Fiscal Illusion at the Local Level: An Empirical Test Using Australian Municipal Data*

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This paper seeks to extend the literature on the empirical analysis of fiscal illusion in two ways. Firstly, it provides a simultaneous test of four specific hypotheses subsumed under fiscal illusion, namely the revenue-complexity, renter illusion, debt illusion and flypaper models. And secondly, it adds evidence drawn from the Australian institutional milieu to existing empirical work which has an overwhelming North American focus. Using 1991 data from 46 local government authorities in Tasmania, the results suggest significant support for revenue-complexity, debt illusion, and the degree of indirectness of the revenue system.

I Introduction

The concept of fiscal illusion hinges on the proposition that the 'true' benefits and costs of government may be consistently misjudged by the citizen's of a given fiscal jurisdiction. The origins of this argument can be traced back at least as far as the work of the great classical economists J.R. McCulloch and J.S. Mill during the Scottish Enlightenment. For example, in his *Treatise on the Practical Influence of Taxation and the Funding System*, McCulloch argued that direct taxation involved less fiscal illusion than an equivalent magnitude of indirect taxation since direct taxation imposes a more obvious burden on taxpayers. Mill advanced similar arguments in his *Principles of Political Economy*, although he focused much more heavily on the upward-biasing effects of fiscal illusion on public expenditure.

The modern version of the theory of fiscal illusion owes much to the Italian economist Puviani (1908) who generalised earlier forms of the hypothesis. Mueller (1989, 342) has summarised the contemporary theory of fiscal illusion as follows: "To bring about an increase in government size, for which citizens are not willing to pay voluntarily, the legislative-executive entities must increase citizens' tax burden in such a way that citizens are unaware that they are paying more in taxes ... If

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tax burdens can be disguised in this way, citizens have the illusion that government is smaller than it actually is, and government can grow beyond the levels citizens prefer".

In the Australian context the application of fiscal illusion is likely to prove interesting. For instance, the Byzantine complexities of the Australian taxation system are well-known and need little elaboration. Similarly, a high degree of vertical fiscal imbalance is a characteristic feature of Australian federalism and long-standing formal arrangements exist to facilitate intergovernmental fiscal transfers from the Commonwealth government to the states. Moreover, problems with horizontal fiscal imbalances between different municipal jurisdictions within state boundaries have led to the establishment of local government grants commissions which assist state governments in determining appropriate levels of state funding.

The empirical analysis of fiscal illusion itself has been almost exclusively directed at the revenue side of the fiscal equation, with a corresponding neglect of the benefits of public expenditure. As a result, the empirical evaluation of fiscal illusion has either taken the form of what Oates (1988, 68) describes as *ad hoc* expenditure studies, or "...more rigorous demand functions for public goods". In both the expenditure and demand approaches a measure of budgetary size or budgetary growth is regressed against various socio-economic variables aimed at capturing those determinants present in the absence of fiscal illusion. An indicator or proxy for the relevant illusionary variable is then added, so that a significant directional coefficient indicates the presence of fiscal illusion. The generic model involved takes the form $E = \alpha X + \beta F + u$, where E is a measure of budgetary size, X is a vector of explanatory variables in the absence of fiscal illusion, F is a vector of variables intended to measure fiscal illusion, and u is the error term.

Apart from this general approach, the empirical study of fiscal illusion has preceded in at least five distinctive directions. Each of these has attempted to model the process where the underestimation of the tax-price of the public good due to fiscal illusion results in an unambiguous expansion in the level of public expenditure. The first of these approaches is revenue-complexity where the misperception of the tax-price results from fragmentation of the revenue system. In essence, it is argued that the increasing complexity of the revenue system would entail a fall in the volume of public expenditure. The second genre of work focuses on revenue-elasticity where growth in the level of public expenditure is associated with income elastic revenue-raising methods. It is hypothesised that the higher the level of dependence on income elastic revenue-raising instruments, the higher the level of illusion, and the higher the resultant level of public expenditure. The third type of approach is the flypaper effect, where lump-sum grants and public utility profits are presumed to exert a stimulatory effect on public expenditures. All other things being equal, the higher the level of dependence on grants/utility profits, the higher the level of illusion, and therefore public expenditure. The fourth area centres on renter illusion, where fiscal illusion is related to the proportion of property owners in a given jurisdiction. It is hypothesised that a degree of illusion is associated with the fact that property taxes are embodied in the rents paid by renters. Finally, the hypothesis that public debt provides illusionary effects has been examined. It

is argued that as a jurisdiction increasingly relies on debt, the level of fiscal illusion will increase, and as a result the level of public expenditure will also rise.

