

Intergovernmental Fiscal Relations in South Africa

By

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Dedication

This dissertation is dedicated to my mother, my aunt, my beloved wife Ntombi and our children Nondumiso, Nokulunga, Lethuxolo and Zekhethelo, for their continued support, love and encouragement.
Many blessings to all of them

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Declaration

With the exception of quotations specifically
acknowledged in the text, this dissertation is
entirely my own work, and has not
been submitted in any other
University



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DSD SHABALALA

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Abstract

Objective Of The Study

This study is about the intergovernmental fiscal relations in South Africa. The primary objective is to review the international experience of fiscal decentralisation with the view to providing answers to the issue of revenue sharing, problems of expenditure and revenue assignment, and the impact of the whole decentralization on the size of the public sector in South Africa.

Methodology

The methodology adopted in this study includes (1) a review and comparison of the practise of fiscal decentralisation in four countries, and (2) an econometric investigation into the impact of fiscal decentralisation on the size of the public sector, using time series quarterly data for the period 1993/94 to the second quarter of 1998/99. Regarding the econometric investigation, a single linear regression model including fiscal decentralisation, fiscal collusion, income and population are assumed to influence the size of the public sector.

Study Findings

Our analysis provides certain interesting results. First, the countries reviewed tend to assign functions in a manner that is consistent with the public finance theory that functions that are distributive in nature and those that are meant to ensure the country's

stability should be reserved exclusively for the federal or national government. Whereas the Australian, Canadian and Brazilian's revenue decentralization show a number of significant taxes that are devolved to the lower levels of government, Germany represents a strong collection at the center. The discrepancy is compensated for by the use of equalization grants in the German model.

Second, fiscal decentralisation is found to exert a negative influence on the size of the public sector, although the impact is statistically not significant. The insignificance of the impact of fiscal decentralisation on the size of the public sector is explained in terms of the fact that there has, in fact, been very little decentralisation in South Africa. The size of the provincial and local government own source revenue relative to the consolidated general government expenditure is very little, pointing to the serious lack of revenue raising powers by the sub-national governments and thus the absence of any meaningful extent of decentralisation.

Third fiscal-collusion exerts a significant negative influence on the size of the public sector. That is, the size of the public sector will reduce if provinces and local authorities are granted enough power to raise their own revenues. This result indicates that the massive transfers of revenue from the national government to the provinces and local authorities (revenue sharing) significantly reinforces the expanding influence of the decentralised expenditures financed through revenue transfers.

Fourth, the overall size of the country's population is found to be inversely related to the size of the public sector supporting the argument that as population increases, economies in providing services are reaped.

Chapter 1.

General Introduction

1.1 Background

Governments' roles in democratic societies are to serve their citizens by providing a stable socio-economic environment and public goods and services desired by the society. There are countless ways in which this can be achieved. That is, policy makers or governments have the choice of a great number of instruments, and the combinations chosen give rise to different fiscal systems. The implications of the particular fiscal system chosen, however, will depend upon the features of the economy of the country concerned, such as the extent of development of the economy, extent of decentralization of government functions, degree of homogeneity of the population, and the extent of government intervention in the economy (Brown and Jackson, 1990).

The Constitution of the Republic of South Africa establishes a federal fiscal system in which the three spheres of government viz. national, provincial and local governments, are distinctive, interdependent and interrelated. The Constitution also identifies functional areas of concurrent and exclusive competence for the three levels of government. Three issues of serious concern and fundamental to the effective intergovernmental fiscal relations have, however, emerged. These issues require careful study and wider debate and consultation in order to arrive at consensus decisions on them (Government of South Africa, 1996).

The first major issue relates to the revenue sharing process between the three spheres of government. The national Constitution requires that nationally raised revenues be divided equitably between the three spheres of government, and that the provincial share be sub-divided

equitably between the nine provinces. In addition to their equitable shares, provinces and local government also receive grants from the national share.

A provincial formula allocates funds between provinces according to their demographic and economic dynamics, taking account of the services for which the provinces are responsible. A local government formula has also been designed to enable municipalities to deliver a package of basic services to low income households at affordable cost. Both formulae have strong equity component, recognising the special needs of poorer areas (Department of Finance [DoF], 1998).

The equitable division of national revenues between the three spheres of government provides each with the funds to provide the services and perform the functions assigned to it under the Constitution, given each sphere of governments' ability to raise its own revenue to pay for these activities. Many questions have been raised, in particular, about the provincial revenue formula that has been developed by the Financial and Fiscal Commission (FFC). Among these concerns are (1) issues relating to the variables in the formula, how they were derived and questions of their credibility; (2) unreliability of the base period figures used in the provincial revenue sharing; (3) rationale behind the phasing-in of the formula over a five-year period; (4) treatment of conditional grants; and (5) treatment of sub-national borrowing powers (FFC, 1995a: 1995b: 1996).

The second major issue relates to the assignment of revenue responsibilities to the sub-national levels of government. Revenue sharing is necessitated by the constitutional assignment of revenue-raising and expenditure responsibility. Most or almost all of the revenues in the country are raised nationally, and although the provinces have significant expenditure responsibilities, they have only limited revenue sources. Since the revenue sources assigned to the provinces simply cannot finance the level of expected local activity, the result of the expenditure devolution downwards is likely to be a strong demand for increased, rather than reduced, transfers.

Unfortunately, there has not been any concrete empirical estimates of “correspondence” between expenditure and tax assignments and the need for transfers. The intergovernmental fiscal relations has been developed with no quantitative assessment of its implications on the size of the government or on the economy as a whole.

The national government accepts that expenditure responsibilities should in principle be matched by taxation powers, however, the potentially disruptive effects that sub-national taxation powers may have on national macroeconomic policies seem to put the national government in a very reluctant position to decentralize revenue powers. Instead, the national government has instructed the Katz Commission which has been set up to inquire into certain aspects of the country’s tax structure to submit proposals on the tax powers of provinces to enable legislation regarding provincial taxation powers, as required by the Constitution (Department of Finance DoF, 1998).

The third important issue relates to the demands that the new fiscal and financial arrangement places on the subnational governments. The Intergovernmental Fiscal Relations Act, which took effect from January 1998, establishes a formal process for considering intergovernmental budgetary issues. The Act has been designed to facilitate and regulate a process of consultation to promote a fair and transparent budget-making process. The Act therefore gives effect to section 214 of the Constitution by setting out the process to arrive at the equitable share of revenues raised nationally. As expected, the new intergovernmental budgeting system has thrown up new challenges and problems. These include the development of an information and reporting system to promote effective financial management, coordination of budgeting and policy-making, and the need to build capacity, particularly at the sub-national levels of government.

The first question that arises when it comes to fiscal decentralization is what kind of tasks should be assigned to subnational governments and which should be retained at the central level. Closely linked to this issue is the crucial question of how the different tasks of lower levels of governments - once identified and defined - should be assigned to different lower levels of government (Brown and Jackson, 1990). This is one of the key issues in the policy discussion on this topic in South Africa. It also constitutes an area where lack of a clearly defined and communicated policy has led to inefficient systems in a number of countries. In other words, it is extremely important that the assignment of tasks to different levels of government is carefully thought out, and once the allocation of tasks has been decided upon, that it be kept as stable as possible. Once the basic structural issues have been decided upon, the question of how to design an efficient financing system, including the issue of the system of taxation, arises. The design of the tax systems required to streamline revenue mobilisation will need to take account of the revenue needs of the lower levels of government. This will naturally put constraints on the types of tax systems which are both feasible and desirable (Prud'homme, 1994).

1.2 The objective

This study is about the intergovernmental fiscal relations in South Africa. The specific objective is to examine the practice and circumstances in industrialized countries, where federal systems of economic decision making have evolved over a longer period of time, with the view to searching for clues or answers to the issue of revenue sharing mechanisms, problems of expenditure and revenue assignment, and the impact of the whole decentralization on the size of the public sector in South Africa.

1.3 Hypothesis

Many studies have attempted to test the Leviathan hypothesis that fiscal decentralization serves as a constraint on the behaviour of revenue-maximizing government and thereby restrains the overall size of the public sector (see, for example, Brennan and Buchanan, 1980; Oates, 1985; Marlow, 1988; Grossman, 1992; and Kneebone, 1992). A problem with all of these studies is that they treat fiscal decentralization as devolvement of either taxing or spending powers, neglecting the inseparability of taxing and spending decisions. This study supports Bird and Wallich (1993) and argues that fiscal decentralization in the Leviathan model of government is a composite, constitutional action containing the two inseparable elements of taxing and spending decisions. Accordingly, this study will test the hypothesis that: "a simultaneous decentralization of national government's taxing and spending powers tends to act as a constraining influence on the overall size of the public sector".

1.4 Structure of the Dissertation

The rest of the dissertation comprises six chapters. Chapter two contains the review of the theoretical aspects of fiscal decentralisation. In chapter three we examine the practice and problems of fiscal decentralization in selected developed and developing countries. In Chapter four we review the experience and issues of fiscal federalism in South Africa. In chapter five we review the empirical tests of the fiscal decentralisation hypothesis. In chapter six we specify and estimate the Leviathan model to test the impact of fiscal decentralization on the size of the public sector. The model estimates and discussions on them are also covered in this chapter. Chapter seven concludes the study with policy recommendations.

Chapter 2

Theoretical Aspects of Fiscal Decentralization

2.1 Definition of Fiscal Decentralization

Fiscal decentralization or fiscal federalism is concerned with economic decision making in federal systems of government, i.e., in systems of government in which public sector decisions can be taken at various levels of government (Shah, 1994).

Brown and Jackson (1990) argue that a decentralized government is one for which a number of small autonomous governments join together to form a federation of states or governments. A central or federal government usually exists to co-ordinate the activities of the smaller local governments. The local governments, however, have autonomy to determine their own levels of public outputs and their own mix of taxes and tax rates. The degree of centralization varies with the amount of autonomy that local governments have over expenditure and tax decisions.

The overriding issue in fiscal decentralization is the assignment problem, i.e., the assignment of expenditure, taxation and regulatory responsibilities to various levels of government. The key issue here concerns the optimal degree of decentralization of public sector decisions of different sorts. The assignment function is, of course, conditional on the sorts of roles undertaken by the public sector and also on the objectives of government intervention in economic activity (Prud'homme, 1994; Bird, 1993; Oates, 1985 as well as Broadway, Roberts and Shah, 1994a).

According to McLure (1993), the division of functions and tax bases among the various levels of sub-national government depends upon the geographic extent of benefits, economies of scale of production and administration, decision making costs, the mobility of taxpayers and

recipients of benefits of public services, and the advantages of vote trading in expressing intensity of feeling. Decentralization can take varying forms, ranging from assigning exclusive jurisdictions for a given function to a given level of government to situations of co-occupied jurisdictions in which one level of government is able to influence the decisions taken by another in varying degrees through mechanisms such as regulation, the power to override decisions or financial intervention. To some extent, the amount of decentralization on the expenditure side can be determined independently of that on the tax side.

Silverman (1992) views decentralisation in a less institutionalised way. He defines five types of decentralization namely, deconcentration, delegation and devolution. The other two are the “top-down” and the “bottom-up” system.

In a deconcentration system, selected functions are assigned to sub-national units within sector ministries or other sector specific national agencies. One can visualize the deconcentrated institutional arrangements in terms of a ‘branch office’ system. In this type of decentralization, local governments do not exist as discrete entities with respect to the functions for which central government ministries are responsible. Thus, with respect to those functions, government exists at local levels in the form of discrete ministry offices without any mechanism at the local level for mandatory horizontal integration.

Delegation is the form of decentralization that takes place when parastatals and other semi-autonomous government agencies are assigned responsibility for implementing or maintaining sector investments. In a minority of cases, decentralized organisational arrangements within sectors are of a purely devolved type.

Devolution of, at least, some functions is found primarily in the urban development sector and with respect to operations and maintenance. The essence of devolution is discretionary authority. To the extent that local governments have discretionary authority, they can do

essentially what they decide to do, bound only by broad national policy guidelines, their own financial, human, and material capacities; and the physical environment within which they must operate. An essential characteristic of discretionary authority is that the supervisory role of central government is limited to ensuring that local governments operate within very broad national guidelines with respect to the functions they are expected to perform. The exercise of effective discretion by local governments, however, depends on their ability to generate the financial and staff resources to implement the decisions that they make.

In the “top-down system” local governments exercise responsibility on behalf of central governments or parastatals. When acting as agents under such systems, local governments do so under supervision from central governments. Under the “bottom-up system”, various levels of government parastatals act as agents of government or government parastatals act as agents of beneficiaries/users/clients. Thus a system of bottom up principal agency is significantly different from the top-down version in terms of the source of discretionary authority to initiate contracts with government agencies and supervise their own implementation.

Silverman (1992) also suggests a sixth type of decentralization, which he calls the ‘hybrid decentralization’. The hybrid decentralization is where the system-wide institutional arrangements is characterized by the coexistence of elements of at least four of the five forms of decentralization discussed earlier together with other highly centralized government functions. According to Silverman, within the hybrid systems, some functions are decentralized in one way and other functions are decentralized in other ways. At the macro institutional level, all decentralized systems can be expected to be hybrid. Decentralized systems at the comprehensive sectoral level are most often hybrid.

2.2 Rationale for Fiscal Decentralization

According to Norregaard (1995) the basic economic rationale for decentralization is the potential efficiency gain which follows from the possible differentiation of the provision of public goods and services in different locations in accordance with the tastes of the local population. Thus, through decentralization, a “market” is established for local public goods, which entails a welfare gain compared to a situation with only one homogenous level of services throughout the economy.

Norregaard’s views corroborate those expressed by Oates (1972) when he said that not all public goods have similar spatial characteristics. Therefore a ‘one size-size-fits-all’ approach does not deliver supply of public goods that is optimal for all citizens. Oates contends that when the jurisdiction that determines the level of provision of each public good includes precisely the set of individuals who consume the good, there is perfect correspondence in the provision of public goods. One would therefore need a highly decentralized public sector with many sub-national jurisdictions of varying sizes. Each level of government possessing complete knowledge of the tastes of its constituencies and seeking to maximise their welfare, would provide Pareto-efficient level of output and would finance this through benefit pricing. It can be concluded from the above, that centralization is costly if it leads the government to provide a bundle of public goods different from the preferences of the citizens of particular regions, provinces, or municipalities.

According to Cremer, Estache, and Seabright (1994), each type of public good should be provided by a level of government enjoying a comparative advantage in accounting for the diversity of preferences in its choice of service delivery. Not only that but, there should be enough welfare gains to justify the devolution to the next level of government.

Theoretically the welfare loss in the central production of each public good should be measured before devolution decisions are made. The extent of the welfare loss depends upon the degree of homogeneity of individual preferences. Highly heterogeneous groups will suffer welfare

losses from a centralized solution. Further, the size of the loss in consumer surplus varies inversely with the price elasticity of demand. Also, if there are economies of scale in the production of the good, then the unit cost for larger communities will be lower than for smaller groups. Thus the extent of the welfare loss depends upon the the distribution of preferences throughout the community, the elasticity of demand and the existence of economies of scale (Oates,1985).

According to Tanzi (1995), the theoretical efficiency gains from decentralization can be significantly undermined in practice by institutional constraints. Ter-Minassian (1997) advances three reasons that contribute to the undermining of efficiency gains in decentralized systems. First, the administrative capacity of sub-national governments may be quite weak. Overstaffing, poor technical skills and training of employees, and the inability to formulate and implement effective spending programs to fully exploit potential financing sources are some of the weaknesses that characterize many regional and local jurisdictions in a number of countries worldwide. The incidence of corruption at the local level is not negligible. Second, subnational governments often have not been able to develop modern transparent public expenditure management systems, including adequate mechanisms for financial control, reporting accounting, and evaluation of expenditure programs. Third, the size of local jurisdictions as a result of historical imperatives, is not always consistent with the full realization of potential efficiency gains from decentralization. It has also been held that - even in cases where the economic conditions for decentralization may not be evident - it will promote local democracy and thereby contribute to democratization of society.

According to Tanzi (1995) there can be a political argument for decentralization if a country is not homogeneous and if ethnic, racial, cultural, linguistic, or other relevant characteristics are regionally distributed. Russia and Ethopia are good examples of such

countries. South Africa before 1994 was largely the same although demographic profiles are changing with the newly found mobility of people. Decentralization may be needed to induce various regions to remain part of the federation and as a goal of national unity to push non-democratic governments toward the forced elimination of regional differences. In democratic societies the economic and political arguments for decentralization tend to converge, since it is argued that decentralization strengthens democracy. Most people are more inclined to engage in local political activities because local policies have a more direct impact on their daily lives (Brown and Jackson, 1990).

Decentralization has also been held to enhance macroeconomic performance by reducing growth of public expenditure and mobilizing local financial resources for development (Shah, 1991). According to Ter-Minassian (1997), the proponents of centralization argue that allocative considerations may come into conflict with distributional and macroeconomic management objectives. Especially in large countries characterized by subnational regional disparities in the distribution of productive resources and incomes, the ability of subnational governments to provide public goods and services to their residents can vary widely, leading to undesirable internal migrations as well as unsustainable social and political pressures. This sometimes results in the provision of sub-standard levels of certain public goods, such as poor primary education and basic health care which adversely affect the stock of human capital of the country. This in turn may have a negative impact on the prospects for long-term growth of the economy.

On the other side, the argument by the proponents of centralization does not imply that the provision of public goods and services other than those of a clearly national nature should be administered centrally. The central government can influence the delivery of public goods through setting of policy guidelines or mandates. Central government could transfer resources to sub-national governments to equalize their capacity to meet mandates and exercise *ex post* control

over the use of transfers and the level of quality of services provided by the lower levels of government (Ter Minassian, 1997).

An important consideration in the macroeconomics of decentralization is that even if the overall level of expenditure of sub-national governments is sufficiently constrained by limits on their taxation and borrowing powers, changes in the composition of their expenditures can affect aggregate demand in a way which may run counter to the stabilization objectives of the central government. Even a balanced budget expansion by sub-national governments could boost aggregate demand, and worsen the balance of payments, if the average expenditure multiplier significantly exceeds that of revenue. From a macroeconomic management perspective therefore, central governments should retain responsibility for expenditures that have a particularly strong impact on demand or that are particularly sensitive to changes in the cycle. Further, the greater the share of public expenditure that is assigned to the sub-national levels of government, the greater the need to involve the latter in the pursuit of any needed fiscal adjustment.

According to Shah (1994), the economic framework developed in the fiscal federalism literature addresses the question of the appropriate level of centralization by assigning taxing, spending and regulatory responsibility to various levels of government. This framework argues for the assignment of a responsibility to the lowest level of government that can internalize benefits and costs of decision making for the specific service.

However, according to Prud'homme (1994), recent discussions on the appropriate level of decentralization of fiscal expenditure have largely been theoretical or anecdotal. Huther and Shah (1998) have developed an index for the quality of governance for a sample of 80 countries. They apply the index to the debate on the appropriate level of fiscal decentralization.

Governance is a multi-faceted concept encompassing all aspects of the exercise of authority through formal and informal institutions in the management of the resource endowment

of a state. The quality of governance is thus determined by the impact of this exercise of power on the quality of life enjoyed by its citizens (Huther and Shah ,1998)

In measuring quality of governance, Huther and Shah (1998), develop indices for the government's ability to (1) ensure political transparency and a voice for all the citizens (2) provide effective public services efficiently (3) promote the health and well-being of its citizens and (4) create a favorable climate for stable economic growth. These factors are among those cited in the World Bank's (1992) booklet, *Governance and Development* as representing the most important goals that ought to be faced by governments. All governments can be expected to pursue these goals regardless of their country's wealth. Huther and Shah (1998) conclude that the decentralization side of this debate cites efficiency gains due to greater voice for local constituents while the centralized side cites efficiency gains from economies of scale often from consolidating human or physical capital. The conclusion of the value of greater decentralization was informed by examining the relationship of fiscal decentralization to various individual and composite measures of quality of governance. At an empirical level, it appears that governance quality may be enhanced by greater decentralization.

2.3 Assignment of Responsibilities

The answer to the question of what kind of functions should be assigned to sub-national governments and which should be retained by the central government is closely related to the Musgrave classification of public tasks. According to Musgrave (1959), distribution functions should be assigned only to the central government because people bearing the burden of distributional policies might migrate and thus render local distributional policies ineffective. The central government should also be largely responsible for stabilisation policies because of spillover effects and because sub-national governments do not usually possess the necessary arsenal of

policy measures, such as monetary policy instruments. Finally, the allocation function should be the core function of sub-national governments since their prime task is to provide public goods and services to the local population in accordance with the preferences of this population and with the financing burden borne by them.

From Musgrave's general principles, the preferred assignment of expenditure responsibilities have been developed in the public finance literature. That is, sub-national governments should be responsible for the delivery of public services that have a direct linkage with communities served by sub-national governments and the national government for expenditures clearly national in nature, such as defence, foreign affairs, international trade, immigration, etc. For stabilisation purposes, the central government should assume responsibility for the central bank and the currency. For the lower levels of government, there is a lack of a clearly defined and communicated policy. However, following the principle of benefit areas, local governments should provide services, the benefits of which accrue to the local population which should bear the major part of the economic burden associated with the provision of the service (Shah, 1991; Bird and Wallich, 1993).

It can be concluded from the above that a given service should be provided by the level of government that most closely represents the region that benefits from such a service on the one hand. On the other hand national public goods such as national defence, macroeconomic stability and redistribution, require centralized administration and centralized policy.

According to Ahmad, Hewitt and Ruggiero (1997), most goods that governments supply do not fit neatly into either of these two categories. For these mixed goods some degree of decentralization coupled with some centralized co-ordination of policy is both feasible and desirable, owing to unclear benefit regions, externalities, economies of scale, or national redistributive implications. For instance, there are certain efficiency advantages to local supply

of primary education and preventive health care, such as possibly better quality through local supervision, and allowance for communities to express cultural and curative preferences. For tertiary education and hospitals, existence of economies of scale and externalities imply that more centralized control may be warranted. This, however, points to the demand for minimum standards that often require centralized decision making and control.

Ahmad, Hewitt and Ruggiero (1997) also point out that, the control of overall expenditure levels is important in a successful macroeconomic strategy. This control is not contingent upon the actual administration of expenditure functions by the central government, but rather on the adoption within a system of intergovernmental fiscal relations, of financing mechanisms that provide appropriate incentives for control. It is also the case that decentralized administrations with poorly defined policy goals and lax financing mechanisms invariably leads to a loss of macroeconomic control.

The question of how to design an efficient financing system, including the issue of the system of taxation has been widely discussed in literature. (McLure, 1993; Broadway, Roberts and Shah, 1994a: 1994b). Consensus seems to suggest that the design of the tax systems required to streamline revenue mobilisation will need to take account of the revenue needs of the lower levels of government. This will naturally put constraints on the types of tax systems that are both feasible and desirable. The important issues that arises include:

- * major economic principles and practical guidelines for tax assignment; and
- * tax types to be assigned to Provincial and Local Governments.

In dealing with the issues raised above, the experiences of countries where federal fiscal arrangements have evolved over a long period of time is very important. Although the practices in these countries differ because of the different institutional, political, and geographical circumstances, there are a number of economic principles of taxation in a federal setting that have

been developed and which can be applied to any federal fiscal economy. Their implications for any given country, however, will depend upon the features of the economy of the country concerned, such as the extent of decentralization of functions, the degree of heterogeneity of the population, and the extent of government intervention in the economy (McLure, 1993; Broadway, Roberts and Shah, 1994a; 1994b).

