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Estimating the Behaviour of  
Productivity in Government  
Administration Services in Australia

by

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## *ABSTRACT*

This paper estimates the change in total factor productivity (TFP) in government administration services in Australia for the period 1986/87-1993/94. A simple model is presented and calibrated using Australian data. TFP is estimated to have remained constant over this period. The issues with respect to measuring the output of government administration services are also explored.

Keywords: total factor productivity, government administration services, real output measures for government administration services.

*J.E.L.* Classification numbers: D24, H40

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# Estimating the Behaviour of Productivity in Government Administration Services in Australia

by

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## *Introduction*

Since the mid-1980s there has been increased pressure on governments in industrialised countries to constrain spending and improve budget outcomes. This has necessitated that the public sector improve its productivity by adopting more efficient practices in service provision. This can be done in one of two ways. Either by maintaining the level of inputs while increasing outputs, or by maintaining output levels while reducing inputs. Australian governments have not been insulated from these trends. The level of real spending by all Australian governments (*ie*, Commonwealth, State and Local) as a proportion of GDP has remained fairly steady since the mid-1980s *eg*, 20.04 per cent in 1986/87 and 19.17 per cent in 1993/94<sup>2</sup>. This suggests that productivity improvements in publicly provided services have taken the form of increasing service levels while maintaining or reducing inputs (see Johnson & O'Dea 1996). While there have been a few isolated attempts to measure productivity performance in certain areas of the public sector in Australia, particularly of late (see ABS 1997c; Pierce 1997; Steering Committee for the Review of Commonwealth/State Service Provision 1995), there have been no studies which attempt to estimate the behaviour of productivity in government administration services in total for Australia. This study attempts to shed light on this issue. The paper is organised as follows.

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<sup>2</sup> ABS 1996b, Table 1.2, p.3.

Section 1 presents a simple model on the relationship between inputs and outputs for government administration services. Section 2 presents estimates of the change in real factor inputs and Section 3 does the same for real output, while also exploring the concept of measuring government administration output. Section 4 presents estimates of the change in TFP in government administration services between 1986/87 and 1993/94 and contains concluding remarks.

## 1. The Model

To estimate the change in TFP it is necessary to outline a theoretical structure which explains the relationship between inputs into, and outputs of, government administration services. In general, the form of this relationship is captured by the following:

$$Y_t = f(I_t) \quad (1),$$

where  $Y_t$  is the quantity of total government administration output at time  $t$ ,  $f$  is a function with a positive first derivative, and  $I_t$  can be thought of as a function of the capital and labour used in government administration in year  $t$ . TFP is defined by:

$$TFP_t = Y_t / I_t \quad (2).$$

That is, TFP at time  $t$  ( $TFP_t$ ) equals total output at time  $t$  ( $Y_t$ ) divided by the total factors ( $I_t$ ) required to produce  $Y_t$ . Converting equation (2) to percentage change form gives

$$tfp_t = y_t - i_t \quad (3)$$

where the lower case italicised letters represent the rate of change of the equivalent upper case variables. Equation (3) says that the percentage change in TFP from year  $t-1$  to  $t$  equals the difference between the percentage changes in output and in total factors employed. Estimation of  $tfp_t$  requires estimates of  $y_t$  and  $i_t$ .

## 2. Real Inputs

The ABS measures government administration services under the division *Government Administration and Defence (ANZSIC<sup>3</sup> M)* in the national accounts. This division includes the subdivision *Government Administration (ANZSIC 81)* which is made up of:

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<sup>3</sup> Australian and New Zealand Standard Industry Classification.

- all Federal, State and Local Government units mainly engaged in government administration and regulatory activities;
- judicial authorities and commissions; and
- representatives of overseas governments (ABS 1996c, Appendix 2, para 26).

The ABS defines real output for this subdivision as the sum of

- wages, salaries and supplements revalued using fixed-weighted wage rate indexes; and
- constant price estimates of consumption of fixed capital *ie*, depreciation (ABS 1996b, Chapter 4, para 4.28).

The ABS's measure of real output is basically the sum of the real labour bill (revalued wages, salaries and supplements using fixed-weighted wage rate indexes) and the real capital bill (constant price estimates of consumption of fixed capital). Thus, this definition is a good measure of the quantity of total *inputs* for government administration services. As such, it cannot be considered a good proxy for real output.

Using inputs as a proxy for measuring real output ensures, for all practical purposes, that little factor productivity growth can be observed (Henderson 1986; Johnson & O'Dea 1996). Changes in factor productivity and capital/labour ratios can significantly affect real output. However, changes in real output due to changes in factor productivity and intensity will not be captured by measuring inputs.