At least four dominant themes may be identified in the empirical literature on fiscal illusion. Firstly, results have generally been mixed. This is in part attributable to the diversity of data and models employed. However, even more noticeable is the failure of most empirical studies to incorporate more than one illusionary hypothesis, and few studies have analysed more than two simultaneously. Secondly, the ability to find empirical support for the fiscal illusion hypothesis is persistently qualified by alternative hypotheses and the endogeneity of some variables. Whilst some of these issues may be addressed by careful econometric analysis, it may not be possible to resolve fully the psychological black box in which decisions under partial information are undertaken. Thirdly, the body of theory concerning fiscal illusion is incomplete. Issues such as the derivation of suitable proxies for illusionary variables and the usefulness of these variables remain contentious. It may well be that some of the assumptions used in past approaches to fiscal illusion lack the theoretical rigour required for empirical analysis. For instance, Brennan and Pincus (1996, 244) have constructed a model which "...reveals a theoretical flypaper effect that does not rely on distortions in public choice mechanisms, such as agenda-setting and fiscal illusion". And finally, empirical work on fiscal illusion has had an overwhelmingly North American institutional focus, with only limited research effort directed at alternative national contexts, most notably Switzerland and the United Kingdom. Indeed, given the federal character of its constitutional milieu, it is somewhat surprising that so little effort has been devoted to the empirical analysis of fiscal illusion in Australia. The present paper seeks to augment the existing fledgling empirical literature on fiscal illusion in Australia by examining the revenue-complexity, renter illusion, debt illusion and flypaper hypotheses simultaneously in the jurisdictional context of forty-six local government areas in the state of Tasmania, Australia.[1]

The paper itself is sub-divided into four main sections. Section 2 provides a brief synoptic description of the institutional structure within which the empirical analysis takes place. Section 3 sets out the models and hypotheses in question, and discusses the variables employed. The results of the subsequent econometric procedures are analysed in section 4. The paper ends with some brief concluding remarks in section 5.

II Institutional Background

Tasmania is the smallest state in the Australian federation both in terms of population and geographic area. It is a small island with an aggregate population of around a half million, many of whom live in the capital city of Hobart or the metropolitan jurisdiction of Launceston. In 1991 it had a total of forty-six local government authorities. The Tasmanian Local Government Grants Commission (LGGC) employs a balanced budget approach to the calculation of grants to these municipalities (Australian Urban and Regional Development Review 1996). Net revenue capacity is

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[1] See Dollery and Worthington (1996) for a detailed survey of the empirical analysis of fiscal illusion.

assessed using annual valuation figures averaged over three years as the base and the 'standard tax rate' for Tasmania as a whole. Expenditure is sub-divided into ten categories, which includes water and sewerage. Regression estimates are employed to determine 'expenditure standards' for all local government authorities. Disability factors are calculated using quantifiable demographic variables, but in practice do not generate substantial upward weighting of expenditure needs because most councils lie within a fairly narrow range. Eight disability factors are applied to the general administration category, which can accommodate no more than seventy percent of 'the most disadvantaged position'. Roads and other expenditure assessments employ different criteria. In general, the outcome of the Tasmanian LGGC grants process generates little variation between municipalities, in comparison with other Australian states.

III Models and Hypotheses

Tests of fiscal illusion are usually subject to two constraints. Firstly, it is unlikely that a test may be designed that will satisfactorily evaluate all five forms of fiscal illusion simultaneously. For example, whilst renter illusion may be examined at the local rather than the federal level, there is little apparent scope for the local analysis of the revenue-elasticity hypothesis, and *vice versa*. Accordingly, any empirical test for fiscal illusion should be addressed at a particular type of illusion, or sub-group of illusions. Secondly, it is doubtful whether fiscal illusion is significant to the same extent at all levels of government expenditure. The models and hypotheses that follow are designed to accommodate these constraints.

The Bergstrom and Goodman (1973) demand function for public expenditure forms the basis for the analysis of fiscal illusion at the local level. This approach, which hypothesises that the level of expenditure conforms to the median voter model, may be placed in a linear-regression formulation which allows for the statistical analysis of fiscal illusion. Modelling fiscal illusion in this manner is consistent with both the literature associated with the demand function for public expenditure, and with the majority of past empirical approaches to fiscal illusion. Support for the fiscal illusion-augmented public expenditure demand function is further strengthened *a fortiori* by the predominance of this method in studies of fiscal illusion at the local level.