According to Broadway, Roberts and Shah (1994a: 1994b), Bird and Wallich (1993), the assignment of taxes by jurisdiction depends partly on the mix of various taxes used in the country overall. In Public Finance theory, the issue of an ideal tax mix has not been widely developed. Governments almost universally employ balanced tax systems, which have the feature that different taxes apply to basically the same bases. For example, general sales taxes, payroll taxes, and income taxes have bases that overlap considerably. From the point of view of efficiency and equity, one should be able to make do with a single general tax base, yet no government behaves this way. The usual reason given for this behaviour is that administrative considerations play an important role. A mix of taxes enables the rate on any one tax to be kept low, thereby reducing the incentive to evade or avoid the tax. In addition, by using a mix of taxes, taxpayers who would otherwise be able to avoid taxation of one type are caught in the net of another, making the tax system fairer. The importance of the various taxes in the overall mix remains, however, a matter of judgement rather than something that can be deduced from the principles.

The arguments advanced above also apply in the case of tax assignment to sub-national governments. Efficiency and equity arguments have to be tempered by administrative considerations, and the exact assignment depends upon informed judgement. Four major economic principles, however, come into play in deciding which taxes to assign to lower levels of government. These include efficiency in the internal common market, national equity, fiscal need and administrative costs (costs of compliance and collection). The internal common market will

be functioning efficiently if all resources, i.e., labour, capital, goods and service are free to move from one region to the other without impediments or distortions imposed by policy. Decentralized tax systems can interfere with the efficiency of the domestic market. For instance, uncoordinated setting of taxes is likely to lead to distortions in markets for resources which are tradable goods. This problem can be lessened if sub-national governments recognize that resources are mobile. However, if they do recognize this, they may engage in socially wasteful beggar-thy-neighbour policies. This may lead to inefficiently low taxes and high subsidies if all jurisdictions engage in such policies (Bird and Wallich, 1993).

The arguments for making equity a federal objective is that all persons ought to enter into society's 'social welfare function' on an equal basis, and presumably that the central government is a level that can ensure that residents in different jurisdictions are treated equitably. To the extent that equity is viewed as a national objective, decentralized taxes can interfere with the achievement of those objectives (Shah, 1991).

To ensure accountability, revenue means should be matched as closely as possible to revenue needs. Thus tax instruments intended to further specific policy objectives should be assigned to the level of government having the responsibility for such a service. In this sense progressive redistributive taxes, stabilization instruments, and resource rent taxes would be suitably assigned to sub-national governments (Kusi and McGrath, 1994).

The decentralization of revenue raising can also serve to increase the costs of collection and compliance, both for the public sector and the private sector. There are fixed costs associated with the collection of any tax, which will have to be borne for each tax type that is used by the sub-national governments. Taxpayers will also have to incur costs of compliance for all taxes levied. The possibilities for evasion and avoidance will increase with decentralization for some types of taxes. This will be true where the tax base is mobile or where the tax base straddles more

than one jurisdiction.

Tax harmonization and co-ordination are important objectives for tax policy. They contribute to the efficiency of the internal common market, reduce collection and compliance costs and help to achieve national standards of equity. Tax harmonization may be horizontal as well as vertical. In the case of tax bases jointly occupied by the national government and sub-national governments, harmonization can be achieved without sacrificing sub-national fiscal responsibility by having a single centralized collection procedure combined with the ability of the sub-national governments to decide on their own rate structures. They may also be required to abide by the national rate structure and only be allowed to choose their own rate levels and possible schedules of credits. Fiscal responsibility requires that at least sub-national governments are able to set their own rate levels.

2.4 Intergovernmental Transfers

Central-provincial fiscal relations consist primarily of a set of financial transfers from the federal government to the states and a set of arrangements for co-ordinating and sharing particular bases. There may also be interactions among governments through regulations. In principle, the two levels of government could be financially independent and separate. However, typically this is not the case. The federal government will collect more tax revenues than it needs for its own purposes and transfer some of them to the states either as grants or by an explicit sharing of tax revenues. This outcome reflects the fact that, while it may be efficient to decentralize expenditure responsibilities to a considerable extent, it is more efficient to centralize tax collections (Ehdaie, 1994). Moreover, in a decentralized federation, there is a need for federal-state transfers in order to allow the federal government to fulfill its national efficiency and equity objectives (Shah, 1991).

Grants from the federal government to the states may have a variety of properties. They

may be conditional or unconditional. A conditional grant is offered to be spent for a particular purpose. The conditions may be general, in the sense of being related to spending in broad areas, or they may be specific and require a provincial expenditure programme to satisfy certain design features (e.g., a particular highway).

According to Broadway, Roberts and Shah (1994b), the use of conditional grants constitutes one of the main ways in which the federal government can influence the states to exercise their expenditure responsibilities in a way which is consistent with national efficiency and equity objectives. The full amount of funds transferred for a particular purpose may be contingent on sub-national expenditures fulfilling certain conditions laid down by the federal government. The conditions may be quite general and indeed should be as unconstraining as is possible, consistent with the objectives being addressed.

While the magnitude of conditional grants is related to expenditures of a given sort by each recipient state or sub-national government, unconditional grants can be determined by a variety of factors. Two sorts of factors are relevant:

- * those determining the allocation of grants across states or sub-national government, and
- those determining their growth rate over time

The simplest allocation formula is an equal per capita grant, in which case population is the sole determinant. Other factors commonly used include average incomes, tax capacity (i.e., the size of particular tax bases), tax effort, urbanization, age structure of the population, and measures of the cost of providing particular state public services or rate of growth of GDP, the rate of growth of provincial expenditures of particular sorts, or other such indices of growth (Shah, 1991; Ehdaie, 1994; FFC, 1995).

Revenue sharing mechanisms are frequently used to address fiscal imbalances or a mismatch of revenue means and expenditure needs arising from the assignment of taxes and

expenditures to different levels of government. Tax sharing formulas can take a variety of forms. They can be highly centralized with the federal government determining the base and rate structure for particular tax source, collecting the tax, and turning over to the state in accordance with the state in which the tax was collected (the derivation principle) or other formulas similar to those outlined for unconditional grants (Ehdaie, 1994).

Decisions concerning the tax structure of jointly occupied tax bases can be decentralized in a variety of ways. The tax base determination can rest with the federal government and states can levy supplementary (piggyback) rates on the same base. The states could also be allowed to choose a rate of tax to apply to federal taxes payable, with the federal government retaining the rights to set the rate structure and base to administer the tax. Or the states may accept the base used by federal government and set its own rate structure, including both tax credits and tax brackets. The states may participate in the administration of the tax jointly with the federal government, especially the auditing of state taxpayers. At the extreme, the states and federal government may act independently to set their own tax structures and collect their own taxes for the same tax. Thus, the spectrum can go from fully harmonised joint taxes to completely unharmonised taxes.(Oates, 1969).

2.5 Summary

Three important issues emanate from the discussion in this chapter. First, it is apparent that fiscal decentralization can take varying forms. These would range from assigning exclusive jurisdictions for a given function to a given level of government to situations of co-occupied jurisdictions in which one level of government is able to influence the decisions taken by another in varying degrees through mechanisms such as regulation, the power to override decisions or financial intervention. To some extent, the amount of decentralization on the expenditure side can be

determined independently of that on the tax side. It is also clear that the general trend is that of decentralizing expenditure simultaneously with revenue decentralization.

Second the rationale for decentralization is that at an empirical level, it appears that the quality of governance may be enhanced by greater decentralization.

Third, that a given service should be provided by the level of government that most closely represents the region that benefits from such a service and that national public goods such as national defence, macroeconomic stability and redistribution, require centralized administration and centralized policy. Also to ensure accountability revenue means should be matched as closely as possible to revenue needs. Thus tax instruments intended to further specific policy objectives should be assigned to the level of government having the responsibility for such a service.

Chapter 3

Fiscal Federalism: International Experience

3.1 The Structure of Government

In this section we review the structure of the federal system of government in Australia, Canada, Germany and Brazil. These countries were selected because of their federal nature and they are in different stages of development. The Australian federation comprises of the Commonwealth Government plus six state governments and two mainland self-governing territories. Over and above this are 900 local government bodies (Table 3.1). The Constitution gives no formal recognition to the role of local government, and this level falls under the state legislative control.

The Constitution underpinning the Australian federation defines relatively few exclusive powers, such as the levying of customs and excise duty, for the central government. The Constitution also prescribes a number of powers that the Commonwealth can exercise concurrently with the states and in which its laws would prevail in the event of a conflict. These powers include defence, foreign affairs, taxation, social welfare benefits and pensions, post and communications, currency and banking, and insurance. Section 96 of the Australian Constitution gives the Commonwealth parliament the power to make grants on terms and conditions as it sees fit.

This is the power that the Commonwealth has used to influence expenditure patterns of sub-national governments, administrative priorities and macroeconomic stabilization policy. The six member states retain for themselves residual and exclusive legislative responsibility for a number of service areas, including law and order, education, health, housing and urban

Table 3.1 STRUCTURE OF GOVERNMENT

COUNTRY	COMPOSITION OF GOVERNMENT
AUSTRALIA	Commonwealth (Central Government) Plus Six Original Colonial State Governments; 900 Local Government Bodies That Have No Formal Constitutional Role.
CANADA	Federal Government, 10 Provinces, 2 Territories And Nearly 5 000 Local Governments
GERMANY	Federal Government, 16 Lander (States) And A Local Government Which Is Not Significant
BRAZIL	The Union, 26 States And About 5 000 Municipalities Of Varying Sizes (Important Level In This Country)

Source: Compiled from Huter and Shah, (1998)

development, road and rail transport, gas and water and the provision of electricity. In addition to these, the national and sub-national governments operate public enterprises, (Craig, 1997).

The Brazilian federation comprises of three levels of government, namely the Union, 26 states, plus the Federal District and about 5 000 municipalities of wide ranging sizes (Table 3.1).

The Canadian federation is made up of the federal government and 10 Provinces, 2 territories as well as 5 000 local authorities (Table 3.1). The Canadian federal government is given responsibility for the national public debt and property, regulation of trade and commerce, defense, money and banking, criminal law, raising of money by any type of taxation, and the authority to legislate in any areas not explicitly allocated to the provinces. (Broadway and Hobson, 1993). The British North America Act of 1867 give provincial legislatures the exclusive right to make laws within the province in areas that are generally local or private in nature, such as property and civil rights, public institutions, education, the management and sale of public lands, and the administration of justice. Provincial government activities can be financed through the

provincial right to use direct taxation. Provincial activities can also be financed by the “spending power” of the federal government. This power allows the federal government to make expenditures usually through transfers for functions under provincial jurisdictions. Local governments receive their powers and responsibilities from the provincial legislatures and all provinces have devolved to local governments the responsibility for primary and secondary education and welfare.

Bird (1990) points out that, public sector financing in Canada is unique because it is one of the most decentralized federations with respect to federal-provincial arrangements and one of the most centralized with respect to provincial-municipal arrangements. Similar to the Australian system, the Canadian model recognizes the federal and provincial levels of government. According to Leslie (1993), the Canadian Constitution Act of 1982 reaffirms that the federal government is responsible for equalizing the ability of provincial governments to provide comparable levels of public services at comparable levels of taxation.

The intergovernmental arrangements in Germany have many features that characterize unitary states – a strong central government with an extensive area of influence, uniformity in legislation on almost all important issues, and a uniform tax system. The Federal Republic of Germany consists of the Federal Government, 16 Lander and a local government sector that is not very significant in the functioning of the federation. The German Constitution places emphasis on uniformity of living conditions for the whole nation rather than on minimum standards.

Another important characteristic of the German federalism is the strong co-ordination of policies among different layers of government. At the central level, emphasis is laid on legislative functions, allocation of financial resources and the formulation of policy guidelines. States and local governments are generally in charge of implementation and administering policies. Lower levels of government often execute policies on behalf of the higher levels of government, where

financing is sometimes tied to the functions performed, with corresponding grants or cost restitution. A federal legislation also requires that some functions be financed by the lower tiers from their own resources without compensation. States bear the responsibilities for administration including tax administration.

The German financial arrangements are such that the horizontal distribution of functions is matched by the prevalence of revenue sharing. All major income taxes and corporate income taxes and the value-added tax accrue to federal and state governments jointly. Legislation on taxes is uniform and centralised (Spahn and Föttinger, 1997).

3.2 Assignment of Responsibilities

3.2.1. Expenditure assignment

In Australia, a little above 50% of the total public sector spending is the responsibility of the Commonwealth government (Craig, 1997). The bulk of the remaining expenditure is incurred at the state level. Social welfare and health spending take the largest share of the Commonwealth spending. Defence is another important component of the Commonwealth budget. The total share of spending for the Commonwealth has been on the decline relative to GDP over the last decade as a result of large grants that are made to sub-national governments for education, health services, housing and social security.

State government expenditures are closely aligned with the residual constitutional powers of this level of government. These are expenditures on education, health services, housing and community amenities, law, order, public safety, transport and communications, and social services. Local government functions include the provision of transport services, recreational and cultural facilities, housing and community services such as local roads and parks (Craig, 1997).

The 1988 Constitution of Brazil assigns relatively few functions exclusively to each level of government. It reserves to the federal level its traditional functions, notably defence, foreign affairs, control of the money supply and of the financial system, and the exploitation of certain monopolies that are currently in the process of being dismantled. A large portion of the federal share of expenditure is towards social security and social assistance, general administration, and interest on the public debt. State spending is concentrated on general administration, education, social assistance and health. Municipal spending focuses on general administration, housing and urban services, primary education, health and local public transport.

Table 3.2 EXPENDITURE ASSIGNMENT

	EDUCATION	DEFENCE	FOREIGN AFFAIRS	HEALTH	MAC.ECON. MAN.	WELFARE
AUSTRALIA Responsibility Provider	F,S F,S	F F	F F	F,S F,S	F F	F,S F,S
CANADA Responsibility Provider	F,S,L F,S,L	F F	F F	F,S,L F,S,L	F F	F,S,L F,S,L
GERMANY Responsibility Provider	S S,L	F F	F F	S S,L	F F	S S,L
BRAZIL Responsibility Provider	F F,S,L	F F	F F	F,S F,S,L	F F	F,S

Source: Compiled from Hutter and Shah, 1998

F = Federal S = State L = Local

The Constitution reserves to the state and municipal levels, the provision of police and other security services as well as a few other services in their respective geographical areas. For the vast part of the public expenditure, the Constitution envisages concurrent responsibilities to be

further specified by federal law. This law, however, has not yet been proposed. This lack of clarity in assignment of spending responsibilities has contributed to duplication and waste of resources in the provision of goods and services. For instance, the federal government continues to be actively involved in the provision of basic education, which, in principle, should be carried out by the local level of government with financial support from the higher levels of government. This is done to ensure minimum standards in service provision nationwide.

Notwithstanding the lack of clarity in spending assignment, in practice, there has been a clear trend toward a decentralization of public expenditure. This trend has been a response to the stress on the federal budget. Over the years, there has been a decline in the federal share of public expenditure, as a result of the unplanned and involuntary decentralization of spending (Ter Minassian, 1997).

The federal government of Canada is responsible for services with national scope, such as defense, international affairs, social services, debt charges, industrial policy and research. The federal government has over time taken for itself functions that were traditionally provincial functions, such as the social safety net. The social safety net consists of payments made directly to individuals and payments made from one level of government to another to support social safety net activities. A large proportion of transfers to individuals include assistance for the unemployed, family allowances, a universal old age pension, and national health insurance. The federal government also makes transfers to provinces to fund programs in post-secondary education, health care and welfare.

The provincial and local governments in Canada have major responsibility for spending on goods and services that are local in nature, such as public education, health care, and municipal services. However, the federal government does have concurrent spending powers for provincial functions which it exercises in the form of transfer payments (Krelove, Stotsky and Vehorn,

1997).

The German Constitution assigns defense, foreign affairs, citizenship, immigration and emigration, international treaties, currency matters, federal transport, and postal and telecommunication services to the federal government. The states are responsible for remaining areas such as culture, education, law and order, environmental and health policies as well as regional economic policy. The Municipalities have a responsibility for communal services, such as local health facilities, sports and recreation, school building, housing, and road construction.

Owing to the high degree of horizontal integration of functions the division of responsibilities in the German federation is not reflected in the distribution of public expenditures across all levels of government. As mentioned earlier, lower levels of governments receive specific mandates and earmarked resources for the delivery of those responsibilities that are commissioned by the higher levels of government (Spahn and Föttinger, 1997).

3.2.2. Revenue Assignment

The major sources of revenue of the Australian Commonwealth flows from four major tax revenues. These are personal income tax, customs and excise duties, company income tax and sales tax. Almost 90% of the Commonwealth revenue comes from taxation, 60% of which is made up of company and personal income taxes and 23% from taxes on goods and services (sales tax). The state governments receive about 40% of grants and advances from the Commonwealth revenue. A further 40% of revenue for the state sector comes from a diversity of taxes such as payroll tax, property taxes as well as taxes and fees on motor vehicles, gambling and insurance. The tax bases are similar in every state, but tax rates and base definitions vary substantially from one state to another.

The taxation systems of the Commonwealth, state and local governments in Australia are administered by separate entities. The Australian Taxation Office administers all the major taxes imposed by the Commonwealth government. The state and local governments maintain smaller agencies to administer their taxes and fees (Craig, 1997).

The Brazilian federal government is assigned the responsibility for personal income tax, the corporate income tax, a selective value-added-tax (essentially an excise tax), a tax on rural property, various types of social security contributions levied on payroll or turnover of enterprises, taxes on foreign trade and certain taxes on financial operations.

Apart from their share of the federal revenue from personal income tax, selective value-added-tax, corporate tax and rural property tax, states are assigned a broad based value added tax (VAT), a tax on motor vehicles and estate and gift taxes. In addition to their 50 percent share of the federally collected revenue, municipalities are assigned a tax on urban real estate property.

The distribution of revenue across levels of government and by type of tax has undergone significant changes in recent years, with the share of the federal government (before revenue sharing) in total tax revenues declining by about 5.5 percentage points between 1988 and 1995 to around 62 percent. Currently various forms of social security contributions account for about 55 percent of own revenues of the federal government, the ICMS (or VAT) accounts for nearly 93 percent of states' revenues and taxes on services (or ISS) provides nearly half of those of municipalities (Ter Minassian, 1997).

In Canada the major sources of revenue are personal income tax, corporate tax and the goods and services tax (VAT) which are collected at the federal level. The personal income tax and the corporate tax are remitted in part to provinces. The provinces collect retail sales tax and the resource tax, while the local level of government collects property tax (Craig, 1997).

TABLE; 3.3 REVENUE ASSIGNMENT

TYPE OF TAX	AUSTRALIA	CANADA	GERMANY	BRAZIL
PERSONAL INCOME TAX				
Base Definition	F	F	F	F
Administration	F	F	F	F
CORPORATE TAX				
Base Definition	F	F	F	F
Administration	F	F	F	F
CUSTOMS				
Base Definition	F,S	F	F	F
Administration	F,S	F	F	F
MULTI-STAGE SALES TAX (VAT)				
Base Definition	N/A	F,S	F	F,S,L
Administration	N/A	F,S	F	F,S,L
EXCISES ON ALCOHOL & TOBACCO				
Base Definition	S	F	F	N/A
Administration	S	F	F	N/A
BETTING, GAMBLING, LOTTERIES				
Base Definition	S	F,S	N/A	N/A
Administration	S	F	N/A	N/A
MOTOR VEHICLE FEES				
Base Definition	L	F,S	F,S	S
Administration	L	F	F	S
PROPERTY				
Base Definition	N/A	S,L	F,L	L
Administration	N/A	S,L	F	L

SOURCE: Huter and Shah, 1998

F=Federal S=State L=Local

In Germany, the power to legislate specific taxes is totally distinct from the right of each layer of government to appropriate the proceeds from these taxes. Although tax legislation is fully centralized, all of the important revenue sources are shared in Germany. The wage and assessed income taxes, corporate tax and VAT, which yield almost three quarters of total tax revenue or 71 percent of total taxes are all jointly appropriated. In addition, local business tax is shared by all levels of government, and a part of the revenue from the federal mineral oil tax is granted to the state governments in order to subsidize their regional public transportation.

Tax assignment to specific levels of governments in Germany is determined by the Constitution. Major revisions of federal financial arrangements can be made only through an

amendment to the Constitution which requires a two-third majority in both houses of the federal parliament. The significance of taxes directly assigned to each layer of government is small. The main federal taxes are excises, the most important of which are those on mineral oil, tobacco, and alcohol. These constitute roughly 17 percent of total taxes. The federal government also has the right to levy a surcharge on income taxes. From its share of the VAT, the federal government has to finance Germany's contribution to the budget of the European Union. The main state taxes are the motor vehicle tax and wealth tax. These account for 5 percent of total taxes. Municipalities levy local business tax, property taxes as well as communal levies on public utilities, while local governments collect about 7 percent of all taxes (Spahn and Fottinger, 1997).

3.3 Borrowing

Borrowing in Australia is co-ordinated by the Loan Council, which was given formal status in legislation passed by the Commonwealth and the states from 1927 to 1929. It was finally sanctioned by the Constitution after a referendum of 1928. The Council comprises one representative of the Commonwealth, the Prime Minister or a nominee and one representative of each state and the State Premier or a nominee.

Since the 1992/93 financial year, the Loan Council has introduced transparent macroeconomic controls over the operation of the public sector. The requirement is that each state and the Commonwealth present to the Loan Council its net financing requirements for the coming financial year. These proposals are considered by the Loan Council taking into account the fiscal position and reasonable infrastructure needs of each jurisdiction as well as the macroeconomic implications of the Loan Council allocations (Craig, 1997).

Since the 1960s, state borrowing in Brazil has primarily been used to finance public infrastructure. The loans are mainly financed by federal institutions that channel to state utilities

and other enterprises funds collected through a variety of forced savings schemes. In the 1970s, the federal and state governments resorted to external borrowing as a result of the dwindling of resources from the state owned institutions. A number of states, however, defaulted on the internal and external debt as a result of the economic recession. This led to the intervention by the federal government. As a result, some of the state's debt were rescheduled and taken over by the federal Treasury. The seriousness of the state debt led to a tightening of the controls on new state borrowing. Central bank regulations now prohibit a state from borrowing from its own banks. This prohibition does not, however, extend to borrowing from other state banks (Ter Minassian, 1997).

The Canadian federal government can borrow funds for current and capital purposes with no formal constitutional restrictions. Provincial governments can also borrow funds for current and capital purposes with no formal constitutional or federal government restrictions. Also, provincial governments are not required to balance their current budgets annually, as is typical in other federations. Both federal and provincial governments are, however, subjected to some market discipline through private ratings done by international investment firms.

The federal government has several sources of borrowing, such as the bond markets, marketable bonds, treasury bills and other debt liabilities. Provincial governments have two major sources of borrowing, namely the bond market and the Canada Pension Plan. The Canada Pension Plan uses its surplus above the current needs to purchase preferentially rated securities from the provinces (Krelove, Stotsky and Vehorn, 1997).

In Germany direct government borrowing from the central bank is prohibited, as is privileged access of public authorities to financing institutions. The Constitution restricts borrowing to the amount of projected outlays for investment purposes in the budget. Similar provisions apply to state budgets in accordance with state constitutions or legislation. Local

government borrowing is tied to their cash flow and is subject to state control (Spahn and Fottinger, 1997).