There is much anecdotal evidence which suggests that both factor intensities and factor productivity have changed significantly in this subdivision since the mid-1980s. This includes the substitution of capital for labour *ie*, substitution of the relatively cheap factor for the relatively expensive factor. This is significant in the case of *Government Administration (ANZSIC 81)* as labour is the major cost in the provision of these services due to its highly labour intensive nature. Thus it is highly probable that the capital/labour ratio has increased. The capital substituted has most probably been in the form of the increased use of computers, as has occurred in other service sectors. Attempts by governments to improve productivity in these sectors make it necessary to reduce real unit labour costs. This may be done by increasing outputs with a less than equivalent increase in labour inputs, or by reducing labour inputs while keeping output constant (Johnson & O'Dea 1996)<sup>4</sup>. Under these circumstances labour productivity is likely to have

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<sup>4</sup> Johnson & O'Dea (1996) give the example of Victoria which reduced government employment by 20 per cent over three years (1992-1995). It was government policy to maintain or even increase the



improved, most likely through labour shedding, and capital productivity likely to have stayed constant or decreased due to the increased use of computerised equipment.

These changes in factor intensities and factor productivity are likely to have impacted on real output in significant ways. The current ABS measure of real output cannot, by definition, capture these types of changes, especially with respect to productivity. The ABS measure of real output is, in fact, a useful measure of real inputs (I).

The ABS estimates that real output for *Government Administration and Defence (ANZSIC M)* has increased by 23.76 per cent between 1986/87 and 1993/94 (ABS 1996d, Table 1.3, p.6). This figure will be used here as an estimate for  $i_t$ .

### 3. Real Output

Since it is not possible, for methodological reasons, to use the ABS estimates of real output for government administration services an acceptable alternative must be found. This requires an examination of the concept of real output for this sector and, thus, it is necessary to explore the various economic activities that government(s) undertake.

At the very basic level the activity of government administration is to provide a legal framework that defines property rights which allows an economic system based upon mainly private ownership, as is the case in Australia, to operate efficiently. This is the judicial system. Although this role is small in its use of resources<sup>5</sup> it is of crucial importance within an economic system such as Australia's and is subject to large positive externalities. Another small but important role is the regulatory supervision that governments provide which set the constraints of market behaviour. This includes issues of entry barriers, pricing, anti-competitive behaviour *etc.* Besides these two small but important roles, the large bulk of government activities can be classed as transferring resources between different groups in society. Resources are largely collected in the form of various taxes. These resources are then distributed via two main methods. One method is a straight cash payment through some form of allowance or pension. Different types of allowances include those for families, single parents, the

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provision of services while these reductions in employment were occurring. This was to be achieved by adopting more efficient work practices.

<sup>5</sup> The input-output group Government Administration (input-output commodity classification code 8101) for 1993/94 indicates that judicial services made up only 4.49 per cent of the value of domestic production (ABS 1997a, Table 1, pp.43-4).

unemployed *etc.* Pensions are paid to retired workers, disabled workers, widows, *etc.* The other main method of distributing resources is in the form of goods and services. These may be provided in kind *eg*, health services under Medicare, or through varying degrees of 'user pays' rationing *eg*, Pharmaceutical Benefits Scheme.

A number of examples of output indicators used for measuring government services can be found in two separate studies on measuring government administration services and productivity for the public sector in the United States and Sweden (see Bureau of Labor Statistics (BLS) (1996); and Murray (1992), respectively). A sample of the output proxies used by these two studies are contained in Table 1. It is clear from Table 1 that both the BLS (1996) and Murray (1992) use a 'transactions' approach to measuring output for individual government functions and/or agencies. That is, each government agency was examined from the point of view of what particular service they provided and this service was used as a measure of output. Both studies also conducted extensive surveys in order to collect their data. Such an approach is very resource intensive and would be difficult to implement in Australia. In attempt to estimate the change in real output for government administration services here an alternative approach will be taken.

### *3.1 An Alternative Measure of Real Output for Government Administration Services*

Table 2 lists the 14 categories of spending (current and capital) by all governments in Australia, as well as each category's share of total government spending. It would be expected that the size of the government administrative service required for each of these government and private sector provided goods and services would vary with the actual size of the national provision of these services. For example, the government administrative service required to maintain the education system (which is largely government provided) is probably proportional to the actual size of the education sector *ie*, real output of the education sector. Thus, one way to indirectly measure the output of this administrative service is to measure the output of the education sector itself, in total. Even in sectors where there is a large private component, administering the regulatory framework for that particular sector would probably be accurately reflected by using the output of the whole sector in question.

Consequently one method of constructing an alternative proxy for real government administration output is as follows.

