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Scope Economies in Australian Local Government**

by

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A Conceptual Note on Scale Economies, Size Economies and Scope Economies in Australian Local Government

Brian Dollery and Euan Fleming**

Abstract

The notion that ‘bigger is better’ has underpinned municipal structural reform policy in Australia and led to its heavy reliance on amalgamation. Several advantages are believed to flow from larger councils, including scale economies and scope economies. However, a surprising feature of the debate over amalgamation is not only the paucity of empirical evidence supporting the idea that ‘bigger is cheaper’, but also the marked degree of conceptual confusion between size economies, scale economies and scope economies. This paper seeks to ameliorate this confusion by carefully distinguishing between these theoretically distinct concepts in the institutional context of Australian local government.

Key Words: Amalgamation; local government; scale economies; scope economies

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Introduction

Australian state and territory government policy makers periodically seek to enhance the efficacy of their respective local government systems, usually in short intensive episodes. In comparison with local government reform in other advanced countries, a key feature of Australian municipal reform programs is their traditionally heavy reliance on structural change as the main instrument of reform (Vince, 1997). Structural reform can take various forms, ranging from relatively minor *ad hoc* resource-sharing schemes through to significant boundary changes and the amalgamation of small councils into larger municipal jurisdictions (Dollery and Johnson, 2005). However, for more than a century Australian structural reform programs have relied overwhelmingly on council mergers – the most drastic form of structural change.

This longstanding faith in the potency of municipal amalgamation reflected an enduring belief that ‘bigger is better’ in Australian local government regardless of individual circumstances (May, 2003). However, widespread disillusionment with the consequences of more recent structural reform programs has begun to shatter the almost universal belief in amalgamation as a panacea for improving the operational efficiency of municipal service delivery. Moreover, although surprisingly little research effort has been directed at investigating the results of council mergers, especially in the critical case of the radical Victorian amalgamation process in the 1990s, an embryonic scholarly literature has begun to assess structural reform founded on amalgamation (see, for example, Dollery and Crase, 2004). There is now a growing realization that ‘one size does not fit all’ in local governance, especially for regional, rural and remote councils. As a result, the nascent academic literature on Australian local government has

started to explore alternative models of municipal governance in contrast to the conventional emphasis on amalgamation (see, for example, Dollery and Johnson, 2005). Nevertheless, despite increasing scepticism in the broader Australian local government community, which echoes similar sentiments in American and Canadian policy circles (see, for instance Bish, 2000; Boyne, 1998; and Sancton, 2000), Australian state government policy seems largely immune to doubt and continues to employ amalgamation. For instance, during the 'nineties, South Australia, Tasmania and Victoria all underwent episodes of municipal consolidation of differing degrees of intensity (May, 2003). Moreover, structural reform aimed at enhancing the efficiency and effectiveness of Australian local government is once more under way, this time in the guise of a program of compulsory amalgamation in NSW, and with the imminent prospect of substantial municipal reform looming in Queensland, the Northern Territory and Western Australia.

Proponents of municipal amalgamation as an effective engine for enhancing local government efficiency typically base their economic case on three main factors that are purportedly associated with larger councils: Significant scale economies; substantial economies of scope; and reduced administrative and compliance costs (Dollery and Crase, 2004). Additional quasi-economic arguments supporting the proposition that 'bigger is better' sometimes include lower representational costs due to fewer elected councillors (see, for example, Varden, 2003) and 'eco-civic regionalization' (Brunckhorst *et al.* 2004). However, by far the most important argument resides in the claim that significant economies of scale will inevitably flow from larger municipalities (Dollery and Crase, 2005). Indeed, attempts have even been made to estimate statistically the 'optimum' size of an Australian council based on minimizing

the aggregate per capita cost of service provision which ostensibly demonstrate that ‘bigger is cheaper’ owing to scale economies (Soul, 2000).

