and consultants, with, for instance, ninety per cent of the then Department of Energy's budget devoted to research work by contractors and consultants.

In contrast Sweden shows explicitly the highest growth in the public employment rate in Table 11, reflecting its high growth rate of public expenditure and strong full-employment policy objective.(1)

In summary, it can be said that employment in the public sector has grown strongly in all the countries considered except for the USA where as argued by Bennet and Johnson the data may still be compatible

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(1) Martin (1982) has sought to explain the share of the public sector in total employment for 20 OECD countries. He finds a weakly established positive relationship between public sector employment share and GDP per capita, but also a more strongly established positive relationship between public sector employment share and the ratio of the non-working to the working population. This latter variable was used on the hypothesis that public sector client groups are more likely to be non-working - the school-going population for instance.

TABLE 11, PERCENTAGE PUBLIC SECTOR EMPLOYMENT REGRESSED ON TIME IN YEARS

Country	Constant Term	Regression Coefficient	t Statistic	R^2	Observations
France	11.51	.13	3.41*	.79	5
Germany	7.94	.36	19.01***	.99	6
Japan	5.11	.08	3.05**	.82	4
Netherlands	11.03	.18	5.11***	.87	6
Sweden	11.73	.93	18.44***	.99	6
UK	14.17	.40	12.51***	.98	6
USA	16.41	.05	.88	.90	6

Note: Regression is E=a+bt where E is the percentage of public sector employment , a is the constant term, b is the regression coefficient and t is time in years with 1960=0. *, ** and *** denote significant difference from zero in .1, .05 and .01 level tests respectively.

TABLE 12, GOVERNMENT EXPENDITURE ON TRANSFERS AS A PERCENTAGE OF NET NATIONAL PRODUCT AT FACTOR COST REGRESSED ON TIME IN YEARS

Country	Constant Term	Regression Coefficient	t Statistic	R^2	Period
France	14.24	.53	22.16	.94	1950-1982
Germany	14.86	.28	8.24	.69	1950-1982
Japan	1.19	.33	9.54	.76	1952-1982
Netherlands	5.33	.81	29.42	.97	1950-1982
Sweden	-.44	.83	28.42	.97	1960-1982
UK	4.70	.40	22.35	.94	1950-1982
USA	3.27	.34	14.60	.87	1950-1982
Aggregate	7.14	.46	10.18	.32	

Note: Regression is Y=a+bt where Y is total government expenditure on transfers divided by net national product at factor cost, a is the constant term, b is the regression coefficient and t is time in years with 1950=1.

with growth.

Having discussed, in the first part of this chapter, government employment and government expenditure in total, the role of <u>transfers</u> within this total of government expenditure is now considered. Tables 2 to 8 show as the second to last of their columns, transfers as a percentage of national income, and this percentage is shown graphically in Figure 1 as the lower line in each graph. From

these diagrams it is seen that there is a clear rising trend of transfers as a percentage of national income, and this trend is summarised in the regression results of Table 12 where government expenditure on transfers has been regressed on time. Once again all the slope coefficients are positive and statistically significant in each case. The Netherlands and Sweden show the strongest time trends for the increase in transfers as a proportion of National Income, and Germany the lowest. Political orientation appears to give some explanation for these findings, with Sweden and the Netherlands having a low level of right-wing Parliamentary representation. In addition, since the War, the overall economic strategy in Sweden has been to "leave the private sector intact",(1) but to redistribute income out of it by tax policy, which would accord with Sweden's high level of transfers.

Given that both <u>total</u> government expenditure and government expenditure on <u>transfers</u> are rising as a percentage of national income, the question arises of how the ratio between these classifications has been changing. Thus it may be asked whether transfers have been rising as a percentage of government expenditure. The data to answer this question are computed as the last column of Tables 2 to 8 and are shown graphically in Figure 2. From these graphs it can be seen that there has been a clear <u>upward</u> trend in transfers as a percentage of government expenditure in all the countries in the sample except for Germany.(2) This pattern is reflected in the regression

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(1) Ryden and Bergstrom (1982, p10)

(2) West Germany does not have a centralised old age or sickness insurance scheme but instead a large number of independent semi-official bodies. Except for old-age insurance these bodies are self-financing. Health insurance is provided by around 2000 separate health funds. Hallett (1973)

TABLE 13, GOVERNMENT EXPENDITURE ON TRANSFERS AS A PERCENTAGE OF TOTAL GOVERNMENT EXPENDITURE REGRESSED ON TIME IN YEARS

Country	Constant Term	Regression Coefficient	t Statistic	R^2	Period
France	39.49	.43	26.58	.96	1950-1982
Germany	42.69	-.09	-2.07	.12	1950-1982
Japan	19.23	.38	4.60	.42	1952-1982
Netherlands	20.33	1.05	22.17	.94	1950-1982
Sweden	21.52	.40	10.96	.85	1960-1982
UK	15.48	.48	19.31	.92	1950-1982
USA	13.62	.56	9.41	.74	1950-1982
Aggregate	25.39	.43	5.99	.14	

Note: Regression is Y=a+bt where Y is government expenditure on transfers divided by total government expenditure, a is the constant term, b is the regression coefficient and t is time in years with 1950=1.

results of Table 13 where government expenditure on transfers as a percentage of total government expenditure is regressed on time. Coefficients are positive for all the countries examined except Germany, and the shift to transfers has been strongest in the Netherlands. OECD (1985b) analyses the growth of social expenditures from 1960 to 1975, and from 1975 to 1981. Although these include non-transfer items such as education, the following points about transfer expenditures emerge from their findings. In Sweden, France and the UK the growth of unemployment compensation has been high, especially over the later of the two periods examined. In France this high growth rate of unemployment compensation stems from growth in both coverage and real benefit. In the UK on the other hand, the high growth rate of unemployment compensation results from a combination of increased numbers and a fall in real benefit (OECD 1985b). Another important transfer, pensions is noted for its high growth rate in Japan, where both the retired population and coverage

have been growing rapidly. In Germany, on the other hand, the average real level of government pensions declined from 1975-81, which accords with the predominance of independent pension schemes.

FUNCTIONAL COMPONENTS OF GOVERNMENT EXPENDITURE

Whilst there are considerable difficulties of consistency and definition, a study by the OECD(1) has broken down total government expenditure into a series of broad functional categories that enables comparisons to be made for all of the countries considered in this study, with the exception of Sweden. This division of government expenditure as a percentage of GDP is given in Table 14. Examining this table,

TABLE 14, GOVERNMENT FUNCTIONAL EXPENDITURE COMPONENTS AS A PERCENTAGE OF GDP

	Defence	Education	Health	Social Security	General Economic Services	Administration
France	3.5	5.8	6.0	18.7	3.6	7.3
Germany	2.9	5.1	6.4	19.6	5.3	5.9
Japan	0.9	4.9	4.6	7.3	6.0	6.2
Netherlands	3.2	7.3	..	21.1	..	..
United Kingdom	4.7	5.9	4.6	12.1	4.4	8.5
United States	5.2	6.0	2.4	10.2	3.3	4.6

Source: Computed from Saunders and Klau (1985, p47)

the main features that stand out are the contrasts between the large share of public expenditure on defence in the UK and the USA and its small share in Japan; the relatively large share of education in public expenditure in the Netherlands and the smaller share in Germany and Japan and the large share of health in the public expenditure of Germany compared with the small share in the USA. Lastly, high Social

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(1) Saunders and Klau (1985)

Security spending in the Netherlands contrasts with low Social Security spending in Japan.

OECD (1985b) also presents the elasticities of growth of these components with respect to the growth of GDP. Again there are some problems of consistency which prevents a uniform comparison of time periods and the consideration of Sweden. These growth elasticities are presented in Table 14.

The largest growth in spending programmes can be seen to be in the

TABLE 14, ELASTICITIES OF GROWTH OF GOVERNMENT FUNCTIONAL EXPENDITURE COMPONENTS WITH RESPECT TO GROWTH IN GDP, VARIOUS TIME PERIODS.

	Years	Total	Gen. Admin	Def-ence	Educ'n	Health	Social Sec'ty	Econ Serv	Other
France	75-81	1.14	1.03	1.18	0.99	1.20	1.25	0.89	1.10
Germany	70-81	1.30	1.37	0.88	1.22	1.52	1.34	1.01	1.61
Japan	70-82	1.37	1.18	1.11	1.26	1.44	1.89	1.12	1.38
N'lds	60-81	1.26	..	0.86	1.17	..	1.33	..	1.33
U.K.	60-79	1.08	1.07	0.82	1.20	1.20	1.29	0.77	1.09
U.S.A	70-78	1.05	0.98	0.44	1.09	1.35	1.41	0.71	1.52

Source: OECD (1985b)

welfare state areas of health and social services, and the lowest growth is in defence and economic services - i.e. capital transactions and subsidies.

To summarise the statistical picture presented above, there has been a clear upward trend in government expenditure and employment in the countries considered with no sign of a decline in recent years. Transfers by government have also maintained their rising trend, both in their relation to national income and also, with the exception of Western Germany, as a proportion of total government expenditure.

In the next section, theoretical explanations of these phenomena are reviewed.

CHAPTER ONE: TOTAL GOVERNMENT EXPENDITURE IN SELECTED DEVELOPED NATIONS

THEORETICAL EXPLANATIONS OF THE GROWTH OF GOVERNMENT

Given the universality and long term nature of government expenditure growth commented on at the beginning of this chapter, it is not surprising that a large number of theories of government expenditure have been proposed to explain this phenomenon. Adolph Wagner, writing in 1883,(1) speaks of "a law of increasing expansion of public, and particularly state, activities", declaring that

> its explanation, justification and cause is the pressure for social progress and the resulting changes in the relative spheres of private and public economy, especially compulsory public economy.

In explaining his law, Wagner identified three types of state activity: the maintenance of law and order necessary for markets to function, material production, and the provision of such things as postal services, education and banking services.(2) The state would be increasingly involved in the first type of activity because Wagner believed there would be a need for centralisation of administration as the market increasingly atomised social and economic life, and as the division of labour increased the complexities of economic life and generated more possible causes of friction. Wagner believed a growing involvement by the state in material production would be required because new technical processes, for example steam power, meant that production would increasingly need to be organised by the state or joint stock companies, and the private alternative was vulnerable to business cycle disturbances. Lastly the state would become

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(1) Translated and reproduced in Musgrave and Peacock (1967, p8)

(2) Because the relevant part of Wagner's work is not available in English translation, this discussion relies on Peacock and Wiseman (1967)

increasingly involved in services such as education and banking because technical developments were likely to favour monopolies, or because the social benefits of services, such as education, were difficult to evaluate.

Peacock and Wiseman criticise Wagner's "law" as being dependent upon his organic theory of the state which in turn is only one of many alternative interpretations of the nature and duties of the state.(1)

In their own contribution, which has stimulated much research and debate, Peacock and Wiseman introduced the idea of the displacement effect into the consideration of government expenditure growth. They argue that

> the revenue and expenditure statistics of the government may show a displacement after periods of social disturbance. Expenditures may fall when the disturbance is over, but they are less likely to return to the old level.(2)

Thus Peacock and Wiseman expect to find a displacement of postwar expenditures higher than prewar ones.

Wagner's views on the determinants of public expenditure growth, and the views of Peacock and Wiseman, have been subject to extensive debate and empirical investigation in the economic literature.(3) In many ways these statistical debates amount to a discussion over which particular econometric sledgehammer is appropriate to crack the nut. Seen in this light, Peacock and Wiseman's methodology, "the visual inspection of charts"(4) is perhaps a more appropriate tool than they

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(1) Peacock and Wiseman (1967, p19)

(2) Peacock and Wiseman (1967, p27)

(3) See for instance Gupta (1967) Bonin, Finch and Waters (1969), Diamond(1977) and Watt (1978). The last reference is reproduced as Appendix I to this chapter.

(4) Peacock and Wiseman (1979, p. 13)

would claim. Thus, one would expect there to be a "structural break" in many economic relationships if two time periods were compared, interrupted by a gap as long as that between 1939 and 1948 for instance, war or no war.

A different line of explanation for the growth of government was suggested by Baumol (1967). In Baumol's view it is more difficult to increase productivity in the public sector because of technical barriers imposed by the labour intensive nature of its services. Thus the share of public expenditure in national income could rise purely as a result of a desire to maintain the volume of public sector output if public sector productivity lags behind other sectors.

Baumol's article drew much comment at the time.(1) Peacock and Wiseman (1979) later suggested that productivity growth in the public sector is low because of <u>institutional</u> barriers to innovation rather than because of technical barriers, and pointed to economic theories of bureaucracy as explanation.

> The theory [of bureaucracy] tells us that bureaucrats are in charge of productive operations in which they have a monopoly of supply and a monopoly of information about the way in which supply is produced. Further their "products" are not priced. They are therefore not under the same pressure to innovate as private producers subjected to competitive conditions...

The view that bureaucrats will expand government beyond its optimum size is most associated with the name of Niskanen (1971 and 1975), although the idea has a long history as Niskanen points out:

> I do not, of course, claim paternity for the idea that bureaucrats act to maximise their bureau's budget. Indeed, the plausibility of "Parkinson's Law" is based on a popular belief that bureaus have an inherent tendency to grow.(2)

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(1) Beck (1985) notes seven comments in the American Economic Review and asks if this is a record.

(2) Niskanen (1971, p.41). See also Parkinson (1962)

CHAPTER ONE: TOTAL GOVERNMENT EXPENDITURE IN SELECTED DEVELOPED NATIONS

Niskanen's model may be set out as follows. Bureaucrats are assumed to be governed by a sponsoring agency which has a budget function that relates the budget B it is prepared to grant the bureau to the perceived output of the bureau Q. Niskanen assumes this function to be quadratic and of the following form:

$$B = aQ - bQ^2 \qquad 0 \leq Q \leq a/2b. \qquad 1$$

The budget is available to the bureau because the sponsors value the bureau's output. Hence B may be thought of approximately as the total public benefit or utility function.(1) More precisely, and as something of an understatement:

> The budget-output function of the sponsors as revealed to the bureau will be related to that of the constituents through the processes by which the officers of the collective organisation are selected and by its internal decision processes, but will not necessarily be identical with that of the constituents.(2)

The first derivative of this utility function corresponds to the marginal valuation of the consumer or the maximum "price" the sponsor is willing to pay, price being placed in inverted commas because of the practical difficulties of identifying it.(3) Niskanen assumes the costs of the bureau also to be quadratic of the following form:

$$TC = cQ + dQ^2, \qquad Q \geq 0. \qquad 2$$

A further assumption that the bureau does not return its surplus funds to the sponsor gives the constraint that the bureau's costs must equal its budget:

$$B = TC. \qquad 3$$

Niskanen assumes that the bureaucrat's utility is a positive

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(1) Mueller (1979, p159)

(2) Niskanen (1971, p45)

(3) Niskanen (1971, pp28-29), Jackson (1982, p127)

monotonic function of size of budget, arguing that from the following likely sources of utility:

> ... salary, perquisites of the office, public reputation, power, patronage, output of the bureau, ease of making changes, and ease of managing the bureau.(1)

all except the last two are positive monotonic functions of the total budget of the bureau. The bureau therefore attempts to maximise its budget. To maximise the budget the bureau will set Q so that the budget at the output equals the total cost, i.e.

$$B = aQ - bQ^2 = cQ + dQ^2 = TC, \qquad 4$$

which yields

$$Q = (a - c)/(b + d). \qquad 5$$

A further constraint is that the sponsor is not satiated - i.e.

$$dB/dQ \geq 0, \qquad 6$$

or

$$Q \leq a/2b. \qquad 7$$

Niskanen's model is shown diagrammatically in Figure 3. The diagram shows the linear marginal cost and marginal valuation functions that result from differentiating the total cost and total benefit functions with respect to Q. Bureaucrats maximise their utility by setting Q=(a-c)/(b+d) unless this is greater than satiation for the sponsors - i.e. a/2ab, in which case a/2ab is chosen.

With full knowledge, the sponsors would restrict bureau output to Q_o, beyond which point the marginal valuation to the sponsors of bureau activity exceeds its marginal cost. Niskanen suggests the sponsors will be unsuccessful in this because only the bureau has

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(1) Niskanen (1971, p 38)

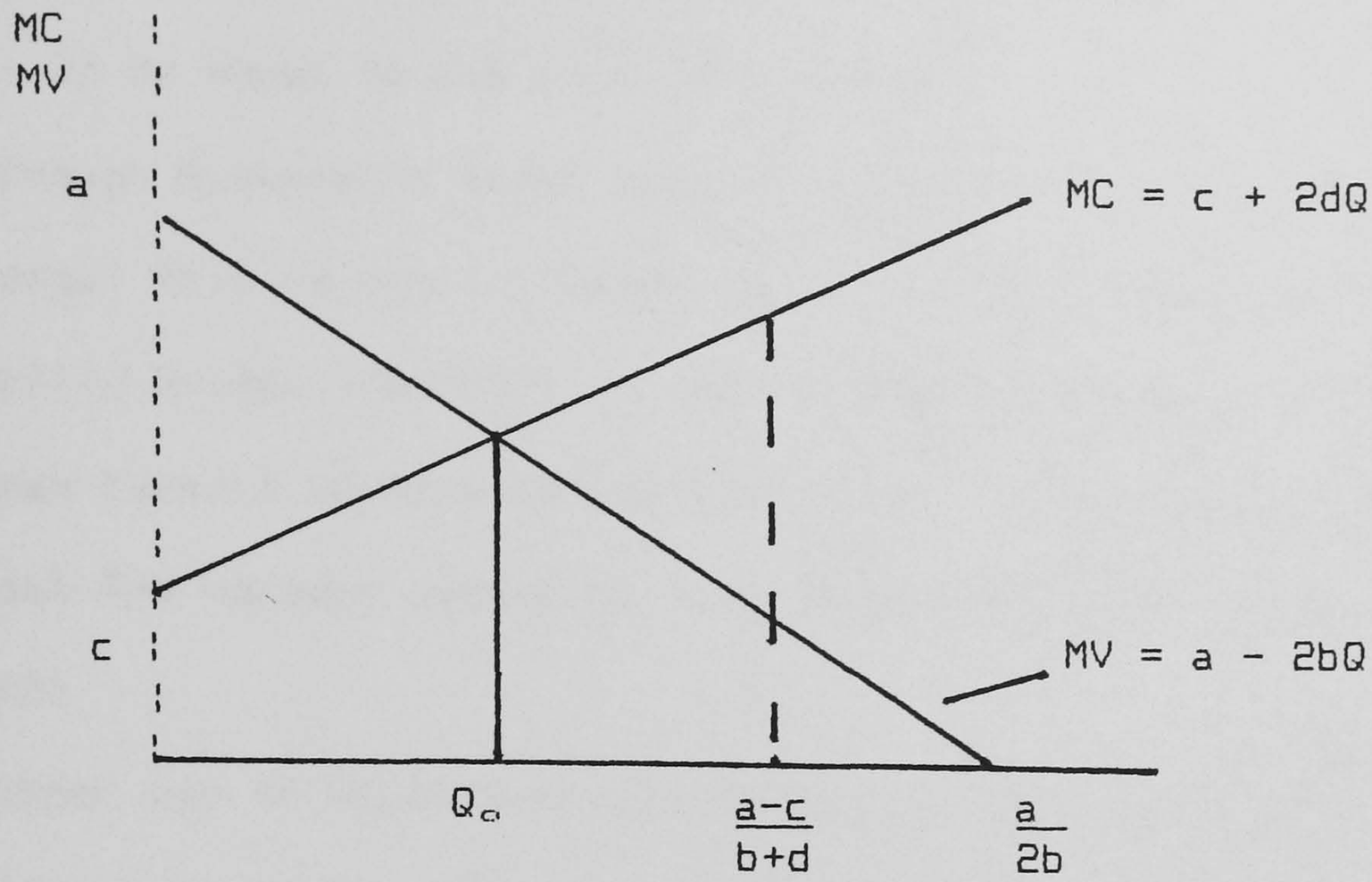

FIGURE 3: NISKANEN'S MODEL

information on marginal cost and it has no incentive to reveal it.(1)

The sponsors only know the total cost - the budget - of the bureau. Thus the sponsor's potential consumer surplus, ace, is exhausted by an equal amount of excess of marginal cost over marginal benefit, efg, imposed upon them by the bureaucrats.

Hartley and Tisdell (1981, p. 60) give a number of examples of how bureaucracies are likely to manipulate information to help secure their budget expansion ambitions:

> A ministry might deliberately underestimate the costs of a project in order to "buy into" a new programme. Cost estimates which are "too low" can lead a government to buy "too much" of a project which appears to be relatively cheap. Once started, public sector projects are difficult to stop. Agents in the political marketplace have an interest in continuation and the costs are borne by the taxpayer. Projects create interest groups of architects, engineers, scientists, surveyors, contractors and unions, each with relative income gains from the continuation of the work.

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(1) Niskanen (1971, p48)

For the particular functions selected by Niskanen the budget will be double the sponsor's optimum, as Q_c can be found (by setting MC=MV) to be equal to one half (a-c)/(b+d).

Although Niskanen's model suggests government bureaucracy will be too large, this is not in itself an explanation for growth of government(1) unless the model is one of long term disequilibrium. Niskanen favours instead an explanation of institutional changes over the past few decades caused by such things as the progressive movement.(2)

Another way in which bureaucrats might over-expand their budgets is suggested by Tullock (1974) who introduces consideration of voter behaviour. In Tullock's view bureaucrats are likely to vote for an expansion of the bureaucracy in elections, an effect that is likely to snowball - although in Britain the effect will be contingent upon the number and distribution of bureaucrats within constituencies.

Consideration of the effect of voters can be divided broadly into two approaches, depending upon the presence or absence of full information. The importance of information has become increasingly recognised in economics. Hayek (1945) emphasised the crucial importance of information in the economy in a seminal article. Stigler (1961 & 1983) suggested the application of standard optimising theory to explain how much information agents would choose to acquire and Sowell (1980) has provided insight into many aspects of society by considering the results of agents rationally making decisions with limited information.

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(1) See Jackson (1982, p135)

(2) Niskanen (1972) cited in Borcherding (1977)

Information costs are not required in Tullock's theory of self interested bureaucrats voting themselves bigger budgets. On the other hand, information costs are important in Downs's (1965) view. Here voters vote for public budgets that are too small because they are assumed to underestimate the benefits of public programmes.

Using information costs to argue the opposite viewpoint, Buchanan and Wagner(1977) argue that deficit finance leads voters to underestimate not the benefits of public programmes, but their costs in terms of future tax obligations. Suffering from "fiscal illusion" when weighing the price of future tax obligations they will vote for public benefits that are larger than they would require with full information. An important feature of these papers therefore is the use they make of the concept of the cost of obtaining information to different groups of actors in the economy.

However, in addition to Tullock's "Dynamic Hypothesis on Bureaucracy" noted above, other voting models can yield results suggesting the likelihood of government size being non-optimal. Thus, a simple median voter model of decision making in the economy can demonstrate that either under-provision or over-provision of public goods may take place and that optimum provision is only likely to be the result of chance. No information costs are necessary to this model.

Thus in Figure 4 there is a pair of diagrams, with, in each case three voters A,B and C having marginal valuation curves for a public good MV_A, MV_B and MV_C. If the price of the public good is P, the social optimum is given by the intersection of this price line and the vertical summation of the marginal valuation curves as Q_o. If provision of the public good is financed by way of equal tax shares of one-third P, individual demands will be given by Q_A, Q_B and Q_C.

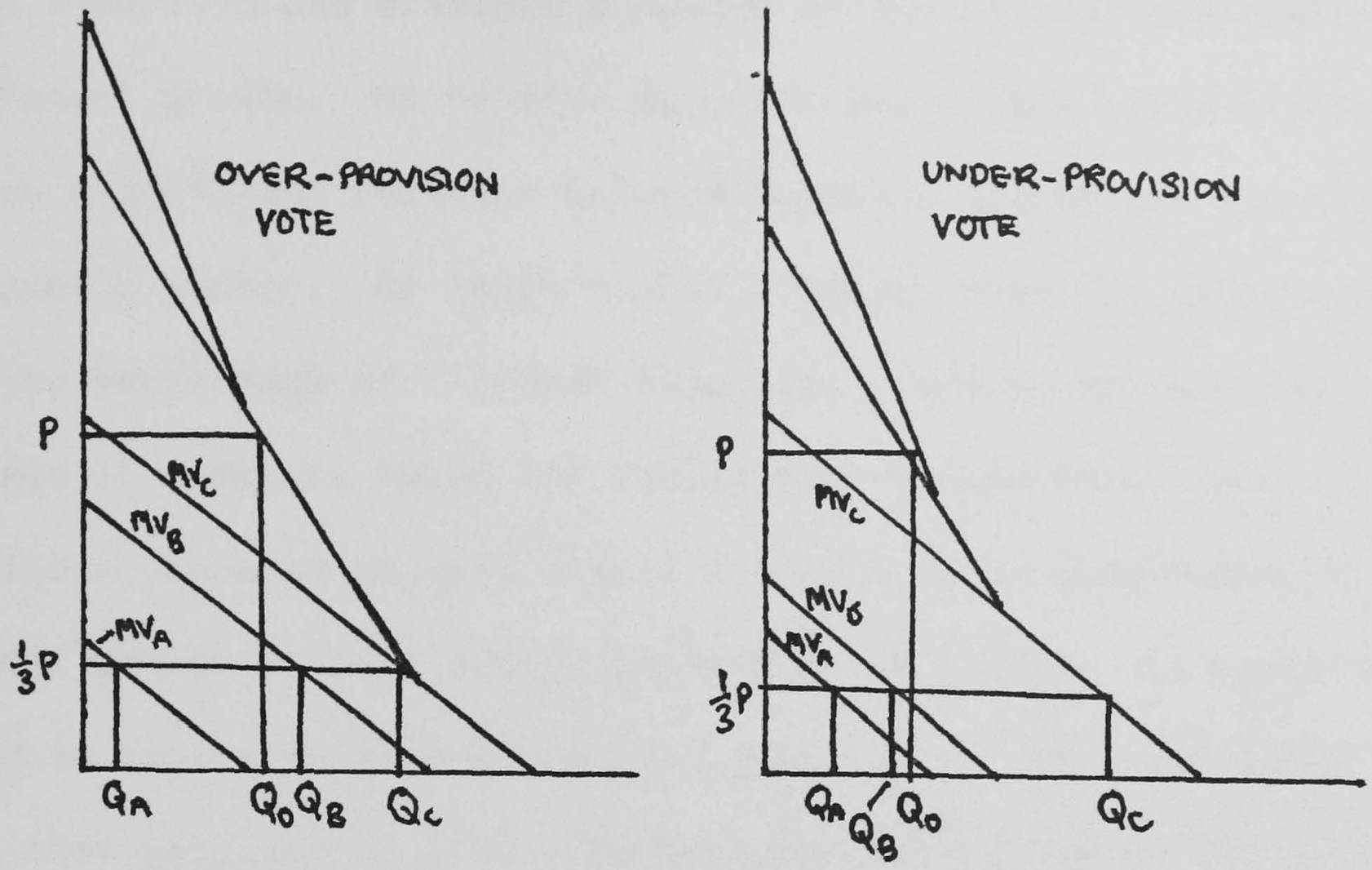

FIGURE 4: A SIMPLE MEDIAN VOTER MODEL

Thus, depending upon the price of the public good, and the height of the marginal evaluation curves, the median voter B will either vote for over provision or under provision, depending on whether Q_B is above or below Q_0.

Spann (1974) has used an analysis similar to the one above to show that a move to collective provision of <u>private</u> goods can receive majority support although substantial welfare loss is imposed on the minority. Deadweight efficiency losses are outweighed by <u>distributional</u> gains to the majority.

Distributional theories of government growth are examined in the next section. However, before examining distributional questions, a brief review of empirical work on some of the above hypotheses is in order.

Cameron (1978) has analysed data for eighteen nations(1) for the

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(1) USA, Canada, UK, Ireland, Austria, Japan, Federal Republic of Germany, France, Italy, Spain, the Netherlands, Austria, Belgium, Switzerland, Sweden, Norway, Denmark and Finland.

years 1960-1975 and examines a number of theoretical explanations for government growth. He rejects Wagner's law on the basis of his finding no significant relation between economic growth and the share of the public sector. He tests fiscal illusion theories using a variable for the percentage of "hidden" taxation. This is measured by the percentage of indirect taxes and social security contributions in overall taxation. Cameron rejects fiscal illusion as an explanation of government growth because a high proportion of "hidden" taxes is not found to relate to high government growth. On the other hand, the view that politics is likely to influence the scope of the public economy is confirmed by his study. Cameron states:

> Thus nations such as Sweden, Norway and Denmark, in which leftist parties tended, on average, to possess a majority of the government's electoral base, experienced increases in public revenues, which were much larger as a proportion of GDP, than those nations such as Japan, Italy or France, where the Left either participated in government only as the minority partner of non-leftist parties or was excluded from government altogether.(1)

In addition Cameron finds that the frequency of elections shows some positive relationship with public sector growth. He tests bureaucratic growth theories by suggesting, following Tarschys (1975) that increases in public sector spending should be high in nations where no single authority controls spending, but instead there is "a multiplicity of autonomous governmental bureaucracies".(2) Somewhat tenuously it appears, he suggests that bureaucratic theories therefore imply higher growth of government in federal states where fragmentation encourages bureaucratic expansion. He therefore rejects

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(1) Cameron (1978, p1253)

(2) Cameron (1978, p1248)

bureaucratic theories of government growth on finding empirically that a high degree of centralisation is related to the expansion of the public economy.

Another writer who has attempted, more recently, to assess the relative importance of competing theories is Borcherding (1985), who considers the case of the United States. Borcherding examines a number of empirical studies and concludes that Baumol's relative price effect can explain thirty-one per cent of the growth of the share of government expenditure in the USA. Borcherding accounts for a further twenty per cent of the growth of the share of government spending in GNP using Peltzman's (1980) estimate of unity for the income elasticity of demand for public expenditure in conjunction with an estimate of growing income equality. Together these explanations account for nearly forty per cent of the growth rate of US public budgets since 1902.(1)

Although Borcherding discusses other theories of government growth at some length, he does not make an attempt to assess their relative importance.

A view has been strengthening recently in the economics literature that growth of government can best be understood by seeing it as essentially a question of income redistribution. One theory based on distributional considerations, due to Spann (1974) has already been considered above. Spann's interest in the effects of potential distributional gains is shared by others.(2) This question is now examined.

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(1) Borcherding (1985, p368)

(2) Pommerhene and Schneider (1985)

CHAPTER ONE: TOTAL GOVERNMENT EXPENDITURE IN SELECTED DEVELOPED NATIONS

GROWTH OF GOVERNMENT AND INCOME REDISTRIBUTION

It is likely that David Ricardo(1) was the first economist to have drawn attention to interest groups' use of government expenditure as a means of redistributing income to themselves, suggesting that the House of Commons was

> ...tormented...with constant solicitations to sacrifice the public good to particular interests.

Over one-hundred and fifty years later Karl Brunner argues that

> The essence of politics is redistribution and political conflicts center on matters of redistribution. This central aspect of political processes, the very motor force of politics, has been discarded by the public goods approach to "collective choice" and government, and similar approaches fail to comprehend therefore, in my judgement, the crucial mechanism producing the relative growth of government.(2)

Models of the growth of government as an agent for securing transfers between groups in society have been developed by many authors. With the extension of the franchise, government expenditure may be increased by the poor voting for increased expenditure. This is the basis of Meltzer and Richard's model (1977, 1983) though the idea had been raised earlier by de Tocqueville writing in 1848. De Tocqueville contrasts majority rule of the rich, the middle classes and the poor:

> In countries in which the poor should be exclusively invested with the power of making laws no great economy of public expenditure ought to be expected: that expenditure will always be considerable; either because the taxes do not weigh upon those who levy them, or because they are levied in such a manner as not to weigh upon those classes. In other words, the government of a democracy is the only one under the power which lays on taxes escapes the payment of them.(3)

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(1) Hansard, 22 May 1822, quoted in Seldon (1987)

(2) Brunner (1978, p662-663)

(3) de Tocqueville (1971, p150), quoted in Bennett and Johnson (1980, p59)

In Meltzer and Richard's model (1977, 1983) the voter is assumed to be fully informed and the median voter determines the level of redistribution. His desired level of redistribution rises with increases in the (positive) difference between average income and the median voter's income. The median voter recognises that too much redistribution can lower GNP and hence the amount available to be redistributed, so in setting the level of his demand for redistribution he will beware of killing the goose that lays the golden egg.

Who the median voter <u>is</u> depends upon who can (and does) vote. Thus the median "voter" could be "a dictator, absolute monarch, or marginal member of a junta"(1) or the median voter in a system of universal suffrage.

Redistributional theories of government growth can also be classified according to their treatment of information costs: Meltzer and Richard emphasise a major difference between their theory and those about to be discussed below:

> Our assumption that voters are fully informed about the size of government differs from much recent literature. There, taxpayers are portrayed as the prey sought by many predators who conspire to raise taxes relative to income by diffusing costs and concentrating benefits, or in other ways(2)

Anthony Downs was an early writer to identify some of the features of a theory of government redistribution where voters <u>lack</u> information, or, as he demonstrated, are "rationally ignorant". As an example, he argues that

> ... legislators are notorious for writing tariff laws which

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(1) Meltzer and Richard (1981, p924)

(2) ibid

> favour few producers at the expense of thousands of consumers.(1)

Downs summarises the reasons for this as follows:

> In order to influence government policy-making in any area of decision, a citizen must be continuously well-informed about events therein. Unlike a voter, he cannot deal merely with post facto differentials. The expense of such awareness is so great that no citizen can afford to bear it in every policy area, even if by doing so he could discover places where his intervention would reap large profits. If he is going to exercise any influence at all, he must limit his awareness to areas where intervention pays off most and information costs least. These are the areas of his production specialisation, since his income flows from them and he already knows a great deal about them.(2)

More generally, Borcherding (1977b, p59) points out that

> ... if a coalition consisting of 100 persons stands to make a net gain of $3000 each from a policy, they may successfully push it through the legislature even though the attendant net damage is $1 each to 500,000 people.

Tullock (1959) has set out a mechanism of using funds raised by a general levy to benefit specific individuals, and Buchanan and Tullock (1962, p289) have shown how this mechanism can be applied to the activities of special interest(3) groups. These arguments lead to the conclusion that the government will engage in excessive activity. Olson (1965, 1982) has analysed the features of interest groups. He argues that the assumption that

> if the individuals in some category or class had a sufficient degree of self interest and if they all agreed on some common interest, then the group would to some extent also act in a self-interested or group-interested manner.(4)

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(1) Downs (1957, p255)

(2) Downs (1957, p259)

(3) The term "pressure group" is more common in Britain.

(4) Olson (1982, p17)

is "fundamentally and indisputably faulty".(1)

The reason for this is that individuals in the interest group have an incentive to free-ride on efforts of others to advance group collective interests. Olson shows that the viability of interest groups depends upon selective incentives - selective in the sense of being differentially provided to those who contribute towards the costs of the interest group.(2)

One interest group that may be well organised is the middle-class as a whole. This is the basis of Stigler's statement of Director's Law:

> Public expenditures are made for the primary benefit of the middle classes, and financed with taxes which are borne in considerable part by the poor and the rich.(3)

In Britain, Le Grand has found evidence that Director's Law operates. Reviewing expenditure on health care, education, housing, and transport, he finds that:

> Almost all public expenditure on the social services in Britain benefits the better off to a greater extent than the poor. This is not only true for services such as roads where, due to the insignificant role played by a concern for equality in determining policy, such an outcome might be expected; it is also true for services whose aims are at least in part egalitarian, such as the National Health Service, higher education, public transport and the aggregate complex of housing policies.(4)

The mechanism of government growth through transfers to interest

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(1) Ibid.

(2) Examples of selective incentives, which can be negative as well as positive include "sending to Coventry", union closed shop arrangements and private goods made available only to members of the interest group.

(3) Stigler (1970)

(4) Le Grand (1982, pp 3-4)

groups has also been identified as part of the new rent-seeking literature (Buchanan, Tollison and Tullock, 1980). In this view the interest-group theory of government is a special case of rent-seeking. Thus according to Tollison

> the theory of rent seeking involves the study of how people compete for artificially contrived transfers.(1) Politicians will have incentives to search for issues on which well defined groups gain transfers at the expense of the general polity.(2)

Gabriel and Loderer's (1983) model is one of transfers from a majority to an interest group. The transfers will be larger, under their model, the larger the individual income of majority members, the lower the incomes of interest group members and the higher the overall income of the population.

Peltzman's (1980) model works in terms of a "politically dominant" policy. A politically dominant policy "maximises the difference between the number of beneficiaries perceiving the policy as the best deal [in terms of redistribution] and losers perceiving it as the worst deal."(3)

Combining elements of a number of related approaches enables the following picture to be constructed. Interest groups succeed in gaining redistribution of income to their members because they have informational advantages over their "victims" the general public. Although a straight cash transfer would be the most attractive way to receive the transfer it has the major disadvantage of being too obvious. The information costs to the injured parties are too low. Thus

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(1) Tollison (1982,p 576)

(2) Ibid. p590

(3) Peltzman (1980, p222)

cover stories(1) are brought in and redistribution is generally in kind to aid the cover story. An advantage of these redistributive theories of government growth is that the are in accord with the relative and absolute growth of transfers shown in Tables 2 to 8 and the regressions of tables 12 and 13 above. A convincing element is their incidental explanation of why so much government provision is of private goods rather than public goods. Under this view, government provision of private goods is a vehicle for complicated redistributions that would be likely to be rejected if they were explicit in cash terms.(2) Often successive redistributions may pass expenditure back and forth between interest groups - a process that has been referred to as "churning".(3)

CONCLUDING REMARKS

The growth of government this century is a well established phenomenon for the developed western nations. Investigation of the latest OECD data in this chapter has confirmed a number of facts about the public sector. Firstly, government expenditure as a percentage of national income has been rising continuously this century, and specifically since 1948 for the countries studied here. Secondly the rate at which it has been rising has itself been increasing over time. Thirdly, there is evidence for a negative relation between conserva-

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(1) This term is used by Tullock, see Tullock (1983, p11)

(2) Plotnick (1986) points out that the predictions of models of interest group induced redistribution can also be derived from altruistic models such as Hochman and Rogers (1969). He suggests that tests that discriminate between the two models may be difficult to construct and that a synthesis of the two approaches may be more promising.

(3) Lindbeck (1985, p324)

tive political orientation and the rate of this growth. Fourthly, public sector employment has also been growing continuously, except in the United States, though here there is evidence that growth may have occurred "off-budget". Lastly, transfers have been continuously rising as a proportion of national income, lending support to the newer theories explaining government growth in terms of income distribution.

A large number of theories have been put forward to explain the growth of government. It is likely that there is no single cause of government growth but rather an aggregation of separate effects stemming from the arguments discussed above. Empirical work to assess the relative contributions that these effects along the lines of Cameron will be of value, but is likely to be hampered by the difficulties of quantification.

Within the theories discussed two broad questions apply rather generally. Firstly there is the question of information. Do voters consistently receive and act on incorrect or incomplete information as in the case of fiscal illusion theories, or theories of bureaucracy. Or, relatedly, are they consistently the victims of interest group behaviour. If so the question first put by Muth in starting the rational expectations revolution arises: "if expectations were not moderately rational there would be opportunities for economists to make profits in commodity speculation, running a firm, or selling the information to present owners".(1) Thus, one may ask, why do not firms arise to sell information correcting fiscal illusions, exposing redistributional conspiracies of interest groups, or revealing infor-

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(1) Muth (1961)

mation that bureaucracies would wish to keep to themselves? The explanation would appear to be that such information is not excludable and therefore needs to be demanded collectively. An opposing interest group needs to be organised, but this may not be practicable, due for instance to diffusion of possible membership.

Secondly, the majority of these theories suggest good reasons for believing that the public sector may be "too large", but are less successful at explaining the continuously increasing share of government expenditure in National Income observed for this century. Is this just the result of a very gradual movement to a high equilibrium position as yet unrealised, or are there some other factors at work such as the progressive relaxation of constraints so far unidentified in the literature? Some evidence that the country with the highest growth rate of government expenditure of those examined in this chapter, Sweden, may have reached an equilibrium appears in Table 15, which shows that public expenditure as a percentage of GDP reached a peak in 1982.

TABLE 15, SWEDEN: PUBLIC EXPENDITURE AS A PER CENT OF GDP

1980	1981	1982	1983	1984	1985	1986	1987
62.3	65.3	67.4	67.0	64.4	65.2	63.5	62.5

Source: The Swedish Economy 1986, National Institute of Economic Research, Stockholm, 1986.

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CHAPTER ONE: APPENDIX I*

ECONOMETRIC TESTING OF THE DISPLACEMENT EFFECT: A NOTE

I. INTRODUCTION

In a recent article, Diamond(1) criticises the econometric technique used by Bonin et al. (1969) in their investigation of the Peacock and Wiseman "displacement' hypothesis.(2) In using slope and shift dummies in a single regression to estimate the displacement effect, Bonin et al. (1969) implicitly assume that the variance of the error term is the same before and after the displacement. Diamond suggests that this assumption is unrealistic(3) and in his tests of the displacement hypothesis implies that the problem of unequal error variance has been overcome. In this comment it is shown that

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* This Appendix reproduces P.A. Watt, "Econometric Testing of the Displacement Effect: A Note", Finanzarchiv, 36(3), 1978. The author wishes to thank A.J.D Buxton, L.G. Godfrey, K. Hartley, J.D. Hey and A.R. Tremayne for helpful comments, but retains responsibility for error.

(1) Diamond (1976/77)

(2) Peacock and Wiseman (1967). In their pioneering analysis of public expenditure growth, Peacock and Wiseman gave the name "displacement effect" to the tendency for public expenditure to shift to a new plateau after "large scale social disturbances". They suggested that the displacement effect was the result of the emergence of "new ideas of tolerable tax levels" and the unearthing of new social wants as a result of the "inspection effect".

(3) Diamond (1976/77 p. 397.)

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Diamond's tests require the same assumption of equal error variance for which he originally criticised Bonin et al. The assumption is then directly tested and where indicated some of Diamond's tests are re-run using a test developed by Jayatissa (1977) which is valid for cases of both equal and unequal error variance.

II. TESTING FOR THE "DISPLACEMENT EFFECT"

Diamond argues that the determinants of public expenditure may be divided into two categories: first, "environmental factors such as per capita GNP," that vary continually and secondly, such factors as "institutional arrangements," and "tastes and preferences," that may usually be assumed to remain constant, but in "times of major social upheaval... can safely be assumed to change". This second category of factors is naturally difficult to quantify and Diamond follows other studies in seeking to express its effect indirectly as a structural shift in the coefficients of a regression equation estimated for more easily quantified variables.

There are three ways in which changes in institutional arrangements, tastes and preferences may be reflected in such a regression equation. First, once and for all changes are likely to affect the constant term. Secondly, any interaction effects will affect the slope coefficients and thirdly, any change in the pattern of variation of tastes and preferences will affect the error variance. A formal test of the displacement hypothesis should focus on these three changes.

Diamond's structural change model may be written as(1)

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(1) Diamond (1976/77, p. 397). The above model is set out in some detail as Diamond's formulation is incorrect; cf. Chow (1960, p59)

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$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} X_1 & 0 \\ 0 & X_1 \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} \qquad u_1 \sim N(0, \sigma_1^2 I) \qquad u_2 \sim N(0, \sigma_2^2 I) \qquad 1.$$

where there are N_1 observations before the displacement and N_2 afterwards and y_1 and u_1 are$(N_1 \times 1)$, y_2 and u_2 are $(N_2 \times 1)$, β_1 and β_2 are $\{(k + 1) \times 1\}$, X_1 is $\{N_1 \times (k + 1)\}$, X_2 is $\{(N_2 \times (k + 1)\}$ and $N_1 + N_2 = N$. Diamond uses the "Chow" test to test H_o: $B_1 = B_2$ against H_1: $B_1 \neq B_2$. This involves comparing the sum of squared errors obtained by estimating a single vector of regression coefficients B in the pooled model

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} \begin{bmatrix} B \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} \qquad 2.$$

with that obtained by estimating B_1 and B_2 in (1). Diamond states the test statistic to be(1)

$$[z/(k + 1)]/[z'/(N - 2k - 2)] \sim F_{(k+1,\ N-2k-2)}$$

where $z = (\hat{y}_1 - X_1 b)'(\hat{y}_1 - X_1 b) + (\hat{y}_2 - X_2 b)'(\hat{y}_2 - X_2 b)$,

$z' = (y_1 - X_1 b)'(y_1 - X_1 b) + (y_2 - X_2 b)'(y_2 - X_2 b)$,

b_1, b_2 and b are the least squares estimators of β_1, β_2 and β, and $\hat{y}_1 = X_1 b_1$ and $\hat{y}_2 = X_2 b_2$. However, this result only holds if $\sigma_1^2 = \sigma_2^2$, i.e. if the error variance is equal before and after the postulated displacements.(2) If, as Diamond himself argues at an earlier point in his article, this assumption is incorrect then the true size of the test will in general be larger than intended.(3)

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(1) In Diamond's article the degrees of freedom are incorrectly given as (2k, N-2k). Diamond (1976/77, p. 395)

(2) See Chow (1960, p. 592), or Fisher (1970)

(3) See Toyoda (1974), but also Schmidt and Sickles (1977)

Thus if $\sigma_1^2 \neq \sigma_2^2$ the probability of incorrectly rejecting the null hypothesis will be greater than Diamond states in his tests.

The question of whether the error variance is equal or not is, therefore, seen to be important. Diamond argues a priori that an assumption of unequal error variance "must be favoured". However, a direct test of the assumption is possible. Such a test is performed in the next section.

III. RE-ESTIMATION OF DIAMOND'S RESULTS

It can be shown that $(N_1 - k - 1)s_1^2/\sigma_1^2 \sim \chi^2(N_1-k-1)$ and $(N_2 - k - 1)s_2^2/\sigma_2^2 \sim \chi^2(N_2-k-1)$ (Where $s_1^2 = \hat{u}_1\hat{u}_1(N_1-k-1)^{-1}$, $s_2^2 = \hat{u}_2\hat{u}_2(N_2-k-1)^{-1}$ and $\hat{u}_1$ and $\hat{u}_2$ are the vectors of residuals obtained using the OLS estimates of B_1 and B_2) if u_1 and u_2 have the properties assumed in equation 1.(1)

If further, it is assumed that u_1 and u_2 are independent, then under H_o: $\sigma_1^2 = \sigma_2^2$:

$$\frac{s_1^2/(N_1 - k - 1)}{s_2^2/(N_2 - k - 1)} \sim F_{(N_1-k-1),(N_2-k-1)}$$

and this statistic can be used to test for equality of error variance.

The results of performing this test on Diamond's three pairings of data series, using his G1 definition of public expenditure, are given in Table 1 below.

The hypothesis of equal error variance is rejected for comparisons a) and c) and it is seen that Diamond's use of the Chow test is inappropriate in these cases and his results are placed in doubt. Fortunately, however, a test appropriate to cases of inequality in error variance has been developed by Jayatissa (1977) and the results

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(1) See, for example, Schmidt (1976 p. 12, Theorem 3).

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TABLE 1: VARIANCE RATIO TESTS

Time series compared	F	Degrees of Freedom	Critical point at 5% level	Null hypothesis of equal error variance rejected?
a) 1920-1938 and 1885-1913	10.152	17,4	8.63	Yes
b) 1930-1938 and 1920-1929	1.220	7,8	4.53	No
c) 1950-1970 and 1920-1938	43.478	19,17	2.76	Yes

TABLE 2: JAYATISSA TESTS ON DIAMOND'S DATA

Time Series compared	F	Degrees of Freedom	Critical point at 5%	Critical point at 1%	Null hypothesis B1 = B2 rejected?
a) 1920-1935 and 1885-1913	57.764	2,1	200	4999	No
c) 1950-1970 and 1920-1938	8.444	2,7	4.74	9.55	Yes

of performing this test for comparisons a) and c) are given in Table 2.(1) The properties of Jayatissa's test are discussed in Appendix II to this chapter.

IV. CONCLUSIONS

Direct testing confirms that Diamond was correct to question the assumptions of equality of error variance before and after a displacement. However, his subsequent use of the Chow test is incorrect.

It is argued that future research involving testing for change of structure should follow the procedure set out in this note. An initial test of the hypothesis of equality of error variance should be

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(1) The computations involved are lengthy. Listings of a FORTRAN subroutine to compute this statistic are available on application to the author.

made and where this is rejected, a Jayatissa test rather than a Chow test should then be used.

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CHAPTER ONE: APPENDIX II*

TESTING FOR CHANGE OF STRUCTURE

INTRODUCTION

The aim of this appendix is to set out and discuss a range of econometric techniques for testing for change of structure. Such tests answer the question of whether a set of regression coefficients is the same for regressions performed on different populations. These testing techniques are used in two parts of this thesis. Chapter 1, Appendix I concerns the question of testing for the existence of a Peacock-Wiseman "Displacement" effect on public expenditure resulting from war. This can be seen as an example of testing for change of structure. The question is examined operationally by testing whether the regression coefficients of a public expenditure model are the same before and after war. The two sample populations are therefore pre-war years in Britain and post-war years in Britain. Because in the testing of the displacement effect it was not wished to include equality of error variance in the null hypothesis, a Jayatissa (1977) test was used. The properties of Jayatissa's test are examined in

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* This Appendix is a significantly expanded version of P.A. Watt, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions when Disturbance Variances are Unequal: Some Small Sample Properties", Manchester School, December 1979, pp. 391-396.

detail in this appendix.

Perhaps the most well-known approach to testing for equality of regression coefficients is that proposed by Chow (1960). In Chapter 5, Appendix III, the question of whether the determinants of investment in housing by different types of local authority vary between authority type is tested by a Chow test. Here the different populations are the different local authority types.

The discussion of these methods of testing for change of structure begins with the Chow test.

THE CHOW TEST

Consider the following two regression models:

$$Y_1 = X_1\beta_1 + \varepsilon_1 \qquad 1$$

$$Y_2 = X_2\beta_2 + \varepsilon_2 \qquad 2$$

Where there are T_1 observations from the first population and T_2 observations from the second population. Y_1 is $(T_1 \times 1)$, Y_2 is $(T_2 \times 1)$, β_1 and β_2 are $(k \times 1)$, X_1 is $(T_1 \times k)$ and X_2 is $(T_2 \times k)$. The T_1 elements of the $(T_1 \times 1)$ error vector ε_1 are each distributed independently as $N(0,\sigma^2)$ as are the T_2 elements of the $(T_2 \times 1)$ error vector ε_2. The Chow test involves comparing the sum of squared errors obtained by estimating β_1 and β_2 in (1) and (2) with the sum of squared errors obtained by estimating the following pooled model:

$$\begin{bmatrix} Y_1 \\ Y_2 \end{bmatrix} = [Y] = \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} [\beta] + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \equiv X\beta + \varepsilon \qquad 3$$

The necessary estimated residuals are obtained as

$$\hat{\varepsilon}_i = Y_i - \hat{Y}_i = Y_i - X_i\hat{\beta}_i = Y_i - X_i(X'_iX_i)^{-1}X'_iY_i \qquad i=1,2 \qquad 4$$

for the population models (1) and (2) and

$$\hat{\varepsilon} = Y - \hat{Y} = Y - X\hat{\beta} = Y - X(X'X)^{-1}X'Y \qquad 5$$

for the pooled model (3).

Chow (1960) and Fisher (1974) have shown that the test statistic

$$F = \frac{(\hat{\varepsilon}'\hat{\varepsilon} - \hat{\varepsilon}'_1\hat{\varepsilon}_1 - \hat{\varepsilon}'_2\hat{\varepsilon}_2)/k}{(\hat{\varepsilon}'_1\hat{\varepsilon}_1 + \hat{\varepsilon}'_2\hat{\varepsilon}_2)/(T_1+T_2-k)} \qquad 6$$

is distributed as F with k and $T_1 + T_2 - k$ degrees of freedom.

This result for two populations is easily generalised to the case of p populations.(1) The model is expanded to

$$Y \equiv \begin{bmatrix} Y_1 \\ Y_2 \\ \cdot \\ \cdot \\ \cdot \\ Y_p \end{bmatrix} = \begin{bmatrix} X_1 & & & \\ & X_2 & & \\ & & \cdot & \\ & & & \cdot \\ & & & X_p \end{bmatrix} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \cdot \\ \cdot \\ \beta_p \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \cdot \\ \cdot \\ \varepsilon_p \end{bmatrix} \equiv X_*\beta_* + \varepsilon \qquad 7$$

where Y is a (T x 1) vector of observations of the dependent variable comprising p (T_i x 1) subvectors Y_i, i = 1, ..., p., X_* is a fixed (T x kp) block diagonal matrix whose diagonal elements are (T_i x k) matrices of explanatory variables with $T_i > k$ i = 1,...,p. β_* is (kp x 1) a vector of regression coefficients comprising p (k x 1) subvectors β_i corresponding to the p classes of data and ε is a (T x 1) vector of random independently normally distributed errors with mean zero and variance σ^2 comprising p (T_i x 1) subvectors ε_i. It is well known that if β_* is estimated by $\hat{\beta}_* = (X_*'X_*)^{-1}X_*'Y_*$ the resulting estimates for the p subvectors of β_*, $\hat{\beta}_i$ i = 1,... p are identical to those obtained by running OLS separately for each of the p populations. A pooled model analagous to 3 is formed as

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(1) See for example Dhrymes (1971).

$$Y \equiv \begin{bmatrix} Y_1 \\ Y_2 \\ \cdot \\ \cdot \\ \cdot \\ Y_p \end{bmatrix} = \begin{bmatrix} X_1 \\ X_2 \\ \cdot \\ \cdot \\ \cdot \\ X_p \end{bmatrix} [\beta] + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \cdot \\ \cdot \\ \cdot \\ \varepsilon_p \end{bmatrix} = X_* \beta_* + \varepsilon \qquad 8$$

where the observation matrices X_i, i = 1 ... p are now stacked vertically to form X, and β is a (k x 1) vector of pooled regression coefficients. The test for equality of the p vectors of regression coefficients β_i, i = 1, ... p is now given by the statistic

$$F = \frac{\tilde{\varepsilon}'\tilde{\varepsilon} - \hat{\varepsilon}'\hat{\varepsilon}/k(p-1)}{\hat{\varepsilon}'\hat{\varepsilon}/T-kp} \qquad 9$$

which is distributed as F with k(p-1) and (T - kp) degrees of freedom, where

$$\hat{\varepsilon}'\hat{\varepsilon} = (Y - X_*\hat{\beta}_*)'(Y - X_*\hat{\beta}_*), \qquad 10$$

$$\tilde{\varepsilon}'\tilde{\varepsilon} = (Y - X\hat{\beta})'(Y-X\hat{\beta}), \text{ and } \hat{\beta} = (X'X)^{-1}X'Y. \qquad 11$$

UNEQUAL DISTURBANCE VARIANCES

The tests so far considered assume that the variance of the disturbance terms is the same for each population. If this assumption is false these tests may still be correctly used if equality of the disturbance variances is added to the null hypothesis,(1) but the test then becomes a joint test of equality of regression coefficients and disturbance variances between the populations. This may be what it is desired to test. If, however, the question to be examined is solely confined to whether the regression coefficients are equal, and the disturbance variances are regarded as nuisance parameters not to be tested, a null which does not specify equality of disturbance variances is necessary and under such a null, use of the Chow test will be

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(1) c.f. Fisher (1950, pp 124 - 125)

incorrect in that it will not have the stated F distribution. This is the situation described in Chapter 1, Appendix I.(1)

An exact test does not require equality of the variances of the disturbance terms has been proposed by Jayatissa (1977) and in the next section this is set out for the two population case.

JAYATISSA'S TEST

Jayatissa establishes his test for the following model

$$Y_1 = X_1\beta_1 + \varepsilon_1 \qquad 12$$

$$Y_2 = X_2\beta_2 + \varepsilon_2 \qquad 13$$

identical to the model of (1) and (2) above except that the errors in (12) are assumed to be identically and independently distributed (iid) with mean zero and variance σ_1^2 and the errors in (13) are assumed to be iid with mean zero and variance σ_2^2.

Computing the test statistic is quite a lengthy process. First, OLS regressions are run for the two population models to give

$\hat{\beta}_i = (X_i'X_i)^{-1}X_i'Y_i$ and $\hat{\varepsilon}_i = \hat{Y}_i - X_i(X_i'X_i)^{-1}X_i'Y_i$

$= M_iY_i$, where $M_i = I_{T_i} - X_i(X_i'X_i)^{-1}X_i'$ $i = 1,2$.

The two vectors of regression coefficients are subtracted to give $d = \hat{\beta}_1 - \hat{\beta}_2$ and a matrix of eigenvectors of M_i is found such that $Z_iZ_i' = M_i$, $Z_i'X_i = 0$ and $Z_i'Z_i = I_{T_i-k}$, for $i = 1,.2$. For each population, $\varepsilon_i^* = Z_i'\hat{\varepsilon}_i$ is then formed and each ε_i^* is then partitioned into r sub-vectors each of k elements where r is the largest integer less than or equal to min $((T_1-k)/k, (T_2-k)/k)$. These r subvectors are denoted $\varepsilon^*_{i(1)}, \varepsilon^*_{i(2)}, \ldots, \varepsilon^*_{i(r)}$, $i = 1,2$. Now let Q_i be a $(k \times k)$ matrix such that $Q_i'Q_i =$

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(1) See Toyoda (1974) and Schmidt and Sickles (1977)

$(X_1'X_1)^{-1}$ and form r vectors

$$\eta_j = Q_1'\varepsilon^*_{1(j)} + Q_2'\varepsilon^*_{2(j)}, \qquad j=1,2,\ldots,r.$$

These vectors are then used to form

$$S = \frac{1}{r}\sum_{j=1}^{r}\eta_j\eta_j'$$

and finally

$$J = \frac{d'S^{-1}d}{r}\cdot\frac{r-k+1}{k} \qquad (14)$$

Using a result from Anderson (1958), Jayatissa proves that under the null: $\beta_1=\beta_2$, (14) is distributed as F with k and r-k + 1 degrees of freedom.

Jayatissa's test is an exact test for the case where it is not desired to constrain $\sigma_1^2 = \sigma_2^2$ in the null, but as Honda (1982) has pointed out there are a number of disadvantages. Firstly there is the waste of data that occurs when $T_1 \neq T_2$, as at least $|T_1 - T_2|$ transformed residuals are thrown away from the larger set of observations in forming the partitioned subvectors $\varepsilon^*_{1(1)}, \varepsilon^*_{1(2)} \ldots \varepsilon^*_{1(j)}$ used for calculating the weight matrix. Waste of observations can also occur when min $((T_1 - k)/k, (T_2 - k)/k))$ is not an integer.

Secondly the matrix Z defined above is, in general, not unique and hence the statistic J is also not unique. A further reason for non-uniqueness of J is the possibility, in cases where transformed residuals are discarded, of discarding a variety of sets of transformed residuals.

Lastly a major disadvantage of the test in practice is the complicated computations needed to calculate it.

CHAPTER ONE, APPENDIX II

THE WALD TEST

Jayatissa's test is the only <u>exact</u> test available at present for testing for change of structure with equal error variances neither part of the null hypothesis nor the alternative hypothesis. With its difficulty of computation and other drawbacks the question arises of whether an alternative asymptotic test might be better in practice.

Such a test is Wald's

$$W = (\hat{\beta}_1 - \hat{\beta}_2)'[\hat{\sigma}_1^2(X_1'X_1)^{-1} + \hat{\sigma}_2^2(X_2'X_2)^{-1}]^{-1}(\hat{\beta}_1 - \hat{\beta}_2)$$

where following the notation used above to set out the Jayatissa test, the two regressions $Y_i = X_i\beta_i + \varepsilon_i$ are distinguished by the subscript $i=1,2$. X_i and Y_i are $(T_i \times k)$ and $(T_i \times 1)$ matrices of explanatory and dependent variables, β_i is a $(k \times 1)$ vector of regression coefficients estimated by $\hat{\beta}_i = (X_i'X_i)^{-1}X_i'Y_i$; ε_i is a $T_i \times 1$ vector of disturbances with elements distributed as $IN(0,\sigma_i^2)$ estimated by $\hat{\varepsilon}_i = Y_i - X_i(X_i'X_i)^{-1}X_i'Y_i$ and $\hat{\sigma}_i^2 = (T_i - k)^{-1}\hat{\varepsilon}_i'\hat{\varepsilon}_i$. Under the null hypothesis $\beta_1 = \beta_2$ W is distributed asymptotically as χ^2 with k degrees of freedom. A proof of this result is given in Honda (1982).

A COMPARISON OF JAYATISSA'S AND WALD'S TESTS

The question now addressed is whether in practice the Wald test is preferable to the Jayatissa test or vice versa. This appendix seeks to shed light on this problem by means of a Monte Carlo study.

Before the Monte Carlo study is described some concepts used in comparing tests are reviewed.

Formally, a <u>test</u> is a procedure for determining whether to accept or reject a statistical hypothesis. Rejection of the null hypothesis is indicated for each sample for which the test statistic is greater

than some appropriately chosen constant k. A test therefore determines a partition of the sample space into a critical region comprising all those samples for which it rules the null hypothesis to be rejected and its complement to the acceptance region. Associated with the critical region are a test's size and power. Size is defined as the probability, given that the null hypothesis is true, of the event of drawing a sample from the critical region (and hence rejecting the null hypothesis). Power is defined as the probability of the same event given that the null hypothesis is false. Clearly high power and low size are to be desired although these aims conflict in the sense that in general an expansion of the critical region obtained by reducing k is expected to increase both.