**Table 1:**

**A Sample of the Functional Categorisation and Output Indicators Used by the BLS (1996) and Murray (1992) in Measuring Government Administration Output**

<b>Government Functions<sup>^</sup></b>	<b>Output Indicators: BLS (1996)</b>	<b>Output Indicators: Murray (1992)</b>
<i>1. Finance &amp; accounting/Tax administration</i>	Employees payrolled	Income tax returns processed
<i>2. Legal and judicial activities/Courts</i>	Cases terminated	Sentencing of offenders
<i>3. Regulation (compliance &amp; enforcement)/ Enforcement service</i>	Enforcement investigations completed	Proceedings
<i>4. Social services &amp; benefits/Social welfare</i>	Claims processed, medical payments made	Number of recipients of benefits, bed days
<i>5. Labor market board</i>	na	Job applicants, hours of attendance at training
<i>6. Regulation (rulemaking &amp; licensing)</i>	Licenses processed, applications reviewed	na

<sup>^</sup> The function descriptions used here are those used in the original studies with the first description being that used in BLS (1996) and second that used in Murray (1992).

\* A health care unit was defined as a weighted composite of inpatient dispositions, occupied bed days and outpatient visits.

**Table 2:**  
**Shares in Government Administration of Commonwealth, State, & Local  
Governments Combined**

<i>Categories of Government Administration</i>	<i>Share of Total Outlays</i>		
	<i>1986/87</i>	<i>1993/94</i>	<i>Average</i>
<i>1. General public services</i>	0.0728	0.0848	0.0788
<i>2. Defence</i>	0.0613	0.0559	0.0586
<i>3. Public order &amp; safety</i>	0.0318	0.0351	0.0334
<i>4. Education</i>	0.1244	0.1336	0.1290
<i>5. Health</i>	0.1251	0.1425	0.1338
<i>6. Social security &amp; welfare</i>	0.1981	0.2687	0.2334
<i>7. Housing &amp; community amenities</i>	0.0394	0.0231	0.0313
<i>8. Recreation &amp; culture</i>	0.0282	0.0236	0.0259
<i>9. Fuel &amp; energy</i>	0.0329	0.0101	0.0215
<i>10. Agriculture, forestry &amp; fishing</i>	0.0155	0.0150	0.0153
<i>11. Mining, manufacturing &amp; construction</i>	0.0082	0.0033	0.0058
<i>12. Transport &amp; communications</i>	0.1052	0.0715	0.0884
<i>13. Other economic affairs</i>	0.0208	0.0295	0.0252
<i>14. Other purposes</i>	0.1361	0.1032	0.1196

Sources: ABS 1996c, Table 4, p.20; 1997c.

- 1) Gather estimates of real output for each of the 14 categories listed in Table 2;
- 2) estimate the contribution to growth of total real government administration output by multiplying each category's share of total spending by the change in real output for that category; and
- 3) sum the contributions to arrive at an estimate for the change in real output.

This will be done for the period 1986/87-1993/94.

### 3.2 Results

The methodology described in the previous section requires estimates of real output for all of the 14 categories of spending listed in Table 2, column 1. These estimates will be taken from the following sources.

- For the categories 'health'; 'recreation and culture'; 'fuel and energy'; 'agriculture, forestry and fishing'; 'mining, manufacturing and construction'; and 'transport and communications', ABS estimates of the change in real output for equivalent ANZSIC national accounts divisions will be used<sup>6</sup>.
- For the category 'defence' the estimate calculated in Verikios (1998) will be used, and for the category 'education' the change in real output will be assumed to equal the estimate for education services reported in Verikios (1997).
- For the category 'housing and community amenities' the change in real output will be assumed to equal the change in the real value of the stock of government dwellings between 1986/87 and 1993/94<sup>7</sup>.

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<sup>6</sup> For the (outlays by purpose) category 'health' the change in real output for the ABS national accounts division Health and Community Services (ANZSIC O) will be used. For the category 'recreation and culture' the change in real output for the Cultural and Recreational Services (ANZSIC P) division will be used. For the category 'fuel and energy' the change in real output of the Electricity, Gas and Water Supply (ANZSIC D) division will be used. For the category 'agriculture, forestry and fishing' the change in real output of the Agriculture, Forestry and Fishing (ANZSIC A) division will be used. For the category 'mining, manufacturing and construction' the change in real output of the share weighted average for the three divisions Mining (ANZSIC B), Manufacturing (ANZSIC C) and Construction (ANZSIC E) will be used. For the category 'transport and communications' the change in real output of the share weighted average for the divisions Transport and Storage (ANZSIC I) and Communication Services (ANZSIC J) will be used (ABS 1996b, Table 1.3, p.5-6; 1996d, Table 1.3, p.6).