3.4 Macroeconomic Management

Whilst it is the primary responsibility of the Commonwealth level of government in Australia to do macroeconomic management, it is recognized that successful stabilization policy requires intergovernmental co-operation. Fiscal policy is influenced by the changes in the Commonwealth's own revenue and spending levels, the size of grants paid to sub-national governments, and changes in the access of sub-national governments to borrowing. However, state and local governments still maintain some degree of independence in budgetary decisions flowing from their own substantial sources of revenue. Correct predictions of the likely response of the sub-national governments to both economic development and the Commonwealth's own policies is important in assessing overall impact of public sector activity.

The stabilization efforts of the Commonwealth government since 1993 were less successful when compared with the fiscal position of the sub-national governments that were all running surpluses in 1996. The sub-national governments achieved these through deliberate reductions in spending, resulting from the significant reductions in numbers of public employees. The same period saw sub-national governments raising more revenue from taxes by tapping into new bases and raising taxes on existing tax bases (Craig, 1997).

Macroeconomic management in Brazil is vested in the federal level of government. Macroeconomic management in Brazil has experienced a profound change as a result of the changes in mechanisms for intergovernmental relations. Three interrelated problems have emerged concerning the conduct of fiscal policy: (1) the federal government has lost considerable

control over some fiscal policy instruments; (2) the effectiveness of the instruments under federal jurisdictions can be potentially undermined by fiscal behavior at lower levels of government; and (3) the federal government has come under a fiscal squeeze because decentralization of tax authority and transfer of revenues have not been accompanied in practice by a transfer of expenditure responsibilities (Ter Minassian, 1997).

As in other industrial nations, the federal budget has been used as a tool of macroeconomic management in the period following World War II in Canada. In recent decades, the rapid rise in government spending that is not matched by a similar increase in revenue has led to large structural deficits and a high debt burden. Also provincial governments are allowed to run their own budget deficits. This has created a heavier consolidated public debt burden and has also complicated the task of fiscal stabilization for the federal government. This is because, in principle, provinces can conduct their own fiscal management, in line with their own objectives, which may be incompatible with those of the federal government (Krelove, Stotsky and Vehorn, 1997).

3.5 Performance of Fiscal Decentralization

In Australia, the federal government is constitutionally required to follow regionally differentiated policies. Although finances are relatively centralized, with a large vertical imbalance favoring the central government, the need to take account of the reactions of state and local governments to Commonwealth policies adds to the difficulty of implementing stabilization policy. While the Commonwealth has the financial power to exert considerable influence on the behavior of sub-national governments, (see Table 3.4) recent efforts have been directed to achieving better cooperation and coordination of policy through effort to involve sub-national governments in the attainment of important national goals. Further, the powers and composition of the Loan Council in Australia assist in the improvement of cooperation within this two-tiered centralized federation.

The cooperation in the Australian federation is also strengthened by the existence of the Commonwealth Grants Commission (CGC) which is one of the distinguishing features of the federation. The CGC operates under terms of reference set by the Commonwealth after consultation with states and territories.

The CGC's investigations aim to determine relative needs according to the principle 'that each State should be given the capacity to provide the same standard of state-type service as the other states, if it makes the same effort to raise revenues from its own sources and conducts its affairs with the same operational level of efficiency' (Krelove, Stotsky and Vehorn, 1997).

As shown in Table 3.4, Canada has a two-tiered, highly decentralized system where spending and revenue-raising responsibilities are appropriately matched. The coordinate-authority model of the Canadian federation has a strong constitutional basis, a fairly strong state influence on federal policy makers. An important characteristic of the federation is that it has proven to be flexible and has allowed for the continued evolution of the system to accommodate new innovations and changes.

The Canadian system is also highly decentralized with respect to federal-provincial relations and is strongly redistributive. Intergovernmental grants are effectively used to equalize the ability to pay for public services and to correct spillovers. Fiscal equalization is a federal program of annual, unconditional payments to provinces which have a substandard capacity to derive revenues from taxation and therefore a substandard capacity to finance public services for their citizens.

Table 3.4 A Comparison of selected fiscal systems

	Tax Separation	Tax overlapping		Tax Sharing
	Australia	Canada	Germany	Brazil
State influence on federal policy makers	Fairly Strong	Strong	Strong	Strong
State government constitutional status	Strong	Fairly strong in law; very strong in fact	Strong	Strong
Actual state control of local government	Strong	Strong	Strong	Weak
Range of local government responsibilities	Limited	Fairly extensive	Limited	Extensive
Local government influence on state policymakers	Weak	Fairly strong	Weak	Strong
Local government influence on state policy	Weak	Fairly strong	Weak	Strong
Local government influence on federal policy	Weak	Weak	Weak	Strong
The character of fiscal federalism	Two-tiered; Centralised	Two-tiered; Decentralise	Two-tiered; Integrated	Three-tiered; Decentralised
Federal-state intergovernmental transfers	Important; Emphasis on conditional grants	Important; Emphasis on Unconditional grants	Unimportant; emphasis on tax sharing	Important
Federal/interstate equalisation performance	Very strong; Revenue and expenditure disparities reduced substantially	Strong; revenue disparities reduced substantially	Strong; revenue and some expenditure disparities reduced substantially	Weak
State tax performance	Fairly Weak	Strong	Fairly strong	Strong
Local Government fiscal independence	Fairly Strong	Fairly Strong	Weak	Weak
Equalisation formula	Federal-state explicit and complex	Federal-state fiscal equalisation	Explicit and complex	Implicit and piecemeal
State-local revenues more or less match responsibilities	No	Yes	Yes	Yes

Source: Shah 1997

The Canadian Parliament and the Government are committed to the principle of making equalization payments to ensure that provincial governments have sufficient revenues to provide

reasonably comparable levels of public services at reasonably comparable levels of taxation. According to (Kerlove, Stotsky and Vehorn, 1997), the Canadian “fiscal equalization program” has endured and is often referred to as the “glue that holds the federation together”.

The similarities of the Canadian and the Australian systems lie in the quest to match spending with the revenues generated in a particular jurisdiction. In the case of Canada, the responsibility for equalization is with the Government and Parliament whilst the CGC in Australia is entrusted with this function.

It can be concluded from the review above that fiscal federalism has proved to be effective in Canada and Australia. These systems present a good model for developing nations.

Whilst the emphasis is placed on the coordination of activities of distinct levels of government in Australia and Canada, the German system emphasizes, to a high degree, regional availability of public infrastructure and government services. Financing public services is mainly based on shared taxes and equalization arrangements stressing the uniformity of living conditions in the whole nation and on horizontal cooperation among layers of government (Table 3.4).

The German system of intergovernmental fiscal relations, however, has a number of flaws, such as the mismatch between revenue-raising and expenditure that reduce its efficiency and impinge on interregional equity. These flaws result from the strict interpretation of the uniformity of living conditions mandated by the Constitution. In spite of this negative element, the German fiscal federal relations have created a high degree of homogeneity regarding regional availability of public infrastructure and government services. According to Spahn and Föttinger (1997), this is the basis on which the German economy thrives. Financing public services is mainly based on shared taxes and equalization arrangements, stressing the uniformity of living conditions in the whole nation and on horizontal cooperation among layers of government. This has, however, not prevented regional authorities from exerting influential roles within the realm of their own

jurisdiction and at the level of the federation.

Unlike the German system, the Brazilian intergovernmental fiscal relations allow states and to a lesser extent the municipalities, substantial own revenue-raising powers (see Table 3.4). This should foster fiscal responsibility and political accountability for their budgetary policies. The current system of tax assignment is incompatible with the received wisdom in the literature as well as the prevailing international practice in this area. For instance, the co-existence of a broad-based state VAT with a more narrowly based multi-rate federal VAT is awkward and has given rise to distortions in the tax burden across sectors and localities.

The Constitution of Brazil also envisages concurrent responsibilities to be further specified by federal legislation, which at present has not been proposed. The lack of clarity in the assignment of spending responsibilities also contributes to duplication and waste of resources in the provision of goods and services. The effect of this is that the system of revenue sharing is based on rigid coefficients, for both vertical and horizontal distribution, which are not based on transparent criteria linked to tax capacities, tax efforts and expenditure needs.

3.6 Factors Influencing Decentralization

3.6.1 Diversity.

A federal system should provide scope for variety and differences in fiscal arrangements pertaining to different states and localities. Communities may differ in their preferences for public services and should therefore not be forced into a uniform pattern (Brown and Jackson, 1990). In order to provide for a diverse community, more decentralization is necessary. Otherwise, certain mechanisms must be in place to ensure that diverse needs are provided for in the case of a public product that is produced and delivered from a central level.

The Australian, Canadian and Brazilian systems tend to comply with the requirement that recognizes differing localities and differences in preferences of communities for public services. However, the extent to which these countries comply differs. Of the four foreign countries reviewed Brazil seems to go the farthest in terms of fiscal decentralization followed by Canada and then Australia. However, this is in a sharp contrast to the German federation, which places emphasis on uniform living conditions for its citizens.

3.6.2 Equivalence.

A good system of decentralization would appropriately match the service with the level that ensures optimum benefit to the users of that service. This brings about value for money and proper accountability. In the four countries reviewed, there is compliance with this principle, particularly on those public services that benefit the whole country and are efficiently provided at federal level. This includes for example defense, foreign affairs and macroeconomic management. There is, however, a wide range of differences among countries at state and local government level depending on the level of decentralization of a country.

3.6.3 Locational neutrality.

Decentralization is affected in this instance where a region has an ability to raise certain taxes which are similar to those raised at the national level, but the same does not apply to other regions. Should the more affluent regions be allowed to raise the said tax, they will be able to provide additional services therefore distorting the need to provide services equitably. Brazil is the only country amongst the four countries reviewed that does not comply with this principle. In Brazil, there is a coexistence of VAT at both state and federal government levels which has given

rise to distortions in the tax burden across sectors. Furthermore, the federal legislation required by the Brazilian Constitution to define spending assignments have not been proposed, this has led to duplication and waste of resources.

3.6.4 Centralized stabilization.

The use of fiscal instruments for purposes of macropolity (stabilization, growth) has to be at the national level. Local governments do not have the policy instruments to make stabilization policy on their own (Brown and Jackson, 1990).

Federal or central governments have a fundamental role in ensuring that minimum or uniform services are rendered to all citizens of a country. In a decentralized system, federal governments are best placed to utilise instruments available to them to provide for stabilization from a central level.

All the countries reviewed have complied with this principle and the issue of fiscal stabilization and economic growth has been approached in a similar way.

3.6.5 Correction for spill-overs

Benefit spill-overs between jurisdictions lead to inefficient expenditure decisions. This calls for correction by higher level government (Brown and Jackson, 1990).

In a decentralized system people have a choice in terms of where they reside sometime in pursuit of job opportunities or relative peace. The mobility of people and resources cannot be restricted at all times. This tends to lead to expenditure pressures on states or jurisdictions that people locate to, leading to the need for equalization grants.

In Brazil federal or interstate equalization is weak which is explained by the lack of

emphasis on intergovernmental transfers of any kind. Also once the expenditure assignment is purely defined, the Brazilian system will also show the need to tackle intergovernmental revenue-expenditure disparities. In Australia, interstate equalization is very strong and revenue-expenditure disparities have been substantially reduced. Canada and Germany are also strong on the interstate equalization.

3.6.6 Minimum provision of essential public services.

The national governments should assure their citizens that, no matter in which state or local area they reside, they will be provided with a minimum level of certain essential public services such as safety, health, welfare and education (Brown and Jackson, 1990).

In Germany, the emphasis is on uniform living conditions for every citizen which goes beyond the question of minimum norms and standards in the service provision. As shown in Table 3.2, Canada, Brazil and Australia also have, as a constitutional prescript, the provision of minimum standard in the provision of public services. It is also important that there are similarities in the provision of defense, education and welfare in all the countries reviewed.

3.6.7 Equalization of fiscal position.

While redistribution is primarily an inter-individual matter, the existence of sharp regional differences in the balance between fiscal capacity and need among local governments cannot be disregarded entirely. Some degree of fiscal equalization among local governments is called for so that minimum service levels can be secured with more or less comparable tax efforts (Brown and Jackson, 1990).

As a result of very strong federal and interstate equalization performance in Australia,

Canada and Germany, the revenue and expenditure disparities in these countries have been reduced substantially (Table 3.4). Canada has a strong tax collection in the states, while Germany is fairly strong and Australia fairly weak, which accounts for the strong Australian equalization programme.

These principles are very difficult to adhere to. Some of them conflict, and they might have economic costs associated with them. It is concluded that these factors are satisfied in the four countries reviewed. The Australian system with its supporting structures such as the CGC and the Loan Council seem to be leading the pack in the system of fiscal federalism. Australia is closely followed by the Canadian system which is in turn followed by the German system.

3.7 Summary

1. Although structured differently the countries reviewed tend to assign functions in a manner that is consistent with the public finance theory that functions that are distributive in nature and those that are meant to ensure the country's stability should be reserved exclusively as federal or national government competence.
2. Whereas the Australian, Canadian and Brazilian's tax decentralization show a number of significant taxes that are devolved to the lower levels of government, the German model represents a strong concentration the center. The discrepancy is compensated for by the use of equalization grants in the German model.

Chapter 4

Fiscal Federalism in South Africa

4.1 The Structure of Government

The South African Constitution, Act No. 108 of 1996, establishes national, provincial and local government as autonomous spheres that are distinctive, interdependent and interrelated. As can be seen in Table 4.1, there are nine provinces in South Africa and about 500 municipalities. There is a move to restructure the municipal level of government with a view to reducing their numbers and establishing mega cities for better control and coordination. The Constitution also identifies functional areas of concurrent and exclusive competence. In order to give effect to the requirements of the Constitution, budgetary procedures and other institutional arrangements have been put in place. The budget making process is the responsibility of all the three spheres of Government (DoF, 1998).

Provision is also made in the Constitution for the intervention of the national government through legislation with regard to matters falling within a functional area of another sphere of government. A number of Acts, such as the Financial Management Act of 1999 have been passed in this regard. These measures may only be necessary to maintain national security, economic unity and essential national norms and standards. Provision is also made to establish minimum standards required for the rendering of services, prevent a province to take action that may be prejudicial to the interests of another province or to the country as a whole. To this extent, the national government is mandated by the Constitution to perform fiscal stabilization and co-ordination functions for the country as a whole, (Government of South Africa, 1996).

In order to coordinate the activities of government with regard to the concurrent functions, there is a National Council of Provinces, that is the upper house of the national

assembly, that looks after the interests of provinces when legislation that will affect the functioning of provinces is discussed.

The Constitution provides for the establishment of the FFC. The FFC has been in existence since 1994. Unlike the Commonwealth Grants Commission in Australia, the South African FFC is not independent as envisaged in the Constitution. The FFC is an advisory body, appointed by the President of the country and accountable to Parliament. The FFC makes recommendations on financial and fiscal matters of the national and sub-national governments. There is also no clear mechanism of giving this advice to the law making bodies. The role of the FFC is therefore minimal in terms of its influence on the system of intergovernmental relations in the country. Nevertheless, the FFC has contributed significantly to the development of the intergovernmental system. The FFC's recommendations for the division of resources between the three spheres of government (revenue sharing) form the basis of the current system of revenue allocation. Most recently the FFC has made recommendations regarding the establishment of the local government equitable share.

Table 4.1 shows that decision making in the South African federation is relatively centralized, with a large vertical imbalance favouring the central government. As a consequence of this strength, the national government is in a position to influence the policies of the sub-national governments. A number of institutions such as the Budget Council and the Budget Forum have been created through legislation in order to support the intergovernmental cooperation in South Africa. The Budget Council consists of Provincial Ministers of Finance and the national minister, whilst the Budget Forum is an extension of the Budget Council by including the representatives of local government.

As in the case of the Loans Council in Australia, there is a Loans Coordinating Committee which is chaired by the Minister of Finance and has a membership of the provincial ministers of

Finance. This committee has not really done any significant work and its performance cannot be evaluated.

Co-operative governance between the spheres of government has also been given effect through the enactment of various pieces of legislation required by Chapter 13 and other sections of the Constitution. Chapter 13 of the Constitution provides for General Financial Matters and also defines the framework for the establishment of control institutions, powers and functions on financial matters. The Financial and Fiscal Commission (FFC) Act gives purpose to the requirements relating to the FFC under Section 220 of the Constitution. The Intergovernmental Fiscal Relations Act establishes a formal process for dealing with intergovernmental budgetary issues. The Act is designed to facilitate and regulate a process of consultation to achieve a budget making process that is fair. The Act gives effect to Section 214 of the Constitution by setting out the process to arrive at the equitable share of revenue raised nationally for the national, provincial and local spheres of government. This includes the equitable division of the provincial share of that revenue among provinces.

4.2 Assignment of Responsibilities

4.2.1 Expenditure Assignment

In South Africa, national government policies influence provincial and local government spending indirectly through co-operative agreements and legislation setting norms and standards. A large portion of the national government expenditure is allocated to the functions that are determined by the Constitution to be under the exclusive powers of the national government. These exclusive powers include the administration of justice, national security (which is vested in a single defence force), a single police service and intelligence services, tertiary education, national and

international airports, lotteries and sports pools, national parks and marine resources, and national public enterprises (Government of South Africa, 1996).

As can be seen in table 4.2 expenditure on the exclusive functions mentioned above totalled R72.30 billion in 1995/96. This expenditure increased to R83.70 billion in 1996/97 during which time some elements of the revenue sharing mechanism were introduced. Expenditure on the national exclusive functions, further increased by 6% in 1997/98 to R88.70 billion and by 2.8% in 1998/99 to R91.20 billion. The expenditure is projected to increase by 4.8% in 1999/2000 to R98.10 billion. (DoF Budget Review, 1998). As a share of the total consolidated general government expenditure, exclusive functions accounted for 46% in the 1995/96, increased to 47.20% in 1996/97 and 46.90% in 1997/98. In 1998/99 44.70% of the total consolidated general government expenditure was spent on exclusive functions. This expenditure is expected to increase to 45.27 in 1999/2000 and drop back to 44.8% in 2000/2001.

Table 4.1 South Africa: Intergovernmental System

Indicator	Characteristics							
I. Structure of Government	National Government, 9 Provinces and about 500 local authorities							
II. Expenditure Assignment	Education	Defence	Foreign Affairs	Health	Mac.Econ. Man	Welfare		
Responsibility	N,P	N	N	N,P,L	N	N,P,L		
Provider	N,P	N	N	N,P,L	N	N,P,L		
III. Revenue Assignment	Personal Income Tax	Corporate Tax	Customs	VAT	Excise	Betting & Gambling	Motor vehicle	Property
Base Definition	N	N	N	N	N	N,P	P	L
Administration	N	N	N	N	N	N,P	P	L

Source: Compiled from Shah 1997

N= National P= Provincial L= Local

in billions	95/96	96/97	97/98	98/99	99/2000	2000/01	
Exclusive National Functions							
Defence	11.6	11.8	10.7	11.0	11.6	12.3	
Justice	1.6	1.7	2.0	2.5	2.7	3.0	
Police	9.3	11.4	13.1	14.1	15.1	16.0	
Prisons	2.7	3.1	3.9	5.4	5.8	6.4	
Water scheme, related services	1.4	2.2	1.9	1.9	2.0	2.3	
Fuel and Energy	0.2	0.2	0.2	0.1	0.1	0.1	
Mining	0.2	0.3	0.3	0.3	0.3	0.3	
Manufacturing	0.8	1.0	1.1	0.6	0.6	0.6	
Regional development	0.9	0.7	0.9	0.7	0.7	0.7	
Other	3.3	3.2	2.8	2.6	3.2	3.8	
General admin, other	10.8	13.5	13.2	9	10.7	11.7	
Interest	29.5	34.6	38.6	43.0	45.3	48.1	
SUB-TOTAL	72.30	83.70	88.70	91.20	98.10	105.3	
	46%	47.20%	46.90%	44.70%	45.27%	44.80%	
Concurrent Functions							
Education	34.6	39.2	40.3	46.8	49.2	52.2	
Health	16.1	18.5	20.2	25.1	26.4	28.1	
Social Security & Welfare	15.2	16.4	18.4	19.8	20.7	22.2	
Housing	3.0	1.6	4.2	3.9	4.3	4.3	
Other	5.1	5.7	5.5	6.5	6.5	7.5	
Transport, Communication	7.3	7.7	7.3	6.5	7.0	7.7	
Agriculture, forestry, fishing	3.5	4.4	4.5	4.3	4.5	4.9	
SUB-TOTAL	84.80	93.50	100.40	112.90	118.60	129.70	
	54%	52.80%	53.10%	55.30%	54.73%	55.20%	
TOTAL	157.1	177.20	189.10	204.10	216.70	235.00	

Source: Department of Finance Budget Review 1998

Some 80% of provincial government expenditure is distributed between health, education and welfare. These expenditures are concurrent in terms of the constitutional prescriptions, but constitute a significant amount of work in provincial governments (Table 4.1). In 1995/96, expenditure on education for instance increased by 11.73%, in 1996/97 by 13.3%, in 1997/98 by 2.8% and by 16.1% in 1998/99 financial year. Thereafter projected growth in spending on education is around 5% per annum. Expenditure on health has also seen an increasing trend. Spending on health increased by 14.9% in 1996/97 and had a lesser increase in 1997/98 financial year to a significant increase of 24.3% in 1998/99. For 1999/2000, growth of around 5% is estimated. As a share of the consolidated government expenditure, spending on concurrent

functions accounted for 54% in 1995/96, 52.8% in 1996/97, rising to 53.1% in 1997/98, and 55.3% in 1998/99. It is projected that the share of spending on concurrent functions will represent 55.2% of the total consolidated government expenditure in 2000/2001.

Since the 1995/96 financial year, the concurrent functions have received an increasing share of the total consolidated government expenditure. Most of these are functions that underpin the reconstruction and development programme.

Provincial exclusive functions include provincial roads and traffic, provincial planning, provincial sport, recreation and amenities, cultural matters and liquor licenses. In relation to the total consolidated general government expenditure, expenditure on provincial exclusive functions is insignificant. Municipal expenditure is in respect of functions such as beaches and amusement facilities, municipal roads, municipal parks and recreation, traffic and parking, local amenities and general municipal services such as water provisioning and energy (Government of South Africa, 1996).

4.2.2 Revenue Assignment

The South African Constitution provides that each sphere of government is entitled to an equitable share of revenue raised nationally to enable it to provide basic services and perform the functions allocated to it. The equitable division of revenue takes into account the functions assigned to each sphere under the Constitution and the capacity of each government to pay for these functions through own receipts and revenues. These functions have been outlined in the previous section (Government of South Africa, 1996; and DoF, 1998).

The equitable share is an unconditional allocation to the national government, provinces and local governments. Provincial and local governments are fully responsible for these funds and are directly accountable for the expenditures out of them. In addition to their equitable share,

provinces and local governments may receive other allocations from the national share as conditional grants to finance specific expenditures that may be determined by national government, as directed by national norms or co-operative agreements (DoF, 1998).