The classical method of comparing tests rests upon consideration of the power of tests of a given size and thereby avoids the question of the relative importance attached to size and power. Knowledge of the exact distributions of tests allows their sizes to be set equal by the appropriate choice of critical values.(1) However as the exact distribution of the Wald test is unknown it is not possible to use this method of comparison here. Instead Monte Carlo simulation techniques were used as the basis for comparison. The critical value for the Wald test is set by reference to its asymptotic distribution to give a test of nominal size 0.5 and the empirical size and empirical power are computed in a Monte Carlo study. Empirical size is defined as the sample proportion of rejections of the null hypothesis in a Monte Carlo experiment where data has been artificially

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(1) Strictly, in some cases not relevant here, randomisation may be necessary to achieve this result. See Silvey (1970, p. 100).

generated so that the null hypothesis is true. Similarly, empirical power is defined as the sampling proportion of rejections of an untrue null hypothesis. Although the exact power and size of Jayatissa's test are known, its empirical size and power have been computed during the same experiments and are tabulated for comparison.(1)

The model used for the Monte Carlo study was:

$$y_t = 0 + b_1 x_t + \varepsilon_t, \qquad \varepsilon_t \sim IN(0, \sigma_1^2), \quad t = 1, \ldots, n_1$$

$$y_t = 0 + b_2 x_t + \varepsilon_t, \qquad \varepsilon_t \sim IN(0, \sigma_2^2), \quad t = n_1+1, \ldots n_1+n_2,$$

with the following parameter values:

$$b_1 = 2.0, \; b_2 = 2.0, 2.5, 3.0, 4.0$$

$$n_1, n_2 = 10, 10; \; 10,40; \; 20,30; \; 50,50$$

$$\theta = \sigma_1^2/\sigma_2^2 = 100.0, \; 10.0, \; 1.0, \; 0.1, \; 0.01$$

Five different pairs of (50 x 2) X_1, X_2 matrices were generated with the first columns being in each case unit vectors, and the second columns (i) uniform, (ii) AR(1), ρ=.0, (iii) AR(1), ρ=.5, (iv) AR(1), ρ=.9, each with zero mean. The variance of the first fifty observations of x_t was set to one. To remove effects on the power of the tests due merely to changes in G, the signal noise ratio, this ratio was kept at a constant value of four for the two equations by making appropriate adjustments to the variances of the disturbances and the second fifty observations of x_t and b_2 and θ were varied. The observation matrices were truncated for values of n_1 and n_2 less than fifty.

One thousand sets of values for the Y_1 and Y_2 vectors were generated for each combination of parameter values with σ_1^2 deter-

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(1) The results for the empirical size of Jayatissa's test provide some check on the computations and give a feel for the sampling variation.

mined by the variances of the regressors in the two subsamples, G, b_1, b_2 and O. The nominal size of the tests was set to .05. In the light of results obtained for the empirical size of W, a Wald test with a nominal size of .025, denoted W2, was also tried. As the results were not sensitive to different values of O only results for the case $\theta = 10$ are given here and they appear in Table I. In common with other Monte Carlo studies the results are conditional on the particular parameter values and observation matrices used in the experiments and there is no <u>firm</u> ground for more general inference.

TABLE 1: RESULTS OF MONTE CARLO EXPERIMENTS
Number of rejections of null hypothesis in 1000 replications
(G04, O=10, b1=2.0)

x process:		Uniform;			AR(1), ρ=0:			AR(1), ρ=.5;			AR(1), ρ=.9		
n1	n2	b2	W	W2	J	W	W2	J	W	W2	J	W	W2	J
10	10	2.0	89	59	55	97	57	49	80	55	48	90	56	49
		2.5	150	107	76	123	81	65	183	138	96	141	95	63
		3.0	282	208	112	149	97	59	360	284	134	211	153	92
		4.0	519	444	209	253	178	104	659	565	301	336	269	125
10	40	2.0	111	69	48	92	60	50	94	60	50	101	64	46
		2.5	279	208	132	179	122	79	296	211	138	277	205	127
		3.0	648	557	294	439	351	187	741	649	322	703	595	304
		4.0	984	968	643	879	824	439	991	987	684	988	970	613
20	30	2.0	64	39	45	56	31	40	71	42	42	68	39	48
		2.5	279	189	178	218	156	141	289	192	192	279	199	185
		3.0	674	572	481	618	519	428	696	595	514	684	576	512
		4.0	976	954	898	936	907	816	988	971	913	984	967	907
50	50	2.0	58	24	51	61	35	48	47	24	39	46	25	48
		2.5	472	367	409	428	335	381	432	309	368	369	274	313
		3.0	930	897	902	909	855	867	924	880	898	832	755	779
		4.0	1000	1000	999	999	998	999	1000	998	998	996	993	995

Note: The critical values for a two sided test of the hypothesis that the type I error is 0.05 are 36 and 64 using the 5 per cent level of significance.

CHAPTER ONE, APPENDIX II

RESULTS OF THE MONTE CARLO STUDY

In these experiments the W test generally has the highest empirical power. It has been noted that it is desirable to make such comparisons of power between tests of equal size, and that the exact size of the Wald test cannot be determined, but in the 50,50 samples the empirical size of W is close to its nominal value of .05. In the smaller samples the empirical size of W is often considerably in excess of its nominal value but here the size of the ad hoc W2 test appears to be only slightly biased above .05, even for very small values of n_1 and n_2, whilst its power is almost always considerably greater than that of J. A comparison of results for the 20, 30 and 10, 40 samples suggests that unbalanced samples markedly reduce the power of J whilst the effect on the two Wald tests is to raise their empirical size. As the degrees of freedom for Jayatissa's J relate to $\min(n_1, n_2)$ this reduction of power is not unexpected.

Similar results to these have recently been reported by Honda (1982) who has carried out more Monte Carlo work along the same lines. What conclusions can be drawn from these results?

With samples as large as 50,50 the nominal size of the Wald test appears to be correct. There is therefore a strong case for preferring it to Jayatissa's test which has lower power and entails a considerably greater computational burden. For the smaller samples no firm conclusions can be drawn. The empirical power of W is considerably greater than that of J but its empirical size is also considerably in excess of the nominal value. However, results for the ad hoc W2 test suggest that not all of this extra power results merely from slippage in size caused by setting the critical value too low, and that research into finding a more systematic method for

improving on the accuracy of the asymptotic distribution of the Wald test in small samples may yield a better test than any considered here.

Meanwhile, whether the gain in power offered by the Wald test adequately compensates for its unreliable size in samples smaller than 50,50 will depend upon the relative importance attached to these properties in the particular testing problem involved.

CONCLUSIONS

This appendix has set out and examined some alternative tests for change of structure which are used in Chapter 1, Appendix I and Chapter 5, Appendix III for empirical testing. When disturbance variances can be assured to be equal, or the experimenter is happy to examine a joint test of equality of regression coefficients and disturbance terms, the Chow type test or extension to several populations set out in the first half of this chapter, may be used. If it is not wished to assume that disturbance variances are equal and attention focusses solely on the question of equality of the regression coefficients the verdict is much less clear cut. A Wald test is easier to compute than a Jayatissa test and yields more power, but at the expense of some slippage in size.

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CHAPTER TWO*

LOCAL GOVERNMENT CURRENT EXPENDITURE

INTRODUCTION

Chapter 1 of this thesis was concerned with general government expenditure in a number of developed western nations. In the next two chapters the focus is narrowed down to local government expenditure in England.

Local government expenditure is important both as a part of the economy and as a part of public expenditure. Local authorities' expenditure stood at £35,000 million in 1985-86, forming more than a quarter of the public expenditure planning total and eleven per cent of GDP. Local government employs three million persons in Great Britain, representing fourteen per cent of the workforce.

Seventy-seven per cent of local government spending is devoted to

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(*) This chapter is a substantially revised and extended version of Chapters 3 and 4 of J.G. Gibson and P.A. Watt, The Effect of GREs on Education Expenditure and Budgetary Decision-making by Local Authorities, Report to the Department of Education and Science, INLOGOV, April 1987.The fiscal pressure measures used are discussed in more length in J.G. Gibson, P. Smith and P.A. Watt "Measuring the Fiscal Pressure on English Local Authorities under the Block Grant System", Environment and Planning C: Government and Policy, 1987,(5) pp 157-170. Discussion of the block grant builds on P.A. Watt, "The New Block Grant and Controls over Local Authority Capital Payments", Local Government Studies, March/April 1980, pp 27-30, and P.A. Watt, "The 1981/82 Block Grant Settlement for England", Local Government Studies, March/April 1981, pp. 12-14. The author is grateful to C.R. Barrett and W.S. Siebert for helpful comments.

current expenditure, fourteen per cent to capital expenditure and eight per cent to debt financing.(1) This chapter, and the following three, are devoted to different categories of local authority expenditure. Thus this chapter is devoted to current expenditure, Chapter 3 is devoted to capital expenditure, Chapter 5 is devoted to the housing branch of the capital expenditure budget and Chapter 4 is devoted to the education branch of the current expenditure budget.

The chapter begins with an examination of the overall pattern of local authority current spending and then turns to its main focus: the modelling of year-on-year changes in local authority aggregate current expenditure. After theoretical discussion, a model of local authority expenditure change is estimated for the year-on-year change in local authority budgets for three pairs of years: 1982/3 on 1981/2, 1983/4 on 1982/3 and 1984/5 on 1983/4.

Results from modelling year-on-year change in local government expenditure have policy implications for the present government, which, since it came to power in 1979, has been concerned to control the level of local government expenditure. The discussion of expenditure modelling is introduced in a section that surveys the recent expenditure modelling literature. The remaining part of the chapter is used to develop a model of local authority expenditure change and test it.

A major element in a local authority's expenditure decision-making is its budget constraint. However the budget constraint facing English local authorities over the years considered - 1982-83 to

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(1) Department of the Environment (1986, p83) and Smith and Squire (1987, p9)

1984-84 - is complicated by a complex grant system. Much of the chapter is therefore devoted to setting out the nature of this budget constraint and developing summary measures to represent its hypothesised effect on spending. These measures are termed fiscal pressure.

In the final part of the chapter a model of local authority expenditure change is estimated using measures of fiscal pressure, variables indicating political control and variables measuring other features of the grant system.

THE PATTERN OF LOCAL AUTHORITY CURRENT SPENDING

In 1983-84 local authorities in England devoted £23,738m to current expenditure. The distribution of this expenditure for recent years is shown in Table 1 which is extracted from a recent public expenditure White Paper (HMSO 1986, p339) and sets out local authority current expenditure by category. The entries for 1984-85 are estimated outturn, as are those for 1985-86, which are derived from local authority budgets.

The distribution of expenditure between categories is seen more clearly in Table 2 which shows the same information expressed as percentages of the yearly totals. Education represents the largest proportion of local authority expenditure, though this has been falling over time, largely as the result of the demographic change of falling school rolls. Social security has at the same time risen sharply, due to a different demographic effect - the rising number of old age pensioners, and has also risen as a result of local authorities being required to take over the administration of housing benefit under the Social Security and Housing Benefits Act 1982.

CHAPTER TWO: LOCAL GOVERNMENT CURRENT EXPENDITURE

TABLE 1: ESTIMATED AND OUTTURN CURRENT EXPENDITURE BY CATEGORY FOR LOCAL AUTHORITIES IN ENGLAND (£ million)

Year:	80-81 out-turn	81-82 out-turn	82-83 out-turn	83-84 out-turn	84-85 out-turn	85-86 est. out-turn	86-87 plans
Agriculture, fisheries food and forestry	86	95	97	109	121	125	116
Industry,energy,trade and employment	102	115	128	141	149	160	149
Arts and Libraries	278	308	339	362	387	409	396
Roads and transport	1,335	1,543	1,751	1,837	1,943	1,778	1,747
Housing	547	525	547	647	584	554	491
Other environmental services	1,680	2,052	2,221	2,383	2,543	2,626	2,651
Law, order and protective services	2,173	2,584	2,869	3,133	3,496	3,578	3,683
Education and science	8,682	9,619	10,227	10,792	11,259	11,627	11,498
Health and Personal social services	1,619	1,795	1,970	2,135	2,278	2,421	2,525
Social security	331	480	880	2,200	2,472	2,678	2,729
Total current expenditure in England	17,031	19,116	21,029	23,739	25,232	25,956	25,985

Source: Extracted from The Government's Expenditure Plans 1986-87 to 1988-89 Cmnd 9702 I & II London.Table 4.1 p339.

In Table 3 the entries of Table 1 are adjusted for inflation,(1) Table 4 shows actual and estimated year-on-year growth of expenditure and Table 5 shows these growth figures in real terms as derived from Table 3. In the earlier years shown in Table 5, the most dramatic real cuts were in housing in 1981-82. These cuts followed the substantial cuts in housing subsidies on the introduction of a new local authority housing subsidy system in April 1981.

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(1) Using the price deflator shown in Association of County Councils (1985, p 279). Because this index did not project forward to 1986-87 this year's index has been extrapolated using the GDP index which can be calculated from a comparison of CMND 9702-II Table 2.2 and Table 2.1.

CHAPTER TWO: LOCAL GOVERNMENT CURRENT EXPENDITURE

TABLE 2: ESTIMATED AND OUTTURN CURRENT EXPENDITURE BY CATEGORY FOR LOCAL AUTHORITIES IN ENGLAND AS PERCENTAGES OF TOTAL.

Year:	80-81	81-82	82-83	83-84	84-85	85-86 est.	86-87
	out-turn	out-turn	out-turn	out-turn	out-turn	out-turn	plans
Agriculture, fisheries food and forestry	0.50	0.50	0.46	0.46	0.48	0.48	0.45
Industry,energy,trade and employment	0.60	0.60	0.61	0.59	0.59	0.62	0.57
Arts and Libraries	1.63	1.61	1.61	1.52	1.53	1.58	1.52
Roads and transport	7.84	8.07	8.33	7.74	7.70	6.85	6.72
Housing	3.21	2.75	2.60	2.73	2.31	2.13	1.89
Other environmental services	11.04	10.73	10.56	10.04	10.08	10.12	10.20
Law, order and protective services	12.76	13.52	13.64	13.20	13.86	13.78	14.17
Education and science	50.98	50.32	48.63	45.46	44.62	44.80	44.25
Health and Personal social services	9.51	9.39	9.37	8.99	9.03	9.33	9.72
Social security	1.94	2.51	4.16	9.27	9.80	10.32	10.50
Total current expenditure in England	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculated from The Government's Expenditure Plans 1986-87 to 1988-89 Cmnd 9702 I & II London.Table 4.1 p339.

TABLE 3: ESTIMATED AND OUTTURN CURRENT EXPENDITURE BY CATEGORY FOR LOCAL AUTHORITIES IN ENGLAND IN REAL TERMS (1984-85=100, £ million)

Year:	80-81	81-82	82-83	83-84	84-85	85-86 est.	86-87
	out-turn	out-turn	out-turn	out-turn	out-turn	out-turn	plans
Agriculture, fisheries food and forestry	114	112	107	114	121	120	106
Industry,energy,trade and employment	135	136	141	147	149	153	137
Arts and Libraries	368	363	373	378	387	392	363
Roads and transport	1,768	1,819	1,924	1,918	1,943	1,705	1,604
Housing	724	619	601	676	584	531	451
Other environmental services	2,490	2,419	2,441	2,488	2,543	2,519	2,433
Law, order and protective services	2,878	3,046	3,153	3,271	3,496	3,432	3,381
Education and science	11,499	11,339	11,238	11,268	11,259	11,152	10,554
Health and Personal social services	2,144	2,116	2,165	2,229	2,278	2,322	2,318
Social security	438	566	967	2,297	2,472	2,569	2,505
Total current expenditure in England	22,557	22,534	23,109	24,785	25,232	24,895	23,851
Price Index	75.5	84.8	91.0	95.6	100.0	104.3	108.9

Source: Calculated from The Government's Expenditure Plans 1986-87 to 1988-89 Cmnd 9702 I & II London.Table 4.1 p339. and Association of County Councils(1985) Rate Support Grant, London Table J p279.

It is interesting to compare the planned negative growth in public expenditure, shown in the last column of Table 5, with the positive real growth that has been the overall pattern of outturns. This is an example of an effect that has been noted in earlier work by Jackman (1984), of major planned cuts in expenditure programs, which do not materialise by the time the plans become outturns.

The tendency for these planned cuts not to be fulfilled in subse-

quent outcomes can be explained in terms of a number of political and institutional effects. Firstly, until the recent Rates Act conferring powers on central government to ratecap selected local authorities, central government has not had direct powers to control the level of any local authority's current expenditure - a situation leading one senior treasury official to describe local government finance as the "Achilles Heel" of Treasury control of public expenditure.(1) Secondly, it has been argued(2) that the effective way to obtain cuts in local government expenditure is to cut central grant. However, it appears that the government has been unwilling to bear the political costs of the implied rate rises.(3) Thirdly, local authorities' political composition has changed during the period which may have worked to prevent cuts.(4)

Apart from social security payments which have risen very rapidly for the reasons described above, Law and Order has received the most sustained growth in resources, reflecting central government policy priorities.(5)

THE FINANCE OF LOCAL AUTHORITY CURRENT EXPENDITURE

The major sources of finance for local government net expenditure(6) are local taxes in the form of rates, and central grants from the gov-

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(1) Layfield, 1976, p307, quoted in Jackman (1984)

(2) Gibson (1983)

(3) Gibson (1983)

(4) Gibson (1985)

(5) See Gibson 1981

(6) "Net" expenditure excludes that financed from fees and charges.

CHAPTER TWO: LOCAL GOVERNMENT CURRENT EXPENDITURE

TABLE 4: YEAR ON YEAR GROWTH IN ESTIMATED AND OUTTURN CURRENT EXPENDITURE BY CATEGORY FOR LOCAL AUTHORITIES IN ENGLAND

Year:	81-82 on 80-81 %	82-83 on 81-82 %	83-84 on 82-83 %	84-85 on 83-84 %	85-86 on 84-85 %	86-87 on 85-86 %
Agriculture, fisheries food and forestry	10.47	2.11	12.37	11.01	3.31	-7.20
Industry,energy,trade and employment	12.75	11.30	10.16	5.67	7.38	-6.88
Arts and Libraries	10.79	10.06	6.78	6.91	5.68	-3.18
Roads and transport	15.58	13.48	4.91	5.77	-8.49	-1.74
Housing	-4.02	4.19	18.28	-9.74	-5.14	-11.37
Other environmental services	9.15	8.24	7.29	6.71	3.26	0.95
Law, order and protective services	18.91	11.03	9.20	11.59	2.35	2.93
Education and science	10.79	6.32	5.52	4.33	3.27	-1.11
Health and Personal social services	10.87	9.75	8.38	6.70	6.28	4.30
Social security	45.02	83.33	150.00	12.36	8.33	1.90
Total current expenditure in England	12.24	10.01	12.88	6.29	2.87	0.11

Source: Calculated from The Government's Expenditure Plans 1986-87 to 1988-89 Cmnd 9702 I & II London.Table 4.1 p339.

TABLE 5: YEAR ON YEAR GROWTH IN ESTIMATED AND OUTTURN CURRENT REAL EXPENDITURE BY CATEGORY FOR LOCAL AUTHORITIES IN ENGLAND (1984-85=100)

Year:	81-82 on 80-81 %	82-83 on 81-82 %	83-84 on 82-83 %	84-85 on 83-84 %	85-86 on 84-85 %	86-87 on 85-86 %
Agriculture, fisheries food and forestry	-1.68	-4.82	6.77	6.32	-0.92	-11.19
Industry,energy,trade and employment	0.35	3.76	4.66	1.21	2.99	-10.88
Arts and Libraries	-1.39	2.60	1.46	2.39	1.37	-7.34
Roads and transport	2.87	5.79	-0.32	1.30	-12.23	-5.97
Housing	-14.58	-2.87	12.38	-13.55	-9.01	-15.18
Other environmental services	-2.85	0.90	1.94	2.21	-0.96	-3.39
Law, order and protective services	5.84	3.50	3.76	6.87	-1.84	-1.49
Education and science	-1.39	-0.89	0.26	-0.08	-0.95	-5.36
Health and Personal social services	-1.32	2.31	2.97	2.19	1.93	-0.19
Social security	29.07	70.91	137.53	7.62	3.91	-2.48
Total current expenditure in England	-0.10	2.55	7.25	1.80	-1.33	-4.20

Source: Calculated from The Government's Expenditure Plans 1986-87 to 1988-89 Cmnd 9702 I & II London.Table 4.1 p339. and Association of County Councils(1985) Rate Support Grant, London Table J p279.

ernment. Rates and grant are linked in the sense that net expenditure must either be financed by rates, grant, or changes in balances.

The total of all grants paid to local government by central government is called aggregate exchequer grant. Out of this are paid specific and supplementary grants and the rate support grant. The relative importance of the various components of aggregate exchequer grant is shown in Table 6.

TABLE 6: COMPONENTS OF AGGREGATE EXCHEQUER GRANT

	1984/85			1985/86		
	Settlement £m	% of Relevant Expenditure	% of Grant	Settlement £m	% of Relevant Expenditure	% of Grant
Relevant Expenditure	24161			25329		
Specific Grants	2410	10.0	20.5	2606	10.3	22.2
Supplementary Grants	166	0.7	1.4	170	0.7	1.4
Domestic Rate Relief	699	2.9	5.9	708	2.8	6.0
Block Grant	8489	35.1	72.2	8280	32.7	70.4
Total	11764	48.7	100	11764	46.5	100.0

Source: ACC (1986, p33)

The rate support grant is itself divided into two parts - domestic rate relief grant, and the block grant. The domestic rate relief grant, or domestic element was introduced in 1967(1) and has been paid at the same rate of 18.5p in the pound for twelve years, including 1986/87. Richard Crossman, the Minister responsible for its introduction wrote at the time:

> The first item on my list was rating and how to shift the burden to taxes. I told [Harold Wilson] I had got into a dead-end because the Chancellor just hadn't the money. I therefore proposed to de-rate the domestic ratepayer. This is my own bright idea which Crocker, my Accountant-General, has accepted as a practical proposition at last. The idea is beautifully simple. If the Chancellor can only spare me £30 million a year in rate relief I am going to make sure that every penny of that £30 million relieves the domestic ratepayer; and that is going to be done by making him a special government grant which the shopkeepers and industry don't share. I got the P.M. into thoroughly good humour by telling him about this idea, which he immediately liked and regards as the sort of thing a Minister is there to invent.(2)

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(1) Foster, Jackman and Perlman (1980 p 194)

(2) Crossman (1975, p419)

However, domestic element is of small magnitude compared with the major element of the rate support grant: the block grant, which, as is shown in Table 6, represents seventy per cent of aggregate exchequer grant. Block grant is a residual element in the sense that it is made up of aggregate exchequer grant minus specific and supplementary grants and the domestic element. The block grant was introduced in 1981-82 and replaced the previously existing needs and resources elements of the rate support grant.(1)

Unlike the domestic element, which is fixed by an authority's total domestic rateable value, block grant varies according to a local authority's level of spending.(2) In this discussion, a grant which varies with expenditure will be called a matching grant. In order to model local authority expenditure change it is necessary to take account of the form of block grant. Block grant is therefore described in detail. First, however, existing work on local authority expenditure modelling is briefly surveyed.

LOCAL GOVERNMENT EXPENDITURE MODELS

A large number of expenditure models have been estimated for local government in the USA and Britain. A convenient starting point for this brief overview of previous work is Ohls and Wales (1972). Ohls and Wales estimate a cross section model of the supply and demand for state and local government services. They state that they "do not attempt to explain how the community demand curve is obtained" though "in practice...this demand curve must be obtained through the voting

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(1) See Watt (1980) and Watt (1981)

(2) In King's (1984) suggested terminology it is an effort-related general grant.

process". A further problem they encounter is that the price of local services is not directly observable. In order to proceed, they assume that the supply price of local expenditure is unaffected by quantity, but is a function of a number of demographic and factor price elements. Demand for local expenditures, on the other hand, is assumed to be a function of income, grant and the price of expenditures. In detail, the following equations are postulated:

Supply:

$$P = a_1NM + a_2D + a_3W + a_4CHPOP \qquad (1)$$

Demand:

$$Q = b_1 + b_2G + b_3Y + b_4P \qquad (2)$$

Where

P is price of state and local services (unobservable)
Q is quantity of state and local services (unobservable)
NM is the fraction of a state's population living in non-metropolitan areas 1966
D is density of population per square mile 1968.
W is an index of wages of employees providing state and local services
CHPOP is the ratio of population in 1960 to population in 1968.
G is per capita federal grants to states and localities, 1968
Y is per capita personal income 1968

The supply and demand Equations (1) and (2) cannot be directly estimated because P and Q are unobservable. However their product is observable as expenditure. Ohls and Wales therefore estimate (1) and (2) multiplied together for three sets of expenditure series: highways, education and local services.

Because of this unobservability of price and quantity, Ohls and Wales are not able to identify the coefficients of Equations (1) and (2), but they are able to arrive at the elasticities of demand and supply with respect to the explanatory variables.

Ohls and Wales's supply price equation is improved upon consider-

ably by Strauss (1974) who sees the local tax rate as the relevant price that decision takers face:

> ...a city council, given a tax base of known assessed value, may cut agency-proposed expenditures and/or raise the property tax rate when proposed expenditures exceed revenues. The property tax rate that is chosen equilibrates the demand pressures for additional services with the supply of revenue.(1)

and

> The property tax rate represents the political risk of a particular expenditure level, given population, income and block grants levels...it operates as a political price that the council faces.(2)

Strauss sets out demand and supply equations for public expenditure of the following form:

$$E^d = b_1 + b_2Y + b_3P + b_4P^2 + b_5Trans + b_6t \qquad (3)$$

and

$$E^s \equiv R + Trans \equiv tW + CAF + Trans \qquad (4)$$

Where

Y is money income
P is population
Trans is grant and income from fees and charges
t is the local tax rate
R is total revenues
W is total local property value
CAF is revenue from fees and charges

Equation 4 is written as an identity because of the legal requirement to balance budgets on the revenue side. There is no equation to relate grant to expenditure because Strauss is describing a system using non-matching grants. A complicated estimation process yields values for the structural parameters of $b_5 = 1.573$ and $b_6 = -457 \times 10^{-6}$. Thus grants are found to increase the demand for

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(1) Strauss (1974, p270)

(2) Strauss (1974, p271)

expenditure and tax rate increases are found to decrease the demand for expenditure.

Ashford, Berne and Schramm (1976) follow Strauss's model rather closely. They hypothesise that local governments are

> ...seeking to maximise social welfare subject to the simultaneous forces of available resources and community needs.(1)

They argue that

> Since higher expenditure requires higher taxes, those making fiscal decisions in local government must simultaneously weigh the urgency of community needs against the ability of the community and others to provide resources for these needs, and then select a combination of expenditure and tax rate which they deem best for the community.(2)

They postulate essentially the same expenditure demand and expenditure supply equations as Strauss, except that political control variables are added to the demand equation. However, their use of the same formulation as Strauss for the expenditure supply identity is, on its own, inadequate for the English data used because, account needs to be taken of the matching element of grant. This matching element was, in the period they studied, the resources element of the rate support grant. Thus in England, under the block grant(3) the authority's budget constraint is affected by the expenditure of the authority because of the matching element of grant and this complicates the expression of the budget constraint. Fiscal pressure expressions of the budget constraint take account of this matching element. This review of expenditure models is therefore briefly interrupted to introduce the

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(1) Ashford, Berne and Schramm (1976, p8)

(2) ibid.

(3) And also under the former resources element of the rate support grant

concept of fiscal pressure.

Fiscal pressure is defined in Davies et al (1983) in the following way in relation to the Rate Support Grant (RSG) settlement:

> We suggest here that the only sensible expenditure level from which to measure the extent to which the RSG measure imposes the need for increased use of rates and balances is the actual level of expenditure of the local authority in the previous year ... Given this starting position a primary measure of the severity of the RSG settlement is the rates/balances increase if the authority attempts to maintain a constant volume of services.(1)

In this definition, fiscal pressure is defined as the year-on-year rate rise that would maintain last year's spending in real terms and is a function of grant changes and inflation. To compute this measure, a block grant model is used to calculate the rate rise for each authority that would result from raising expenditure by the rate of inflation. Because authorities face different budget constraints, there will be considerable variation across authorities in this measure.

The first use of a fiscal pressure variable in empirical work is Barnett (1986). Barnett defines his fiscal pressure variable as

> the increase in the rate of local taxation that a local authority would have to levy if it sought to maintain in real terms the expenditure plans of the last period(2)

Barnett hypothesises that local authority expenditure is determined by factors including fiscal pressure and a pattern of incremental budgeting from past expenditure, and that political control can affect the relationship between fiscal pressure and expenditure. The model estimated later in this chapter builds on the approach adopted by

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(1) Davies et al (1983) p. 127-128

(2) Barnett (1986), p136

Barnett. Another author who uses an incremental approach is Bennett (1984), who argues that:

> The approach developed in this paper views decisions on local taxes and expenditures as essentially bureaucratic decisions...Local government decisions are not entirely incremental, however. They are subject to variable local demand and to constraints on the supply of revenue deriving from the size of the local tax base and intergovernmental transfers...In addition, it is hypothesised that local government decisions are informed by the desire to maximise some overall utility function.(1)

Bennett concludes that

> The results of the analysis strongly confirm that a very large proportion of the expenditure level of local authorities in Britain is determined by rolling forward the decisions of previous years.(2)

The model developed in this chapter draws on several features of the works discussed above. Before setting out this model, the basic features of the local authority budget constraint are discussed, as determined by the block grant.

BUDGETARY CHOICE UNDER THE BLOCK GRANT

The budget constraint under the basic block grant(3) is described first. Next the more complicated budget constraint under targets and grant penalties is described and an approximate measure of the effect of these complicated changes in the grant system is developed. Thirdly, the expected effects of other variables seen as exerting influence on budgetary choice - namely local politics, and the published figures of GRE and target - are discussed.

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(1) Bennett (1984, p257)

(2) Bennett (1984, p267)

(3) i.e. without targets and grant penalties.

CHAPTER TWO: LOCAL GOVERNMENT CURRENT EXPENDITURE

THE BUDGET CONSTRAINT : BASIC BLOCK GRANT

(i) Basic Block Grant

In setting out the block grant system it will be convenient to work with variables scaled by population. The basic block grant per head (BG) of an authority is the difference between its total expenditure per head (TE)(1) and an amount it is deemed to raise by applying a standard tax effort to its property tax base. Local property taxes are levied by applying a tax effort termed the grant related poundage (GRP) to the property tax base.

This tax effort is an increasing function of the authority's total expenditure per head in relation to an assessment of its need to spend called its Grant Related Expenditure Assessment per head (GRE). GREs are determined by the government in consultation with the local authority associations, and are intended to be a benchmark of each authority's spending needs. They are constructed using an amalgam of regression analysis of past expenditure, consideration of unit costs and committee debate.(2)

First the block grant of an authority is determined by a set of equations specified by the government in its annual Rate Support Grant Report.(3) The authority's grant related poundage is determined by two alternative equations, depending on whether its total expenditure is above or below a threshold level of expenditure. Above the threshold level of expenditure (on average ten per cent above GRE) the

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(1) i.e. all spending left to be met on revenue account after receipt of other grants

(2) See Association of County Councils (1985)

(3) The particular values in the formula quoted here are for 1984/85

rate poundage price of spending steepens. The two equations that determine GRP are, for authority i:

$$GRP_i = GRP^* + s_1(TE_i - GRE_i) \qquad (5)$$

where expenditure is less than Threshold, and

$$GRP_i = GRP^* + s_1(THR_i - GRE_i) + s_2(TE_i - THR_i) \qquad (6)$$

where expenditure is greater than Threshold.

Then GRP_i is used to define block grant in the following formula:

$$BG_i = TE_i - \frac{GRP_i \cdot GRV_i \cdot M_i}{100} \qquad (7)$$

BG_i is the block grant claim of local authority i (£ per head)
TE_i is the total expenditure of local authority i (£ per head)
GRE is the grant-related expenditure assessment of authority i (£ per head)
GRV_i is the gross rateable value of local authority i (£ per head)
M_i is the multiplier for local authority i
GRP_i is the grant related poundage (in pence) for local authority i
GRP^* is the grant related poundage for spending equal to GRE.
THR_i is the threshold expenditure for local authority i (£ per head)

When an authority is spending at its grant related expenditure assessment, Equation 5 determines GRP, $TE_i - GRE_i = 0$ and hence $GRP_i = GRP^*$.(1)

GRP* can be seen as the benchmark level of rate poundage that corresponds to the benchmark need to spend (GRE) and is set by the Secretary of State for the Environment annually in the Rate Support Grant Report. Full rate poundage equalisation would be achieved should all authorities spend at GRE because GRP*, which is set by class of authority, sums by tier of local authority to the same rate poundage for ratepayers throughout England.

Above threshold the rate poundage cost of spending, dGRP/dTE, is raised from s_1 to s_2, an effect known as taper.(2) Two further

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(1) Balances will be assumed to remain constant in this discussion

(2) e.g. increased 25% from 0.6p to 0.75p for 1984/85.

conditions set on the grant system are firstly that the grant-related poundage cannot be below zero(1) and that grant cannot be negative, but is set to zero should the Equation 7 yield a negative grant.

Conceptually, the block grant can be split into two components - lump-sum and matching(2) - similar respectively to the replaced needs element and resources elements of the previous rate support grant system. The rate of matching, or marginal rate of grant can be found by taking the derivative of (7) with respect to total expenditure:

$$\frac{dBG_i}{dTE_i} = 1 - \frac{(dGRP/dTE_i).GRV_i.M_i}{100} \qquad (8)$$

where $dGRP/dTE_i$ is s_1 below threshold, and s_2 above threshold. This rate of matching can be negative(3) and this occurred, for example, on expenditure below threshold for those authorities where GRV.M was greater than £166.6 per head and on expenditure above threshold for those authorities where GRV.M was greater than £133.3 per head for 1984/85. The multiplier, M_i is a device that enables the Secretary of State to modify the effective GRV of each authority for the purposes of year-on-year safety-netting and London equalisation. From here on, multipliers will be assumed to be equal to one to reduce notational clutter, though they are taken account of in the empirical work later. To the same end, the i subscript is also dropped.

The lump-sum, or fixed element of block grant is defined (by the Society of County Treasurers (1981)) as the amount of grant receivable

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(1) Were this to be the case, grant receipts would be so high as to allow a negative rate to be set - i.e. payment would flow from the authority to the ratepayer.

(2) See Society of County Treasurers (1981)

(3) This contrasts with the situation under the old resources element grant where the lowest rate of matching was zero.

if GRP is equal to zero. If GRP is zero, grant is equal to total expenditure. Hence the fixed element can be found by substituting GRP = 0 in Equation 5 and solving for TE, which at this point of the schedule is equal to grant. Thus:

$$\text{Fixed Element} = \text{GRE} - (\text{GRP}^*/s_1). \qquad (9)$$

Some features of the grant system can be shown diagrammatically. Figure 1 shows a grant receipts function $OA_1A_2A_3Z$ for authority A. The section of the function A_1A_2 occurs where expenditure is below threshold. The marginal rate of grant as expressed by Equation 8 is negative, shown by the slope. For section A_2A_3 expenditure is above the threshold level OT and the negative slope steepens, caused by the rise of dGRP/dTE from s_1 to s_2 in Equation 8. To the left of A_1A_2 the block grant Equation 7 would indicate a grant function marked by the dotted line in the diagram. However, this section is also to the left of the forty-five degree line OA_1, where grant receipts would exceed expenditure - a situation prohibited by statute. Hence, for this range, grant receipts are set equal to expenditure and the function is given by OA_1.

The fixed element of the grant, discussed above is OF, defined by the point where A_1A_2 meets the forty-five degree line and rate poundage first becomes zero as expenditure falls. Lastly for all expenditures above A_3 the authority receives no grant. At these points, the grant, as determined by formula, would be negative, as shown in the diagram by the dotted line below the horizontal axis. Statute prevents this, and grant is set to zero along the section A_3.

In the early years of the block grant system three patterns of grant receipt function occurred. These are shown in Figure 2 for three authorities, A, B, and C, their grant receipt functions being

$OA_1A_2A_3$, $OB_1B_2B_3$ and $OC_1C_2C_3$ respectively. From Equation 9 it can be seen that the amount of fixed element component of block grant depends partly on the size of the authority's GRE. Threshold is set at approximately ten per cent above GRE, and corresponds to the kinks A_2 B_2 and C_2 on each schedule. It can therefore be seen from the diagram that authority A has the highest GRE and fixed element, and C has the lowest.

The most important determinant of the slope of the schedules, expressed in Equation 8 is the authority's rateable value per head, GRV. Authority A has the largest rateable value per head, which generates negative marginal grant on all its expenditure above its fixed element, with the rate of loss increasing beyond threshold. Authority B has the lowest rateable value per head and receives positive marginal grant on all expenditure, although at a decreased rate above threshold. Authority C is intermediate with respect to rateable value per head and receives positive marginal grant below threshold, and negative marginal grant above threshold.(1)

The block grant equations affect the budget constraint for a local authority area by supplementing total local resources. Assuming, for simplicity, that block grant is financed from central funds not collected from the local authority area, the local resources of the area per head can either be spent on local government expenditure per head (TE), or private goods per head (Y_d). If the level of resources before grant is Y, the local budget constraint can be written as:

$$Y + BG = TE + Y_d \qquad (10)$$

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(1) Authorities with grant receipts functions like authority C could therefore receive over part of the range, the same level of grant for two different expenditure levels.

Substituting for BG from (7) and re-arranging gives:

$$Y_d = Y - \frac{GRP(TE).GRV}{100} \qquad (11)$$

- subject again to the two constraints that a negative GRP is replaced by zero, and block grant cannot be negative.

This relationship is shown in Figure 3. In this figure $Y_1 = Y_2 = Y$ are distinguished for descriptive purposes. $Y_1A_1A_2A_3Y_2$ represents the local budget constraint. The section Y_1A_1 corresponds to OA_1 in Figure 1, where local government expenditure is entirely financed by grant. A_1A_2 corresponds to A_1A_2 in Figure 1 and likewise for A_2A_3. The portion A_3Y_2 corresponds to A_3Z in Figure 1, where no block grant is paid.

Implicit in this budget constraint is a range of choices for the council on rates and expenditure. How does the authority make these choices? Institutionally the framework is as follows.

LOCAL AUTHORITY BUDGET DECISION-MAKING

Formally the local authority budget decision is made by its councillors. This Chapter examines budget decision-making within a utility maximising framework, it will therefore be of interest to focus on the utility function of the median Councillor.

A local authority's budget, with its implied rate levy is usually decided by Council in its March meeting.(1) The budget, which is presented to Council for approval is the product of estimates from spending departments which typically have been subject to scrutiny and revision by the Finance Committee with the assistance of the Treasur-

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(1) Danziger (1978, p150)