Given the centrality of economies of scale to the case for municipal amalgamation in Australia, it is thus little short of astonishing that the two most important dimensions of scale economies are consistently misrepresented and misunderstood in Australian policy debates. In the first place, empirical evidence on the extent of economies of scale in local government service provision is inconclusive. Moreover, existing Australian work on the phenomenon has been uniformly mis-specified (Byrnes and Dollery, 2002). It is therefore misleading to claim that substantial economies of scale are manifested in either Australian local government or its counterparts abroad.¹

Secondly, advocates of the notion that ‘bigger is better’ in Australian local government routinely advance the idea that agglomerating the service provision activities of small councils into larger jurisdictional units through amalgamation will result in lower per capita costs of local services without drawing critical distinctions between the various kinds of economies potentially attendant upon size that embrace not only scale economies, but also scope economies and size economies. Indeed, a peculiar feature of both Australian and international debates on the merits or otherwise of structural change programs in local government is the almost universal neglect of scope economies, its fallacious conflation into the conceptually different category of scale economies, and the misunderstood complexities of the interactions between scale economies and

¹ A substantial international empirical literature exists on the question of scale economies in local government. By contrast, very little research effort has been directed at the problem in Australia. Byrnes and Dollery (2002) not only summarize both empirical literatures, but also discuss the validity of extant Australian studies. Chicoine and Walzer (1985) provide a useful synopsis of the related empirical evidence on structure and expenditure in local government (see specially their Table 2.1).

scope economies as organizational size increases. For instance, the Final Report of the Commonwealth House of Representatives Standing Committee on Economics, Finance and Public Administration (2003, p.84) entitled *Rates and Taxes: A Fair Share for Responsible Local Government* cites (apparently without flinching) a submission by a leading federal government agency to the effect that ‘structural reform can deliver economies of scale and can enable councils to employ a wider range of professionals so they can offer a wider range and usually higher quality of services’ (see, for example, Dollery 2005). Similarly, the most recent Productivity Commission (2005, p.293) *Report on National Competition Policy* observes that ‘further council amalgamations and/or shared service provision arrangements would allow for greater realization of economies of scale and lead to considerable cost savings’. Finally, whilst at least distinguishing between scale economies and scope economies, even the otherwise brilliant discussion paper entitled *Size, Shape and Sustainability of Queensland Local Government* (Local Government Association of Queensland, 2005) offers neither insight into their relative importance nor any possible synergies between the two forces.

Given the fundamental importance of the distinctions between scale economies, size economies and scope economies for the debate over structural reform in Australian local government and the potential advantages of amalgamation and other alternative models of municipal governance, it is imperative that the current conceptual confusion be addressed. This forms the central purpose of the present paper. Emphasis will fall on economies of scope since it is by far the most misunderstood and neglected aspect of the debate and every effort will be made to illuminate the discussion with salient examples drawn from the municipal sector.

The paper itself is divided into five main parts. Section 2 deals with economies of scale and with its conceptual cousin returns to scale. Section 3 distinguishes between scale economies and size economies. Section 4 focuses on economies of scope and its causes and consequences. The problematic relationship between scale economies and scope economies is examined in section 5. The paper ends with some brief concluding comments in section 6.

Economies of Scale

Scale economies, size economies and scope economies all derive from the nature of production processes within organizations. Production typically requires different input factors, like capital, labour and materials, applied in varying proportions to a technological process that generates one or more outputs. Economists use production functions, which provide the technical relationships between measurable inputs and measurable outputs, to investigate the properties of production processes. This approach has generated a classification of different types of generic production characteristics that can be assessed in terms of returns to scale. Returns to scale in this sense refers to how output responds to increases or decreases in all inputs together. Put differently, if all inputs are doubled, returns to scale will determine whether output will double (i.e. constant returns to scale), more than double (i.e. increasing returns to scale), or less than double (i.e. decreasing returns to scale). As the scale of physical production increases, most production processes will exhibit increasing returns to scale, constant returns to scale, and decreasing returns to scale.

Two main factors are held responsible for determining the nature of returns to scale. On the one hand, rising output allows for an ever-increasing division of labour (and other inputs) into more specialized functions, hence boosting productivity and inducing increasing returns to scale. On the other hand, managerial difficulties, for example stemming from the complexities of inventory control, steadily mount as output increases, thereby decreasing factor productivity and fostering decreasing returns to scale. Since eventually managerial incapacities outweigh the gains from specialization, at very high levels of output all production processes will ultimately be subject to decreasing returns.