The illusionary approaches examined in this paper relate to the revenue-complexity, renter illusion, debt illusion and flypaper hypothesis. Table 1 outlines the models and variables examined. In broad terms, cross-sectional variables of forty-six local government areas (LGA) in Tasmania are examined in order to ascertain the directional impacts and significance of the illusionary manifestations.[2]

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[2] Municipal data was selected from Tasmania for three reasons. The first is that Tasmania does not have in force "rate ceilings" as found in, say NSW. Municipal decisions on expenditure thus tend to be more disassociated from state control. Secondly, it would be unwise to cross state borders in selecting data sets, as substantial differences in the regulation, revenue raising and administration of local governments exist. Thirdly, Tasmania was the only state to provide concise published data on a local government basis for the 1991 Australian Census.

The selection of local public expenditure to evaluate fiscal illusion is appropriate for several reasons. Firstly, "an adequate amount of statistical information is an obvious *sine qua non* for demand estimation" (Wildasin 1989, 355). Australia only has seven states, whilst analysis nationally requires detailed and standardised time series data over substantial time periods. Secondly, expenditures at the local level are most likely to adhere to the classical unidimensional assumptions of the median voter model: that is, whilst at state and national level various requirements such as welfare and defence must be "juggled", the provision of public goods at the local level is usually confined to more narrowly defined projects such as roads, parks and sanitation Thirdly, objective measures of public expenditure performance are less difficult to quantify. For instance, the cost or benefit of better local roads is surely more recognisable, to both the median voter and the administration, than decisions taken at a higher level of federal structure. Finally, and most importantly in terms of the median voter model, the local community is more likely to adhere to the implicit assumptions of homogeneity. Thus, if a demand function is to be estimated on the basis of socio-economic variables alone, without the benefit of individual utility functions, some restrictions must be introduced. For instance, the assumption that voters of a particular income class have particular elasticities of demand would appear more robust at the local level than at that of the relatively heterogenous state level

Despite its widespread acceptance in the literature, this generic approach to the empirical analysis of fiscal illusion is open to criticism on at least two counts.[3] Firstly, it can be argued that there is a good deal of 'ad hocery' involved in the selection of independent variables and their associated expected coefficient signs. This argument cannot be dismissed lightly. It would certainly be more satisfactory if independent variables and anticipated signs could formally be derived from an explicit voter utility maximising and government cost minimising framework for public expenditure decisions, along the lines of Brennan and Pincus (1996) in the case of the flypaper effect. Unfortunately, given the paucity of rigorous *a priori* theorising in the area of fiscal illusion, it is not possible to follow a more formal approach. Secondly, and relatedly, it could be argued that this generic approach to the empirical analysis of fiscal illusion has a basic identification problem, since it amounts to estimating a reduced form equation which mixes up both demand and supply factors affecting publicly-provided goods and services. Thus, although jurisdictional variation may appear to be due to differences in the demand for public expenditure according to the median voter model, the supply of publicly-provided goods and services could also be a function of many of the same variables. Whilst beyond the scope of the present study, more extensive data sets and advanced statistical techniques would go some way in addressing this deficiency.

The dependent variable in Table 1 is local government expenditure (*EXP*). Whilst this is the measure of public good provision used in most past empirical studies, it is by no means the most appropriate. In other words, the use of expenditure assumes that output is measured by the value of

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[3] We owe both of these criticisms to an anonymous referee.

public inputs. Criticism of this fact is largely derived from two associated corollaries. The first is that in using expenditure as a proxy for public good provision, cross-sectional studies would imply that the production function is uniform across jurisdictions. Studies by Hamilton (1983) have indicated that community "inputs" may substantially modify the output of public goods, so that misspecification of output may well be a problem. The second corollary is constant returns to scale; that is, increases in expenditure will increase the output of public goods proportionately. Despite these qualifications, and considering the absence of more suitable dependent variables, the level of expenditure is the most appropriate measure of public good provision.