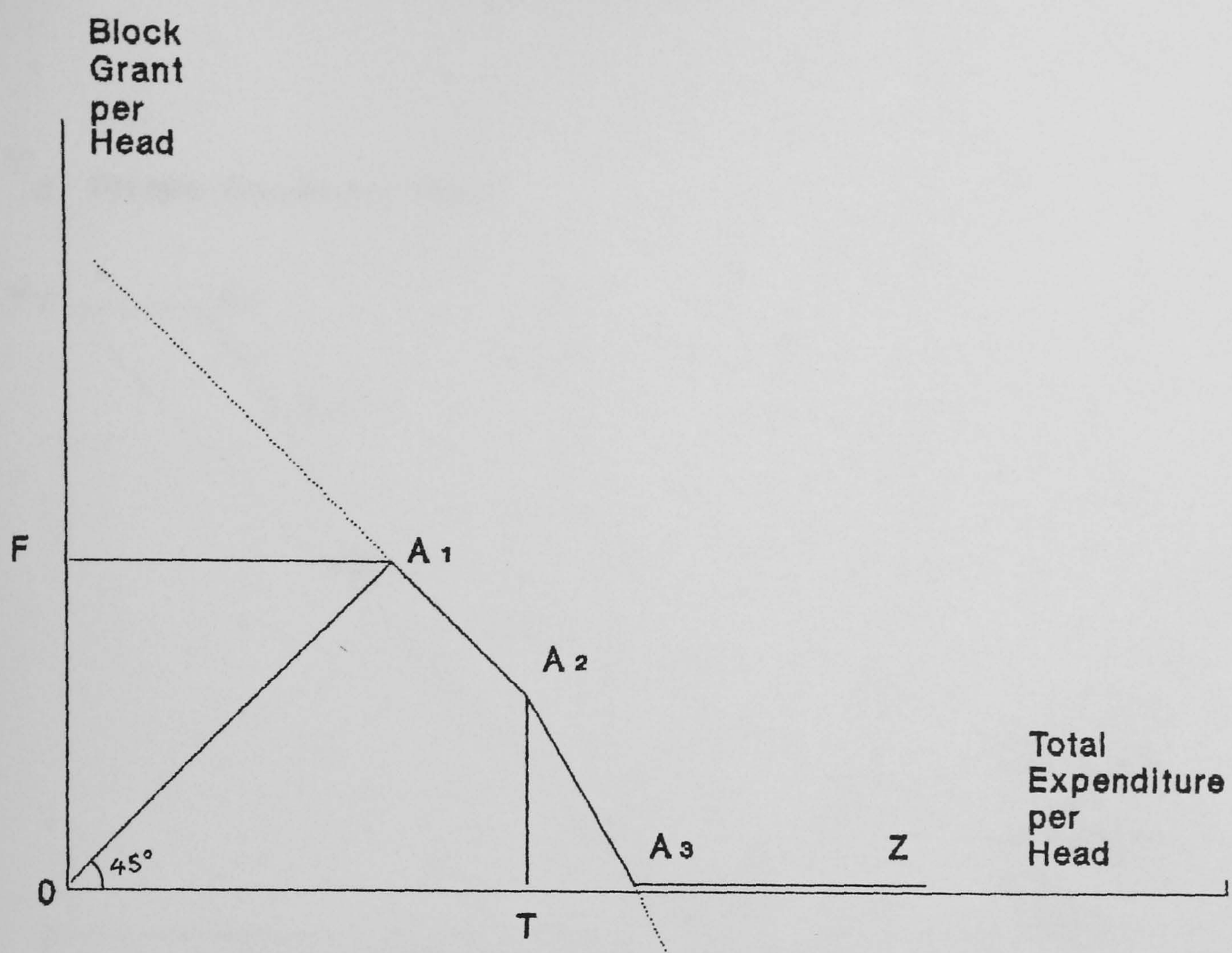

Figure 1: Grant Receipts Function for Authority A

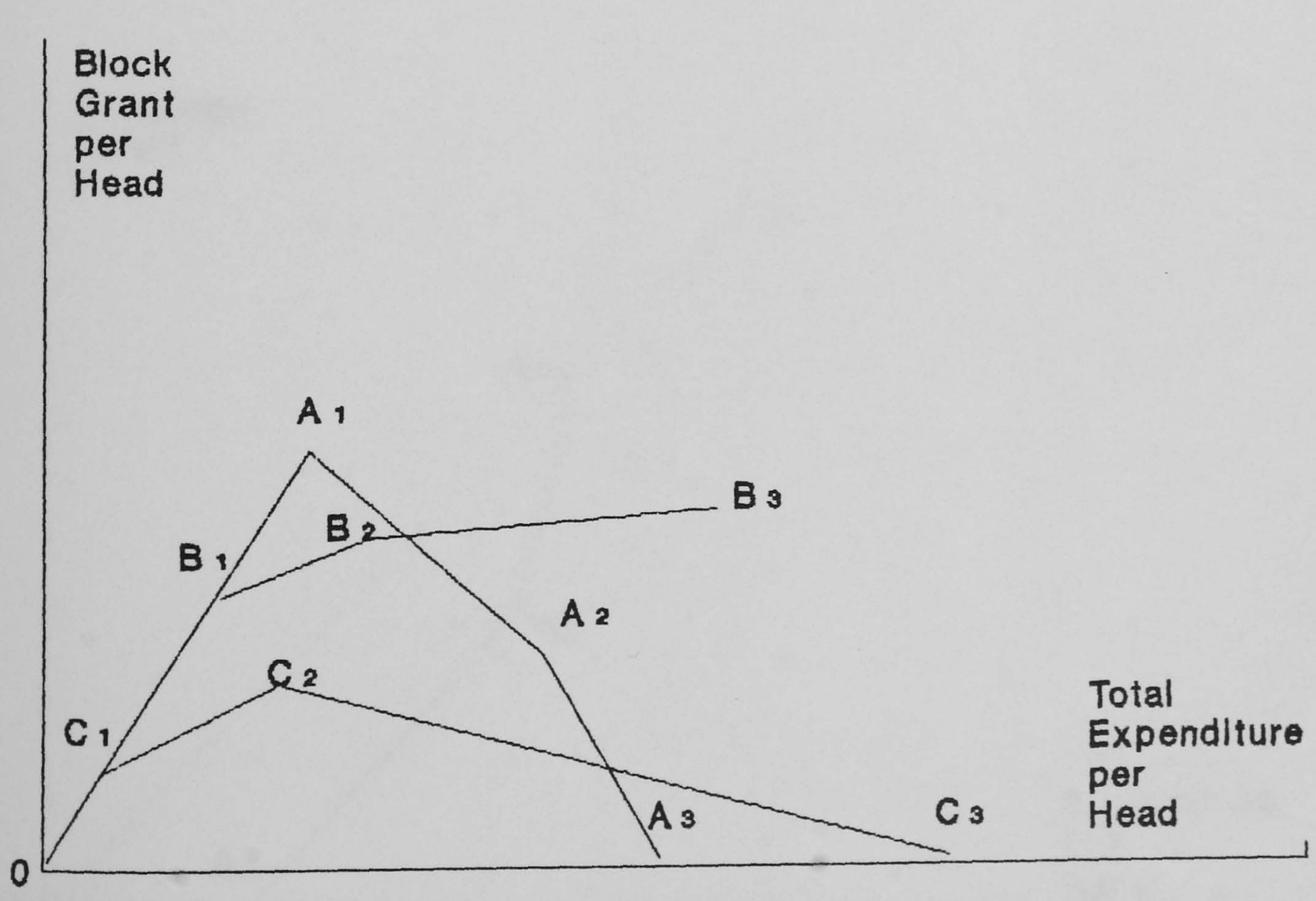

Figure 2: Alternative Patterns of Grant Receipt

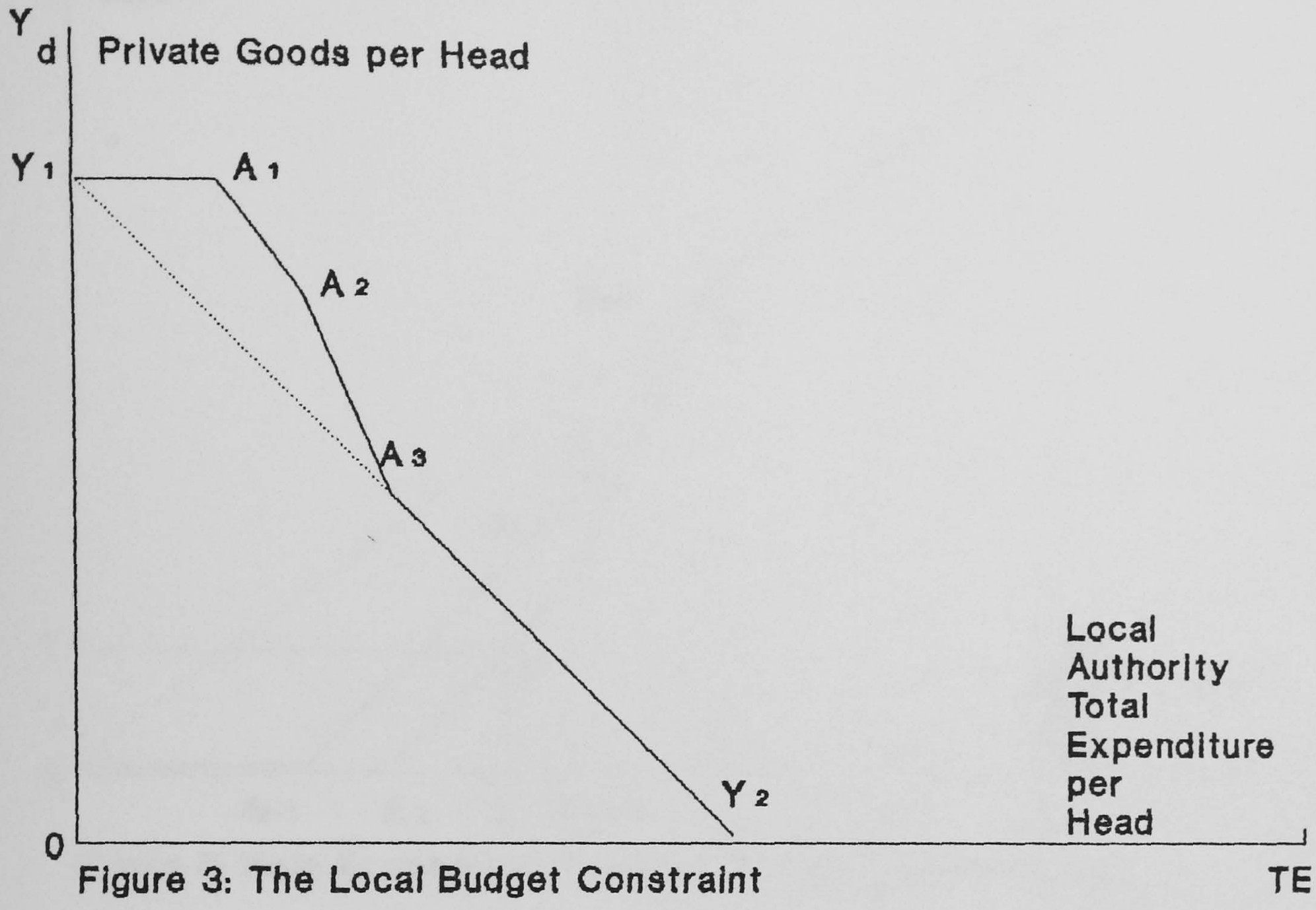

Figure 3: The Local Budget Constraint

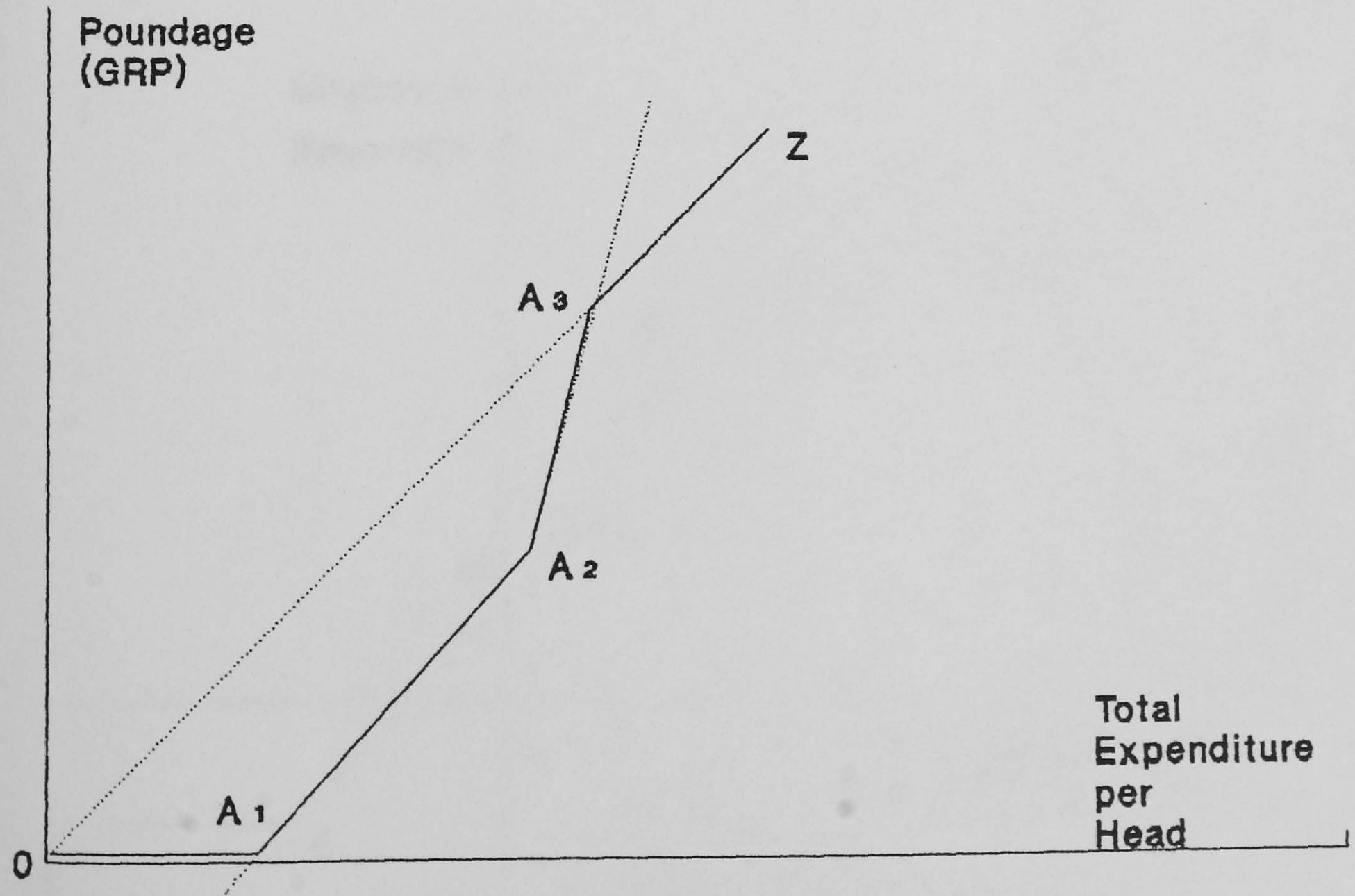

Figure 4: Rate Poundage as a Function of Total Expenditure

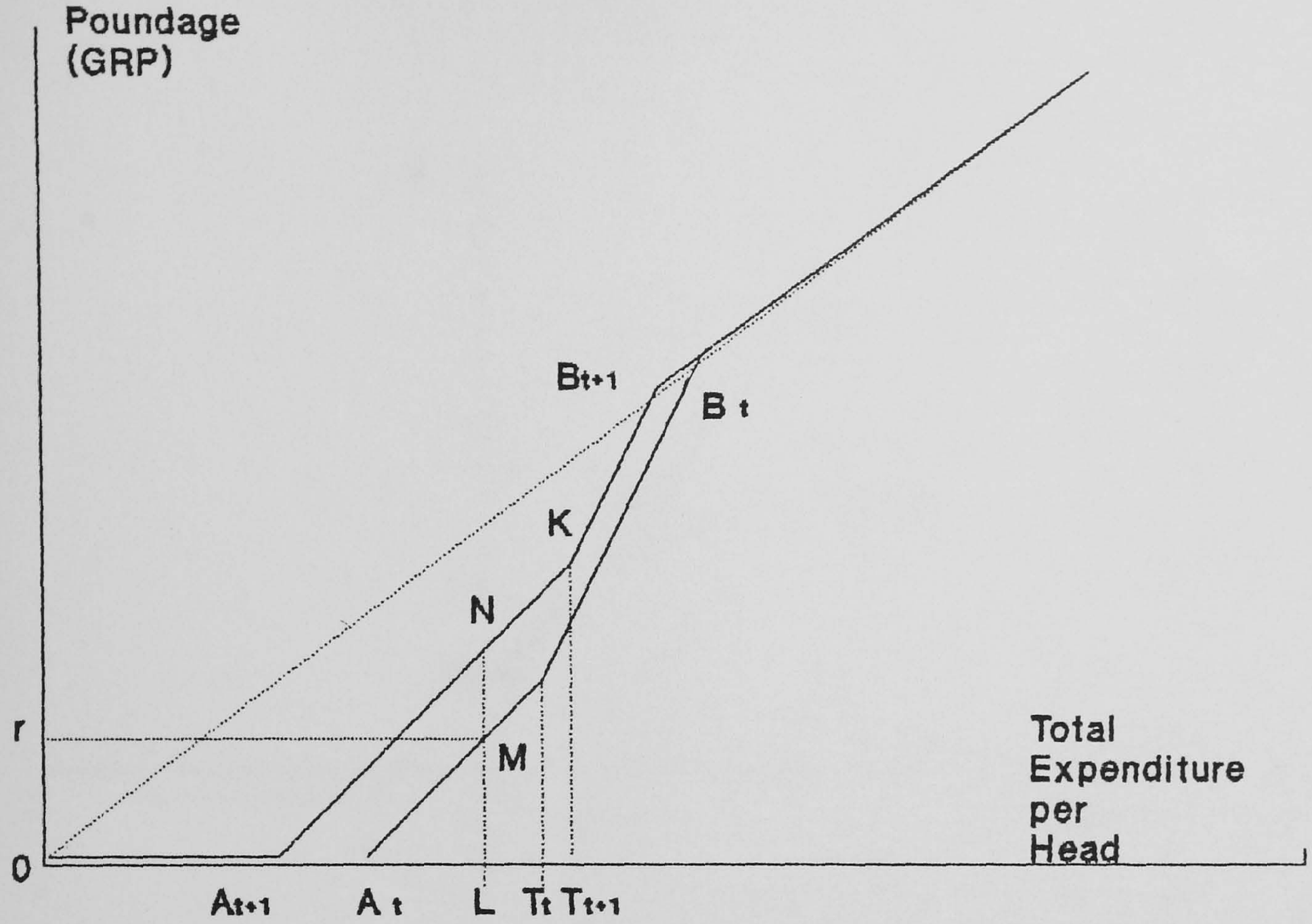

Figure 5: Rate Expenditure Function for Successive Years

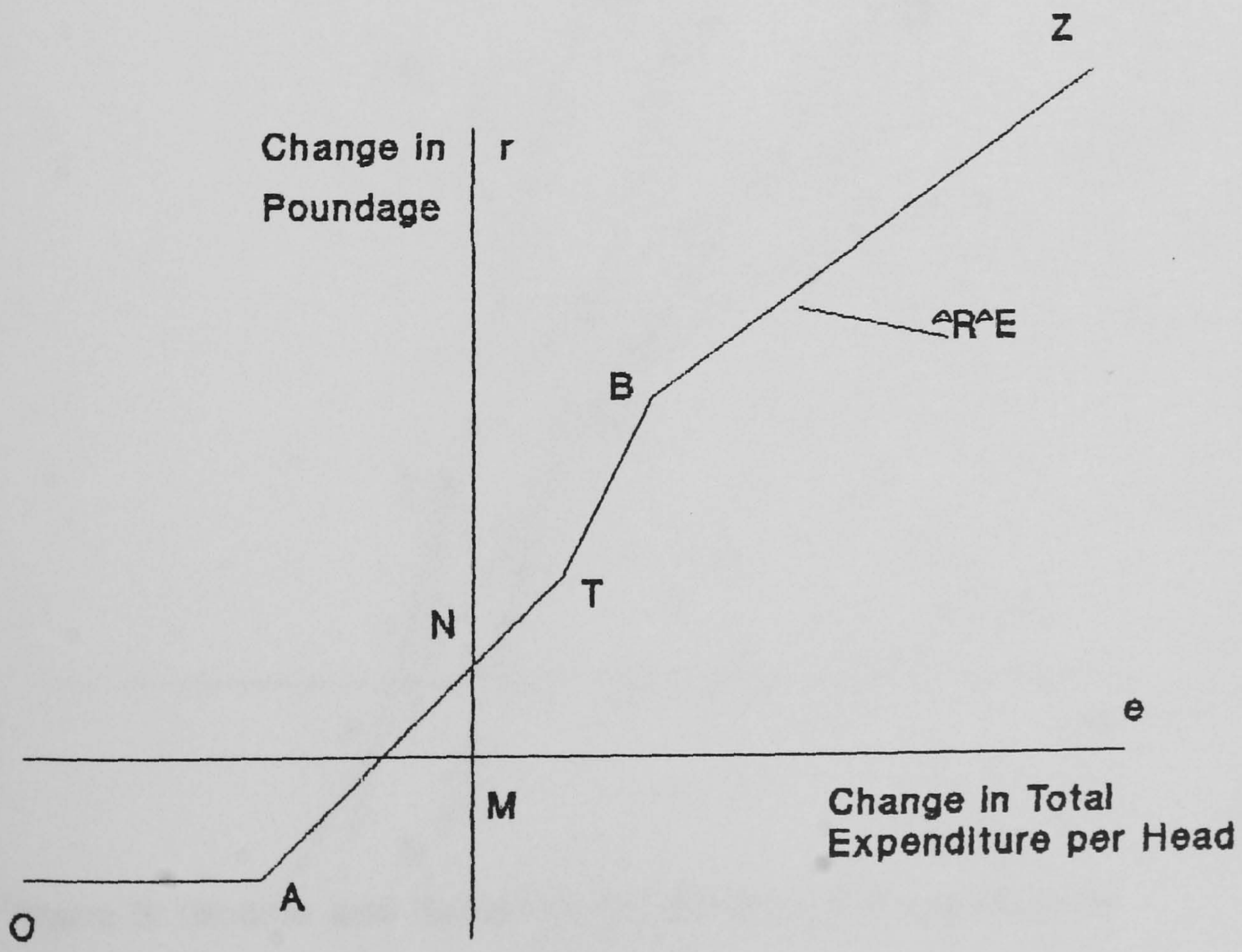

Figure 6: Change in Poundage against Change in Expenditure

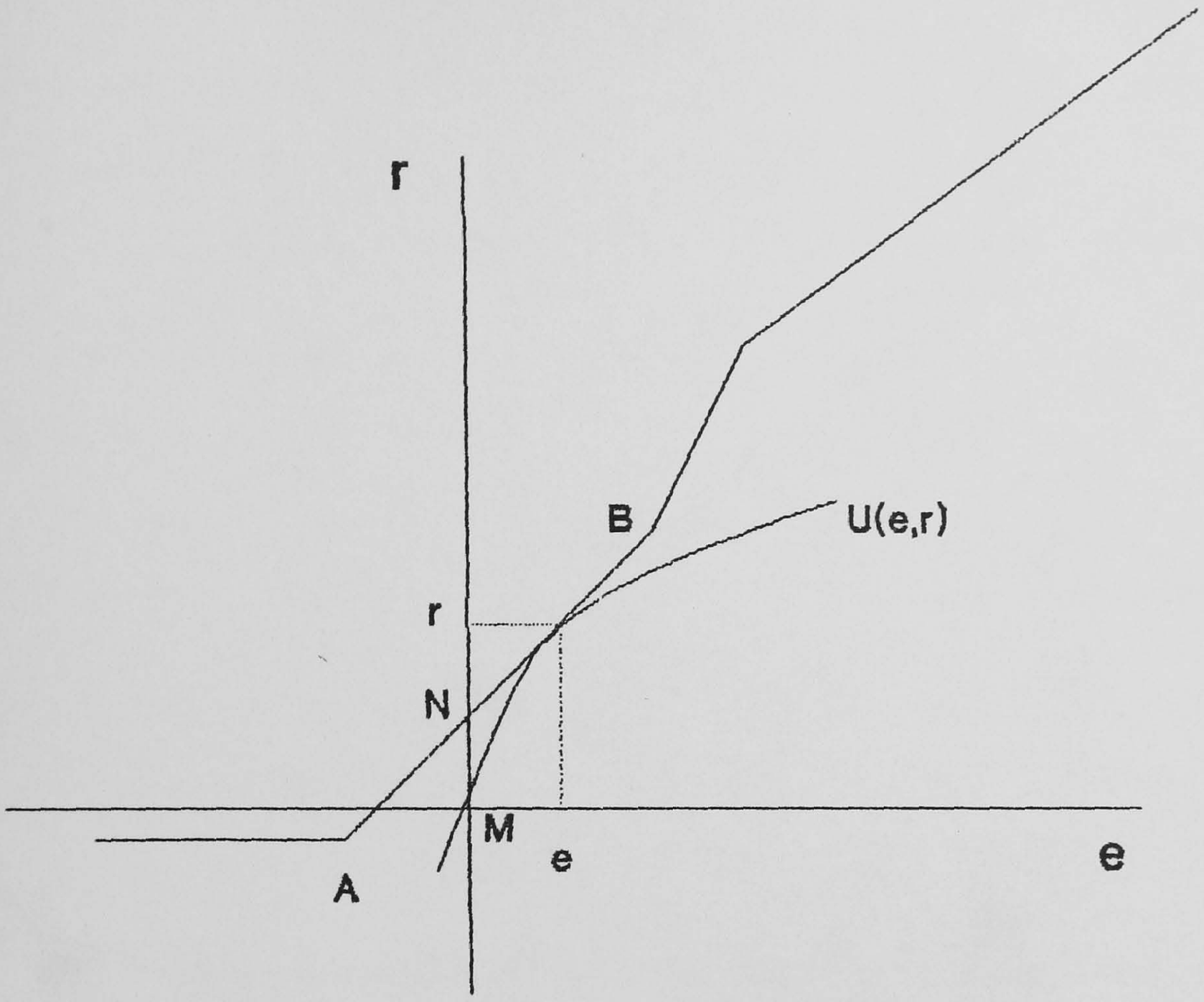

Figure 7: Utility Maximisation Subject to Budget Constraint

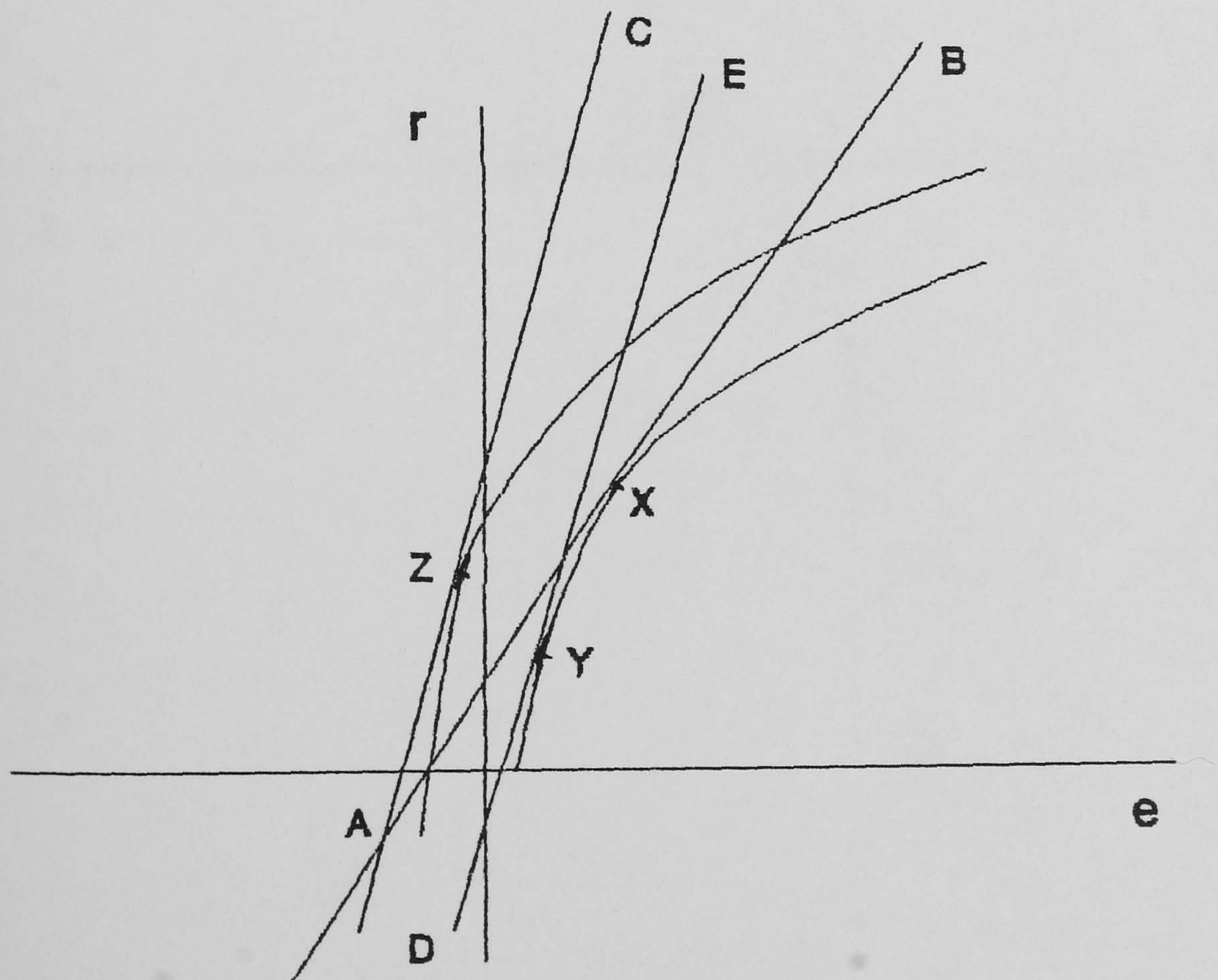

Figure 8: Income and Substitution Effects of Slope Change

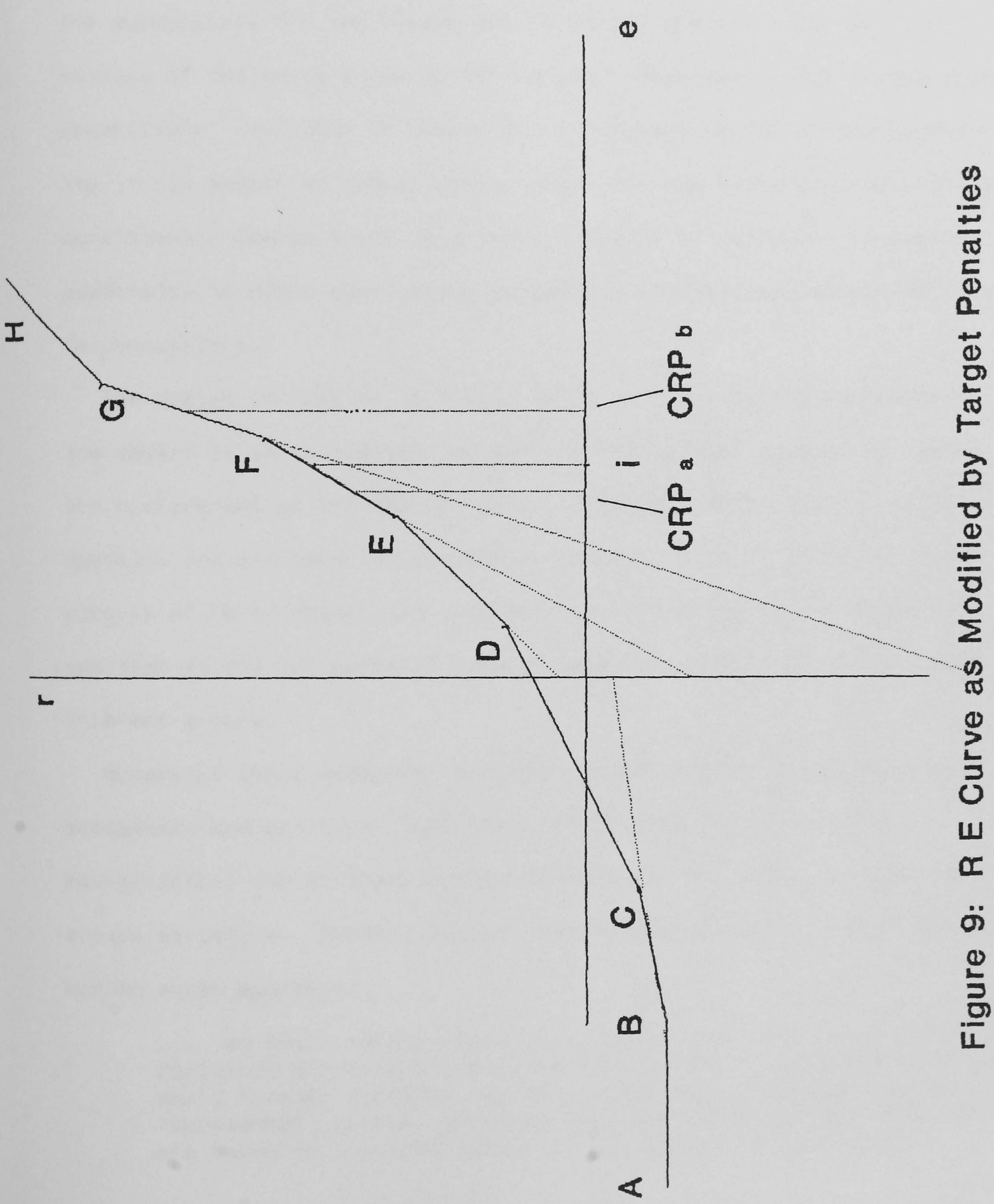

Figure 9: R E Curve as Modified by Target Penalties

er. The median Councillor's preferences are therefore likely to come under bureaucratic influences of the form outlined in Chapter 1. Central government influence is also possible. A report will often be produced by the Treasurer setting out Government guidelines, such as the authority's GRE and Target and sometimes sketching out the implications of following these guidelines.(1) Greenwood (1981) found that councillors' responses to Government guidelines varied between authority in his sample of twenty authorities - in one authority councillors consistently denied their importance - and it is difficult to view conformity to often-conflicting guidelines yielding any strong utility to councillors.

The median Councillor is likely to be at least partly motivated by the desire to be re-elected and will to this extent attempt to follow the preferences of the median voter. Because elections occur infrequently, and are held for bundles of issues, there is scope for the pursuit of Party objectives that may not be desired by the elector in addition to the influence of central government, bureaucrats and other interest groups.

Models of local authority budgetary decision-making constructed by economists and political scientists frequently involve utility maximisation, though there are differences in the source of the preference structure. Foster, Jackman and Perlman (1980, p. 288) take a median voter approach:

> ... we shall simply assume that local government expenditure decisions do reflect the preference of the local community. We shall further identify the local community with some average or representative voter whose preferences and financial resources are taken as characteristics of the community as a whole.

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(1) Greenwood (1981, p82)

However, Wilde (1968, pp. 340-341) relies simply upon a more permissive approach:

> Assume that this local governing body has a set of preferences for goods and services, both social and private, and that such preferences are consistent. Such consistency would mean that a normal indifference map could be taken to represent those preferences. (It should be noted that this indifference map resembles that of an individual in being convex to the origin and non-intersecting, but is not assumed to be part of a "social map" or part of a "social welfare function". This map is not assumed (necessarily) to represent the true preferences of the citizenry) ...

In the model proposed here, decision-making is assumed to be vested in an individual local authority decision-maker whose preferences reflect those of both the median Councillor and the other interests suggested above, and who aims to maximise utility subject to the local authority budget constraint.

It is well known that budgeting procedures usually work from the previous year's budget as a base(1) and the importance of the existing budget is recognised here in that it is assumed that key elements in the decision-maker's utility function are changes in the local authority's expenditure and changes in its rate poundage. The budget constraint is therefore re-stated in the next section, firstly in terms of feasible rate-expenditure combinations, and then in terms of feasible changes in rates and expenditure.

THE BUDGET CONSTRAINT IN TERMS OF RATES AND EXPENDITURE

In Figure 4 rate poundage (GRP) is shown as a function of total expenditure by a rate-expenditure (RE) function . The points $OA_1A_2A_3Z$ correspond to points $OA_1A_2A_3Z$ in Figure 1 and to $Y_1A_1A_2A_3Y_2$ in Figure 3. Thus on the section OA_1 no rate

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(1) Danziger 1978

poundage is levied, as Equation 5 would indicate a negative GRP (as shown by the dotted line projected below the horizontal axis) and this is prevented by statute. OA_1 is equal to the fixed element of grant defined above. On the section A_1A_2, rate poundage rises by s_1=dGRP/dTE for every pound per head increase in TE. On the section A_2A_3 expenditure is above threshold and poundage rises at the rate of s_2 until at point A_3 all grant is exhausted, and the poundage then rises at the rate 100/GRV.(1) The dotted projection of A_2A_3 represents negative block grant that can be generated by Equations 6 and 7 but is prevented by statute. Figure 4 is determined by Equations (5) and (6), plus the two constraints on non-negative GRP and BG.

Figure 5 is similar to Figure 4 but shows the relationship between rate poundages and expenditure for a hypothetical local authority for two successive years - A_tB_t for year t and $A_{t+1}B_{t+1}$ for year t+1. The authority has a higher threshold in the second year (T_{t+1}), than in the first year (Tt). As drawn, dGRP/dTE is the same in both years, and thus the two RE functions are parallel. The difference between the RE functions is in threshold and fixed element.

The difference in fixed element, determined by Equation 9 is composed of a rise in GRE that has increased threshold, and an increase in GRP*. For simplicity zero population change is assumed.

Figure 6 can be derived from Figure 5 to show the relationship between expenditure <u>changes</u> and rate poundage <u>changes</u> ($\triangle R \triangle E$).

Thus, the vertical axis of Figure 6 shows changes in rate poundages

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(1) For authorities of type B in Figure 2 this last section is absent as the section A_2A_3 is less steep than OA_3 and thus does not ever cross OA_3.

and the horizontal axis shows changes in expenditure levels per head. In order to generate the ^R^E function of Figure 6 some initial level of expenditure for year t must be assumed. Assume therefore that OL is the budget in year t. The resulting rate level for year t (Or) is read off the RE function in Figure 5 at M. Starting from this rate level in year t, a zero expenditure change in year t+1 will lead to a rate increase of MN - shown in both Figure 5 and Figure 6. As expenditure is increased along the horizontal axis from the origin on Figure 6, rates rise according to the slope of $OA_{t+1}KB_{t+1}Z$ and ^R^E is traced out. In effect $OA_{t+1}KB_{t+1}Z$ is drawn out on Figure 6 with the point M in Figure 5 moved to the origin of Figure 6.

The equation of the ^R^E function can be derived algebraically as follows. Define

$$r \equiv GRP_{t+1} - GRP_t \qquad (12)$$

and

$$e \equiv TE_{t+1} - TE_t \qquad (13)$$

where time t is defined such that at time t, GRP_t and TE_t are pre-determined, but TE_{t+1} is a choice variable to the local authority. Thus the authority has a range of budget options for TE_{t+1} and the consequent GRP_{t+1} which are determined by the function drawn in Figure 6. This function changes above threshold. Below threshold, along the segment AT, $TE_{t+1} \leq THR_{t+1}$ (i.e. $e \leq THR_{t+1} - TE_t$).

Substituting from (5) for GRP_{t+1}, $r = GRP_{t+1} - GRP_t$ can be written as:

$$r = GRP^*_{t+1} + s_1(TE_{t+1} - GRE_{t+1}) - GRP_t. \qquad (14)$$

Substituting from (13) for TE_{t+1} and re-arranging gives

$$r = s_1 e + GRP^*_{t+1} - GRP_t + s_1(TE_t - GRE_{t+1}) \qquad (15)$$

$$\vdots$$

$$e \leq THR_{t+1} - TE_t$$

The last three terms of (15) are all pre-determined at time t or set by central government. If these three terms are denoted by c_1, (15) becomes

$$r = s_1 e + c_1 \qquad (16)$$
$$\vdots$$
$$e \leq THR_{t+1} - TE_t.$$

Hence r is a linear function of e.

Similar algebra for expenditure increases above THR_{t+1} (along segment TB in Figure 6) yields a second linear function of e:

$$r = s_2 e + c_2 \qquad (17)$$
$$\vdots$$
$$e > THR_{t+1} - TE_t$$

where

$$c_2 = GRP^*_{t+1} - GRP_t + s_1(THR_{t+1} - GRE_{t+1}) + s_2(TE_t - THR_{t+1}).$$

The segments OA (in Figure 6) corresponding to a zero rate poundage, and BZ corresponding to zero block grant, although shown in Figure 6, are not relevant to the later empirical work as no local authorities in the sample were located on this part of their budget constraint. The relevant budget constraint to the local authority decision-maker, ATB is therefore piecewise-linear and, because $s_1 > s_2$, the budget set is convex.

Suppose now that the local authority decision-maker discussed above can be characterised as seeking to maximise a strictly quasi-concave utility function U(e,r), where increases in expenditure, e, are con-

sidered as "goods" and increases in rate poundage, r, are considered "bads"(1) so that $U_e > 0$ and $U_r < 0$. The budget constraint for the decision-maker will be (16) below threshold and (17) above threshold. Consider the case where equilibrium is reached below threshold, as shown in Figure 7. Dropping the 1 subscript, the problem for the local authority decision-maker can be written as max U(e,r) s.t. $-se + r = c$.

Forming the Lagrangian $L = U(e,r) + \lambda(c + se - r)$, the first-order conditions are:

$$L_\lambda = c + se - r = 0 \qquad (18a)$$

$$L_e = U_e + \lambda s = 0 \qquad (18b)$$

$$L_r = U_r - \lambda = 0, \qquad (18c)$$

which gives $s = -U_e/U_r$ at the tangency point $(\bar{e},\bar{r})$.

At the equilibrium $(\bar{e},\bar{r})$,

$$c + s\bar{e} - \bar{r} \equiv 0 \qquad (19a)$$

$$U_e(\bar{e},\bar{r}) + \bar{\lambda}s \equiv 0 \qquad (19b)$$

$$U_r(\bar{e},\bar{r}) - \bar{\lambda} \equiv 0. \qquad (19c)$$

Taking the total differential yields:

$$s d\tilde{e} - d\tilde{r} = -\tilde{e}ds - dc \qquad (20a)$$

$$s d\bar{\lambda} + U_{ee}de + U_{er}dr = -\bar{\lambda}ds \qquad (20b)$$

$$-d\bar{\lambda} + U_{re}d\bar{e} + U_{rr}d\bar{r} = 0. \qquad (20c)$$

To investigate the comparative statics of this model, consider first the effect of a change in intercept c. To do this let ds = 0 to keep the slope constant in (20) above, and divide through by dc. In matrix form this yields:

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(1) This approach follows Sondheimer (1986). See Buchanan and Lee (1982) for a similar assumption used in a different context.

$$\begin{bmatrix} 0 & s & -1 \\ s & U_{ee} & U_{er} \\ -1 & U_{re} & U_{rr} \end{bmatrix} \begin{bmatrix} \partial\bar{\lambda}/\partial c \\ \partial\bar{e}/\partial c \\ \partial\bar{r}/\partial c \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \\ 0 \end{bmatrix}, \qquad (21)$$

which can be solved via Cramer's rule to give:

$$e = \frac{1}{|J|} \begin{vmatrix} s & U_{er} \\ -1 & U_{rr} \end{vmatrix} \qquad (22)$$

and

$$r = \frac{-1}{|J|} \begin{vmatrix} s & U_{ee} \\ -1 & U_{re} \end{vmatrix}, \qquad (23)$$

where $|J|$ is

$$\begin{vmatrix} 0 & s & -1 \\ s & U_{ee} & U_{er} \\ -1 & U_{re} & U_{rr} \end{vmatrix}.$$

How are these equations to be interpreted? The constant c is the level of increase of rates that must be charged for a zero increase in expenditure. As c rises, the budget of the decision-maker available to finance either expenditure increases or rate reductions, falls. The constant c is therefore analogous to the negative of income in price theory. For this reason the marginal utility of an increase in the constraint c, represented by $\bar{\lambda}$ is negative, as from Equation 19c, $\bar{\lambda} = U_r(\bar{e},\bar{r})$ and $U_r < 0$ by assumption. It is assumed here that rate-reductions and expenditure-increases are both superior goods(1) and that consequently $\partial\bar{e}/\partial c < 0$. This sign is the opposite to the income effect of consumer theory as c represents negative income.

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(1) i.e. an increase in income leads to an increase in consumption - see Intriligator (1971, p159)

Pursuing the analogy with consumer theory, s is the rate increase "price" of increasing expenditure. To consider the effect of a change in price s, let dc = 0 and divide the equations (20) by ds:

$$\begin{bmatrix} 0 & s & -1 \\ s & U_{ee} & U_{er} \\ -1 & U_{re} & U_{rr} \end{bmatrix} \begin{bmatrix} \partial\bar{\lambda}/\partial s \\ \partial\bar{e}/\partial s \\ \partial\bar{r}/\partial s \end{bmatrix} = \begin{bmatrix} -\bar{e} \\ -\bar{\lambda} \\ 0 \end{bmatrix}. \qquad (24)$$

Solving for $\partial\bar{e}/\partial s$ by Cramer's rule gives

$$\frac{\partial\bar{e}}{\partial s} = \frac{\bar{e}}{|J|}\begin{vmatrix} s & U_{er} \\ -1 & U_{rr} \end{vmatrix} - \frac{\bar{\lambda}}{|J|}\begin{vmatrix} 0 & -1 \\ -1 & U_{rr} \end{vmatrix}. \qquad (25)$$

This result is analogous to the Slutsky equation of consumer theory. The first term is the income effect of the price change of the good expenditure-increases, e, whose price is an increase in the rates of s for every unit of e. This can be verified by noting that the first term is equal to e times Equation 22. The second term is the income-compensated price effect, and this latter point can be shown by setting the income change resulting from a price change: $-\bar{e}ds = 0$, as well as $-dc = 0$ in Equation (20a). Equation (24) then becomes

$$\begin{bmatrix} 0 & s & -1 \\ s & U_{ee} & U_{er} \\ -1 & U_{re} & U_{rr} \end{bmatrix} \begin{bmatrix} \partial\bar{\lambda}/\partial s \\ \partial\bar{e}/\partial s \\ \partial\bar{r}/\partial s \end{bmatrix} = \begin{bmatrix} 0 \\ -\bar{\lambda} \\ 0 \end{bmatrix}. \qquad (26)$$

Solving for $\partial\bar{e}/\partial s$ by Cramer's rule gives

$$\left(\frac{\partial\bar{e}}{\partial s}\right)_{\text{compensated}} = \frac{-\bar{\lambda}}{|J|}\begin{vmatrix} 0 & -1 \\ -1 & U_{rr} \end{vmatrix} = \frac{\bar{\lambda}}{|J|}. \qquad (27)$$

As shown above $\bar{\lambda} < 0$, and $|J|$ is positive if the second-order conditions for utility maximisation are assumed satisfied, hence the income-compensated substitution effect is negative.

Equation (25) may be re-written as

$$\left(\frac{\partial \bar{e}}{\partial s}\right) = \left(\frac{\partial \bar{e}}{\partial c}\right)\bar{e} + \left(\frac{\partial \bar{e}}{\partial s}\right)_{\text{compensated}} \qquad (28)$$

The overall effect is negative, $\frac{\partial \bar{e}}{\partial c}$ is negative by the assumption that e can be considered as a superior good, and c can be considered as negative income, and it has been demonstrated that $\left(\frac{\partial \bar{e}}{\partial s}\right)_{\text{compensated}}$ is negative.

These effects can be shown diagrammatically. In Figure 8 the effect of a change in slope of the budget line is split into an income and substitution effect. To simplify the diagram, only the portion of the budget constraint corresponding to AB in Figure 7 is shown. The initial budget constraint is AB and equilibrium is at X. The rate price of extra spending s_1 is then assumed to rise and the budget line becomes AC with a steeper slope. The point A is obtained by solving the two ^R^E functions generated by Equation 15 with the two values for s_1, for common r and e, and can be shown to occur at $r = GRP^*_{t+1} - GRP_t$ and $e = TE_t - GRE_{t+1}$.(1) The change in slope has an income effect for all points on the new budget constraint other than A. The <u>pure</u> effect of a slope-change can be seen by considering the compensated slope change, represented by the budget line DE which has the new steeper value for s_1 but has c adjusted so that utility remains constant. The compensated equilibrium moves to Y. Hence XY represents the substitution effect of an increase in s_1 and

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(1) The point A may not exist in terms of actual grant payments if the constraint BG ≥ 0 which generates the horizontal portion of the ^R^E function (as shown in Figure 6) comes into play before the two functions cross. Nevertheless the point A is still valid as a geometric construction point.

is negative. If the income compensation is then removed, the budget constraint becomes AC and the income effect of the price change is represented by YZ. The total effect of the price change is XZ, made up of a negative substitution effect XY and an income effect (assumed negative).

To summarise the above discussion, the options available to a local authority's decision-makers have been shown to be expressible in the form of ^R^E functions. These functions are piecewise-linear and, on any section, firstly expenditure has been shown to be negatively affected by the slope of the ^R^E curve with $\partial e/\partial s < 0$ and secondly expenditure has been assumed to be susceptible to a superior income effect (Intriligator, 1971, p. 159) in being negatively affected by the height of the curve $\partial e/\partial c < 0$. However, the budget constraint, as set out so far leaves out the effect of targets and penalties, a major element of the system as operated up to 1985/86. These are now described.

(ii) Expenditure Targets and Grant Penalties

Expenditure <u>targets</u> are set for each local authority by the government on the basis of past expenditure. Exceeding target expendi-

TABLE 7: GRANT PENALTIES 1982/83 TO 1985/86: RATE OF ADDITION TO GRP

Percentage Expenditure above target	Rate of addition to GRP per percentage point overspend			
	1982/83	1983/84	1984/85	1985/86
0%-1%	3p	1p	2p	7p
1%-2%	3p	1p	4p	8p
2%-3%	3p	5p	8p	9p
3%-4%	3p	5p	9p	9p
4%-5%	3p	5p	9p	9p
Each subsequent 1%	zero	5p	9p	9p

ture invokes small grant penalties from authorities classified as low spenders and larger grant penalties from authorities classified as high spenders.(1) The criterion for this classification has been previous budgeted expenditure in relation to target and/or GRE, with GRE becoming relatively more important in the later rules.(2)

Grant penalties take the form of an addition to GRP in the block grant claim Equation 7. The addition depends on the percentage expenditure above target. Penalties have become larger in each successive year and their effect on the marginal rate of grant has become much heavier than the effect of taper above threshold on grant support. Table 7 shows the additions to GRP for overspending target at the ratepayer level for the financial years 1982/83 to 1985/86.

The reason why penalties have become more severe year by year has been put as follows in a commentary on the 1985/86 RSG settlement:

> First targets must get tougher year by year if they are to have any effect. Once an authority has incurred a penalty it is built into its rate demand, and, all other things being equal, it could incur a similar level of penalty the next year without increasing its rate. Secondly, the increased severity of the penalties is designed to eradicate overspending caused by a large number of authorities exceeding their target by up to 2%".(3)

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(1) Association of County Councils, 1984.

(2) There has been a tendency, caused by the basing of targets on previous budgets, combined with constraints on the year-on-year reductions required, for the increase in targets to be positively related to past expenditure increases. This has left a pattern where the relationship of target to GRE depends predominantly on past spending patterns by an authority. High spending by authorities in relation to GRE tends to result in targets well above GRE, and vice versa for low spending authorities, and this has resulted in targets being relatively large in relation to GRE in London and relatively low for non-metropolitan Counties. Audit Commission (1984).

(3) Association of Metropolitan Authorities, 1985, p.11

Targets and grant penalties have introduced further detail into the relationship between expenditure and rates set out above under the basic block grant system. The penalty for the first increment of overspending target changes the slope and the intercept of the RE function although it remains linear. Hence if target is above threshold, Equation 6 for the RE function becomes

$$GRP = GRP^* + s_1(THR - GRE) + s_2(TE - THR) + 100.P.\frac{(TE - TGT)}{TGT} \qquad (29)$$

where P is the appropriate rate of addition to GRP selected from Table 7. Thus, in Figure 4 the RE function for 1983/84 will have six linear segments instead of four linear segments as shown, the extra two segments being at target and at target plus two per cent. It follows from this that each ^R^E function will have six kinks in 1983/84. In 1984/85 the number of kinks increased to seven. The equations of the ^R^E functions can be derived as:

$$r = (s_k + \frac{100.P}{TGT_{t+1}}).e + c_k + \frac{100.P}{TGT_{t+1}}(TE_t - TGT_{t+1}) \qquad (30)$$

where TGT_{t+1} is the target for year t + 1 and k = 1, or 2, depending on whether the authority is above or below threshold. The ^R^E budget constraint will be of the form ABCDEFGH of Figure 9. It remains piecewise-linear, and because successive penalties increase its slope(1) the budget set remains convex over its relevant range BCDEFG in Figure 9.(2)

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(1) An exception to this occurs for the year 1982/83 which is the authorities that spent above GRE and over 5% above Target. 12 (out of 36) metropolitan Districts and 9 (out of 39) non-metropolitan Counties came into this category in 1982/83 and for this year these authorities' budget sets are not convex.

(2) The increases in the slope of the RE function, and hence the slope of the ^R^E functions, are greater than those induced by the block grant taper discussed above. Thus, in 1984/85, after splitting

Locally, over each segment the comparative statics results obtained from that optimisation, $\partial e/\partial s < 0$ and $\partial e/\partial c < 0$, will hold. Furthermore, the discussion by Moffitt (1986) shows that for a piecewise-linear budget constraint, defining a convex budget set, the comparative statics results obtained above hold, with the exception that income and price effects may also be zero if the local authority decision-maker "sticks" at a kink on the budget constraint. The comparative statics results become $\partial e/\partial s \leq 0$ and $\partial e/\partial c \leq 0$.

How is the effect of this complicated budget constraint to be incorporated in the expenditure modelling? One way of proceeding is to bring the full constraint explicitly into the estimation procedure using maximum-likelihood methods.(1) In this chapter however, a more limited task is undertaken based on the use of approximations to express the budget constraint. The method used, similar to that of Barnett (1986), is now discussed. Recall that Figure 9 shows the ^R^E curve augmented by the full effects of the target penalties. Instead of one intercept and one slope of the discussion of the utility maximisation model above, there are six slopes and six intercepts for

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the ratepayer level addition to GRP in non-metropolitan areas, the penalty addition to GRP for non-metropolitan Counties per percentage point of spending above target was 1.7471p for up to one per cent overspend, 3.4942p for the second percentage overspend, 6.9885p for the third percentage point overspend, and 7.8620p above this. In 1984/85 the average GRE for the non-metropolitan Counties was £340 per head and average target was £330 per head. The slope of the ^R^E function, in the absence of targets and penalties, would be either $s_1 = 0.6$ or $s_2 = 0.75$, depending upon whether the authority was above or below threshold. If the authority was in the third per cent above threshold the additional slope caused by target penalties would be $100P/TGT = 100 \times 6.9885/330 = 2.12$ for a County with average target, which dwarfs the effect of s_1 or s_2.

(1) Barnett, Levaggi and Smith (1988)

the function. The approach to estimation taken here is to approximate to the ^R^E curve by using just one slope term and one intercept term.

The intercept term is an expression of the height of the budget constraint. If there is just one linear relationship it does not matter where on the horizontal axis this height is measured, so long as it is the same for each authority. The natural ordinate for measuring the intercept is along e = 0. However, as a method of approximating to the height of the budget constraint, projecting back to the intercept at vertical axis is likely to increase error as these intercepts diverge widely. In comparing the constraints facing different authorities, a measure of the height of the budget constraint taken nearer to the authorities actual expenditure is likely to reduce the divergence. In his model, Barnett (1986) measures the height of the budget constraint at i, where i is the rate of expenditure increase that would preserve in real terms the expenditure plans of the last period.(1) Table 8 sets out the average values for e actually budgeted for by metropolitan Districts and non-metropolitan Counties (the authorities studied in the empirical work) and the values for CRPb and CRPa selected for this study. Essentially the values for expenditure change CRPb and CRPa have been selected on an ad hoc basis to be in the neighbourhood of average actual expenditure change of the authorities considered. The measure used in this study is CRPb (Change in Rate Poundage b) of Figure 9, which can be seen from Table 8 to be close to the average observed values for the authorities considered.(2) The slope of the budget constraint is measured by

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(1) Barnett (1986, p136)

(2) In some regressions CRPa is used.

TABLE 8: ACTUAL EXPENDITURE INCREASES (%) AND EXPENDITURE INCREASES USED IN FISCAL PRESSURE MEASURES

Average Expenditure Increase

Year	Metropolitan Districts	Non-Metropolitan Counties	CRPb	CRPa
1982/83	5.98	8.59	9	5
1983/84	3.81	4.49	5	3
1984/85	2.42	3.02	3	0

comparing the height of the ^R^E curve over an interval around the actual e budgeted by authorities. The approximation to the height of the constraint measured at CRPb is called <u>fiscal pressure</u> in this study. Secondly, the approximation to the slope of the ^R^E curve between CRPa and CRPb (CRPb-CRPa) is called <u>marginal fiscal pressure</u>.

The <u>a priori</u> expectations, based upon the discussion of local authority optimisation above are that local authority expenditure increases will vary inversely with both average and marginal fiscal pressure. These fiscal pressure measures are clearly an imperfect expression of the complicated budget constraint that confronts local authorities. However, as approximations, it is expected that they will show the hypothesised negative relation to local authority expenditure increases. The main barrier to confidence in the applicability of the comparative statics results derived above would be the non-convexity shown by the ^R^E functions where the constraint on non-negative block grant operates.(1) However, none of the authorities in the observation sets used (non-metropolitan Counties and metropolitan Districts) spent in this region of the budget con-

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(1) i.e. segment GH in Figure 9.

straint. As mentioned above, a non-convexity problem does exist for the 12 metropolitan Districts and 9 non-metropolitan Counties spending above GRE and more than five per cent above target in 1982/83, which may impair the performance of the model in this year.

Other variables are likely to influence the local authority decision-maker's utility function. Three of these variables are discussed below - namely (1) local politics (2) targets, and (3) GREs.

OTHER EXPLANATORY VARIABLES IN THE EXPENDITURE MODEL

Local Politics

Debate over the years 1982-83 to 1984-85 would lead to an expectation that local politics was a major influence on expenditure and expenditure changes during these years. Although there is a large literature on the measurement of political control, it has included a number of contributions which have been sceptical about the relative importance of local politics - especially in the less politicised shire Counties. To the some extent this body of opinion arose from the fact that a number of studies which found significant effects for urban authorities were unable to find such effects for the non-metropolitan(1) or their predecessor administrative Counties (Karran, 1982). However, there are weaknesses in both works cited.

In Ashford, Berne and Schramm (1976), as has been noted above, the model specifies that marginal rate of grant was zero for all authorities, thus ignoring the effects of resources element. Karran uses the level of grant to explain expenditure, but does not take account of the effect of expenditure in determining grant. Newton and

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(1) Ashford, Berne and Schramm, 1976.

Sharpe (1984) show that a simple cross-tabulation of published financial data by party control reveals fairly obvious differences between administrative Counties under different party control.

Another feature of this literature has been the debate about the best way to measure political variables. In a number of studies there has been no noticeable improvement derived from using size of majority as opposed to dummy (zero-one) variables to register the fact of which party has control (if any). In the model estimated here, zero-one variables are used and three types of political control are distinguished: Labour control, Conservative control, and No Overall Control (including Liberal control). The results from the use of these variables is of interest because the consensus among commentators was that large differences arose during these years between local parties of the same colour in different areas.

GRE changes

From Equations 5, 6 and 7 above it can be seen that the Government's assessment of the expenditure needs of each local authority (GRE) is a major determinant of the grant received for a given level of spending as $BG/GRE = s_1$. This GRE effect is already embodied in the fiscal pressure variables. Nevertheless, there is another potential expenditure influence exercised by GRE and GRE changes, in that GRE may be regarded as a normative guideline to local authorities on spending. Such an effect was emphasised by critics of the Government's intention to publish GREs at the time of the introduction of the block grant system. It was argued that the central assessment of each authority's needs would override or be used as a substitute for local judgment on expenditure levels both in total and

for individual services.

The measure used in this study is the change in GRE compared to the previous budget of the authority. It is expected that the effect of an increase in GRE will be positive.

Target/Expenditure Guidance

Target change compared to previous budget is the other major determinant of the fiscal pressure experienced by different local authorities, and thus its potential expenditure effect is embodied in the fiscal pressure variables. However, it is conceivable that target exerts an additional expenditure effect because of the step changes it introduces into the local authority budget constraint and because of the prominence it receives in budgetary discussion. If a positive and significant effect is found for the target increase variable this suggests that authorities are budgeting closer to target than would be expected from consideration of the fiscal pressure and other variables alone. In theory such a finding is compatible with two separate types of behaviour - strategic budgeting (i.e. attempting to ensure that next year's target is based on a large budget) or treating target as a normative guideline on spending which the authority has attempted to follow. However only the former seems a credible interpretation given the predominance of authorities budgeting over target compared to those below target.

EMPIRICAL ANALYSIS

The empirical analysis of local authority behaviour was undertaken on annual changes in local authorities' total expenditure in 1982/83, 1983/84 and 1984/85.

Specifically, the dependent variable, e, was the year-on-year

change in an authority's total expenditure. Three sets of the dependent variable were collected for the three years studied, as follows:

For the 1982/83 regressions: the percentage change in the local authority's total expenditure between 1981/82 budgets and 1982/83 budgets

For the 1983/84 regressions: the percentage change in the local authority's total expenditure between 1982/83 budgets and 1983/84 budgets

For the 1984/85 regressions: the percentage change in the local authority's total expenditure between 1983/84 budgets and 1984/85 budgets

Seven explanatory variables were used in the estimation of expenditure change functions to represent the factors argued to be of importance above. They are listed below, and their predicted signs are given in parentheses. For each of the three years, three fiscal pressure variables were used as follows:

CRPb - the change in rate poundage for a 9% cash increase in total expenditure in 1982/83, and for a 5% cash increase in 1983/84, and for a 3% cash increase in 1984/85 (given zero use of balances and zero provision for clawback) (-)

CRPa - the change in rate poundage for a 5% cash increase in total expenditure in 1982/83, and for a 3% cash increase in 1983/84, and for a 0% cash increase in 1984/85 (given zero use of balances and zero provision for clawback) (-)

CRPb-CRPa (marginal fiscal pressure) - the increase in the change in rate poundage for the increase in the change in expenditure used to define the CRPs (see above) (-)

Divergences between target and budget and GRE and budget were measured as follows:

PCT - the percentage change in target compared to previous budget (+)

PCG - the percentage change in GRE compared to previous budget (+)

Lastly, political dummies were used:

CON - equal to 1 when majority of seats held by Conservative party (-)

NOC - equal to 1 when no party holding a majority of seats (or where majority of seats held by Liberal party). (-)

The model can be summarised as follows: the utility function of the local decisionmaker is indexed by political control (CON, NOC) and by the target variable PCT and the GRE variable PCG to give:

$$U(e,r \mid CON, NOC, PCT, PCG). \qquad (31)$$

The basic model estimated is:

$$e = f(CRPa, CRPb-CRPa, PCG, PCT, CON, NOC), \qquad (32)$$

with $\partial CB/\partial CRPa \leq 0$, $\partial CB/\partial(CRPb-CRPa) \leq 0$, $\partial CB/\partial PCG > 0$, $\partial CB/\partial PCT > 0$, and with the shift dummies CON and NOC exerting a negative effect on e. Linearity is assumed and the coefficients of the variables are estimated by ordinary least squares.

The model is applied to metropolitan Districts and non-metropolitan Counties. The results indicated that all seven variables had some role as determinants of changes in local authorities' expenditure. However, consideration of these results led to the estimation of expenditure functions for local authorities disaggregated into three groups by political control.

Figure 10 shows schematically the sets of regressions which are presented below.

FIGURE 10: Regression Results - Summary of Sets of Regressions

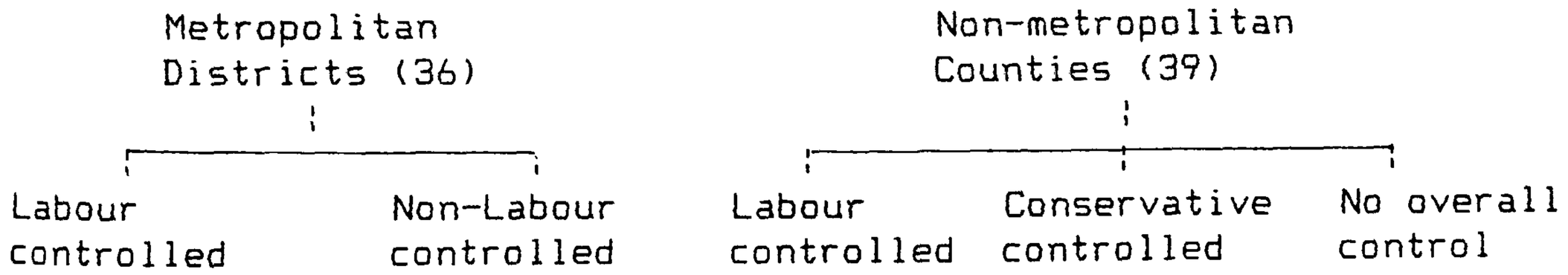

TABLE 9 REGRESSION RESULTS, ANNUAL CHANGES IN EXPENDITURE - METROPOLITAN DISTRICTS

Year/ Regression Number	Const	<-----Explanatory Variables-----> CRPb	CRPa	CRPb -CRPa	PCG	PCT	CON	NOC	R2
82/83:									
1.	10.74	-.16[a] (-4.10)							.331
2.	11.33		-.16[a] (-3.62)	-.23[b] (-1.36)					.334
3.	5.96				.22[a] (2.06)	-.17 (-.45)			.215
4.	10.55	-.15[a] (-2.43)			.04 (.33)	.01 (.03)	-1.39[c] (-.89)	1.09 (.58)	.364
5.	11.57		-.14[a] (-2.22)	-.26[b] (-1.42	.05 (.56)		-1.66[c] (-1.05)	0.96 (.51)	.372
83/84:									
1.	3.86	-.04[c] (-1.22)							.042
2.	5.19		.02 (.47)	-.18[a] (-2.53)					.164
3.	2.21				-.13* (-3.29)	.68[a] (4.77)			.408
4.	2.47	.01 (.41)			-.10* (-2.01)	.62[a] (3.33)	-.71[c] (-1.07)	-.90[c] (-1.16)	.449
5.	6.94		.01 (.31)	-.37[a] (-3.67)	-.13* (-2.45)		-.77[c] (-1.17)	-1.18[b] (-1.62)	.461
84/85:									
1.	3.66	-.08[a] (6.37)							.544
2.	3.93		-.06[a] (-3.12)	-.10[a] (6.43)					.594
3.	2.41				.07[a] (2.33)	.18[b] (1.53)			.574
4.	3.32	-.05[a] (-2.65)			.07[a] (2.19)	.07 (.56)	-.50[c] (-1.29)	-.15 (-.36)	.673
5.	3.46		-.05[a] (-2.82)	-.05[b] (-1.83)	.08[a] (2.57)		-.49[c] (-1.27)	-.21 (-.51)	.670

Notes: [a],[b] and [c] denote regression coefficients significantly different from zero in a one-tailed test at the .05, .10 and .25 levels respectively. * denotes "wrong" sign, significantly different from zero in a two-tailed test at the .10 level. n=36

TABLE 10 REGRESSION RESULTS, ANNUAL CHANGES IN EXPENDITURE - NON-METROPOLITAN COUNTIES

Year/ Regression Number	Const	<-----Explanatory Variables-----> CRPb	CRPa	CRPb -CRPa	PCG	PCT	CON	NOC	R^2
1982/83:									
1.	8.82	-.01 (-.45)							.005
2.	8.70		.00 (.03)	-.01 (-.46)					.006
3.	5.09				.28[a] (1.91)	.79[a] (3.32)			.276
4.	7.87	-.02[c] (-1.11)			.40[a] (2.74)	.55[b] (1.83)	-4.61[a] (-3.56)	-1.30[c] (-.82)	.523
5.	7.31		.03 (.32)	-.02[c] (-1.10)	.55[a] (3.30)		-4.37[a] (-3.11)	-.46[c] (-.99)	.478
1983/84:									
1.	5.80	-.11[a] (-4.14)							.317
2.	6.16		-.08[a] (-3.22)	-.20[a] (-3.54)					.368
3.	3.54				.13[c] (1.30)	.16[c] (.70)			.357
4.	5.28	-.06[a] (-1.88)			.16[a] (1.80)	.22[c] (1.04)	-1.76[a] (-3.63)	-1.83[a] (-3.66)	.601
5.	6.60		-.06[a] (-2.12)	-.16[b] (-1.46)	.17[a] (1.92)		-1.77[a] (-3.56)	-1.86[a] (-3.67)	.598
1984/85:									
1.	4.02	-.11[a] (-5.69)							.467
2.	3.99		-.12[a] (-3.49)	-.11[a] (-5.55)					.468
3.	2.21				.09[c] (1.12)	.21[c] (1.09)			.372
4.	4.06	-.10[a] (-2.69)			.02 (.20)	.19[c] (.86)	-0.92[b] (-1.63)	-.20 (-.35)	.542
5.	4.08		-.11[a] (-2.90)	-.11[a] (2.15)	.06[c] (.77)		-.68[b] (-1.17)	-.01 (-.00)	.531

Notes: [a],[b] and [c] denote regression coefficients significantly different from zero in a one-tailed test at the .05, .10 and .25 levels respectively. n=39.

CHAPTER TWO: LOCAL GOVERNMENT CURRENT EXPENDITURE

OVERALL REGRESSIONS

The two sets of overall regressions results are given in Table 9 for the metropolitan Districts and Table 10 for the non-metropolitan Counties. In each case five regressions per class are shown for each year. The approach used was to try to identify first the contribution of fiscal pressure variables alone (regressions 1 and 2), and then to compare this with the total effect of the GRE and Target variables (regression 3). Political variables are added in order to assess their importance (regressions 4 and 5). Regression number 4 excluded the marginal fiscal pressure variable and regression number 5 excluded the Target variable because they were usually highly correlated. High correlations also occurred between some other combinations of variables, and this signalled a potential difficulty in separating the independent effect of all the variables.

Because a priori expectations have been established for the signs of the coefficients, one-tailed tests are used in considering the results. One of the tests [c] is unusually high in size, set at the 0.25 level. It is included as being of some interest given the difficulty of working on cross-section data on changes.

Looking at the results, generally the level of explanation in the regressions is reasonable given that the dependent variable measures such short-term changes in expenditure. When the maximum number of five explanatory variables was included (i.e. regressions 4 or 5) the coefficient of multiple determination ranged between .364 and .673 for the metropolitan Districts, and between .478 and .601 for the non-metropolitan Counties.

The level of fiscal pressure appeared to be a significant and important determinant in all cases except for the metropolitan Dis-

tricts in 1983/84 (and in this case marginal fiscal pressure appeared to be important) and for the Counties in 1982/83. In addition marginal fiscal pressure often had a significantly negative effect on expenditure changes in the regressions. For the non-metropolitan Counties, the zero-order relation between the level of fiscal pressure and expenditure change as measured by regression 1, has increased strongly from 1982/83 (R^2=.005) to 1984/85 (R^2=.467). This may be an example of a long period of taking up slack before changes in the financial environment began to take effect.

Political control variables were statistically significant in most of the six regressions in which they were tried. Conservative control always appeared to exert a significant negative effect on expenditure change, with the possible exception of the metropolitan Districts in 1982/83. The quantitative importance of Conservative control relative to the average trend in expenditure appeared to increase over the period for the metropolitan Districts. The effect of political control though was larger in the non-metropolitan Counties than in the metropolitan Districts throughout the period - it amounted to over a four per cent change in expenditure compared to Labour control in the readjustment phase of 1982/83. The explanation for this is probably the unusually large proportion of authorities that had had changes in political control and were undertaking expenditure readjustments.(1)

After changes in political control, the importance of the political control dummy would be expected to be greater than usual. The importance of political control variables is seen as an interesting

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(1) The theory underlying this is given in Gibson (1985) - see also Jones and Stewart (1982, p52.)

finding, given past difficulties in discerning such political effects for the non-metropolitan Counties. The effect of the no overall control variable was usually less important and statistically significant - but only in one case did it have the "wrong" sign.

It is important to make a distinction between a coefficient's quantitative size and its statistical significance in relation to the GRE and Target variables. The coefficients on GRE and target were statistically significant throughout the period in the Counties becoming less strongly significant in 1984/85. For the metropolitan Districts Target appeared to be highly significant in 1983/84 and less strongly significant in 1984/85 whereas GRE became highly significant in 1984/85. However the quantitative effect of each one per cent change in GRE was never large in relation to the underlying upward trend in nominal expenditure - represented here by the size of the constant. In fact despite remaining statistically significant in the Counties the coefficient on PCG (the percentage change in GRE compared to previous budget) became smaller arithmetically than the coefficient on the (one penny) change in fiscal pressure by 1984/85, whereas it had been larger in 1982/83 and 1983/84.

In the Districts the statistically significant coefficient on GRE in 1984/85 represented a small quantitative guideline reaction of under one tenth of each percentage change in GRE. One important anomalous effect is the strongly established wrong signs on PCG for metropolitan Districts in 1983/84.

Overall, apart from this last finding, the results follow the a priori expectations from earlier discussion and it is suggested that the level of explanation is satisfactory for cross-section estimation on expenditure changes. The lowest levels of explanation are for

1983/84, and the violation of the convexity assumption, mentioned above, that occurred for just over one quarter of the observations for this year may have some responsibility for this.

In the next section it is investigated whether there were differences in the structural reaction of groups of authorities under different political control. The a priori hypothesis postulated was that Labour authorities would be less influenced by any guideline effect via the GRE or Target variables than non-Labour authorities.

AUTHORITIES DISAGGREGATED BY POLITICAL CONTROL

The five sets of disaggregated regressions are presented in Tables 11 to 15. Metropolitan Districts were split into two groups: Labour controlled and non-Labour controlled for each of the three years studied. In non-Metropolitan Counties, the relatively numerous hung authorities made it possible to split the data into three groups: Labour controlled, Conservative controlled and authorities with no overall control. Each of these tables is discussed briefly before before an overall summary of these regressions is made.

Table 11 gives the results for Labour controlled metropolitan District councils. These authorities appeared to react mainly to fiscal pressure. There was very little sign of GRE or Target having a guideline effect until GRE in 1984/85. In fact the strongest association with GRE was a negative one, as found in the aggregate regressions above in 1983/84, caused by the fact that those Districts spending furthest above GRE increased their spending most.

In 1983/84 there was a very significant positive reaction to target, but this may have been merely a proxy measure of the effect via marginal fiscal pressure which was also highly significant. Despite

TABLE 11: REGRESSION RESULTS, ANNUAL CHANGES IN EXPENDITURE - LABOUR CONTROLLED METROPOLITAN DISTRICTS

Year/ Regression Number	Constant	<-----Explanatory Variables------> CRPb	CRPa	CRPb -CRPa	PCG	PCT	R^2
1982/83:							
1.	11.35	-.18[a] (-3.65)					.348
2.	12.72		-.17[a] (-3.37)	-.31[b] (-1.42)			.358
3.	6.08				.25[b] (1.83)	-.15 (-.31)	.211
4.	10.91	-.17[a] (-2.22)			.04 (.27)	-.36 (-.08)	.350
5.	12.33		-.15[b] (-1.87)	-.32[b] (-1.42)	.06 (.50)		.365
1983/84:							
1.	4.71	-.03[c] (-.73)					.025
2.	5.25		.02 (.43)	-.13[b] (-1.47)			.098
3.	2.96				-.10* (-1.94)	.48[a] (2.56)	.248
4.	2.81	.01 (.16)			-.10* (-1.81)	.50[a] (2.21)	.249
5.	6.48		.01 (.21)	-.32[a] (-2.71)	-.13* (-2.21)		.282
1984/85:							
1.	3.63	-.08[a] (-5.31)					.561
2.	3.90		-.06[a] (-2.71)	-.10[a] (-5.03)			.601
3.	2.49				.08[a] (1.97)	.19[c] (1.33)	.545
4.	3.48	-.05[a] (-2.62)			.07[a] (1.90)	.00 (.01)	.661
5.	3.45		-.06[a] (-2.69)	-.05[b] (-1.63)	.07[b] (1.89)		.661

Notes: n=27 (1982/83); n=23 (1983/84); n=24 (1984/85) [a],[b] and [c] denote regression coefficients significantly different from zero in a one-tailed test at the .05, .10 and .25 levels respectively. * denotes 'wrong' sign, significantly different from zero in a two-tailed test at the .10 level.

TABLE 12: REGRESSION RESULTS, ANNUAL CHANGES IN EXPENDITURE - NON LABOUR CONTROLLED METROPOLITAN DISTRICTS

Year/ Regression Number	Constant	<-----Explanatory Variables------> CRPb	CRPa	CRPb -CRPa	PCG	PCT	R^2
1982/83:							
1.	8.78	-.09[c] (.90)					.104
2.	8.95		-.07 (-.65)	-.11 (-.36)			.105
3.	6.32				.12 (.69)	-.09 (-.16)	.123
4.	7.41	-.04 (-.29)			.08 (.32)	-.04 (-.06)	.137
5.	6.97		-.05 (-.35)	.01 (.02)	.08 (.45)		.140
1983/84:							
1.	3.91	-.07[c] (-1.29)					.131
2.	5.33		.01 (.11)	-.31[a] (-3.26)			.516
3.	1.66				-.09 (-.88)	.74[a] (2.49)	.537
4.	1.48	.01 (.18)			-.09 (-.82)	.75[a] (2.30)	.539
5.	6.85		-.00 (-.00)	-.47[a] (-2.56)	-.11 (-1.02)		.566
1984/85:							
1.	4.04	-.13[a] (-2.25)					.337
2.	4.33		-.09[b] (-1.46)	-.15[a] (-2.65)			.454
3.	2.42				.08[c] (1.18)	.10 (.38)	.549
4.	3.01	-.08[c] (-.99)			.01 (.12)	.28[c] (.85)	.598
5.	2.81		-.04 (-.58)	-.03 (-.28)	.10[b] (1.41)		.564

Notes: n=9 (1982/83); n=13 (1983/84); n=12 (1984/85) [a],[b] and [c] denote regression coefficients significantly different from zero in a one-tailed test at the .05, .10 and .25 levels respectively.

TABLE 13: REGRESSION RESULTS, ANNUAL CHANGES IN EXPENDITURE - LABOUR CONTROLLED NON-METROPOLITAN COUNTIES

Year/ Regression Number	Constant	<-----Explanatory Variables------> CRPb	CRPa	CRPb -CRPa	PCG	PCT	R^2
1982/83:							
1.	10.78	-.02 (-.56)					.038
2.	11.79		-.06 (-.24)	-.02 (-.55)			.043
3.	5.22				.49[c] (1.09)	1.21[c] (1.06)	.547
4.	6.10	-.02[c] (-.91)			.55[c] (1.18)	1.11[c] (.96)	.601
5.	3.93		.11 (.55)	-.02[c] (-.86)	.94[a] (2.72)		.571
1983/84:							
1.	6.94	-.15[a] (-5.63)					.799
2.	8.19		-.12[a] (-3.92)	-.29[a] (-3.59)			.864
3.	4.06				.14 (.41)	.49[c] (.78)	.666
4.	5.91	-.11[a] (-3.21)			.02 (.10)	.31 (.74)	.877
5.	7.20		-.11[a] (-3.27)	-.19[c] (-.91)	.10 (.51)		.870
1984/85:							
1.	4.55	-.14[a] (-4.32)					.700
2.	4.32		-.15[a] (-3.70)	-.13[a] (-3.31)			.708
3.	2.14				.16 (.69)	.08 (.15)	.240
4.	4.59	-.15[a] (-3.17)			.04 (.26)	-.20 (-.54)	.716
5.	4.11		-.14[a] (-3.12)	-.12[b] (-1.54)	.02 (.15)		.709

Notes: n=10 [a],[b] and [c] denote regression coefficients significantly different from zero in a one-tailed test at the .05, .10 and .25 levels respectively.

TABLE 14: REGRESSION RESULTS, ANNUAL CHANGES IN EXPENDITURE
-CONSERVATIVE CONTROLLED NON-METROPOLITAN COUNTIES

Year/ Regression Number	Constant	<-----Explanatory Variables------> CRPb	CRPa	CRPb -CRPa	PCG	PCT	R^2
1982/83:							
1.	11.79	-.26[a] (-4.64)					.531
2.	11.84		-.22[a] (-2.08)	-.30[a] (-2.65)			.535
3.	1.34				.68[a] (3.51)	.16 (.67)	.421
4.	9.81	-.22[a] (-2.06)			.15 (.46)	.04 (.18)	.537
5.	10.42		-.22[a] (-2.02)	-.23 (-.61)	.11 (.16)		.536
1983/84:							
1.	5.21	-.06[c] (-.85)					.037
2.	6.06		-.05[c] (-.81)	-.24[b] (-1.48)			.113
3.	3.11				.20[b] (1.75)	.13 (.30)	.209
4.	3.32	-.02 (-.33)			.19[b] (1.52)	.14 (.33)	.214
5.	4.15		-.02 (-.34)	-.08 (-.41)	.19[b] (1.48)		.214
1984/85:							
1.	4.00	-.15[a] (-2.59)					.261
2.	5.21		-.04[c] (-.94)	-.32[a] (-5.64)			.642
3.	0.24				.09[c] (1.31)	.90[a] (4.17)	.682
4.	0.35	-.01 (-.16)			.08[c] (1.11)	.89[a] (3.81)	.683
5.	3.96		-.01 (.12)	-.25[a] (-3.78)	.12[b] (1.71)		.694

Notes: n=21 [a],[b] and [c] denote regression coefficients significantly different from zero in a one-tailed test at the .05, .10 and .25 levels respectively.

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TABLE 15: REGRESSION RESULTS, ANNUAL CHANGES IN EXPENDITURE - NON-METROPOLITAN COUNTIES UNDER NO OVERALL CONTROL

Year/ Regression Number	Constant	<-----Explanatory Variables------> CRPb	CRPa	CRPb -CRPa	PCG	PCT	R^2
1982/83:							
1.	12.68	-.08					.053
		(-.53)					
2.	10.93		-.17	.22			.067
			(-.55)	(.25)			
3.	9.03				-.30[c]	2.56[a]	.778
					(1.30)	(4.02)	
4.	5.74	.10			-.13	2.50[a]	.792
		(.50)			(-.34)	(3.40)	
5.	-21.04		.13	2.10[b]	1.29[b]		.492
			(.43)	(1.65)	(1.83)		
1983/84:							
1.	5.65	-.15[b]					.294
		(-1.58)					
2.	6.30		.12[b]	-.43[a]			.879
			(1.72)	(-6.03)			
3.	2.44				.14[c]	.37[c]	.805
					(.76)	(.87)	
4.	0.16	.12			.08	.77[c]	.871
		(1.42)			(.45)	(1.61)	
5.	5.71		.11[c]	-.36[c]	.05		.882
			(1.47)	(-1.56)	(.29)		
1984/85:							
1.	4.25	-.09[c]					.202
		(-1.23)					
2.	3.95		-.16[b]	-.08[c]			.327
			(-1.54)	(-1.06)			
3.	3.77				.60[a]	-1.88*	.631
					(2.86)	(-2.59)	
4.	2.89	.08			.77[b]	-2.21	.664
		(.47)			(1.76)	(-1.93)	
5.	-2.02		-.01	.32	.45[b]		.650
			(-.05)	(1.49)	(1.92)		

Notes: n=7 [a],[b] and [c] denote regression coefficients significantly different from zero in a one-tailed test at the .05, .10 and .25 levels respectively. * denotes 'wrong' sign, significantly different from zero in a two-tailed test at the .10 level.

this, the level of explanation achieved in 1983/84 was low and relied partly on the perverse association between GRE and spending. The degree of explanation was very high in 1984/85, and satisfactory in 1982/83 and was mostly due to the level of fiscal pressure.

Table 12 gives the results for non-Labour controlled metropolitan District councils. The level of explanation for these authorities was low in 1982/83. In 1983/84 either marginal fiscal pressure or Target was the key variable and explained over fifty per cent of variation. In regressions including both variables (not shown here), marginal fiscal pressure appeared to be the more important variable. In 1984/85 all the variables appeared to have some importance - certainly GRE was statistically significant for the first time.

Table 13 gives the results for Labour controlled non-metropolitan Counties. Average fiscal pressure seemed to be the dominant variable in 1983/84 and 1984/85 but GRE and Target jointly had an important influence both statistically and quantitatively in 1982/83 only. Levels of explanation were very high throughout.

Table 14 gives the results for Conservative controlled non-metropolitan Counties. For these authorities the fiscal pressure variables were the most important in 1982/83, but in 1983/84 GRE was significant and its coefficient quite large. In 1984/85 marginal fiscal pressure, target and GRE all appeared important.

Lastly Table 15 gives the results for non-metropolitan Counties under no overall control. These authorities were markedly different from the other groups in 1982/83 with Target being the key variable. As this group usually budgeted above Target it can be inferred that

there was a strong "strategic budgeting"(1) effect exhibited. However, in 1983/84 this effect was not present, and by 1984/85 it was replaced by the largest reaction to GRE seen in any of the sets of regressions. This was accompanied by some fairly strongly established wrong signs for the target variable.

In general non-metropolitan Counties under no overall control reacted most strongly to target and GRE variables, and reacted in the opposite way to a priori expectations for Target in 1984/85. Only in 1983/84 did there appear to be a possible reaction to fiscal pressure rather than to GRE or Target.

Overall, there was more reaction to GRE amongst non-Labour groups of authorities and by 1984/85 it had seemed to become a more important factor compared to Target - perhaps the increasing severity of grant penalties had by then made strategic budgeting too expensive or perhaps authorities were aware by then that the target methodology was less rewarding to such behaviour. Except in the case of the "hung" Counties fiscal pressure was again usually a consistently important and statistically significant variable - the exceptions being in 1982/83 in two of the other four groups - Labour controlled non-Metropolitan Counties and non-Labour controlled Metropolitan Districts.