Under the Intergovernmental Fiscal Relations Act of 1997, the budget process begins with the FFC making recommendations on the division of revenue 10 months before the start of the financial year. The Minister of Finance is then required to consult with provinces, local government and the FFC concerning the proposals of the FFC. The Act establishes a Budget Council and Budget Forum to facilitate consultation with provinces and local government. The Minister of Finance is also required to table a Division of Revenue Bill at the time of the Budget, specifying the allocations to each sphere of government and the conditions that may apply to any of the allocations. The 1998/99 budget was the first to be guided fully by the requirements of the Intergovernmental Fiscal Relations Act.

The taxation system in South Africa is managed by a single national entity known as the South African Revenue Services (SARS). SARS collects and administers all taxes on behalf of the national government, which are then shared by all spheres of government as prescribed by the Constitution.

The formula for the division of revenue between the national and provincial spheres of government has been developed by the FFC. The formula is given as:

$$\mathbf{P = S + m + T + I + B} \quad (4.1)$$

where

P = the total provincial allocation;

S = minimum national standards grant to enable provinces specifically to provide primary and secondary education and primary and district health care to their residents;

- m** = spillover grant to provide for the financing of those services which have interprovincial spillover effect;
- T** = fiscal capacity equalisation grant to ensure that provincial functions are financed from an equitable provincial taxing capacity and to encourage accountability and democratic institutions associated with the establishment of provincial legislatures;
- I** = institutional grant to provide funds for each province to finance the core of its legislature as required by the Constitution; and
- B** = basic grant to enable provinces to establish and maintain institutions necessary for the fulfilment of their constitutional obligations according to their constitutional obligations according to their own priorities (FFC, 1996).

Over and above the elements contained in the formula, the FFC proposes that *ad hoc* allocations (**ADHp**) can be made as conditional grants to provinces to cover contingencies. The FFC further recommended that provincial borrowings (**Borp**) and Provincial Own Source Revenue (**O**) be included in the formula for the calculation of the Provincial total revenue. The FFC also proposes the granting of a tax room in personal income tax system for provinces to ‘piggy-back’ on. The tax room is described as the reduction by the national government of its tax rate in order for provinces to levy a surcharge on the tax up to the maximum left by the national government. For the tax room to be implemented, it is required that a national law be enacted. In the interim, the FFC proposes that a transitionally assigned surcharge (**TAS**) be introduced to start the process of encouraging the collection of revenue through taxation by provinces. Taking all these elements into consideration, the complete formula is therefore as follows:

$$\mathbf{P} = \mathbf{S} + \mathbf{m} + \mathbf{T} + \mathbf{I} + \mathbf{B} + \mathbf{AdHp} + \mathbf{Borp} + \mathbf{TAS} + \mathbf{O} \quad (4.2)$$

Where the national share will be determined as:

$$\mathbf{G}' = \alpha \mathbf{R} + \mathbf{BorG} - \mathbf{AdHp} \quad (4.3)$$

In equation 4.3, \mathbf{G} represents the total national revenue after all adjustments have been made, and \mathbf{BorG} the total borrowing by the national government, and $\alpha \mathbf{R}$ represent the change in the nationally collected revenue (FFC, 1996).

The Constitution places limitations on the power of provincial and local governments to raise revenue. In terms of the Constitution, provinces' power to impose taxes, levies, duties and surcharges may not be exercised in a way that materially and unreasonably prejudices national economic policies, economic activities across provincial boundaries, or the national mobility of goods, services, capital and labour. Also, this power must be regulated by an Act of (national) parliament after consideration by and recommendation of the FFC (Constitution of the RSA, Act 108 of 1996). Provincial and local governments collect own source revenues that are not included in the revenue sharing and cannot be deducted from the equitable share.

4.3 Borrowing

The Constitution of South Africa provides that a province or a municipality may raise loans for capital and current expenditure in accordance with reasonable conditions determined by national legislation, but loans for current expenditure may be raised only when necessary for bridging purposes during a fiscal year. The said legislation may be enacted only after recommendations from the FFC have been considered. The Borrowing Powers of Provincial Governments Act was passed in 1996. Presently, the national government borrows through the issue of financial instruments that are sold both domestically and internationally. Provinces are not allowed to borrow except for the running of overdrafts on their current accounts that are held at various commercial banks. There is also an agreement that provinces will not exercise their power to

borrow until after the 1999/2000 financial year. The agreement for Provinces not to borrow in order to increase their capacity to deliver infrastructure will be reviewed on a year to year basis. Municipalities, however, are allowed to borrow for current expenditure as well as for infrastructure development. A number of municipalities are rated by outside agencies and that gives them a better standing to borrow within the country (Government of South Africa, 1996).

4.4 Macroeconomic Management

It is the primary function of the national government to perform the functions of macroeconomic management functions in South Africa. It is recognized that successful stabilization policy requires intergovernmental co-operation since fiscal policy is influenced by changes in the national revenue and spending levels, level of grants paid to sub-national governments, and access of sub-national governments to borrowing. Provinces, however, have not exercised the right to borrow as contained in the Borrowing Powers of Provincial Governments Act of 1997.

Whereas legislation allows provinces to borrow for bridging finance and for the financing of fixed assets, there is an agreement to the effect that no province be allowed to borrow up to the 1999/2000 financial year for a number of reasons. First, the macroeconomic framework of the country prescribes the maximum level of debt to GDP over the medium term. Given that subnational governments cannot borrow, the national government is using its borrowing powers as a stabilization tool and there is no intention to allow provinces room to borrow. Second, most provinces are not financially sound to satisfy lenders that they can meet their debt obligations. The capacity and experience of some provinces to manage debt is also in doubt given their bad record in the management of expenditure. Third, provincial borrowing may, in some circumstances, crowd out private sector borrowing which may be more economically beneficial to the country. Also, the magnitude of the debt of former homelands and self-governing territories

which was taken over by the national government after the integration undermines the provinces' case to borrow (DoF, 1998).

The constitution provides for minimum standards that should be financed through an equitable share of revenue raised nationally. Yet, the national government departments have not done anything to provide legislation prescribing minimum standards. This gap created by the lack of legislation has been filled by the existence of other cooperative arrangements that attempt to bring about some equity in the delivery of public services such as education, health and welfare.

4.5 Factors Influencing Decentralization

4.5.1 Diversity.

South African communities are very diverse, with at least eleven official languages and a variety of cultures and ethnic groups. As a historical fact, the majority of people within these communities tend to be located in the different provinces on the basis of their cultural and ethnic origins. For this reason the demands on the fiscus by these communities will always differ from province to province. The Eastern Cape Province, KwaZulu-Natal Province, the Northern Province and Mpumalanga for instance, are provinces that have a strong presence of indigenous African groupings such as Xhosas, the Zulus and the Tsongas respectively. These ethnic groups have a strong belief in their customs and traditions. For this reason these provinces have demands for services such as the House of Traditional Leaders, which is basically to ensure that the effects of democratic change in the country, does not undermine the fundamental beliefs of these ethnic groups as a people. It is the reasons of culture and habits that prompted the debate of a 'volkstaat' for the Afrikaaner people. This, it was argued will promote self-determination for this group of people.

4.5.2 Locational neutrality.

Taxes in South Africa are structured in a manner that does not encourage regional distortions. As a result the affluent provinces are theoretically not able to deliver services better than others. In practice, however, there are qualitative variances in the delivery of social services. For example, the per capita expenditure on social services such as education and health vary from province to province, with the affluent provinces able to maintain higher per capita expenditures.

The national government took a deliberate decision to reverse the inequities of the past and allow for access to services to people that were underserved. This decision has contributed to the failure to decentralize revenue and expenditure.

4.5.3 Centralized stabilization.

The use of fiscal instruments for purposes of stabilization and growth is a national government monopoly. Subnational governments do not have the policy instruments to make stabilization policy on their own. Provinces have to conduct their business in a manner that does not undermine the attempts and policies of the national government in promoting economic growth and ensuring stability. Subnational governments do not have the ability to undermine the national government policy priorities because the expenditure and debt targets are set in the macroeconomic framework by the national Minister of Finance. These targets in turn determine some 95% of the allocation to subnational governments. Further, subnational governments are not allowed to borrow nor to budget for a deficit, and should they overrun their budgets, the national government can intervene by imposing restrictions that are backed by constitutional priorities.

4.5.4 Correction for spill-overs

The mobility of people is on the increase in South Africa. The 1996 census has proved that the

Gauteng Province has had significant shift in population since the earlier census. This reflects the attraction of middle income earners to the Province in pursuit of better job opportunities, which has put some pressure on the Gauteng government's social spending, in particular on health spending. A similar trend is found in KwaZulu-Natal which shares borders with the Eastern Cape Province. The general perception in the Eastern Cape is that the quality of public goods is low. This has led to the situation where people walk across to the KwaZulu-Natal Province to enjoy services, such as primary health care and primary education which are perceived to be good quality and cheap. In some of the schools and clinics, 100% of the beneficiaries come from the Eastern Cape Province.

4.6 Summary

The major observations that came out of the discussions in this chapter include:

The Government of South Africa is structured as a multi-tier government with a strong central government that performs the functions of macroeconomic management and produces national products that would not be produced by other sub-national governments without perpetuating fiscal distortions.

Unlike other developed fiscally decentralized systems, South Africa has not meaningfully devolved both expenditure and revenue to sub-national governments. In order to promote good and effective governance it may be useful for South Africa to speed up the devolution of taxes to sub-national governments.

The borrowing regime of provincial governments has been suppressed by the national government in order to first stabilize the fiscal and financial management systems of the provincial governments.

Chapter 5

Fiscal Decentralization Hypothesis: Empirical Tests

5.1 The Fiscal Decentralization (Leviathan) Hypothesis

Following the argument that private monopoly in production leads to relatively high prices and profits, the public choice literature suggests that similar analysis of government structure may be useful in the modeling of public production. Drawing on this analogy, Brennan and Buchanan (1980) model government as “Leviathan”, i.e., a public entity which systematically seeks to exploit its citizenry through the maximization of tax revenue it extracts from the economy. From this perspective, they develop a fiscal constitution whose central purpose is to constrain “Leviathan” by limiting in various ways its access to tax and other fiscal instruments (Oates, 1985).

Brennan and Buchanan’s model is an extreme version of the “public choice model” of government, in which they consider a worst-case scenario of government unconstrained by the electoral process. They argue that the electoral process may not effectively constrain the actions of self-interested, utility-maximizing government agents to those actions that advance public goods. Rather, majority voting may be subject to exploitation by government agents. Through strategic determination of policy platforms or collusive behavior with competing government agents, government may be able to minimize the constraining influence of the electoral process. Furthermore, the actions of some government agents such as tenured bureaucrats may not be subject to the discipline of the political market place (Grossman, 1992).

According to Brennan and Buchanan, government’s ability to maximize revenue is limited only by the constitutional constraints placed upon its actions. They stress that fiscal decentralization is one such powerful constraint on Leviathan: competition among governments in the context of the inter-jurisdictional mobility of persons in pursuit of fiscal gains can offer partial

or possible complete substitutes for explicitly fiscal constraints on the taxing power. Such competition among governments in a federal system that places heavy reliance on local fiscal decisions will greatly limit the capacity of Leviathan to channel resources into the public sector (Oates, 1985). Thus the effectiveness of the decentralization constraint is greater the more mobile are voters and the greater the extent to which public goods are local in nature.

As a caveat to their hypothesis, Brennan and Buchanan argued that lower-level governments would try to circumvent the discipline of fiscal decentralization by colluding among themselves or with the central government. They noted that within a constitutionally designed federal structure, one would predict that there would be constant pressure by competitive lower-level governments to secure institutional re-arrangements that would moderate competitive pressures. Such institutional re-arrangements would probably be collusive agreements between the central and lower-level governments. Lower-level governments would cede to the central government taxing powers which the central government could then levy across all governments at a uniform, revenue-maximizing rate. The revenues would then be shared among governments, with the lower-level governments' share provided in the form of intergovernmental grants (Grossman, 1992).

Collusion concentrates the powers of taxation in the hands of the central government, expanding the range over which the central government can apply its monopoly power. The greater the range of economic activity taxed by the central government, the more potent its taxing powers are likely to be and the greater will be total public sector size. The potency of the central government's revenue-maximizing powers is likely to increase disproportionately with increases in the tax bases available to it.

The Leviathan hypothesis is thus motivated by the desire to successfully understand government behavior as well as to recommend effective means of controlling its behavior. Among

other suggestions, Brennan and Buchanan offer the private monopoly corollary that competition among different fiscal units is an effective means of controlling the aggregate size of Leviathan. Hence, the resulting decentralization hypothesis that total government intrusion into the economy should be smaller, *ceteris paribus*, the greater the extent to which taxes and expenditures are decentralized.

5.2 Empirical Tests of the Decentralization (Leviathan) Hypothesis

While the Leviathan hypothesis has been the source of lively debate and a wide range of policy proposals, it has not been the subject of much systematic empirical work or testing. Recent empirical studies on this issue have examined the effects of intergovernmental competition on aggregate government size. In what follows, we review three of such studies, *i.e.*, Oates (1985), Grossman (1989; 1992), and Joulfaian and Marlow (1990). These studies have been selected based on the analytical framework employed and relevance of the findings to the present study.

Oates (1985) examines one of the testable implications of the decentralization hypothesis namely, "other things being equal, the size of the public sector should vary inversely with the extent of fiscal decentralization".

Brennan and Buchanan (1980) see a decentralized public sector as a mechanism for limiting the growth or size of government. Oates argues that the opposite could also be true, *i.e.*, increased decentralization could lead to an increase in the size of government. His argument runs as follows. Suppose that instead of a monopolistic setting, competition among political parties produces an outcome that conforms fairly closely to the tastes of the citizenry - as under the conventional median-voter model. In such a competitive political environment, one would have no reason to expect a negative association between the size of public budgets and the degree of fiscal decentralization. In a centralized setting, the outcome would conform to the preferences of the

overall median voter. If, in contrast, levels of output were set independently in each jurisdiction, the median voter in each locality would effectively choose the budget. It is impossible therefore to determine whether the average level of output in the decentralized case would exceed or fall short of output under centralised decision making without knowing both the distribution of tastes and the location of the populace.

According to Oates, one might argue for the competitive case that, from a purely budgetary perspective, increased fiscal decentralization would typically result in a higher level of government expenditure. Greater decentralization may result in the loss of certain economies of scale with a consequent increase in costs of administration. That is, fiscal decentralization may be relatively expensive in budgetary terms. Thus, a more competitive view of the functioning of the public sector would suggest, contrary to the Leviathan model, an absence of a positive association between government size and fiscal centralization with the possibility that this association might even be negative.

Using data on public finances dis-aggregated by level of government, Oates examines the influence of fiscal decentralization on the behavior of government in 43 countries. He also explores the association between the budgetary size of state and local governments and the degree of decentralization of state-local "fisc" in each of the 48 states and local governments in the United States.

As a measure of the size of the public sector in the United States case, Oates uses aggregate state-local tax receipts in each state as a fraction of personal income (G). For the extent of state-local decentralization, Oates uses three proxy measures. These include two fiscal centralization ratios - state share of state-local general revenues (R) and the state share of state-local total expenditure (E) and one non-fiscal measure of decentralization: the absolute number of local government units in the state (L). Oates uses this third measure because in Brennan and

Buchanan's observation, the potential for fiscal exploitation varies inversely with the number of competing governmental units in the inclusive territory. The results of Oates analysis of the 48 states in the United States which are relevant to the present study are summarized in Tables 5.1-5.3.

The results summarized in Table 5.1 show a considerable diversity in both the size of government (G) and extent of fiscal concentration (R and E). In the case of the size of government, the ratio varies from a high of 0.18 to a low of 0.10, with a mean of 0.12 across states. For the centralization ratio across states, the figure varies from a maximum of 0.78 to a minimum of 0.43 with a mean value of 0.58 on the revenue side, and from 0.59 to 0.22 and a mean of 0.43 on the expenditure side. Likewise, the number of local governments varies from 6,620 in one state to only 120 in another state.

The results of Oates rank correlation analysis summarized in Table 5.2 show a negative correlation between the size of government (G) and each of the fiscal centralization ratio (R and E), indicating that a more centralized state-local sector tends to be associated with a smaller state-local sector. Although the negative correlations established between G and each of R and E run counter to the prediction of the Leviathan hypothesis, the degree of association is not sufficiently strong in either case to reject the null hypothesis of no correlation. In contrast, the correlation between G and the number of local governments (L), is negative, supporting the Leviathan hypothesis, but here again the relationship is very weak. In general, Oates simple rank correlations analysis does not produce a conclusive result.

In an attempt to control for other variables that influence the size of the public sector, Oates undertook a number of regression analysis. In the absence of a fully specified model of the economy he resorted to a series of ad hoc reduced-form equations using explanatory variables that other studies have found to be of significance in explaining the size of the government sector.

Table 5.3 summarizes the results of the regression analysis. The results of the first three simple regressions are roughly consistent with that of the rank correlation analysis. That is, they

Table 5.1 Summary Statistics

Variable	Mean	Maximum	Minimum	Standard Deviation
G	0.12	0.18	0.10	0.02
R	0.58	0.78	0.43	0.08
E	0.43	0.59	0.22	0.08
L	1660	6620	120	1450

Source: Oates (1985)

Note : G= Total state-local tax receipts as a fraction of state personal income;
R= State share of state-local general revenues
E= State share of state-local total expenditures
L=Number of local government units;

Table 5.2 Spearman Rank Correlation Coefficient

Variable Pair	Correlation Coefficient	t-statistics
G, R	-0.22	1.50
G, E	-0.25	1.73
G, L	-0.06	0.41

Source: Oates (1985)

TABLE 5.3 – ESTIMATED REGRESSION REVIEW

(1R)	$G^l = -1.8 - .004R$ (11.5) (1.5)	$R^2 = .04$
(1E)	$G^l = -1.7 - .006E^*$ (14.9) (2.2)	$R^2 = .10$
(1L)	$G^l = -2.0 + .5 \times 10^{-5}L$ (59.2) (0.3)	$R^2 = .003$
(2R)	$G^l = -2.9 + .0001Y^* - .003P - .002U + .01I^* - .006R$ (8.7) (3.5) (0.4) (1.7) (2.8) (1.7)	$R^2 = .32$
(2E)	$G^l = -2.8 + .0001Y^* - .0002P - .002U + .008I - .004E$ (6.6) (3.1) (0.0) (2.0) (1.9) (1.0)	$R^2 = .29$
(2L)	$G^l = -3.0 + .0001Y^* - .008P - .002U^* + .007I - .0002L$ (9.2) (3.7) (1.0) (2.1) (1.8) (1.1)	$R^2 = .29$

Source: Oates (1985)

Note : numbers in parentheses below the estimated coefficients are the absolute values of the t-statistic. An asterisk indicates that the coefficient is statistically significant at the .05 level (using a two-tail test).

U = Percentage of state's population residing within Standard Metropolitan Statistical Areas (SMSA)

P = Population (in millions)

Y = State personal income per capita

I = Intergovernmental grants as a percentage of state-local general revenues.

all indicate negative association of G^l with R and E. The correlation of G^l with L in this case is positive but remains very weak.

In an attempt to control for the influence of other key variables on the size of the public sector, Oates estimated three multiple regressions (equations 2R, 2E and 2L in Table 5.3). In all of these equations, the level of per capita income (Y) has a positive and significant association with the size of the public sector (consistent with earlier studies of Wagner's Law). Population

size (P) exhibits a negative sign but is not significantly different from zero in any of the three equations. The extent of urbanization (U) is negatively related to G' and is statistically significant in one of the three equations. This indicates that, other things being equal, the more urbanized is a state, the smaller is its public sector, reflecting perhaps some economies in providing services to more densely populated areas. The variable (I) representing the percentage of state-local general revenues that comes from intergovernmental grants, comes out with a positive coefficient and statistically significant in one equation, supporting the view that intergovernmental grants provide a significant stimulus to expenditures by the recipient.

Of central interest for the present study is the effect of the centralization variables on the size of government. The fiscal centralization ratios, R and E, each exhibits a negative sign, but in neither case can the null hypothesis of no association be rejected. The number of local government (L) also comes out with a negative sign (consistent with the Leviathan view) but with a weak association.

Overall, the results of Oates (1985) study suggest that there does not exist a strong and systematic relationship between the size of government and the degree of centralisation of the public sector, pointing to the non-existence of real difference in outcomes, in terms of whether Leviathan is constrained by decentralization or not.

Marlow (1988) questions the findings of Oates on two grounds. First, Marlow claims that Oates tested the hypothesis for only a subset of total public activity, i.e., state and local versus federal state and local. By ignoring the federal government, Oates excluded a major component of public sector activity, which in recent years is more than one-half of the total public sector activity. For this reason, Marlow concludes that Oates tests provide at best, weak tests of decentralization. Second, Marlow suggests that Oates under-estimated the total impact of government by measuring centralization using tax receipts rather than expenditures. Since

expenditures are always balanced by total finances (taxes and debt), government expenditure measures provide more meaningful measures of public sector size by concentrating on a more complete measure of total resource absorption by government.

Grossman (1989) argues that Oates study failed to consider the collusion caveat Brennan and Buchanan attached to their hypothesis. His evidence reaffirms Marlow's findings on decentralization and suggests that intergovernmental grants circumvent the discipline of fiscal federalism, contributing to the growth of government.

Grossman (1989) tests the hypothesis that intergovernmental transfers lead to an increase in total public sector size. Employing an ad hoc model and drawing on variables that other studies have found to be significant in explaining the size of the public sector, Grossman presents two tests of hypothesis, one employing cross-sectional data for 48 contiguous states of the United States for the period 1976-1977, and the other employing time series data for the United States covering the period 1948 to 1984. In this study, Grossman defines the size of the of the public sector as the ratio of state and local tax revenues to personal income (G), and the level of intergovernmental transfers as state transfers to local governments normalized by population (TR). To control for other factors that might influence the size of the public sector, three additional variables are included. These are per capita income (Y), which is assumed to be positively correlated with G; federal transfers per capita to state and local governments (FTR); and population per multiple function government (MFG) to capture a number of influences, including the size of population, urbanization, and a number of localities. Grossman's cross-section statistics and regression results are summarized in Tables 5.4 and 5.5.

Table 5.4. Summary Statistics: Cross-Section Data

Variable	Mean	Maximum	Minimum	Standard Deviation
G	0.12	0.18	0.10	0.02
TR	242	592	96	92
Y	6068	7382	4530	716
FTR	302	527	189	64
MFG	10	45	2	8

Source: Grossman (1985)

Notes: G: ratio of state and local tax revenue to personal income
 TR: state transfers per capita to local government; Y: per capita income
 FTR: federal transfers per capita to state and local government
 MFG: population per multiple function government

Table 5.5. Cross-Sectional Regression Results

Variable	(1)	(2)
TR	0.0001** (5.24)	0.00006** (4.14)
Y		0.000004* (1.87)
FTR		0.0001* (4.89)
MFG		0.0003 (1.22)
CONSTANT	0.094** (16.91)	0.036* (2.13)
\check{R}^2	0.360	0.583
F-stat	27.421	17.434
SEE	0.014	0.011

Source: Grossman (1989)

Note: absolute value of t-statistics in parentheses;

* implies significant at the 90% level, two-tailed test

** implies significant at the 95% level, two-tailed test

Grossman's regression results provide strong evidence consistent with the hypothesis. Column 1 of Table 5.5 presents the results of a simple linear regression of G on TR. The coefficient of TR is positive and significant. This is consistent with the interest group hypothesis that intergovernmental transfers increase the total size of the public sector.