TABLE 1
Variables and definitions for local expenditure and fiscal illusion

Variables	Details	Data Source
EXP	Total local expenditure in the *j*-th municipality	*Government Finance Statistics: Tasmania 1990/1991* ABS Cat. 5501.6
AREA	Rateable area of the *j*-th municipality (km^2)	*Tasmanian Inquiry into the Modernisation of Local Government*, 1991.
ROAD	Road length of the *j*-th municipality (km)	*Tasmanian Inquiry into the Modernisation of Local Government*, 1991.
TAX	Median voter tax-price of the *j*-th municipality. It is the amount of local rates payable on a home of median value.	*Tasmanian Inquiry into the Modernisation of Local Government*, *Tasmanian Government Gazette* Vol. 275, 1991. *Government Finance Statistics: Tasmania 1990/1991* ABS Cat. 5501.6
OWN	Proportion of homes owned in the *j*-th municipality	*Local Government Areas: Tasmania 1991 Census* ABS Cat. 2790.6
INC	Median voter income in the *j*-th municipality	*Local Government Areas: Tasmania 1991 Census* ABS Cat. 2790.6
POP	Population in the *j*-th municipality	*Local Government Areas: Tasmania 1991 Census* ABS Cat. 2790.6
O65	Proportion of population over 65 in the *j*-th municipality	*Local Government Areas: Tasmania 1991 Census* ABS Cat. 2790.6
HERF	Herfindahl index of revenue-simplicity for the *j*-th municipality.	*Government Finance Statistics: Tasmania 1990/1991* ABS Cat. 5501.6
GRANT	Dummy for reliance on grants in the *j*-th municipality	*Government Finance Statistics: Tasmania 1990/1991* ABS Cat. 5501.6
UTILITY	Dummy for reliance on utility revenue in the *j*-th municipality	*Government Finance Statistics: Tasmania 1990/1991* ABS Cat. 5501.6
DEBT	Dummy for reliance on debt revenue in the *j*-th municipality	*Government Finance Statistics: Tasmania 1990/1991* ABS Cat. 5501.6
INDIRECT	Dummy for measure of indirectness of the revenue system in the *j*-th municipality	*Government Finance Statistics: Tasmania 1990/1991* ABS Cat. 5501.6

Also shown in Table 1 are the set of socio-economic variables required by the demand function approach. Since we have quantified public service provision in terms of expenditure, this vector

would ideally consist of a single direct measure that determines spending on each local government function. It would therefore be comprised of the preferences of citizens/ratepayers for local public services, and exogenously imposed disability factors that impact upon provision. For example, preferences for local road services may relate to road lengths as well as type (that is, sealed, kerbed and guttered; sealed; gravel; cycle path; formed and flat-bladed track). Further, the provision of roads (and hence, expenditure) would also depend upon disability factors relating to topography, climate, soils, materials, drainage and heavy traffic. Unfortunately, a single direct measure to quantify the local public services required for each function does not exist.

However, an approximation for this measure can be obtained by identifying observable factors which are the determining ones for selected functions. The rateable area (*AREA*) and rateable area roads (*ROAD*) (Wagner 1976; Munley and Greene 1978) are expected to exhibit a positive coefficient in regard to expenditure, especially as Australian local governments usually direct significant resources to these purposes.[4] The proportion of the population over sixty-five years (*O65*) is also included. A positive coefficient would be expected indicating a higher consumption of public goods as this proportion increases.

The next socio-economic variable selected is median income (*INC*). The basis for inclusion of this variable derives from Wagner's Law whereby "growth in income facilitates the relative expansion in expenditures (on public goods)" (Henrekson 1988, 111). However, income also represents "the willingness to pay for public goods" (Marshall 1991, 1339) on the assumption that public goods may be defined as being normal goods. Moreover, income is often used as a proxy for unmeasurable socio-economic variables, or those unintentionally excluded (so-called income-correlated characteristics). Oft quoted measures include "educational level, employment and family stability [and] general success in society" (Hamilton 1983, 347). Broadly speaking, the expected coefficient on income should be positive (as with a normal good). Nonetheless, despite the widespread use of income measures as a variable in public good estimation, there is still some controversy. Firstly, the use of median measures of income may obscure the true income elasticity of demand for the public good, since there is no reason to believe that elasticities are constant across a particular income class of any jurisdiction. Secondly, an assumption of the median voter model is that the median tax-payer also receives the median income. Romer and Rosenthal (1979) argue that this amounts to assuming income is monotonic; the median voter may not be the recipient of median income, and hence the equation may be misspecified. However, studies such as Wildasin (1989, 375) accept that at the "macro-level" i.e. full local expenditure, the impact of the median voter constraints and assumed monotonicity will have a minimal impact.

The variable population (*POP*) should fulfil two requirements, depending on the model specification. Firstly, unless the local public good is defined in a pure Samuelson sense, goods will

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[4] Rateable area and rateable area roads, rather than municipal area and municipal area roads, were selected since many Tasmanian LGAs encompass sizeable wilderness (state-funded) and national park (federally funded) regions. Rateable area and rateable area roads are likely to give a more accurate indication of local fiscal responsibilities.

be subject to some private divisibility. Numerous studies have indicated that the failure to take into account measures of "crowding" or "economies of consumption" will involve substantial misspecification bias (Bergstrom and Goodman 1973; Munley and Greene 1978; Oates 1988; Marshall 1991, Heyndels and Smolders 1994). And secondly, population may provide an indication of economies of production incurred in the provision of public goods (Romer and Rosenthal 1979; Marshall 1989). In general, and if public goods are non-rival in consumption, the expected coefficient on population should be negative in per capita terms, reflecting a decreasing average cost of public good provision as population increases. However, it may well be that the positive influences on population dominate, not only in gross terms as expected, but also in per capita terms.