CONCLUDING COMMENTS

This chapter has discussed the main features of local government current expenditure in recent years. Education expenditure represents

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(1) The practice of budgeting over target in the hope of generating a favourable target for the next year which would be expected to be based on the previous year's target.

the largest share but has been falling over time whilst social security spending has risen sharply in the same period. The most dramatic real cuts over the period have been in housing in 1981-82. In general a tendency for planned cuts not to be realised in outcomes has been noted and some reasons for this have been suggested.

The primary purpose of the chapter has been to specify and estimate a model of local authority expenditure change. Existing models of expenditure change have been surveyed and elements of these models, particularly that of Barnett (1986) have been used to specify the model tested in the later part of the chapter.

An extensive analysis of various expressions of the budget constraint confronting local authority decision-makers has been carried out. This has been combined with a simple utility maximisation model concerned with choice over expenditure-increases seen as "goods" and rate-increases seen as "bads". Simple approximations, termed fiscal pressure and marginal fiscal pressure, have been used to represent the complicated local authority budget constraint and a model of budget decision-making, augmented by consideration of politics and GRE and Target guidelines has been estimated.

The empirical results presented here have shown the importance of fiscal pressure, GRE, Target, and political control. Local authorities were found to respond to increases in both the level and the rate of increase of fiscal pressure with respect to expenditure increase, by either decreasing their expenditure, or decreasing the rate at which they increased it year on year. Year-on-year expenditure increase was also generally negatively influenced by Conservative political control, and, in a less well established way, by lack of overall control. GRE and Target had some limited role in influencing

the expenditure of some groups of authorities, but usually a smaller role than fiscal pressure.

Although current expenditure is the largest category of local government expenditure, capital expenditure is of major importance. The next chapter is concerned with central government's record of intervention and control of capital expenditure.

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CHAPTER THREE*

THE CONTROL OF LOCAL AUTHORITY CAPITAL EXPENDITURE

INTRODUCTION

In this chapter attention is turned from the consideration of local authorities' current expenditure of Chapter 2 to a consideration of local authorities' capital expenditure. Amongst the questions raised are: What is the case for control of local authority capital expenditure? Is this case convincing? What has been the recent practical experience of control? The chapter focusses on the system of local authority capital expenditure control introduced by the Local Government, Planning and Land Act 1980, although a brief description of the system it replaced is given. It ends with a discussion of the proposals for reform put forward in a recent Green Paper (HMSO 1986) and an associated consultation paper (Department of the Environment 1986).

THE NEED TO CONTROL THE LEVEL OF CAPITAL EXPENDITURE

The most recent expression of the Government's reasons for wishing to control the level of capital expenditure by local authorities appears in the Green Paper, Paying for Local Government (HMSO, 1986 p44) in the following two-point statement:

(*) This chapter is partly based on P.A. Watt, "The Control of Local Authority Capital Expenditure" Local Government Studies, 8 (3),May/June 1982 pp 91-95. The author wishes to thank J.G.Gibson, K.Hartley, R.A.Jackman, I.G.McBrayne and J.D.Stewart for helpful comment but retains responsibility for views expressed and error.

-The Government is committed to eliminating inflation, which requires continuing downward pressure on monetary growth and lower public borrowing as a share of GDP.

-Tight control of public spending is vital to provide the scope for reducing the burden of taxation, which is an essential ingredient in improving motivation and efficiency and thus increasing employment.

An earlier and more detailed expression of a government view appears in the Treasury's evidence to the Layfield enquiry (Local Government Finance 1976, appendix 6, pp 14-47. Here it is stated that

> As already explained, the central government is concerned with the total demand on resources of public expenditure and has the responsibility to strike the balance between the claims on resources of the balance of payments, investment, public expenditure and private consumption.(1)

and

> Within what is judged an acceptable rate of growth of public expenditure, Ministers decide how much is to be spent on each major programme over the period ahead. These decisions will of course reflect the political, economic and social priorities of the ministers concerned. For those programmes in the execution of which local authorities are concerned, the allocations will involve judgements about the local authority spending which will flow from the broad policies laid down by the government. It follows that the system does not involve a government decision that a given amount of expenditure shall be allocated to all local authorities. The total emerges as the sum of the decisions on particular programmes.(2)

On capital spending, the Treasury add that

> The case for the control over capital spending is, first, that this is one of the principal means by which the government can ensure the implementation of national policies in the main services which local authorities undertake ... secondly it is an indirect means of moderating the growth of current expenditure; for capital expenditure frequently generates the need for additional staff and running expenses...

From these quotations the following motivations for the control of capital expenditure can be discerned:

1. The desire to control inflation

2. Supply side arguments about taxation burden

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(1) p 15

(2) p 14

3. The desire to influence the private sector/public sector ratio

4. The desire to influence the content of local policies in the direction of national priorities

To this list may be added a fifth argument

5. The objective of macroeconomic control and stabilisation

A number of academic writers have commented on the need for the Government to control local authority expenditure.(1) As these writers point out, central Government's role in control of local government behaviour for purposes of macroeconomic stabilisation depends upon which particular macroeconomic theory is held to be correct. This is also true of the role of government in the control of inflation.

Jackman (1982) argues that, given the present government's monetarist approach, monetarism may be the most useful theoretical approach to explore. He puts the simple implications of monetarism clearly:

> For much of the postwar period, monetarism has been associated with the proposition that the level of aggregate demand in the economy is determined primarily by the quantity of money in circulation. On this interpretation of monetarism, it follows immediately that, since local authorities cannot print money, they cannot have any impact on aggregate demand.

As Jackman points out, however, the Government would argue that high public borrowing makes the task of satisfactorily controlling the money supply difficult or impossible.(2) The reason for this difficulty is bound up with the finance of the Public Sector Borrowing Requirement (PSBR). The PSBR must be financed by some combination of

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(1) See Jackman (1982), Barlow (1981), Jackson (1984), Foster et al (1980), and King (1984)

(2) For a Government view see Walters (1984, p273): "one could control the monetary expansion only if the demands of the public sector for funds were also suitably controlled"

borrowing from abroad, borrowing from the banking sector, or by borrowing from the private sector. None of these three alternatives is attractive to the Government. Borrowing from abroad leads to interest payments leaving the country, borrowing from the banking sector involves expanding the money supply and borrowing from the private sector leads to competition with other borrowers and a rise in interest rates. Local authority borrowing forms a part of the PSBR and hence there is a case for controlling borrowing. An indirect method of influencing local authority borrowing is to control local authority capital expenditure as part of this is financed by borrowing.(1) Thus a somewhat tortuous case is established for the control of local authority capital expenditure.

> An annual capital expenditure control enables the Government to have some influence over the amount of net external borrowing by local government(2)

The case for the control of the total of local authority borrowing or indirectly the total of local authority capital expenditure is established as a consequence of motivations one and five: high local authority borrowing makes control of the money supply difficult and control of the money supply is necessary to control aggregate demand and inflation. However, the arguments so far presented only suggest a need to control the overall level of borrowing and not its distribution between authorities nor what it is spent on. If the desired control of borrowing is attempted via capital expenditure, the need is only to control that part of expenditure financed by borrowing. In practice the control is of capital expenditure however

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(1) Forty-six per cent is forecast for 1987-88. This figure is calculated from HMSO (1987, p361) table 4.7 as (100 x row3)/row 6.

(2) Mr Terry Heiser, Department of the Environment Permanent Secretary replying to Q2673 in Committee of Public Accounts, Minutes p1 Department of the Environment 1986

financed and extends to the distribution between authorities and what the money is spent on. As will be seen later, the control of borrowing is in practice rather weak. Thus the macroeconomic objectives one and five so far discussed do not adequately explain the Government's capital expenditure control policy, and it will be necessary to examine motives two to four in what follows. In analysing these other motives that have been advanced for Government control of capital expenditure a public choice viewpoint will be helpful. This approach is introduced in the next section.

A PUBLIC CHOICE ANALYSIS

Implicit in the above discussion about macroeconomic motivations for central control of local government capital expenditure is what has been called the traditional economists' "benevolent despot" model(1) of government. Under this view, the government is to be likened to a benevolent despot who gathers advice on the best policy from economists and then faithfully implements it. Thus it is only necessary for the best policy to be explained to the government for it to be put into action, and as a corollary, to explain the actions of government one must seek to find reasons why the policy adopted is the most sensible.

In contrast, the public choice approach lies in taking the view that the government is made up of individuals who, whilst having a mind to the public interest(2), also respond to whatever other incentives exist in the situation they find themselves in. The difference between the two viewpoints is well put in the following quotation:

> The simple fact that governments are run by human beings with

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(1) Tullock (1976, p2)

(2) Hayek (1974) p42-45, amongst others, would argue that it is most unlikely that the public interest will be known or even can be known.

> the normal human desire for personal well-being and individual or institutional aggrandisement must be insisted upon only because of a long intellectual tradition of implicitly treating government as a special exception to such incentives and constraints. This tradition stretches from the impartial "philosopher king" of Plato to the exalted "statesman" of the mercantilist literature of two or three centuries ago to the public spirited government as conceived in modern tracts that bill themselves as "empirical social science and not value statements"(1)

Under the public choice approach, political behaviour is modelled as if the actors were driven by self interest as has long been assumed in economic modelling of the market.(2) Using this approach the demand for the control of local authority capital expenditure may be viewed as coming from national politicians who desire to gain votes from a national electorate and money for party funds, and from central government bureaucrats to the extent that they are able to undertake discretionary(3) behaviour as agents of the politicians.

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(1) Sowell (1980 p146). Sowell's gives Dahl and Lindblohm (1976) as an example of such a modern tract

(2) Schumpeter (1942, p282) quoted in Downs (1957) provides an early statement of this point: "In observing human societies we do not as a rule find it difficult to specify, at least in a rough commonsense manner, the various ends that the societies under study struggle to attain. these ends may be said to provide the rationale or meaning of corresponding individual activities. But it does not follow that the social meaning of a type of activity will necessarily provide the motive power, hence explanation of the latter. If it does not, a theory that contents itself with an analysis of the social end or need to be served cannot be accepted as an adequate account of the activities that serve it. For instance, the reason why there is such a thing as economic activity is of course that people want to eat, to clothe themselves and so on. To provide the means to satisfy those wants is the social end or meaning of production. Nevertheless we all agree that this proposition would make most unrealistic starting point for theory of economic activity in commercial society and that we shall do much better if we start from propositions about profits. Similarly the social meaning or function of parliamentary activity is no doubt to turn out legislation and, in part, administrative measures. But in order to understand how democratic politics serve this social end, we must start from the competitive struggle for power and office and realise that the social function is fulfilled, as it were, incidentally - in the same sense as production is incidental to the making of profits.

(3) This word is used in the sense of Williamson (1963)

From this alternative perspective the demand for stabilisation and control of inflation may be seen as coming from individual voters, from interest groups who may be particularly concerned, and from administrators in Whitehall who have an interest in the Government having a role in stabilisation.(1) A public choice approach has been applied to the related question of analysing the behaviour of central bank administrators by Acheson and Chant (1973) and Chant and Acheson (1973). They argue that bureaucrats will have survival of the bureau as an important objective. One argument supporting this is the evolutionary argument that bureaus whose members are not interested in its survival will cease to exist. From the public choice viewpoint it can be seen that it is not necessary for the Government actually to have, in a technical sense, a role in these matters for it to adopt one. Thus it may take actions in the name of stabilisation that do not have stabilising effects. A public choice analysis would predict that Government bureaucrats would take an active role in the control of local authority capital expenditure, and that it would continue even if unsuccessful. Reason for this would be firstly the employment preservation interests of bureaucrats and secondly various interest groups may wish to trade political support for certain types of administrative action.

The following extract from a letter from the Prime Minister to the Chairmen of the local authority associations in November 1982 serves to illustrate how interest groups may well have views on matters usually placed under the heading of stabilisation:

> I am concerned to learn that after underspending on capital substantially in 1981/82 local authorities show every sign of doing the same in 1982/83 because they are making little use of their capital receipts. As local authorities have some 1.5 billion of capital receipts, the scope for additional invest-

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(1) Musgrave (1959) defines stabilisation as "maintaining a high level of resource utilisation and a stable value of money."

> ment is very considerable indeed.
>
> I recently met the Group of Eight, the body which represents all sides and parts of the construction industry, and they drew particular attention to the way in which local authority (and nationalised industry) capital investment is falling below the Government's public expenditure provision.(1)

The subsequent overspend(2) in the next financial year raises at least a doubt over the strict technical necessity of such interventions.

Whilst a public choice approach may throw some light on events such as this by drawing attention to the role of interest groups such as the Group of Eight, it is on issues three to five that the approach is most illuminating. The issue of <u>accountability</u> raised in the Layfield report(3) is of key importance to these issues. Accountability it is argued here is a concept that is closely related in spirit to a public choice approach. The reason for this is that discussion of accountability proceeds in terms of the costs and benefits to individual voters acting in accord with self-interest. This is also the approach of the public choice school.

Essentially the accountability approach lies in asking the question: Why are the above five issues matters of national interest rather than matters of purely local interest? Thus whilst inflation and macroeconomic stabilisation are clearly national matters, the effect of the local authority on the burden of taxation and the private/public balance are matters for local voters as <u>a fortiori</u> must be the content of local policies. Why should persons other than the local voter have concerns over such issues? Ideally they should not, but inappropriate financial arrangements may generate such con-

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(1) Quoted in Association of Metropolitan Authorities (1984, Appendix B)

(2) See table 1 below

(3) Local Government Finance (1976). Accountability is also discussed at some length in Jackman (1982) on which some of this discussion is based

cerns. The problem is that inappropriate financial arrangements can give a local voter an interest in the decisions of other local authorities, or can cause the voters of other authorities to have an interest in the decisions of his authority. The route for political pressure in expression of these interests is then central Government. There are two mechanisms by which the national voter will have a stake in local decision-making.

First, the burden of non-domestic rates, and that portion of domestic rates not borne by the local voter(1), is likely to be spread well outside the locality. Secondly, under the rate support grant system the matching element of the grant distorts the cost of marginal expenditure. Until the 1986/87 settlement this second effect meant that for many authorities extra spending would be subsidised by persons from outside their jurisdiction.(2) However, under the 1986/87 settlement, rates of matching have been almost entirely negative.(3)

The view presented here is therefore that arguments two, three and four on taxation burden, the private/public sector ratio and the content of local policies only have force as a result of an entirely implicit argument that there is an absence of accountability in local decision making leading to the national voter having a financial interest in local voters' decisions.(4) The private/public ratio, and

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(1) i.e. paid for by rate rebates or social security benefits.

(2) Under block grant at the time of introduction, many authorities enjoyed positive rates of matching at the margin although this effect was reduced by the penalties levied for overshooting targets.

(3) This, of course, still generates an interest from the individual as a national voter, only in the reverse direction. Thus voters outside a local authority with negative rates of matching have an interest in that authority increasing their current expenditure as this will attract less grant.

(4) There is however an argument that remains for influencing the content of local policies in the direction of national priorities and

the burden of taxation to the local voter are not to be decided purely by the local voter because it is not just the local voter that pays. Mechanisms of expenditure control exist to give some say to the national voter who is footing a large part of the bill.

It is therefore concluded that the case for control of local authority borrowing lies first in macroeconomic arguments about the need to control the public sector borrowing requirement, of which the local authority borrowing requirement forms a part, and secondly as an indirect tactic for mitigating the root problem of lack of accountability for capital expenditure caused by inappropriate local authority financial arrangements. This tactic does not solve the accountability problem and the results are not likely to be the same as a direct solution. The direct solution is to place responsibility for finance of local expenditure entirely with the local voter.

Having set out the somewhat tortuous reasoning behind the control of local authority borrowing, the question of how this control is exercised is now examined. The account begins with a brief description of the system replaced in 1981.

THE OLD SYSTEM OF LOAN SANCTION

Before 1981, the basis of central control of local authority capital expenditure was the loan sanction system. This system had its origins in a desire to ensure financial propriety in the raising of loans and grew into an administrative mechanism for expenditure control.(1) Capital expenditure plans were submitted to the appropriate

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that is the argument that persons move around the country from time to time and have an interest in some degree of uniformity of national standards. However it is argued here that this argument is of minor importance to most local voters in relation to main process of adjustment of provision to their preferences.

(1) See Local Government Finance (1976)

government department within the key sector,(1) for consideration for loan sanction. Loan sanctions would be granted for individual projects or sometimes blocks of projects within a sector and by these decisions central government could influence both the total and distribution of local authority capital expenditure.

Because control was exercised over borrowing, the control over expenditure was neither complete nor precise: for instance local authorities were free to finance schemes from revenue or capital receipts without the need for approval from central government departments. Also, the loan sanction system only exercised control over starts which had to be made in the year the sanction was granted. Once the project had begun capital payments were determined by the physical progress of the project. Because of this lack of control over timing and amount the resulting control over the local authority borrowing requirement was regarded as too imprecise: "[The new system] ... will enable central government to ensure that the total of local authority capital spending each year is consistent with national expenditure plans, which is not possible under the present system."(2) This lack of precision led the Government to institute a system of control over local authorities' capital expenditure.

THE PRESENT SYSTEM OF CAPITAL EXPENDITURE CONTROL

The present system of capital expenditure control was introduced in April 1981 under the provisions of the Local Government, Planning and

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(1) "Key sector" services are those for which ministers have special responsibility - most importantly: housing, transport, education, police and personal social services. Block borrowing approvals were also allocated for locally determined schemes and authorities were also authorised to borrow for subsidiary sector schemes without seeking approval. See Department of the Environment (1976)

(2) Press notice accompanying Department of the Environment (1979). See also HMSO Paying for Local Government (1986, p45)

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Land Act 1980 although some of its features were already embodied in the Housing Strategies and Investment Programmes (HIPs) and Transport Policies and Programmes (TPPs) procedures. In different ways the present system both increased and reduced the autonomy enjoyed by local authorities under the old system.(1) Under the present system, control is exercised not on loans but on capital payments(2) whether financed by loans or from revenue. There is thus a significant reduction in the local autonomy that previously existed in the open-ended freedom of local authorities to finance capital expenditure from revenue. Each local authority submits expenditure plans to the relevant central department for a maximum of four categories of expenditure: housing, education, transport and the personal social services and is notified of its allocation at around the time of the Rate Support Grant settlement. For a fifth block, "other services", no expenditure plans are submitted: allocations are made by a method determined by the Department of the Environment after consultation with the local authority associations. A sixth block, for urban aid was created from part of the "other services" in 1984-85. Further variety is added by the retention of the old system of loan sanction for expenditure within the ambit of the Home Office: i.e. capital expenditure on police, magistrates' courts and probation services.

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(1) The present system of capital expenditure control was described on its introduction in Department of the Environment (1981). Minor amendments were made in Department of the Environment (1982). These circulars were superseded by Department of the Environment (1983) which was itself updated in certain respects by Department of the Environment (1984) and Department of the Environment (1985). For a discussion of the system see Raine (1980). There have been a number of Department of the Environment Circulars on HIPs eg 18/77, 63/77 and TPPs for Transport Supplementary Grant eg 104/73, 60/74, 125/75.

(2) i.e. payments made for "prescribed" expenditure, defined in Schedule 12 to the Local Government, Planning and Land Act 1980 to include most items of capital expenditure.

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Administratively the present system of control integrates with the cash limits system of public expenditure control introduced by the Treasury in 1976.(1) Central government concern focusses on the Department of the Environment LA1 cash limit now printed in the Public Expenditure White Papers. This net provision for local authority capital spending is arrived at by forecasting what percentage of local authorities' spending power, deriving mainly from accumulated capital receipts, in-year receipts and allocations, will be spent and adding to this forecast non-prescribed spending. The main interest is the total of this spending.(2) Correspondingly, in a concession granted between the printing of the first and second Bill(3) each local authority is allowed to aggregate its allocations into a single block and distribute expenditure within this total as it wishes - a facility termed one hundred per cent virement in discussion. Thus, to quote the Minister for Local Government, Mr Tom King,

> In return for the overall ceiling on capital expenditure there should be greater freedom within the local authorities and less interference from Whitehall, with authorities determining exactly how allocations should be spent and deciding between the priorities naturally found in individual authorities(4)

Objective four identified at the beginning of this chapter, was therefore given a lower priority than the other objectives which, directly or indirectly, are linked to the total of expenditure.

Although the ceiling that the authority faces is based on its total

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(1) See Bevan (1980)

(2) see HMSO (1981, p20 and 1982, p90)

(3) see Local Government Planning and Land Bill H.L. (1979) and Local Government Planning and Land Bill No 2 Bill (1980). Changes in government thinking can also be followed by comparing Department of the Environment (1979) and Department of the Environment (1980a)

(4) See Local Government Planning and Land Bill No 2 Bill (1980),Standing Committee D minutes, column 1159, April 15.

of allocations, there are possibilities to "enhance" the ceiling. Thus a year-to-year tolerance of ten per cent is allowed and in addition, profits from trading undertakings can be added, allocations can be transferred between authorities and there is also scope for the use of capital receipts.

Unlike the loan sanction system, where payments, once the project has started, can extend indefinitely into the future, the present system allocates a total for payments for a year at a time. This places new emphasis on the scheduling of capital projects and, under the old loan sanction system, local authorities' record on this was not impressive. A CIPFA survey found that for seventy-nine per cent of authorities who responded to their questionnaire the approved capital programme was not normally achieved within the timescale provided(1) However, only limited inference can be drawn from this finding. The old loan sanction system operating when the survey was made did not penalise programme slippage. Hence it might well have made sense for authorities to set an ambitious time scale for their capital programme, seeing the nominal slippage thereby resulting as, if anything, a spur to progress.

THE OPERATION OF THE PRESENT SYSTEM OF CAPITAL EXPENDITURE CONTROL

Table 1 shows the overall experience of control of capital expenditure by local authorities since the introduction of the present system. In each of the columns the top figure is the planned level of capital expenditure, the next figure below is the estimated outturn, and any figures appearing below the are outturns and subsequent revisions. The figure at the foot of the columns shows the percentage divergence of the plan from the latest figure for outturn.

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(1) Chartered Institute of Public Finance and Accountancy (1981)

TABLE 1 THE RECENT PATTERN OF LOCAL AUTHORITY CAPITAL EXPENDITURE PLANS AND OUTCOMES

Millions of Pounds Cash

White Paper	Year 81-82	Year 82-83	Year 83-84	Year 84-85	Year 85-86	Year 86-87
March 1981	3068					
March 1982	2537	3252				
Feb. 1983	2459	2049	2982			
Feb. 1984	2535	2687	2840	2729		
Jan. 1985	2539	2779	3184	3108	2213	
Jan. 1986	2549	2784	3442	3556	3026	2652
Divergence from plan	-17%	-14%	15%	30%	37%	

Source: computed from Cmnd 8494 -II, 8789-II, 9143-II, 9428-II, and 9702-II a See also Comptroller and Auditor General (1986) where a similar computation has been made. Planned expenditure for 1981-82 has been computed from information in Table 3, p11, Audit Commission (1985). "Divergence" relates to the difference between the planned figure at the top of each column, and the latest figure for outcome (at the bottom of each column).

From this table it can be seen that the first two years of operation of the system resulted in a large shortfall in net spending on the capital programme, and the next three years led to a large overspend(1).

The reason underspends and overspends are possible is that neither the amount of capital receipts generated by sales nor the amount of these capital receipts used to justify capital expenditure are known in advance by the Government and hence must be the object of some form of forecasting exercise at the time plans are made. This is explained in Comptroller and Auditor General (1986, p8)

> The main element in the over-spending in subsequent years was a wide discrepancy between the detailed controls applied to individual authorities and the global provisions they were intended to protect. In determining the total amounts available for distribution to local authorities as allocations of prescribed

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(1) Reasons for this are discussed in the next section on the timing of intervention.

> expenditure Department of the Environment did not take full account of the extent to which those allocations could legitimately be enhanced by the use of capital receipts and other means. This was done as a calculated risk, on the assumption that authorities in aggregate would not spend up to their maximum permitted limits. This was a valid assumption in that in the early years of the system authorities used only about 65 per cent of their total spending power, and even now are using no more than about 75 per cent.

This calculated risk proved to be greater than expected in later years because of the spending of accumulated capital gains and because of the way the year-on-year virement(1) possibility was interpreted after the Department of the Environment took Counsel's opinion in 1984. At first they had believed that the ten percent tolerance would merely act as a transfer between adjacent years, but as a result of Counsel's opinion it is now interpreted in a way that can lead to an overall increase in allocations. The Comptroller and Auditor General goes on to illustrate this problem:(2)

> For example, the Cash Limit for 1983-84 was based on a gross expenditure figure of 4,731 million, of which 4,075 million was distributed as allocations of prescribed expenditure; but on the basis of the best available estimates local authorities could, by making full use of all the available sources of enhancement ... legitimately have incurred gross capital expenditure totalling some 7,700 million without exceeding their individual spending limits. Actual outturn of gross capital expenditure was 5,506 million.

As the first of the quotations from the report of the Comptroller and Auditor General notes, authorities have only been spending 65 to 75 per cent of the amount they are empowered to spend(3) so in this sense local authorities' spending is not strictly being controlled.

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(1) To avoid confusion with inter-block virement, the Department of the Environment has adopted the practice of calling year-on-year virement tolerance.

(2) Comptroller and Auditor General (1986, p9)

(3) Since the Comptroller and Auditor General's Report the percentage use of spending power has continued to grow. For 1987-88 the Department of the Environment are forecasting 82% - see Table 2. line 7.

CHAPTER THREE: THE CONTROL OF LOCAL AUTHORITY CAPITAL EXPENDITURE

The outturn total capital expenditure that is compared with the cash limit is net of all capital receipts. Why the net figure is used is speculated upon in the Sixth Treasury and Civil Service Committee report (session 1984-85) as follows:

> We find it strange that the Government did not foresee the problems inherent in this accounting treatment for these transactions, or its scale. We are left with the impression that the rationale for the existing arrangements has had everything to do with the Government's desire to reduce the apparent size of the PSBR, and too little to do with the rational use of local authority assets.(1)

To summarise the control process, the Government has as its instruments the allocations given to local authorities and some control over the enhancements that may be attached to them. It can use these instruments to generate a distribution of capital expenditure powers to local authorities. About 25 to 35 per cent of this power to spend is not taken up. The proportion of capital expenditure empowerment that is actually spent plus the amount of non-prescribed capital expenditure adds up to the outturn of total gross capital expenditure. From this is subtracted the total of all in-year capital receipts to arrive at the target of total net capital spending, which is compared with the cash limit.

Table 2 shows how the cash limit is made up for 1987-88. Enhancements to allocations have been described briefly above, and it has been noted that capital receipts cause difficulty in predicting the total gross capital spending "empowerment". Firstly, the level of capital receipts is not known at the time allocations are made. Secondly it is not known what proportion of capital receipts local authorities will decide to spend. However, by statute, the Secretary of State can set a maximum "prescribed" proportion for spending

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(1) Treasury and Civil Service Committee (1985 p. xvi), quoted in Association of Metropolitan Authorities, 1986.

TABLE 2: SPENDING POWER AND PROVISION FOR DOE/LA1 IN 1987-88 OUTCOMES

		million	
1	Spending power from accumulated receipts	2150	38%
2	Spending power from in-year receipts	588	10%
3	Allocations[1]	2584	46%
4	Tolerance	258	5%
5	Trading Profits	40	1%
6	Total Spending Power[1]	5620	100%
7	multiply by assumed usage of spending power	0.82	
8	equals forecast spending from spending power	4608	
9	less receipts netted off gross provision	-165	
10	plus non-prescribed spending	430	
11	plus allocations for passenger transport authorities' rolling stock	55	
12	equals Total gross provision for spending on DOE/LA1	4928	

([1]) excluding 55m transferred to local authority capital to help passenger transport authorities purchase rolling stock - line 11.

Source: Department of the Environment (1987, p361)

in-year and accumulated capital receipts. The prescribed proportion has been successively tightened over recent years. The prescribed proportion was 50 per cent in 1981-82 and 1982-83 for housing receipts. In 1983-84 the prescribed proportion of 50 per cent was extended to most other services. In 1984-85 it was reduced to 40 per cent for most housing receipts and for 1985-86 and 1986-87 the proportions were again reduced to 20 per cent for housing services and 30 per cent for other services.(1) These reductions in the prescribed percentage increase control but as has been noted,(2) how far this reduction conflicts, in practice, with another of the Government's objectives - encouragement of asset sales - is not established.

Because of the way the statutory provisions are interpreted, the prescribed proportion at present only delays, rather than prevents, capital receipts over and above the prescribed proportion being spent.

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(1) See Comptroller and Auditor General (1986, p17)

(2) See for instance Committee of Public Accounts (1986, p xiii)

This is because according to the "cascade" principle the prescribed proportion of the remaining balances of capital receipts may be spent in future years until the whole of the capital receipts are eventually spent.

Because capital receipts reduce net capital spending in the year they are received, it has been argued by commentators(1) that when they are spent they only increase capital spending by an amount equal to the amount they previously reduced it by, leaving no overall change. Ward (1985) clarifies the issue as follows:

> The problem seems to be one of timing, with capital receipts gained in one year being used to finance expenditure in a later year. Whether this is important for Government fiscal and monetary policy is by no means clear. On the Government's own philosophy it arguably ought not to be, since authorities have already accumulated the finance for such expenditure, so presumably it will not cause borrowing difficulties. At the same time, the recession in the construction industry is so severe that possible problems of excess demand for its output are unlikely to arise. The one problem seems to be that it might push up the PSBR as measured in particular years, but then this is only the inevitable counterpart of unspent receipts reducing the PSBR in other years and it is questionable how far it matters, except to those who attach almost mystical significance to the figure.(2)

Essentially the government can be viewed as being happy about the short term reduction in capital expenditure, as measured, and can be viewed as being unhappy about concomitant increases in capital expenditure, as measured, when this is spent. This can be explained by seeing the motivation of the Government as more to do with a desire to reduce the size of the public sector than with macroeconomic control. However, the Government is limited in the extent to which it can move to prevent spending of capital receipts as the power to spend receipts is a major incentive to asset disposal.

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(1) Ward (1985, p52)

(2) Ward(1985, p 52)

CHAPTER THREE: THE CONTROL OF LOCAL AUTHORITY CAPITAL EXPENDITURE

THE TIMING OF INTERVENTION

One of the problems any administered system of capital expenditure control must overcome is that of the timing of intervention, and of ensuring that it is in the right direction in the presence of substantial lags in the system.

Although control over timing was emphasised when the present system of capital expenditure control was introduced(1), because of the long term nature of capital programmes(2) tight control may not be possible. In fact recent history suggests that attempts to stabilise local authority capital spending by central intervention may well be counterproductive. An example is the imposition of a six month moratorium on housing investment in October 1980,(3) which was followed by the prospect of a major underspend for housing in 1981/82 and exhortations in March 1982 by the Secretary of State for the Environment for expenditure on housing investment:

> "The freedom to spend is yours ... the object of the exercise is to use the benefit of those programmes to get extra construction work(4)

Although the moratorium on housing investment is likely to have contributed to the housing underspend in 1981-82,(5) underspending was not confined to housing as can be seen from Table 3 which provides a breakdown of plans and outturns in the different sectors. Several further reasons can be advanced for the underspend of seventeen per-

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(1) See Department of the Environment, Press Notice 479 (1979)

(2) CIPFA (1980, p8)) found the most favoured time scale to be three years

(3) Department of the Environment (1980b)

(4) Heseltine (1982, p384)

(5) Strictly, the term underspending should only be applied to the total of capital expenditure as one hundred percent virement between blocks is permitted

TABLE 3: PLAN AND OUTTURN FOR LOCAL AUTHORITIES' CAPITAL EXPENDITURE BY SERVICE

Millions of Pounds Cash

	1981-82			1982-83			1983-84		
	Plan	Out-turn	Diff	Plan	Out-turn	Diff	Plan	Out-turn	Diff
Agriculture, fisheries, food and forestry	98	114	16%	115	113	-2%	50	69	38%
Industry, energy, trade and employment	36	4	-89%	48	5	-90%	47	4	-91%
Arts and libraries	17	20	18%	17	28	65%	18	40	122%
Roads and Transport	677	618	-9%	722	725	0%	766	794	4%
Housing	1262	767	-39%	1258	584	-54%	1096	1259	15%
Other environmental services	450	501	11%	575	734	28%	487	670	38%
Law, order and protective services	95	92	-3%	106	114	8%	127	109	-14%
Education and science	355	362	2%	310	413	33%	283	424	50%
Health and personal social services	90	70	-22%	102	67	-34%	108	73	-32%
Total	3080	2548	-17%	3253	2783	-14%	2982	3442	15%

Source: Comptroller and Auditor General (1986)

cent in 1981-82 and fourteen percent in 1982-83.

Firstly, capital receipts have been about 500m higher than forecast in the Public Expenditure Survey(1). Because of the unpredictable nature of capital receipts, spending them in the same year is a difficult exercise. Secondly, the unfamiliarity of the new controls and the new emphasis on timing increase both the likelihood of slippage and the need to avoid it. Thirdly, there is the restraint that stems from the revenue implications of capital expenditure at a

(1) Department of the Environment (1982)

time when revenue expenditure is being squeezed by targets and penalties. Fourthly, there is the problem of the lateness of notification of allocations subsequent to submission of programmes to central departments in comparison with the timescale for the preparation of a capital programme(1)

As the operation of the new system has continued, large underspends in 1981-82 and 1982-83 have been converted into even larger overspends in 1983-84, 1984-85 and 1985-86. Two reasons for this can be mentioned. Firstly, over time, local authorities began to spend their accumulated capital receipts.(2) Secondly they had been encouraged to spend by ministers' statements (see above, for example) and indeed by a letter from the Prime Minister in November 1982 to the local authority associations.(3)

The experience with housing underspend, seen in conjunction with the 15 per cent overspend in 1983-84 may be an example of the possible destabilising effect of government intervention postulated by Friedman and discussed by Jackman.(4) Friedman notes three lags that may affect government's "stabilising" actions:

> (1) the lag between the need for action and the recognition of this need; (2) the lag between recognition of the need for action and the taking of action; and (3) the lag between the action and its effects(5)

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(1) See CIPFA (1981, p17)

(2) See Association of Metropolitan Authorities (1984, p11). Accumulated capital receipts, unlike in-year capital receipts are not subtracted off local authorities' net capital expenditure, the total of which nationally is subject to cash limits. See HMSO Paying for Local Government, (1986 pages 10 and 45).

(3) See Association of Metropolitan Authorities (1984, Appendix B).

(4) See Jackman (1982 p75) and Friedman (1953)

(5) Friedman (1953, p145)

Given these lags, which may be considerable,(1) by the time an action is having an effect it may be in the wrong direction. Friedman also shows(2) that even if corrective action is more frequently in the right than in the wrong direction, if it is too great in magnitude, it will still be destabilising.

With Friedman's views in mind, it is instructive to examine the special interventions by the Department of the Environment that have been described in Comptroller and Auditor General (1986, p19). Thus in October 1982 it appeared that the 1982-83 Cash Limit would be underspent. This was a correct view as Table 1 shows. Authorities were invited to submit bids for supplementary allocations for that year and were empowered to make unlimited additional expenditure on housing improvement grants which would be covered by retrospective allocations.

Although this helped reduce the expected underspending for 1982-83, its continuing effects are thought by the Comptroller and Auditor General (1986, p19) to have contributed to the substantial overspend of cash limit for 1983-84 of fifteen per cent shown in Table 1.

As a result of an expectation of underspending of the Cash Limit for 1983-84 a two per cent addition was made to allocations of prescribed expenditure for 1984-85. However, in the event the outturn was as shown in Table 1, an overspend of fifteen per cent in 1983-84 and thirty per cent in 1984-85.

At the very least, the above is strong evidence that intervention is not always stabilising in its effect.

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(1) For instance central government receives details of capital payments quarterly in arrears, and even relatively small schemes can take 15-20 months before contracts are let. (Audit Commission, 1985 p. 40 and p. 37)

(2) Friedman (1953, p132)

CHAPTER THREE: THE CONTROL OF LOCAL AUTHORITY CAPITAL EXPENDITURE

THE LINK BETWEEN CONTROL OF CAPITAL EXPENDITURE AND THE LOCAL AUTHORITY BORROWING REQUIREMENT

So far the discussion of the operation of the present system has focussed on the experience of control of local authorities' capital expenditure. Two reasons for the need to control capital expenditure were advanced: first as a means of indirectly controlling the local authority borrowing requirement, and secondly because incorrect mechanisms of accountability meant that reducing capital expenditure was seen as a legitimate end in itself.

There is therèfore a need to consider, with respect to the first of these reasons, the nature of the presumed link between local authority capital expenditure and the local authority borrowing requirement. The evidence available on this question suggests that

> The revised arrangements introduced from 1981-82 to improve controls over both revenue and capital spending appear in practice to have had very little practical effect on the LABR outturn, which has continued to show very wide fluctuations, in both directions, from the budget forecasts.(1)

These fluctuations are shown in Table 4 for the United Kingdom as a whole. The reason the fluctuations are so large is that the local authority borrowing requirement is determined by "the difference between two very large numbers"(2): overall annual local authority income and annual local authority expenditure. The Department of the Environment view is therefore reported to be that the aim can only be to influence the LABR over time, rather than attempt to control it for individual years.(3)

From the analysis presented in this section of the chapter it is clear that the Government's attempts to control the aggregate of local

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(1) Comptroller and Auditor General (1986, p10)

(2) ibid.

(3) ibid.

TABLE 4: OUTTURN ON LABR FOR UNITED KINGDOM

Year	Budget Forecast (million)	Outturn	% Deviation
1979-80	1.2	2.9	141.67
1980-81	1.4	2.3	64.29
1981-82	1.0	-0.1	-110.00
1982-83	0.6	0.4	-33.33
1983-84	-0.2	1.4	800.00
1984-85	1.3	2.4	84.62
1985-86	1.5	2.1[1]	40.00

Source: Comptroller and Auditor General (1986) Table 4. (1) from correspondence with the Department of the Environment.

authorities' capital expenditure has not been a marked success and the effect of its intervention may have at times, been destabilising. The Government is itself dissatisfied with the operation of the system and has put forward suggested options for change in its Green Paper "Paying for Local Government". These are now discussed.

THE PROPOSALS OF THE GREEN PAPER

In its Green Paper and associated Consultation Paper(1) the Government has set out some possible lines for reform of the present system of control of local authority capital expenditure. The Government sees two possible new methods of control: control over external borrowing limits or control over gross capital expenditure. These will be discussed in turn.

External Borrowing Limits

Under this proposed system, the Government would set controls over a local authority's external borrowing for capital purposes. As has

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(1) Paying for Local Government (HMSO 1986) and Department of the Environment 1986. Some local authority reactions are contained in Association of Metropolitan Authorities (1986) and Association of District Councils (1986).

been shown above the arguments that exist for the control of capital expenditure revolve around the effect on the local authority borrowing requirement so it would seem more logical to control local authority borrowing directly rather than expenditure.

Typically a local authority's borrowing fluctuates greatly from year to year and as authorities pool their borrowing and lending transactions for both revenue and capital purposes to optimise cash flow it is not always even very clear in any particular instance whether borrowing is for capital or revenue purposes.

The Government therefore views controlling external borrowing as probably impractical because of a likely mismatch between borrowing allocations it would make for each authority and the authorities' volatile borrowing requirements. Implicit in the Green Paper's discussion is the view that it would be necessary to set an allocation for each authority to have control over the total. However an alternative is the use of a price mechanism as discussed above to control the total of borrowing in the medium term without the need to set limits for any authority.

Controls over Gross Capital Expenditure

As discussed above, overspending and underspending on the local authority Cash Limit for capital spending has in part been caused by problems in predicting capital receipts and the lack of control over their subsequent spending of accumulated receipts. Under the second scheme proposed in the Green Paper the Government would fix its cash limit for local authority capital expenditure in gross terms. Thus this total would be unaffected by in-year capital receipts.

Allocations for capital expenditure would be made to local authorities that would either include capital expenditure financed by capital receipts, or allow such expenditure as a supplement. If the

allocation included an allowance for that part of the expenditure to be financed by capital receipts, this would represent an important reduction in local authorities' freedom as this would necessarily involve the Government in prescribing a level of expected capital receipts for each authority.

The method proposed in the Green Paper is that the receipts element of the allocation would be based on some proportion of the capital receipts over the previous three years. The Green Paper also proposes as an alternative, a method similar to that used at present of specifying a prescribed proportion for spending capital receipts, and in addition disallowing the spending of any portion of capital receipts in the year that they arose. Here again, the main criticism advanced in this study is of the need for the extensive central planning used in this method of trying to control a national aggregate.

However, central Government not only attempts to control the overall level of capital expenditure but also, as has been noted, applies a detailed process of scrutiny of local authority plans in order to try to take account of "need" in its subsequent issue of allocations. The value of such a procedure is questioned in the next section.

THE NEED FOR SUBMISSION OF PLANS

It can be argued that the need for submission of plans to central departments is the weakest element of the present system of capital expenditure control. Although local authorities are required to make detailed submissions of their capital expenditure plans to the relevant central government department as detailed above, an implication of the one hundred per cent virement concession is that there is no

necessity that expenditure plans be carried out in practice.(1) Local authorities may, therefore, see advantage in allowing some divergence between plans submitted for approval and plans actually carried out. A particular case of such divergence is the overbidding that was believed to exist under the old loan sanction system(2)

However, the major question over submission of plans is whether central departments have the knowledge and information necessary to make allocations.(3) For example housing investment programme allocations are made to the nearest thousand pounds and are based on ministerial discretion and the generalised capital need index.(4) The generalised need index is based on information that is at least four years old and the two major factors it aims to take account of are derived from the English House Condition Survey "which might cover ten houses in an average authority"(5) The Audit Commission (1985, p 37) has serious doubts about this central planning process:

> Every year, a total of over 1,200 separate allocations of capital expenditure is issued to local authorities by a combination of the central government departments involved ... these allocations vary significantly from local authorities' bids and in unpredictable ways. Part of the variation may be due to exaggerated bids being submitted in the first place, by authorities anticipating reductions. Whatever the cause, central government is telling authorities in very considerable detail (i.e. to the nearest one-twentieth of a house in the case of housing) what it can afford. It is also in effect influencing local priorities, since in practice ... authorities are reluctant to move expenditure (i.e. to vire) between expenditure blocks since they fear subsequent problems with the sponsoring department. ... [T]he "discount from bid"

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(1) Whilst there is no necessity to stick to plans, there is evidence that local authorities fear to vire extensively as they expect this to lead to problems with the department whose allocation has been underspent. (Audit Commission 1985, p37)

(2) See Judge (1975)

(3) The problems here are a particular form of the problems of socialist planning which have been raised by Hayek (1935) and others.

(4) See Audit Commission 1985, p41)

(5) ibid.

> varies not only from year to year but also from block to block. Such an approach is prone to the well-known problems of central planning: central government officials, operating with an inevitably limited and often out-of-date information, and lacking detailed local knowledge cannot be expected to be better judges of local needs and priorities than members accountable to the local electorate.

The new procedure of allowing one hundred per cent virement effectively concedes the point that local authorities are better equipped to judge local priorities than central departments. Once this concession has been made the next logical step is dropping the submission of programmes to central departments. At the individual project level, in housing, there has already been much simplification, the latest in April 1985 after the Audit Commission Report went to press(1)

> ...successive Secretaries of State since 1980 in my Department have pressed very hard for simplification and we have gone a long way down the track with housing to simplify things. There are 367 housing authorities and 279 now out of subsidy are not subject to any project control; only 88 authorities in subsidy are subject to project control. All that is involved initially is the submission of one single sheet of paper. The Department is under obligation, if it wants to intervene at all to call for more information, to act within 20 days. So we have actually got a fairly simple system in our Department and we are working further to see whether we can simplify it again. We have reduced project control very, very markedly compared with the period before 1980.(2)

From the public choice perspective Departments may well have an interest in continuing to scrutinise capital expenditure submissions, as even if this scrutiny has no valid function sudden abandonment of established procedures might lead to undesired redundancies.

A POSSIBLE SYSTEM OF ALLOCATION

If Government abandoned its concern to judge centrally the merits of the contents of individual local authorities plans its control

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(1) See HMSO, Paying for Local Government, 1986, p47

(2) Mr Terry Heiser, Department of the Environment Permanent Secretary replying to Q2733 in Committee of Public Accounts, Minutes p13 Department of the Environment 1986

requirements would then be satisfied by a system for allocating a given total sum of capital between authorities. Such a system is mentioned in Layfield(1) and several schemes have been suggested by Harrison(2) The simplest scheme would be to remove controls and let the market allocate through the interest rate. If the government held that this would generate "too much" local authority capital expenditure, a premium could be added to the interest rate, or authorities could be compelled to finance a fixed proportion of investment from revenue, or be compelled to bid for shares in a fixed total quota of investment. These schemes are all forms of price rationing and arguments against price rationing often suggest injustice may occur as a result of differences in ability to pay. However, with the move towards full equalisation under the block grant system the force of such arguments is reduced.

CONCLUSIONS

Five reasons for control of local authority capital expenditure were listed at the beginning of this chapter. Reasons one and five relate to the macroeconomic motivations of control of inflation and stabilisation. The argument is that local authority <u>borrowing</u> is important in that it forms part of the PSBR and a large PSBR makes control of the money supply difficult. However it is difficult to attach much credibility to this motive for control. Firstly, control is exercised on <u>expenditure</u> rather than <u>borrowing</u>. Secondly, the control of expenditure relies on local authorities voluntarily not spending up to their empowered spending levels, so the whole idea of control is thrown into doubt. Thirdly, the relation between expendi-

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(1) Local Government Finance (1976, p250)

(2) Harrison (1980)

ture and borrowing is subject to enormous variation from year to year as the evidence of Table 4 suggests. It therefore seems extremely dubious whether control has in fact been exercised macroeconomically, and whether there is any need for such control.

This therefore leaves the motivations of reducing the burden of taxation, reducing the size of the public sector and influence over the content of local policies. Here the root cause is the lack of accountability in local government finance that involves national government in issues of essentially local interest. Concern to reduce the size of the public sector explains the government's apparently schizophrenic attitude to gross and net capital spending. Thus although the presentational interest is in the lower, net capital spending aggregates, the underlying government concern is with keeping down gross spending, as the increasing restriction on the use of capital receipts indicates.

The overall conclusion is that accountability lies at the heart of the question of capital expenditure control. The Secretary of State is therefore wise to link reform with the proposed change to community charge(1) which seeks to address the accountability question directly.

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CHAPTER FOUR*

MODELLING LOCAL AUTHORITY EDUCATION EXPENDITURE CHANGE

INTRODUCTION

Chapter 2 of this thesis has examined overall local authority current expenditure and Chapter 3 has examined local authority capital expenditure. In this chapter consideration turns to modelling the education budget; quantitatively the most important branch of the local government current expenditure budget.

The chapter is divided into three main sections. First education spending is discussed in the context of aggregate local government spending. Second, existing work on expenditure modelling is surveyed, and thirdly a model of local authority education expenditure change based on the approach to aggregate expenditure modelling of Chapter 2, is developed and estimated on data for 1982/83 to 1984/85.

THE FINANCIAL CONTEXT OF EDUCATION BUDGETS

In 1980/81 the block grant replaced the previous needs and resources rate support grant elements. A part of the new system was

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(*) This chapter is partly based on J.G. Gibson and P.A. Watt, "A Model of Education Expenditure Change in English Local Authorities", in Thomas, H. and Simpkins, T(Eds) Economics and the Management of Education: Emerging Themes, Falmer Press, Lewes 1987(b).

the introduction of Grant-Related Expenditure Assessments (GREs) . These were assessments of an authority's need to spend, based broadly on prices attached to numbers for client groups. GREs replaced the former Assessed Spending Needs (ASNs) which were calculated for the pooled expenditure needs of both upper and lower tiers of local authority and were calculated for aggregate spending rather than service by service.

The newly introduced GREs, in contrast, were calculated for each authority, both upper and lower tier, and because services provided differed between tiers, it was necessary to disaggregate GREs for each service for each authority. Thus whilst the previous ASNs gave only a global figure for all services, GREs were "service based". An education GRE for example would be computed for each local education authority. The disaggregation of needs assessment gave rise to hopes amongst those concerned with low levels of education provision in some authorities that publication of education GREs would encourage increases in provision, although given the Government's plans for cuts, greater uniformity in education spending was a more feasible hope.

Seen from the centre, on the other hand, service GREs provided a possible instrument of influence within the framework of a general grant system where the freedom of local authorities to ignore the wishes of Education ministers to spend upon specific programmes - such as in-service training - had emerged as an issue in the later 1970s.

The disaggregated assessment of GREs on a service-by-service basis was a major point of criticism of the new grant system by many in

local government who were concerned to preserve local freedom with respect to service priorities. For them the composition of local budgets should be entirely a matter of local preferences.

As events turned out, any concern for increasing provision of low spenders was overridden by the Government's first priority of reducing expenditure. The Government decided that it needed real cuts in expenditure by all authorities rather than just from those spending above GRE and for this purpose introduced expenditure targets and grant penalties for spending above target.(1) Grant penalties withdrew grant from individual authorities as they spent over target. This concern with the expenditure of individual authorities was a departure from previous practice that was not clearly spelt out by the Government when the block grant proposals were proceeding through Parliament during 1980. In fact, the grant penalties had to be given legality retrospectively through the Local Government Finance Act of 1982.

Grant penalties increased in size each year from 1981/82 to 1985/86, but despite this, local government overspending persisted both on its aggregate current expenditure and education current expenditure. This is shown in Table 4.1 which gives aggregate overspend as column 7 and education overspend as column 8. Also, as Table 4.2 shows, the Government had consistently revised upwards its plans for spending in order to make them appear more attainable. Local government actually increased its current expenditure in 1982/83 and

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(1) See Chapter 2 for more detail

TABLE 4.1 CURRENT EXPENDITURE, ENGLISH LOCAL GOVERNMENT (£m. cash)

	Provision:			Budgets:			Overspend:	
	Aggr. Crrnt	Educ. Crrnt	2/1	Aggr. Crrnt	Educ. Crrnt	5/4	Aggr. 4 on 1	Educ. 5 on 2
Year	Expd.	Expd.	%	Expd.	Expd.	%	%	%
	1	2	3	4	5	6	7	8
81/82	16180	8333	51.50	17534	8862	50.54	8.37	6.35
82/83	18000	9190	51.06	19260	9601	49.85	7.00	4.47
83/84	19692	9882	50.18	20550	10331	50.27	4.36	4.54
84/85	20389	10123	49.65	21439	10489	48.92	5.15	3.62

Source: Extracted from Association of County Councils: Rate Support Grant various years.

1983/84. The second successive increase was regarded by the Government as the final straw, and in response the Rates Bill was introduced in 1984 which enabled limits to be set on the rate levels of selected authorities.

TABLE 4.2 REVISIONS TO GOVERNMENT PLANS FOR LOCAL GOVERNMENT CURRENT EXPENDITURE, ENGLAND

£m. 1983/84 PRICES

White Paper	1981/82	1982/83	1983/84	1984/85
Cmnd 8175 (Mar 81)	18226	17852	17700	
Cmnd 8494 (Mar 82)		18902	18720	18558
Cmnd 8789 (Feb 83)			19620	19142
Cmnd 9143 (Feb 84)				19543

Within this context, real spending on primary education fell throughout the period and was more or less static for secondary educa-

tion. This is shown in Table 4.3. The totals hide large differences between authorities in spending changes. Travers(1986) has calculated using 1983/84 prices, that real spending on primary schools fell by 19.6 per cent in South Tyneside between 1979/80 and 1984/85 and by 18.4 per cent in Leeds and 16.4 per cent in Trafford, whereas Hounslow spent 12.1 per cent more, Nottinghamshire 5.9 per cent more and Waltham Forest 5.2 per cent. In secondary education Richmond reduced spending by 23.4 per cent, Bromley by 17.0 per cent, and Harrow by 15.4 per cent; increases took place in Leeds (9.2 per cent), Wigan (7.6 per cent) and Bradford (7.3 per cent). Thus within the totals there has been wide diversity.

A feature of the grant system as it evolved from 1981/82 was that

TABLE 4.3 REAL CURRENT EXPENDITURE: PRIMARY AND SECONDARY EDUCATION (£mn.1984/85 costs)

	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85
Primary	2751	2702	2615	2548	2518	2535
Secondary	3796	3824	3827	3844	3876	3880

targets tended to be lowest for those authorities already spending at the lowest levels relative to GRE, the shire Counties. Table 4.4 gives the data for 1983/84 which shows how much more severe targets were for the low spending shire counties. This would be expected to increase spending disparities.

The reason for low targets being assigned to low spending authorities was twofold: (1) targets were related to previous budgets, and (2) the higher spending authorities included a number

TABLE 4.4 : COMPARISON of 1983/84 TARGETS AND GREs

	Sum of Targets	Sum of GREs	Excess of Sum of Targets over Sum of GREs	No. of authorities with Target: below GRE	at or above GRE
Class of Authority	£m	£m	%		
London Precepting	1,673	1,343	24.6	-	3
Inner London Boroughs	898	695	29.2	1	12
Outer London Boroughs	1,719	1,615	6.4	2	18
Metropolitan Counties	1,104	928	19.0	-	6
Metropolitan Districts	4,057	3,891	4.3	11	25
Non-Met Counties	9,237	9,287	-0.5	23	16
Non-Met Districts	1,446	1,471	-1.7	199	98
ENGLAND	20,134	19,230	4.7		

who ignored grant penalties or were not subject to them - such as ILEA(1) - whereas the low spending counties tended to respond to the restraint of targets.

The above discussion raises a number of interesting questions for empirical work. First, did the new service based GREs appear to influence the pattern of spending of local authorities on education? Second, what was the influence of Targets? Third, did an authority's aggregate GRE change, year-on-year affect education expenditure? Before examining these questions empirically, previous statistical work is reviewed.

EXISTING WORK IN EDUCATION EXPENDITURE MODELLING

There have been a number of papers published that set out to explain the level of Local Authority spending on education.

CHAPTER FOUR: MODELLING LOCAL AUTHORITY EDUCATION EXPENDITURE CHANGE

Dawson (1976) constructed models seeking to explain expenditure per school pupil. Her models explained 48 per cent of the variation of expenditure per primary school pupil for all local education authorities in England and Wales, and 59 per cent of the variation in expenditure per secondary school pupil. Primary and secondary education were considered separately. The most important variables in the study of primary education were an index indicating the extent to which small schools featured in an authority's service and a variable measuring the percentage of teachers employed to meet special educational needs. For secondary schools the most important variables were those indicating the mix of school type and the course of study followed by older pupils. For all the regressions a dummy variable, set to one if the authority was in Greater London and zero otherwise, indicated a significant positive effect on expenditure.

Using a broadly similar approach Foster, Jackman and Perlman (1980, p270) reported the following results for the (then) County Boroughs:

$$\begin{aligned} XPRI = {} & 107.50 - 0.24PROPO + 0.008Y + 0.11PRI \\ & \quad (0.09) \quad\quad (0.003) \quad (0.05) \\ & -2.28CON + 36.68ILLEG + 3.29LAB \qquad R^2 = 0.24 \\ & \quad (2.47) \quad\quad (24.58) \quad\quad (3.25) \end{aligned}$$

and

$$\begin{aligned} XSEC = {} & 222.94 - 0.59PROPO + 0.022Y - 7.05CON \\ & \quad (0.25) \quad\quad (0.009) \quad (5.31) \\ & +67.27ILLEG + 1.30DEC - 10.65HIGHD - 0.90NEDGR \quad R^2 = 0.15 \\ & \quad (66.34) \quad\quad (0.78) \quad\quad (7.28) \quad\quad (0.63) \end{aligned}$$

where PROPO measured the proportion of owner-occupiers, Y measured household income regionally, CON and LAB measured the proportion of councillors in the Conservative and Labour parties, PRI was the number of primary school children in the authority, DEC was the rate of decline of population, HIGHD the proportion of the population in densely populated wards and parishes, ILLEG measured the proportion of illegitimate births, and NEDGR the receipt of needs grant per head of population.

Jackman and Papadachi (1981) estimated a model to explain education expenditure for the 104 education authorities in England and Wales for 1978/79. They found more success in explaining primary education expenditure than secondary education expenditure with multiple correlation coefficients of 0.74 and 0.60 respectively. They classified their explanatory variables as representing three factors: a cost factor, a preference factor (percentage Labour or other left councillors) and budgetary factors, such as the share of marginal expenditure met by domestic rates, the level of lump sum grants per schoolchild and a measure of regional income.

Most recently Jesson et al. (1985) have estimated a model which explains 71.3 per cent of expenditure per secondary school pupil in the 96 English LEAs in 1981/82. They report the following regression:

$$
\begin{aligned}
EXP = 1{,}305 &+ \underset{(2.8)}{2.24BA} - \underset{(-3.9)}{4.73CH} - \underset{(-4.2)}{6.11OS} + \underset{(2.9)}{3.35GRADS} \\
&+ \underset{(2.1)}{9.5AS} - \underset{(-2.0)}{7.23CONTACT}
\end{aligned}
$$

where BA measures the percentage of children born outside the UK, Ireland, USA and the old Commonwealth or in households whose head was similarly born, CH measures the percentage change in numbers of 11-16 year old pupils on the LEA roll over the five years preceding 1982, OS measures the percentage of oversize classes, GRAD measures the percentage of graduate teachers employed, AS measures the percentage of "additional" teaching staff employed other than on the permanent staff, and CONTACT measures the class-contact ratio: the proportion of school staff actually teaching at any given time.

A MODEL OF LOCAL AUTHORITY EDUCATION EXPENDITURE CHANGE

The model of education expenditure developed in this chapter differs from the models discussed above in taking as its focus the incremental change in education budgets. This attempt to model year-on-year changes in education expenditure is made firstly because of the intrinsic policy interest of such an approach in a world where planning is largely carried out incrementally, secondly because the effects of GREs and Targets may be expected to show up in year-on-year changes, and thirdly because the Government itself focusses on expenditure changes in policy debate.

A major factor to take account of in modelling the determinants of change of education expenditure is the effect of the grant system. The amount of grant paid to a local authority determines the level of local rates which must be set for any given level of expenditure and thus affects the rate "price" of education spending. This effect has been discussed in Chapter 2 and is shown in Figure 4 on page 97.

CHAPTER FOUR: MODELLING LOCAL AUTHORITY EDUCATION EXPENDITURE CHANGE

For empirical study a measure of the impact of grant changes is required, preferably one that is invariant with respect to the expenditure behaviour of individual authorities. A suitable measure is that given by the fiscal pressure variables(1) and defined and discussed in Chapter 2. To recall that discussion, fiscal pressure is defined as the rate poundage change required for maintaining a constant, or given, volume of expenditure. The fiscal pressure variables derived there answer the question: "If each authority increased its expenditure by x per cent, what would be the consequent rise (fall) in rates for each authority?"

These fiscal pressure variables are used in the model of education expenditure change developed here. The model follows the approach developed in Chapter 2 for aggregate local authority expenditure change. Its hypothesised form is as follows:

$$CHEDB=f[ALIGN,CEDGR,-CRPb,-(CRPb-CRPa),PCT,PCG,-C,-N] \qquad (1)$$

The definitions of the variables for the regressions explaining the change in education budgets from 1982/83 to 1983/84 are given below.(2)

Dependent variable:

CHEDB - the percentage year-on-year change in the education budget 1982/83 to 1983/84.

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(1) Gibson, Smith and Watt (1987a)

(2) Definitions of the variables for the regressions explaining the change in education budgets from 1983/84 to 1984/85 may be deduced by simply moving all years in the definitions one year forward.

Explanatory variables:

ALIGN - the change in education budget that would make education's share of the local authority budget in 1983/84 the same as education GRE's share of total GRE in 1982/83.

CEDGR - the percentage change in education GRE between 1982/83 and 1983/84.

CRPb - the change in rate poundage for a 5 per cent cash increase in 1983/84, (and for a 3 per cent cash increase in 1984/85) - given zero use of balances and zero provision for clawback.

CRPa - the change in rate poundage for a 3 per cent cash increase in 1983/84, (and for a 0 per cent cash increase in 1984/85) - given zero use of balances and zero provision for clawback.

CRPb-CRPa - the increase in the change in rate poundage for the increase in the change in expenditure used to define the CRPs (see above)

PCT - the percentage change: 1983/84 target compared to 1982/83 budget

PCG - the percentage change: 1983/84 GRE compared to 1982/83 budget

CON - equal to 1 when majority of seats held by Conservative party mid 1982 (Mid 1983 for 83/84 to 84/85 regressions).

NOC - equal to 1 when no party holding a majority of seats (or where majority of seats held by Liberal party) mid 1982 (Mid 1983 for 83/84 to 84/85 regressions).

Fiscal pressure is measured by the variables CRPb and (CRPb-CRPa). The first is a measure of the level of fiscal pressure facing the authority - the expected rate rise if expenditure were raised by a hypothetical 5 per cent by every authority in 1983/84, and for the second of the two time periods studied, the expected rate rise if expenditure were raised by a hypothetical 3 per cent by every authority in 1984/5. The second fiscal pressure variable is a measure of marginal fiscal pressure.It indicates the extent of the change in rate rise expected on moving from a low hypothesised across-the-board

expenditure increase (CRPa as defined above) to a higher hypothesised expenditure increase (CRPb).

Both the level of fiscal pressure and marginal fiscal pressure are expected to be negatively related to increases in authorities' total expenditure and hence they are also expected to be negatively related to changes in what is usually the major part of total expenditure: education expenditure.

Four more variables are included because of their likely effect on the overall budget and hence, indirectly, on the education budget. Firstly there are two financial guideline variables: PCT - the percentage change in target compared to previous budget and PCG - the percentage change in GRE compared to previous budget. These two variables - the grant/fiscal effects of which are already embodied in the fiscal pressure variables - are expected to be positively related to increases in the education budget to the extent that authorities treat them as guidelines. Secondly two variables measure political influence: CON, a dummy variable representing Conservative control of a local authority, and NOC a dummy variable indicating where an authority is subject to no overall political control.