Column 2 of the Table 5.4 reports the results for the multiple regression which are again consistent with the hypothesis. The positive relationship between G and TR, though weak, is still significant. The three control variables also have the expected signs, with both Y and FTR significant. The coefficient of MFG is positive, but insignificant. The income elasticity of G is approximately 0.22, interpreted for the mean values of the variables. In other words, a 1% increase in per capita income leads to a 1.2% increase in total per capita taxes, which is consistent with the standard interpretation of Wagner's Law. The elasticity of G with respect to FTR is greater than zero, approximately 0.31. This is also consistent with the general findings of the intergovernmental grant literature that transfers increase the recipient government's spending. Finally, increases in population, urbanization, and a number of localities composite variable MFG, result in an increase in the relative size of government.

For the time-series analysis, Grossman defines the size of the public sector as total (federal, state, and local) government receipts as a percentage of Gross National Product (G). The transfer variable (TR) is defined as real federal grants-in-aid per capital. Three control variables, viz. (1) real GNP per capita (Y) to measure the Wagner's Law; (2) the ratio of government goods and services implicit deflator to the GNP implicit deflator (RC) to measure the productivity differential effects; and (3) population (P) to serve as a scale variable are also included. The summary statistics and results of the time series analysis are presented in Tables 5.6 and 5.7, respectively.

Table 5.6 Summary Statistics. Time Series Data

Variable	Mean	Maximum	Minimum	Standard Deviation
G	28.21	32.35	24.08	2.57
TR	114.03	230.86	28.20	71.55
Y	5070.90	6927.50	3512.20	1061.60
RC	93.02	110.80	73.19	10.33
P	0.20	0.24	0.15	0.03

Source: Grossman (1989)

Table 5.7. Time-Series Regression Results

Variable	(1)	(2) ^a
TR	-0.019 (1.53)	-0.021* (1.72)
TR1	0.004 (0.30)	0.003 (0.21)
TR2	0.026* (1.99)	0.032** (2.40)
Y	0.002* (2.23)	0.003** (2.70)
RC	0.120 (1.13)	0.149 (1.40)
P	-79.850 (1.34)	226.450 (0.63)
CONSTANT	20.193** (3.12)	-0.869 (0.92)
R ²	0.935	0.239
F-stat	-	2.724
DW	1.789	1.880

Source: Grossman (1989)

Notes: Absolute value of t-statistics in parentheses

a: all variables are in first differences

*: significant at the 90% level, two-tailed test

** : significant at the 95% level, two-tailed test

The time-series regression results provide additional evidence in support of the Leviathan hypothesis. The coefficients for TR2 (TR lagged periods) in column 1 and TR and TR2 in column

2 are significant at the 90% level. The coefficient for TR1 is not significant in both equations. These results indicate that in the initial period, increased grants lead to a reduction in the size of government. This, however, reverses in subsequent periods such that by the third period the net effect is a positive increase in the public sector size. Of the control variables, all have the expected sign but only the coefficient for Y is significant. Overall, the explanatory power of the first differences equation is weak, explaining about 25% of the variation in G. It is, however, significant at the 5% level.

Overall, Grossman (1989) analysis supports the hypothesis that intergovernmental transfers results in a larger overall budget. This implies that policies designed to enhance the fiscal independence of lower-level governments would be effective tools for controlling the growth of the public sector, i.e., fiscal decentralization should lead to a smaller public sector.

In one of his recent work, Grossman (1992) examines the impact of fiscal decentralization and intergovernmental collusion on the size of the public sector in Australia. In doing this, Grossman estimates the following equation:

$$SIZE_t = a_0 + a_1 DEC_t + a_2 GRT_t + a_3 X_t + e_1, \quad (1)$$

where,

SIZE = public sector size (defined as total public sector outlays as percentage of GDP)

DEC = decentralization (defines as state and local government outlays as a percentage of total government expenditure);

GRT = fiscal dependence (defined as intergovernmental grants as a percentage of total lower-level government's finances;

X = a matrix of control variables;

e = a random disturbance term; and

t = time.

Table 5.8. Regression Results for Tests of the Fiscal Decentralization and Intergovernmental Collusion Hypotheses

Variable	1	2	3	4
DEC	0.135 (1.10)	0.079 (0.60)	-0.001 (0.01)	0.120 (0.86)
GRT	-	-	0.322* (2.50)	0.349* (3.36)
PY	-	-	-	-0.002 (1.72)
P	-	-0.001 (0.89)	-	2.552* (3.39)
CONSTANT	27.589* (4.13)	2.262* (2.57)	18.820* (2.87)	4.150 (0.72)
\check{R}^2	0.845	0.872	0.865	0.904
DW	1.695	1.484	1.733	1.709
RHO	0.947	0.797	0.893	0.662

Source: Grossman (1992)

Notes: All regressions are corrected for serial correlation using the Cochrane-Orcutt Technique.

Absolute value of t statistic in parentheses.

* significant at 90% level, two-tailed test

Two control variables, viz. real disposable income per capita (PY_t) to test for Wagner's Law and population (P_t) to act as a scale variable were also used. Table 5.8 reports the regression results.

Equation 1 reports the results for a simple test of the decentralization hypothesis. Equation 2 includes the two control variables but not GRT. The results reported in these equations offer no support for the decentralization hypothesis. The coefficient for DEC is positive in both equations, contrary to expectations, and not significant. The results suggest that increased fiscal decentralization does not generate the Tiebout-style competition among State and local governments envisioned by Brennan and Buchanan. The results are also dramatically different from the supportive results reported for the United States by Grossman (1989).

Of the control variables, only P is significant. The positive coefficient suggests that government goods and services suffer from congestion problems or dis-economies of scale. The negative, though insignificant, coefficient of PY suggests that public sector size is mildly income inferior.

Equations 3 and 4 give the results with GRT variable included. The coefficient of DEC in both equations are still not significant, providing further support for the conclusion that the Tiebout-style competition is not a major phenomenon at the State and local level in Australia. The positive coefficient for GRT, however, supports the fiscal dependence hypothesis. The evidence suggests that grants do circumvent the discipline imposed on lower-level governments in a federal system. This latter finding is consistent with those reported by Grossman (1989) for the United States.

Oates and Grossman studies reviewed above have found an inverse relationship between fiscal decentralization and public sector size and a positive correlation between the extent of intergovernmental collusion and public sector size in the United States. The Australian evidence, however, is only partially consistent with the United States findings. Fiscal decentralization is positively correlated with public sector size, though the correlation is not significant. Fiscal dependence, however, is positively and significantly correlated with public sector size.

Joulfaian and Marlow (1990) express some concern about Oates and Grossman studies. According to them, these studies fall into two categories: they have either resorted to testing of a subset of government or have used data at their highest level of aggregation. Oates (1985) falls into the first category and Grossman (1989: 1992) into the second. The former excludes the federal government since it measures Leviathan as the ratio of state and local government activity over some measure of income. Such definitions, however, exclude part of the total government activity and are not consistent with the Brennan and Buchanan wording of "total government

intrusions” in their decentralization hypothesis. The latter category, using time- series data, combines state, local and federal government activity in all states into one unit of observation. The down-side of this approach in Grossman is that it implicitly assumes that the simple-summing of all local and state governments, along with the federal sector is appropriate. This assumption, however, may not be appropriate in cases where the different levels of government operate under varying fiscal constraints.

To attempt to address the shortcomings of Oates and Grossman studies, Joulfaian and Marlow (1990) proceed to test the decentralization hypothesis by examining a data set which considers units of governments. By dis-aggregating the United States federal spending on a state-by-state basis, they construct a cross-section of state data on federal, state and local government activity. This brings into the analysis the activity of the federal government, which the previous studies have excluded. Consistent with previous work, however, they model the size of government as a function of several control variables but with two specifications of the decentralization measure:

$$L = a_0 + a_1X + a_2G + a_3DEC + u \tag{2}$$

$$L = a_0 + a_1X + a_2G + a_3SL + u \tag{3}$$

where,

L = total government expenditures (federal, net of grants plus state plus local) share of state product (GSP) for each state;

X = control variable for each state;

G = ratio of federal grants to state and local governments revenues for each state;

DEC = ratio of state and local government expenditures to total government expenditures for each state;

SL = number of state and local governments for each state in 1982; and

u = random disturbance term.

Joulfaian and Marlow model as presented in equations (2) and (3) allows for an appropriate testing of the decentralization hypothesis in four areas. First, the measure of public size (L) includes all levels of government and is therefore consistent with the Brennan and Buchanan hypothesis that “total government intrusion “ is relevant for public sector size. Second, all the relevant measures of government are defined in terms of total expenditures, rather than tax revenues, and therefore reflect a more complete measure of total resource absorption by government than those using revenue-based measures. Third, the model allows for the control of the possibility that grants offset the hypothesized inverse relationship between decentralization and government size. Fourth, is the inclusion of the alternative measure of decentralization (SL). This measure was suggested by Oates (1989) but he did not find the hypothesized inverse relationship with total government size. While DEC is essentially a concentration measure, SL reflects the number of partially competing government units.

The decentralization hypothesis suggests an inverse relationship between government size (L) and decentralization (DEC) and a positive relationship between government size (L) and grants (G). Two control variables are included: per capita gross state product ($PGSP$) to control for income effects, and population (POP) as a scale variable.

Table 5.9 displays the summary statistics of the selected variables for 50 states of the United States, and Tables 5.10 and 5.11 the regression results for the government size equations for 1981 and 1984, respectively. The summary statistics, especially the minimum and maximum values, suggest substantial variations in the size of government (L), the degree of decentralization (DEC), federal grants to states (G), and the number of state and local governments within states (SL).

Table 5.9. Summary Statistics

Variable	Period	Mean	Maximum	Minimum	Standard Deviation
L	1981	0.32	0.43	0.20	0.05
	1984	0.33	0.44	0.24	0.04
DEC	1981	0.52	0.67	0.36	0.07
	1984	0.50	0.74	0.33	0.08
G	1981	0.19	0.26	0.08	0.03
	1984	0.15	0.22	0.08	0.03
SL	1982	1636	6467	18	1445

Source: Marlow (1990)

Notes:

L = federal government expenditures, other than grants, and state and local expenditure as a share of GSP for each state

DEC = ratio of state and local government expenditures to total government expenditures for each state

G = ratio of federal grants to state and local governments revenues for each state

SL = number of state and local governments for each state

Table 5.10. Regression Results for Government Size Equations: 1981

Variable	1	2	3	4
CONSTANT	0.38 (18.97)	0.38 (5.41)	0.52 (5.27)	0.43 (6.60)
POP*	-0.89 (0.62)	-0.86 (0.55)	-0.65 (0.45)	-2.45 (1.42)
PGSP**	-4.33 (3.39)	-4.32 (2.58)	-3.34 (2.08)	-5.08 (3.32)
G		0.01 (0.05)	0.05 (0.20)	0.12 0.50
DEC			-0.28 (2.79)	
SL***				-1.88 (3.35)
F	5.82	3.80	5.22	6.28
\bar{R}^2	0.16	0.15	0.26	0.30
SEE	0.05	0.05	0.05	0.04

Source: Marlow (1990)

Notes: Dependent variable: federal, state and local expenditure share of GSP

Absolute t-statistics are in parentheses

* coefficients multiplied by 1000000

** coefficients multiplied by 1000

*** coefficients multiplied by 100000

Table 5.11. Regression Results for Government Size Equations: 1984

Variable	1	2	3	4
CONSTANT	0.38 (16.14)	0.42 (6.56)	0.49 (8.05)	0.44 (7.53)
POP*	-1.60 (1.34)	-1.84 (1.44)	-1.86 (1.58)	0.28 (0.18)
PGSP**	-2.65 (1.85)	-3.24 (1.91)	-0.47 (0.25)	-3.68 (2.25)
G		-0.17 (0.66)	-0.09 (0.36)	-0.21 (0.84)
DEC			-0.26 (2.93)	
SL***				-1.18 (2.25)
F	2.64	1.89	3.80	2.81
\check{R}^2	0.06	0.05	0.19	0.13
SEE	0.04	0.04	0.04	0.04

Source: Marlow (1990)

Notes: Dependent variable: federal, state and local government expenditure share of GSP

Absolute t-statistics are in parentheses

* coefficients multiplied by 1000000

** coefficients multiplied by 1000

*** coefficients multiplied by 100000

The first columns of Tables 5.10 and 5.11 show the relationships between the control variables and government size. In general, the coefficients of POP are not statistically significant from zero. The estimated coefficients of PGSP are negative and statistically significant for the 1981 equation and, to a lesser extent, for the 1984 equation as well. The estimated coefficients of G in the second column are statistically not different from zero in both 1981 and 1984. They also remained insignificant after the measures of decentralization were added in the third and fourth columns. The estimated coefficients of DEC in the third columns are statistically significant and negative in both years. The effects of the PGSP are significant in 1981 but not significant in 1984. The alternative measure of decentralization, SL, in the fourth column is also statistically significant and negative in both years. Thus both the coefficients of DEC and SL are statistically significant

and of the expected signs in both time periods. This results support the view that fiscal decentralization is a significant determinant of total government size. Joulfaian and Marlow also contend that although their analysis present cross-sectional evidence from two time periods, support of this hypothesis does not appear to be time sensitive.

5.3.Summary

The review of the three major empirical tests of the decentralization hypothesis has shown that, in general:

1. Fiscal decentralization has significant and negative effect on the size of the public sector (measured in terms of total expenditures);
2. Fiscal collusion and public sector size are positively related;
3. Increases in population or urbanization result in an increase in the relative size of the government; and
4. Increases in income per capita have a positive and significant association with the size of the public sector, consistent with the Wagner's Law.

The first two findings give credence to the Brennan and Buchanan hypothesis, whether tested with cross-section or time-series data. An important thing to observe in the empirical test of this hypothesis, however, is that the test should consider the roles of all levels of government, i.e., the public sector should be defined to include all levels of government.

Chapter 6

Fiscal Decentralisation in South Africa.

An Empirical Analysis

6.1 The Empirical Model

This study attempts to test the Leviathan hypothesis that fiscal decentralisation in South Africa serves as a constraint on the behaviour of revenue-maximising national government, thereby restraining the overall size of the public sector. The Leviathan model predicts that, other things being equal, the overall size of the public sector should inversely vary with the extent of simultaneous decentralisation of the national government's taxing and spending decisions (fiscal decentralisation). Furthermore, other things being equal, the decentralisation should include the simultaneous transfer of the national government's revenue and of its spending powers to sub-national governments (fiscal collusion) (Ehdaie, 1994).

In this study, fiscal decentralisation (FISDEC) is defined as the ratio of total provincial and local government own-source revenue used to finance their expenditures to total consolidated general government (national plus sub-national) expenditures. FISDEC is assumed to vary only with the extent of simultaneous (de)centralisation of the national government's taxing and spending powers. Its variation excludes changes in the decentralisation degree of expenditure financed through sources other than the sub-national government's own-source revenues.

As a measure of fiscal collusion (FISCOL), this study uses the ratio of the national government's transfers (grants) to provincial and local governments over the consolidated general government expenditures. FISCOL only varies with the variation of simultaneous transfer of the national government's revenue and assignment of its spending responsibility to provincial and

local governments. It remains fixed with the extent of fiscal (de)centralisation. FISDEC and FISCOL are thus independent policy variables.

As a measure of public size (PUBSIZ), this study adopts the definition employed by Grossman (1989; 1992) and Kneebone (1992). PUBSIZ is defined as the total consolidated general government expenditure share of the gross domestic product.

To test the fiscal decentralisation hypothesis, the level (or growth rate) of PUBSIZ is assumed to be related to the level (or growth rate) of FISDEC, FISCOL and a set of other control variables, “Z”, as follows:

$$PUBSIZ = \alpha_0 + \alpha_1 FISDEC + \alpha_2 FISCOL + \alpha_3 Z + U \tag{6.1}$$

where

PUBSIZ = ratio of total consolidated general government expenditure to GDP;

FISDEC = ratio of provincial and local governments own-source revenues to total consolidated general government expenditure;

FISCOL = ratio of national government transfers to provincial and local governments to total consolidated general government expenditures;

Z = a vector of other control variables (such as population, degree of urbanisation)

U = disturbance term

The Leviathan fiscal decentralisation hypothesis implies that $\alpha_1 < 0$. The sign of α_2 may be negative or positive, depending on whether the stimulating effect of the transfers from the national government to the sub-national governments (revenue sharing) on the size of the public sector exceeds or falls short of the constraining influence of the decentralised expenditures financed

through revenue transfers. A positive sign of α_2 regardless of its significance level would indicate that revenue sharing with tax decisions concentrated in the hands of the national government exterminates the constraining influence of decentralisation of the spending power, providing further support to the Leviathan hypothesis.

To control for the influence of other variables, the study uses per capita gross domestic product (PERCAP) for Wagner's Law and total population (POP) as a scale variable. According to the Wagner's law, demand for public goods and services is more income-elastic than demand for private goods and services, implying a positive relationship between PUBSIZ, the demand for public goods and services relative to the demand for public-private goods and services, and GDP per capita. The GDP per capita also controls for the positive effect of economic development on the size of the public sector. The more developed a country, the higher would be its GDP per capita and thus the size of the public sector. As regards the effect of scale variable, Oates (1985) has argued that the more populated a country is, the smaller should be its public sector, reflecting some economies in providing services to more densely populated areas. The counter-argument is that growth in total population would increase the demand for public services, encouraging the expansion of the public sector (Kneebone, 1992).

6.2. Monte Carlo Experiments

The least squares estimates, α_1 , α_2 , and α_3 , to be obtained from equation (6.1) are assumed to have certain desirable statistical features, namely that they are best, linear and unbiased estimators (BLUE). In practice, however, we never know whether the BLUE property holds for our estimates. In other words, we cannot tell whether the estimates produced by equation (6.1) are good or bad. To test whether our least square estimators are best, linear and unbiased, we undertake some Monte Carlo experiments, which are essentially computer simulation or sampling experiments.

The Monte Carlo experiment proceeds in four parts as follows: In the first part, we estimate equation (6.1) and obtain the true values of α_0 , α_1 , α_2 , and α_3 . We then select a sample size, say 25. We fix the values of X (i.e., FISDEC, FISCOL, and Z), to obtain 25 X values. Using some random number generating process, we obtain the random factor u for each observation.

In the second part, we generate the value of y (PUBSIZ) for each observation, using the relationship (6.1) and the values of α_0 , α_1 , α_2 , α_3 , and u . Using the values of y thus generated and the data for X , we use regression analysis to obtain estimates $\hat{\alpha}_0$, $\hat{\alpha}_1$, $\hat{\alpha}_2$, and $\hat{\alpha}_3$.

In the third part, we repeat the experiment 10,000 times, each time using the same α_0 , α_1 , α_2 , and α_3 and X values. We then take the averages of these 10,000 estimates and call them $\check{\alpha}_0$, $\check{\alpha}_1$, $\check{\alpha}_2$, and $\check{\alpha}_3$.

Finally, we compare the Monte Carlo average estimates, $\check{\alpha}_0$, $\check{\alpha}_1$, $\check{\alpha}_2$, and $\check{\alpha}_3$ to the true values α_0 , α_1 , α_2 , and α_3 . If the average estimates are about the same as the true values, then the Monte Carlo experiments have established that the least square estimators are indeed unbiased.

6.3 Stationarity and Integration

The empirical analysis of fiscal decentralisation in South Africa outlined above in section 6.1 will require the use of quarterly time series data. In time series analysis, trends may give rise to spurious regression results, uninterpretable t-values, and goodness of fit measures which are too high, making the regression results extremely difficult to evaluate. For this reason, it is important to verify whether the underlying process that generates the series can be assumed to be invariant with time. If the characteristics of the stochastic process change over time, i.e., if the process is non-stationary, it will be difficult to represent the time series over past and future intervals of time by a simple algebraic model. On the other hand, if the stochastic process is fixed in time, i.e., stationary, then it will be possible to model the process via an equation with fixed coefficient that can be estimated from past data (Pindyck and Rubinfeld, 1991).

To avoid spurious regression by relating non-stationary to stationary data series, it is very important to investigate the order of integration of the variables under investigation. According to

Charemza and Deadman (1992), a non-stationary series which can be transformed to stationary series by differencing d times is said to be integrated of the order d . A series y_t integrated of order d is conventionally denoted as:

$$y_t \sim I(d) \tag{6.2}$$

If we wish to test the hypothesis that a non-seasonal variable y_t is integrated of the order one, that is y_t is generated by

$$y_t = y_{t-1} + e_t \tag{6.3}$$

where e_t represents a series of identically distributed stationary variables with zero means, a straightforward procedure will be to test for $\rho = 1$ in an auto-regressive equation:

$$y_t = \rho y_{t-1} + e_t \tag{6.4}$$

If the error term in equation 6.4 is a white noise process, then the equation represents a random walk process when $\rho = 1$. But, such a process generating y_t is non-stationary. However, if $|\rho| < 1$, then the process generating y_t in equation 6.4 is integrated of order zero and is stationary. It is possible to estimate equation 6.4 by ordinary least squares (OLS), and to test the hypothesis that $\rho = 1$ by using the t-test. The problem with this approach is that the OLS estimate of ρ may be substantially biased in an auto-regressive equation and little is known about the distribution of the t-test where the variable y_t is non-stationary.

An appropriate and simple method for testing the order of integration of y_t in equation 6.4 is to apply a unit root test (see Dickey and Fuller, 1979). The unit root test is a test of the hypothesis that in equation 6.4, $\rho = 1$. This test is based on the estimation of an equivalent regression equation of the form:

$$\Delta y_t = \delta y_{t-1} + \epsilon_t \quad (6.5)$$

Equation 6.5 can also be expressed as

$$y_t = (1 + \delta)y_{t-1} + \epsilon_t \quad (6.6)$$

which is the same as equation 6.4 with $\rho = (1 + \delta)$.

If $\delta < 0$ in equation 6.5 or 6.6, it implies that $\rho < 1$ in equation 6.4. The Dickey-Fuller (DF) test consists of testing the negativity of δ in the OLS regression in equation 6.6. If we reject the null hypothesis: $\delta = 0$, in favour of the alternative: $\delta < 0$, it implies that $\rho < 1$, and that y_t is integrated of the order zero. This means that the variable y_t is stationary or the structural relationship described by equation 6.4 is invariant with time (Charemza and Deadman, 1992).

Time series x_t and y_t are said to be co-integrated of the order d, b where $d \geq b \geq 0$.

This is written as:

$$x_t, y_t \sim CI(d, b) \quad (6.7)$$

If both series are integrated of the order d , then there exists a linear combination of the variables. If the variables are not co-integrated, then we may be estimating a spurious regression because of the presence of stochastic or deterministic trends in the data.

According to Granger and Engle (1985), there are two major principles to observe in testing for co-integration of variables in a long run relationship. First, if two variables appear in a long run relation, then both variables have to be of the same order of integration. If the number of variables is greater than two, i.e., if there are more than one explanatory variables, the order of integration of the dependent variable cannot be higher than the order of integration of any of the explanatory variables. Second, there must be either none or at least two explanatory variables integrated to an identical order of integration of the dependent variable. For example, if we have

$$y_t = \alpha_0 + \alpha_1 x_t + u_t \quad (6.8)$$

where y_t , x_t , are vectors, the Granger-Engle (1985) procedure requires for:

- (i) a test for the order of integration of y_t and the elements of x_t by means of the DF and augmented Dickey-Fuller (ADF) statistics;
- (ii) a test for the presence of co-integration between y_t and x_t by means of ADF statistics.