The final, and apparently the most important, socio-economic variable is the tax-price (*TAX*). In common with virtually all public good demand function studies since Bergstrom and Goodman (1973), the tax-price of the median voter should *ex ante* inversely determine the level of provision of the public good, given the substitution from the public to the private good. However, two problems usually surround the selection of a suitable tax-price. The first is the conflict between mean and median tax-prices. Most work has employed the median voter approach, since the mean tax-price has been shown to involve substantial multicollinearity and to violate the assumptions of the primary model of collective choice. The second conflict revolves around the question of whether the relevant median tax-price is the median voter's tax times the marginal cost of public good provision, the median voter's tax rate times the marginal cost of public good provision, the median voter's tax-share, or an equal share of the additional provision of the public good (Yinger 1982). Work by Hayes (1989) has argued that the median voter's tax share is the most appropriate, both theoretically and empirically. After examining all four approaches, Hayes (1989, 273) found that the median voter's tax share displayed small biases for most socio-economic variables and provided better estimates given a possibly misspecified production function, as against the alternative approaches which exhibited inconsistent parameters. Hayes (1989, 273) asserted that the results indicated "statistical support for the median voter's tax-share approach". As a result it is the method employed below.[5]

To these socio-economic variables, past approaches to fiscal illusion have added a vector of illusionary factors. The variables selected in this regard depend critically on the processes and powers of a particular governmental level. In an analysis performed at the local level of

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[5] The approach used to calculate the median voter's tax-price follows the work of Oates (1972), Bergstrom and Goodman (1973) and Pommerehne and Schneider (1978) and others. Using gazetted rates and charges for 1991, and the median assessed annual value (AAV) for each municipality (the basis for rate assessment in Tasmania) a median municipal contribution was calculated.

governmental expenditure, the revenue-complexity, renter illusion, debt illusion and "flypaper" effects are applicable.[6]

The form of fiscal illusion most examined in the existing literature is that pertaining to the illusion of costs associated with public services; that is, a recurring and systematic propensity exists to underestimate the true tax cost of the publicly-provided good. In terms of consumer analysis, the perceived fall in the relative price of the publicly-provided good results in an unambiguous increase in the quantity perceived as being optimal, and given the illusionary effect, the higher perceived optimum level of consumption will be associated with an unambiguous (though unattainable) increase in utility. This 'increase' in utility then translates, via the political process (and the median voter model), into an increase in government expenditure. Accordingly, the most appropriate specification for each of the illusionary variables would be to directly quantify the median voter's underestimation of the tax-price (that is, the difference between the actual and perceived tax-price). However, since data of this type is rarely available, the vector of illusionary factors is specified indirectly using measures thought to be closely correlated with the subjective misperception of the true tax-price of the publicly-provided good.

The revenue-complexity hypothesis states that "... the more complicated the revenue system, the more difficult it is for the taxpayer to determine the tax-price of public outputs - and the more likely it is that he will underestimate the tax-burden associated with public programs" (Oates 1988, 69). In general, the more complex the revenue system *ceteris paribus*, the larger the level of public expenditure. The variable used for accounting for the revenue-complexity hypothesis is the Herfindahl index of revenue simplicity (*HERF*) (Wagner 1976; Clotfelter 1976; DiLorenzo 1982b; Breeden and Hunter 1985; Misiolek and Elder 1988; Heyndels and Smolders 1994).[7] This unweighted measure has drawn some criticism given that the visibility of the revenue classes is likely to vary significantly (Pommerehne and Schneider 1978; Henrekson 1988). However, there appears to be "a systematic relationship between the Herfindahl index and the degree of revenue visibility" indicating that the use of a weighted measure may well involve substantial multicollinearity (Oates 1988, 79). The fiscal illusion hypothesis predicts a negative coefficient which would indicate that an increased simplicity or concentration of the revenue structure is associated with a reduced level of local public expenditures.

The renter illusion hypothesis argues that other things being equal, jurisdictions with a relatively large fraction of renters tend to spend more per capita on local public services. Such an observation

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[6] At the local level in Australia, revenue is primarily derived from municipal rates and the usage of municipal services and does not relate directly to income levels within a municipal area. Accordingly, the revenue-elasticity hypothesis is not relevant.