Education specific effects are measured by two variables: ALIGN and CEDGR. Before discussing CEDGR, the construction of ALIGN is explained at some length. The variable ALIGN is included to test for the presence of convergence/divergence between local authority education budgets and education GREs. Education GREs attempt to be the best objective measure of the costs of providing education services to a similar standard in different local authorities. The ALIGN variable

is derived as follows. Consider a local authority for which the education budget represents 45 per cent of the total local authority budget, but for which education GRE represents 50 per cent of the total GRE for the authority. For this authority there is a substantial divergence between education's share of the budget and education's share of GRE. Now consider the possibility that a local authority might use GRE as a guideline and, in particular, wishes to remove this divergence next year.

If the local authority wished to adjust its spending to remove entirely the last observed divergence between education's share of its GRE and education's share of its budget it would need to raise its education budget in the next year to 50 per cent of its total budget. Of course spending on other budgets may change, but for simplicity assume that other budgets remain constant. The question then is, by what percentage must spending on education rise so that education budget share equals education GRE share? Let this percentage rise in education budget be denoted by the variable ALIGN, then algebraically the relation is

$$\frac{EDGRE1}{TGRE1} = \frac{EDB1+[(ALIGN\ /\ 100).EDB1]}{TB1} \qquad (2)$$

where EDGRE1 is education GRE in year 1, TGRE1 is total GRE in year 1, EDB1 is education budget in year 1 and TB1 is total budget in year 1.

Rearranging (2) above yields:

$$ALIGN = 100.[(EDGRE1\ /\ TGRE1)\ /\ (EDB1\ /\ TB1)-1] \qquad (3)$$

Thus for the numerical example described, the education budget would need to be increased by 11.1% to remove the divergence between education GRE share and education budget share. In practice such adjustment, where it occurs, is expected to be both less than-complete and not accomplished entirely in one year. The coefficient on this variable is therefore expected to be positive but considerably below the figure of unity that would indicate full adjustment.

Finally, the variable CHEDGR, the percentage year-on-year change in education GRE is included to test whether changes in education GRE are reflected in changes in education expenditure. Because education GRE is calculated by the Government to take account of changes in need as reflected in changing pupil numbers it also has the role of indicating changing demographic factors in the model.

THE DATA

The tables below show these data for all education authorities except the ILEA, i.e. outer-London Boroughs, Metropolitan Districts and non-Metropolitan Counties.

Table 4.5 shows the data, means, maxima and minima and standard deviations for outer-London Boroughs for 1982/3 to 1983/4, and Table 4.6 shows the corresponding figures for 1983/4 to 1984/5. Hillingdon has the highest year-on-year increase in education budget in the first pair of years considered, and, it is interesting to note the highest decrease in education budget in the second of the pair of years considered. Also of note in these two tables is that Haringey combines two extremes - a large gap between its total spending and

TABLE 4.5 DATA FOR OUTER-LONDON BOROUGHS 1982/3 TO 1983/4

Authority	CHEDB %	ALIGN %	CEDGR %	CRPb	CRPb -CRPa	PCT %	PCG %	C O N	N O C
Barking	9.03	1.93	4.23	31.09	5.69	3.75	-7.41	0	0
Barnet	6.17	-6.38	-1.27	19.83	3.70	4.37	1.09	1	0
Bexley	3.18	0.08	4.11	20.54	9.86	0.44	-3.84	1	0
Brent	9.84	2.43	1.71	23.86	13.15	-0.65	-13.88	0	1
Bromley	3.15	-0.50	1.58	21.72	3.48	4.37	4.30	1	0
Croydon	5.85	-6.61	0.77	31.06	3.57	4.37	11.36	1	0
Ealing	1.77	-3.44	2.52	17.13	4.49	4.20	3.35	1	0
Enfield	1.74	-0.73	5.80	17.68	7.26	2.29	1.84	1	0
Haringey	5.82	11.02	1.95	31.05	13.62	-0.65	-21.00	0	0
Harrow	1.41	2.49	1.75	26.61	10.87	-0.65	-8.73	1	0
Havering	3.35	-3.88	2.85	13.57	3.26	5.37	-1.11	1	0
Hillingdon	11.99	-3.06	3.15	19.41	6.74	2.71	-6.01	1	0
Hounslow	3.65	1.27	2.40	33.98	11.41	-0.65	-9.07	0	0
Kingston	3.07	-8.93	3.14	20.92	3.00	6.98	5.07	1	0
Merton	5.46	2.62	1.94	19.90	3.88	4.37	3.99	1	0
Newham	10.33	7.22	5.26	12.29	13.66	-0.65	-8.55	0	0
Redbridge	7.27	0.64	4.21	19.59	3.71	4.37	4.51	1	0
Richmond	4.33	-15.04	3.09	25.69	3.20	4.37	0.66	0	1
Sutton	7.69	2.67	-0.02	18.67	3.59	4.37	3.88	1	0
Waltham Forest	5.07	11.00	4.84	27.15	12.83	-0.65	-15.86	0	1
Mean	5.51	-0.26	2.70	22.59	7.04	2.62	-2.77	.7	.2
Std Dev.	3.05	6.29	1.77	6.03	4.12	2.52	8.31	.5	.4
Max.	11.99	11.02	5.80	33.98	13.66	6.98	11.36	1	1
Min.	1.41	-15.04	-1.27	12.29	3.00	-0.65	-21.00	0	0

its GRE and target, putting it under great fiscal pressure, and a large difference between education's share of the budget and its GRE share. Table 4.7 shows the data, means, maxima and minima and standard deviations for Metropolitan Districts for 1982/3 to 1983/4, and Table 4.8 shows the corresponding figures for 1983/4 to 1984/5. The average increase in education budgets for both successive pairs of years is slightly above the corresponding averages for the outer-London Boroughs. For the first pair of years Newcastle shows the greatest increase in education budget, and interestingly has the

TABLE 4.6 DATA FOR OUTER-LONDON BOROUGHS 1983/4 TO 1984/5

Authority	CHEDB %	ALIGN %	CEDGR %	CRPb	CRPb -CRPa	PCT %	PCG %	C O N	N O C
Barking	6.60	-5.73	2.56	25.23	7.68	2.16	-9.38	0	0
Barnet	3.74	-10.09	5.00	11.27	5.26	2.16	-2.16	1	0
Bexley	2.12	-2.84	4.05	8.05	10.87	0.23	-3.92	1	0
Brent	6.67	-1.09	3.98	13.34	28.42	-4.15	-16.78	0	1
Bromley	4.53	-0.44	2.36	9.21	4.48	2.66	2.68	1	0
Croydon	2.95	-10.29	2.35	17.98	4.67	2.66	9.10	1	0
Ealing	4.55	-3.10	3.27	9.92	6.25	2.24	0.01	1	0
Enfield	4.98	1.14	2.97	14.21	8.40	0.52	-1.13	1	0
Haringey	-0.99	11.02	3.04	42.43	29.35	-6.06	-25.70	0	0
Harrow	1.29	0.47	4.63	7.37	11.86	0.16	-7.77	1	0
Havering	3.57	-3.55	3.12	6.72	5.68	2.16	-3.85	1	0
Hillingdon	-7.74	-11.43	1.86	13.62	11.10	0.43	-8.86	1	0
Hounslow	12.40	-0.63	3.81	27.02	21.22	-1.66	-11.87	0	0
Kingston	4.89	-7.81	3.68	14.15	5.21	2.16	-0.41	1	0
Merton	1.48	-0.67	3.40	1.64	7.10	1.14	0.98	1	0
Newham	7.64	1.31	1.90	33.82	28.34	-3.76	-14.04	0	0
Redbridge	4.07	-4.26	2.23	7.49	4.75	2.66	3.12	1	0
Richmond	1.45	-12.75	4.20	10.27	12.43	-0.40	-4.49	0	1
Sutton	4.11	-4.23	4.74	6.46	5.16	2.16	2.83	1	0
Waltham Forest	5.42	1.89	3.03	23.43	10.65	1.47	-15.94	0	1
Mean	3.69	-3.15	3.31	15.18	11.44	0.45	-5.38	.7	.2
Std Dev.	3.90	5.59	0.94	10.31	8.43	2.52	8.42	.5	.4
Max.	12.40	11.02	5.00	42.43	29.35	2.66	9.10	1	1
Min.	-7.74	-12.75	1.86	1.64	4.48	-6.06	-25.70	0	0

budget share for education most below GRE share, as reflected by the ALIGN variable.

Table 4.9 shows the data, means, maxima and minima and standard deviations for non-Metropolitan Counties for 1982/3 to 1983/4, and Table 4.10 shows the corresponding figures for 1983/4 to 1984/5. The average increase in education budgets for both successive pairs of years is slightly above the corresponding averages for both the Metropolitan Districts and the outer-London Boroughs.

TABLE 4.7 DATA FOR METROPOLITAN DISTRICTS 1982/3 TO 1983/4

Authority	CHEDB %	ALIGN %	CEDGR %	CRPb	CRPb -CRPa	PCT %	PCG %	CON	NOC
Birmingham	4.27	9.79	4.47	-0.06	5.01	4.37	7.67	1	0
Coventry	3.45	5.81	1.74	1.05	4.96	4.37	1.55	0	0
Dudley	4.81	-1.28	5.38	8.07	4.19	4.37	13.03	1	0
Sandwell	5.20	-0.88	5.77	-0.56	5.25	3.74	6.18	0	0
Solihull	4.19	-1.56	3.64	3.20	4.29	4.37	11.21	1	0
Walsall	6.17	7.88	6.71	9.26	12.88	-0.65	-1.69	0	1
Wolverhampton	5.66	-1.32	4.42	6.35	5.15	4.37	4.85	0	0
Knowsley	6.61	-0.67	1.28	22.31	9.82	2.17	-2.34	0	0
Liverpool	7.72	-2.37	1.56	8.95	6.88	2.40	-4.00	0	1
St Helens	5.28	2.55	2.72	10.50	11.14	1.65	-1.30	0	0
Sefton	2.54	-1.37	1.20	13.14	4.29	4.37	10.76	1	0
Wirral	6.85	5.44	1.90	8.23	4.56	4.37	3.78	1	0
Bolton	5.78	1.82	2.87	6.11	4.50	4.37	6.65	0	0
Bury	3.86	2.15	2.06	18.31	12.01	-0.65	-4.66	1	0
Manchester	10.22	6.99	-1.65	8.59	7.99	4.07	-16.04	0	0
Oldham	6.35	5.70	2.44	7.33	4.83	4.37	5.49	0	0
Rochdale	4.86	6.15	3.75	16.96	14.35	-0.65	-9.91	0	1
Salford	6.82	5.74	1.50	8.94	4.75	3.49	-2.76	0	0
Stockport	2.93	0.98	1.72	16.26	4.32	4.37	4.68	1	0
Tameside	3.87	5.43	3.13	21.83	13.16	-0.65	-5.51	0	0
Trafford	4.60	5.56	-1.25	22.00	4.57	4.37	4.80	1	0
Wigan	8.49	4.31	2.07	17.74	12.85	-0.65	-5.16	0	0
Barnsley	3.99	4.28	3.36	20.95	12.68	0.70	-7.76	0	0
Doncaster	5.84	5.68	3.74	14.42	11.00	1.95	-7.12	0	0
Rotherham	7.94	7.00	4.52	13.27	4.66	4.37	0.53	0	0
Sheffield	7.46	12.90	3.88	21.14	13.86	-0.65	-16.00	0	0
Bradford	6.59	2.19	5.28	27.83	12.51	-0.65	-2.64	0	1
Calderdale	5.77	4.07	5.27	31.69	12.13	-0.65	-2.93	0	1
Kirklees	5.22	1.28	4.19	19.03	4.73	4.37	5.19	0	0
Leeds	6.56	1.59	2.37	19.98	4.40	4.37	2.58	0	0
Wakefield	5.49	0.39	3.75	6.82	4.31	4.37	2.59	0	0
Gateshead	6.33	6.33	2.91	7.78	5.29	3.63	-3.06	0	0
Newcastle	11.84	16.05	0.31	29.39	14.72	-0.65	-20.68	0	0
North Tyneside	6.13	6.69	3.43	30.33	13.71	-0.65	-13.54	0	0
South Tyneside	6.39	1.45	0.78	25.23	9.16	2.46	-5.51	0	0
Sunderland	10.05	10.54	3.93	22.98	12.86	-0.61	-4.25	0	0
Mean	6.00	4.09	2.92	14.59	8.27	2.35	-1.25	.2	.1
Std Dev.	2.00	4.23	1.84	8.84	3.96	2.21	7.87	.4	.4
Max.	11.84	16.05	6.71	31.69	14.72	4.37	13.03	1	1
Min.	2.54	-2.37	-1.65	-0.56	4.19	-0.65	-20.68	0	0

TABLE 4.8 DATA FOR METROPOLITAN DISTRICTS 1983/4 TO 1984/5

Authority	CHEDB %	ALIGN %	CEDGR %	CRPb	CRPb -CRPa	PCT %	PCG %	C O N	N O C
Birmingham	4.18	3.25	2.05	9.84	6.45	3.96	10.76	1	0
Coventry	8.78	6.04	1.31	15.46	7.17	2.16	-2.30	0	0
Dudley	3.93	-3.02	4.24	1.32	5.07	3.78	12.86	1	0
Sandwell	-1.52	-4.14	3.77	5.69	6.50	2.66	5.70	0	0
Solihull	2.16	-2.33	4.17	4.36	5.31	2.66	8.99	1	0
Walsall	8.43	2.47	3.29	10.15	20.31	-0.67	-1.56	0	1
Wolverhampton	2.97	-2.93	0.16	10.60	6.86	2.63	2.26	0	0
Knowsley	4.12	-2.03	1.99	19.20	15.52	-0.17	-4.20	0	0
Liverpool	1.01	-5.77	0.68	19.50	14.36	-0.49	-8.75	0	0
St Helens	5.31	0.95	3.10	20.75	25.07	-1.83	-5.58	0	0
Sefton	4.51	0.85	0.75	12.57	5.49	2.66	6.06	1	0
Wirral	6.20	2.15	1.79	10.19	9.49	0.90	0.78	1	0
Bolton	3.05	-1.71	3.63	3.62	6.07	2.66	6.16	0	0
Bury	2.33	-2.58	2.52	9.94	11.59	0.38	-3.79	1	0
Manchester	1.97	-0.83	1.02	12.89	15.07	0.79	-19.78	0	0
Oldham	4.58	0.91	4.09	10.70	6.65	2.66	4.09	0	0
Rochdale	2.63	2.14	1.60	15.84	21.65	-0.75	-10.09	0	1
Salford	1.85	3.37	2.11	27.20	17.35	-0.65	-6.09	0	0
Stockport	3.82	0.70	3.13	11.05	5.43	2.66	3.55	0	1
Tameside	5.68	3.86	3.62	7.96	21.14	-1.08	-5.30	0	0
Trafford	2.39	3.12	2.68	8.04	5.93	2.58	3.48	1	0
Wigan	4.73	-3.46	5.77	-7.50	12.22	0.49	-3.05	0	0
Barnsley	3.42	3.48	2.31	12.07	15.61	-0.13	-7.37	0	0
Doncaster	3.05	4.50	4.96	13.31	20.01	-0.75	-7.16	0	0
Rotherham	3.29	1.89	3.54	10.05	7.09	1.99	-0.34	0	0
Sheffield	5.25	10.02	4.14	36.34	31.82	-4.46	-17.43	0	0
Bradford	4.82	-3.28	5.27	2.23	11.30	0.45	2.75	0	1
Calderdale	1.54	-1.12	5.18	10.25	14.34	0.10	0.94	0	1
Kirklees	5.64	1.49	4.81	20.91	9.93	0.95	3.47	0	0
Leeds	4.52	-1.12	3.02	12.80	5.84	2.59	2.34	0	0
Wakefield	6.69	-1.53	5.78	5.86	6.23	2.17	2.78	0	0
Gateshead	4.68	5.65	-0.45	41.78	27.74	-2.25	-12.74	0	0
Newcastle	8.38	4.22	1.95	27.99	31.37	-2.31	-22.01	0	0
North Tyneside	2.99	4.10	3.27	36.74	31.39	-3.81	-15.61	0	0
South Tyneside	4.65	-1.69	-0.51	35.30	16.04	-0.08	-9.11	0	0
Sunderland	5.32	2.82	2.91	27.77	28.49	-2.36	-5.22	0	0
Mean	4.09	0.84	2.88	14.80	14.10	0.56	-2.51	.2	.1
Std Dev.	2.11	3.41	1.66	11.00	8.57	2.10	8.36	.4	.4
Max.	8.78	10.02	5.78	41.78	31.82	3.96	12.86	1	1
Min.	-1.52	-5.77	-0.51	-7.50	5.07	-4.46	-22.01	0	0

TABLE 4.9 DATA FOR NON-METROPOLITAN COUNTIES 1982/3 TO 1983/4

Authority	CHEDB %	ALIGN %	CEDGR %	CRPb	CRPb -CRPa	PCT %	PCG %	CONC	NOC
Avon	8.98	4.63	1.75	17.00	12.29	-0.65	-5.29	0	0
Bedfordshire	1.19	0.16	5.32	13.63	13.20	-0.64	-4.68	0	1
Berkshire	7.35	2.03	3.89	10.08	11.84	1.41	0.78	1	0
Bucks	8.73	-3.04	6.28	0.48	4.41	4.37	7.78	1	0
Cambridge	8.30	0.20	4.49	10.61	4.37	4.37	7.52	1	0
Cheshire	5.65	4.92	3.63	26.54	12.93	-0.64	-3.81	0	1
Cleveland	4.12	0.93	3.78	31.82	14.11	-0.65	-4.77	0	0
Cornwall	5.92	-0.49	2.93	11.45	4.35	4.37	10.53	0	1
Cumbria	5.30	-0.61	2.67	7.59	10.11	1.95	1.28	0	0
Derbyshire	6.11	1.30	4.31	8.17	8.59	2.39	2.72	0	0
Devon	6.79	-1.16	2.73	8.14	4.25	4.37	7.95	1	0
Dorset	6.27	2.47	3.25	5.09	4.24	4.37	4.93	1	0
Durham	7.82	4.16	2.96	16.68	10.07	1.92	-1.19	0	0
East	6.82	-0.12	3.13	7.21	4.12	4.37	5.76	1	0
Essex	7.31	2.77	4.41	10.07	4.40	4.37	6.52	1	0
Gloucs	6.86	3.79	1.77	8.50	4.45	4.37	4.36	1	0
Hampshire	5.81	2.42	3.29	9.70	4.44	4.37	4.66	1	0
Hereford & W	3.64	4.91	4.28	5.56	4.50	4.37	5.83	1	0
Hertfordshire	6.13	0.14	1.18	8.94	4.51	4.37	3.00	1	0
Humberside	6.59	1.90	3.83	20.26	13.00	-0.65	-2.35	0	0
Isle of Wight	6.97	-5.47	2.59	9.82	4.51	4.37	5.22	0	0
Kent	8.10	3.35	4.72	3.90	4.32	4.37	11.36	1	0
Lancashire	9.15	5.86	2.70	14.68	4.79	4.37	5.49	0	0
Leicester	9.58	4.13	3.64	9.02	4.70	4.37	5.51	0	1
Lincolnshire	5.69	5.51	4.03	15.11	4.54	4.37	6.09	1	0
Norfolk	4.86	0.48	3.27	13.00	4.27	4.37	7.93	1	0
North Yorks	3.90	-0.39	2.26	13.67	4.41	4.37	3.49	1	0
Northants	10.23	-1.68	5.72	5.12	4.74	4.37	6.62	0	1
Northumberland	10.36	7.58	2.83	2.12	9.84	2.07	1.67	0	0
Notts	6.70	4.71	3.06	34.79	12.85	-0.65	-3.05	0	0
Oxfordshire	4.11	1.80	2.58	6.16	4.26	4.37	3.93	1	0
Shropshire	6.67	1.45	4.20	8.11	4.55	4.37	8.24	0	1
Somerset	9.88	9.21	0.63	16.48	4.38	4.37	2.94	1	0
Staffordshire	5.31	-2.24	4.25	8.90	5.01	4.00	3.76	0	0
Suffolk	6.15	-0.99	4.16	7.33	4.32	4.37	4.71	1	0
Surrey	5.50	0.47	3.24	13.93	3.89	4.37	6.44	1	0
Warwickshire	7.81	5.56	2.67	8.89	4.52	4.37	4.51	0	1
West	6.25	4.64	4.13	9.60	3.90	4.37	8.82	1	0
Wiltshire	7.89	4.57	2.83	10.91	4.44	4.37	6.73	1	0
Mean	6.69	2.05	3.42	11.51	6.47	3.28	3.90	.5	.8
Std Dev.	1.94	3.05	1.15	7.12	3.45	1.88	4.24	.5	.4
Max.	10.36	9.21	6.28	34.79	14.11	4.37	11.36	1	1
Min.	1.19	-5.47	0.63	0.48	3.89	-0.64	-5.28	0	0

TABLE 4.10 DATA FOR NON-METROPOLITAN COUNTIES 1983/4 TO 1984/5

Authority	CHEDB %	ALIGN %	CEDGR %	CRPb	CRPb -CRPa	PCT %	PCG %	C O N	N O C
Avon	6.00	-0.77	4.89	25.46	29.75	-2.84	-3.97	0	0
Bedfordshire	2.44	-0.06	4.83	12.82	15.10	0.18	-0.60	0	1
Berkshire	4.24	-2.24	6.27	7.88	15.65	-0.08	4.41	1	0
Bucks	6.92	-5.01	5.61	2.73	6.74	1.97	6.02	1	0
Cambridge	4.89	-2.80	7.28	3.81	5.50	2.66	8.50	1	0
Cheshire	3.67	0.66	4.70	11.23	21.08	-0.74	-1.26	0	1
Cleveland	3.56	-1.22	3.02	9.82	26.28	-1.43	-1.43	0	0
Cornwall	6.99	-1.97	6.19	-1.46	5.52	2.66	10.58	0	1
Cumbria	3.43	-1.18	0.46	32.62	28.77	-2.43	-2.54	0	0
Derbyshire	5.67	0.64	5.72	16.07	26.38	-1.78	2.10	0	0
Devon	5.24	-2.02	6.14	5.25	5.41	2.66	7.76	1	0
Dorset	7.29	-0.82	4.68	2.38	5.19	2.66	5.80	1	0
Durham	3.47	-1.00	3.79	22.67	17.91	-0.33	0.15	0	0
East	3.94	-4.82	5.84	3.37	5.17	2.66	8.52	1	0
Essex	5.06	-1.73	5.21	5.87	5.52	2.66	7.72	1	0
Gloucs	4.79	-1.21	4.14	4.05	5.63	2.57	6.09	1	0
Hampshire	4.28	-0.29	5.12	4.90	5.86	2.47	6.47	1	0
Hereford & W	5.83	4.11	5.87	0.46	5.64	2.66	7.57	1	0
Hertfordshire	3.09	-2.69	3.69	7.08	7.60	1.56	2.88	1	0
Humberside	2.02	-2.25	4.53	16.18	26.50	-1.64	0.98	0	0
Isle of Wight	3.46	-8.70	7.06	7.79	7.49	1.66	5.91	0	0
Kent	3.42	0.36	4.99	1.57	5.52	2.66	10.70	1	0
Lancashire	4.94	0.52	4.20	11.90	8.42	1.39	5.21	0	0
Leicester	6.53	-2.56	5.23	5.57	5.96	2.66	7.24	0	1
Lincolnshire	4.04	2.50	5.34	8.97	5.75	2.66	7.85	1	0
Norfolk	4.29	-1.92	5.74	6.69	5.32	2.66	9.26	1	0
North Yorks	5.77	-1.12	2.60	13.89	6.29	2.16	3.33	1	0
Northants	5.01	-7.66	7.77	2.09	5.99	2.66	9.99	0	1
Northumberland	7.26	1.09	-0.60	17.90	24.76	-1.50	-3.24	0	0
Notts	-1.01	-1.98	4.49	10.49	17.90	-0.28	1.58	0	0
Oxfordshire	4.23	0.94	3.89	8.81	6.02	2.16	4.21	1	0
Shropshire	6.52	-2.68	4.05	8.41	5.81	2.66	8.56	0	1
Somerset	9.85	3.66	6.34	14.01	13.41	0.16	3.78	1	0
Staffordshire	3.71	-2.55	5.32	11.44	13.07	0.35	3.72	0	0
Suffolk	4.15	-2.83	4.42	3.96	6.22	2.16	5.12	1	0
Surrey	2.67	0.04	4.09	4.66	5.56	2.24	5.07	1	0
Warwickshire	3.45	1.36	5.88	4.93	7.74	1.51	5.25	0	1
West	4.90	1.22	6.47	1.48	4.79	2.66	13.26	1	0
Wiltshire	6.21	-0.31	5.10	6.58	5.50	2.66	8.22	1	0
Mean	4.67	-1.21	4.88	8.83	11.10	1.27	4.89	.5	.2
Std Dev.	1.85	2.56	1.61	7.11	8.08	1.73	4.14	.5	.4
Max.	9.85	4.11	7.77	32.62	29.75	2.65	13.26	1	1
Min.	-1.01	-8.70	-0.60	-1.46	4.79	-2.83	-3.97	0	0

THE RESULTS

The task of modelling expenditure changes is more ambitious than that of modelling expenditure levels because one would expect to see greater randomness in year-on-year changes if only because of data measurement errors. However, in view of this it is argued that the results from testing the model are satisfactory in terms of their overall explanatory power.

Table 4.11 gives the regression results of the model used to explain the increase in education budgets for 1983/84 over 1982/83 for

TABLE 4.11 REGRESSION RESULTS FOR 1982/83 TO 1983/84, DEPENDENT VARIABLE CHEDB

	Met Dists		non-Met Counties		Outer-London	
	Coeff	t	Coeff	t	Coeff	t
ALIGN	.158b	1.759	.267a	2.521	.106	.530
CEDGR	-.125	-.459	-.099	-.297	-.398d	-.766
CRPb	.013	.293	-.059d	-.947	-.180	-1.052
CRPb-CRPa	-.325d	-.923	.141	.257	-.056	-.054
PCT	-.290	-.482	.233	.220	.211	.150
PCG	-.107d	-1.129	.188d	1.026	-.024	-.102
CON	-1.520c	-1.692	-1.839b	-2.088	-3.987d	-1.285
NOC	.259	.266	-1.039d	-1.067	-.701	-.245
CONST	9.074b	2.010	5.924d	.803	13.154d	.980
R^2	.494		.322		.254	
R^2	.344		.142		-.288	
No of Obs	36		39		20	
SSR	71.031		97.259		131.772	

a, b, c and d denote regression coefficients significantly different from zero in a one tailed test at the .01, .05, .10 and .25 levels respectively.

Metropolitan Districts, non-Metropolitan Counties and outer-London Boroughs. Table 4.12 gives the corresponding regression results for increases in education budgets for 1984/85 over 1983/84. ALIGN has

the expected sign in all six regressions and is usually significantly

TABLE 4.12 REGRESSION RESULTS FOR 1983/4 TO 1984/5, DEPENDENT VARIABLE CHEDB

	Met Dists		non-Met Counties		Outer-London	
	Coeff	t	Coeff	t	Coeff	t
ALIGN	.322b	2.349	.143d	1.065	.388a	3.241
CEDGR	-.139	-.408	-.072	-.224	1.853a	2.927
CRPb	-.051d	-.752	.738d	.827	.038	.332
CRPb-CRPa	.075	.451	.572	.219	1.304a	3.727
PCT	.059	.081	.069	.047	4.264a	3.950
PCG	.058	.583	.189d	.851	.466a	3.440
CON	-.809d	-.701	1.497d	1.103	-6.188b	-2.134
NOC	-.050	-.044	1.587d	1.165	-1.873d	-.786
CONST	4.189d	1.214	1.766	.331	-11.822c	-1.584
R^2	.233		.145		.819	
R^2	.006		-.083		.687	
No of Obs	36		39		20	
SSR	120.088		110.718		52.107	

a, b, c and d denote regression coefficients significantly different from zero in a one tailed test at the .01, .05, .10 and .25 levels respectively.

different from zero. CEDGR, the percentage year-on-year change in education GRE is less successful, usually not being significantly different from zero, though it does carry the correct sign in the one regression where its significance is firmly established: in outer-London Boroughs for 1983/84 on 1984/85. In fact the regression as a whole for outer-London Boroughs for 1983/84 on 1984/85 stands out from all the other regressions in having by far the highest value for R^2 and having all coefficients significant except the level of fiscal pressure and with their expected signs. It is not known if this result is due to other than sampling variation.

Generally the level of fiscal pressure (CRPb) and marginal fiscal

pressure (CRPb-CRPa) variables are not very successful, usually being not significantly different from zero, the exception being marginal fiscal pressure in the outer-London Boroughs regression just mentioned. This story is repeated for PCT (percentage change from target to budget) and PCG (percentage change from GRE to budget), which generally show up poorly again except for outer-London Boroughs in the second time period. In contrast, the political variables CON and to a lesser extent NOC are usually significant with generally the expected negative signs, except in the case of non-Metropolitan Counties in 1983/4 to 1984/85 where the effect is quite strongly in the direction opposite to that expected.

Given the rather low t ratios for NOC generally it might seem to be

TABLE 4.13 REGRESSION RESULTS FOR 1982/3 TO 1983/4, DEPENDENT VARIABLE CHEDB, LAB USED INSTEAD OF CON, NOC

	Met Dists		non-Met Counties		Outer-London	
	Coeff	t	Coeff	t	Coeff	t
ALIGN	.114c	1.334	.227b	2.132	.037	.192
CEDGR	.017	.080	-.131	-.396	-.277	-.524
CRPb	.011	.240	-.056d	-.875	-.124d	-.759
CRPb-CRPa	-.409c	-1.160	.213	.382	.068	.066
PCT	-.420	-.695	.270	.250	.357	.253
PCG	-.169b	-1.978	.197d	1.050	-.124	-.574
LAB	.707d	1.021	1.285c	1.460	2.101d	.820
CONST	9.043b	2.057	3.955	.537	6.898	.580
R^2	.457		.273		.177	
$\bar{R}^2$	.322		.109		-.302	
No of Obs	36		39		20	
SSR	76.112		104.353		145.318	

a, b, c and d denote regression coefficients significantly different from zero in a one tailed test at the .01, .05, .10 and .25 levels respectively.

preferable to express political effects in a less detailed way - by

just using a labour dummy (LAB) on its own for instance. This is tried in the tables of regressions in Tables 4.13 and 4.14. On balance it is worth keeping both CON and NOC in the regressions as the reduction in R^2 that arises from just using LAB is marked.

TABLE 4.14 REGRESSION RESULTS FOR 1983/4 TO 1984/5, DEPENDENT VARIABLE CHEDB, LAB USED INSTEAD OF CON, NOC

	Met Dists		non-Met Counties		Outer-London	
	Coeff	t	Coeff	t	Coeff	t
ALIGN	.311b	2.319	.138d	1.099	.315b	2.453
CEDGR	-.101	-.307	-.068	-.216	2.075a	2.957
CRPb	-.050d	-.758	.074d	.840	.081	.644
CRPb-CRPa	.077	.466	.060	.234	1.601a	4.472
PCT	.046	.064	.076	.520	5.082a	4.507
PCG	.050	.512	.187d	.860	.366b	2.547
LAB	.417	.461	-1.541d	-1.217	2.714d	1.027
CONST	3.610d	1.111	3.239	.622	-22.644	-3.947
R^2	.224		.145		.750	
R^2	.030		-.048		.604	
No of Obs	36		39		20	
SSR	121.476		110.757		71.914	

a, b, c and d denote regression coefficients significantly different from zero in a one tailed test at the .01, .05, .10 and .25 levels respectively.

CONCLUSIONS

The model described above is directed at the task of explaining not levels of education budgets but year-on-year changes in the education budget. It has been argued that this is at once more difficult, but more interesting in a policy context. It is therefore pleasing that the levels of explanation obtained are quite high. In general the ALIGN variable works well. Overall its coefficients suggest that when budget share for education is out of line with GRE share, budget

changes are made in the following year that on average remove about one third of the discrepancy. A second finding is that the effect of politics is generally well established in these models with Conservative, or no overall control having a negative effect on changes in education budgets.

The effect of change in education GRE (CEDGRE) is less well established with all coefficients carrying the "wrong" signs though insignificantly different from zero except for outer-London Boroughs in 1983/84 to 1984/85. Fiscal pressure measures are not very successful in these models. The chain of causation with these variables is indirect in that they were included because of their likely effect on the total budget and hence by implication a partial effect on the education budget. These variables are far more successful in explaining changes in overall local authority budgets as seen in Chapter 2. Changes in overall GRE and target also have limited explanatory power except for the regressions for outer-London Boroughs in 1983/84 to 1984/85 where they are very successful.

In fact the regressions for outer-London Boroughs in 1983/84 to 1984/85 perform outstandingly well for reasons that are not entirely clear.

How do these results compare with the studies mentioned earlier? A major difference in approach is that the present study attempts to explain year-on-year changes, whereas Dawson (1976), Foster, Jackman and Perlman (1980), Jackman and Papadachi (1981) and Jesson et al (1985) all attempt to explain levels. Nevertheless, there is a consistency with Foster, Jackman and Perlman and Jackman and Papadachi in

finding negative effects on expenditure of Conservative control.

The models estimated here have laid more emphasis on the factors that impinge on local government from central government - the fiscal pressure experienced, the extent to which their education budget share differs from their GRE share and the overall budget effect of the divergence of their budget from target and GRE. The models reviewed in the brief survey above place more emphasis on demographic factors such as pupil numbers and cost factors such as the proportion of graduate teachers. In this study, changes in cost and demographic factors are represented by the change in education GRE.

It is concluded that the extent to which expenditure changes can be explained by the mainly financial factors and also political used here is encouraging. Future work may generate closely fitting models that combine such financial measures with a greater range of cost and demographic factors than are used here.

In the next chapter the housing branch of the capital expenditure budget is examined.

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CHAPTER FIVE*

A MODEL OF LOCAL AUTHORITY HOUSING INVESTMENT

INTRODUCTION

So far, the chapters in this thesis have examined general government expenditure and aggregate local authority expenditure, both current (Chapter 3) and capital (Chapter 4). In Chapter 5 the education branch of the local authority current expenditure budget was examined. In this chapter, housing, the most important branch of the local authority capital expenditure budget is examined.

Capital expenditure on housing has for many years accounted for more than fifty per cent of the local authority capital expenditure budget.(1)

This chapter develops a model proposed in Nicholson and Topham (1971) as a theoretical basis for examining the investment decisions of local authorities in Great Britain. It provides an analysis of the determinants of investment in housing by what were, until the 1974 reorganization, the four tiers of local authority responsible for

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(*) This Chapter is based on R.J. Nicholson, N. Topham and P.A.Watt, "Housing Investment by Different Types of Local Authority", Bulletin of Economic Research, II November 1975, pp 65-86.

(1) In 1967/68 it stood at 57% of the capital expenditure of local authorities in England and Wales. Some figures for other years are 1975/76: 63%, 1979/80: 54%, 1982/83: 54%, 1984/85 56*% (Central Statistical Office, Annual Abstract of Statistics - various years).

housing; County Boroughs (CBs), Non-County Boroughs (NCBs), Urban Districts (UDs) and Rural Districts (RDs).(1) These authorities differed widely in size, sociological and economic composition, local resources etc., and represented different levels of local government organization and administration. The purpose of the investigation is to establish what the determinants of investment in housing are for these four tiers of local authority and find if they differ significantly between tiers.(2) Such information is of value to central governments who wish to implement a housing programme when the various areas of local government may react differently to different stimuli.

BACKGROUND

1.1 THE MODEL

Briefly, the model represents a simple welfare maximizing process which treats investment decisions by local governments in a way analagous to that employed in conventional investment analysis of profit making industry but, in the present context, with the emphasis on social costs and benefits.

The level of investment is seen as determined by two interacting schedules called the social marginal efficiency of investment (SMEI) and social marginal cost of funds (SMCF) - schedules. The SMEI schedule reflects the real rate of return on marginal projects. It is

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(1) London Boroughs were not included in this study because the reorganisation of the authorities into the G.L.C., which occurred during the sample period, resulted in major discontinuities in statistical series.

(2) The possible effect of size of local authorities as a factor affecting investment decisions is considered in Nicholson and Topham (1972). Statistical tests for differences between the tiers are carried out in Appendix III to this chapter.

related to such factors as the size and condition of housing stock, overcrowding, population growth, age and socio-economic composition which determine the net benefits from capital expenditure on housing and, it may be argued, ultimately falls as investment increases. The SMCF schedule parallels the marginal cost of funds schedule in conventional analysis and indicates the risk rate (including political risk) associated with the financial implications of the capital programme. It is related to factors which give rise to financial pressure on an authority as investment increases and would be affected by, for example, the product of the penny rate per head. It is presumed that authorities continue investment until project return is equated with the risk rate at the margin.

Investment decisions are also affected by local influences; for example local drive, local tastes and local authority attitudes. The classification of these influences involves the important question of whose social welfare function is the relevant one in the welfare maximizing process, the central government's or the local government's? The two may not be the same since the latter is a function of local tastes and local priorities which may in some respects be at variance with central government priorities. The present study has classified as SMEI variables those which reflect central government priorities as indicated by central government policy statements. All local influences are classified together as Local factors. If Local factors are important they may be taken as indicating local divergences from the central government's welfare function and, from the point of view of central government, making for non-optimal decisions. However so far as these factors represent specific local tastes they are directly relevant to local SMEI schedules and their

inclusion certainly contributes to optimal allocation from the point of view of the local community. Not all local influences necessarily make for optimal allocation and one possibly distorting influence, "Impetus", is included in the analysis.

Formally the model may be set out in the following way. I denotes the level of investment; r^m and r^c the rate of return and risk rate associated with the marginal project; x_1, x_2,... factors specifically affecting the SMEI schedule; y_1,y_2,...factors specifically affecting the SMCF schedule; and z_1, z_2,... factors (including Local factors) which can affect either schedule.

SMEI schedule $r^m = f_1(I,x_1,x_2,\ldots,z_1,z_2,\ldots,e)$

SMCF schedule $r^c = f_2(I,y_1,y_2,\ldots,z_1,z_2,\ldots,n)$

Equilibrating condition: $r^m = r^c = r$

(e and n, stochastic disturbance variables)

It is assumed that the x...,y...,z... factors relevant to the local authority's decision taking process are known factors on which the authority takes its decision,(1) and econometrically are exogenous variables. The endogenous variables in the model are the level of investment I and the equilibrating rate of return r. Thus there are two reduced form relations:

$$I = g_1(x_1,\ldots,y_1,\ldots z_1,\ldots,u) \qquad (1)$$

$$r = g_2(x_1,\ldots,y_1,\ldots z_1,\ldots,v) \qquad (2)$$

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(1) Or, less strongly, that the conditions which motivate investment are described by these ex ante variables

r is in practice unmeasurable and so it is not possible to estimate (2) or the parameters in the SMEI and SMCF schedules. All the following work is devoted to an examination of (1), the reduced form investment function in which investment is expressed as a function of all the explanatory exogenous variables.

1.2 THE BASIC DATA

Investment for each local authority is measured by the annual capital payments for housing per thousand population, at constant prices, averaged over the years 1962-8. This average has been calculated for all 82 CBs and for a sample of lower tiers consisting of 143 NCBs, 112 UDs and 86 RDs.(1) The analysis is therefore a cross-section one and the concern is with the variation in capital expenditure as between local authorities.

A major task has been the selection and construction, for all 423 authorities, of measurable variables which reflect the factors believed to influence the investment decision. Altogether over forty separate variables were compiled and these are listed in Appendix I. It was never intended that all of them would be included together in the estimated investment functions, but since little work has been done in this area of public investment it has been necessary to examine a wide range of variables to decide which, on institutional and economic grounds, are the most relevant ones in the decision taking

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(1) An initial random sample for each tier was taken from IMTA records, but certain authorities whose boundaries had been changed during the years 1962-68 were replaced by other authorities also randomly selected. The sampling fractions in round terms were: NCBs 0.5, UDs 0.2, RDs 0.2.

process, and which are statistically the most reliable and useful ones to represent these decision factors.(1) Detailed provisional analyses resulted in a final selection" of seventeen variables which are described in the following paragraphs and given short names for reference in subsequent discussion.

SMEI VARIABLES

Adequacy of the existing housing stock

(1) The estimated number of houses declared unfit in 1955 as a proportion of total housing stock in an area. (UNFITNESS)

This is an indicator of the quantity of low quality housing as perceived by the public health inspector. It is possible that the figure understates the true incidence of unfitness in areas with particularly severe housing problems as the inspector may unofficially bear in mind and be limited by the ability of the local authority to replace those houses he declares unfit.

(2) The number of households in an authority without or sharing hot water supply as a per cent of all households. (HOT WATER LACK)

This variable is introduced as an indicator of lack of amenities in the existing housing stock.

(3) The number of dwellings in an authority with rateable value under 10 as per cent of all dwellings in that area. (LOW RV)

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(1) All the variables together with quadratic forms of some of them were used in Nicholson and Topham (1971), and the reasons they were selected and the decision hypotheses associated with them are set out in that paper. A detailed study of the statistical problem of multicollinearity arising from the use of such a large number of variables was given in Nicholson and Topham (1973). Both of these studies were for County Boroughs only.

The implications of this variable are complex. Low rateable value housing may, in certain areas, be poor or inadequate housing and hence be an indicator of housing need. The variable is to be interpreted in this way in the investment functions of CBs, NCBs and UDs. But in RDs a large proportion of housing of low rateable value does not necessarily indicate inadequate housing: it indicates a large stock of small houses or houses which, because of their situation, have low letting value. In this situation the variable is more an indicator of limited local financial resources since an authority's available tax base is the total rateable value of the properties in its area. The lower the total rateable value per head, the greater the pressure in raising finances locally through the rates. In this sense, as pointed out in Appendix 2, LOW RV has affinities with variable 10 (below) relating to the Rate Deficiency Grant, and is to be classified as an SMCF variable. However for the tiers other than RDs the SMCF aspect of LOW RV is in general better picked out by variables 10 and 11, LOW RV being interpreted as an SMEI variable.

(4) An overcrowding index given by the percentage of households in an authority living at a density of more than one person per room. (OVERCROWDING)

Demographic

(5) Population growth rate (total), 1951-61, per cent per year. (POPN. GR. TOT)

(6) Population growth rate (balance), 1951-61, per cent per year. (POPN. GR BAL) This is the excess (or deficit) of population

growth rate (total) over the rate of natural increase by births and deaths, and hence is the migration rate into or out of an authority.

(7) Actual population of the authority at the 1961 Census of Population. (POPULATION)

This variable is introduced in an attempt to detect any effects resulting from the size of the local authority.

(8) The number of persons per acre. (POPN. DENSITY) This variable was originally introduced as a possible indirect indicator of housing needs, on the hypothesis that a high population density might be associated with dense and poorly arranged housing. In practice, however, it has been more useful as an indicator which distinguishes between different kinds of authority (see Section 1.3). The variable is highly correlated with actual population size.

SMCF VARIABLES

Financial Resources

(9) The Percentage of an authority's total current expenditure met by the Rate Deficiency Grant. (RDG)

This variable is discussed in Appendix 2. It is in principle a measure of the lack of local resources.

(10) The product of the penny rate per head, 1961. (PENNY RATE PRODUCT)

This is an indicator of the strength of the local tax base, and hence of local resources. It measures the total rate income per head to a local authority arising from a levy of a one-penny in the pound rate on its taxable properties. If an authority's total rateable value per head is low, the PENNY RATE PRODUCT will also be low. The

variable is, therefore, in general a more sensitive indicator of the financial pressures which are associated with a weak tax base than LOW RV (except, perhaps, in the special circumstances of RDs, discussed above) since this relates to only a Proportion of the tax base.

LOCAL VARIABLES

The rationale of sub-national government is that there is significant variation in tastes and choice patterns between local communities. Variables 11 to 16 are included to take account of these differing attitudes. Local tastes are reflected in local welfare functions and so are relevant to local SMEI functions and contribute to local optimal allocation decisions.

Local Tastes and Attitudes

(11) A socio-economic index given by the percentage of heads of households included in the 1961 Census of Population socio-economic classes 1, 2, 3, 4 and 13. (SOCIO-ECON)

This is an index of the proportion of a local authority's population in the "higher" socio-economic groups. It is presumed that residents in those groups would prefer housing in the private rather than the public sector. The lower the proportion, the greater that sector of the population which might be expected to demand local authority housing.

(12) Housing propensity: the total local authority stock as a per cent of the total stock of all dwellings in the area. (HOUSING PROPEN) This variable is taken as an indicator of the authority's propensity to provide local authority housing in its area. It is governed by the demand for local authority housing in earlier years, and the

authority's response to it. If this response is maintained, the variable reflects a long term "attitude" of the local authority.

(13) The proportion of total government seats held by the Labour party 1955-64. (LABOUR)

This variable, which ranges from 0 to over 0.8, was introduced to test whether local political "colour" was significantly associated with housing investment.

Type of Area

The following three variables were introduced to indicate certain socio-economic characteristics of each local authority. They may be regarded as coming broadly within the classification of local choice variables.

(14) Industrialization Index: the percentage of total rateable value accounted for by factories, mills, etc., 1963-4. (IND. INDEX)

(15) Domestic property index: the percentage of total rateable value accounted for by houses, maisonettes, flats, etc., 1963-4. (DOM. INDEX)

(16) Commercialization Index: the percentage of total rateable value accounted for by shops, offices and other commercial buildings, 1963-4. (COMM. INDEX)

Local Impetus

(17) 1958-61 addition to local authority housing stock as per cent of total post-1945 local authority housing stock. (IMPETUS)

This variable, in association with the dependent variable, measures

the importance of an on-going housing programme. It is introduced to indicate the dynamic of the town-hall machine. This influence on local housing investment is discussed more fully in Nicholson and Topham (1971, p.285). The important point is that it may not be wholly a function of local community tastes, but one reflecting decisions of a strong executive team attempting to pursue its own goals. To this extent it makes for non-optimal allocation.

Regional Variations

A set of eight regional dummy variables. These are discussed in Section 2.1.

It will be appreciated that there are inter-correlations among many of these variables. However, in choosing them from the original bank of variables listed in Appendix 1, the attempt has been to use representative series and so control, as far as possible, the statistical consequences of inter-correlation. All the variables are, in terms of the model proposed, exogenous. With four exceptions they relate to years prior to the capital expenditure period of 1962-8 and are, therefore, known decision taking variables. The exceptions, RDG and the Industrialization, Domestic Property, and Commercialization indexes are for the years 1963-4 but may be taken as exogenous for the purpose of the model.

1.3 CHARACTERISTICS OF THE TIERS

The means of all the variables used in the subsequent analyses are given, for each tier, in Table 1. These reveal social and economic differences between the tiers an appreciation of which is important for understanding the influences which govern local authorities' decisions to invest in housing. In what follows, CBs, NCBs and UDs are

TABLE 1: MEANS OF THE VARIABLES BY TIER

Variable	County Boroughs	Non-County Boroughs	Urban Districts	Rural Districts All	Rural Districts High Agricultural Index	Rural Districts Low Agricultural Index
			Dependent Variable			
HOUSING EXPENDITURE £ thousands	8.34	8.79	7.21	5.12	4.31	5.94
			Explanatory Variables			
SMEI Variables						
1 Unfitness	8.44	5.58	4.38	6.17	6.97	5.38
2 Hot Water Lack	24.49	21.8	17.8	26.14	30.77	21.51
3 Low RV	16.21	16.25	18.05	32.82	40.23	25.42
4 Overcrowding	10.61	7.83	7.66	9.15	8.24	10.05
5 Popn. Gr. Tot.	0.12	0.63	1.55	0.63	-0.12	1.37
6 Popn. Gr. Bal.	-0.28	0.38	1.27	0.17	-0.50	0.83
7 Population*	16.30	3.02	1.95	2.09	1.22	2.96
8 Popn. Density	12.04	6.65	4.76	0.43	0.17	0.70
SMCF Variables						
9 RDG	15.02	20.04	22.22	38.14	47.98	28.3
10 Penny Rate Prod	5.95	5.95	5.18	4.20	3.69	4.72
LOCAL VARIABLES						
11 Socio-Econ	11.47	15.66	17.62	17.36	18.89	15.83
12 Housing Propen	26.97	24.50	22.52	18.40	16.47	20.33
13 Labour	0.60	0.21	0.24	0.06	0.00	0.12
14 Ind. Index	16.78	13.47	11.88	7.82	3.79	11.86
15 Dom. Index	46.28	52.28	57.04	59.58	64.92	54.24
16 Comm. Index	23.56	20.79	16.46	9.97	11.37	8.56
17 Impetus	15.35	12.56	10.56	9.86	7.66	12.06

* ten thousands

referred to collectively as the urban tiers, distinguishing them from the RDs.

County Boroughs

These are on average the largest and most densely populated authorities in the survey, and include all the large city slum districts. The average quality of housing stock as indicated by the

incidence of unfitness and poorness of amenities (hot water lack) is the lowest and the overcrowding index is the highest of the urban tiers. Their socio-economic pattern is indicated by the lowest proportion of population in the high socio-economic groups, the highest industrialization and commercialization indexes, and the highest proportion of total housing stock in the public sector, of all tiers. Politically they are mainly Labour controlled. They show the lowest rate of population growth and, indeed, are characterized by net outward movement of population.

Non-County Boroughs

These are smaller authorities, with population density less than half that of CBs. There is lower incidence of unfitness or poorness of amenities in the housing stock, and less overcrowding. The socio-economic index is higher and the industrialization and commercialization indexes are lower, indicating that these authorities are more residential in character. The rate of population increase is higher than for CBs and, perhaps more important from a housing point of view, there is a net movement into these authorities.

Urban Districts

These are the smallest of the urban tiers and have the lowest population density. They exhibit all the characteristics of "desirable residential areas". Compared with CBs and NCBs they have the highest socio-economic index, the lowest incidence of unfitness and poor amenities in the housing stock, least overcrowding, and the highest incidence of residential property. The proportion of total housing stock accounted for by local authority housing is lower, and capital expenditure on housing by local authorities is lower, than in either

CBs or NCBs. These authorities show, on average, a high rate of growth of population which reflects considerable movement of population into the areas. Rural Districts RDs form a special case. It became apparent from preliminary results that there were two distinct types; those with small populations scattered over large areas and comprising predominantly farming communities, and the more compact ones with greater local financial resources developing as residential rather than agricultural areas. Accordingly the authorities were classified into two equal sub-groups by a specially constructed agriculturalization index refecting the percentage of the authority's total rateable value accounted for by agricultural property. The means of the variables in these classes are shown in Table 1.

Compared with the urban tiers, the incidence of unfitness of housing stock, poor amenities and overcrowding is higher than in NCBs or UDs. Indeed HOT WATER LACK is higher than in any other tier. Within RDs, unfitness and lack of amenities is higher in the more agricultural areas, but overcrowding higher in the more residential, low agricultural, areas. Nevertheless, in spite of these indications of inadequacies in their housing stocks, investment in housing per head is substantially lower in RDs -particularly in the more agricultural RDs -than in any of the urban tiers. Some reasons for this may be traditional, coupled with the fact that it is difficult to build up a housing programme in scattered rural areas where requirements may be for a few houses here and a few there. Certainly the proportion of housing stock accounted for by local authority housing (again, particularly in the more agricultural RDs) is lower than in any of the urban tiers. A contributory factor may be that housing investment in RDs is inhibited by lack of local resources : the product of a penny rate

which measures the strength of the local tax base is lower in both groups of RDs than in the urban tiers and the proportion of total expenditure financed from the Rate Deficiency Grant is approximately twice as high. These two indicators show also that the thinly populated high agricultural RDs are poorer than the more urban-type of RDs. In this context it is at first sight strange that the Socio-Economic index of the RDs is higher than that of any of the urban tiers, with that of the agricultural RDs highest of all. Unfortunately the index in this respect is misleading since the grouping of occupations made by the Census of Population which constitutes this index includes farmers, many of whom are small, independent, owner-occupiers with very limited resources.(1) Finally, population is declining in the more agricultural RDs from which there is a net outflow, but increasing in the residential-type RDs which experience on average a net inflow of population second only to that of the UDs.

As a broad conclusion, the characteristics of the residential, low agricultural, RDs are comparable in many respects with those of the urban tiers; it is the high agricultural RDs which stand out as having quite special characteristics.

1.4 STATISTICAL PROCEDURE

A linear investment function was assumed, permitting estimation by simple linear regression of the dependent variable (capital payments for housing per head) on the explanatory (exogenous) variables. Because of the differences between the tiers it was not to be expected that all variables would be equally appropriate in the individual

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(1) See for example Wilson (1973)

investment functions. The problem, therefore, was that of constructing the most appropriate function from the bank of explanatory variables. The method chosen was that of Optimum Regression proposed by Beale, Kendall and Mann (1967) which selects from the available explanatory variables that combination giving, for a specified number, n, of explanatory variables, the highest value of R^2. By varying the control parameter, n, models of different size could be estimated making possible an assessment of the stability of the coefficients. This was considered a reasonable procedure since the bank of seventeen variables had already been pre-selected in the light of their economic and institutional relevance to the decision taking process. The maximum possible values of R^2, using all variables, are shown in Table 2.

Figure 1 shows how the optimal values of (excluding regions) rise

TABLE 2: VALUES OF R^2 USING 17 EXPLANATORY VARIABLES AND REGIONAL DUMMIES

		Excluding regional dummies	Including regional dummies
CBs		0.533	0.616
NCBs		0.367	0.411
UDs		0.355	0.415
RDs	all	0.345	0.414
	High agricultural	0.579	*
	Low agricultural	0.445	*

* There were too few observations in these sub-groups to make a regional analysis possible

to the maximum as the number of explanatory variables is increased. The curve traced out by the for each tier first rises quite rapidly as further variables are introduced, but subsequently tends to fatten out. Ranked by the models for the CBs show the highest explanatory

power, and those for UDs the lowest. The for the two more homogeneous groups of RDs are higher than that for all RDs together. Results obtained by adding the variables to the regional dummies showed the same patterns.

In the light of these results it was decided to concentrate on mod-

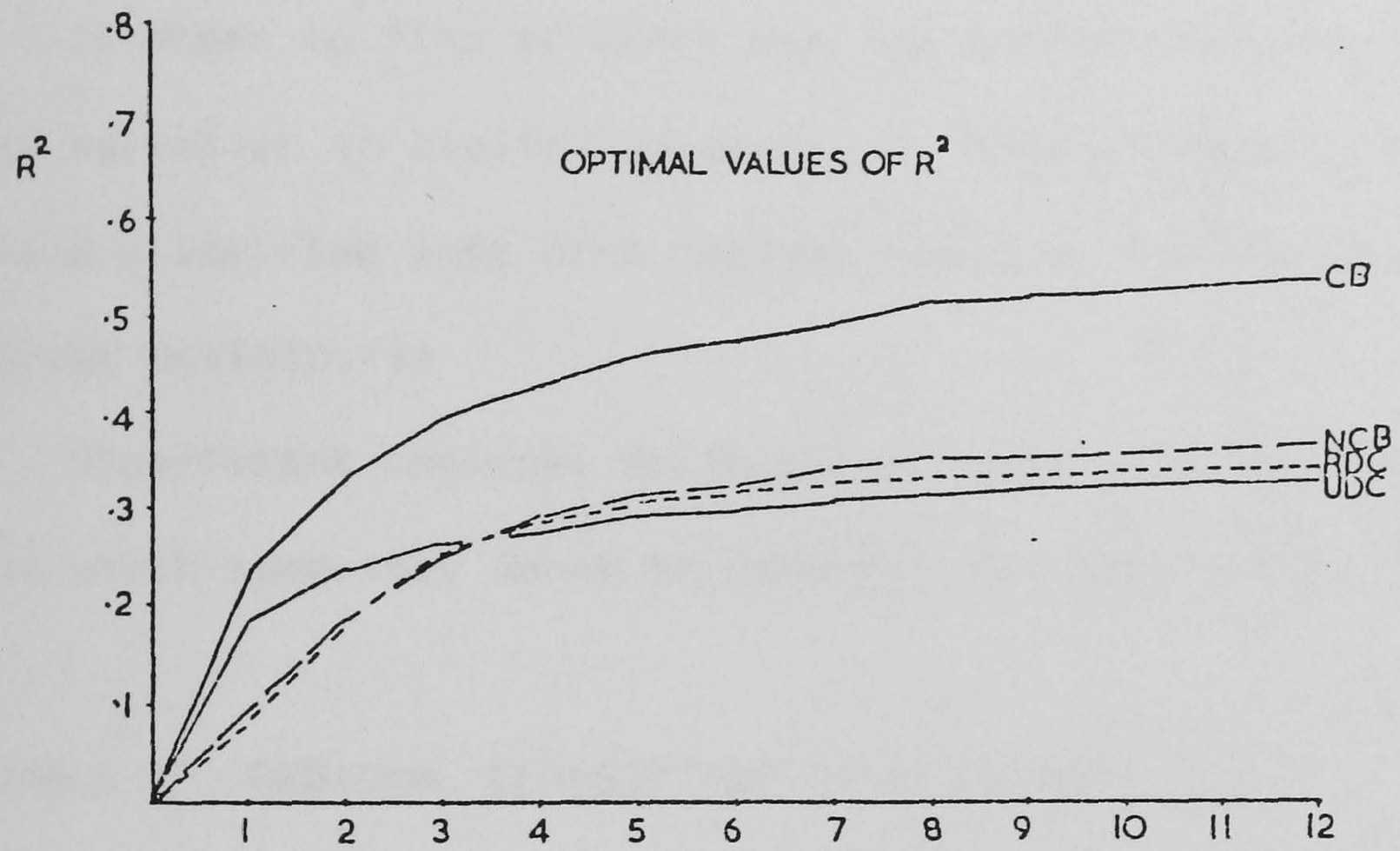

FIGURE 1

els which included five or six of the basic explanatory variables (i.e. not counting regional dummies). These models were large enough to allow selection of the most appropriate group of variables for each individual tier. They were also as large as could be achieved before the "flat" part of the R^2 curve was encountered. Statistically, this means that additional variables beyond the 6 would have been either unimportant ones in the decision process, or so inter-correlated with the included ones that individual coefficients would have become unstable and no reasonable significance tests of hypotheses could have been carried out.

All data are used in standardized form (i.e. scaled to zero mean and unit standard deviation) so that the regression coefficients can

be compared among themselves and between tiers. In this respect, however, it must be appreciated that they are all subject to sampling error.

THE ANALYSES

2.1 REGIONAL VARIATIONS

In order to find if there was any specifically regional explanation of variation in capital payments per head on housing the authorities were classified into nine regions based on the New Standard Regions of Great Britain.(1)

Significant regional differences could arise from regional policy, in which case they would be regarded as contributing to optimum allocation from the national and, it is to be hoped, the local points of view. Regional variations could also reflect the fact that important causal factors (e.g., levels of building costs) are themselves distributed in some significant regional pattern. From this standpoint all seventeen variables described in Section 1.2 were examined by analysis of variance using the 9-region factor of

TABLE 3: REGIONAL CLASSIFICATION OF AUTHORITIES

	ENGLAND								WALES
	North	Yorks and Humberside	Mids	East	West	Mids	West	Anglia	
CBs	10	13	5	10	5	11	21	3	4
NCBs	7	14	8	35	19	10	24	10	16
UDs	10	13	6	18	12	9	25	8	11
RDs	13	14	5	20	12	2	7	5	8

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(1) See for example, the Abstract of Regional Statistics, no 6, 1970, HMSO, London

classification.(1) Four variables in particular stood out as having in all tiers significant regional association: OVERCROWDING, HOT WATER LACK (the amenity indicator), LOW RV, and RDG. Since in subsequent analyses these influences are taken care of by specific variables, a regional effect is important only if regional variables have some further, net, explanatory power, that is to say if regional analysis picks up influences for which specific measures have not been included.

Eight regional dummy variables taking the values 1 or 0 were introduced to incorporate the 9-regional classification. Such variables when included in regression analysis act as regional "shift" indicators. As a first step the dependent variable was regressed on the eight regional dummies only and the values of R^2 achieved were CBs .089, NCBs .008, UDs .178 and RDs .148.

These correlations are all low and, even with these sample sizes, only that for UDs reaches marginal significance at the 5 per cent level. The values of indicate the maximum explanatory power of the regional classification since no other variables (with which the regional dummies might be correlated) are included. The conclusion is that specifically regional variation arising from whatever source (regional policy or omitted variables) is not a significant part of the explanation.

There remains the possibility that one or two individual regions might have a significant shift effect when incorporated with other

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(1) This procedure was suggested by comments made by Professor Sir Roy Allen in Nicholson and Topham (1971, p307). The treatment of dummy variables is explained in most Econometrics texts; for example Johnston (1973).

variables. This was tested by forcing all regional dummies into the regression models, but it was found that in no case did any of the regional variables appear as significant, nor did their addition significantly increase the explanatory power of the models. In general their presence merely increases the standard errors of the coefficients of the other variables or makes the coefficients unstable because of the intercorrelations between variables and regions.(1) For this reason the models given in the following sections concentrate on the optimum regression results derived from the seventeen basic variables only. However, for comparison, models including all regional dummies are also shown.

2.2 COUNTY BOROUGHS

The results of the six variable models are given in Table 4. The same six variables appear in both models and neither the coefficients nor their t values are much affected by the inclusion of the regions. The values of are 0.473 or 0.544 if the regional dummies are included.

The functions include important SMEI variables. The first two, UNFITNESS and HOT WATER LACK make it clear that need for replacement and improvement of housing stock are important determinants of housing investment. A further one is OVERCROWDING, indicating the relevance of the inadequacy of existing stock for housing an authority's population. The coefficient of this variable is particularly strongly established. The inclusion of LOW RV with positive sign, acting as an indicator of the presence of low quality housing and hence of housing need (Section 1.2), underlines the importance of the state of the

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(1) See, for example, the result for HOT WATER LACK in the model for UDs, section 2.4.

TABLE 4: CBs: HOUSING INVESTMENT FUNCTIONS

	Excluding regions		Including regions	
	Coefft	|t|	Coefft	|t|
Unfitness	0.325	3.46	0.328	3.09
Hot Water Lack	0.189	1.96	0.190	1.65
Low Rv	0.214	1.57	0.270	1.83
Overcrowding	0.338	3.51	0.400	3.22
RDG	-0.344	2.57	-0.400	2.80
Impetus	0.239	2.76	0.255	2.93
	R=.688	R^2=.473	R=.744	R^2=.544

existing housing stock as a determinant.