To undertake these tests, a function of the form:

$$\Delta y_t = \beta + \sum \alpha \Delta x_t - \gamma u_t + \epsilon_t \quad (6.9)$$

is estimated. Thereafter, we apply the standard diagnostic tests. Like any other test, this approach has its own problems. First, the test statistics will be slightly different in each application, hence the critical values suggested by Granger and Engle (1985) are rough guides only. Second, where there is a vector of n variables, there may be up to $(N - 1)$ co-integrating vectors. In this case, there is no guarantee that the Granger-Engle (1985) or Engle-Yoo (1986) procedure will give an

estimate of a unique co-integrating vector, i.e., the OLS estimate of the co-integrated relationship may be linear combination of two or more co-integrating vectors.

6.4 Data Sources

Data used for both the unit root tests and econometric analysis were obtained from the June 1992 to September 1998 issues of the Reserve Bank of South Africa (RBSA) *Quarterly Bulletin*. (Refer to Annexure E) In addition to data on monetary aggregates, the RBSA *Quarterly Bulletin* contains statistics on all aspects of government finance namely, exchequer account, main central government budget, extra-budgetary institutions, consolidated central government finances, provincial government and local authorities finances, consolidated general government expenditure. The *Bulletin* also contains statistics on national accounts, both in current and constant terms, data on international trade and balance of payments, and general economic indicators.

6.5. Stationarity and Integration Results

The Shazaam computer programme was used to conduct the stationarity and integration tests. Summary results of our stationarity and integration analysis are presented in Tables 6.1 and 6.2, whilst detailed computer printouts are included in annexure A. The entries in Table 6.1 show that in both the Dickey-Fuller and Augmented Dickey-Fuller tests, the calculated unit root statistics are greater than their corresponding critical values. For the unit root test in levels, the calculated Dickey-Fuller and Augmented Dickey-Fuller statistics are -3.0684 and -2.9175 compared with the critical value of -4.9112. For the test in logarithm, the calculated statistics are -3.2440 and -2,5203 for the Dickey-Fuller and Augmented Dickey-Fuller test, respectively, compared with the

critical value of -4.9122. For the unit root test in growth rates, the Dickey-Fuller statistic is -2.6683 and the Augmented Dickey-Fuller, -2.9608, both of which are greater than the critical value of -4.9122. The three tests all leading to the rejection of the null hypothesis of non-stationarity and the acceptance of the alternative hypothesis of stationarity in all the variables.

Table 6.1. Stationarity Analysis
Sample period: 2nd quarter 1993/1994 to 2nd quarter 1998/1999

Regression	Unit Root Test		
	DF	ADF	95% critical value
In Levels			
PUBSIZ on INPT, FISDEC, FISCOL, PERCAP, POP	-3.0684	-2.9175	-4.9112
In Logarithm			
PUBSIZ on INPT, FISDEC, FISCOL, PERCAP, POP	-3.2440	-2.5203	-4.9122
In Growth Rates			
PUBSIZ on INPT, FISDEC, FISCOL, PERCAP, POP	-2.6683	-2.9608	-4.9122

Source: Annexure A

The entries in Table 6.2 show that for the variable PUBSIZ in levels, both the calculated DF and ADF statistics are smaller than the critical values for both the regression equations. For the regression equation with intercept and trend, the t-value for the DF test is -7.9712 and for ADF test, the t-value is -4.5875 compared with the critical t-value of -3.0522. For the regression equation with intercept and no trend, the calculated t-value for both the DF and ADF are respectively, given as -7.4349 and -3.8644, each smaller than the critical t-value of -3.7119. Although the entries show that the t-values in the DF and ADF tests in both equations for the FISDEC, FISCOL, PERCAP and POP variables exceed the critical value, i.e., are significant, the non-significance of the dependent variable, PUBSIZ, in both tests and for both equations indicates that the null hypothesis of a unit root cannot be rejected for the time series of the variables.

Table 6.2. Co-integration Test
Sample period: 2nd quarter 1993/1994 - 2nd quarter 1998/1999

Variable	Unit Root Test					
	with intercept and trend			with intercept and no trend		
	DF	ADF	95% critical value	DF	ADF	95% critical value
In Levels						
PUBSIZ	-7.9712	-4.5875	-3.0522	-7.4349	-3.8644	-3.7119
FISDEC	-2.7122	-1.5998	-3.0522	-4.3325	-3.612	-3.7119
FISCOL	-3.5041	-1.9596	-3.0522	-4.9399	-2.0057	-3.7119
PERCAP	-1.0069	-0.9721	-3.0522	-0.9830	-1.0085	-3.7119
POP	2.6208	1.1893	-3.0522	0.8003	-1.1738	-3.7119
In Logarithm						
PUBSIZ	-7.1987	-3.9580	-3.0522	-6.7746	-3.3809	-3.7119
FISDEC	-2.6735	-1.6086	-3.0522	-4.5330	-3.4183	-3.7119
FISCOL	-3.9957	-2.7546	-3.0522	-5.2048	-2.1989	-3.7119
PERCAP	-1.8269	-1.6494	-3.0522	-0.4466	-0.3999	-3.7119
POP	2.9691	1.2170	-3.0522	0.7796	-1.1852	-3.7119
In Growth Rates						
PUBSIZ	-6.8123	-3.4225	-3.0522	-5.0925	-3.2164	-3.7119
FISDEC	-2.6598	-1.6116	-3.0819	-4.2101	-3.1058	-3.7612
FISCOL	-4.1926	-3.2545	-3.0819	-4.8589	-1.3257	-3.7612
PERCAP	-1.7596	-1.4507	-3.0819	0.0760	-0.0312	-3.7612
POP	2.1583	1.1328	-3.0819	0.7008	-1.2116	-3.7612

Source: Annexure B

In logarithm terms, the DF and ADF tests for the PUBSIZ variable for the equation with intercept and trend are not significant, although the tests for the other variables (except the DF test for FISCOL) are all significant. In the equation with intercept and no trend, the DF test for PUBSIZ, FISDEC and FISCOL are not significant, but the DF tests for PERCAP and POP are significant. For the ADF test, however, the entries show that all the variables, including PUBSIZ, are significant as the calculated t-value for each variable exceeds the critical value. For this

equation, therefore, the null hypothesis of a unit root can be rejected for the time series of all the variables, i.e., the variables are co-integrated of the order zero.

The tests for co-integration in terms of growth rates also produce the same results as that produced in terms of logarithms. For the regression with intercept and trend, both the DF and ADF tests show that the variables PUBSIZ and FISCOL are not significant while the variables FISDEC, PERCAP and POP are significant. For the equation with intercept and no trend, DF test for PUBSIZ, FISDEC and FISCOL are not significant while the other variables are significant. For the ADF test, however, all the variables, including PUBSIZ, are significant.

The test results analysed above indicate that a regression of PUBSIZ on FISDEC, FISCOL, PERCAP, and POP, with an intercept and no trend, and estimated in logarithm or growth rate terms will not produce spurious results since the variables will be co-integrated.

6.6. OLS Regression Results

The estimation results of equation 6.1 in logarithms and in growth rates are presented in Table 6.3. Quarterly data for the period 1993/94 to second quarter 1998/99 were used. The shazam computer package was also used to estimate the equation. Refer to **annexure C and D** the computer printouts generated utilising shazam computer package.

The entries in Table 6.3 show that the explanatory power (adjusted R^2), of the two regressions is fairly similar. However, regression 1 produces better results than regression 2, in terms of the number of significant variables associated with the size of the public sector. Our discussion of the empirical analysis will therefore be based on the results produced by regression 1.

Table 6.3. OLS Estimation Results

Sample period: 1st quarter 1993/94 to 2nd quarter 1998/1999

Dependent Variable: PUBSIZ

Explanation Variable	In Logarithm (Regression 1)	In Growth Rates (Regression 2)
INPT	10.01* (2.21)	-0.06 (-0.84)
FISDEC	-0.16 (-1.46)	-0.08 (-0.65)
FISCOL	-0.42* (-5.77)	-0.42* (-5.79)
PERCAP	0.69* (2.47)	2.70 (1.11)
POP	-3.29** (-1.94)	3.48 (0.38)
F (4, 17)	10.43	10.34
Adjusted R ²	0.64	0.65

Source Annexure C

* significant at 5% level (critical value for DF=18 is 2.101)

** significant at 10% level (critical value for DF=18 is 1.734)

t-values in parentheses

Consistent with the Wagner's law, the level of per capita income (PERCAP) has a positive sign in both equations, but statistically, has significant association with the size of the public sector (PUBSIZ). This means that as the South African society develops and income per capita rises, the demand for public goods and services correspondingly rise. An attempt to meet the increasing demand for its goods and services will course the size of the public sector to expand, i.e., expenditure of the consolidated general government increases relative to the gross domestic income.

The results also show that the overall size of the South African population (POP) is inversely related to the size of the public sector, being significantly different from zero at the 10% probability level. For this equation, a 1% increase in the size of the population will cause a 3.3% contraction in the size of the public sector, supporting the argument that as population increases, economies in providing services are reaped, thereby constraining the size of the public sector.

As hypothesised, fiscal decentralisation (FISDEC) exerts a negative influence on the size of the public sector, although the impact is statistically not different from zero at 10% probability level. The insignificance of the impact of fiscal decentralisation on the size of the public sector is explained in terms of the fact that there has, in fact, been very little decentralisation in South Africa. As demonstrated in Chapter 5, the size of the provincial and local government own source revenue relative to the consolidated general government expenditure is very little, pointing to the serious lack of revenue raising powers by the sub-national governments and thus the absence of any meaningful extent of decentralisation.

Finally, the coefficient of the fiscal-collusion variable (FISCOL) is negative but statistically significant at 5% probability level. For this result, a 10% increase in own source revenue relative to total national and sub-national expenditures will cause a 4.2% contraction in the size of the public sector. That is, the size of the public sector will reduce if provinces and local authorities are granted enough power to raise their own revenues. The increase in own source revenue can come about as a result of decentralisation from the national level of government. Such decentralisation would create a better link between revenue and expenditure. The disjunction between expenditure and revenue has been identified in public finance literature as one of the ineluctable sources of government failure. Where revenues that sustain expenditure activity are mobilised by one level of government and the expenditure are undertaken by another level of government, inefficiencies such as overexpenditure are encouraged because costs are disconnected from revenues that sustain them. Under these conditions, even if possibilities exist for lowering of cost functions, raising productivity or realising economies of scale, these opportunities are less likely to be exploited fully by subnational governments. This result, which is inconsistent with the Leviathan hypothesis, indicates that the massive transfers of revenue from the national government to the provinces and local authorities (revenue sharing) significantly reinforces the expanding influence

of the decentralised expenditures financed through revenue transfers. For instance, transfers from national to subnational government amounted to R40,2 billion in 1993/94. The figure increased to R45,8 billion in 1994/95, R65,8 billion in 1995/96 and R84,8 billion in 1996/97. By 1997/98, the transfers had reduced to R86,9 billion (DOF: Budget Review 1998). In other words, the centralisation of revenue-raising powers contributes to the inability of transfers to neutralise the constraining influence of decentralised expenditures financed by them.

6.7 Results of Monte Carlo Experiments

The results of the Monte Carlo experiments are summarized in Table 6.4. Refer to **annexure D** for the detailed computer printouts generated using the shazam package. The result of the experiment with sample size 10 generally shows over-estimation of the parameters and large standard errors compared to the results presented in column 1 of Table 6.3. The result shows an overestimation of the coefficient of FISDEC by 0.01, FISCOL by 0.04, PERCAP by 0.18 and POP by 1.26. The results of the sample sizes of 15 and above generally turned out quite well, although none of the coefficients is significant.

For the variable FISDEC, the coefficients produced by the Monte Carlo experiments range between -0.15 and -0.17, compared to the true estimate of -0.16. The estimated standard errors also range between 1.91 and 1.88 for the sample sizes 15 and 22, and 0.86 and 0.65 for sample sizes 60 and 99, compared with standard error 0.11 in annexure C. This means that the experiments over-estimated the standard errors, although the over-estimation reduces as the sample size increases.

For the variable FISCOL, the coefficients produced by the experiments range between -0.42 and -0.43 compared with the true estimate of -0.42. For the standard errors, the experiments produced between 0.55 and 0.48 for sample sizes 60-99 and between 1.26 and 1.77 for sample

sizes 15-22. Again these figures over-estimate the true standard error of 0.07 in annexure C

Table 6.4. MONTE CARLO EXPERIMENTAL RESULTS

VARIABLE	B	ASE	ESE	T	STDSE	N
CONSTANT	13.15	241.04	229.65	0.06	74.16	
FISDEC	-0.17	2.65	2.49	-0.07	0.80	
FISCOL	-0.46	1.89	1.77	-0.26	0.57	
PERCAP	0.87	18.30	17.30	0.05	5.59	
POP	-4.55	105.76	100.45	-0.05	32.44	10
CONSTANT	10.94	159.40	154.89	0.07	35.22	
FISDEC	-0.16	1.95	1.91	-0.08	0.44	
FISCOL	-0.42	1.57	1.53	-0.27	0.35	
PERCAP	0.75	6.77	6.56	0.11	1.49	
POP	-3.69	55.81	54.22	-0.07	12.33	15
CONSTANT	9.14	79.43	78.05	0.12	13.39	
FISDEC	-0.17	1.91	1.88	-0.09	0.32	
FISCOL	-0.42	1.28	1.26	-0.33	0.22	
PERCAP	0.65	4.86	4.77	0.14	0.82	
POP	-2.93	29.76	29.19	-0.10	5.01	22
CONSTANT	10.20	25.53	25.69	0.40	2.43	
FISDEC	-0.15	0.85	0.86	-0.18	0.08	
FISCOL	-0.42	0.55	0.55	-0.76	0.05	
PERCAP	0.69	0.87	0.87	0.79	0.08	
POP	-3.33	6.10	6.13	-0.54	0.58	60
CONSTANT	10.27	20.37	20.35	0.50	1.48	
FISDEC	-0.16	0.65	0.65	-0.24	0.05	
FISCOL	-0.43	0.48	0.48	-0.89	0.03	
PERCAP	0.69	0.77	0.77	0.89	0.06	
POP	-3.34	4.94	4.93	-0.68	0.36	99

Source: Annexure D

B is the average parameter estimate

ASE is the standard deviation of the parameter estimate

ESE is the average standard error

T is test-values

STDSE is the standard deviation of the standard errors

For the PERCAP variable, the Monte Carlo experiments estimated coefficients between 0.65 and 0.75, compared to the true estimate of 0.69. Here again, the larger the sample size, the

closer the experimental results become good estimates of the true value. In fact for sample sizes 60 and 99, the estimates produced by the experiments are just equal to the true estimate. Like FISDEC and FISCOL, the experiments over-estimated the standard error for the PERCAP variable.

The coefficients estimated by the Monte Carlo experiments range between -3.69 and -2.93 for the variable POP, compared to the true estimate of -3.29. The standard error of the estimate was however over-estimated by the experiments.

Generally, the estimates of the Monte Carlo experiments are very close to the true estimates, suggesting that the true estimates are unbiased and could therefore be used as basis for inferences.

6.8 Summary

Our econometric investigation has shown that:

As the South African society develops, per capita income rises and this will influence the demand for public goods and services.

The overall size of the population is inversely related to the size of the public sector, supporting the argument that as population increases, economies in providing services are reaped.

Fiscal decentralisation exerts a negative influence on the size of the public sector, although the impact is statistically not significant. The insignificance of the impact of fiscal decentralisation on the size of the public sector is explained in terms of the fact that there has, in fact, been very little decentralisation in South Africa.

Fiscal-collusion is a significant factor influencing the size of the public sector. For example

a 10% increase in own source revenue relative to total national and sub-national expenditures will cause a 4.2% contraction in the size of the public sector. That is, the size of the public sector will reduce if provinces and local authorities are granted enough power to raise their own revenues.

Chapter 7

Conclusion

7.1 International Experience

This study sets out to review the international experience of fiscal decentralization and assess the impact of fiscal decentralization on the size of the public sector. The major findings include the following: The experiences of the countries reviewed indicate that the system of fiscal federalism has not only been implemented in a uniform way but has also evolved over time and is being improved. In Australia, for instance, the federal government is constitutionally required to follow regionally differentiated policies. While the Commonwealth has the financial power to exert considerable influence on the behavior of sub-national governments, efforts have been directed to achieving better cooperation and coordination of policy by involving the sub-national governments in the important policy decisions.

The cooperation in the Australian federation is also strengthened by the existence of Commonwealth Grants Commission that operates under terms of reference set by the Commonwealth after consultation with states and territories. The coordinate-authority model of the Canadian federation has a strong constitutional basis, a fairly strong state influence on federal policy making. An important characteristic of the federation is that it has proven to be flexible and has allowed for the continued evolution of the system to accommodate new innovations and changes.

The German system of intergovernmental fiscal relations has a number of flaws, such as the mismatch between revenue-raising and expenditure that reduce its efficiency and impinge on interregional equity. These flaws result from the strict interpretation of the uniformity of living

conditions mandated by the German Constitution. In spite of this negative element, the German fiscal federal relations have created a high degree of homogeneity in terms of regional availability of public infrastructure and government services.

The Brazilian system allows states and, to a lesser extent municipalities substantial own revenue-raising powers fostering fiscal responsibility and political accountability for their budgetary policies.

7.2 South African Fiscal Federalism

The South African system of fiscal federalism compares favourably with that of Australia, Canada, Germany and Brazil. The assignment of expenditure as envisaged by the South African Constitution is in line with that of the four countries reviewed and has also been implemented correctly. Although revenue assignment is sufficiently provided for in the Constitution, in practice revenue assignment has been skewed against subnational governments. This has rendered subnational governments to administrative arms of national government. The imposition of restrictions to provincial revenue raising through taxation and borrowing deprives provinces the right to make decisions on spending priorities.

The empirical analysis of the South African fiscal decentralization show that (1) as the South African society develops and income per capita rises, the demand for public goods and services correspondingly rise, i.e., expenditure of the consolidated general government increases relative to the gross domestic income; (2) the overall size of the South African population is inversely related to the size of the public sector that is an increase in the size of the population will cause a contraction in the size of the public sector, supporting the argument that as population increases, economies in providing services are reaped, thereby constraining the size of the public sector; (3) although not statistically significant, fiscal decentralisation appears to exert a negative

influence on the size of the public sector and (4) an increase in own source revenue relative to total national and sub-national expenditures will cause a contraction in the size of the public sector. That is, the size of the public sector will reduce, if provinces and local authorities are granted enough power to raise their own revenues.

7.3 Policy Proposals

The shortcomings of the South African fiscal federalism are rooted on the insufficient powers of the provinces to raise their own source revenue. This is due to the failure to implement in full the recommendations of the FFC in the application of revenue sharing formula proposed by the FFC. Because of the size of the concurrent functions it is necessary that minimum national standards be determined both in terms of quantity and quality. Such a determination will ensure that equitable services are delivered throughout the country and that the equitable share of revenue provides adequate funding for these functions. Provision for minimum standards through the equitable share will also eliminate provincial disparities that give rise to interprovincial spill-overs. As provinces begin to satisfy the basic social needs within their jurisdictions, communities will no longer find it necessary to utilize services from other provinces.

The most important element of the FFC revenue sharing formula that requires urgent attention relates to the granting of the surcharge on personal income tax. Such a surcharge will not only put more revenue in the coffers of provincial governments, but will also enhance the cooperation between spheres of government. Further, improvements in provincial own source revenue through a systematic and controlled approach discourages provinces from pursuing revenue items that will be detrimental to the stabilization efforts of the national government. Adequate funding of provincial governments will provide provinces with the ability to ensure political transparency, provide efficient public services, promote good health and education of the

citizens of the country and create a favorable climate for stable economic growth. For their part, provinces need to design expenditure priorities that are in line with the expectation of their respective communities thereby convincing national government that spending is carefully targeted. Also, provinces need to build sufficient capacity to deal with expenditure management.

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Annexure A

Unit root tests for residuals

Based on OLS regression of PUBSIZ on:

INPT FISDEC1 FISCOL1 PERCAP1 POP1

21 used for estimation from 1994Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.0684	22.6516	21.6516	21.2975	21.6553
ADF(1)	-2.9175	23.3039	21.3039	20.5958	21.3114
ADF(2)	-2.4840	23.3658	20.3658	19.3038	20.3772
ADF(3)	-1.9388	23.3689	19.3689	17.9528	19.3840

95% critical value for the augmented Dickey-Fuller statistic = -4.9122

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for residuals

Based on OLS regression of PUBSIZ on:

INPT FISDEC2 FiSCOL2 PERCAP2 POP2

21 observations used for estimation from 1994Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.2440	22.5019	21.5019	21.1479	21.5057
ADF(1)	-2.5203	22.5387	20.5387	19.8306	20.5462
ADF(2)	-2.5385	22.9663	19.9663	18.9042	19.9776
ADF(3)	-1.6403	23.1973	19.1973	17.7812	19.2124

95% critical value for the augmented Dickey-Fuller statistics = -4.9112

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for residuals

Based on OLS regression of PUBSIZ on:

NPT FISDEC3 FISCOL3 PERCAP3 POP3

21 observations used for estimation from 1994Q2 to 1999Q2.