While the concept of returns to scale refers exclusively to the physical relationships between inputs and outputs, by contrast economies of scale translates this information into monetarized cost values. Accordingly, expressed in monetary terms, increasing returns to scale is reflected in increasing economies of scale (with the average cost of a unit of output falling), constant returns to scale into constant economies of scale (with the average cost of a unit of output remaining the same), and decreasing returns to scale into diseconomies of scale (with the average cost of a unit of output rising).²

In the context of Australian local government, scale economies and scale diseconomies have wide application. If councils each produce their own services and there are substantial aggregate economies of scale, then it follows that a system of numerous small municipalities will result in higher expenditures for the same level and composition of output than a system of

² In more formal terms, an economy of scale is said to exist when an increase in output reduces the cost per unit of the good or service produced. If cost is given by a cost function (C) that depends on the quantity of output (Q), then an economy of scale is given by: $C(Q_1 + Q_2, 0) < C(Q_1, 0) + C(Q_2, 0)$.

fewer larger councils. However, as we have seen, scale economies are specific to particular technologies and particular services. It follows that the most efficient level of production will depend on the type of service in question. This means that where local government produces a range of different services, each with its own unique production characteristics, no single size of government will be able to produce all services at the minimum possible cost for each service.

In general, labour-intensive, customer-orientated services, such as municipal rangers, health inspectors, etc., generate few scale economies because their idiosyncratic nature means that an increased volume of services requires a correspondingly larger number of employees. By contrast, capital-intensive services, like sewage disposal and domestic water supply, usually yield significant economies of scale since the cost of fixed assets can be spread across a greater number of homes. From the perspective of structural reform, consolidation of councils into one larger council can thus reap scale economies through outcomes such as higher utilization rates of fixed assets owned by the council, greater opportunity to exploit the benefits of specialization, and discounted bulk-purchasing of inputs. On the other hand, scale diseconomies can occur when enlargement of the boundary of a council makes it more difficult to manage its activities. Management problems typically proliferate when amalgamation breaks the close links between small councils and their residents.

In terms of the Australian debate over the efficacy of amalgamation programs to improve municipal efficiency, it is possible to draw to main two conclusions. In the first place, whether scale economies or scale diseconomies exist depends on the nature of the municipal service in question and it is a moot point whether

aggregate economies or diseconomies characterize council service activities as a whole (especially since other factors potentially related to organizational size, like economies of scope, are simultaneously at play). Moreover, doubt in this regard must amplify over time as Australian local government moves away from its current relatively narrow focus on comparatively capital-intensive ‘services to property’ towards relatively labour-intensive ‘services to people’. Secondly, given the fact that the existence and magnitude of scale economies and scale diseconomies depends on the particular municipal service under consideration, the ability of small councils to accrue scale economies by purchasing services with substantial scale economies from other service producers or to enter into ‘resource-sharing’ arrangements with neighbouring local authorities in any event removes much of the force of the ‘bigger is cheaper’ argument.

Economies of Size

Size economies differ from scale economies by allowing input proportions to alter when a doubling of output is achieved for less than twice the cost. Municipal councils would be interested in both concepts in trying to achieve greater efficiencies from the services they offer, but they are more likely to follow the size economies route. However, for many practical purposes the distinction between scale and size economies is not important; it most useful when underlying production functions need to be specified in empirical analysis (see, for example, Wolff, 2004; and Deller *et al.*, 1988).

Nevertheless, the distinction between scale economies and size economies does sometimes matter. For instance, suppose several local authorities combine their administrative functions, thereby saving some of the costs incurred by

individual councils producing the same core outputs but each carrying out their own administrative functions. The inputs into administrative functions are likely to be applied in proportions different from those used to provide core council services. It is likely that clerical inputs would have a smaller cost share, changing the overall proportions of input use, when councils combine their administrative functions. On the other hand, scale economies achieved through the discounted bulk-purchasing of inputs by a consolidated group of councils might entail negligible changes in cost shares among inputs.

Economies of Scope

Production functions that allow for the joint production of two or more outputs simultaneously give rise to returns to scope in the production process. Put differently, where a single production process generates a different relationship between inputs and outputs than two separate production processes producing the same outputs, then returns to scope are present. Along the same lines as the technological concept of returns to scale describes three different generic physical relationships between inputs and output, so too returns to scope enables us to distinguish increasing returns to scope, constant returns to scope and decreasing returns to scope. Under increasing returns to scope, joint production by one organization generates more output than separate production by two different organizations using the same quantity of inputs. For constant returns to scope, joint production by one organization generates identical output to separate production by two different organizations using the same quantity of inputs. Thirdly, under decreasing returns to scope, joint production by one organization generates less output than separate production by two different organizations using the same quantity of inputs.