On the SMCF side there is clear indication that differential financial pressures in the CBs are important; RDG is well established with a negative coefficient, showing that lack of local resources inhibits housing expenditure.

Finally, the local IMPETUS variable is well established, providing evidence that housing investment is higher in those areas with a continuing, on-going, housing programme.

It is noticeable that population growth does not appear as a determinant. As shown in Table 1 there is, in fact, a net movement of population out of these authorities. Thus the determinants of investment reflect the social and economic characteristics of these areas as outlined in Section 1.3 with the dominating need for housing arising from inadequate housing stock rather than from population growth.(1)

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(1) These conclusions are supported by the more detailed analysis of the forty explanatory variables in Nicholson and Topham (1971, p295-6). This correspondence justifies use of the present smaller scale models and our confidence in the result. The earlier models were less satisfactory in the way the attempted to represent the SMCF forces. The RDG variable used in the present work was not included in earlier work.

TABLE 5: NCBs: HOUSING INVESTMENT FUNCTIONS

	Excluding regions		Including regions	
	Coefft	¦t¦	Coeff	¦t¦
Hot Water Lack	0.181	2.28	-	-
Low RV	0.230	2.09	0.291	2.65
Popn. Gr. Tot.	0.433	5.38	0.405	5.13
Population	-0.224	2.92	-0.272	3.20
RDG	-0.267	2.76	-0.264	2.42
Socio-Econ	-	-	-0.201	2.45
Impetus	0.241	3.26	0.229	3.04
	R=.571	R^2=.326	R=.624	R^2=.389

2.3 NON-COUNTY BOROUGHS

The two six variable models shown in Table 5 have five variables in common and in this respect are consistent with each other. All coefficients are significant but the values of R^2, 0.326 excluding regions and 0.389 including regions are lower than those for CBs.

Table 1 has illustrated two important differences between the characteristics of CBs and NCBs. The incidence of poor quality or inadequate housing stock is lower in the NCBs, and whereas CBs exhibit net population movements outwards, NCBs are growing areas with net movement of population into them. This difference is reflected in the determinants of housing investment, for the two functions in Table 4 are dominated by POPN. GR. TOT. The need to provide housing for a growing population is, in a sense, more urgent than that for replacement and condition of stock purposes since people must be housed whereas replacement of poor stock can be (and often is) deferred. Nevertheless although pressure from inadequate housing stock is lower than for CBs, there is some evidence that it is relevant. The poorness of amenities indicator HOT WATER LACK appears in the function

which excludes regions and is as well established as in the CB models. Other NCB models (obtained using step-wise regression and a components approach) have also included this variable as a significant determinant. The relevance of stock condition is also indicated by the inclusion of LOW RV in both models with positive sign (as in the CB models).

On the SMCF side there is evidence that differences in local resources are important. RDG enters both models with a significant negative coefficient the magnitude of which is, however, a little lower than that in the CB models.

Finally there are two Local factors. In the model including regions the amenities variable HOT WATER LACK does not appear because of its inter-correlation with the regional dummies (see Section 2.1) which have been forced in. Instead the SOCIO-ECON index is included suggesting that local tastes are important in determining local optimum allocation. The index has negative sign showing that per head investment in local authority housing is less in the areas of high socio-economic composition. The IMPETUS variable appears in both models and indicates the importance of a continuing on-going programme.

The dominating SMEI variable in the NCB models is unquestionably population growth. But a striking feature is the inclusion of POPULATION which is well established in both models with a significant negative coefficient. Other NCB models constructed from other approaches have also included POPULATION as a significant variable. It is difficult to interpret this with certainty. Superficially, it is tempting to regard it as a scale variable indicating that the larger the authority the lower the cost per head of local authority housing. However there is no direct evidence that this is the case and it is

striking that, if economics of scale are important, the variable does not turn up in the CB models or indeed those of any other tier. Alternatively POPULATION may be acting as a surrogate for some omitted variable(s), but it is not obvious which.

2.4 URBAN DISTRICTS

The picture which emerges from the investment functions for UDs given in Table 6 is not so clear cut as that for CBs and NCBs. Although the two six variable models have five variables in common the coefficients and t values of two of them, RDG and LOW RV, differ rather widely between the models, and the negative sign of HOT WATER LACK in the model including regions is misleading being a statistical consequence of inter-correlation between this variable and the regional dummies.(1)

Table 1 has shown that of the three urban tiers, UDs have the lowest incidence of unfitness, lack of amenities and overcrowding, but the highest population growth rates with evidence of considerable inward population movement. Hence, in the light of the relative importance of these determinants in CBs and NCBs it might have been expected that population growth would dominate the UD models, with stock replacement and improvement being of considerably less importance. In fact this result does not occur and the population growth variables do not appear at all. There is evidence that unfitness of housing stock is a determining variable and this is supported by the fact that the proportion of low rateable value housing, LOW RV, enters

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(1) When this model was run excluding regional dummies HOT WATER LACK appeared with positive sign. The result illustrates the statistical problem of multi-collinearity which arises when the regional dummies are considered (see Section 2.1)

TABLE 6: UDs: HOUSING INVESTMENT FUNCTIONS

	Excluding regions		Including regions	
	Coefft	¦t¦	Coeff	¦t¦
Unfitness	0.187	1.98	0.178	1.84
Hot Water Lack	-	-	-0.267	1.67
Low RV	0.181	1.67	0.363	2.37
RDG	-0.216	1.98	-0.163	1.32
Housing Propen	0.287	3.17	0.266	2.73
Comm. Index	0.084	0.98	-	-
Impetus	0.254	2.75	0.216	2.33
	R=.548	R^2=.300	R=.630	R^2=.397

both models with positive sign as a "needs" indicator, as in the other two urban tiers. Other models constructed using step-wise regression and components have each indicated that lack of amenities, HOT WATER LACK, is also a positive determinant (see for example the previous footnote).

UDs have less in the way of local financial resources than CBs or NCBs. Their penny rate product is lower and reliance on RDG support in total expenditure is greater than in CBs or NCBs. Not unexpectedly therefore on the SMCF side RDG enters both models (as it does those for CBs and NCBs) with negative sign, indicating that housing is inhibited by limitation of local resources. However, neither the standardized coefficients nor the associated t values are as high as those in the other urban tier models.

What is striking, and this may prove to be the essence of the matter, is the importance of local factors. In both models that aspect of local tastes reflected in HOUSING PROPENSITY, an optimizing influence from the local standpoint, is firmly established as a determinant, and the importance of a local on-going programme is indicated by

IMPETUS - though this may not necessarily make for optimal allocation. These are the two most strongly established variables, and ones which have also proved to be important in other models constructed for this tier.

As already stated the surprising result is that population growth rates do not appear in the models, whereas in NCBs somewhat lower growth rates were, in fact, the dominating determinants. A possible explanation is that there may be more spare housing available in UDs. Certainly the Households/Dwellings ratio in 1961 was lower in UDs than in the other two urban tiers (though the difference was only fractional and may not be significant), and it is suggestive that UDs have the lowest incidence of overcrowding. However, it is possible that the explanation lies in the preference of the growing population for private sector housing - another facet of local tastes. UDs have the highest social class index of the urban tiers and have already been described as having the characteristics of "desirable residential areas" (Section 2.4). It may be that households in these areas are in the higher social groups which are likely to prefer private to public sector housing. There are a number of factors supporting this possibility. First, the average percentage of total housing stock in the public sector is the lowest of the urban tiers, as is the actual amount per head spent on housing (Table 1). Secondly, the ratio of the total number of local authority houses to the total number of private houses under construction in June 1964 (the middle of the period covered by this study) was lower in UDs than in the other urban tiers.(1) Finally it is interesting to note that although the popula-

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(1) The ratios are: CBs 2.23, NCBs .85 and UDs .52

tion growth rates are on average higher than those of NCBs their variation over authorities is not correlated with capital payments per head on housing whereas in NCBs the correlation is positive and significant.(1)

The picture which emerges is of areas with reasonably good housing stock albeit with a large proportion of (small) low value housing, but with growing populations more inclined to the private housing sector; areas which have limited resources and whose housing expenditure patterns are dominated by local factors, tastes and impetus, but which are affected also by the general need for replacement of inadequate stock.

2.5 RURAL DISTRICTS

The six variable optimal regression models for the full sample of RDs (corresponding to those reported for the urban tiers) caused problems of interpretation because of the inter-correlation between POPULATION and POPN. DENSITY. After considerable experimentation with variable combinations, it was found that the most clearly established models were five variable ones selected from a reduced bank obtained by excluding these two population variables from the original set. These models are given in Table 7, and it is seen that each of them contains the same variables.

Two clear-cut SMEI variables are included. The amenities indicator HOT WATER LACK, which has a higher incidence in RDs than in any of the urban tiers, is strongly established, indicating that need to improve

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(1) The correlations between capital payments per head on housing and population growth rate (total) and population growth rate (balance) respectively are for NCBs .314 and .256, and for UDs .009 and -.020.

TABLE 7: ALL RDs: HOUSING INVESTMENT FUNCTIONS

	Excluding regions		Including regions	
	Coefft	¦t¦	Coeff	t
Hot Water Lack	0.472	3.98	0.51	2.84
Pop. Gr. Bal	0.284	2.18	0.35	2.17
Low RV	-0.278	1.9	-0.34	1.70
Socio Econ	-0.200	1.8	-0.20	1.70
Housing Propen	0.231	2.02	0.28	2.23
	R=.554	R^2=.307	R=.607	R^2=.368

the quality of stock is an important determinant of housing expenditure. RDs taken all together have, on average, populations growing at the same rate as those of NCBs. In the present models population growth is represented by POPN. GR BAL which is shown to be a well established determinant. In this respect population growth acts in the same way as a determinant of housing expenditure as in NCBs (with UDs different from either).

RDs have substantially less local resources at their disposal than urban tiers. Their total rateable values are more dependent on domestic hereditaments, and a much higher proportion of the housing stock is of low rateable value, these factors being reflected in the lower penny rate product. The dependence on RDG support is also higher. It is not surprising, therefore, that there should be some restriction on housing expenditure coming from the SMCF side (in part reflected in the generally lower level of housing expenditure by these authorities). What is interesting is that for RDs the SMCF restriction is indicated by LOW RV (taking its significance here as an indicator of a limited local tax base as described in Section 1.2) which enters the functions with negative coefficients. In the urban tiers

this role was taken by RDG, and LOW RV entered with positive sign as an indicator of inadequate housing which induced capital expenditure, but in RDs the large proportion of low rateable value housing indicates more the predominance of smaller houses than a stock of inadequate housing.

Finally, two facets of local tastes are represented in the models by SOCIO-ECON and HOUSING PROPENSITY, the former being more in the nature of a current demand variable relating to preferences between private and public sector housing, the latter representing long run attitudes reflected by local authorities.

Further light is shed on these determinants by separate analyses of the data for the high and low agricultural density RDs described in Section 1.3. The model shown in Table 7 for all RDs and separate "own" models were estimated for each sub-group and the results are given in Table 8. The values of $R^{\bar{2}}$ for these more homogeneous sub-groups are higher than those for all RDs together, and those for the "own" models higher than those for the imposed total model. Both sets emphasize the importance of the amenities indicator HOT WATER LACK, but it appears more important in the low agricultural, more residential, RDs than in the predominantly agricultural ones. Population movements are also included but again with higher coefficients in the low than in the high agricultural RDs. Table 1 has shown population to be increasing with inward migration in the former but falling with outward migration in the latter. The positive coefficients of the population growth rate variables mean, therefore, that growing population is an incentive to local authority housing investment in low agricultural areas, but that population outflow reduces housing investment in high agricultural areas.

TABLE 8: HIGH AND LOW AGRICULTURAL DENSITY RDS: HOUSING INVESTMENT FUNCTIONS

	Total RD models				Own models			
	High agricultural		Low agricultural		High agricultural		Low agricultural	
	Coefft	|t|	Coefft	|t|	Coefft	|t|	Coefft	|t|
Unfitness	-	-	-	-	-	-	0.18	1.16
Hot Water Lack	0.49	3.29	0.67	3.5	0.33	2.31	0.69	3.63
Popn Gr. Tot.	-	-	-	-	0.19	1.27	0.22	1.15
Popn Gr. Bal.	0.22	1.34	0.35	1.59	-	-	-	-
Socio-Econ	-0.02	0.14	-0.22	1.13	-0.19	1.04	-	-
Low RV	-0.16	0.87	-0.39	1.84	-	-	-0.52	2.3
Housing Propen.	0.14	0.86	0.36	2.11	0.13	0.92	0.45	3.15
Dom. Index	-	-	-	-	0.38	2.29	-	-
R	0.561		0.586		0.607		0.593	
R^2	0.314		0.343		0.368		0.352	

Restriction on investment from the SMCF side, indicated by the negative coefficient of LOW RV is more noticeable in the low agricultural, more residential, RDs, no doubt because these are the ones with the higher levels of expenditure and more strongly established "needs" indicators and more likely, therefore, to be feeling the pressure of local limitation of financial resources. Lastly, in each sub-group local factors are indicated. In the low agricultural RDs the tastes indicator HOUSING PROPENSITY is strongly established. In the high agricultural RDs the significance of DOM. INDEX (the domestic property index) shows that local authorities tend to invest more the higher the domestic property proportion of total rateable value. The obverse of this is that the more agricultural the RD the less likely is the local authority to undertake housing.

CONCLUSIONS

3.1 THE EXPLANATORY POWER OF THE MODELS

The values of R^2 achieved by the functions range from 0.300 to 0.554. That is to say they explain something between 30 per cent and 55 per cent of the variation in investment expenditure in housing, measured by capital payments per head, by local authorities. This is an encouraging result but obviously leaves considerable variation unexplained. It is encouraging because it shows that, although local authorities act autonomously as providers of public sector housing, they also exhibit some common response to generally accepted indicators of housing need. There is evidence that they all regard replacement and improvement of stock, and demand for housing from a growing population as important. These are criteria featuring in the central government's social welfare function. But demand for housing in local areas also reflects local tastes for public sector as against private sector housing and the inclusion of variables to incorporate local tastes adds significantly to the explanatory power of the models in all tiers and hence reflect the influence of local optima. Another local factor, impetus, the impact of an on-going programme is also significant, though its implications for optimum allocation are uncertain. Finally it is demonstrated in all tiers that local financial resources are relevant in the decision process, investment expenditure being inhibited in the poorest authorities.

Different functions, involving different determinants of housing investment, have been obtained for the different tiers, and the values of R^2 achieved for the CB models are higher than those for any other tier. It may be asked if these are real differences or whether they are the result of random effects. The question arises because all

coefficients are subject to sampling error and because, although the models are optimal, other combinations of variables might yield values of R^2 nearly as high. As one way of exploring the second possibility, each tier's own optimal models were compared with models obtained using the variables included in the optimal models of the other tiers estimated with the first tier's data. In all cases the tier's own model stood out as the best, with the highest R^2 and most clearly established coefficients. This question of whether there are significant differences in the housing investment behaviour of different tiers is investigated formally in Appendix III to this chapter. It is concluded that the differences between the functions found are real ones and reflect the different characteristics of the tiers as they affect housing decisions. Other estimating procedures have also established that the values of R^2 for CBs are higher than those of other tiers. There are two possible explanations. The first is that CBs make more systematic decisions in line with generally accepted criteria relating to the need for housing, the decision of the lower tiers being more affected by random influences. If this be correct the conclusion has important implications for local housing policy for the CBs are the largest authorities and might be expected to have more efficient town hall machinery. The second is that decisions of the smaller tiers are no less systematic but are related to local factors which have not taken into account.

3.2 WHY ARE THE CORRELATIONS LOW?

The fact that none of the functions estimated (excluding regional dummies) have R^2 greater than 0.47 is disappointing. But the maximum correlations given in Table 2 on page 214 do not exceed 0.53 and these

may be regarded as the highest correlations which can be achieved with the type of explanatory variable used here. It would, however, be erroneous to conclude that the residual variation indicates the extent of randomness associated with the decision taking process in providing local authority housing. In the first instance not all the relevant variables have been included. Availability and price of land, and other specific local problems such as limitations caused by the provision or availability of drainage and sewers, which have been stressed to us by local government officers as being important, have not been considered. Nor have we taken specific account in the models of building in the private sector. In general there may well be a range of essentially local determinants which govern and in some areas dominate local decisions. Some of the influences might conceivably be measured in a way in which they could be incorporated into the present type of analysis; others could only be explored on an individual authority case study basis. However, it is probably in a study of these local factors that improvements in the explanatory powers of the models lie.

A second source of imprecision is that the variables actually used do not measure the influences associated with them sufficiently accurately. For instance, discussion with Chief Officers has convinced us that differences in local attitudes and local enthusiasm are important, but all these subtle differences may not have been captured in the HOUSING PROPENSITY and IMPETUS variables. However, it is in connection with the SMCF variables that difficulty of measurement has been greatest. Appendix 1 lists a number of variables which have been explored but ultimately discarded, leaving only RDG and PENNY RATE PRODUCT as indicators. The whole area of the financial side of local

authority investment decisions certainly merits further examination.

Finally, there is the problem of "lumpiness" in the expenditure figures. Such short time series as have been examined indicate that expenditure on housing does not proceed in a steady way in all authorities; there are humps and troughs resulting from housing drives or from the completion of stages in housing programmes. On a cross section analysis such as the present one, there is always the danger that the authorities in a sample will be at different points in their patterns of investment expenditure, so that the dependent variable may itself involve imprecision. This is more likely to occur the smaller the authority and may in part explain why the R^{2}s of the smaller authorities are lower than those of CBs.

3.3 THE RELEVANCE OF THE UNDERLYING MODEL

All the above factors must be allowed for, and the functions made as comprehensive as possible to achieve maximum explanatory power, before the magnitude of the genuinely random influences affecting the decision taking process can be recognized. It is important to recall in this context, therefore, that the underlying econometric model from which the present analysis has been developed is a welfare maximizing model, paralleling models developed from the theory of the firm in connexion with investment expenditure in private industry. The implication of such a model is that the balancing of forces incorporated in the SMEI and SMCF schedules ensure that optimum decisions are taken, reactions from local public opinion - paralleling the reactions of shareholders in private industry - being such that the purely random elements in decision taking resulting from planners' idiosyncrasies will always be held in check. Such an assumption about the optimizing

of decisions in private industry is reasonable, since firms must respond to shareholders' pressures which may be sharp and considerable. But in the area of local authority capital expenditure a greater departure from optimum allocation than would be tolerated in private industry might occur because the acid test of profitability does not have to be met in the public sector. There is in this situation more scope for randomness or divergence from the optimum. It is important that the magnitude of this random element in housing investment, which the present study suggests may be significantly large, be known because the greater it is the greater are the deviations from optimal housing decisions and hence the greater is the social cost.

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APPENDIX 1: LIST OF THE VARIABLES EXAMINED

SMEI Variables

UNFITNESS
HOT WATER LACK
LOW RV
OVERCROWDING
Percentage of dwellings without a fixed bath
Percentage of dwellings with rateable values below £18
Percentage of population aged over 60 years
†Average weekly income per regional household 1961–3
Total LA rent income as a percentage of total gross values of dwellings in the housing revenue account (HRA)
†Regional unemployment percentage in construction industry (1961)
†Regional unemployment percentage in construction industry, average (1961–68)
POPN GR. TOT.
POPN GR. BAL.
POPULATION
POPN DENSITY
Ratio of households (1961) to dwellings (1961)
Ratio of estimated households (1971) to dwellings (1961)
Ratio of estimated households (1981) to dwellings (1961)

SMCF Variables

RDG
PENNY RATE PRODUCT
Interest paid per £1 rateable value, 1961
Average rate of interest on all debt, 1961
Debt charges on housing revenue account (HRA) per £1 total gross values on that account
Exchequer subsidy on HRA per £1 loan charges on that account
Ratio of current expenditure on HRA to potential income (1961 subsidy basis)
Total ratefund contribution to HRA divided by product of penny rate

Local Variables

SOCIO-ECON
HOUSG PROPEN.
Post-1945 LA dwellings as a percentage of total housing stock
LABOUR
†Number of years with labour majority in period 1955–64
Poundage of area (1961)
Anticipated demolitions 1955–60 as a percentage of dwellings
IND. INDEX
DOM. INDEX
COMM. INDEX
IMPETUS
Post-1945 dwellings as a percentage of all LA dwellings
1958–61 addition to LA stock as a percentage of all LA dwellings

Regions

A set of 8 dummy variables discussed in text (section 2.1)

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* The variables retained in the present study are shown by the code names given in Section 2.2.
† Variable available only for County Boroughs.

CHAPTER FIVE: APPENDIX 2: THE RATE DEFICIENCY GRANT

The rate deficiency grant is an earlier version of what became the resources element of the rate support grant. Allocation of the grant involves a comparison of the penny rate product per head of England and Wales as a whole with that of each local authority. The grant is paid to any local authority whose level of resources thus measured is below this national average. For these authorities the central government acts as a ratepayer, serving in effect to raise their penny rate product per head to the national average.

RDG, the variable used in the present study, is the percentage that is applied to the authority's rate-borne expenditure(1) to determine the amount of grant and is calculated as follows:

$$RDG(\%) = (A-B)/A$$

where

A = National Penny Rate Product per head

B = Authority Penny Rate Product per Head

and the actual amount of grant an authority receives is:

(Rate-borne expenditure of the authority).RDG(%)/100

As thus expressed the grant is open ended: the more an eligible authority increases its rate-borne expenditure the larger will be the grant it receives. For this reason RDG is seen as an indicator of lack of financial resources.

However, this open-endedness is limited by a complicated system of constraints. Broadly the result is that if an authority's expenditure

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(1) Rate-borne expenditure denotes the total of expenditure met out of the rates and also by the rate deficiency grant. Loan financed capital expenditure is therefore excluded. See Local Government Act, 1958, Part 1, Section 5, Subsection 6.

is above the average deemed appropriate for its tier and population size the excess expenditure will not qualify for the grant. In the absence of these constraints a poor authority will be raised through grant aid to a position on a par with an authority having a national average level of resources. If however, the local authority has a high, or rapidly rising level of expenditure, its qualification for the rate-deficiency grant will denote a low level of resources though, because of the constraints, this deficiency may not necessarily be fully made up.

Two other variables, LOW RV and PENNY RATE PRODUCT can be viewed as possible alternatives to RDG as a measure of financial resources. Of the two, LOW RV is, in the three urban tiers, more clearly associated with the quality of housing and PENNY RATE PRODUCT, whilst having the advantage of straightforwardness was found to be inferior to RDG in its explanatory power in the investment functions.

CHAPTER FIVE: APPENDIX III

LOCAL AUTHORITY HOUSING INVESTMENT: AN ANALYSIS OF COVARIANCE

INTRODUCTION

In Chapter 5 the question was raised of whether there are significant differences in the housing investment behaviour of the four classes of local authority examined: the County Boroughs, the Non-County Boroughs, the Urban Districts and the Rural Districts. In this appendix the question is pursued formally. Tests for change of structure are applied to investment functions estimated for the four classes of authority. The testing procedure relates to that described on page 64 in Appendix II to Chapter 1 of this thesis,(1) though in contrast to the exposition set out there a dummy variable technique is used in the computations. The equivalence of these two techniques is shown in Stewart (1976).

STATISTICAL FRAMEWORK

Testing for difference in the investment functions of the different classes of authority involves examining by means of an F test, reductions in the sum of squared errors obtained by using successively more

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(1) For instance, expression 9 on page 64 is the appropriate test statistic for the third null hypothesis tested below.

elaborate models. The following computations are involved.(1)

Firstly the data for the four tiers is pooled and the classical linear regression model of the form

$$Y = X\beta + u \qquad (1)$$

is estimated. In this formulation the intercept term and slope coefficients of the investment function are constrained to be the same for each tier. It may be the case, however, that whilst the slope coefficients are truly equal, the intercept term is different for each tier of local authority. This may be allowed for by using a modified function of the form

$$Y = D\alpha + X\beta + u \qquad (2)$$

where D is a matrix of three dummy variables indicating tier membership.(2). The null hypothesis that there is no difference in intercept terms between tiers, i.e. $\alpha = 0$ is then tested by using an F test to establish whether the sum of squared errors decreases significantly between (1) and (2).

A second possibility is that allowing the intercepts to vary between tiers is not sufficient, and that the slope coefficients are also different for each tier. To examine this question, four separate regressions of the form

$$Y_i = X_i b_i + r_i \qquad i = 1, 4 \qquad (3)$$

are run; one for each tier, and the total of the sum of squared errors

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(1) A detailed account of the procedures used appears in Johnston (1973) pp. 192-207. Alternative treatments are in Dhrymes (1971) Appendix B pp. 142-147 and Almon (1967) pp. 132-139.

(2) See Johnston (1973) pp. 176-186 for an explanation of the use of dummy variables. No dummy variable is used to denote County Boroughs in order to avoid singularity of the dummy variable matrix as this information is contained in the other three variables.

for the four tiers is obtained. A test is then made to establish whether this total sum of squared errors is significantly less than the sum of squared errors obtained using (2).

A final test which establishes whether there is a significant decrease in the residual sum of squares when moving from (1) to (3) indicates whether the slope coefficients and constants are, when taken as a whole, significantly different across tier classes.

THE INVESTMENT FUNCTION

The basis of the investment function to use for this testing lies in the functions estimated for the different classes of authority in Chapter 5. Recall from page 216 that optimal regression(1) was used to select explanatory variables for the investment functions for each tier from a bank of seventeen possible candidates. The number of explanatory variables in the selected subsets was limited to six for County Boroughs, Non-County Boroughs and Urban District Councils and five for Rural District Councils as it was found that further variables did not contribute greatly in terms of R^2. The resulting investment functions are given in Table 1. The short names given to the explanatory variables are defined in pages 205-210 of Chapter 5. The regression coefficients given in both Table 1 and Table 2 following are in fact standardised beta coefficients,(2) the regression computations having been performed on the correlation matrix. An advan-

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(1) Beale, Kendall and Mann (1967)

(2) The standardisation of each observation of a variable is carried out by subtracting from it the mean of the variable and dividing by the variable's standard deviation. When multiplied by Sy/Sx standardised beta coefficients become ordinary regression coefficients.

TABLE 1: ORIGINAL FUNCTIONS

	COUNTY BOROUGHS		NON-COUNTY BOROUGHS		URBAN DISTRICTS		RURAL DISTRICTS	
	Std	t	Std	t	Std	t	Std	t
HOT WATER LACK	.189	1.96	.131	2.28			.472	3.98
UNFITNESS	.325	3.46			.187	1.98		
LOW RV	.214	1.57	.230	2.09	.181	1.67	-.278	1.90
COMM INDEX					.084	0.98		
SOCIO-ECON							-.200	1.80
OVERCROWDING	.338	3.51						
POP GR TOT			.433	5.38				
POP GR BAL							.284	2.18
POPULATION			-.244	2.92				
HOUSING PROPEN					.267	3.17	.231	2.02
IMPETUS	.239	2.76	.241	3.26	.254	2.75		
RDG	-.344	2.57	-.267	2.76	-.216	1.98		
R^2	.473		.326		.300		.307	

tage of standardised beta coefficients is that they are scale free and may therefore be directly compared. Because standardised variables have zero means the constant term for these regressions is also zero.

It can be seen from Table 1 that, of the original seventeen, twelve variables appeared in one or more of the subsets. As the testing for change of structure requires that the same set of variables be used for each subset of data it was decided to use all of these twelve variables to estimate a function for all the classes of authority. The use of all twelve variables introduces the problem of multicollinearity with a consequent loss of reliability in the individual beta coefficients. In this study, however, it is the overall explanatory power as measured by the sum of squared errors that is of

importance and unreliability of individual coefficients may be tolerated.

THE RESULTS

The results of the various regressions necessary for carrying out the analysis of covariance procedure outlined above in Section II are given in Table 2.

Moving from the left of this table, the first pair of columns gives

TABLE 2: TWELVE VARIABLE FUNCTIONS

	POOLED SAMPLE				SEPARATE TIER REGRESSIONS							
	SAME INTRCPT		DIFF INTRCPT		CB		NCB		UDC		RDC	
	Std	t	Std	t	Std	t	Std	t	Std	t	Std	t
HOT WATER LACK	.191	3.44	.201	3.57	.184	1.65	-.189	2.30	.141	1.09	.485	3.63
UNFITNESS	.117	2.21	.117	2.19	.341	2.88	-.025	0.27	.143	1.38	.081	0.66
LOW RV	.097	1.35	.105	1.45	.193	1.27	.250	2.08	.163	1.25	-.251	1.30
COMM INDEX	.027	0.57	.028	0.50	.001	0.01	-.052	0.65	.082	0.89	.058	0.55
SOCIO-ECON	.051	0.86	.050	0.82	-.100	0.58	-.121	0.20	.109	0.87	-.134	0.91
OVERCROWDING	-.020	0.35	.003	0.05	.346	2.62	-.110	1.14	.013	0.11	.024	0.18
POP GR TOT	.084	0.38	.115	0.50	-.090	0.35	.623	2.47	.008	0.01	-.101	0.23
POP GR BAL	.097	0.35	.032	0.14	.206	0.62	-.215	0.88	.116	0.20	.300	0.67
POPULATION	-.064	1.24	-.019	0.33	.020	0.19	-.222	2.47	-.002	0.02	.163	1.21
HOUSING PROPEN	.307	5.68	.289	5.26	.033	0.27	.147	1.61	.348	3.03	.242	1.93
IMPETUS	.215	4.68	.220	4.71	.256	2.72	.236	3.09	.243	2.52	.050	0.49
RDG	-.182	2.69	-.194	2.82	-.330	1.88	-.277	2.65	-.171	1.47	-.048	0.31
CONST	.000	-	.000	-	.000	-	.000	-	.000	-	.000	-
NCB DUMMY			.133	1.87								
UDC DUMMY			.118	0.69								
RDC DUMMY			.056	0.05								
R^2	.239		.247		.479		.355		.318		.328	
SUM OF SQUARED ERRORS	320.973		317.677		42.175		91.595		75.633		57.050	

Total of sum of squared errors for the separate tier regressions: 266.453

the standardised beta coefficients and t statistics of the pooled regression in which intercepts(1) and slope coefficients are constrained to be equal for each tier. In the next pair of columns the results of allowing the individual tier intercepts to vary whilst holding the slope coefficients equal for each tier are given. Here the coefficients of the dummy variables represent shifts in the constant term from the County Borough base of zero.(2) The last eight columns contain the results of performing a separate regression for the data of each tier.

With these results available it is now possible to move to the formal testing of the homogeneity of the housing investment functions between tiers. The three null hypotheses which may be tested are as follows.

(1) Assuming the slope coefficients to be equal, that the intercept terms do not change between tiers.

(2) Allowing the intercepts to be different for each tier, that the slope coefficients do not change between tiers.

(3) That the slopes and intercepts do not, as a whole, change between tiers.

The results of these tests are given in Table 3.

It is apparent from this table that the null hypotheses two and three are both rejected at the 1% and 5% levels of significance, but that null hypothesis one is not rejected at either of these levels.

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(1) Because standardised variables are used, the mean of each variable is zero and the intercept term is thus also zero.

(2) The t statistics associated with these coefficients are liable to mislead as they reflect only the difference between the tier they represent and the base tier, County Boroughs. Thus in a situation where the intercepts were close together apart from a common difference with County Boroughs, the three t statistics would be high, possibly giving the impression of a wider variation in intercepts than was the case. See Johnston (1973) p. 179.

TABLE 3: RESULTS OF TESTS

Null Hypothesis	F	Degrees of Freedom	Critical Point at 1%	5%	Null Hypothesis Rejected?
1	1.41	(3,407)	2.60	3.78	NO
2	2.07	(36,387)	1.70	1.46	YES
3	2.03	(39,387)	1.70	1.46	YES

The conclusion drawn from the rejection of hypothesis three is that, taken together, there is a significant difference between the slopes and intercepts of the investment functions of the four tiers. The combination of the rejection of hypothesis two and the non-rejection of hypothesis one allows the more detailed conclusion that the overall difference is predominantly due to differences in the slope coefficients rather than intercepts.

CONCLUSIONS

Formal testing has established the existence of significant differences in the housing investment behaviour of different tiers of local authority. It can be seen from Tables 1 and 2 that the investment function for County Boroughs has a markedly higher value of R^2 than those of the other four tiers.(1) It is of course not possible to tell from this study whether a lower value of R^2 can be attributed to a higher degree of true randomness in a tier's investment function or to the effect of omitted variables, but if the former alternative is correct the conclusion is that County Boroughs are more systematic in

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(1) All the values of R^2 are quite low. This is discussed in Chapter 5 above, pp 231-233.

their housing investment decisions than the smaller tiers of authority.

To distinguish further between the tiers it is necessary to examine the coefficients of the individual variables in the tier regressions, and this is hazardous because of the presence of multicollinearity already mentioned. Bearing this in mind it may be noted that County Boroughs appear to react most strongly to unfitness and overcrowding, two clear indicators of need. This, however, may be merely a reflection of the fact that County Boroughs have the highest mean values for these two variables.

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CHAPTER SIX*

PROFITS, REGULATION AND THE UK AEROSPACE INDUSTRY

INTRODUCTION

This chapter examines the effect of government intervention on the aerospace industry since the war in Britain.

The first five chapters of this thesis have each examined some aspect of central or local government expenditure. For reasons of length the subject of taxation as a whole is not considered. However, clearly taxation and expenditure on goods, services and transfers are not the only ways the government can intervene to affect the allocation of resources in the economy. Beginning with this chapter, each of the last three chapters is concerned with some of these other forms of government intervention.

The government can, for instance, affect the allocation of resources by paying subsidies to private producers. Thus Chapter 7 looks at the Direct Grant schools which received a per pupil subsidy from the government. It can be said to incur tax expenditures when it makes exemptions in its levying of taxes. Chapter 8 examines tax expenditures on owner-occupied housing.

(*) This chapter is based on K. Hartley and P.A. Watt, "Profits, Regulation and the UK Aerospace Industry", Journal of Industrial Economics, XXIX, June 1981, pp413-428.

CHAPTER SIX: PROFITS, REGULATION AND THE UK AEROSPACE INDUSTRY

Further forms of government intervention are considered in this chapter. The government can induce changes in the behaviour of private agents by passing laws, or by a threat of passing laws or by use of market power. These forms of government intervention are important in the aerospace industry which has a long history of government subsidy, intervention over profit rates and the use of government monopsony power to influence structure.

Few studies exist on the determination of profitability in UK Government regulated industries.(1) Aerospace is an ideal industry to study since it is dependent on Government contracts which have state-determined profit rates. Various hypotheses on the industry's profitability have been suggested. Critics allege that profits depend on wars and domestic military work. Firms claimed that until 1968, the state's profit rules failed to recognize that technical progress was resulting in shorter production runs and greater emphasis on less profitable development work. Questions also arise about the effects on profits of the mergers of 1959-60 and the Review Board for Government Contracts established in 1968. These variables and the features of both the industry and Government procurement policy relevant to explaining profitability are outlined and incorporated into estimating equations. Consideration is also given to the effects of profit controls on wages and unregulated outputs.

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(1) There have been some studies of profits in the US aerospace industry. See, e.g., Poirier and Garber (1974); also Agapos and Gallaway (1970). For a more general survey, see Wynn (1975).

CHAPTER SIX: PROFITS, REGULATION AND THE UK AEROSPACE INDUSTRY

THE UK AEROSPACE INDUSTRY AND MARKETS

The UK aerospace industry consists of airframe, engine, electronics and equipment firms involved in the design, development and production of military and civil aircraft, helicopters and missiles. Some of the industry's performance indicators for the period of the study are shown in Table I. Real output rose in the early 1950s, fluctuated around a plateau until 1969 and then declined. Employment reached a peak in 1957, followed by a long-run decline to 1973 by which time the labour force had fallen by over 100,000. Real productivity peaked in 1965-66 and, for the whole period, rose by no more than 30%. There was also a change in the output mix as shown by sales to the UK Government and exports. Even so, the industry depends on British Government orders and finance for both military and civil work. For most of the period, UK Government sales accounted for 50% or more of the industry's output. Rising export proportions give a misleading impression of independence from the UK Government since overseas sales are usually of aircraft which have been wholly, or partly, state-financed. Also, home market civil sales often involve the state through the nationalized airline.

The UK industry operates in a dynamic market subject to state protection and regulation. Most of the industry was privately owned until the nationalization of Rolls Royce Engines in 1971 and the airframe firms in 1977. Under private ownership, Governments have affected profitability directly through the profit rules for pricing state contracts. Traditionally, their procurement policy has offered higher profit rates for production work than for R & D contracts, hence the importance of output mix as a determinant of profitability. In addition, British Governments have affected profitability indirect-

TABLE 1: THE UK AEROSPACE INDUSTRY

Year	Output (£m)	Index of output at constant prices (1958=100)	Employment (000s)	Percentage of sales to UK Government: Procurement (%)	Percentage of sales to UK Government: Total (%)	Exports as % of tot sales (%)	Aerospace profits on capital (%)	Profits on capital for manufacturing (%)
1949	136	58	183.3	62.5	79.4	14.7	18.0	
1950	143	57	179.5	54.5	75.5	14.7	18.6	
1951	163	58	193.2	59.5	80.9	13.5	22.8	
1952	225	73	236.4	68.0	84.4	10.7	19.7	
1953	301	95	261.7	63.5	78.4	16.6	18.0	
1954	350	107	278.9	68.6	85.7	11.4	13.7	
1955	338	97	294.9	63.0	82.2	14.2	18.4	17.9
1956	365	97	307.6	49.3	72.6	20.6	18.5	16.4
1957	400	101	311.9	42.5	66.3	23.8	15.7	15.6
1958	405	100	301.4	34.6	55.6	32.1	12.6	14.4
1959	405	98	292.5	37.5	59.8	30.1	10.6	15.4
1960	435	100	292.1	42.5	60.9	31.0	9.4	15.7
1961	500	110	303.4	40.0	60.0	29.0	5.9	13.4
1962	470	101	291.6	45.8	69.1	23.4	7.0	12.1
1963	475	100	269.8	44.2	67.4	24.2	8.7	12.9
1964	520	104	267.3	40.4	63.5	20.2	6.3	14.2
1965	590	110	258.2	36.4	59.3	26.3	9.2	13.4
1966	625	110	253.9	33.6	55.2	36.0	7.0	11.8
1967	595	103	254.0	33.6	55.4	32.8	6.5	11.9
1968	660	106	249.1	31.8	51.5	31.8	7.1	13.7
1969	695	105	245.6	27.3	48.2	38.1	6.1	13.3
1970	645	88	235.1	27.1	50.4	34.9	5.0	12.1
1971	655	82	217.8	25.9	48.9	35.9	10.2	13.1
1972	755	86	207.5	23.2	44.4	41.1	15.6	15.4
1973	805	82	201.7	27.9	46.6	44.1	20.2	17.7

Notes:
(i) Total UK Government sales consist of military and civil R & D work for the UK Government plus procurements of equipment for the UK Services (i.e. UK military production business). Sales to UK state-owned airlines are not included in UK Government sales. Output is net of duplication.
(ii) The aerospace profit rates on capital are before tax, dividends and appropriations to reserves but after charging depreciation and R & D to the extent written off in the accounts. Capital employed is the arithmetic averagec of the net assets shown by company balance sheets at the beginning and end of financial years. The data for 1949-64 were published in Cmnd. 2853, Report of the Committee of Inquiry into the Aircraft Industry (Plowden) (1965)- Data for 1960-73 were published in Business Monitor, 'Survey of the UK Aerospace Industry' (1975) ; but the published data are for airframe and helicopter companies only, excluding engines. Correspondence with Rolls Royce Ltd. resulted in data on profits and capital for both RR and Bristol Siddeley Engines Ltd., 1960-73; but no information is available for 1970 due to the appointment of a Receiver in February 1971 before completion of the 1970 accounts: hence 1970 figures were estimated using a linear interpolation between adjacent years. The resulting profit and capital figures for engines were added to those for airframes and helicopters to produce a continuous series 1949-73 (latest published figure). However, the Plowden data and adjusted Business Monitor series overlap between 1960 and 1964, producing alternative profit figures. The Plowden figures for 1949-64 are used in Table 1, although for 1960-4, the adjusted Business Monitor profit rates were 8.8, 3.2, 5.8, 8.0 and 5.1%.
(iii) Profits on capital for manufacturing are net income - net assets for the largest listed UK manufacturing companies. Net income is gross income minus short term interest and depreciation at book values (before tax) ; net assets are gross assets minus accumulated depreciation.
Sources: Report of the Committee of Inquiry into the Aircraft Industry, 1964-65 (Plowden) (1965) Business Monitor (1975); Department of Industry, 'Companies' rate of return on capital employed', Trade and Industry, October 24th, 1975.

ly through their monopsony influence on market demand and structure, including the extent of competition for state business.(1) As monopsonists, UK Governments have used procurement policy to determine projects and hence technical progress, as well as the size and structure of the industry, entry and exit, together with prices, profits (via bargaining), technical efficiency and export performance. The volume of domestic military orders affects total output and employment. Their character also determines technical progress as the UK Services have demanded more complex, and hence costlier, weapons.(2) The rising cost of aircraft has resulted in shorter production runs and a relatively greater proportion of R & D costs in the total. Between 1945 and 1955, the output of UK military aircraft usually exceeded 600 units, with over 1000 and up to some 3800 units not unknown(3)

In the 1970s, the typical UK output was some 200-300 units, an exception being the collaborative three-nation Tornado with a planned output of 805 units. Output is significant for unit costs. Not only is there the "spreading" of R & D outlays, but learning economies mean that unit production costs decline by about 10% for each doubling in cumulative output.

Governments have determined market structure. The industry was

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(1) Hartley (1974).

(2) The increasing complexity of modern combat aircraft has been reflected in their electronics inputs which typically account for 20% of unit <u>production</u> cost, with 35-50% not unknown. These figures were based on an interview study of European and US firms which also suggested that engines might be some 30%, and the airframes 50% of unit production costs.

(3) Report of the Committee of Inquiry into the Aircraft Industry 1964-65 (1965, p. 17

subject to a Government-promoted structural change in 1959-60 when 16 airframe and helicopter firms and six engine companies were merged to form five major groups: two each for airframes and engines and one for helicopters. The aim was to create the largest groups consistent with the maintenance of the minimum number of firms required for domestic competition.(1) Following the mergers, the industry did not reach its pre-merger profitability until the early 1970s! Questions arise as to whether this decline in profitability reflected other influences within the market.

Table 1 shows that for aerospace two periods of profitability can be distinguished, namely, the 1950s and 1960s with profit rates highest in the earlier years, but with distinct "breaks" in 1956 and 1970. For 1949-56, profit rates averaged 18-5%. There was rising real output and employment with a relatively high proportion of volume production work for the UK Services as a result of the Korean War and the re-equipment programme. After 1956, profit rates declined and remained at a low level until 1970. Volume production work for UK procurement fell substantially and exports became relatively more important. Defence Reviews in 1957 and 1965-68 were associated with reductions in profitability and a rise in export shares. Real output fluctuated around a relatively high level in the 1960s when there was an increasing share of development work in UK Government sales and a greater volume of civil R & D business. Inevitably, the trend towards shorter production runs created difficulties in maintaining efficient capacity working. For civil aircraft, Government policy in the 1960s

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(1) Hartley (1965). Later, Rolls Royce acquired Bristol Siddeley Engines creating one UK engine company and four major groups by 1966.

was to contribute up to 50% of the estimated launching costs with the industry contributing the remainder. After 1965, civil aircraft policy was dominated by financial assistance for R & D on Concorde and the RB211 engine. In the circumstances, it has been hypothesized that the increased private funding of civil R & D adversely affected the industry's profitability(1). A further factor might have been a more effective policing and control of costs and profits on Government contracts. In fact, the 1960s were characterized by the Ferranti and Bristol Siddeley Engines "excessive" profits cases which culminated in a major revision of state profit policy and the formation of the Review Board for Government Contracts (1968)(2) A formal link was created between the profitability of Government non-competitive contracts and UK manufacturing industry. As a result, profitability rose in the early 1970s. This was also a period of falling output, a relatively low proportion of domestic military orders and a rising share of exports. Interestingly, a graph of aerospace profits and the industry's real output for the whole period suggests an inverse relationship.

One of the arguments for a revision of the profit rules on Government contracts was based on a comparison of aerospace profitability with other industries. Table 1 shows that average profit rates in aerospace were generally lower than in the rest of British industry, averaging 10.5% and some 14%, respectively. As well as being lower,

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(1) Report of the Committee of Inquiry into the Aircraft Industry 1964-65 (1965, p. 127)

(2) See Second Report of the Inquiry into Pricing of Ministry of Aviation Contracts (1965) and Report of the Committee of Inquiry into Certain Contracts made with Bristol Siddeley Engines (1968).

rates were also more volatile. They fluctuated within a 13% point range between 1955-73, compared with approximately 6% points for the rest of UK industry. Such comparisons were one of the elements in the Government's new profit rules of 1968.

Industry profit rates also conceal a diversity of experience between markets and firms. In the early 1960s, the profit rates of the engine companies generally exceeded those of the airframe firms.(1) By 1964 profits for the main airframe, missile and helicopter groups were a mere 2.4%! This reflected the relatively low profitability of the airframe and missile firms only (following the mergers): helicopters were the leading profit sector for 1960-67, as shown by the record of Westland in Table II. After 1966 relative profitability was reversed with the airframe, missile and helicopter units being more profitable than engines, although within this grouping helicopter profitability fell.

Variations in profitability also exist between specialist and diversified companies. In the early 1950s, the profit records of the Hawker Siddeley Group and Westland were better than the industry average. This was when Hawker Siddeley made virtually no civil aircraft and its profit rates were two to three times greater than firms with both military and civil aircraft(2). Hawker Siddeley is a useful case study since by the 1960s it was a diversified firm with engineering as well as military and civil aircraft and missile activities. The Group's share of aerospace in its total sales declined from some 75%

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(1) Report of the Committee of Inquiry into the Aircraft Industry 1964-65 (1965 p. 127

(2) Report of the Committee of Inquiry into the Aircraft Industry 1964-65 (1965 p. 127)

TABLE II: AEROSPACE PROFITS, 1960-73 (PERCENTAGE PROFITS ON CAPITAL)

Year	Aerospace Industry	Airframes missiles & helicopters	Aero-engines	Hawker Siddeley Group	Westland Helicopter Group
1960	9.4	8.0	10.2	na	20.6
1961	5.9	3.6	2.6	9.9	20.7
1962	7.0	6.3	5.2	11.3	19.7
1963	8.7	6.8	9.6	11.6	16.5
1964	6.3	2.4	8.9	10.9	15.9
1965	9.2	9.3	9.1	11.2	15.6
1966	7.0	6.9	6.9	10.1	15.1
1967	6.5	10.4	3.5	12.0	12.3
1968	7.1	13.5	3.0	13.8	11.8
1969	6.1	14.2	0.4	10.0	7.7
1970	5.0	8.1	Receiver	9.7	5.6
1971	10.2	14.6	4.7	13.3	7.1
1972	15.6	20.4	11.1	19.6	8.8
1973	20.2	28.6	13.1	20.9	11.9

Notes

(i) Profits are before tax.

(ii) Rolls Royce experience with the RB211 engine resulted in Receivership in February 1971 and no accounts were completed for 1970.

(iii) The 1960 accounts for Hawker Siddeley were for a 17-month period and they have been omitted.

Sources: Business Monitor (1975 p. 39); Hawker Siddeley Group, Annual Reports, St. James's Square, London; Westland Aircraft Ltd., Annual Reports, Yeovil, Somerset.

in the early 196os to 45% in 1973: hence, it provides evidence on the relative profitability of a diversified aerospace company. Every year between 1961 and 1973, the firm's profitability exceeded that for the aerospace industry, and was usually greater than for the main airframe, missile and helicopter firms (Table II). None the less, like the rest of the aerospace industry, Hawker's profit rates were usually <u>less</u> than for UK manufacturing industry. This brings us to the aims of the Government's profit formula.

CHAPTER SIX: PROFITS, REGULATION AND THE UK AEROSPACE INDUSTRY

PROCUREMENT POLICY, REGULATION AND FIRM BEHAVIOUR

UK Government purchases of military aerospace equipment usually involve non-competitive contracts, with the supplier and state negotiating a price based on actual or estimated costs and a state-determined profit margin.(1) Contracts distinguish between development and production work. For development projects where uncertainty is prevalent, some form of cost reimbursement contract (cost-plus) is usually adopted, whereby the firm tends to recover all its costs, regardless of their level. In this case, the state bears most, if not all, of the risks.(2) With production work, where the uncertainties have been removed and the task can be clearly specified ex ante, fixed price contracts based on estimated costs are typical. These provide efficiency incentive during the production run, so placing the contractor at risk.

The profit element in the pricing of both cost reimbursement and fixed price contracts is determined by the state's profit formula for non-competitive work. This distinguishes between risk and non-risk contracts (i.e. fixed price and cost-plus, respectively) and reflects the Government's concern with negotiating "fair and reasonable" prices. Until 1968, the state's basic profit formula provided for a return of 7.5% on capital and up to 2% on costs for risk and 2% on costs for contractor performance.(3) There was a constraint that

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(1) The extent of competition is analysed in Hartley (1967) and Hartley (1974).

(2) Such "blank cheque" contracts are believed to provide the financial framework for cost escalation and labour hoarding: Hartley and Cubitt (1976-77); also Hartley and Corcoran (1975).

(3) Hartley (1969)

returns on capital for non-competitive contracts should not exceed 15% for risk work and 10% for non-risk work. Following the "excessive" profits cases of the 1960s and industry criticisms, changes occurred in 1968 with the establishment of a specialist regulatory agency, namely the Review Board for Government Contracts. This Board reinforced the "policing and monitoring" functions of the Ministry of Defence procurement agency. The 1968 changes also introduced equality of information, post-costing and a revised profit formula aimed at providing defence contractors with a "fair" return on capital employed, defined as "... a return equal on average to the overall return earned by British industry"(1) The Review Board was an independent body responsible for reviewing the operation of the profit formula, normally every three years. In 1968, the formula aimed at an annual target return on the historic cost of capital of 14%, equivalent to a real net return on equity of 6.8%. In 1970, the target rate was raised slightly to 14.3% and remained unchanged until 1975. Differential profit rates are allowed between risk and non-risk business and in the early 1970s, the target rates were 16.1 and 10.7%, respectively. In addition, the Review Board acts as a referee where either party to a contract considers that its outcome shows that the price negotiated was not "fair and reasonable". Between 1968 and 1975, individual contracts could be referred to the Review Board for investigation and possible re-negotiation where profit rates exceeded 27.5% or where losses were greater than 15% on capital.(2)

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(1) See Review Board for Government Contracts (1977) Appendix A, p. 39.

(2) Review Board for Government Contracts (1974 p. 38). Also, by 1975, accelerating inflation raised doubts about the basic fea-

CHAPTER SIX: PROFITS, REGULATION AND THE UK AEROSPACE INDUSTRY

The operation of the Review Board is worth a separate study. Its criteria for "excessive" profits and efficiency could be compared with those used by the Monopolies and Mergers Commission. For our purposes, it is only necessary to identify the main features of UK procurement policy, 1949-73. These include profit constraints, differential returns between risk and non-risk contracts, the creation of the Review Board and the subsequent formal link between defence profits and UK industry. Thus, UK aerospace firms operate in a regulated, imperfect and protected market, where there are opportunities for discretionary behaviour. Utility-maximizing models predict that with profit regulation, firms are likely to substitute increased expenditures for profits in the controlled sector. They might also substitute any relatively profitable unregulated activities for regulated ones in an effort to achieve preferred combinations of profits and other "goods" (e.g. staff, managerial emoluments).(1) Much depends on the actual form of managerial preference functions and the explanation of regulation. Some models of regulation suggest that it might benefit the industry rather than society.(2) On this view, the "package" which the UK Government offered the aerospace industry might have been a preferred combination for the manufacturers. The package contained specified profit rates on Government contracts, preferential

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tures of the 1968 profit formula - e.g. its historic cost basis, whether past profit experience was a suitable yardstick and whether the profitability of UK industry was the appropriate criterion for an "efficient and viable" defence industry; but such issues are outside the period of our study: Review Board for Government Contracts (1974 p. 19).

(1) Williamson (1965) ; also Averch and Johnson (1962).

(2) Stigler (1971).

purchasing and protection in the domestic market, including a general commitment to support the UK industry. To firms, such characteristics could be perceived as a low risk package which might explain their initial acceptance of relatively low profits in the 1960s, with a later upward adjustment which was to the advantage of the industry.

EMPIRICAL RESULTS

The difficulties inherent in empirical work were especially acute for this study. Profits and capital are subject to the flexible definitions of accountants, and for diversified aircraft firms problems arise in isolating the contribution of aerospace. Also, following the mergers, a substantial amount of the profits and capital employed were allocated to the accounts of the principal shareholding companies, rather than to the newly created units. Even the official profit figures suffer from a discontinuity with the major engine company excluded after 1964. Nevertheless, empirical work in this area is justified by the frequency with which policy-makers use published data to make statements about profitability, its determinants and the role of the Review Board. In this context, the policy emphasis is on the level of profit rates, rather than changes or absolute amounts.

Hypotheses on the industry's profitability were tested using standard econometric techniques. The characteristics of both the market and UK procurement and regulatory policy suggested a model in which the aerospace industry's profitability was determined by output, the sales "mix", factor proportions, relative competitiveness, the profitability of manufacturing industry and the "policing" function of the Review Board. Two factors specific to aerospace were identified, namely the Korean War and the mergers. The resulting estimating equa-

tion is of the general form:

$$\pi/K = f(Q, \alpha/Q, K/L, C, M, PRI, W, RB, t)$$

π/K = UK aerospace industry's rate of return on capital employed
Q = output of the aerospace industry
α/Q = output "mix"
K/L = factor proportions represented by the ratio of capital to labour
C = international competitiveness
M = dummy variable for mergers
PRI = profitability of UK manufacturing industry
W = dummy variable for Korean War
RB = dummy variable representing the Review Board for Government Contracts
t = a time-trend

Ambiguities arise in the interpretation of some of the variables and their predicted signs. At the firm level, the predicted relationship between profits and output will depend on the objective function, market and entry conditions(1) and the extent to which firms are in short- or long-run equilibrium, or in transitory disequilibrium. At the industry level, the regulated nature of the market is a further complication. Moreover, with private venture research and Government work, profits can be received in "lumps" following the sale of a project, so distorting the relationship between current sales and profitability. Indeed, the reverse causation from profits to sales is not implausible. Lags are a possible solution, but they are unable to reflect accurately some of the delays in price-fixing for defence contracts. For example, the final price for the Blue Steel development contract was not agreed until seven years after the work ended!(2). Also, if Governments require a specific aerospace capacity in the UK, they have to cover its supply price as reflected in the average

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(1) With restricted entry, aircraft firms can adjust their output levels either internally or through variations in the amount of subcontracting.

(2) Eighth Report from the Public Accounts Committee (1973 p. xvi)

profitability of manufacturing industry. As a result, the aerospace industry's profits will reflect the performance and output of the rest the economy: hence, even if there is a relationship between aerospace profits and output, it might differ from that in other British firms. In view of the plotted relationship between profits and output, a negative sign was expected.

Negative coefficients were also predicted for the proportion of R & D sales, the capital-labour ratio and the mergers. Positive relationships were expected for the proportion of UK procurement sales, competitiveness, manufacturing profits and the Korean War.

Exports and the Review Board were more debatable. For profit-maximizers which are price-makers in the UK and price-takers overseas, an increase in exports might have an adverse effect on profitability.(1) Alternatively, overseas markets are not subject to UK Government profit regulations(2). Interviews with industry executives suggested that on military work, profit rates on exports are greater than on domestic sales due to the absence of profit controls. On one military aircraft, a profit rate of 25% on capital was obtained on overseas sales, compared with a maximum of 15% from the UK Government. and, if there is a temporary monopoly, exports might favourably affect profits. Similarly, the regulatory function of the Review Board should have a negative impact, but this might be difficult to separate from the 1968 policy of linking profits directly to the average performance of manufacturing industry.

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(1) Cooper and Hartley (1970, Ch 4).

(2) Exports of UK Government-financed aerospace projects are subject to a levy on sales; - see: Report of the Committee of Inquiry into the Aircraft Industry 1964-65 (1965, p. p26)

Some equations included a time-trend as a means of distinguishing any "other influences". Time is sometimes used to reflect technical progress. Indeed, the industry's criticisms of Government contracting suggested that technical progress might have had a negative impact on profitability. However, this effect should be captured by the share of R & D work in total output. If so, time will reflect "other influences" and its meaning and predicted sign become ambiguous. Both linear and log-linear equations were estimated and examples of the former(1) are shown in Table III. The equations explained over 80% of the variations in profitability, but multicollinearity was a problem. A principal component analysis of the data suggested that models with more than six explanatory variables would have substantial multicollinearity and that this might also arise with a smaller number of variables; hence there were constraints on the range of estimating equations. Significant coefficients with the expected signs were often obtained for output, the share of procurement, the capital-labour ratio and the profitability of manufacturing industry. There was also evidence of a positive time-trend. Strong support emerged for a negative impact of structural change, confirming the results of other studies of post-merger performance(2) Table III shows that, ceteris paribus, mergers might have reduced the industry's

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(1) The log-linear equations generally gave the same or fewer significant coefficients.

(2) A Review of Monopolies and Merger Policy (1978 p 17). The mergers were associated with a rise in the degree of concentration at the industry level, and a substantial rise in concentration within the airframe sector-e.g. in 1958, 14 enterprises accounted for most of the employment in airframes; by 1963, three groups employed over 80% of the sector's labour force. Thus, the mergers led to increased concentration and lower profit rates: see also Table II for airframe profits.

TABLE III
UK AEROSPACE INDUSTRY PROFITS

Equation	Dependent variable	Coefficients of: Constant	Q	R/Q	P/Q	X/Q	K/L	C	M	PRI	W	RB	t	$\bar{R}^2$	DW
1.	$\frac{\pi}{K}$	15·46*	−0·17**		21·89*				−9·15**				0·63*	0·729	1·41
		(7·42)	(0·04)		(9·96)				(2·36)				(0·26)		
2.	$\frac{\pi}{K}$	32·29**	−0·09*			16·49	−10·51**		−4·16					0·761	1·05
		(3·88)	(0·04)			(8·89)	(3·64)		(2·06)						
3.	$\frac{\pi}{K}$	−4·24		46·58	19·65**				−7·49**		3·35*			0·835	2·46
		(9·35)		(29·82)	(8·12				(1·37)		(1·52)				
4.	$\frac{\pi}{K}$	28·02**	−0·09*		8·20		−11·27**		−6·05*				0·53*	0·817	1·53
		(7·19)	(0·04)		(9·19)		(3·45)		(2·16)				(0·21)		
5.	$\frac{\pi}{K}$	34·59**	−0·10*				−12·81**		−5·95*			−1·52	0·51*	0·814	1·50
		(3·36)	(0·04)				(3·11)		(2·22)			(2·33)	(0·23)		
6.	$\frac{\pi}{K}$	4·12					−8·16*		−5·30*	1·40**		−2·75	0·66*	0·852	1·54
		(9·03)					(3·07)		(1·91)	(0·39)		(1·95)	(0·23)		
7.	$\frac{\pi}{K}$	32·29**	−0·06				−11·03**	0·06	−2·77			2·57		0·767	1·17
		(6·88)	(0·08)				(3·39)	(1·10)	(1·89)			(1·79)			
8.	$\frac{\pi}{K}$	9·25	−0·12		4·47				−4·76*	1·59**		0·44		0·741	1·47
		(13·47)	(0·11)		(10·16)				(1·73)	(0·44)		(2·33)			

Notes

(i) π/K is the industry's profit rate on capital employed, as shown in Table I. Equations 1, 3–7 use the data in Table I, whilst equations 2 and 8 used the adjusted data for 1960–64, as defined in Table I, note (ii).
(ii) Q is an index of output at constant prices with 1958 = 100, as shown in Table I. In some instances, output was lagged one year, with similar results to those reported in Table III.
(iii) R/Q is UK Government expenditure on military and civil R & D as a proportion of total output.
(iv) P/Q is UK military procurement as a proportion of total output.
(v) X/Q is the proportion of total output which is exported.
(vi) K/L represents factor proportions and is the ratio of capital to labour. Capital is in constant 1970 prices, using a price index for aerospace; labour is the industry's total employment (000's).
(vii) C is an indicator of international competitiveness showing UK aerospace exports as a proportion of aerospace exports from the rest of the world, excluding the UK. An alternative measure, namely UK exports as a proportion of total world exports, including the UK, was also used.
(viii) M is a dummy variable for the mergers, with 0 for 1949–59 and 1 for 1960–73.
(ix) PRI is the rate of return on capital employed in large manufacturing companies. Equation 6 uses the data shown in Table I. An alternative measure, namely after tax profitability in large manufacturing firms was used in equation 8.
(x) W is a dummy variable for the Korean War, with 1 = 1950–53 and 0 elsewhere.
(xi) RB is a dummy variable representing the Review Board for Government Contracts with 1 = 1968–73 and 0 = 1949–67.
(xii) t is a time-trend. Equations 1, 2, 4, 5 and 7 are based on 1949–73; equation 3 is 1949–64 and equations 6 and 8 are for 1955–73.
(xiii) $\bar{R}^2$ is the multiple correlation coefficient adjusted for degrees of freedom; DW is Durbin–Watson statistic, all being within the inconclusive range.
** denotes significant at 1% level; * is significant at 5% level; estimated standard errors are shown in parentheses.

profit rates by about 6% points. Since similar results were obtained for the sub-period 1949-64 (Table III, equation 3), there was no evidence that the findings reflected the modification in the official profit series in 1964. They might, of course, reflect some of the accounting changes associated with the mergers, but these affected only a few firms in the industry. On the contrary, in 1965 an official Report concluded that the "reorganization of the industry following the mergers ... was slow and is still incomplete"(1). Another study also found a substantial post-merger adjustment period, typically five years, with one major aircraft firm estimating 12 years and "substantial" adjustment costs associated with integrating different organisations.(2) Slow adjustment might be explained by the pricing and regulatory system for UK Government contracts. On such work, a firm's fixed outlays are recovered through an overhead recovery rate within a framework of admissible costs. With a long-run decline in the demand for military aircraft, this method tends to result in the state financing excess capacity in the industry, so reducing the incentive for firms to adjust downwards their plant capacity and overhead labour. Indeed, the pricing system and profit constraints provide firms with an inducement to accumulate capital at the state's expense.(3) The negative sign on the capital-labour ratio provides

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(1) Report of the Committee of Inquiry into the Aircraft Industry 1964-65 (1965, p. 22)

(2) Hartley and Corcoran (1976).