<sup>7</sup> This was calculated using ABS data on dwellings held by general government at average 1989/90 prices (see ABS 1997b, Table 8, p.18). The capital stock indexes used for these calculations were end-year gross capital stock and end-year net capital stock. To calculate a value for the capital stock for the years 1986/87 and 1993/94 a three-quarter weight and one-quarter weight was applied to each of these indexes, respectively.

- For the category 'social security and welfare' the change in real output will be assumed to equal the change in the total number of recipients of pensions, allowances and other benefits from the Department of Social Security (DSS), between 1986/87 and 1993/94 (see DSS 1987; 1994).
- For the remaining four categories of 'general public service'; 'public order and safety'; 'other economic affairs'; and 'other purposes', the change in real output will be assumed to equal the change in real gross domestic product (GDP) over the period 1986/97-1993/94 *ie*, 21.99 per cent<sup>8</sup>.

Table 3 contains the estimates, shares and contributions to growth of total government administration output for each category, as well as the estimated change in real output for total government administration output for the period 1986/87-1993/94. This methodology estimates that real output grew by 22.78 per cent *ie*, 3.25 per cent annual average growth, over this period.

The estimate presented here is based more directly upon output proxies. That is, it attempts to account, albeit indirectly, for the expected demands on administrative services provided by governments. It does this by measuring changes in real output of those sectors that governments are responsible for in the provision of administrative services. These sectors include categories where the government is involved in the direct provision of services *eg*, 'education', and also where the administrative service almost exclusively involves regulatory supervision *eg*, 'agriculture, forestry & fishing'; 'and mining, manufacturing and construction'.

#### 4. TFP Productivity Estimates and Concluding Remarks

Section 2 estimates that real inputs to government administration services have grown by around 23 per cent between 1986/87 and 1993/94. Section 3 estimates that real output for government administration services also grew by around 23 per cent over the same period. These estimates suggest that TFP has remained constant between 1986/87 and 1993/94. It was noted earlier that one outcome of improving public sector efficiency was higher labour productivity and lower capital productivity. If this premise is accepted, then it appears that any improvements in labour productivity have almost completely been offset by falls in capital productivity.

The above analysis suggests that despite attempts to improve public sector efficiency TFP has remained constant. The highly labour intensive nature of government administration services constrains attempts at improving public sector

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<sup>8</sup> The general nature of these services suggests that the administration service required for each would move in line with economic activity. Thus the use of the change in real GDP as an estimate for the change in real output for these categories.

Table 3:

**Estimates of the Change in Real Output for Government Administration  
Categories and Total Government Administration Output (Commonwealth, State  
and Local Governments Combined) between 1986/87 and 1993/94**

<i>Categories of Government Administration</i>	<b>1. Estimated Change in Real Output (%)</b>	<b>2. Average Share of Total Outlays*</b>	<b>3. Contribution to Change in Real Output of Total Government Administration Output (%)</b>
1. Defence	-3.98	0.0586	-0.23
2. Education	14.59	0.1290	1.88
3. Health	31.47	0.1338	4.21
4. Social security & welfare	19.30	0.2334	4.51
5. Housing & com- munity amenities	39.87	0.0313	1.25
6. Recreation & culture	20.75	0.0259	0.54
7. Fuel & energy	23.90	0.0215	0.51
8. Agriculture, forestr. & fishing	13.81	0.0153	0.21
9. Mining, manufactur- ing & construction	20.80	0.0058	0.12
10. Transport & communications	46.73	0.0884	4.13
<b>Sub-total</b>	<b>na</b>	<b>0.7430</b>	<b>17.13</b>
11. General public services	21.99 <sup>^</sup>	0.0788	1.73
12. Public order & safety	21.99	0.0334	0.74
13. Other economic affairs	21.99	0.0252	0.55
14. Other purposes	21.99	0.1196	2.63
<b>Sub-total</b>	<b>na</b>	<b>0.2570</b>	<b>5.65</b>
<b>TOTAL</b>	<b>na</b>	<b>1</b>	<b>22.78</b>

\* See Table 2, column 4.

<sup>^</sup> This is equal to the change in GDP(I) at average 1989-90 prices between 1986/87 and 1993/94 (ABS 1996b, Table 1.2, p.3).

efficiency to focus almost exclusively on improving labour productivity. This has most probably come in the form of labour shedding and increased use of capital equipment, particularly computer equipment. This strategy seems to have been 'productivity neutral' in the sense that TFP has not altered much. It is possible that the emphasis on improving labour productivity has been too great and that a more total factor approach to improving efficiency is necessary in future reforms of the public sector in order to ensure TFP improves.



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