The analytical analogy between returns to scale and economies of scale holds also for the relationship between returns to scope and economies of scope since in both cases we have a physical and a monetary measure of the same phenomenon. Accordingly, expressed in monetary terms, increasing returns to scope is reflected in increasing economies of scope (falling average cost of output), constant returns to scope into constant economies of scope (average cost of output remaining the same), and decreasing returns to scope into diseconomies of scope (rising average cost of output).³

The outputs in question can be goods, or services, or a combination of the two, but would typically be services in the context of the kind of outputs produced in Australian local government. The separate producers of outputs could be independent firms, public agencies, or even non-profit organizations. For example, a council might currently produce service X while a private firm or state government department provides service Y, or the council might provide service Y but outsource its production, or services X and Y could be provided separately by two divisions acting as independent entities within an existing municipality.

If we now consider the question of scope economies within the institutional milieu of Australian local government, then it is possible to identify four potential sources of scope economies and diseconomies in council operations: Diminishing returns to inputs; jointness in inputs; jointness in outputs; and interactions between the processes of service provision or goods production.

³ In more formal terms, an economy of scope is said to exist when the production of two outputs by a single producer is cheaper than the production of the same quantity of these outputs by two separate producers. If cost is given by a cost function (C) that depends on the quantity of two outputs (Q1) and (R1), then an economy of scale is given by: $C(Q1,R1) < C(Q1,0) + C(0,R1)$

We will now examine each of these possibilities in turn, using salient municipal examples to illuminate the discussion.

Diminishing returns to inputs

In the first place, the existence of diminishing returns to inputs in a production process used to produce two goods or services implies that increasing amounts of an output X have to be given up as a council increasingly specializes in the production of the other output Y. An example of this type of scope economy would be where two activities previously handled by two separate departments are devolved onto a single individual or division in the organization, such as simultaneously handling inquiries concerning council fees and charges as well as tourism information. Despite a careful perusal of the relevant literature, we could find no empirical evidence on the extent of diminishing returns to inputs in Australian council operations, but we nonetheless suspect it is not great.

Jointness in inputs

Secondly, jointness in inputs is likely to be more prevalent as a source of scope economies than diminishing returns to inputs. Jointness in inputs occurs where one input can be used in the production of more than one output. Municipal administrative functions, where the same functions can be used in more than one sphere of activity, generate a host of salient examples. For instance, in the event of amalgamation or some resource-sharing agreement, the resultant centralized administrative inputs could be used to service various activities, thus saving costs that would be incurred by individual councils each producing the same outputs with their own separate administrative division.

Jointness in inputs often arises where a council owns fixed assets that are not fully utilized. Consider the typical case of the use of machinery purchased for public road maintenance in many Australian rural shires. If this machinery is less than fully utilized, then the council could employ it to provide a service for fee maintaining or repairing private feeder roads on rural properties or even contracting road maintenance for adjoining shires. A similar and not uncommon example in regional Australia occurs where a municipal building which houses an information centre also doubles as a bus terminal along long-distance coach routes.

Some inputs are not joint in production but are nonetheless sufficiently closely related to enable easy substitution between different inputs into a production process to take place. Relatively flexible substitution of this kind enables one organization producing two outputs to save inputs compared with the situation where the outputs are produced by separate organizations. It should be added that the probability of such a situation arising naturally increases with the reduced need for functional specialization. A common example of this phenomenon is a multi-function municipal building. For instance, the operation of a kitchen to provide meals for the homeless could also be used as a base for preparing a 'meals on wheels' service to housebound elderly and frail residents. Similarly, an 'op-shop' selling used clothing and household goods could provide a shopfront for additional services, such as a recycling depot. An additional example is the multi-tasking of some council employees. In instances of this kind, a municipal employee might not be fully occupied performing one largely non-specialized job, or a job with a functional specialization that is similar to that required in some other council activity. Accordingly, any spare time could be committed to producing another output. For instance, a person

responsible for the social welfare of poor members of a local government jurisdiction that takes a part of their time might also be employed operating a 'drop-in centre' for unemployed youth during specified hours. Moreover, it is not uncommon to find examples of council staff who run an information centre also selling refreshments and local souvenirs on the premises. Empirical evidence of economies of scope deriving from this source has been presented by Grosskopf *et al.* (1995) in the institutional context of American healthcare services (including acute care, intensive care, out-patient surgeries and emergency room visits).