[7] Where the Herfindahl index of revenue complexity is $HERF_j = \sum_{i=1}^{n} \left(REV_i \right)^2$

such that the index for the *j*-th LGA is the sum of the squared proportions of total expenditure of eight revenue classifications; rates, licenses/fees/fines, grants, charges, interest, utility transfers, loans, other income.

is based on the apparent failure of renters to understand the link between the level of local services demanded and the level of rent paid. The variable used to elucidate the renter illusion hypothesis (*OWN*) is the proportion of homes owned or being purchased in the municipality (Goetz 1977; Martinez-Vazquez 1983; Heyndels and Smolders 1994). The renter illusion hypothesis would *a priori* indicate a negative coefficient, as the proportion of homes owned or being purchased increases, the level of expenditure would fall.

In terms of the flypaper effect, "a lump-sum intergovernmental grant is perceived by individuals as a reduction at the margin of the tax-price [such that there is] a willingness on the part of the electorate to support higher levels of spending" (Oates 1988, 77). To proxy this effect, dummy variables are used to identify those municipalities which derive a greater than average share of total income from grants (*GRANT*) and/or transfers from trading activities (*UTILITY*) (DiLorenzo 1982b; Breeden and Hunter 1985; Marshall 1989).[8] In general, proportionately higher levels of dependence should be associated with municipalities that are increasingly subjected to illusion of the flypaper nature. The *a priori* regression coefficient on these qualitative variables would be positive, since as reliance on grants and/or utility profits increases *ceteris paribus*, so expenditure should also increase.

An identical use of qualitative variables to identify debt-dependent jurisdictions holds for debt illusion (*DEBT*) (Dalamagas 1993). In this approach "individuals are more likely to perceive the cost of public programs if they pay for them through current taxation than if tax liabilities are deferred through public sector borrowing" (Oates 1988, 76). The expected coefficient on this variable should be positive, indicating that "reliance on debt, rather than tax finance should result in a larger public budget" (Oates 1988, 76).

Finally, a weighting measure for the revenue-complexity hypothesis is employed by the construction of a measure of indirectness of the revenue system (*INDIRECT*) (Pommerehne and Schneider 1978; Misiolek and Elder 1988; Henrekson 1988). Use of a separate variable tends to avoid the problems associated with "weighting" of the revenue-complexity measure itself. In line with the hypothesis of "visibility" of revenue sources, a proportionately more obscure revenue system would imply an increase in the level of expenditure on the local public good, implying an *a priori* positive coefficient.

In order to correctly evaluate the demand function for local public goods, a number of alternative regression specifications are also examined. This has been undertaken in order to identify the most econometrically appropriate functional form for the study. The specifications employed relate to the use of either a linear or log-linear function in either aggregate or per capita terms. Moreover, and in line with the questions of endogeneity of tax-price and revenue-complexity posed by Oates

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[8] Financial transactions for individual local government authorities are split into Ordinary Services and Trading Activities. The only activities in Tasmania currently classified as 'trading activities' are the public utilities of water supply and sewerage; all other activities are classified as ordinary services (*Government Finance Statistics: Tasmania 1990/91 and 1991/92*, ABS Cat. No. 5501.6).

(1988) and Marshall (1989), an assessment of possible misspecification flowing from the use of endogenous variables is also made.

IV Results

The estimated coefficients and standard errors of the parameters detailed above are presented in Table 2. a models were employed in an attempt to correctly specify the empirical questions at issue. Model 1 in Table 2 summarises the results of an ordinary least squares regression, Model 2 involved a generalised least squares regression, and model 3 ran a log-linear ordinary least squares regression on the transformed variables (i.e. changing aggregate to per capita) of model 1. Sufficient evidence exists on the basis of a number of econometric tests for the selection of the log-linear over the linear form. These results sustain the findings of Baker (1983), Logan (1986), Feenburg and Rosen (1987), Misiolek and Elder (1988) and Grossman (1990) in the econometric suitability of the log-linear over a linear form for estimations of this type.

TABLE 2
Results of regression estimation for local expenditure and fiscal illusion