(3) Averch and Johnson (1962). The system for recovering overheads can lead to a contract carrying expenses incurred on another project (e.g. military versions of civil aircraft) and the inclusion of a proportion of a firm's private venture R & D as part of the costs on Government work - See: Third Report from the Public Accounts Committee (1970 pp. xxix-xxxi).

further support, suggesting that labour is the factor which the industry uses for downward adjustments. If valid, this explanation produces the interesting result that the UK Government's pricing system financed capital accumulation and excess capacity which adversely affected the industry's profitability in the 1960s, so providing it with a case for the upward adjustment in profit rates in 1968!

The remaining results were either less conclusive or unexpected. There was only tentative support for a positive impact of the Korean War, and insignificant coefficients were more typical. Doubts, therefore, arise about the empirical validity of the "war profiteering" hypothesis. Some other results were unexpected. Research intensity, export shares and the industry's international competitiveness made no apparent contribution to variations in profitability. Nor was the Review Board found to have a significant negative effect. Indeed, a few equations suggested that the Board might have had a positive impact. At the same time, the evidence shows that policy has successfully linked aerospace and manufacturing industry profit rates.

Further tests were undertaken to identify the contribution of other possible explanatory factors. These included capacity-utilization, a political dummy for the UK Government and a lagged dependent variable.(1) Capacity-use was included because of the assertion that higher utilization raises profitability, but there was no support for the hypothesis. Profits might be further affected by whether a Labour

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(1) Similar equations were estimated for the US aircraft industry, 1961-76. both output and research intensity made no apparent contribution to explaining profitability, but significant and negative coefficients were obtained for export shares and the ratio of the number of military to civil aircraft produced-i.e. exports and military output had an adverse effect on profit rates in the US industry.

or Conservative Government is in office, with the former being more critical of defence profits. However, the political dummy had no significant effect on profitability. A lagged dependent variable was also incorporated to test for delays in the adjustment of actual to desired profits. Both linear and log-linear equations gave a significant and positive coefficient for the lagged dependent variable.

SOME FURTHER IMPLICATIONS

Three further questions were considered. First, does diversification "protect" an aerospace company's profits? Second, are the determinants of profits in the regulated aerospace industry different from the rest of the UK economy? Third, does regulation have any effect on wages or other product markets ?

(1) Diversification

Hawker Siddeley is a diversified aerospace group whose non-aircraft business could "protect" its overall profitability. If so, a negative relationship would be expected between the proportion of aerospace business in total sales and the group's profit rates. Empirical tests provided no support for this diversification hypothesis.(1) An example is:

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(1) The restricted form of the equation reflects data limitations. Profit rates on capital were only available for the Group; other data available were aerospace sales and profits, and Group sales. A significant and positive coefficient for the proportion of aerospace sales might have indicated that the Group had been relatively more successful (profitable) with its aerospace product mix: either it produced a given aerospace mix relatively more efficiently or, it had a more profitable mix with, say, a greater emphasis on production rather than research work and/or a different proportion of exports in its total aviation sales.

$$HSG\ \pi/K = \underset{(3.85)}{19.60^{**}} - \underset{(0.04)}{0.15^{**}Q} + \underset{(16.14)}{111.17^{**}\pi/S} + \underset{(0.04)}{0.02A/HSG}$$

$R^2 = 0.89$ DW = 1.84

where

HSG π/K = Hawker Siddeley Group's profit rates on capital employed.

Q = UK aerospace industry's output in constant prices, 1958 =100.

π/S = profit rate on Hawker Siddeley's aerospace sales.

A/HSG = Hawker Siddeley's aerospace sales as a percentage of total Group sales (an indicator of diversification).

n = 13; 1961-73. Remaining details as in Table III.

(2) Is Aerospace Different?

It is possible that the determinants of aerospace profits are unique compared with the rest of the UK economy. This can be tested by estimating a profits model for other British industries and then comparing the explanatory variables. In particular, the elasticity of profit rates with respect to output might differ between regulated defence contractors and other firms, with the latter expected to have higher elasticities. However, attempts to estimate a model on limited cross-section data for manufacturing were unsuccessful. The explanatory power was extremely low and the model was not considered sufficiently well established to form a basis for comparison with aerospace.(1)

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(1) Data were collected from the Times Top 1000 Companies, 1971 on rates of return on capital, sales (Q, in thousands, 1971), exports (X), employment (L) and capital. The cross-section sample consisted of 86 firms. An example of one of the best equations is:

$$\pi/K = \underset{(1.73)}{18.59^{**}} + \underset{(0.0000024)}{0.0000038Q} + \underset{(10.39)}{15.94X/Q} - \underset{(0.00003)}{0.00006^{*}L}$$

$R^2 = 0.04$. Remaining details as in Table III.
No significant relationships were estimated between profit rates

(3) Regulation, Wages and other Markets

Regulated firms have an incentive to substitute discretionary expenditures for profits, especially on non-competitive and cost-based Government contracts. Wages are a major outlay. It can be hypothesized that pay increases in the regulated aerospace industry with cost-based Government contracts are likely to be resisted less vigorously than they would be in a commercial market. A crude test of this hypothesis used data on wage increases in aerospace compared with other industries. Aerospace was never at the "top of the league" for pay increases and there were other industries, operating in unregulated commercial markets, with greater rises.(1) Thus, there was no support for the hypothesis of "excessive" pay increases in the regulated aerospace market.

Satisfactory tests of models of the regulated firm require a

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and sales for the manufacturing firms, a result which was in complete contrast to the findings for the aerospace industry: But such results might reflect the differences between estimating from time-series data for a single industry and cross-section data for large manufacturing firms.

(1) The percentage change in average annual wages was obtained for aircraft; chemicals; electrical engineering; food, drink and tobacco; metal manufacturing; motor vehicles and motor-cycles; shipbuilding; and all manufacturing. Data were obtained for three periods, namely 1954-58, 1963-68 and 1958-68. Aerospace was usually around, or even below, the average for UK manufacturing. For example, for 1958-68, annual wages rose by 71.7% in aerospace; 75.1% for all manufacturing; 80% for chemicals and 78.5% for food, etc. The results could reflect data problems - e.g. data relate to the whole industry and not to plants working on Government contracts. There are also difficulties of holding constant other relevant variables - e.g. demand, unions, human capital. Alternatively, the Government's procurement agency might be relatively successful in regulating wage increases (i.e. a clearly observable variable). If so, regulated firms might respond by raising non-wage expenditures (e.g. on job leisure) or expanding their employment of human capital. A US study reached a similar conclusion. Peck and Scherer (1962, p. 524).

detailed study of enterprise behaviour embracing all aspects of both inputs and outputs. In the absence of published data, a limited interview survey was used to obtain further qualitative evidence on behaviour in related, but unregulated, markets.(1) The interviews concentrated on the relative profitability of various outputs, namely civil sales and exports, including licensed production and spares: these are possible substitute markets for a regulated enterprise. The interviews provided no overwhelming support for the hypothesis that civil aerospace sales are more profitable than military work. Two responses were illuminating, both from American firms and each illustrating the diversity of experience and behaviour at the micro-level. One executive claimed that civil aircraft sales are more profitable for a successful airliner, but that the civil market is risky. Another respondent regarded military work as more profitable, since the firm's civil aircraft sales were in a highly competitive market and its airliner prices had actually been reduced below average total cost but above variable costs: the firm recovered these costs on its military sales. However, this firm had planned to use its civil aircraft business to obtain greater volume so spreading over-heads and "allowing the company to be more competitive on military contracts".

With exports, the interviews provided support for all plausible possibilities! Similar numbers of firms claimed that exports were

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(1) The interviews were undertaken as part of Keith Hartley's NATO Research Fellowship for a general study of weapons procurement policies in NATO. The sample embraced all the major airframe companies in the UK, Europe and the USA. The questions explored the relative profitability of different markets, using a structured questionnaire.

more, less or as profitable as domestic sales. One UK executive explained that exports were "much more profitable" since home sales to the Government involved "careful monitoring of excess profits". Further profit opportunities arise with licensed production and the pricing of spares in unregulated markets. Firms in the UK, USA and France were almost unanimous in stating that licensed production, including co-production and industrial collaboration, was usually as profitable for the licensor as domestic military aircraft work.(1) Spares pricing is a more controversial issue and has to be analysed in the context of each firm's pricing strategy over the life-cycle of its products. European industry, for example, often alleges that US aerospace equipment sold abroad is "cheap, but you pay for the spares". American companies were questioned on this point. Some US companies accepted that for aircraft exports they raised the prices of spares on later orders. Foreign spares prices might be 15-20% higher than for sales to the US Government. But the explanations for this policy were diverse. They included the search for higher profit rates, the fact that exports involve special requirements and that foreigners often buy spares at the end of a production run or require them urgently, as well as the US Government's levy on foreign military sales. One American firm stressed that since US regulatory rules do not apply to foreign sales, its export prices for aircraft and spares reflect "what the market will bear", including any monopoly position. But not all US firms raised prices on spares exports. References were made to the

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(1) Licensed production involves awarding a licence to a foreign firm allowing it to manufacture the innovating company's aircraft. These results are probably reliable since there might be a bias towards claiming that such work is less profitable.

"loss of consumer goodwill" and the fact that rivals can compete on both spares and new aircraft. In other words, the interview study confirmed the diversity of experience amongst firms, a finding which shows the limitations of industry level studies.

CONCLUSION

This study has shown that there are opportunities for the empirical investigation of aerospace as a regulated industry. The econometric work showed the influence of output, the share of procurement and factor proportions. The clear link between UK aerospace profitability and manufacturing industry profitability might be interpreted as an indicator of the "success" of Government procurement policy, although this is offset by the negative impact of the state induced mergers. Further opportunities remain for empirical work. Questions arise as to whether changes in the Government's procurement agency have had any effect on profit regulation, on whether firms have responded to regulation by hoarding floorspace, and on the behaviour of regulated firms towards "free" markets.

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CHAPTER SEVEN*

COST FUNCTIONS FOR GOVERNMENT GRANT-AIDED SCHOOLS

INTRODUCTION:

The state has played a major role in education for over a century. Currently most education is provided by local education authorities who finance and administer the system of state schools. The way their budgetary decisions are influenced by the financial environment they are placed in by central government, by the views of local politicians, and by demographic change was analysed in Chapter 4. However, until the system was abolished in 1976, the government also supported nearly two hundred Direct Grant schools in the private sector to which it paid a capitation grant. This chapter investigates the relationship between the size of these Direct Grant schools and their average cost of output. There are a number of reasons why this relationship is of interest. First, if a certain size of school minimizes unit cost there is scope for what may be in aggregate considerable savings in education expenditure. Secondly, costs are relevant to the education vouchers discussion and more recently the debate over

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(*) This chapter is based on P.A.Watt "Economies of Scale in Schools: Some Evidence from the Private Sector", Applied Economics, 12, 1980, pp 235-242. The author is grateful to A.J. Buxton, K. Hartley, A. Maynard and G.B. Stafford for helpful comments but retains responsibility for error.

the proposal that schools be enabled to "opt out" from local authority control and receive direct per capita funding from the government. To the extent that such schemes are competitive, the form of the cost function is relevant because if unit costs fall continuously it is well known that no competitive equilibrium will exist.(1) Thirdly the cost function is relevant to discussion of inter-regional educational equality.(2) With the existence of different sizes of school and non-constant average costs, a simple equalization of per pupil expenditure will not lead to equal exposure to the educational process.

The majority of existing empirical work is American and is briefly reviewed in the next section.

EXISTING STUDIES

An important problem for much American work on education costs,(3) as Riew (1966) and Wales (1973) have pointed out, is that for many states data are only available at the school district rather than school level, and a school district may contain many schools.(4) Riew (1966) avoids this problem, at a possible cost of making his sample unrepresentative, by excluding districts containing more than one school. His results are reproduced in Table 1.

Riew concludes from his results that the cost minimizing school size is 1675 pupils. Wales (1973) argues that this result may stem largely from Riew's use of a quadratic cost function, finding in his

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(1) See e.g. Friedman (1962, p93)

(2) See Michelson (1972)

(3) e.g. Schmandt and Stevens (1960), Hirsch (1960)

(4) Thus the largest school district in the Schmandt and Stevens study contained 80,485 pupils

TABLE 1: RIEW'S ESTIMATED COST FUNCTIONS FOR WISCONSIN SCHOOLS

$$Y = 10.31 - .402X_2^{*} + X_2^{2} + .107X_3^{*} + .995X_4 - 13.62X_5 + .618X_6^{*} - .102X_7$$
$$\qquad\quad (.062)\quad (.000023)\ (.013)\quad (.640)\quad (11.95)\quad (.189)\quad (.109)$$

Note: R^2 = .557, * Denotes significance at the .01 level. Standard errors in parentheses.
Riew's variables were defined as follows:
Y = operating expenditures per pupil year,
X_2 = no. of pupils,
X_3 = average teacher's salary'
X_4 = no of courses offered,
X_5 = average no. of courses taught per teacher,
X_6 = percentage change in enrolment 1957-60,
X_7 = percentage of classrooms built after 1930.

own analysis of teacher salary costs that although the quadratic form gives a reasonably good fit, a rectangular hyperbola indicating constantly decreasing costs fits much better.

Both Riew and Wales endeavour to allow for differences in the quality of output of schools. Riew by the inclusion of variables X_3, X_4 and X_5 (see Table 1) and Wales by the inclusion of a variable measuring teacher experience. These, however, are input measures of quality. Data availability strongly favours this approach but theoretically it is not ideal as the question of whether these inputs are fully converted into outputs remains unexamined. Output measures are used by Cohn (1974) who regresses the percentage change over two years in pupils' average scores in an educational development test on a set of input measures of school quality similar to those used by Riew. However an R^2 of only .07 is obtained and Cohn chooses to return to input measures for his estimation of cost functions, obtaining results comparable with those of Riew.

The only study that exists for the U.K. is that of Glennerster and Wilson (1970) who adopt an approach similar to Riew's and use input measures of quality. One output measure of quality, the average num-

ber of passes obtained by 'A' level candidates is tried but found to be unsuccessful. The results of the regressions are not given directly but discussed qualitatively in the text. They conclude that 'size is not significantly associated with cost per pupil'.(1)

METHOD OF ANALYSIS

The model adopted here is essentially that suggested by Cohn and Riew (1974). It is assumed that school governors set out to minimize total costs subject to the realization of a desired level of quality per pupil, Q_o. A production function of the form $Q = Q(Y_1 \ldots Y_m; S, X_1 \ldots X_m)$ is assumed, where quality per pupil, Q, depends upon a vector of school inputs Y and a vector of exogenous factors S, $X_1 \ldots X_m$. S denotes the number of pupils which, it is assumed, the school is not free to vary. In the short run the number of classrooms will be fixed and if, as seems likely, the rate of utilization of classrooms does not vary greatly over time then the assumption may be reasonably realistic.(2) From the Lagrangean

$$L(Y_1 \ldots Y_m, \lambda) = p_1Y_1 \ldots p_mY_m - \lambda\{Q(Y_1 \ldots Y_m; S, X_1 \ldots X_m, Q_o)\}$$

the (n + 1) functions expressing the necessary(3) conditions for an extremum may be solved to yield a system of equations in which the cost minimizing inputs $\bar{Y}_i$; i=1,n are expressed as explicit func-

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(1) Glennerster and Wilson (1970, p. 166)

(2) In Cohn and Riew's model, S is included amongst the school's choice variables. The school is assumed to minimise <u>total</u> cost subject to a constraint stated in terms of quantity <u>per pupil</u>. If total costs always decrease with size this formulation will clearly not lead to useful results. The problem is avoided in the solution of the maximisation problem by their <u>implicit</u> treatment of S as fixed.

(3) It is assumed that the second order sufficient conditions for minimisation are satisfied. See Chiang (1974) p.389.

tions of the exogenous variables. Substitution of these functions into the total cost function and division by the level of output yields the following general form for minimised average cost AC*:

$$AC^* = h(S, X_1 \ldots X_m;\ Q_o,\ p_1 \ldots p_m)$$

on which estimation will be based. The advantages of estimating average rather than total cost functions in reducing multicollinearity and heteroscedasticity have been pointed out by Feldstein (1967, p63) in another connection.

THE DATA

There is a severe lack of data in this area. The private sector was chosen because most education authorities do not keep separate accounts for each school,(1) and it was necessary to go back to 1968 to obtain the systematic data collected by the Public Schools Commission (1970). The boys' and girls' direct grant grammar schools were chosen for study as representing a fairly homogeneous group, reducing the need to correct for quality differences. Quality differences may also be reduced by the requirement that these schools be scrutinized and approved by the D.E.S. with the aim of ensuring that expenditure is generally no higher than for comparable maintained and direct grant schools.(2) This scrutinization, and competition between the schools is also likely to reduce possible X-inefficiency, lending validity to the assumption of cost minimization. To avoid problems of possible cross-subsidization between day and boarding schools, the forty boys'

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(1) Glennerster and Wilson (1970, p119)

(2) Glennerster and Wilson (1970, p66)

and twenty-one girls' schools that accept a proportion of boarders were excluded from the sample, as were the (two) co-educational schools.

The variables used can be classified using the average cost function (see Equation 1). The measure of scale, S, in various functional forms is used and exogenous factors $X_1 \ldots X_m$ are represented by the age of the school measured by the date of foundation FN, and the proportion of students financed by the local authority, LA/S. This latter variable is likely to indicate the degree of control a local authority exerts over a school and is expected to be negatively related to average costs. No direct measure of output quality was available. Hence as in the American studies, various input measures were used as indicators of Q_o: teacher pupil ratio (T/S), proportion of teachers with an M.A. degree (MA/T) and the proportion of pupils in the sixth form (VI/S). The measurement of quality by the proportion of staff with a Master's degree may be criticized as being weighted by purchased Oxford and Cambridge M.A.s, but this measure is retained for lack of an alternative. Table 2 gives the means of the variables collected.

The boys' schools are on average larger, have larger sixth forms and a slightly higher proportion of local authority financed pupils. Girls' schools have the higher teacher pupil ratio.

As no direct data on costs were available, measurement of the dependent variable is based on the fees charged by the schools. This could cause error in two ways. First, there is the possibility that fees may be set above costs and the surplus used for discretionary

TABLE 2: MEANS OF VARIABLES USED AND THEIR ABBREVIATIONS

Variable	Abbreviation	Boys'	Girls'	Combined
School Fees	FEE	176.5	173.3	174.8
No. of Pupils	S	721.5	582.5	597.3
Teacher pupil ratio	T/S	0.0603	0.0622	0.0615
Percentage local authority financed pupils	LA/S	64.51	62.78	63.4
Proportion of sixth form	VI/S	0.266	0.217	0.234
Proportion of governors' financed places	G/S	0.0089	0.0052	0.0065
Date of foundation	FN	1606*	-	-
Proportion of teachers with M.A. degree	MA/T	0.3115*	-	-

Note: No of pupils in smallest school: boys' 397, girls' 183.
No of pupils in largest school: boys' 1414, girls 947.
Sources: Public Schools Commission (1970) vol. II, Appendix 2, and Burnet (1968). *his variable, collected from Burnet (1968) was available for only 24 of the boys' direct grant schools.

non-educational expenditure by governors.(1) Competition, and the D.E.S. scrutinizing process may prevent this. Secondly, so that fees do not understate costs, corrections must be made for subsidies which cause fees to diverge from costs and allowance must be made for free places. These corrections are now discussed.

Total costs in direct grant schools are met by fees paid by parents, fees paid by local authorities, grants from the D.E.S. and only three per cent from other sources - mainly foundation income.(2) A percentage of pupils (LA/S) have their fees paid entirely by the local education authority. This does not affect the use of fees as a measure of average cost as school still receives the fee. Nor does the fact that parents are charged a variable proportion of the total fee according to their income, as the difference is made up to the

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(1) In analogy with the managers of Williamson (1967)

(2) Public Schools Commission (1970, vol I, p. 54)

school by a full matching D.E.S. grant. A very small proportion, G/S of pupils are awarded free 'governors places' and the fees variable has therefore been divided by the factor [1 + (G/S)] . The effect of this adjustment is slight.

It is necessary to take account of D.E.S. capitation grants. In 1968 these were ≡84 per sixth former and ≡52 for other pupils.(1) Average variable costs per pupil are therefore calculated using the following formula:

$$AVC = \{FEE \times \frac{1}{(1 + G/S)}\} + [52 \times (1 - VI/S)] + (84 \times VI/S)$$

This has been termed average variable cost because fixed costs in the form of loan charges are largely excluded from fees being mostly met from such sources as appeals or endowment funds.(2)

RESULTS

Regressions were estimated for several forms of cost function for boys' and girls' schools. Results for the boys' schools are given in Table 3. The explanatory power is very low for the boys' schools.(3) Equation 1 implies a cost minimising size of school of 906 pupils(4) but it is difficult to place any reliance on this statistic because of the low explanatory power of the regression it derives from and

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(1) Glennerster and Wilson (1970, p61)

(2) Glennerster and Wilson (1970, p77)

(3) The poor fit of the regressions for the boys' schools suggests possible heteroskedasticity associated with school size. However, when a test suggested by Goldfeld and Quandt (1965) was performed on the equations in Tables 3 and 4 the null hypothesis of homoscedasticity was not rejected.

(4) Setting dAVC/dS = -.0886 + (2 x .0000489S) = 0 and solving for S.

TABLE 3: BOYS' SCHOOL COST FUNCTIONS (DEPENDENT VARIABLE AVC)

Variable	Equation 1	Equation 2	Equation 3	Equation 4
S	-0.0866		-.0107	-.169
	(1.22)		(0.73)	(1.51)
S	0.0000489			.000112
	(1.10)			(1.60)
1/S				
V1/S	48.2	74.7	76.5	-201
	(0.59)	(1.03)	(0.99)	(1.10)
T/S	91.5	39.9	25.8	131
	(0.15)	(0.07)	(0.04)	(0.12)
LA/S	-0.271	-0.273	-0.293	-0.224
	(2.19)[a]	(2.23)[a]	(2.40)[a]	(0.65)
MA/T				71.9
				(1.36)
FN				0.0618
				(1.33)
CONST	230	178	199	193
	(3.17)[b]	(4.33)[b]	(4.90)[b]	(2.08)[a]
R^2	0.246	0.238	0.221	0.227
No. of observations	41	41	41	24

Note: |t| appears in parentheses.

[a] indicates a coefficient significantly different from zero in a one tailed test at the five per cent level.

[b] indicates a coefficient significantly different from zero in a one tailed test at the one per cent level.

TABLE 4: GIRLS' SCHOOLS COST FUNCTIONS (DEPENDENT VARIABLE AVC)

Variable	Equation 1	Equation 2	Equation 3
S	0.0473		-0.00421
	(0.89)		(0.41)
S	-0.0000452		
	(0.99)		
1/S		-1420	
		(0.62)	
V1/S	96.1	84	99.3
	(2.88)[b]	(2.50)[b]	(2.98)[b]
T/S	745	801	673
	(2.97)[b]	(3.20)[b]	(2.81)[b]
LA/S	-0.234	-0.261	-0.240
	(3.90)[b]	(4.68)[b]	(4.05)[b]
CONST	127	142	144
	(5.29)[b]	(10.28)[b]	(9.17)[b]
R^2	0.613	0.608	0.607
No. of observations	74	74	74

[b] denotes a coefficient significantly different from zero in a one tailed test at the one per cent level.

because this size is outside the size range of schools sampled. Equations 2 and 3 show that very different functional forms for S give little difference in fit. LA/S is generally found to have a significantly negative effect on fees. In Equation 4, NF and MA/T, available for a subset of the boys' schools fail to reach significance.

The explanatory power for the girls' schools (Table 4) is much higher. Here, measures of output quality VI/S and T/S are found to have a significantly positive effect on costs. However, it again is difficult to draw conclusions on the effects of scale, as Equation 1 implies a cost <u>maximizing</u> size of 523 and as in the case of the boys' schools, different functional forms have little effect on fit. LA/S again has a marked negative effect on costs.

CHAPTER SEVEN: COST FUNCTIONS FOR GOVERNMENT GRANT-AIDED SCHOOLS

CONCLUSIONS

In nearly all the equations estimated, the proportion of pupils financed by local authorities has a strong negative effect on costs. This may be due to the use of monopsony power by local authorities, or if, as seems likely, not all quality differences have been taken account of by the indicators used in this study, the variable may indicate a tendency for local authorities to choose lower quality schools.

There is nothing to choose between the various functional forms tried for scale effects and none of the coefficients of the scale variables tried reach significance. This lack of difference between the various functional forms tried lends support to the view of Wales (1973, p. 714) that the consideration of only the quadratic form in other studies may have yielded misleading results.

Although there are strong a priori reasons for believing in the likely importance of economies of scale in the very smallest educational units, such economies may be exhausted fairly rapidly, for in the range of school sizes considered in this study(1) the hypothesis no support.

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(1) The boys' school sample ranged from 397-1414 pupils. For the girls' schools the sample ranged from 183-947.

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CHAPTER EIGHT*

GOVERNMENT INTERVENTION IN THE OWNER-OCCUPIED HOUSING MARKET

INTRODUCTION

This chapter examines government intervention in the owner-occupied housing market in the form of the subsidy it grants to owner-occupiers. The chapter begins with discussion of alternative definitions of this subsidy and then surveys existing work on its measurement. In the final part of the chapter empirical work is presented in which subsidies to recent buyers in Birmingham are measured.

THE DEFINITION OF SUBSIDIES TO OWNER-OCCUPIERS

In what sense is it true to say that the owner-occupier in Britain is in receipt of a subsidy from the government?

Grey et al. (1981, p. 30) define housing subsidy as:

> any reduction in the price paid by individual consumers of housing as a direct or indirect result of government intervention ... It makes no difference whether the governments contri-

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(*) This chapter is based upon chapters contributed by the author to J. Doling, V.A. Karn and P.A. Watt, The Reform of Housing Finance: Its Impact on Low Income Owner-Occupiers, Report to the Rowntree Charitable Trust, 1984, and also J. Doling, and P.A. Watt, "Housing Finance and the Owner-Occupied Sector" in Lundqvist, L.J. and Wiktorin, M. (eds), Current Trends in British Housing, Bulletin M83: 17, National Swedish Institute for Building Research, Gävle 1983.

> bution takes the form of a cash payment or a reduction in tax liability.

In practice the government will always be expected to intervene in the economy by levying taxes, so this definition may be narrowed down by defining subsidy as the difference between the tax owner-occupiers would pay if the benefits of owner occupation were taxed consistently with other income and the tax they are actually required to pay (Doling and Watt 1983). The reason for focussing on inconsistency of taxation is that there are strong arguments for taxing all goods the same on grounds of horizontal equity.(1) However, stopping short of reforming the entire tax system from top to bottom, overall consistency is not possible. An important reason for this is the tax system's differential treatment of consumption goods and investment goods. Consumption goods confer their benefits at once and investment goods confer their benefits as a stream of services over time. Whilst the distinction is clear in principle, in practice it is difficult to draw the line between these two categories. Discussion of tax reform usually begins by categorising housing as either an investment good or a consumption good and then arguing for consistency of treatment of housing with other goods within that category(2)

Consideration of subsidy to owner-occupiers therefore hinges on the prior question of whether housing should be categorised as a consumption good or an investment good. Because a house yields its flow of housing services over time to the purchaser, economic theory indicates that housing should be considered as an investment good. From this

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(1) Whitehead 1980, p. 86.

(2) Dept. of the Environment (1977 part 11 p. 13) and Grey et al. (1981).

standpoint reform of housing finance should aim at treating housing in the same way as other investment goods. However in practice there are many cases of investment goods being treated as consumption goods by the British tax system - for example, cars, refrigerators and durable goods in general, which, like houses, yield a flow of services over time. Acceptance of this argument leads to the contrary view that houses should be classified as consumption goods because the tax system fails to classify other durable goods correctly. Whilst this is true, it can be argued that housing, at least, should be correctly classified as an investment good because it is the most important investment good that most households purchase. Rather than attempting to settle the argument finally, this chapter will set out the implications for tax reform of considering housing first as a consumption good and secondly as an investment good. A third possibility, that of treating a house as a financial asset, will not be considered as it has aroused very little interest in debate and is the least easily justified view.

(i) The House as a Consumption Good

If a house is considered to be a consumption good, the inconsistency in treatment of housing, and hence the subsidy, lies in the treatment of loans for house purchase. Whilst interest on loans obtained to finance consumption does not qualify for tax exemption, interest paid on loans to finance house buying does. The tax exemption applies to the householder's principal house (should he have more than one) and applies at his marginal tax rate. Thus the larger the loan obtained by the purchaser the higher the subsidy, and similarly the higher the marginal rate of income tax (and by implication,

income) the higher the rate of subsidy. The subsidy therefore consists of the homeowner's mortgage interest tax relief and is regressive in form. Under this definition, depending on the view of housing as being a consumption good, the subsidy is relatively visible and its identification does not involve such exercises as the imputation of "housing income". Probably because of this, calls for the abolition of mortgage interest tax relief are the most frequently heard suggestions for reform of the tax treatment of housing.

New building, and improvement of dwellings does not attract VAT, and whilst in this respect housing is treated inconsistently, voices are not heard suggesting the removal of this concession, perhaps because zero VAT rating for housing was explicitly designed from the outset to encourage house building (Whitehead 1980). Repair work, solicitors fees and estate agents fees are all charged at the standard rate.

Whilst viewing housing as a consumption good results in a simple analysis, it has already been argued that the view of housing as an investment good is more logical and in the next section the implications of such a view are explained.

(ii) The house as an investment good

If owner-occupied housing is classed as an investment good, removal of subsidy would consist in treating housing consistently with other investment goods for tax purposes. Owners of investment goods are taxed on the flow of income the investment generates and on any capital gains made. If a loan has been taken out to finance purchase of the investment, interest payments can be offset against taxable income.

Thus investors in industry will receive tax relief on any loans taken out to purchase plant and machinery for example, and will pay tax on any profits and any capital gains which they make in the course of their operations. In the case of owner-occupation, the money value of the flow of benefits generated by investment in the house is called its imputed rent, with the implication, if the house is seen as an investment good, that this rent be taxed. In addition a tax should be levied on any gains in the market value of the dwelling by analogy with capital gains tax on investment. Here a distinction should be made between real and nominal capital gains. This was recognised in April 1983 when the Chancellor moved to a system of taxing real capital gains by allowing nominal capital gains to be written down by inflation.

The final implication of viewing a house as an investment good is that while extending taxation to the imputed rent and real capital gains accruing to owners, the present mortgage interest tax relief should be retained. In contrast to the position obtaining when the house is viewed as a consumption good, interest payable on a mortgage used to finance investment in the house is a legitimate business expense.

To summarise, viewing a house as an investment good leads to the definition of the subsidy to owner-occupiers as the absence of tax on imputed rent and capital gains, whereas viewing a house as a consumption good leads to the definition of the subsidy as mortgage interest tax relief plus, possibly, the benefit of its zero VAT rating.

Before examining some attempts to measure subsidy under these alternative categorisations of housing as a consumption good versus an investment good, it will be useful to examine how subsidies may be

capitalised into the selling price of a house. In the next section, subsidies are first of all examined in the context of a rental market, and the relation between the rental price of a house and its selling price is then set out in the next sections.

THE EFFECT OF SUBSIDIES

Supply and demand analysis can be used to consider the effect of a subsidy on the housing market. Assume for example that owner-occupiers receive a subsidy proportional in size to the price paid for the housing. Suppose for the moment that they pay a rent for their housing. At equilibrium in Figure 1 this rent will be $\bar{R}$, and the equilibrium quantity will be $\bar{Q}$. If the rate at which the subsidy is paid is s, then if the consumer was prepared to pay R per unit of housing before the subsidy is paid, then after the subsidy he will be prepared to pay (R+sR) per unit of housing. A new demand curve $D_1D'_1$ is constructed that includes the subsidy in the price the consumer will be prepared to offer. This is done in Figure 1. The two

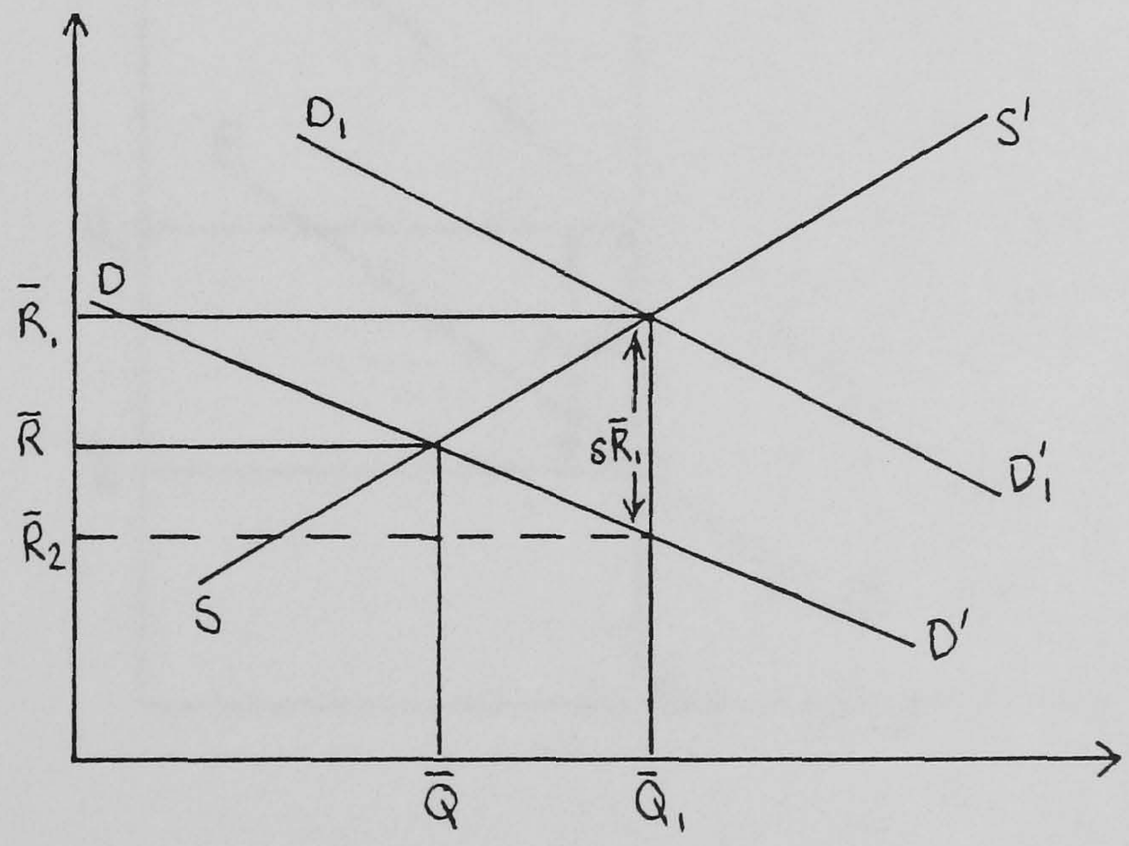

FIGURE 1

curves diverge because the subsidy, being proportional to rent, is higher at higher rent levels. With the subsidy the equilibrium price

will rise from $\bar{R}$ to $\bar{R}_1$ the quantity will rise from $\bar{Q}$ to $\bar{Q}_1$ and the subsidy paid will be $s\bar{R}_1$ per unit. Although the market price rises from $\bar{R}$ to $\bar{R}_1$ this rise is less than $s\bar{R}$, so the consumer's contribution falls, and is represented in Figure 1 by $\bar{R}_2$.

The extent to which the rise in the market rent caused by the subsidy is capitalised depends upon the elasticities of the supply and demand curves. Of key importance is the elasticity of supply of housing. How supply elasticity relates to tax capitalisation can be seen by considering the two extreme cases (a) totally inelastic supply and (b) infinitely elastic supply.

(a) Totally inelastic supply

Figure 2 represents the case where supply is totally inelastic. In such a case the subsidy will be totally capitalised and there will be no effect on the quantity of housing.

The totally inelastic supply curve SS' is vertical and the equilib-

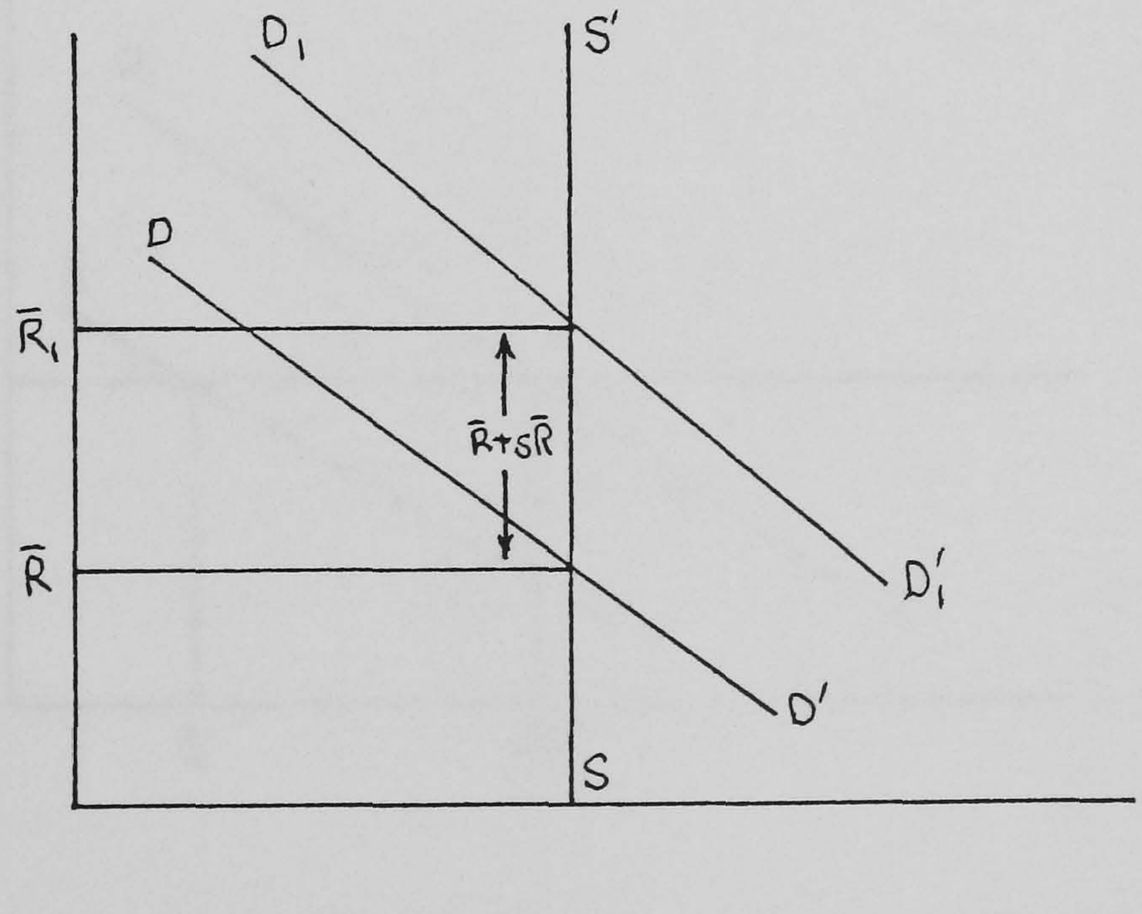

FIGURE 2

rium price rises from $\bar{R}$ to $\bar{R}_1 = (\bar{R}+s\bar{R})$, therefore the increase is exactly equal to the subsidy $s\bar{R}$. Hence zero supply elasticity leads to 100% capitalisation. The subsidy will not affect the quantity of

housing consumed but will be totally absorbed in a rise in prices of the existing stock of houses. The owners of the houses at the time the subsidy is introduced (or more precisely, at the time it is announced), will experience a once and for all gain in the price they can sell their house for. If the subsidy is paid by the government then this once and for all gain to existing owners is a cost to tax-payers in general. Those who purchase houses after the subsidy has been introduced, however, will receive no such gain because they face prices which have capitalized the subsidy. In so far as they are tax-payers they, like other non-owners, will have experienced a net loss from the introduction of the subsidy.

(b) Infinitely elastic supply

Suppose now the elasticity of supply is not equal to zero but infinity. This case is illustrated in Figure 3. In this case supply

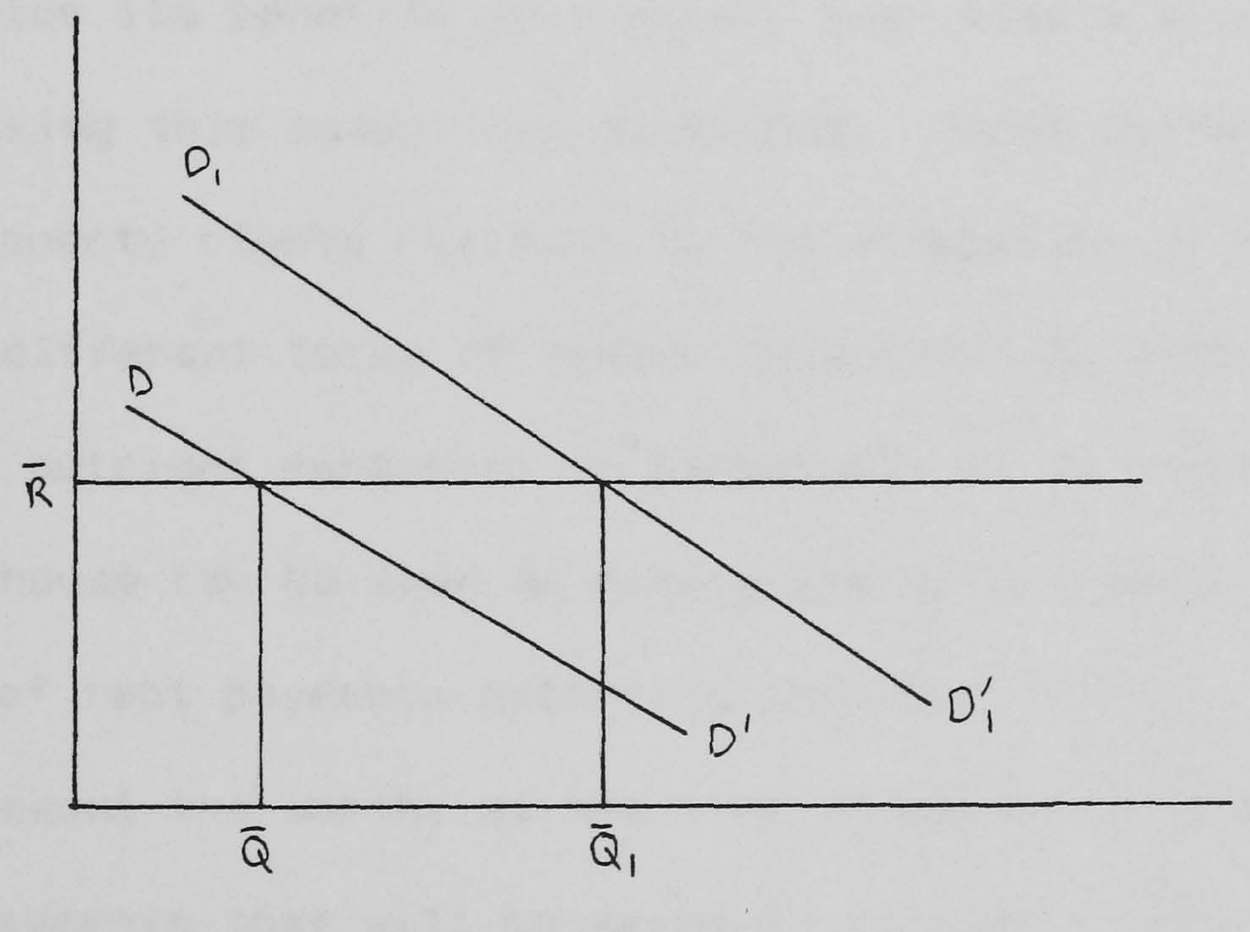

FIGURE 3

responds fully to the newly increased demand conditions after the subsidy is introduced, and the quantity of housing services consumed arises from $\bar{Q}$ to $\bar{Q}_1$. On the other hand there is no increase in rents, which remain fixed at $\bar{R}$ and consequently no capitalisation.The

whole of the subsidy is passed on to individual owners who now pay only $\bar{R}-s\bar{R}$ for their housing.

The effects of different possible supply elasticities on the effectiveness of subsidies are discussed at greater length in Welham (1982) and White and White (1977). However, at present there is a vacuum of knowledge on the actual magnitude of the elasticity of supply of housing. This lack of information is a serious deficiency as it is clear from the analysis that knowledge of the elasticity of supply of housing is of key importance in the discussion of housing subsidy policy.

THE SELLING PRICE OF A HOUSE OF GIVEN RENTAL VALUE

So far the analysis has worked in terms of a rental price for housing. Although this simplifies the analysis, very few houses are rented in the private sector in Britain(1) and by definition, no owner-occupied housing. Because a house is an expensive durable good which yields its benefits only slowly over time a wide variety of ways of purchasing this output has developed. These different ways of buying property rights relating to the occupation of housing correspond to different forms of tenure (see Pennance 1969). Tenure can vary from outright ownership in perpetuity to an overnight lodging. Buying a house can be seen as making one single payment equivalent to a stream of rent payments extending into the future. The amount paid will represent the worth, at the time of payment, of the future stream of rent payments that will be saved by purchase. If the house is expected to last N years and command a rent of R per year, then if the interest rate is i, the present value or price P of the house can be

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(1) 11.5% in 1983 (Minford, Peel and Ashton 1987, p48)

written as follows.

$$P = R/(1+i) + R/(1+i)^2 + R/(1+i)^3 + \ldots + R/(1+i)^N \qquad (1)$$

dividing (1) by (1+i) yields

$$P/(1+i) = R/(1+i)^2 + R/(1+i)^3 + \ldots + R/(1+i)^N + R/(1+i)^{N+1} \qquad (2)$$

subtracting (2) from (1) gives

$$P - P/(1+i) = R/(1+i) - R/(1+i)^{N+1} \qquad (3)$$

i.e.

$$P(1+i-1)/(1+i) = R/(1+i) - R/(1+i)^{N+1} \qquad (4)$$

multiplying by (1+i) gives

$$Pi = R - R/(1+i)^N \qquad (5)$$

thus, the price of a house that commands a rent of R can be stated as:

$$P = R[1 - 1/(1+i)^N]/i \qquad (6)$$

Furthermore, if the life of the house is assumed to be infinite $(1 + i)^N$ will be infinite and $1/(1 + i)^N$ will be zero, so the expression can again be simplified to

$$P = R/i \qquad (7)$$

Thus with the aid of formulae (6) and (7) a rent stream can be capitalised into a selling price for a house.(1) Similarly a stream of future subsidy payments can also be capitalised into an addition to the price.

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(1) As an example of the use of these formulae, suppose that a house can be rented out for £1000 a year and let the rate of interest be 3%. If the house were assumed to have an infinite life it could be sold according to formula 3, for a price of £1000/.03 = £33,333.

Using formula (6), if the house had a life of 100 years it could be sold for

$$\frac{£1000\ (1 - .05203)}{.03} = £31,599 \quad (\text{where } .05203 = 1/(1.03)^{100})$$

and if the house had a life of 50 years it could be sold for

$$\frac{£1000\ (1 - .2281)}{.03} = £25,729 \quad (\text{where } .2281 = 1/(1.03)^{50})$$

The next section reviews attempts made, under one or another theoretical definition of subsidy, to measure its actual magnitude using data for the UK.

A SURVEY OF ESTIMATES OF SUBSIDIES TO OWNER-OCCUPIERS IN THE UK.

An early attempt to calculate the subsidy to owner-occupation was that of Odling-Smee (1975). Odling-Smee viewed housing as an investment good. He started from the premise that the subsidy to owner-occupiers could be measured by comparing:

> the actual costs of owner-occupation with those that would be incurred if the owner-occupier were both tenant and landlord in [a] hypothetical neutral government policy system.

In the case of housing, neutral government policy would lead to a market rent being charged, as one of the features of government neutrality would be that government policies designed to hold rents down would be absent. Hence Odling-Smee's ideal government-neutral benchmark system would have the owner-occupier paying income tax on an imputed gross market rent for his property. He would be allowed to set interest charges as well as maintenance and administration costs against this income. In addition he would be liable to pay capital gains tax on the property. Comparing this benchmark with what owner-occupiers actually pay, the subsidy is seen to amount to the sum of (unpaid) taxes on imputed income and imputed accruals of capital gains.

Odling-Smee calculates imputed net rent to owner-occupiers as aiP, where P is the average price of owner-occupied housing i is the discount rate and $a = 1/(1-1/(1+i)^N)$ with N set to an assumed average life of housing of 50 years. The use of this formula may be understood by with reference to formula (6) derived above for calculating

the price (P) that would be paid for a house that commanded a rent stream of R per year.(1)

The formula generates a price from a rent stream, but it can be re-arranged to yield a rent stream from a price - Odling-Smee's imputation process. Thus (6) may be re-arranged to give

$$R = iP/(1-1/(1+i)^N) \qquad (8)$$

or using Odling-Smee's definition for a,

$$R = aiP \qquad (9)$$

his imputation formula. To use this formula Odling-Smee needs estimates for the parameters i, P and N in Equation (8). The average price of owner-occupied housing, P is obtained from the average price of dwellings mortgaged with building societies in the U.K. in 1973 which was £9,942(2) Odling-Smee rounds this figure up to £10,000. The appropriate discount rate, i, is the difference between i_m, the over-all money rate of return, and the annual rate of growth of house prices, which are assumed to be 11 and 8 per cent respectively. N, the average remaining life of housing is assumed to be 50 years. These assumptions give a value of ai of approximately .04. Hence the imputed net market rent is £10,000 x .04 which would attract a tax at the rate of 30 per cent, of £120. Before 1977-78, capital gains tax was likely to be levied at a rate lower than the 30 per cent basic rate. Thus if capital gains did not exceed £5,000 tax was limited to approximately the taxpayer's top income tax rate on half the capital gains for the year.(3) Capital gains tax is assumed to be nearer the

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(1) Recall (6) as $P = R(1-1/(i+i)^N)/i$

(2) Housing and Construction Statistics no. 11, Table 38

(3) Sinclair (1983)

lower end of the possible range of 15 to 30 per cent at 20 per cent and with house prices assumed to be rising at 8 per cent per year, the imputed capital gains tax is £160 = 0.2 x .08 x £10,000. The total subsidy is therefore £280 on a £10,000 house.

Odling-Smee's work can be criticised in that the imputed rent he calculates is in the nature of a real rather than a nominal rent, and the UK tax system, with the exception of the move to taxation of real capital gains announced in the March 1983 budget, is based on taxing nominal income. Whilst there is a strong case in logic for basing taxation on real rather than nominal magnitudes, reform stopping short of changing the whole system of taxation would suggest a more limited aim of consistency of nominal taxation.

Robinson (1981) adopts essentially the same framework as Odling-Smee for his study, viewing the house as an investment good, but computes imputed rent as a nominal magnitude, applying a rate of 14% to capital value to obtain the imputed rent of the house. He uses a more sophisticated method of obtaining capital values than Odling-Smee. These are computed from gross rateable values given in the Family Expenditure Survey (1977) using a predicting equation estimated from data in the Department of the Environment's Survey of Building Society Mortgages.(1)

Two estimates for subsidy to owner occupiers are computed in Robinson's study. The two estimates arise because the subsidy inher-

ent in not taxing capital gains cannot be calculated in a simple way

because the taxpayer may pay capital gains tax at different rates

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(1) This predicting equation was $P = 8164 + .09898RV^2$ with rateable value appearing as its square. This equation produced a very close fit with $R^2 = .99$.

depending on his total capital gains during the year. Hence Robinson's estimates correspond to assuming, in turn, minimum and maximum liability to capital gains taxation. Average subsidy will lie somewhere between Robinson's upper estimate of £463 under maximum capital gains taxation and £338 with minimum capital gains taxation (1977 prices).

Robinson computes results by income class and finds that

> for the 70% of households in the middle income range (i.e. £2080-7799 pa), [in 1977], the subsidy is almost a lump sum receipt.

Assistance falls rapidly for those below this range and rises rapidly for those above. Essentially this is a consequence of the marginal tax rates implicit in the tax system. Robinson also performs separate calculations for outright owners and for owners with a mortgage and finds that assistance is greater for owners with a mortgage both at the lower and upper ends of the income scale although in the middle income range outright owners received more. Robinson's results are for 1977 and in his discussion he notes that his results imply the existence of a much higher level of subsidization to owner occupiers than the Government's Housing Policy Review(1) of 1974/75 suggests, even allowing for price changes between the two years.

The most important reason for this is the different theoretical standpoint adopted in defining housing subsidy. Earlier in this chapter it was shown that there were arguments for defining housing as either an investment good or a consumption good, although the economic case for the investment good definition was stronger. As noted, Robinson's and Odling-Smee's studies are based on defining housing as

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(1) DOE (1977)

an investment good. In contrast, the Housing Policy Review calculated the subsidy to housing by viewing housing as a consumption good. Under this view it identified the subsidy as mortgage interest tax relief.

The results of the Housing Policy Review calculations for housing subsidy are given in Table 1.

The Housing Policy Review argues that

> For the owner occupied sector, average tax relief and option mortgage subsidy rose steadily with income though not proportionately.

This statement, with its implication that the housing subsidy is progressive in effect, is disputed by Wilkinson and Wilkinson (1982), who

TABLE 1: TAX RELIEF ON MORTGAGE INTEREST AND OPTION MORTGAGE SUBSIDY 1974/75 BY INCOME RANGE

Income of Household Head and Wife	Average tax relief or subsidy per household
£	£
Under £1,000	59
£1,000 - £1,499	73
£1,500 - £1,999	91
£2,000 - £2,499	104
£2,500 - £2,999	101
£3,000 - £3,499	129
£3,500 - £3,999	129
£4,000 - £4,999	148
£5,000 - £5,999	179
£6,000 or over	369

Source: Extracted from Table IV.34 Housing Policy Review, Technical Volume I, p. 214.

present an expanded version of the Table 1 which is presented here as Table 2. They calculate the percentage of income that the subsidy represents by taking the arithmetic mean of each income class. For income above £6,000, which is given as an open ended class in the Housing Policy Review work, they use Inland Revenue Data to estimate a

median of £7,711 and an arithmetic mean of £9,232. Use of these estimates, leads to estimates of subsidy as a percentage of income for this top income class of 4.8% if the median income is used or 4.0% if the mean income is used.

TABLE 2 ESTIMATE OF MORTGAGE INTEREST PAYMENTS, GROSS AND NET OF TAX RELIEF AND OPTION MORTGAGE SUBSIDY ENGLAND AND WALES 1974-75

Income of head of household and wife	Average tax relief or subsidy	% of income
	£	
Under £1,000	59	6.9
£1,000 - £1,499	73	5.8
£1,500 - £1,999	91	5.2
£2,000 - £2,499	104	4.6
£2,500 - £2,999	101	3.7
£3,000 - £3,499	129	4.0
£3,500 - £3,999	129	3.4
£4,000 - £4,999	148	3.3
£5,000 - £5,999	179	3.3
£6,000 or over		
est av. £7,711*	369	4.8
or £9,232†		4.0

* median
† arithmetic mean

On the basis of these calculations, Wilkinson and Wilkinson argue that

> if the three lowest income classes which contain less than 13% of households with mortgages are excluded, a different picture emerges with the subsidy being roughly in proportion to income over a very wide range of incomes, and at the top end of the range relief appears to be regressive.

Welham (1982), like Wilkinson and Wilkinson, also suggests that subsidies to owner-occupiers are likely to be regressive, but his calculations are performed on a different basis from that of the Housing Policy Review and of Wilkinson and Wilkinson. Welham identifies failure to tax imputed rent as the subsidy to housing and thus like Odling-Smee (1975) and Robinson (1981) implicitly views housing as an

investment good. However he makes no mention of income from capital gains, concentrating purely on imputed rent. Table 3 extracts some of his results for imputed rent for 1973-4 for different income groups. These data for imputed rent are based on rateable values and, he notes, there is reason to believe these may underestimate market rents by a factor of two. Welham points out that income groups above £4,000 gained most, stating:

> fairly confidently that the benefits of the subsidy accrue mainly to higher income groups and/or existing owner-occupiers.(1)

TABLE 3: IMPUTED RENT 1973-74

Range of Personal income - lower limit	Total Imputed rent	Estimate of marginal rate of tax	Tax relief	Tax relief/as a percentage of income
£	£m	%	£m	
<595	45	-	-	-
595	66	30	20	1.3
750	148	30	44	1.5
1,000	102	30	31	1.1
1,250	78	30	23	.8
1,500	96	30	29	.8
1,750	113	30	34	.9
2,000	270	30	81	1.0
2,500	319	30	96	1.3
3,000	429	30	129	1.6
4,000	211	30	63	2.0
5,000	82	34	28	2.2
6,000	80	45	36	2.6
8,000	41	54	22	2.9
10,000	18	59	11	2.0
12,000	44	70	31	1.9

Source: extracted from Welham (1982) Table 2, p151

Further evidence on the regressive nature of housing subsidies is presented by Atkinson and King (1980). In contrast to the studies so

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(1) Welham (1982, p 151)

far discussed, Atkinson and King examine the cost of the owner-occupier's equity in his house. Table 4 shows part of a table presented in Atkinson and King illustrating how the cost of equity in housing declines to an owner-occupier as his income rises.(1) The reason for this decline in equity cost is that as an owner-occupier's income rises, his marginal tax rate will rise by steps as well. As the owner-occupier's marginal tax rate rises, a subsidy in the form of a tax exemption becomes correspondingly more valuable. The overall effect of this is to make it cheaper for an owner-occupier to put money into housing the higher his income rises.

Work by Hills (1980, 1982) is closer to that of Odling-Smee (1975)

TABLE 4: CAPITAL COSTS OF OWNER-OCCUPIERS

Opportunity Cost of owner's equity	Marginal tax rate of owner-occupier (per cent)				
	25	30	40	50	60
	Value of one unit of equity in owner-occupation				
9%	.55	-.02	1.16	-2.30	-3.44
12%	1.00	.40	.80	-2.00	-3.20
15%	1.45	.82	.44	-1.70	-2.96

Source: Table 3, Atkinson and King (1980), mortgage is assumed to be 80% of value of the house, the mortgage rate is assumed to be 12% and the average annual rate of increase of house prices 8%.

and Robinson (1981). He views housing as an investment good and defines subsidy as the difference between existing financial flows to and from owner-occupiers under the existing system and those that would ensue under a hypothetical comprehensive income tax with the

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(1) The owner-occupier's equity is his stake in the house. It is the amount left for the owner if the house is sold and any lenders repaid.

TABLE 5: Subsidies to Owner-Occupiers

	£m 1979/80
Total tax relief (in real terms)	3,720
Comprising: Income tax exemption on imputed rents	1,545
Capital gains tax exemption	525
Mortgage interest relief plus option mortgage subsidy	1,650
Total: if VAT exemption at £1,105 m treated as subsidy	4,825
if gross rates of £1,900 m offset against subsidy	1,820
if VAT exemption added, and gross rates subtracted (i.e. both adjustments)	2,925

Source: Hills (1982) Table 5

same structure of tax rates as the actual system in 1978/79, including an expenditure tax at the standard VAT rate of eight per cent. The comprehensive income tax would be based on real income, and hence Hills's estimates of capital gains are low compared to those of Robinson and Odling-Smee who estimate <u>nominal</u> capital gains. Table 5 reproduces his results for owner-occupiers.

Unlike Robinson and Odling-Smee, it can be seen from Table 5 that Hills includes mortgage interest tax relief as a subsidy to owner-occupiers, even though when housing is seen as an investment good, this is a legitimate expense to be set against imputed rental income. The reason Hills includes this as a subsidy is because he focusses in real gains and expenses rather than nominal gains and expenses. This also explains his low estimate for capital gains exemption. Thus real capital gains are lower than nominal capital gains, but as a quid pro quo, real interest paid will be much lower than nominal interest. In fact for the year in question, 1978/79,

Hills argues that the real rate of interest after deducting inflation was less than zero. Under this view zero tax relief should be allowed as no real interest was paid. Hence the whole of mortgage interest tax relief actually allowed can be viewed as a subsidy.

Hills also calculates the implications of viewing VAT exemption on housing as a subsidy, and of viewing local rates as a tax on housing, and these results are included in Table 5.

Many of these approaches to calculation of subsidy to owner-occupiers are embraced in a comprehensive study by Hughes (1981) who calculates four alternative measures of housing subsidy which he labels S_1 to S_4. Hughes's four measures of housing subsidy are:

S_1 the failure to tax the (real) rate of return on housing wealth,

S_2 equal to S_1 plus the subsidy inherent in the failure to tax gains made by homeowners as a result of inflation reducing the real value of their mortgage debt,

S_3 equal to the failure to tax the nominal return to housing wealth and

S_4 the familiar mortgage interest tax relief.

These subsidies are defined algebraically by Hughes as follows:

$$S_1 = t_1 rH$$

$$S_2 = t_2 (rH+iD)$$

$$S_3 = t_3 (r+i)H$$

$$S_4 = t_4 (r+i)D$$

His variables are defined as follows:

H = current value of owner-occupied house.

D = outstanding mortgage debt.

r = real rate of interest on mortgage debt, assumed to be equal to the real rate of return on other assets available to the household.

i = Rate of inflation.

t_i, i=1,4 is the relevant marginal tax rate.

TABLE 6: AVERAGE SUBSIDY OF OWNER-OCCUPIERS (estimates per household for 1973 in £p.a.)