Finally, scope economies resulting from joint inputs are by no means a one-way process: scope diseconomies might also occur in certain circumstances. The most likely source of scope diseconomies through the joint use of inputs in council operations resides in the greater organizational complexity it entails. In other words, council managers may not be able to perform their jobs as efficiently if they are simultaneously trying to solve a complex set of problems associated with different council activities.

Jointness in outputs

A third cause of economies and diseconomies of scope arises from jointness in outputs. This situation occurs when more than one output is produced from the same (or approximately the same) set of inputs, thus differing from jointness in inputs by the degree of commonality in input use. In typical production arrangements along these lines, one of the outputs is of secondary importance (or a so-called by-product) in most cases of jointness in output. In the literature a distinction is conventionally drawn between pure and impure by-products. In technical terminology a pure by-product is produced from exactly the same set

of inputs whereas an impure by-product is produced with minor additions of inputs.

A few illustrations taken from contemporary Australian local government will serve to elucidate the nature of scope economies deriving from jointness in outputs. An example of an impure by-product is where staff employed at a council rubbish depot to gather domestic and industrial waste also receive, sort, pack and transfer recyclable material. The recyclable material, which clearly forms part of the output of the rubbish depot, is not a perfect by-product in that inputs additional to those used in the operation of the rubbish depot are required to sort, pack and transfer the recyclable material. But the combined cost of collecting and receiving rubbish and recycling materials would be less than the cost of performing each task separately, resulting in scope economies. A second instance of jointness in outputs is that of a sewerage facility that not only receives sewage delivered to it but also converts this sewage into recycled water for non-potable residential and commercial uses. Once again, in this case the combined costs of sewage reception and recycling would be lower than performing the sewerage task separately from the provision of recycled water to residents.

In an analogous fashion, Gary Wolff (2004) provides numerous instances of scope economies entailing jointness in outputs in river basin management that might be relevant to the operations of councils. Moreover, he notes that improved technology is often the key in enhancing the potential for jointness in output. For example, membrane reactors have made satellite wastewater treatment plants that supply irrigation water for local landscaping much more feasible. In some cases, these satellite facilities not only allow one to capture water supply and environmental benefits, but also reduce the expense of capital

improvements in the wastewater collection pipes or treatment plants downstream.

Interactions between production processes

Interactions between production processes constitute the final source of scope economies and diseconomies. Interactions between production processes can occur when the production processes generate independent outputs: This means they differ in kind not only from jointness in outputs (where outputs are interdependent), but also from jointness in inputs (because there is no common input usage). However, there is nevertheless a link between the independent processes since outputs from one process are inputs into the second process.

Interactions between production processes producing different council outputs can be of two generic types: informational and physical. In this sense, the act of producing one output can provide information and knowledge that enhances the production of another output. This type of interaction is much more common in the provision of services than in the production of goods. A few salient municipal examples can illustrate this source of scope economies. One example is where the operation of a council youth 'drop-in' centre in some town provides its operators with information and insights concerning the social problems afflicting young people in that town that could be relayed to social welfare officers. A second illustration is the implementation of regulations to control noxious weeds in rural shire jurisdictions that simultaneously yields useful knowledge to councils that also provide a weed-spraying service for a fee. Yet another example is the provision of a service that allows residents to vent their feelings through questionnaire surveys and other instruments about

particular issues - the information gathered can often be fed back to the council to improve other services.

In general, physical interactions tend to be more common in the production of goods rather than services, and are particularly common in resource-based industries. A well-known agricultural example is the cultivation of a legume crop resulting in nitrogen fixation that benefits the next crop planted in the same ground. Similarly, where an orchardist places beehives in the vicinity of an orchard, it generates mutual benefits in the form of both fruit and honey production. However, examples of this genre of scope economy are also evident in the local government environment. For instance, Wolff (2004) observes that it is becoming increasingly prominent in municipal operations to improve environmental services to residents as well as to simultaneously attract tourists. Thus the construction of flood easements, stormwater treatment, nature strips and grass-lined drainage swales all aid the removal of excess water after precipitation. These actions not only deal with the immediate problem of unwanted water from the perspective of residents, but also enhance amenity services provided by aquatic habitat to draw tourists.