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
CONSTANT	465.79	7330.6	-0.078	2.673***	0.132	3.115***
	(3546.6)	(8081.6)	(2.978)	(0.802)	(2.987)	(1.147)
AREA	-0.308	6.763**	-0.102*	-0.102*	-0.114**	-0.107**
	(1.061)	(3.028)	(0.056)	(0.051)	(0.055)	(0.055)
ROAD	2.167	-0.873	0.217*	0.202*	0.295***	0.269***
	(3.114)	(6.1266)	(0.118)	(0.103)	(0.098)	(0.097)
TAX	-0.838	-5.550**	-0.099		-0.129	-0.094
	(1.312)	(2.0665)	(0.096)		(0.093)	(0.199)
OWN	-46.349	-321.87***	-0.805***	-0.830***	-0.891***	-0.891***
	(30.950)	(44.844)	(0.220)	(0.206)	(0.208)	(0.217)
INC	0.023	0.22597**	0.308		0.307	
	(0.086)	(0.0906)	(0.288)		(0.289)	
POP	0.419***	0.402***	0.816***	0.822***		
	(0.033)	(0.036)	(0.057)	(0.043)		
O65	191.64	755.79***	0.331***	0.299***	0.302***	-0.265***
	(122.18)	(125.46)	(0.103)	(0.094)	(0.101)	(0.092)
HERF	3680.0	5795.7	-0.357	-0.329	-0.401	-0.357*
	(5803.7)	(7186.3)	(0.260)	(0.203)	(0.258)	(0.204)
GRANT	20.473	470.47	0.012		0.004	
	(808.54)	(2904.4)	(0.101)		(0.101)	
UTILITY	447.87	2857.3	0.023		0.001	
	(737.16)	(1956.6)	(0.097)		(0.096)	
DEBT	1639.4*	4732.8***	0.246**	0.234**	0.219**	0.226**
	(857.83)	(750.43)	(0.110)	(0.098)	(0.107)	(0.112)

INDIRECT	330.08	-1911.0	0.578***	0.590***	0.593***	0.589***
	(779.48)	(4247.3)	(0.103)	(0.093)	(0.103)	(0.112)

Values in parentheses are the corresponding standard errors. Asterisk(s) represent the level of significance; * - 90%, ** - 95% and *** - 99%.

Model 4 is a log-linear modified form of Model 2. In order to correct for presumed multicollinearity present in Models 1, 2 and 3, insignificant variables are excluded. Whether the alternative specification is preferred over the full *a priori* model is determined by Akaike information and mean squared error criteria. RESET specification tests support the exclusion of the insignificant variables and the null hypothesis of homoskedasticity is not rejected.

In the modified form, all variables are significant, except *HERF* which is negative, but insignificant. *DEBT* and *INDIRECT* are significant supporting the debt and indirect illusion hypotheses. The renter illusion hypothesis is supported by the significantly negative sign of *OWN* indicating that a lower proportion of renters in a municipality is associated with a lower level of expenditure. *POP* is significant and positive, but since the model is not expressed in per capita terms, this fails to support either the "economies of consumption" or "economies of production" arguments.

Model 5 is a per capita form of the log-linear model. Tests for heteroskedasticity fail to reject the null hypothesis of homoskedasticity and a RESET specification test favours the functional form over that presented in Models 1 and 3. In terms of the illusion variables, the renter illusion hypothesis is supported by the positive and significant sign on *OWN*, as is the debt illusion hypothesis with *DEBT*, and the measure of indirectness with *INDIRECT*. The hypothesis of revenue-complexity (*HERF*) and the flypaper effect (*GRANT* and *UTILITY*) are not supported by the insignificant signs on these coefficients.

Using the per capita data, a Hausmann specification procedure was run to test for the endogeneity of the tax-price of public goods (*TAX*), in accordance with questions raised by Oates (1988) and Marshall (1989). The results reject the null hypothesis of exogeneity and we may conclude that inclusion of *TAX* in ordinary least squares estimates is likely to involve simultaneity. Similar problems have prompted past studies to adopt the two-stage least squares approach such as in Clotfelter (1976), Feenburg and Rosen (1987), Marshall (1989) and Grossman (1990).

A further Hausmann specification test is run on the measure of revenue-complexity (*HERF*) about which Oates (1988, 79) has argued that "the likelihood of endogeneity seems to me quite high" and which Marshall (1989, 3) noted has therefore "compromised existing empirical studies of fiscal illusion". The test fails to reject the null hypothesis, and we may conclude that the Herfindahl index is exogenously determined to the level of expenditure.

The above results indicate that while we might be willing to regard the physical and environmental characteristics of a municipality as exogenous variables, the tax variable is clearly endogenous. The tax rate, for example, depends on the size of the public budget and on the tax base, whilst the level of expenditure will be determined by tax rates along with other characteristics of the population. In brief, TAX is likely to be correlated with the disturbance terms and, as a result, the estimated coefficients in Models 1 to 5 are subject to simultaneous-equation bias.

For this reason, the study goes back and reestimates Model 4 using two-stage least squares. In the first step, we eliminate from TAX that part which is correlated with the disturbance terns by generating a revised set of values for the suspect independent variable. This involves specifying a set of predetermined variables that influence TAX. The present study uses area, road length, population, the proportion of the population over 65 years and median income, along with additional variables relating to median housing values and the level of debt. The "revised" value of TAX is no longer correlated with the disturbance term so that the parameters can be estimated using the standard technique.