	Test Statistic	LL	AIC	SBC	HQC
DF	-2.6683	18.6390	17.6390	17.3565	17.6971
ADF(1)	-2.9608	19.6099	17.6099	17.0449	17.7260
ADF(2)	-2.0958	19.6106	16.6106	15.7632	16.7848
ADF(3)	-1.6821	19.6223	15.6223	14.4924	15.8545

5% critical value for the augmented Dickey-Fuller statistic = -4.9122

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Annexure B

Unit root tests for variable PUBSIZ1

The Dickey-Fuller regressions include an intercept and a linear trend

7 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
ADF	-7.9712	64.0557	62.0557	61.2224	61.9728
ADF(1)	-4.5875	66.3210	63.3210	62.0712	63.1968
ADF(2)	-5.5805	69.1229	65.1229	63.4565	64.9572
ADF(3)	-4.3657	69.2897	64.2897	62.2006	64.0826

5% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PUBSIZ1

The Dickey-Fuller regressions include an intercept but not a trend

7 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
ADF	-7.4349	64.0765	61.0765	59.8267	60.9523
ADF(1)	-3.8644	66.4496	62.4496	60.7832	62.2840
ADF(2)	-4.7768	69.1366	64.1366	62.0536	63.9296
ADF(3)	-3.6870	69.2903	63.2903	60.7906	63.0418

5% critical value for the augmented Dickey-Fuller statistics = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable FISDEC1

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-2.7122	52.2650	50.2650	49.4924	50.2254
ADF(1)	-1.5998	52.2659	49.2659	48.1070	49.2065
ADF(2)	-1.5272	53.2175	49.2175	47.6724	49.1384
ADF(3)	-1.3600	53.4754	48.4754	46.5439	48.3765

95% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISDEC1

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.3325	52.3975	49.3975	48.2386	49.3382
ADF(1)	-3.612	53.5171	48.5171	46.9719	48.4380
ADF(2)	-1.5525	53.2681	48.2681	46.3366	48.1692
ADF(3)	-1.5124	53.4975	47.4975	45.1797	47.3788

95% critical value for the augmented Dickey-Fuller statistic = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISCOL1

The Dickey-Fuller regressions include an intercept and a linear trend

7 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.5041	20.9173	18.9173	18.0841	18.8345
ADF(1)	-1.9596	26.5921	22.5921	20.9257	22.4265
ADF(2)	-1.9561	29.7085	24.7085	22.6254	24.5014
ADF(3)	-1.3715	36.3657	30.3657	27.8661	30.1173

5% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISCOL1

The Dickey-Fuller regressions include an intercept but not a trend

7 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.9399	24.4145	21.4145	20.1646	21.2902
ADF(1)	-2.0057	27.0420	23.0420	21.3755	22.8763
ADF(2)	-2.2941	27.8415	22.8415	20.7585	22.6345
ADF(3)	-1.0187	29.8401	23.8401	21.3404	23.5916

5% critical value for the augmented Dickey-Fuller statistics = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable PERCAP1

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-1.0069	-103.3857	-105.3857	-106.2190	-105.4686
ADF(1)	-.97209	-103.3811	-106.3811	-107.6309	-106.5053
ADF(2)	-1.1234	-102.7894	-106.7894	-108.4558	-106.9550
ADF(3)	-10-.0888	-102.5132	-107.5132	-109.5963	-107.7203

95% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PERCAP1

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-.98297	-102.9288	-105.9288	-107.1786	-106.0530
ADF(1)	-1.0085	-102.8484	-106.8481	-108.5146	-107.0138
ADF(2)	-.44117	-102.6984	-107.6984	-109.7814	-107.9055
ADF(3)	-.83199	-102.0754	-108.0754	-110.5750	-108.3238

95% critical value for the augmented Dickey-Fuller statistic = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable POP1

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC	
DF	2.6208		75.9761	73.9761	73.2035	73.9365
ADF(1)	1.18934	80.2233	77.2233	76.6793	76.1640	
ADF(2)	1.14038	80.2245	76.2245	74.6793	76.1454	
ADF(3)	1.07220	80.4644	75.4644	73.5330	75.3655	

5% critical value for the augmented Dickey-Fuller statistics = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable POP1

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	.800262	76.0086	73.0086	71.8498	72.9493
ADF(1)	-1.1738	82.1728	78.1728	76.6277	78.0937
ADF(2)	-1.8827	83.6801	78.6801	76.7486	78.5812
ADF(3)	-2.3969	85.1068	79.1068	76.7890	78.9881

5% critical value for the augmented Dickey-Fuller statistic = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PUBSIZ2

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-7.1987	25.4487	23.4487	22.6155	23.3659
ADF(1)	-3.9580	27.8484	24.8484	23.5985	24.7241
ADF(2)	-5.0786	30.8241	26.8241	25.1577	26.6585
ADF(3)	-3.9220	30.9818	25.9818	23.8988	25.7748

95% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PUBSIZ2

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-6.7746	25.4758	22.4758	21.2260	22.3515
ADF(1)	-3.3809	27.9503	23.9503	22.2838	23.7846
ADF(2)	-4.4263	30.8396	25.8396	23.7566	25.6326
ADF(3)	-3.4002	30.9845	24.9845	22.4849	24.7361

95% critical value for the augmented Dickey-Fuller statistics = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable FISDEC2

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC	
DF	-2.6735	9.0655	7.0655		6.2323	6.9827
ADF(1)	-1.6086	9.4207	6.4207	5.1708	6.2964	
ADF(2)	-1.1833	9.5281	5.5281	3.8617	5.3624	
ADF(3)	-.46059	14.0143	9.0143	6.9312	8.8072	

95% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISDEC2

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.5330	13.4595	10.4595	9.2097	10.3353
ADF(1)	-3.4183	13.5650	9.5650	7.8986	9.3993
ADF(2)	-3.3677	14.4655	9.4655	7.3825	9.2585
ADF(3)	-1.5907	15.6730	9.6730	7.1733	9.4245

95% critical value for the augmented Dickey-Fuller statistic = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISCOL2

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-3.9957	4.6787	2.6787	1.8455	2.5959
ADF(1)	-2.7546	11.6801	8.6801	7.4303	8.5559
ADF(2)	-2.7081	11.8101	7.8101	6.1437	7.6444
ADF(3)	-2.1171	13.9336	8.9336	6.8506	8.7265

95% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISCOL2

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-5.2048	7.7822	4.7822	3.5324	4.6580
ADF(1)	-2.1989	11.9327	7.9327	6.2662	7.7670
ADF(2)	-2.2936	12.3904	7.3904	5.3073	7.1833
ADF(3)	-1.1352	13.9478	7.9478	5.4482	7.6994

95% critical value for the augmented Dickey-Fuller statistics = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable PERCAP2

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-1.8269	55.9078	53.9078	53.0746	53.8250
ADF(1)	-1.6494	55.9123	52.9123	51.6625	52.7881
ADF(2)	-1.9355	56.6643	52.6643	50.9979	52.4986
ADF(3)	-1.6221	57.1084	52.1084	50.0254	51.9014

95% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PERCAP2

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-.44661	55.9336	52.9336	51.6838	52.8094
ADF(1)	-.39989	55.9337	51.9337	50.2672	51.7680
ADF(2)	.48921	57.0150	52.0150	49.9320	51.8079
ADF(3)	.096456	57.1530	51.1530	48.6534	50.9045

95% critical value for the augmented Dickey-Fuller statistic = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable POP2

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC	
DF	2.9691		81.1271	79.1271	78.2939	79.0443
ADF(1)	1.2170	85.6736	82.6736	81.4237	82.5493	
ADF(2)	1.1654	85.6736	81.6736	80.0072	81.5080	
ADF(3)	1.1620	85.9709	80.9709	78.8879	80.7638	

95% critical value for the augmented Dickey-Fuller statistics = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable POP2

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	.779622	81.2130	78.2130	76.9632	78.0888
ADF(1)	-1.1852	87.7112	83.7112	82.0448	83.5456
ADF(2)	-1.8384	89.0568	84.0568	81.9737	83.8497
ADF(3)	-2.2224	90.1642	84.1642	81.6645	83.9157

95% critical value for the augmented Dickey-Fuller statistic = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PUBSIZ3

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-6.8123	11.0587	9.0587	8.0007	9.4428
ADF(1)	-3.4225	12.3810	9.3810	8.9942	9.0120
ADF(2)	-2.4805	13.1229	9.1229	7.4565	9.6495
ADF(3)	-1.3557	13.5897	10.5897	7.2566	9.0826

95% critical value for the augmented Dickey-Fuller statistic = -3.0522

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PUBSIZ3

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-5.0925	17.0763	16.0763	15.3267	15.0523
ADF(1)	-3.2164	17.8581	16.8581	15.7532	14.2840
ADF(2)	-1.7768	18.1376	16.1376	16.0006	14.9296
ADF(3)	-1.2870	18.2903	16.2903	16.7922	14.0413

95% critical value for the augmented Dickey-Fuller statistics = -3.7119

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable FISDEC3

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-2.6598	7.4658	5.4658	4.7578	5.4734
ADF(1)	-1.6116	7.6908	4.6908	3.6288	4.7021
ADF(2)	-1.2171	7.7148	3.7148	2.2987	3.7299
ADF(3)	-.097859	11.6855	6.6855	4.9154	6.70435

95% critical value for the augmented Dickey-Fuller statistic = -3.0819

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISDEC3

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.2101	11.1145	8.1145	7.0524	8.1258
ADF(1)	-3.1058	11.1835	7.1835	5.7674	7.1986
ADF(2)	-3.0915	12.0603	7.0603	5.2902	7.0792
ADF(3)	-1.3003	13.3338	7.3338	5.2096	7.3564

95% critical value for the augmented Dickey-Fuller statistic = -3.7612

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISCOL3

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.1926	5.5795	3.5795	2.8714	3.5870
ADF(1)	-3.2545	12.5513	9.5513	8.4892	9.5626
ADF(2)	-3.1250	12.6457	8.6457	7.2296	8.6608
ADF(3)	-2.5231	13.7904	8.7904	7.0203	8.8093

95% critical value for the augmented Dickey-Fuller statistic = -3.0819

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable FISCOL3

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-4.8589	7.8300	4.8300	3.7679	4.8413
ADF(1)	-1.3257	12.6454	8.6454	7.2293	8.6605
ADF(2)	-1.2076	12.6822	7.6822	5.9121	7.7010
ADF(3)	-.041151	14.6922	8.6922	6.5680	8.7148

95% critical value for the augmented Dickey-Fuller statistics = -3.7612

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable PERCAP3

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	-1.7596	49.1041	47.1041	46.3960	47.1116
ADF(1)	-1.4507	49.1539	46.1539	44.0919	46.1653
ADF(2)	-1.5618	49.6775	45.6775	44.2613	45.6925
ADF(3)	-1.4167	50.2480	45.2480	43.4779	45.2668

95% critical value for the augmented Dickey-Fuller statistic = -3.0819

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable PERCAP3

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	.075975	49.1475	46.1475	45.0854	46.1588
ADF(1)	-.031209	49.1604	45.1604	43.7443	45.1755
ADF(2)	.77172	50.2432	45.2432	43.4731	45.2621
ADF(3)	.34161	50.3947	44.3947	42.2705	46.7532

95% critical value for the augmented Dickey-Fuller statistic = -3.7612

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root tests for variable POP3

The Dickey-Fuller regressions include an intercept and a linear trend

17 observations used in the estimation of all ADF regressions

Sample period from 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC	
DF	2.1583		70.7724	68.7724	68.0643	68.7799
ADF(1)	1.1328	74.7833	71.7833	70.7212	71.7946	
ADF(2)	1.0888	74.7893	70.7893	69.3732	70.8044	
ADF(3)	.94557	74.9726	69.9726	68.2025	69.9915	

95% critical value for the augmented Dickey-Fuller statistics = -3.0819

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC = Hannan-Quinn Criterion

Unit root test for variable POP3

The Dickey-Fuller regressions include an intercept but not a trend

17 observations used in the estimation of all ADF regressions.

Sample period for 1995Q2 to 1999Q2

	Test Statistic	LL	AIC	SBC	HQC
DF	.70078	70.7858	67.7858	66.7237	72.7971
ADF(1)	-1.2116	76.7199	72.7199	71.3038	72.7350
ADF(2)	-1.9298	78.3447	73.3447	71.5746	73.3636
ADF(3)	-2.5007	79.9328	73.9328	71.8086	73.9554

95% critical value for the augmented Dickey-Fuller statistic = -3.7612

LL = Maximum log-likelihood AIC = Akaike Information Criterion

SBC = Schwarz Bayesian Criterion HQC =Hannan-Quinn Criterion

ANNEXURE C

FILE INPUT SIPHO.IN
 UNIT 80 IS NOW ASSIGNED TO: SIPHO.IN
 SAMPLE 1 22
 HEAD Y X1 X2 X3 X4 / LIST
 VARIABLES AND 22 OBSERVATIONS STARTING AT OBS 1

Y	X1	X2	X3	X4
.442000	3.188000	2.651000	9.072000	3.671200
.204000	3.484000	2.753000	9.095000	3.675300
.281000	3.369000	2.683000	9.110000	3.679600
.365000	3.253000	2.398000	9.126000	3.684600
.666000	2.883000	2.406000	9.165000	3.689600
.356000	3.419000	2.364000	9.186000	3.694600
.387000	3.230000	2.707000	9.197000	3.699800
.256000	3.447000	2.492000	9.231000	3.700100
.284000	3.356000	2.529000	9.262000	3.700600
.313000	3.807000	2.372000	9.290000	3.701100
.328000	3.570000	2.745000	9.306000	3.701500
.243000	3.698000	2.466000	9.342000	3.702000
.400000	3.575000	2.298000	9.382000	3.702500
.305000	3.853000	2.345000	9.400000	3.705200
.393000	3.666000	2.476000	9.419000	3.705700
.297000	3.729000	2.304000	9.432000	3.709700
.420000	3.517000	2.254000	9.459000	3.715800
.298000	3.824000	2.251000	9.473000	3.721800
.387000	3.541000	2.332000	9.479000	3.728100
.299000	3.687000	2.242000	9.487000	3.734300
.347000	3.529000	2.231000	9.513000	3.740500
.244000	3.983000	2.291000	9.524000	3.746700

LS Y X1 X2 X3 X4 / MAX

REQUIRED MEMORY IS PAR= 3 CURRENT PAR= 500

LS ESTIMATION

OBSERVATIONS DEPENDENT VARIABLE = Y

NOTE..SAMPLE RANGE SET TO: 1, 22

R-SQUARE = 0.7104 R-SQUARE ADJUSTED = 0.6423

VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.32870E-02

STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.57332E-01

SUM OF SQUARED ERRORS-SSE= 0.55879E-01

MEAN OF DEPENDENT VARIABLE = 2.3416

LOG OF THE LIKELIHOOD FUNCTION = 34.5150

DELTA SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)

AKAIKE (1969) FINAL PREDICTION ERROR - FPE = 0.40341E-02

FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)

AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -5.5211
 SCHWARZ (1978) CRITERION - LOG SC = -5.2731
 MODEL SELECTION TESTS - SEE RAMANATHAN (1992,P.167)
 CRAVEN-WAHBA (1979)
 GENERALIZED CROSS VALIDATION - GCV = 0.42538E-02
 HANNAN AND QUINN (1979) CRITERION = 0.42423E-02
 RICE (1984) CRITERION = 0.46566E-02
 SHIBATA (1981) CRITERION = 0.36945E-02
 SCHWARZ (1978) CRITERION - SC = 0.51277E-02
 AKAIKE (1974) INFORMATION CRITERION - AIC = 0.40016E-02

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	0.13709	4.	0.34272E-01	10.426
ERROR	0.55879E-01	17.	0.32870E-02	P-VALUE
TOTAL	0.19297	21.	0.91889E-02	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	120.76	5.	24.153	7347.952
ERROR	0.55879E-01	17.	0.32870E-02	P-VALUE
TOTAL	120.82	22.	5.4918	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
X1	-0.42406	0.7350E-01	-5.769	0.000	-1.1288	-0.6389
X2	-0.15987	0.1091	-1.466	0.161	-0.335	-0.1663
X3	0.68632	0.2775	2.473	0.024	0.514	2.7305
X4	-3.2860	1.697	-1.936	0.070	-0.425	-5.1994
CONSTANT	10.008	4.539	2.205	0.042	0.472	4.2741

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

X1	0.54025E-02				
X2	-0.15065E-02	0.11894E-01			
X3	-0.11223E-01	0.10962E-01	0.77011E-01		
X4	0.27221E-01	0.76852E-02	-0.38179	2.8813	
CONSTANT	-0.11686E-01	-0.15426	0.71001	-7.2334	20.603

X1	X2	X3	X4	CONSTANT
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CORRELATION MATRIX OF COEFFICIENTS

X1	1.0000				
X2	-0.18793	1.0000			
X3	-0.55024	0.36221	1.0000		
X4	0.21818	0.41514E-01	-0.81050	1.0000	
CONSTANT	-0.35027E-01	-0.31162	0.56368	-0.93883	1.0000

X1	X2	X3	X4	CONSTANT
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BS. NO.	OBSERVED VALUE	PREDICTED VALUE	CALCULATED RESIDUAL	
1	2.4420	2.3949	0.47056E-01	I *
2	2.2040	2.2554	-0.51428E-01	* I
3	2.2810	2.3116	-0.30551E-01	* I
4	2.3650	2.4009	-0.35856E-01	* I
5	2.6660	2.5668	0.99184E-01	I *
6	2.3560	2.3442	0.11784E-01	I*
7	2.3870	2.3600	0.27010E-01	I*
8	2.2560	2.3247	-0.68690E-01	* I
9	2.2840	2.3770	-0.92997E-01	* I
10	2.3130	2.2284	0.84580E-01	I *
11	2.3280	2.2790	0.49044E-01	I *
12	2.2430	2.2923	-0.49345E-01	* I
13	2.4000	2.3972	0.28271E-02	*
14	2.3050	2.2753	0.29748E-01	I *
15	2.3930	2.3450	0.47995E-01	I *
16	2.2970	2.3416	-0.44565E-01	* I
17	2.4200	2.4379	-0.17945E-01	* I
18	2.2980	2.2981	-0.13021E-03	*
19	2.3870	2.3886	-0.16054E-02	*
20	2.2990	2.3262	-0.27198E-01	* I
21	2.3470	2.3924	-0.45429E-01	* I
22	2.2440	2.1775	0.66510E-01	I *

URBIN-WATSON = 2.0650 VON NEUMANN RATIO = 2.1633 RHO = -0.09978

SIDUAL SUM = -0.84377E-14 RESIDUAL VARIANCE = 0.32870E-02

M OF ABSOLUTE ERRORS= 0.93148

SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7104

NS TEST: 9 RUNS, 10 POS, 0 ZERO, 12 NEG NORMAL STATISTIC = -1.2822

EFFICIENT OF SKEWNESS = 0.2244 WITH STANDARD DEVIATION OF 0.4910

EFFICIENT OF EXCESS KURTOSIS = -0.7393 WITH STANDARD DEVIATION OF 0.9528

RQUE-BERA NORMALITY TEST- CHI-SQUARE(2 DF)= 0.8106 P-VALUE= 0.667

GOODNESS OF FIT TEST FOR NORMALITY OF RESIDUALS - 10 GROUPS

SERVED 0.0 0.0 1.0 6.0 5.0 4.0 4.0 2.0 0.0 0.0

PECTED 0.2 0.6 1.7 3.5 5.0 5.0 3.5 1.7 0.6 0.2

I-SQUARE = 3.9737 WITH 3 DEGREES OF FREEDOM, P-VALUE= 0.264

TOP

FILE INPUT SIPHOA.IN
NIT 80 IS NOW ASSIGNED TO: SIPHOA.IN
SAMPLE 1 21

* Y = PUBSIZ
* X1 = FISCOL
* X2 = FISDEC
* X3 = PERCAP
* X4 = LPOP

READ Y X1 X2 X3 X4 / LIST

5 VARIABLES AND 21 OBSERVATIONS STARTING AT OBS 1

Y	X1	X2	X3	X4
0.2370000	0.2960000	0.1020000	0.2300000E-01	0.4060000E-02
0.7700000E-01	-0.1150000	-0.7000000E-01	0.1500000E-01	0.4300000E-02
0.8400000E-01	-0.1160000	-0.2850000	0.1600000E-01	0.5030000E-02
0.3010000	-0.3700000	0.9000000E-02	0.3900000E-01	0.5010000E-02
-0.3100000	0.5360000	-0.4200000E-01	0.2100000E-01	0.4980000E-02
0.3200000E-01	-0.1890000	0.3420000	0.1100000E-01	0.5210000E-02
-0.1320000	0.2170000	-0.2150000	0.3400000E-01	0.2500000E-03
0.2800000E-01	-0.9100000E-01	0.3700000E-01	0.3100000E-01	0.4900000E-03
0.2900000E-01	0.4510000	-0.1570000	0.2800000E-01	0.4900000E-03
0.1500000E-01	-0.2360000	0.3730000	0.1600000E-01	0.4900000E-03
-0.8500000E-01	0.1280000	-0.2790000	0.3600000E-01	0.4900000E-03
0.1570000	-0.1230000	-0.1690000	0.4000000E-01	0.4900000E-03
-0.9500000E-01	0.2780000	0.4700000E-01	0.1800000E-01	0.2710000E-02
0.8800000E-01	-0.1870000	0.1320000	0.2000000E-01	0.4900000E-03
-0.9600000E-01	0.6200000E-01	-0.1730000	0.1200000E-01	0.3930000E-02
0.1230000	-0.2120000	-0.4900000E-01	0.2700000E-01	0.6100000E-02
-0.1220000	0.3070000	-0.3000000E-02	0.1400000E-01	0.6070000E-02
0.8800000E-01	-0.2830000	0.8100000E-01	0.7000000E-02	0.6270000E-02
-0.8700000E-01	0.1460000	-0.8900000E-01	0.8000000E-02	0.6230000E-02
0.4700000E-01	-0.1580000	-0.1100000E-01	0.2600000E-01	0.6190000E-02
-0.1020000	0.4540000	0.5900000E-01	0.1100000E-01	0.6150000E-02

OLS Y X1 X2 X3 X4 / MAX

REQUIRED MEMORY IS PAR= 3 CURRENT PAR= 2000

OLS ESTIMATION

21 OBSERVATIONS DEPENDENT VARIABLE = Y

NOTE..SAMPLE RANGE SET TO: 1, 21

R-SQUARE = 0.7211 R-SQUARE ADJUSTED = 0.6514

VARIANCE OF THE ESTIMATE-SIGMA**2 = 0.67994E-02

STANDARD ERROR OF THE ESTIMATE-SIGMA = 0.82459E-01

SUM OF SQUARED ERRORS-SSE= 0.10879

MEAN OF DEPENDENT VARIABLE = -0.93810E-02
 LOG OF THE LIKELIHOOD FUNCTION = 25.4622

MODEL SELECTION TESTS - SEE JUDGE ET AL. (1985,P.242)
 AKAIKE (1969) FINAL PREDICTION ERROR - FPE = 0.84183E-02
 (FPE IS ALSO KNOWN AS AMEMIYA PREDICTION CRITERION - PC)
 AKAIKE (1973) INFORMATION CRITERION - LOG AIC = -4.7867
 SCHWARZ (1978) CRITERION - LOG SC = -4.5380
 MODEL SELECTION TESTS - SEE RAMANATHAN (1992,P.167)
 CRAVEN-WAHBA (1979)
 GENERALIZED CROSS VALIDATION - GCV = 0.89243E-02
 HANNAN AND QUINN (1979) CRITERION = 0.88028E-02
 RICE (1984) CRITERION = 0.98901E-02
 SHIBATA (1981) CRITERION = 0.76474E-02
 SCHWARZ (1978) CRITERION - SC = 0.10695E-01
 AKAIKE (1974) INFORMATION CRITERION - AIC = 0.83403E-02

ANALYSIS OF VARIANCE - FROM MEAN

	SS	DF	MS	F
REGRESSION	0.28131	4.	0.70328E-01	10.343
ERROR	0.10879	16.	0.67994E-02	P-VALUE
TOTAL	0.39010	20.	0.19505E-01	0.000

ANALYSIS OF VARIANCE - FROM ZERO

	SS	DF	MS	F
REGRESSION	0.28316	5.	0.56632E-01	8.329
ERROR	0.10879	16.	0.67994E-02	P-VALUE
TOTAL	0.39195	21.	0.18664E-01	0.000

VARIABLE NAME	ESTIMATED COEFFICIENT	STANDARD ERROR	T-RATIO	P-VALUE	PARTIAL CORR.	STANDARDIZED COEFFICIENT	ELASTICITY AT MEANS
X1	-0.42271	0.7300E-01	-5.790	0.000	-0.823	-0.8228	1.7059
X2	-0.81123E-01	0.1241	-0.6536	0.523	-0.161	-0.1004	-0.1482
X3	2.7084	2.430	1.114	0.282	0.268	0.1976	-6.2279
X4	3.4784	9.204	0.3779	0.710	0.094	0.0608	-1.3319
CONSTANT	-0.65686E-01	0.7816E-01	-0.8404	0.413	-0.206	0.0000	7.0021

VARIANCE-COVARIANCE MATRIX OF COEFFICIENTS

X1	0.53293E-02				
X2	0.31410E-02	0.15407E-01			
X3	0.47310E-01	0.13366	5.9065		
X4	0.10056	0.19967	12.614	84.716	
CONSTANT	-0.15297E-02	-0.34553E-02	-0.17222	-0.57678	0.61092E-02