Interdependence between Scale/Size Economies and Scope Economies

It should immediately be stressed that there is no theoretical relationship between scale/size economies and scope economies. Accordingly, the advantages of one can therefore be reaped without the other. However, it is also conceptually possible to achieve scale/size economies and suffer scope diseconomies simultaneously, just as it is possible to derive economies of scope simultaneously with the occurrence of scale/size diseconomies.

In the first place, the coexistence of scale/size economies with scope diseconomies is frequently related to a high degree of functional specialization in production. Expanding the output of one production process, while forgoing the opportunities to benefit from scope economies, can lead to the more effective use of specialized resources that yield economies of scale or economies of size. This specialization can occur in a number of different guises in the municipal milieu. Two of the more common examples in council operations are the need for specialized fixed assets (for example, a particular machine that performs a specific and limited function) and skilled employees, like engineers, ecologists and health workers, who provide a particular service.

Consider the alternative outcome of a local authority that decides to provide a greater number of different services that yield scope economies at the expense of scale/size economies achievable by specializing in fewer services. For example, the specialized skills and inputs needed to construct facilities to collect sewage are distinct from those needed to provide local health services, but both nonetheless have the potential to reap scale/size economies given sufficient funds to provide both services to residents. In the context of structural reform of local government, suppose adequate funds are available to fulfill only one of these functions to the full extent of potential scope economies because financial constraints limit the volume and range of services a given municipality can provide. Under these circumstances, attainment of scope economies would come at the expense of the scale/size economies that are available from fulfilling the other function. A council could lessen this trade-off by engineering scope and scale/size economies simultaneously into its operations in a situation where funding limits are tight. When each council acts independently financial restrictions might constrain its ability to take advantage

of potential scope economies by expanding the array of services offered. But amalgamation of councils or a resource-sharing agreement between councils may allow each council to reduce the unit costs of the goods and services it currently provides. These reductions in unit costs would 'free up' funds that could now be diverted into new services. The new services would foster scope economies if the additional output is achieved at a cost lower than the separate provision of existing services.

In the empirical literature on scope economies, Deller *et al.* (1988) examined the potential for size and scope economies in low-volume rural road service in United States. They found that individual local government units that specialized in road service forewent opportunities to achieve scope economies. Those municipalities that consolidated the provision of particular types of road service were able to achieve both size economies and scope economies from the joint use of inputs. The most obvious explanation for this outcome is that the specialist skills and machinery needed in construction were common across the different road service types.

Concluding Remarks

Notwithstanding continuing confusion in the Australian debate over the merits or otherwise of structural reform in Australian local government, and the attendant erroneous conflation of economies of scale, economies of size and economies of scope, it is thus clear that these concepts are entirely theoretically distinctive and possess different characteristics, both conceptually and operationally. While for practical purposes, the distinction between scale economies and size economies seems to have little relevance in the institutional context of Australian local government, the same cannot be said for scale/size

economies and scope economies. We have sought to demonstrate that economies and diseconomies of scale arise independently of economies and diseconomies of scope. Consequently, as a matter of logic, municipal amalgamation of two or more councils producing and providing a large range of services using different input combinations and different technological processes can simultaneously generate economies and diseconomies of scale and scope. Accordingly, the oft-repeated claim that somehow net scale economies will eventuate out of such mergers, that outweigh all other considerations, cannot be sustained without detailed empirical analysis of all the individual services involved. Indeed, the international evidence on municipal consolidations suggests precisely the opposite (see, for example, Bish, 2000; Boyne, 1998; Chicoine and Walzer, 1985; Sancton, 2000).

Given the potential impact of scope economies and diseconomies as well as the possible interactions between scale economies and scope economies that will arise as a consequence of combining the activities of two or more councils, either through amalgamation or through resource-sharing arrangements, the ongoing neglect of these factors can have serious consequences for the success or otherwise of structural reform programs in Australian local government. It is thus critical that state and territory local government policy makers include these potentially significant effects into their calculations. Moreover, since almost nothing is known about the empirical magnitudes involved, at least in the Australian municipal milieu, it is therefore imperative that future research efforts should seek to establish the likely size of these effects.

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