The results of this estimation technique are presented in Model 6. The illusion variable *OWN* (renter illusion) is negative and significant, thereby supporting the illusionary hypothesis, as is *HERF* (revenue-complexity). The qualitative variable constructed for debt illusion hypothesis (*DEBT*) is positive and significant, supporting the hypothesis that reliance on debt is associated with higher levels of expenditure. In terms of *INDIRECT*, the measure of indirectness of the revenue system, the *ex ante* coefficient significantly corresponds with the *ex post* outcome. Further, given the consistency in estimates between the two-stage least squares equation and the earlier ordinary least squares equation, the results suggest, at least in this particular study, the inconsistency introduced by simultaneity is apparently not too serious. A test for model selection using the Schwarz criteria supports the use of the modified form.

In general, the models examined support Munley and Greene (1978, 97) that tests for fiscal illusion are "sensitive to the specification of those [expenditure] equations". Using econometric analysis, it was concluded that the log-linear per capita regression model is preferred to the other forms discussed, supporting the studies of Baker (1983), Logan (1986), Feenburg and Rosen (1987) and Misiolek and Elder (1988). Of course, this is entirely consistent with the underlying median voter model of government behaviour whereby the data generally should be per capita. In terms of particular illusion hypotheses, renter illusion (*OWN*) is strongly supported regardless of functional form, as is debt illusion (*DEBT*). The measure of indirectness of the revenue system (*INDIRECT*) also strongly supports the presumed influence of the visibility of the revenue system on expenditure. The evidence supporting the revenue-complexity hypothesis (*HERF*) however, remains inconclusive. Despite this, the present results reject the "alternative hypothesis" of Oates (1988) of revenue-diversification as against that of revenue-complexity, on the basis of revenue structure proven to be determined exogenously to the level of expenditure. Given the strong

evidence supporting revenue-visibility, it may well be that the Herfindahl index is an inappropriate proxy measure for the issue of revenue-complexity.

One significant result of the present study is that no evidence of the putative flypaper effect has been found. Given that other Australian studies at the State government level, such as Dollery and Worthington (1995a, 1995b), have observed this phenomenon, some explanation should be made for its apparent absence at the local level. Two possibilities exist. The first is that the proxy employed for the flypaper effect inadequately describes the misperception of the tax-price in a model of intergovernmental grants. The second, and more likely, possibility is that the limited taxing and spending abilities presented to governments at the local level in Australia are less amenable to illusion of this sort. And this introduces the more fundamental issue in studies of this type in that Australian LGAs function in a far more restricted fiscal environment than their U.S. equivalents. Thus, the supply of publicly-provided goods and services, whilst a function of many of the variables detailed, is also derived in the context of Federal-State financial relations and fiscal equalisation. The need to address the characteristics of different institutional milieus remains a challenge to empirical studies of fiscal illusion.

V Concluding Remarks

This paper has sought to provide an empirical evaluation of fiscal illusion on local expenditure by examining the cross-sectional effects of revenue-complexity, renter illusion, the flypaper effect and debt illusion on 1991 data drawn from 46 local government authorities in Tasmania, Australia.

In broad terms, the results suggest that the format of the tests is appropriate econometrically, and that significant support for the revenue-complexity, debt illusion and the degree of indirectness of the revenue system does exist at the local level. The study itself augments existing empirical literature on the theory of fiscal illusion in at least two ways. Firstly, it represents one of the few empirical analyses of fiscal illusion based on Australian data, and accordingly complements existing U.S. and Canadian work with evidence derived from an alternative jurisdiction of roughly similar institutional structure. And secondly, unlike most previous studies, only a handful of which have attempted to statistically test more than two illusionary hypotheses simultaneously, the present paper subjects four putative forms of fiscal illusion to the same data.

However, the study does suffer from a number of limitations. One problem is that the expenditure models used may simply be capturing the activities of the Tasmanian LGGC. For example, the disability factors used by the LGGC to calculate grant relativities, and the 'output indicators' employed in the current study as the determining factors for municipal expenditure, are potentially very similar. A related problem is the strong possibility that some of the variables used to measure fiscal illusion are not only determined by the level of expenditure, but also by the vector of socioeconomic factors thought to influence such expenditure in the first place. Lastly, there is the important question of whether Australian LGAs actually exercise the degree of discretion over

revenues and expenditures suggested by the public finance literature. While beyond the scope of the present study, more detailed analysis of the institutional constraints placed upon Australian local governments' spending and taxing decisions would go some way in addressing this question.

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