X1 X2 X3 X4 CONSTANT

CORRELATION MATRIX OF COEFFICIENTS

1 1.0000
 2 0.34664 1.0000
 3 0.26665 0.44309 1.0000
 4 0.14966 0.17477 0.56390 1.0000
 ONSTANT -0.26808 -0.35615 -0.90662 -0.80174 1.0000

X1 X2 X3 X4 CONSTANT

OBS. NO.	OBSERVED VALUE	PREDICTED VALUE	CALCULATED RESIDUAL		
1	-0.23700	-0.12267	-0.11433	*	I
2	0.77000E-01	0.44187E-01	0.32813E-01		I *
3	0.84000E-01	0.67299E-01	0.16701E-01		I*
4	0.30100	0.21304	0.87960E-01		I *
5	-0.31000	-0.21466	-0.95345E-01	*	I
6	0.32000E-01	0.34377E-01	-0.23771E-02	*	
7	-0.13200	-0.47020E-01	-0.84980E-01	*	I
8	0.28000E-01	0.55443E-01	-0.27443E-01	*	I
9	0.29000E-01	-0.16606	0.19506		I *
10	0.15000E-01	0.48854E-01	-0.33854E-01	*	I
11	-0.85000E-01	0.20451E-02	-0.87045E-01	*	I
12	0.15700	0.11006	0.46944E-01		I *
13	-0.95000E-01	-0.12884	0.33836E-01		I *
14	0.88000E-01	0.58525E-01	0.29475E-01		I *
15	-0.96000E-01	-0.31690E-01	-0.64310E-01	*	I
16	0.12300	0.12225	0.75204E-03	*	
17	-0.12200	-0.13618	0.14185E-01		I*
18	0.88000E-01	0.88139E-01	-0.13879E-03	*	
19	-0.87000E-01	-0.76845E-01	-0.10155E-01	*	I
20	0.47000E-01	0.93943E-01	-0.46943E-01	*	I
21	-0.10200	-0.21120	0.10920		I *

DURBIN-WATSON = 2.2198 VON NEUMANN RATIO = 2.3308 RHO = -0.25245
 RESIDUAL SUM = 0.13878E-16 RESIDUAL VARIANCE = 0.67994E-02
 SUM OF ABSOLUTE ERRORS= 1.1338
 R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.7211
 RUNS TEST: 10 RUNS, 10 POS, 0 ZERO, 11 NEG NORMAL STATISTIC = -0.6626
 COEFFICIENT OF SKEWNESS = 0.7645 WITH STANDARD DEVIATION OF 0.5012
 COEFFICIENT OF EXCESS KURTOSIS = 1.1588 WITH STANDARD DEVIATION OF 0.9719

SHARQUE-BERA NORMALITY TEST- CHI-SQUARE(2 DF)= 2.1034 P-VALUE= 0.349

GOODNESS OF FIT TEST FOR NORMALITY OF RESIDUALS - 10 GROUPS

OBSERVED 0.0 0.0 1.0 4.0 6.0 7.0 1.0 1.0 1.0 0.0
 EXPECTED 0.2 0.6 1.7 3.3 4.7 4.7 3.3 1.7 0.6 0.2
 CHI-SQUARE = 4.9402 WITH 3 DEGREES OF FREEDOM, P-VALUE= 0.176
 STOP

ANNEXURE D

OBSERVATIONS

FILE INPUT SIPHO10.IN

UNIT 80 IS NOW ASSIGNED TO: siph010.in

SAMPLE 1 22

READ X1 X2 X3 X4 / LIST

VARIABLES AND 22 OBSERVATIONS STARTING AT OBS 1

X1	X2	X3	X4
188000	2.651000	9.072000	3.671200
484000	2.753000	9.095000	3.675300
369000	2.683000	9.110000	3.679600
253000	2.398000	9.126000	3.684600
883000	2.406000	9.165000	3.689600
419000	2.364000	9.186000	3.694600
230000	2.707000	9.197000	3.699800
447000	2.492000	9.231000	3.700100
356000	2.529000	9.262000	3.700600
807000	2.372000	9.290000	3.701100
570000	2.745000	9.306000	3.701500
698000	2.466000	9.342000	3.702000
575000	2.298000	9.382000	3.702500
853000	2.345000	9.400000	3.705200
666000	2.476000	9.419000	3.705700
729000	2.304000	9.432000	3.709700
517000	2.254000	9.459000	3.715800
824000	2.251000	9.473000	3.721800
541000	2.332000	9.479000	3.728100
687000	2.242000	9.487000	3.734300
529000	2.231000	9.513000	3.740500
983000	2.291000	9.524000	3.746700

IM BOLS 6 10000 STDOLS 6 10000

SET RANFIX

SET NODOECHO

SET MAXCOL=10000

DO #=1, 10000

SAMPLE 1 10

ENR E=NOR(1)

SAMPLE 1 10

ENR Y=10.06-(0.42)*X1-(0.16)*X2+(0.69)*X3-(3.31)*X4+E

LIST Y X1 X2 X3 X4 / COEF=BOLS:# STDERR=STDOLS:#

END

*** EXECUTION BEGINNING FOR DO LOOP # = 1

*** EXECUTION FINISHED FOR DO LOOP # = 10000

PRINT BOLS=BOLS'

ATRIX STDOLS=STDOLS'
 AMPLE 1 10000
 FAT BOLS / MEAN=B STDEV=ASE

ME	N	MEAN	ST.DEV	VARIANCE	MINIMUM	MAXIMUM
OTE...TREATING COLUMNS OF BOLS AS VECTORS						
LS	10000	-0.46013	1.8940	3.5874	-7.5130	6.0728
LS	10000	-0.16583	2.6504	7.0246	-9.0935	10.879
LS	10000	0.86841	18.303	335.02	-78.533	71.087
LS	10000	-4.5504	105.76	11184.	-401.42	447.95
LS	10000	13.149	241.04	58098.	-939.52	866.97
LS	10000	0.00000	0.00000	0.00000	0.00000	0.00000

FAT STDOLS / MEAN=ESE STDEV=STDSE

ME	N	MEAN	ST.DEV	VARIANCE	MINIMUM	MAXIMUM
OTE...TREATING COLUMNS OF STDOLS AS VECTORS						
DOLS	10000	1.7710	0.57189	0.32706	0.19369	4.3721
DOLS	10000	2.4928	0.80498	0.64800	0.27264	6.1541
DOLS	10000	17.305	5.5882	31.228	1.8927	42.721
DOLS	10000	100.45	32.437	1052.2	10.986	247.98
DOLS	10000	229.65	74.158	5499.4	25.117	566.93
DOLS	10000	0.00000	0.00000	0.00000	0.00000	0.00000

ENR T=B/ESE

AMPLE 1 6

ORMAT (5F6.2)

RINT B ASE ESE T STDSE / FORMAT

B	ASE	ESE	T	STDSE
6	1.89	1.77	-0.26	0.57
7	2.65	2.49	-0.07	0.80
7	18.30	17.30	0.05	5.59
5	105.76	100.45	-0.05	32.44
15	241.04	229.65	0.06	74.16
0	0.00	0.00	0.00	0.00

B is the average parameter estimate

ASE is the standard deviation of the parameter estimate

ESE is the average standard error

VALUES

STDSE is the standard deviation of the standard errors

TOP

OBSERVATIONS

LE INPUT SIPHO15.IN

IT 80 IS NOW ASSIGNED TO: siph015.in

AMPLE 1 22

READ X1 X2 X3 X4 / LIST

VARIABLES AND 22 OBSERVATIONS STARTING AT OBS 1

X1	X2	X3	X4
.188000	2.651000	9.072000	3.671200
.484000	2.753000	9.095000	3.675300
.369000	2.683000	9.110000	3.679600
.253000	2.398000	9.126000	3.684600
.883000	2.406000	9.165000	3.689600
.419000	2.364000	9.186000	3.694600
.230000	2.707000	9.197000	3.699800
.447000	2.492000	9.231000	3.700100
.356000	2.529000	9.262000	3.700600
.807000	2.372000	9.290000	3.701100
.570000	2.745000	9.306000	3.701500
.698000	2.466000	9.342000	3.702000
.575000	2.298000	9.382000	3.702500
.853000	2.345000	9.400000	3.705200
.666000	2.476000	9.419000	3.705700
.729000	2.304000	9.432000	3.709700
.517000	2.254000	9.459000	3.715800
.824000	2.251000	9.473000	3.721800
.541000	2.332000	9.479000	3.728100
.687000	2.242000	9.487000	3.734300
.529000	2.231000	9.513000	3.740500
.983000	2.291000	9.524000	3.746700

IM BOLS 6 10000 STDOLS 6 10000

ET RANFIX

ET NODOECHO

ET MAXCOL=10000

O#=1, 10000

AMPLE 1 15

ENR E=NOR(1)

AMPLE 1 15

ENR Y=10.06-(0.42)*X1-(0.16)*X2+(0.69)*X3-(3.31)*X4+E

DLS Y X1 X2 X3 X4 / COEF=BOLS:# STDERR=STDOLS:#

ENDO

*** EXECUTION BEGINNING FOR DO LOOP # = 1

*** EXECUTION FINISHED FOR DO LOOP # = 10000

ATRIX BOLS=BOLS'

ATRIX STDOLS=STDOLS'

_SAMPLE 1 10000
_STAT BOLS / MEAN=B STDEV=ASE

NAME	N	MEAN	ST.DEV	VARIANCE	MINIMUM	MAXIMUM
...NOTE...TREATING COLUMNS OF BOLS AS VECTORS						
BOLS	10000	-0.41986	1.5740	2.4776	-6.5139	5.2451
BOLS	10000	-0.15566	1.9526	3.8126	-7.3374	6.8902
BOLS	10000	0.74642	6.7668	45.789	-23.893	29.277
BOLS	10000	-3.6931	55.807	3114.5	-234.91	189.50
BOLS	10000	10.941	159.40	25407.	-544.61	622.20
BOLS	10000	0.00000	0.00000	0.00000	0.00000	0.00000

_STAT STDOLS / MEAN=ESE STDEV=STDSE

NAME	N	MEAN	ST.DEV	VARIANCE	MINIMUM	MAXIMUM
...NOTE...TREATING COLUMNS OF STDOLS AS VECTORS						
STDOLS	10000	1.5344	0.34895	0.12177	0.41911	2.9621
STDOLS	10000	1.9137	0.43521	0.18941	0.52272	3.6943
STDOLS	10000	6.5570	1.4912	2.2236	1.7910	12.658
STDOLS	10000	54.217	12.330	152.03	14.809	104.66
STDOLS	10000	154.89	35.225	1240.8	42.307	299.00
STDOLS	10000	0.00000	0.00000	0.00000	0.00000	0.00000

_GENR T=B/ESE

_SAMPLE 1 6

_FORMAT (5F6.2)

_PRINT B ASE ESE T STDSE / FORMAT

B	ASE	ESE	T	STDSE
-0.42	1.57	1.53	-0.27	0.35
-0.16	1.95	1.91	-0.08	0.44
0.75	6.77	6.56	0.11	1.49
-3.69	55.81	54.22	-0.07	12.33
10.94	159.401	154.89	0.07	35.22
0.00	0.00	0.00	0.00	0.00

_* B is the average parameter estimate

_* ASE is the standard deviation of the parameter estimate

_* ESE is the average standard error

_* t VALUES=B/ESE

_* STDSE is the standard deviation of the standard errors

_STOP

OBSERVATIONS

```
FILE INPUT SIPHO221.IN  
JOB 80 IS NOW ASSIGNED TO: siph0221.in  
SAMPLE 1 22  
LEAD X1 X2 X3 X4 / LIST  
1 VARIABLES AND 22 OBSERVATIONS STARTING AT OBS 1
```

X1	X2	X3	X4
3.188000	2.651000	9.072000	3.671200
3.484000	2.753000	9.095000	3.675300
3.369000	2.683000	9.110000	3.679600
3.253000	2.398000	9.126000	3.684600
3.883000	2.406000	9.165000	3.689600
3.419000	2.364000	9.186000	3.694600
3.230000	2.707000	9.197000	3.699800
3.447000	2.492000	9.231000	3.700100
3.356000	2.529000	9.262000	3.700600
3.807000	2.372000	9.290000	3.701100
3.570000	2.745000	9.306000	3.701500
3.698000	2.466000	9.342000	3.702000
3.575000	2.298000	9.382000	3.702500
3.853000	2.345000	9.400000	3.705200
3.666000	2.476000	9.419000	3.705700
3.729000	2.304000	9.432000	3.709700
3.517000	2.254000	9.459000	3.715800
3.824000	2.251000	9.473000	3.721800
3.541000	2.332000	9.479000	3.728100
3.687000	2.242000	9.487000	3.734300
3.529000	2.231000	9.513000	3.740500
3.983000	2.291000	9.524000	3.746700

```
DIM BOLS 6 10000 STDOLS 6 10000  
SET RANFIX  
SET NODOECHO  
SET MAXCOL=10000  
DO #=1, 10000  
SAMPLE 1 22  
GENR E=NOR(1)  
SAMPLE 1 22  
GENR Y=10.08-(0.424)*X1-(0.159)*X2+(0.686)*X3-(3.286)*X4+E  
POLS Y X1 X2 X3 X4 / COEF=BOLS:# STDERR=STDOLS:#  
ENDO  
**** EXECUTION BEGINNING FOR DO LOOP # = 1  
**** EXECUTION FINISHED FOR DO LOOP # = 10000  
MATRIX BOLS=BOLS'
```

MATRIX STDOLS=STDOLS'

AMPLE 1 10000

TAT BOLS / MEAN=B STDEV=ASE

ME N MEAN ST.DEV VARIANCE MINIMUM MAXIMUM

NOTE...TREATING COLUMNS OF BOLS AS VECTORS

BOLS	10000	-0.41772	1.2820	1.6436	-4.9112	4.4490
BOLS	10000	-0.17227	1.9143	3.6644	-7.6421	6.6114
BOLS	10000	0.64691	4.8588	23.608	-17.219	21.877
BOLS	10000	-2.9328	29.757	885.48	-115.62	106.84
BOLS	10000	9.1422	79.430	6309.1	-300.65	313.54
BOLS	10000	0.00000	0.00000	0.00000	0.00000	0.00000

TAT STDOLS / MEAN=ESE STDEV=STDSE

ME N MEAN ST.DEV VARIANCE MINIMUM MAXIMUM

NOTE...TREATING COLUMNS OF STDOLS AS VECTORS

STDOLS	10000	1.2639	0.21679	0.47000E-01	0.53104	2.0874
STDOLS	10000	1.8754	0.32168	0.10348	0.78795	3.0973
STDOLS	10000	4.7719	0.81852	0.66997	2.0050	7.8811
STDOLS	10000	29.189	5.0067	25.067	12.264	48.207
STDOLS	10000	78.051	13.388	179.23	32.794	128.91
STDOLS	10000	0.00000	0.00000	0.00000	0.00000	0.00000

PRINT B/ESE

AMPLE 1 6

FORMAT (5F6.2)

PRINT B ASE ESE T STDSE / FORMAT

B	ASE	ESE	T	STDSE
0.42	1.28	1.26	-0.33	0.22
0.17	1.91	1.88	-0.09	0.32
0.65	4.86	4.77	0.14	0.82
0.93	29.76	29.19	-0.10	5.01
0.14	79.43	78.05	0.12	13.39
0.00	0.00	0.00	0.00	0.00

B is the average parameter estimate

ASE is the standard deviation of the parameter estimate

ESE is the average standard error

t VALUES = B/ESE

STDSE is the standard deviation of the standard errors

TOP

OBSERVATIONS

```
LE INPUT SIPHO601.IN
IT 80 IS NOW ASSIGNED TO: siph601.in
AMPLE 1 60
ENR X1=3.5277+NOR(0.25517)
ENR X2=2.4359+NOR(0.17264)
ENR X3=9.3159+NOR(0.14982)
ENR X4=3.7050+NOR(0.01995)
IM BOLS 6 10000 STDOLS 6 10000
ET RANFIX
ET NODOECHO
ET MAXCOL=10000
O #=1, 10000
AMPLE 1 60
ENR E=NOR(1)
AMPLE 1 60
ENR Y=10.08-(0.424)*X1-(0.159)*X2+(0.686)*X3-(3.286)*X4+E
OLS Y X1 X2 X3 X4 / COEF=BOLS:# STDERR=STDOLS:#
NDO
*** EXECUTION BEGINNING FOR DO LOOP # = 1
*** EXECUTION FINISHED FOR DO LOOP # = 10000
MATRIX BOLS=BOLS'
MATRIX STDOLS=STDOLS'
AMPLE 1 10000
PRINT BOLS / MEAN=B STDEV=ASE
ME N MEAN ST.DEV VARIANCE MINIMUM MAXIMUM
NOTE...TREATING COLUMNS OF BOLS AS VECTORS
LS 10000 -0.41608 0.54834 0.30068 -2.4448 1.7135
LS 10000 -0.15314 0.85285 0.72736 -3.1650 3.0690
LS 10000 0.68751 0.86780 0.75307 -2.4541 4.1027
LS 10000 -3.3338 6.1002 37.212 -27.556 18.777
LS 10000 10.201 25.532 651.90 -80.551 109.73
LS 10000 0.00000 0.00000 0.00000 0.00000 0.00000
PRINT STDOLS / MEAN=ESE STDEV=STDSE
ME N MEAN ST.DEV VARIANCE MINIMUM MAXIMUM
NOTE...TREATING COLUMNS OF STDOLS AS VECTORS
OLS 10000 0.54572 0.51549E-01 0.26573E-02 0.34998 0.74260
OLS 10000 0.85607 0.80865E-01 0.65391E-02 0.54901 1.1649
OLS 10000 0.87230 0.82397E-01 0.67893E-02 0.55941 1.1870
OLS 10000 6.1301 0.57905 0.33529 3.9313 8.3415
OLS 10000 25.690 2.4267 5.8886 16.475 34.958
OLS 10000 0.00000 0.00000 0.00000 0.00000 0.00000
ENR T=B/ESE
AMPLE 1 6
PRINT MAT (5F6.2)
PRINT B ASE ESE T STDSE / FORMAT
```

B	ASE	ESE	T	STDSE
.42	0.55	0.55	-0.76	0.05
.15	0.85	0.86	-0.18	0.08
.69	0.87	0.87	0.79	0.08
33	6.10	6.13	-0.54	0.58
20	25.53	25.69	0.40	2.43
00	0.00	0.00	0.00	0.00

B is the average parameter estimate

ASE is the standard deviation of the parameter estimate

ESE is the average standard error

t VALUES = B/ESE

STDSE is the standard deviation of the standard errors

TOP

OBSERVATIONS

```
FILE INPUT SIPHO991.IN
IT 80 IS NOW ASSIGNED TO: siph0991.in
AMPLE 1 99
ENR X1=3.5277+NOR(0.25517)
ENR X2=2.4359+NOR(0.17264)
ENR X3=9.3159+NOR(0.14982)
ENR X4=3.7050+NOR(0.01995)
DIM BOLS 6 10000 STDOLS 6 10000
LET RANFIX
LET NODOECHO
LET MAXCOL=10000
DO #=1, 10000
AMPLE 1 99
ENR E=NOR(1)
AMPLE 1 99
ENR Y=10.08-(0.424)*X1-(0.159)*X2+(0.686)*X3-(3.286)*X4+E
COLS Y X1 X2 X3 X4 / COEF=BOLS:# STDERR=STDOLS:#
NDO
*** EXECUTION BEGINNING FOR DO LOOP # = 1
*** EXECUTION FINISHED FOR DO LOOP # = 10000
MATRIX BOLS=BOLS'
MATRIX STDOLS=STDOLS'
AMPLE 1 10000
PRINT BOLS / MEAN=B STDEV=ASE

ME N MEAN ST.DEV VARIANCE MINIMUM MAXIMUM
NOTE...TREATING COLUMNS OF BOLS AS VECTORS
LS 10000 -0.42735 0.48389 0.23415 -2.1242 1.3690
LS 10000 -0.15921 0.64964 0.42204 -2.6046 2.1782
LS 10000 0.68962 0.76651 0.58753 -2.3928 3.5053
LS 10000 -3.3437 4.9357 24.361 -21.728 14.602
LS 10000 10.270 20.373 415.04 -58.455 82.462
LS 10000 0.00000 0.00000 0.00000 0.00000 0.00000
PRINT STDOLS / MEAN=ESE STDEV=STDSE

ME N MEAN ST.DEV VARIANCE MINIMUM MAXIMUM
NOTE...TREATING COLUMNS OF STDOLS AS VECTORS
DOLS 10000 0.48154 0.34902E-01 0.12182E-02 0.35249 0.62167
DOLS 10000 0.65113 0.47194E-01 0.22273E-02 0.47664 0.84062
DOLS 10000 0.77302 0.56029E-01 0.31393E-02 0.56587 0.99798
DOLS 10000 4.9310 0.35740 0.12774 3.6096 6.3660
DOLS 10000 20.350 1.4750 2.1757 14.897 26.273
DOLS 10000 0.00000 0.00000 0.00000 0.00000 0.00000
ENR T=B/ESE
AMPLE 1 6
PRINT MAT (5F6.2)
PRINT B ASE ESE T STDSE / FORMAT
```

B	ASE	ESE	T	STDSE
1.43	0.48	0.48	-0.89	0.03
1.16	0.65	0.65	-0.24	0.05
1.69	0.77	0.77	0.89	0.06
1.34	4.94	4.93	-0.68	0.36
1.27	20.37	20.35	0.50	1.48
1.00	0.00	0.00	0.00	0.00

B is the average parameter estimate

ASE is the standard deviation of the parameter estimate

ESE is the average standard error

t VALUES=B/ESE

STDSE is the standard deviation of the standard errors

TOP

Annexure E

SOUTH AFRICA: SELECTED INDICATORS

FINANCIAL YEAR	QUATER	CONSOLIDATED GENERAL GOVERNMENT EXPENDITURE	TRANSFERS TO SUBNATIONAL GOVERNMENTS	SUBNATIONAL GOVERNMENT OWN SOURCE REVENUE	GROSS DOMESTIC PRODUCT	POPULATION (MILLION)
		R000	R000	R000	R000	
1993/94	1	39316	9532	5570	342101	39.30
	2	31868	10389	5001	351627	39.46
	3	35078	10191	5131	358328	39.63
	4	38952	10073	4284	366000	39.83
1994/95	1	55004	9829	6102	382498	40.03
	2	41047	12642	4405	392706	40.23
	3	43452	10987	6510	399164	40.44
	4	39406	12378	4761	412915	40.45
1995/96	1	41855	11998	5247	426283	40.47
	2	44334	19948	4751	412915	40.49
	3	45735	16247	7118	445757	40.51
	4	43558	17584	5130	462247	40.53
1996/97	1	53082	18955	5282	481340	40.55
	2	49268	23229	5138	491304	40.66
	3	54893	21471	6532	501337	40.68
	4	50686	21103	5074	509617	40.84
1997/98	1	59254	19965	5646	526726	41.09
	2	53518	24508	5082	537404	41.34
	3	59219	20433	6096	544481	41.60
	4	55040	21979	5183	552169	41.86
1998/99	1	59600	20313	5551	570337	42.12
	2	54733	29376	5410	580104	42.38