	No mortgage	with mortgage
S_1	66	86
S_2	66	157
S_3	289	312
S_4	0	96

Source: Hughes (1981) Table 1

Table 6 extracts Hughes's results for owner-occupiers under the various definitions and Table 7 his results for income distribution. Hughes notes that the subsidy varies little for incomes between £1,000 and £4,000 but rises rapidly thereafter as a result of the progressive

TABLE 7: DISTRIBUTION OF HOUSING SUBSIDIES TO OWNER-OCCUPIERS BY INCOME GROUP

Income	Subsidy defn. S_1	S_2	S_3	S_1	S_2	S_3	S_4
£ 1 -	3	136	50	53	115	49	
£ 500 -	31	222	73	107	281	40	
£ 1,000 -	91	304	90	137	278	59	
£ 1,500 -	77	288	72	124	257	70	
£ 2,000 -	81	309	75	134	270	80	
£ 2,500 -	89	331	78	144	287	91	
£ 3,000 -	82	303	87	184	319	107	
£ 3,500 -	106	434	88	165	321	106	
£ 4,000 -	111	430	104	203	384	136	
£ 5,000 -	136	548	140	288	569	195	
£ 7,500 -	225	909	240	483	944	320	
£10,000 -	655	2,449	309	770	1,175	626	
Average	66	289	86	157	312	96	

Source: Hughes (1981) Table 2

marginal rates of tax on higher incomes. He finds that owner-occupiers at the lower end of the income distribution receive much lower subsidies than owner-occupiers in general because most of

the former households pay no income tax. It is not clear whether Hughes took account of option mortgages, although these were not widely taken up and are unlikely to affect the results very much.

THE GAINS AND LOSSES FROM TAX REFORM

The studies so far discussed have been concerned with defining and quantifying subsidy to owner-occupiers. A further step is to consider the gains and losses that would result from removal of subsidy and to assess the overall desirability of such a change. One of the most complete studies of this kind has been carried out by King (1981, 1983c). King considers the gains and losses to households of revenue neutral reforms of housing taxation. A revenue neutral tax reform occurs when a combination of tax changes leaves the total revenue collected by the government unchanged. King considers the case where the removal of housing subsidies is balanced by a reduction of taxation in the form of an equal lump sum paid to each household.

The removal of subsidy that King (1981) considers is the introduction of a tax on imputed rental income. Rental income of owner-occupiers is measured by the household's gross rateable value minus an estimate of depreciation and maintenance. King goes further than other UK studies by looking at the tax reform under two alternative regimes. First he takes the case where behaviour is assumed to be unchanged as a result of the tax reform. Thus housing consumption is assumed to remain unaltered after the removal of the subsidy and computations yield the "first-round" effects of the change. This is the methodology implicit in all the other computations of housing subsidy surveyed in this chapter. However King performs further calculations in which he allows for post-reform behavioural changes in the

form of supply and demand adjustments. King uses results of his estimates for the demand for housing from King (1980) and for supply conditions performs calculations under two alternative assumptions: that the elasticity of supply of housing is infinite, and, secondly, that the elasticity of supply is 2.0. Under an infinite elasticity of supply, it will be recalled from the discussion of Figure 3 earlier that no price change will occur when the demand curve is shifted from D_1D_1' to DD' by removal of the subsidy. Thus the removal of subsidy reduces the quantity of housing from $\bar{Q}_1$ to $\bar{Q}$ but the price of housing remains unaltered at $\bar{R}$.

In contrast, under King's alternative assumption of an elasticity of supply of 2.0, imputed rents will fall after the reform from $\bar{R}_1$ to $\bar{R}$ as was shown in Figure 1 above.

King computes the "first-round" gain to households after the removal of the subsidy, which he calls the cash gain. However he also computes a measure of the benefit of the change which takes into account ensuing adjustments in supply and demand. This he calls the equivalent gain, which is defined as the sum of money which the household would have accepted in the initial position as an alternative to the reform, a sum that would make it just as well off and in this sense a sum equivalent to the impact of the reform.(1)

If the sum of all households' equivalent gains is positive this positive amount shows the losses from the distorting effects of the pre-reform subsidy - the deadweight loss or excess burden - and efficiency gains will result from its removal. The tax reform King con-

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(1) Equivalent gain is dependent upon the assumption of a particular utility function for the consumer. King assumes a homothetic translog indirect utility function.

siders is revenue neutral and the average equivalent gain is 16.6p per week (at 1973 prices, or 48.2p per week at 1980 prices), which is 0.4% of mean household income. But as King points out, in addition to questions of efficiency gains there are considerations of vertical and horizontal equity to be examined.

Vertical equity considerations would enter in a case where, for instance, the sum of equivalent gains might be positive but generated by a combination of losses to the poor and gains to the rich. To examine this question King computes the Atkinson (1970) inequality index before and after the removal of subsidy. Atkinson's inequality index requires that the policy evaluator choose a parameter e that expresses his aversion to inequality. If he sets e=0 this implies that he has no aversion to inequality. The higher he sets e the more averse he is to inequality. The idea of the inequality aversion parameter can be clarified with an example. Suppose household (a) has an income four times that of household (b), then if a policymaker sets the inequality aversion parameter to 1/2 this means he values giving £1 to household (b) as equivalent to taking $4^{1/2} = 2$ pounds from household (a) the richer household. If e is set to 1 he will value giving the poorer household £1 equivalently to taking $4^{1} = 4$ pounds from the richer household.

King presents the following results for inequality indices for the pre- and post-tax reform positions, reproduced in Table 9.8. These results are for the case where the elasticity of supply is assumed infinite, i.e. there will be no price effect of the removal of the subsidy.

The inequality indexes of Table 8 can be interpreted in the following way. For the post reform case with e=2.0 the inequality parameter

TABLE 8: VERTICAL INEQUALITY INDEXES FOR 1973 REMOVAL OF OWNER-OCCUPIERS SUBSIDY F.E.S. DATA (King 1981)

		Pre-reform	Post-reform
	0.0	0.000	0.000
	0.5	0.087	0.082
e	1.0	0.171	0.161
	2.0	0.330	0.311
	5.0	0.635	0.596

is .311. This means that if incomes were equally distributed, the same level of social welfare could be achieved with only (1.0 - .311) = .689, or 68.9% of the post reform level of income. With e=0 policymaker attaches no importance to income distribution and the index is therefore zero. It can be seen from Table 10 below that removal of current owner-occupiers' subsidies reduces inequality for all of the range of values of inequality aversion parameters discussed.

Tax reforms can also have effects on horizontal equity, and King (1983a) has developed an index to express this effect. King argues that changes in horizontal equity are associated with changes in the ranking of households with respect to well-being. Thus, he argues, if the best off and worst off household change places, there has been a change in horizontal equity. If the first ranking was considered ethically correct then such a change will reduce horizontal equity. Alternatively if one baulks at making such ethical judgements it nevertheless appears likely that complaints from the losing households will be more strident than gratitude from the benefitting households, and because of this, the scope for altering the ranking of households may be limited by political feasibility. King's index may then be thought of as relating to political feasibility.

King's index is analogous to Atkinson's vertical inequality index in requiring the specification by a policymaker of an inequality aversion parameter. Suppose individuals i and j swap positions in the income distribution, then a measure of the magnitude of this change is the magnitude of the difference between i's income before the change and j's income after the change, divided by average income. If this magnitude is called s, i.e. $s = |y_i - y_j|/\bar{y}$ and the inequality aversion parameter is labelled as n, then the social value, as a proportion of an individual's income, of a change in ranking of magnitude s is given by $1-e^{-ns}$. Thus to quote the example given by King if s = 10% = 0.1 and n = 0.1 this change is considered to be equivalent in social valuation terms to a reduction in income of $1-e^{0.1\times0.1} = 1 - .99 = .01 = 1\%$. Table 9 reproduces King's result for his index of horizontal equality.

The entities in this table may be interpreted along the lines of the following example. Taking the case where e = 0.0 and n = 5.0 i.e. no aversion to vertical inequality combined with high aversion to horizontal equity, the level of social welfare maintained in the absence of the reform could be obtained with (1.0 - .058) = .942 or 94.2% of the post reform level of income.

TABLE 9: HORIZONTAL INEQUALITY INDEXES FOR 1973: REMOVAL OF OWNER-OCCUPIERS SUBSIDY IMPLICIT IN FAILURE TO TAX IMPUTED RENT (King 1981)

		n			
		.5	1.0	2.0	5.0
e	0.0	.006	.012	.024	.058
	0.5	.006	.011	.023	.055
	1.0	.005	.010	.020	.050
	2.0	.004	.008	.015	.038
	5.0	.001	.002	.005	.012

TABLE 10: INDEX OF OVERALL INEQUALITY FOR REMOVAL OF OWNER-OCCUPIERS' SUBSIDY (King, 1981)

		Pre reform	Post reform n			
			0.0	0.5	1.0	2.0	5.0
e	0.0	.000	.000	.006	.012	.024	.058
	0.5	.087	.082	.087	.092	.103	.133
	1.0	.171	.161	.166	.170	.179	.204
	2.0	.330	.311	.313	.316	.321	.337
	5.0	.635	.596	.597	.597	.598	.601

King combines these two indexes into a single combined index of horizontal and vertical equity and this index is reproduced in Table 10.

It can be seen from this table that when combined with vertical inequality aversion (e) low, overall inequality is higher in the post-reform state than the pre-reform state, but with higher vertical inequality aversion (e = 2.0 or 5.0), gains in vertical equity lead the post reform state to have less overall inequality than the pre-reform state.

King tabulates the "social value" of the reform for different values of horizontal and vertical inequality aversion parameter into pounds per week. His results are reproduced here in Table 11.

It can be seen that if there is no aversion to horizontal inequity

TABLE 11: SOCIAL GAIN OF REMOVAL OF OWNER-OCCUPIERS' SUBSIDY £1 WEEK PER KING 1981 HOUSEHOLD

		n 0.0	0.5	1.0	2.0	5.0
e	0.0	.165	-.101	-.367	-.894	-2.414
	0.5	.317	.109	-.098	-.506	-1.685
	1.0	.443	.289	.136	-.165	-1.039
	2.0	.620	.544	.468	.318	-0.122
	5.0	.787	.778	.767	.746	0.884

(n = 0.0) the social gains of removal of owner-occupiers' subsidy are positive and increase with the policymakers aversion to vertical inequity.

This major work by King has been followed up by Hughes (1981) in the latter part of his work already discussed above. Hughes also calculates the indices of horizontal and vertical equity introduced and used by King. Although in his earlier work (Hughes 1975) he favours a move to real rather than nominal based housing taxation, in Hughes (1981) calculations are provided of the effect of reform under a range of different definitions of housing subsidy which embrace both real and nominal orientations.

To investigate the gains and losses from eliminating housing subsidies, Hughes examines three methods of returning the unpaid subsidy to households after the reform to ensure revenue neutrality:

A - lowering all marginal tax rates by the same absolute amount

B - raising all tax allowances by the same percentage

C - making a uniform lump-sum post-tax transfer to all households

The specific amounts involved under the three alternatives, calculated for each of Hughes's four subsidy measures S_1-S_4 are reproduced from Hughes's paper in Table 12. He argues that the reductions in taxation possible show how there is

> a very substantial commitment of public resources, which ... achieves little in terms of improving the distribution of income or of achieving a better allocation of resources in fulfilling individual or social preferences.(1)

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(1) Hughes (1981, p100)

TABLE 12: ALTERNATIVE POSSIBLE EFFECTS OF REMOVAL OF DIFFERENT DEFINITIONS OF HOUSING SUBSIDY

	Implied adjustment from Type of subsidy to be eliminated			
	S_1	S_2	S_3	S_4
Reduction in standard marginal tax rate from 30% to (%)	23.5	22.3	17.4	24.5
% increase in all tax allowances	35.5	44.0	88.0	29.5
Post-tax lump sum transfer (£ pa)	66.7	82.7	168.9	53.9

Source: Hughes (1981)

When, however, Hughes uses Atkinson and King's vertical and horizontal inequality indices shown in Table 13 he finds that the results show conclusively that

> the removal of all housing subsidies cannot in itself be justified by the argument that it will improve the distribution - no matter which measure of subsidies is adopted.(1)

The reason for the divergence between King's work, which favours the removal of subsidies, and Hughes's work which concludes that such a move is not justified on distributional grounds is that Hughes examines the effect of the removal of subsidy to all tenures, whereas King only considers removal of subsidies from owner-occupiers. In King's study therefore, there is considerable redistribution of income from owner-occupiers to those holding other tenures. It is this redistribution from the generally richer owner-occupiers to the generally poorer holders of other tenures that makes reform show up well in King's study in terms of inequality reduction.

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(1) Hughes (1981, p 108)

It is clear that there is room for a variety of interpretations and measurements of housing subsidy. Taking an overall view it can be said that the studies surveyed above together suggest that housing subsidies are at present large, regressive, and that the effects of removing them are likely to be on balance, beneficial. One might ask therefore, why they are not removed. Here a public choice viewpoint is informative. It would suggest that owner-occupiers form a substantial interest group of considerable political importance and the prospects of the removal of subsidies from this interest group are low.

The studies surveyed above are similar in that they make estimates

TABLE 13:INEQUALITY INDICES FOR DISTRIBUTIONS OF NET REAL INCOME AFTER ALTERNATIVE REFORMS

	Index of Vertical Inequality	Indices of Horizontal Inequality due to Reform		Indices of Overall Inequality for Reform	
		n = 0.5	n = 2.0	n = 0.5	n = 2.0
1. Pre-Reform Distribution					
= 1.0	0.151				
= 2.0	0.289				
2. Removal of S_2 subsidy with lower marginal tax rates					
= 1.0	0.175	0.019	0.076	0.191	0.237
= 2.0	0.338	0.019	0.074	0.350	0.387
3. Removal of S_3 subsidy with higher tax allowances					
= 1.0	0.167	0.019	0.072	0.182	0.227
= 2.0	0.330	0.019	0.075	0.343	0.381
4. Removal of S_2 subsidy with lump sum transfer					
= 1.0	0.145	0.017	0.066	0.160	0.202
= 2.0	0.277	0.017	0.069	0.289	0.327
5. Removal of S_1 subsidy with higher tax allowances					
= 1.0	0.169	0.016	0.062	0.182	0.221
= 2.0	0.332	0.018	0.070	0.344	0.379
6. Removal of S_3 subsidy with higher tax allowances					
= 1.0	0.167	0.031	0.117	0.193	0.265
= 2.0	0.332	0.026	0.106	0.350	0.403
7. Removal of S_4 subsidy with higher tax allowances					
= 1.0	0.164	0.018	0.071	0.179	0.223
= 2.0	0.321	0.019	0.075	0.334	0.372

Source: Hughes (1981)

of the size of subsidies to owner-occupiers as a whole. However, estimates of subsidies to particular types of owners may be of interest. As owner-occupation grows as a form of tenure and extends down the income scale, many new owner-occupiers purchase in inner-city areas. In the next section estimates are made of the subsidy to these owner-occupiers. Specifically the following section estimates the subsidy to recent buyers of houses in inner-city Birmingham

SUBSIDIES TO RECENT-BUYERS IN INNER-CITY BIRMINGHAM

The study of subsidy to owner-occupiers described here takes advantage of the existence of a particularly detailed survey of recent house-buyers in inner-city Birmingham - the Inner City Home Ownership Project (Karn, Kemeny and Williams, 1984). This survey does not provide a comprehensive view of the subsidy effects on all owner-occupiers but as argued above, in the context of the many estimates of overall subsidy it is of interest to examine the effects on a particular sub-group. It has been frequently advocated that one objective of reform of housing finance should be the abolition of subsidy. In debate over this reform, evidence on how much subsidy particular groups currently receive is likely to be of interest. Further, the estimates of subsidies to owner-occupiers surveyed above are handicapped by relatively poor information on the value of houses - usually supplied by rateable value. (Hills 1980, Robinson 1981, King 1981). An advantage of the Birmingham data used here is that it is a survey of recent buyers and the market price and date of purchase are recorded. In the course of the Inner survey, a large amount of information was collected for a sample of recent house buyers in five "inner-city" areas of Birmingham: Sparkhill, Soho, Saltley and

Handsworth. Details of the sample are given in Appendix I which is extracted from Karn, Kemeny and Williams (1984).

Using Karn, Kemeny and Williams's data, estimates of housing subsidy are made under the alternative views of housing as a consumer good and as an investment good.

The study is presented in the next three sections. In the first section, estimates are made of mortgage interest tax relief - the subsidy to home owners implicit in viewing the home as a consumption good. The second two sections present estimates of imputed rent and capital gains. Failure to tax these constitutes the subsidy to home owners implicit in viewing the home as an investment good.

MORTGAGE INTEREST TAX RELIEF

In this section the results of investigating the level of mortgage interest tax relief received by recent buyers in inner-city Birmingham.

The initial survey was not designed with the purposes of investigating tax relief to owner-occupiers, but rather their overall financial circumstances. (Karn, Kemeny and Williams, 1984) Nevertheless, the use of a certain number of assumptions allows inference on the level of subsidy received by recent buyers in the Birmingham Inner City.

In general, owner-occupier j's entitlement to mortgage interest tax relief can be expressed as:

$$MITR_j = (1 - t_j)\ I\ (i_j,\ T_j,\ L_j,\ d_j,\ n)$$

where t_j is the marginal tax rate, for owner-occupier j and I is his annual interest payment. This annual interest payment is a function

of L_j, the amount of his loan; i_j, the rate of interest he pays; T_j, the term of his loan; d_j, the date of his house purchase and n, the date or tax year for which the calculations are made. Only a proportion of this information is available from the survey data, the rest being supplied by assumption. The marginal rate of tax, t_j is not available and it is assumed for the purpose of these calculations that all members of the sample were paying tax at the standard rate for the tax year 1979/80 of thirty per cent.(1)

The type of lender supplying the loan for home purchase is available from the survey and tax relief calculations have therefore been performed for borrowers grouped by type of lender and with interest rates appropriate to the type of lender assumed. Similarly, the term of the mortgage typically offered by the type of lender has been assumed in the calculations. Hence a twenty-five year term has been assumed for building societies and local authorities and alternative assumptions of five and seven years have been made for banks.

Rates of interest were taken to be fifteen per cent for building society loans - the standard rate for April 1980 - and thirteen per cent for local authority loans which was the rate charged by Birmingham City Council at the time. Separate calculations were performed for banks with terms of five years and seven years. Five years is the maximum term for personal loans, and the rate of interest for these was 20.51 per cent. A second set of calculations was performed on the assumption that loans were secured on the property rather than the person at three per cent over the base rate of seven-

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(1) The thirty per cent band for 1979/80 runs from £750 to £10,000. The average take-home pay for the sample was £3328. This assumption therefore appears to be quite realistic.

teen per cent obtaining for 1979/80 and with a term of seven years.

The date of purchase of the houses is available from the data, and tax relief was calculated for the financial year April 1979 - April 1980. Finally the amount of the mortgage loan is available from the data.

The following expression, derived in Appendix II as expression (10) was used to calculate the recent buyers' interest payments:

$$I_n = \frac{Li\,[(1 + i)^{T} - (1 + i)^{n-1}]}{(1 + i)^{T} - 1}$$

Where I_n, is the interest payment in year n, i is the rate of interest, T is the term of the loan, and L is the amount of the loan.

In fact this formula is a simplification, in that the mortgage year may not coincide with the tax year April 79 - April 80 and the mortgage may be in, say, year k for the first few months of the tax year and year k + 1 for the remaining months of the tax year. The adjustment used to take account of this is also described in Appendix II under the heading "Calculation of Annual Interest Payments".

The results of these computations for the average tax relief found in the four inner-city areas of Birmingham sampled are given in Tables 14, 15, 16 and 17. By way of comparison, the national average for mortgage interest tax relief is given in Social Trends (HMSO 1982, p. 158) for 1979-80 as £152 for all owner-occupiers and £265 for mortgagors.

These national figures are quite low compared with the results for Birmingham, especially as average house prices in the sample were well below the national average as shown in Table 18. However the low national average for tax relief can be explained by the fact that the national figures relate to all mortgagors including those who bought a

long time ago. Other things being equal, the longer a mortgagor has held a mortgage the lower the tax relief will be, because the price paid for the house is expected to be lower, the longer ago it was bought, and the interest payments on a mortgage decline over time and in consequence so does tax relief. This decline of interest payments over time is illustrated by the example given in Table 19.

As an alternative way of setting the Birmingham results in context it is possible to infer likely tax relief granted to house buyers paying the national or regional average prices shown in Table 18. In order to make such a comparison, assumptions need to be made on how long the mortgage has been held, and what percentage of the house purchase price has been raised by mortgage. For the purposes of comparison the mortgage percentage, and the number of months the mortgage had been held were assumed to be the average of the Birmingham sample. The average percentage mortgage for the Birmingham sample is given in Table 20 and the average number of months mortgage is given in Table 21.

These results were used to calculate the mortgage interest tax relief that would result from holding building society loans of the average maturity for the Birmingham sample (26 weeks) for the average proportion of the selling price (79.3). The term of the loan has been assumed to be 25 years and the rate of interest that obtaining at the time for building societies: 15%. The results of these calculations are given in Table 22.

The values for tax relief are very high compared with the national Social Trends figure of £265 for all mortgagors, and the same reasons can be advanced for this divergence as were advanced to explain the divergence between this figure and the Birmingham survey results,

TABLE 14: VALUE OF TAX RELIEF 1979-1980
BUILDING SOCIETY LOANS AT 15% WITH 25 YEAR TERM

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	74	245	6.25
SOHO	18	191	10.80
SALTLEY	13	225	22.43
HANDSWORTH	49	299	13.80
BIRMINGHAM COMBINED	154	259	6.56

TABLE 15: VALUE OF TAX RELIEF 1979-1980
LOCAL AUTHORITY LOANS AT 13% WITH 25 YEAR TERM

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	25	192	13.29
SOHO	22	156	8.34
SALTLEY	17	197	18.11
HANDSWORTH	34	251	15.76
BIRMINGHAM COMBINED	98	211	8.11

TABLE 16: VALUE OF TAX RELIEF 1979-80
BANK LOANS AT TWENTY PER CENT WITH 7 YEAR TERM

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	34	122	10.48
SOHO	59	130	9.38
SALTLEY	72	116	7.27
HANDSWORTH	18	239	34.44
BIRMINGHAM COMBINED	183	135	6.07

TABLE 17: VALUE OF TAX RELIEF 1979-1980
BANK LOANS AT 20.51% WITH 5 YEAR TERM

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	34	105	11.40
SOHO	59	111	9.65
SALTLEY	72	106	7.66
HANDSWORTH	18	213	37.01
BIRMINGHAM COMBINED	183	120	6.44

TABLE 18: AVERAGE HOUSE PRICES

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	155	5,638	135.8
SOHO	169	4,678	124.3
SALTLEY	166	4,260	151.1
HANDSWORTH	129	7,363	259.7
BIRMINGHAM COMBINED	619	5,414	90.6

Average House price (excluding new houses) Britain, DoE survey 1979 £19,886
Average House price, West Midlands Quarter 1, 1979 £16,520
Average House price, West Midlands pre 1919 Terrace £9,377
Average House price, West Midlands post 1919 Terrace £12,361

TABLE 19: TAX RELIEF @ 30% ON 10,000 REPAID OVER 25 YEARS

YEAR	INTEREST	TAX RELIEF @ 30%
1	1,200	360
2	1,190	357
3	1,180	354
4	1,169	350
5	1,156	346
6	1,142	342
7	1,126	337
8	1,108	332
9	1,088	326
10	1,065	319
11	1,040	312
12	1,012	303
13	981	294
14	945	283
15	906	271
16	861	258
17	812	243
18	756	226
19	694	208
20	624	187
21	546	163
22	458	137
23	360	108
24	251	75
25	128	38

TABLE 20: PERCENTAGE OF HOUSE PRICE LENT BY BUILDING SOCIETIES

	NO. OF OBSERVATIONS	MEAN %	STD ERROR
SPARKHILL	74	82.6	1.24
SOHO	18	71.5	3.56
SALTLEY	13	79.6	4.61
HANDSWORTH	49	77.9	1.94
OVERALL BIRMINGHAM	154	79.3	

TABLE 21: AVERAGE NUMBER OF MONTHS MORTGAGES HAVE BEEN HELD BY BUILDING SOCIETY BORROWERS IN SAMPLE AS OF APRIL 1979

	NO. OF OBSERVATIONS	MEAN (mnths)	STD ERROR
SPARKHILL	74	26.3	1.86
SOHO	18	25.7	4.22
SALTLEY	13	23.5	4.52
HANDSWORTH	49	27.1	2.16
BIRMINGHAM OVERALL	152	26.2	1.30

namely that the average from Social Trends is for all mortgagors and will include many who are paying low interest because they bought a long time ago at a low price and their mortgage interest payments have diminished over time.

On the other hand, the figures for tax relief in Table 22 are high compared with the Birmingham survey results. The reason for this is that average house prices in the surveyed areas as shown in Table 18 are well below national and regional averages. The calculations for Table 22 were made under the assumption that the percentage mortgage advance was the same as the average given for building society borrowers in the Birmingham inner-city areas surveyed: 79.3%. However a national average percentage advance can be calculated from fig-

TABLE 22: NATIONAL AND REGIONAL MORTGAGE INTEREST TAX RELIEF COMPARISONS

£ AVERAGE PRICE	SOURCE, AND DESCRIPTION OF PROPERTY	£ IMPLIES ANNUAL INTEREST	£ TAX RELIEF AT 34%
19,886	Average for Britain, 1979 Building Society financed purchases. Price at mortgage completion stage DoE Survey.	2,339	795
16,520	Average for West Midlands Quarter 1, 1979 DoE 5% sample survey.	1,943	660
9,377	West Midlands, Average, 1st Quarter 1979, Pre 1919 terrace. Abbey National Survey.	1,103	375
12,361	As above but post 1919 terrace.	1,453	494

ures given in Tables 9 and 10 of (BSA 1981), at 60.9%. When this lower percentage is applied the tax relief is correspondingly reduced. These re-calculated comparisons are given in Table 23, from which it can be noted that the tax relief is still higher than that computed for Birmingham.

Another way of placing the results of Tables 14 to 17 for tax relief in the Birmingham surveys in context is to compare the level of relief with average weekly income for the owners. Average weekly income after deductions is tabulated in Tables 24 to 26 for borrowers from building societies, banks and local authorities.

From this analysis it can be seen that though the subsidy implicit in mortgage interest tax relief for recent Birmingham inner-city buyers may be low in comparison with national averages, the sums involved are significant, seen in relation to the incomes of the sample

TABLE 23: NATIONAL AND REGIONAL MORTGAGE INTEREST TAX RELIEF COMPARISONS.

TABLE A9 RE-WORKED WITH PERCENTAGE LOAN SET AT 60.9%

HOUSE PRICE	ANNUAL INTEREST	TAX RELIEF
19,886	1,796	610.7
16,520	1,492	507.3
9,377	847	287.9
12,361	1,117	376.6

TABLE 24: AVERAGE WEEKLY INCOME AFTER DEDUCTIONS: BUILDING SOCIETY BORROWERS

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	71	67.7	2.6
SOHO	19	64.4	4.2
SALTLEY	13	70.6	4.2
HANDSWORTH	47	76.4	2.9
OVERALL BIRMINGHAM	150	71.1	1.7

TABLE 25: AVERAGE WEEKLY INCOME AFTER DEDUCTIONS: BORROWERS FROM BANKS

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	32	62.9	4.9
SOHO	54	70.7	2.6
SALTLEY	71	63.6	2.2
HANDSWORTH	14	61.0	6.0
OVERALL BIRMINGHAM	171	65.0	1.6

TABLE 26: AVERAGE WEEKLY INCOME AFTER DEDUCTIONS, BORROWERS FROM L.A.

	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	25	63.6	3.1
SOHO	19	62.3	4.7
SALTLEY	17	69.5	5.3
HANDSWORTH	34	73.4	4.0
OVERALL BIRMINGHAM	95	68.8	2.2

members, often exceeding four weeks' post-tax income.

It will be recalled that the view of mortgage interest tax relief as being the subsidy to home owners stems from viewing the house as a consumption good but that a house is more logically viewed as an investment good. The implication is that the subsidy to home owners resides in the failure to tax imputed rent and capital gains. The magnitude of subsidy under this view is examined in the next two sections.

IMPUTED RENT

If a house is an investment good then for consistency with the treatment of other investment goods an owner-occupier should pay tax on the imputed rental income derived from occupation of his own home and an income derived from any gain in its capital value. At the same time he should be granted tax relief on interest payments paid on a mortgage taken out to purchase the house.

Currently owner-occupiers are granted tax relief on mortgage interest but, inconsistently, are no longer taxed on imputed rental income and are not taxed on capital gains made on their home. In this section calculations are made of the average level of extra tax that mem-

bers of the Birmingham inner-city sample would have paid if a tax on imputed rental income had been in force in April 1979 and in the next section the implications of taxing capital gains from the owner-occupiers house are considered.

CALCULATION OF IMPUTED RENT

It is difficult to estimate the market rent of a property in Britain because the private market for rental housing is small and shrinking and legislation has affected rent levels. In contrast, much information exists on the capital values of owner-occupied property, as there are frequent sales in a free market. However there is a drawback with capital values in that the concession of failing to tax imputed rent may itself be capitalised into the price of the house.

It is recalled from earlier discussion that the extent of capitalisation depends inter alia on the elasticity of supply of housing. As noted, very little empirical work has been done on the elasticity of supply of housing. However a priori reasoning supplies some information. In the long run, supply will only be inelastic if there is restricted availability of any of the factors of production of housing. It is likely that such restrictions will only be manifest in the supply of land. Arguing thus, Grey et al. (1981 p26) suggest that the increase in price produced by subsidy "might be of the order of 5-10%, with a spread around the average depending on the importance of land."

As noted the data set used in this research has an advantage in that the market price and date of sale of houses has been recorded. Previous studies have had to use rateable values and projections from regression equations to estimate the market price of housing (Robinson

(1981), Hughes (1981)). Robinson used the relation (mentioned on page 296) $P = 8164 + .09898RV^2$ with an R^2 of 0.99. Although this is a good fit, the actual price data is preferable. Other studies have suggested drawbacks to using rateable value to predict price. Foster, Jackman and Perlman (1981, p 311) found that "the correlation between house prices and rateable values was rather weak". One of their findings was that the ratio of rateable value to price fell as house prices rose and this would support Robinson's use of a quadratic relationship for prediction.

Given that the actual market price of the houses in the sample was collected an imputed rent could be derived from this price data. This is discussed by Odling-Smee (1975). If a house is expected to last forever, the rental value can be obtained by applying the opportunity cost of capital to the price of the house and adding annual administrative and maintenance costs. Thus:

$$R = rP + C \qquad (9)$$

where R is rent, r is the opportunity cost of capital, P is the price of the house and C is the sum of administrative and maintenance costs. If on the other hand, the house has a limited lifetime, the overall rate of return on the house must be higher so that the purchase price can be recovered by the end of the life of the house. Equation (9) then becomes:

$$R = arP + C \qquad (10)$$

(Odling-Smee, 1975, p18) with the amortisation of the purchase of the house effected by the adjustment a and with:

$$a = 1/[1-(1/1+r)^n] \qquad (11)$$

where n is the number of years of remaining life of the house. For likely values of n - say over 25 years, this adjustment becomes quite

small as a is close to unity.

In performing imputed rent calculations an important question to be settled concerns the treatment of inflation. Ideally it is the real rather than money imputed rent that should be taxed as the latter is inflated by purely paper gains. However, the concession of mortgage interest tax relief is based on money rather than real interest payments which for many years have been zero or negative (Hills 1980, Atkinson and King 1980). Hence, a position stopping short of wholesale reform of the whole treatment of inflation by the tax system suggests that the relevant magnitude to calculate is money imputed rent. Atkinson and King (1980) and Robinson (1981) have followed this course in their work and have derived imputed rents on the basis of a 12% and a 14% return respectively.

Applying these rates to house prices in the sample yields the results given in Table 27. The home prices have been written up to April 1979 values using monthly inflation rates. The derivation of these inflation rates is explained later in this chapter. These results can be set in a regional and national context by using the national and regional average prices quoted in Table 22. Thus, using Atkinson and King's 12% rate of return, the imputed rent based on the average house price for Britain in 1979 (£19,886) is £2,386. The implied subsidy from failure to tax this at 30% is £716. The corresponding subsidy for the average West Midlands house sold in the first quarter 1979 is £594, for a pre-1919 West Midlands terraced house, £338 and for a post 1919 West Midlands terrace £445. Imputed rents for inner-city Birmingham can be seen to be somewhat below these regional and national averages.

A second implication of viewing the house as an investment good -

TABLE 27: AVERAGE TAX BENEFIT RESULTING FROM FAILURE TO TAX IMPUTED RENT

	Rate of Interest 14%		
	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	155	282	6.83
SOHO	169	189	5.10
SALTLEY	166	211	7.02
HANDSWORTH	129	356	11.77
OVERALL BIRMINGHAM	619	257	4.14

	Rate of Interest 12%		
	NO. OF OBSERVATIONS	£ MEAN	STD ERROR
SPARKHILL	155	242	5.86
SOHO	169	162	4.38
SALTLEY	166	181	6.02
HANDSWORTH	129	305	10.09
OVERALL BIRMINGHAM	619	220	3.56

the subsidy implicit in failure to tax capital gains - is now examined.

CAPITAL GAINS

It has been argued that if housing is regarded as an investment good, owner-occupiers are subsidised in that capital gains on housing are not taxed whilst capital gains on other investments are. To gain some idea of the magnitude of these gains, estimates are now made for the Birmingham inner-city areas. An important step in this is the estimation of the rate of change of house prices.

(i) The Rate of Change of House Prices

Fleming and Nellis (1981) have recently reviewed the range of house price statistics available in the United Kingdom. They identify two weaknesses of these data.

Firstly, with the exception of surveys by the Inland Revenue (Economic Trends 1974, 1976, 1979, 1980) the prices sampled are for sales financed by a particular type of institution - usually building societies. Building societies have different lending markets to banks, insurance companies and local authorities and also differ between themselves in this respect (Doling & Williams, 1983).

Secondly, with the exception of the index produced by the Nationwide Building Society, price indexes are based on a simple averaging of purchase price and no attempt is made to take account of changes in the characteristics of houses sold from sample period to sample period. Unless allowance is made for such changes, indexes can be misleading. For example if mainly small houses had been sold in the first period, and mainly large houses sold to the second period, a simple index of price change from these figures could over-estimate any price rise because of the change in the nature of the houses sold to larger and hence more expensive properties. In the estimates presented here, explicit allowance for changes in the characteristics of houses over time is made by using hedonic price indexes (Griliches, 1971).

In the hedonic approach, the price of a house is assumed to be explained by its characteristics. If data is available on a number of relevant characteristics of houses, a high proportion of the variation in their price can be explained statistically in terms of variation of characteristics. If the date of sale is included as one of the characteristics then hedonic techniques allow the measurement of the pure effect of the passage of time on price after making allowance for shifts in the other characteristics of the houses sold over time.

Estimation of the hedonic price index is described in detail in

Appendix III. For the purposes of estimation it was assumed that a constant monthly growth rate of house prices r applied over the time period and the estimates of r for the four areas of Birmingham examined are given in Table 28.

The major point to arise from these estimations is that house price

TABLE 28: ESTIMATES OF THE RATE OF INCREASE OF HOUSE PRICES

	MONTHLY GROWTH $(1 + r)$	ANNUAL GROWTH $(1 + r)^{12}$	PERCENTAGE INCREASE
SPARKHILL	1.0074	1.0924	9.24%
SOHO	.9983	.9808	-1.92%
SALTLEY	1.00781	1.0980	9.80%
HANDSWORTH	1.00561	1.0694	6.94%

inflation in inner-city Birmingham has been very low, and in the case of Soho, prices have actually fallen.

During the period for which these rates of inflation were estimated, the General Index of Retail Prices rose from 100 to 165.8 which represents an average constant annual growth rate of prices of 13.47%.(1) Hence it can be seen that these rates of increase of house prices are considerably below the general level of increase of prices, even for the case of Saltley where the rise in house prices was most rapid.

If comparisons are made with the national average rate of inflation of house prices, the rise in prices in inner-city Birmingham is seen to be even lower by contrast. Fleming and Nellis (1981) quote an average percentage change in annual price of houses for 1975-1979 of 18.4 for new houses, and 16.6 for second hand houses, using the

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(1) (1975 16.5%, 1976 15.9%, 1977 8.3%, 1978 13.4%, 1979 18.0%).

DoE/BSA survey published in Housing Construction Statistics (HMSO, quarterly).

(ii) The Level of Capital Gains

The estimates of the monthly inflation factors given in Table 28 can be used to calculate an imputed capital gain for each of the houses in the data set. Recorded for each house is the purchase price, and date of purchase. Hence a growth factor can be applied to each house price based on the number of months between the start of the 1979/80 tax year: April 1979 and the time the house was purchased. More precisely, the price of the house in April 1979, denoted P79 can be imputed using the relation $P79 = P \times MIR^{MSP}$, where P is the purchase price, MIR is the monthly inflation rate from Table 28 and MSP is the number of months between the purchase date and April 1979. With all house prices written up to the level implied by the monthly growth rate for April 1979, the capital gain for each house can be imputed for the 1979-80 tax year by the relation

$CG = (P79 \times MIR^{12}) - P79$

The results of performing these calculations are given in Table 29.

TABLE 29: IMPUTED CAPITAL GAINS

	AVERAGE CAPITAL GAIN	MAX	MIN	NO. OF OBSERVATIONS
SPARKHILL	£620	£1015	£154	155
SOHO	-£ 87	-£ 28	-£247	169
SALTLEY	£493	£1759	£ 53	166
HANDSWORTH	£589	£1192	£162	129

Because house price inflation was negative for Soho for this year, capital <u>losses</u> are estimated for this area.

(iii) The Subsidy Implicit in Failure to Tax Capital Gains

Given these implicit capital gains, and for the case of Soho, losses arising from ownership, the question arises of how much subsidy is implicit in the failure to tax such gains. More specifically, if these capital gains were taxed consistently with other capital gains what would the tax bill be? Unfortunately the answer to this question would vary from year to year because the precise details of capital gains taxation have tended to change from year to year. Capital gains for the tax year that this study has chosen to focus on - 1979/80 are calculated here. For the years 1977-78, 1978-79 and 1979-80 no tax was levied on capital gains of up to £1,000. The excess over £1,000 was taxed at 15% provided total net gains were below £5,000. Details of capital receipts are not known for the sample, but it seems likely that few of the sample would make any significant capital gains and hence it has been assumed that capital receipts from other sources are zero. On this basis, liability to capital gains taxation can be computed by treating housing consistently with other assets. Table 29 showed that average capital gains were well below the threshold of £1,000 beyond which the tax would be levied. In fact, very few capital gains were made in excess of £1000 for any of the households in the sample: in Sparkhill, one household made a gain of over £1000, in Soho all capital gains were negative, in Saltley three households made gains over £1000 and in Handsworth, six households. Their average imputed liability to capital gains tax is shown in Table 30.

From these calculations it can be inferred that the households in the survey would benefit from the extension of capital gains taxation to gains on owner-occupied housing. Very few would pay any extra tax as a result of this move, but all could be expected to benefit from

TABLE 30

	No. of households with imputed capital gain <£1000	Average imputed liability to capital gains tax of these households
SPARKHILL	1	£2.26
SOHO	0	£0
SALTLEY	3	£4.37
HANDSWORTH	6	£15.61

the reduction in tax rates that this extra source of revenue would permit. As it is only those with expensive houses that benefit from this exemption, because of the £1000 allowance, it can be seen that the nature of this exemption is regressive.

The exemption of owner-occupied housing from capital gains tax can also work against low-income owner-occupiers in a rather unusual way as shown by Soho. Here, where house prices have fallen, rather than risen, the owners will sustain capital losses. As their property is exempt from taxation on capital gains, by the same token these capital losses cannot be included amongst those set against other capital gains that the homeowner may enjoy. Although in theory this effect is possible, in practice it seems unlikely that many from our sample will have other sources of income in the form of capital gains.

Since April 1980 the details of capital gains taxation have been changed again in that the first £5,300 of gains are now exempt, and since April 1982 the original cost on which the gain was made may be written up by inflation as measured by the retail price index, thus changing the nature of the tax from a tax on nominal capital gains to a tax on real capital gains. The effect of both of these measures is to reduce still further those that would be liable to pay capital gains tax should the owner-occupiers' exemption be removed.

CHAPTER EIGHT: GOVERNMENT INTERVENTION IN THE OWNER-OCCUPIED HOUSING MARKET

CONCLUSIONS

This chapter has shown that the definition of subsidy to owner-occupiers depends upon whether a house is viewed as a consumption or an investment good. Taking the more logical view that a house is an investment good leads to the definition of housing subsidy as failure to tax imputed rent capital gains. If, on the other hand, housing is seen as a consumption good, the subsidy to owner-occupiers is measured by mortgage interest tax relief.

The survey of estimates of subsidies to owner-occupiers and the effects of tax reform leads to the conclusion that subsidies to owner-occupiers are large, regressive and that overall gains in efficiency and equity are likely to result from their removal. Despite this, the subsidies remain, and this is explained by the public choice argument that strong efforts to block the removal of subsidy will be made by the interest group that would be adversely affected - owner-occupiers.

Note was made of the absence of studies of subsidy to particular sub-groups within owner-occupation as a whole in the UK. Recent buyers in inner-cities were argued to be of particular interest as representing a high proportion of new-entrants to owner-occupation. A study of subsidy to this group was therefore made on a set of data already collected for inner-city Birmingham.

Subsidy under the two alternative views of housing as a consumption good and housing as an investment good were considered. The results for the consumption good measure - mortgage interest tax relief - show that tax relief is high when compared with national figures, bearing in mind that property prices in the areas surveyed are well below the national average. Tax relief is also high in relation to the average

weekly income of those in the sample, often exceeding four weeks' net income.

Under the investment view of housing, the tax relief from failure to tax imputed rent was found to be of a similar magnitude. To investigate capital gains, data on house prices, dates of purchase and house characteristics was used in the hedonic estimation shown in Appendix III to obtain a set of house price inflation rates for the areas surveyed. House price inflation was found to be very low, with prices in Soho actually falling. Because of these low house-price inflation rates, in conjunction with the £1,000 threshold on capital gains taxation and the low level of house prices, the subsidy implicit in failure to tax capital gains was seen to be negligible. In fact the owners would benefit from <u>removal</u> of this tax relief as others richer than they would then be liable and a revenue neutral reform would leave owners in the sample better off.

CHAPTER EIGHT: APPENDICES

CHAPTER EIGHT, APPENDIX I: SOURCES OF DATA

The data used in the estimates of subsidy was from a 1979 survey of recent buyers in the inner areas of Birmingham. (Karn, Kemeny and Williams, 1984). This was carried out for a Department of Environment sponsored project on Low Income Home-ownership in the Inner City. The study was of "inner-city" home-ownership. "There is no general agreement on a definition [of inner-city] and in terms of housing the nearest approximation for this study was to equate the inner-city areas with areas where pre-1919 housing predominates or where such stock has been cleared or replaced, usually with post-war local authority housing. This was the definition used. As far as owner-occupation goes, the overwhelming bulk of inner-city housing is found in pre-1919 areas (as against rebuilt areas) in the inner ring of the city. The study therefore confined itself to owner-occupation in this older stock. Strictly speaking, in order to be able to generalise about inner city home-ownership of old stock in Birmingham, using the above definition, it would be necessary to conduct a random sample of owners of pre-1919 housing. A sample drawn from this population would be scattered randomly around the whole inner ring of the city. However, the 1974 survey, which was funded by the Social Science Research Council was designed as three discrete area surveys within inner Birmingham because it was aimed to get a balance of ethnic groups. While this means that the degree to which it has been possible to generalise about "Inner Birmingham" is somewhat reduced, the problem is lessened by the fact that the areas are relatively large. The four areas ultimately surveyed in Birmingham in 1979 comprise some 13,000 dwellings: about one fifth of the pre-1919 inner ring housing stock".(1)

CHAPTER EIGHT, APPENDIX II: FORMULA FOR MORTGAGE INTEREST

A series can be constructed for mortgage debt at the end of each year. Thus if i is the interest rate P is the sum borrowed, m is the annual payment and T is the term of the loan, the following table can be generated:

Year	Debt at End of Year
0	P
1	$P(1 + i) - m$
2	$P(1 + i)^2 - m(1 + i) - m$
3	$P(1 + i)^3 - m(1 + i)^2 - m(1 + i) - m$
n	$P(1 + i)^n - m(1 + i)^{n-1} - \ldots - m(1 + i) - m$
T	$P(1 + i)^T - m(1 + i)^{T-1} - \ldots - m(1 + i) - m$

The last n terms of the expression for debt at end of year n form a

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(1) Karn, Kemeny and Williams, 1984, p131. See also ibid. pp 131 - 140)

geometric progression and can be written:

$$\frac{m(1 - (1 + i)^n)}{1 - (1 + i)} \qquad (1)$$

or

$$\frac{m[(1 + i)^n - 1]}{i} \qquad (2)$$

Hence debt in year n can be written:

$$D_n = P(1 + i)^n - \frac{m[(1 + i)^n - 1]}{i} \qquad (3)$$

Now debt in year T, where T is the term of the loan, must be zero, hence setting D_T equal to zero using equation 3,

$$D_T = 0 = P(1 + i)^T - \frac{m[(1 + i)^T - 1]}{i} \qquad (4)$$

re-arranging gives:

$$m = \frac{Pi\ (1 + i)^T}{[(1 + i)^T - 1]} \qquad (5)$$

To derive an expression for interest payments in year n it is noted that the interest in year n will be paid on debt in year n-1 which is available from expression 3. Hence interest in year n : (I_n) is given by:

$$I_n = i(D_{n-1}) = i\left\{P(1 + i)^{(n-1)} - \frac{m[(1 + i)^{(n-1)} - 1]}{i}\right\} \qquad (6)$$

i.e. $$I_n = Pi(1 + i)^{(n-1)} - m(1 + i)^{(n-1)} + m \qquad (7)$$

Substituting for m using (5) this can be written:

$$I_n = Pi(1+i)^{(n-1)} - \frac{Pi(1+i)^T(1+i)^{(n-1)}}{(1+i)^T - 1} + \frac{Pi(1+i)^T}{(1+i)^T - 1} \qquad (8)$$

i.e.

$$I = \frac{Pi(1+i)^{(n-1)}(1+i)^T - P(1+i)^{(n-1)} - Pi(1+i)^T(1+i)^{n-1} + P\ (1+i)^T}{(1 + i)^T - 1} \qquad (9)$$

i.e.

$$I_n = \frac{Pi[(1 + i)^T - (1 + i)^{n-1}]}{(1 + i)^T - 1} \qquad (10)$$

CHAPTER EIGHT, APPENDIX III

CALCULATION OF ANNUAL INTEREST PAYMENTS APRIL 1979 - APRIL 1980

Available from the data matrix is MP - the months since purchase measured at the interview date. MI gives the month of interview measured as Jan 79 = 1 Feb 79 = 2 etc. Hence months since purchase (MSP) seen as from 4/79 i.e. April 79 is given by:

$$MSP = MP + 4 - MI$$

At the beginning of April 1979 the mortgage will be in its MSP/12 + 1 = IN year where the division MSP/12 is carried out as integer division with truncation.

However, consider the truncated remainder to the division given by IREM = MSP - (IN - 1) x 12. If at the start of the financial year the mortgage is IREM months into its IN^{th} year then for the last IREM months of the financial year the mortgage will be in its $(IN + 1)^{th}$ year. If monthly interest payments in year n are denoted I_n then the annual interest payments for April 79 - April 80 will be given by:

$$IREM.I_{(n-1)} + (12 - IREM).I_n$$

CHAPTER EIGHT, APPENDIX III: ESTIMATION OF THE HEDONIC PRICE INDEX

The Model

The data used for this study have been described in Appendix I. Amongst the information collected was the year and month of purchase of each house, the purchase price, and a number of characteristics of the house that might be expected to affect the purchase price. The rate of increase of house prices was analysed within a simple hedonic framework. For each area the following model was hypothesised:

$$P_{i,t} = Z_1^{X_{i,1}} Z_2^{X_{i,2}} \ldots Z_{k-1}^{X_{i,k-1}} (1+r)^t e_i \qquad i = 1,n \qquad (1)$$

where n is the number of observations sampled in the area, $X_{i,1}$ is equal to one for i = 1..n, Z_1 therefore being the house price con-

stant. Observations for $X_{i,2}$ to $X_{i,k-1}$ record for each recent buyer i a set of house characteristics thought to affect the purchase price $P_{i,t}$. t records the month of purchase of the house, lying between its extreme values of 0 in December 1979 and -60 for January 1975, and price is assumed to grow at a constant monthly rate r.

Writing (1 + r) as Z_k and t as $X_{i,k}$, taking logarithms and writing $\ln e_i$ as u_i enables (1) to be re-written as:

$$\ln P_{i,t} = X_{i,1}\ln Z_1 + X_{i,2}\ln Z_2 + \ldots + X_{i,k}\ln Z_k + U_i \quad i = 1,n \qquad (2)$$

or equivalently: $\underline{y} = \underline{X}\underline{\beta} + \underline{u}$

where $\underline{y}' = (\ln P_{1,t} \ln P_{2,t} \ldots \ln P_{n,t})$,

$\underline{\beta}' = (\beta_1 \ \beta_2 \ldots \beta_k) = (\ln Z_1 \ln Z_2 \ldots \ln Z_k)$

$$\underline{X} = \begin{pmatrix} X_{1,1} \ldots X_{1,k} \\ \vdots \quad\quad \vdots \\ X_{n,1} \ldots X_{n,k} \end{pmatrix}.$$

Each element u_i, i = 1,n is assumed to be independently normally distributed with mean zero and variance ^{2}.

Given an estimate of $_k$, the rate of growth of house prices r may be derived reversing the substitution process made above. Hence $\beta_k = \ln(1+r)$ and thus $(1+r) = e^{\beta_k}$ or

$$r = e^{\beta_k} - 1 \qquad (4)$$

As r is the monthly growth rate it is of interest to compute an annual growth rate of prices $r_{}$ as:

$$r_{} = (1 + r)^{12} - 1 \qquad (5)$$

The idea of using the coefficient on time within the structure of an hedonic model to capture the pure effect of the passage of time, after account has been taken of changes in other characteristics by the other variables in the equation, was first used by Court (1939) and later by Griliches (1961). However, a difference is that in these

studies, the coefficient on time expresses the shift in price between cross sections for two time periods.

Estimation and Data

Ordinary least squares was used to estimate the model in (3). The dependent variable was the natural logarithm of the selling price of the house and this was regressed on the set of explanatory variables listed and defined in Table 1.

In order to render the data reasonably homogeneous the minority of

TABLE 1: EXPLANATORY VARIABLES

PTYPE Dummy = 0 for terraced house and 1 for an end of terrace house
PREIW Dummy = 1 for pre-1919 houses and 0 for post-1919 houses
FNGDN Dummy = 1 if house has a front garden or paved parking area, 0 otherwise
STRYS Number of storeys of the house
CELLR Dummy = 1 if house has cellar, 0 otherwise
BKGDN Dummy = 1 if house has back garden, 0 otherwise
HALL Dummy = 1 if house has entrance hall, 0 otherwise
NBEDS Number of bedrooms in house
BATHR Dummy = 1 if house has a separate bathroom, 0 otherwise
CNCL Dummy = 1 if source of loan was local council, 0 otherwise
BSINS Dummy = 1 if source of loan was a building society or insurance company, 0 otherwise
BNK Dummy = 1 if source of loan was a bank, 0 otherwise
TIME Variable denoting month of purchase lying between - 60 for January 1975 and 0 for December 1979.

properties that were neither terraced nor end-of-terrace were omitted from the data set.

The results of the regressions are given in Table 2. The coefficients on the variable time from the basis for the growth rates of prices presented in Table 28 in Chapter 8. Thus for example the coefficient on TIME for Sparkhill is 0.00737 which gives the monthly growth rate of prices (1 + r) quoted in Table 28 as

$e^{0.00737} = 1.0074$.

CHAPTER EIGHT, APPENDIX III

TABLE 2, HEDONIC PRICE EQUATIONS

	SPARKHILL		SOHO		SALTLEY		HANDSWORTH	
VARIABLE	COEFF	t	COEFF	t	COEFF	t	COEFF	t
CONST	.743E-1	20.14	.719E-1	26.47	.851E-1	10.73	.712E-1	14.13
PTYPE	.346	2.18	.571E-1	0.48	.610E-1	0.38	.449	2.13
PREIW	-.223E-1	-0.15	.630E-1	0.74	-.498	-1.24	-.213	-2.14
FNGDN	-.216E-1	-0.36	.516E-1	0.62	.796E-1	1.01	-.621E-1	-0.38
STRYS	.220	1.51	.114	1.05	-.155	-.55	.356	2.09
CELLR	-.208	-2.42	-.182	-3.11	-.203	-1.94	-.157	-1.40
BKGDN	.180	1.30	.435	2.58	-.126	-0.33	.428	1.07
HALL	.105	2.35	.203	3.62	.145	2.01	.682E-1	0.77
NBEDS	.120	2.83	.291E-1	0.77	.153	2.59	.575E-1	0.79
BATHR	.189	2.25	.106	1.17	.429	4.79	.494	2.31
CNCL	.167	2.10	.111	1.57	-.230	-2.10	.204E-1	0.19
BSINS	.431	6.17	.319	4.34	-.776E-2	-.07	.143	1.36
BNK	.680E-2	0.09	.782E-1	1.48	-.820E-1	-1.19	.280E-1	.21
TIME	.737E-2	5.20	-.161E-2	-1.10	.779E-2	3.97	.560E-2	2.42
n	154		159		159		83	
SSE/n	0.6179E-1		.6949E-1		.1318		.8621E-1	
R^2	0.532		0.344		.319		.405	
$\bar{R}^2$	0.488		0.285		.258		.293	

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CONCLUSIONS

The concern of this thesis has been government expenditure and intervention in the economy. The first five chapters have looked at different aspects of government expenditure. The last three are concerned with other aspects of government intervention. The focus of the expenditure chapters moves from general government expenditure in Chapter 1 to local government current expenditure Chapter 2 and local government capital expenditure in Chapter 3. Chapters 4 and 5 examine branches of the local authority current expenditure and capital expenditure budget. Chapter 4 examines the education branch of the current expenditure budget and Chapter 5 examines the housing branch of the capital expenditure budget. In the second part of the thesis, Chapters 6 to 8 consider other forms of government action: its intervention in the aerospace industry and its effect on industry profits, its payment of direct grants to schools in the private sector and lastly its tax expenditures on owner-occupiers

What conclusions emerge from this work? The broad picture that emerges from Chapter 1 is that government expenditure in developed nations has been growing continuously this century. The public expenditure patterns of seven developed nations: France, Germany, Japan, the Netherlands, Sweden, the UK and the USA are examined in detail since World War II and confirm this pattern. Total public expenditure as a percentage of national income has been growing continuously since the Second World War, and at an increasing rate. Within this pattern

of growth, expenditure on goods and services has been growing continuously, and expenditure on transfers has also been growing continuously, but at a faster rate. Hence the share of transfers in public expenditure in these nations has been rising.

What explains this growth of expenditure? Estimation of the relationship between political orientation of the government and expenditure growth suggests that the proportion of Conservative members of parliament has a role in the explanation, with a ten per cent increase in Conservative membership of Parliament expected to reduce the percentage of government expenditure to national income by three per cent, though this leaves political orientation itself to be explained.

A large number of theoretical explanations put forward to explain government expenditure growth were surveyed in Chapter 1, including the displacement effect, Wagner's law, Baumol's Disease, bureaucratic expansionism, bureaucratic voting, and fiscal illusion. An area of much current interest, where the growth of government is seen as resulting from interest groups' endeavours to secure transfers in kind for their members, was also surveyed. Redistribution is seen in these theories as the engine of government growth, fuelled by the political actions of those who stand to gain. It is concluded from this survey of the growth of government that no single theory is likely to explain government growth entirely, but that the explanation lies in a combination of effects operating at once. Empirical research to distinguish between different theories is currently hampered by poor data and further research designed to improve data sources is likely to be fruitful.

There are two appendices to Chapter 1. Appendix I is concerned with the econometrics of testing for the displacement effect in

CONCLUSIONS

Diamond's (1976/77) study. Diamond is shown to have used the wrong test for change of structure in his work, given his emphasis on excluding equality of error variance before and after the displacement from his null hypothesis. Appendix I shows that re-testing with a test that meets his stipulations does not change his results.

Appendix II is a study of a range of alternative tests for change of structure, stimulated by the problems raised in Appendix I, and also Appendix III of Chapter 5. These are surveyed and small sample properties are investigated by Monte Carlo simulation. It is concluded that a Chow test for change of structure is appropriate when either disturbance variances can be assumed to be equal or a joint test of equality of regression coefficients and disturbance terms is required. If, on the other hand, it is not wished to assume that disturbance variances are equal, or the experimenter wishes to know whether the regression coefficients are equal without including error variance equality in the null hypothesis the recommendation becomes much less clear cut. The Wald test suggested in Appendix II is easier to compute than a Jayatissa test and yields more power, but at the expense of some slippage in the size of the test.

In Chapter 2, current expenditure of local government is examined. Over the last five years housing expenditure is found to have been cut whilst there have been increases in expenditure on social security and law and order. A tendency is noted for central Government to plan cuts in local government current expenditure which do not materialise in outcomes. In the main part of Chapter 2 the local authority budget constraint is analysed in detail and approximate measures of the constraint, termed fiscal pressure are developed. A model of local authority expenditure change is then specified and estimated making

use of the measures of fiscal pressure.

The model of local government expenditure change developed in Chapter 2 seeks to answer the question: what determines the change in a local authority's annual budget year-on-year? This question is a subject of much speculation. The current Conservative government has been seeking to control local government expenditure since it came to power in 1979. The conclusions from the empirical work on English local authorities of Chapter 2 are that fiscal pressure has a negative effect on year-on-year increases in local authority budgets. In addition, the political control of the local authority is of importance, with Conservative control tending to reduce expenditure increases.

Chapter 3 analyses the arguments surrounding the control of local authority <u>capital</u> expenditure. The macroeconomic argument for its control are found to be weakly established. This argument is that local government borrowing forms a large part of the public sector borrowing requirement (PSBR) and a large PSBR makes money supply control difficult. However, Government controls are not on local authority borrowing but on local authority capital expenditure. There is enormous variation in the relation between capital expenditure and borrowing from year to year and; overall, local authorities do not even spend up to their capital expenditure empowered spending levels. Hence it <u>is</u> not clear that control is being exercised. Furthermore, it is shown that stabilisation of capital expenditure attempted by the government may well have been counter-productive. The essential force behind the Government's desire to control local authority capital expenditure is argued to be accountability. Since central government makes a major contribution in grant toward paying for what the local voter votes for, central government desires to have a major voice in

determining how much is spent and aims to see a reduction. "He who pays the piper calls the tune".

In Chapter 4 a model of local government education expenditure change is developed, based on the model of Chapter 2. As in the model developed for current expenditure in Chapter 2, fiscal pressure and Conservative control are found to have negative effects on education expenditure increases. Thus, for instance, Conservative control is found to reduce the year-on-year increase in education budgets by two per cent in non-Metropolitan Counties between 1982/3 and 1983/4 and by four per cent in outer-London Boroughs. In the next year, in outer-London, the Conservative negative effect rises to six per cent.

In addition, there is some evidence from the variable ALIGN of local government moving its education budget share into line with its GRE share. However, there is considerable instability in the coefficients in these models. Further research would be valuable, devoted to expanding the representation of demographic factors in the model in the form of numbers of different categories of pupil.

Chapter 5 of this thesis explored housing expenditure, the most important branch of the capital expenditure budget of local authorities. Expenditure on housing was found to be positively related to factors indicating need, such as the percentage of unfit housing stock and the percentage of households without hot water. The variable IMPETUS, a measure of bureaucratic momentum in the housing program was found to have high explanatory power. Investment functions were estimated for the four types of housing authority in existence before reorganisation: County Boroughs, non-County Boroughs, Urban Districts and Rural Districts. Formal testing in Appendix III to Chapter 5 indicated that the investment function was not homogeneous

across the four different classes of authority. County Boroughs proved to be the most easily modelled, supplying, thereby, tentative grounds for a belief that they were the most systematic in their housing investment behaviour. In contrast with the models of Chapters 4 and 5 political control did not emerge from the empirical work as an important explanatory variable, though this may be because Labour control correlates with indicators of need such as hot water lack.

Chapter 6 of this thesis examined the UK aerospace industry. This industry has been, and continues to be, the subject of much government intervention. A model of the determinants of profitability in the aerospace industry was specified and estimated. The most striking finding was that Government-induced mergers may have reduced the industry's profit rates by around six per cent. A negative finding was that the Review Board for Government Contracts, set up after the "excessive" profits cases of the 1960s, was not found to have a significant negative effect on profit rates. Lastly, as might be expected, there was a significant positive relation between aerospace profitability and manufacturing industry profitability.

Recent legislation reintroduces direct payment from central government to schools that "opt out" of local government control. Chapter 7 of this thesis studied the cost functions of the direct grant schools, schools which received a capitation fee under the Direct Grant system abolished in 1976. The conclusion of the study is that there were no grounds for inferring significant economies of scale from the data studied. This result is of interest as a negative result because, should significant economies have been found this would have unfavourable implications for schemes for re-organisation of education based upon competition between schools. Other findings from the work

were that models applied to girls' schools in general had significantly greater explanatory power than the same models applied to boys' schools, and that a high proportion of pupils with fees paid by the local authority is generally associated with lower costs.

The last chapter of the thesis examined tax expenditures on owner-occupied housing. Definitions of the subsidy to owner-occupiers vary according to whether a house is seen as a consumption good or an investment good. Seen as a consumption good a house attracts subsidy in the form of mortgage interest tax relief. On the other hand, when the house is, as is more logical, seen as an investment good, the subsidy becomes the failure to tax imputed rent and capital gains. A survey of estimates of subsidy to owner-occupiers indicates that subsidies favour the rich and generate deadweight losses. The fact that they are not removed by the government is attributed to the political power of owner-occupiers as an interest group. Further research is needed in the public choice field on mechanisms for compensating interest groups with some part of such efficiency gains so that removal of deadweight losses is not blocked by "political impossibility".

Having surveyed existing estimates of subsidy, Chapter 8 goes on to estimate subsidies to the sub-group of owner-occupiers represented by recent buyers in inner-city Birmingham. Subsidy is found to be high for this group - its annual value often exceeding four weeks' post-tax income.

Lastly, Appendix III specifies and estimates a hedonic model of house price inflation. An interesting finding is that house price inflation at the time of the survey (1979) in inner-city Birmingham

has been low, and in the case of Soho, negative. Exemption from capital gains tax on housing has not been of benefit to these owners.