The Growth of Urban Areas in Australia

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Abstract

This paper analyses the main causes of the growth in population and employment in urban areas in Australia. We find that two-thirds of the variations in growth rates between 1981 and 1991 are explained by four factors: an inland location, a reliance on primary sector production, a tourist orientation, and suburban growth. Tourism and suburban growth greatly increased both population and employment growth. Inland towns and coastal commodity towns experienced well below average growth. Similar results are found for the five years from 1976 to 1981. Consistent with earlier Australian research, we find that urban growth in the 1980s was negatively correlated with government employment in the cities in 1981. But, unlike this previous research, we find that there is no general relationship between urban growth and the initial population level, the initial human capital or the level of economic specialisation of an urban area.

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I Introduction

In their recent path-breaking article on Australian city growth in the *Economic Record*, Bradley and Gans (BG, 1998) conclude that the main factors influencing the growth of urban areas in Australia are the initial conditions. In particular, the authors find that the growth rates of city populations and labour forces are related positively to the initial level of human capital and negatively to the population level. The main measure of human capital used is the proportion of the workforce with university or post-secondary school vocational skills, which ranges from about 12 to 25 per cent of the workforce. The level of population is interpreted as a negative proxy for the quality of urban life. They conclude more tentatively that growth rates are negatively correlated with initial government employment and the degree of specialisation. However, BG note that all these findings are 'preliminary'. They also note that, although the initial conditions are correlated with city growth, they should not necessarily be interpreted as 'causal' or 'structural factors'.

Prima facie, these main conclusions seem plausible. As BG point out, research suggests that city growth in the United States is related positively to the initial education level of the population (Glaeser et al., 1995). The reasoning is that there are major spillovers from education, which increase productivity growth in urban areas as they do nationally. Moreover, as people become more affluent, they tend to place greater priority on the 'quality of life'. The demand for environmental goods is income elastic and people seek out preferred environments. Given a crude correlation between city size and pollution, population would move to smaller cities.

On closer examination these reasonings seem more fragile. Firstly, the relationship between the change in population (or workforce) and the initial stock of human capital is not clearly specified. There must be some implicit assumption(s) that the human capital stock has a lagged effect on the size of the labour force over and

above its effect in the initial year. But the nature and magnitude of this lagged relationship is not clear. Secondly, most of the urban economics literature (including BG, 1998, and Glaeser et al., 1995) assumes that labour is highly mobile between cities. O'Sullivan (1996) estimates that the elasticity of labour supply in the United States with respect to wages is about 5.0. Given a highly elastic labour supply curve, and a less elastic labour demand curve, changes in the urban workforce depend more on shifts in the demand for labour than on the initial supply of labour or on shifts in supply.

Turning to the population variable, we may immediately observe a possible contradiction. The human capital argument relies on the importance of knowledge spillovers. As Henderson et al. (1995) and many others have observed, these positive externalities generally *increase* with urban output and population size (this is described broadly as the agglomeration economies of city size).[1] Firms are attracted to large cities because the real cost of labour and other inputs is relatively cheap. These arguments imply that population size may itself be a cause of population growth.

Of course, if environmental quality falls with city size, quality of life considerations may cause net emigration from large cities. However, immigrants to cities do not bear the marginal external costs of pollution they cause. More importantly, the presumption that population and quality of life are inversely related is not necessarily well based. Many residents of Sydney pay nearly double the housing and transport costs that apply in other cities, without a fully offsetting increase in nominal wages or a decrease in other prices. This implies that they perceive the non-monetary quality of life to be higher in Sydney than elsewhere. More generally, if

[1] The technical urban economics literature distinguishes between two agglomeration economies. With localisation economies, a firm's unit costs fall with increased output in its industry. With urbanisation economies, a firm's costs fall with increased output of a city. Henderson et al.(1995) find that both economies apply to new industries, but only the former economies apply to mature industries.

population and quality of life are negatively related, one has to question why large cities are large in the first place. If large cities have a poor quality of life, real wages must be higher in large cities to attract labour. Larger cities will then experience a lower rate of growth only if real income rises more slowly than in other cities. It is the change in relative real income that matters, not the initial quality of life.

These doubts are reinforced by the empirical results in BG (1998). For convenience, the main relevant results are reproduced in Table 1. These equations seek to explain the variations in population and employment growth rates in 104 urban areas in Australian between 1981 and 1991. As shown, the initial level of population and the share of qualified workers in the labour force are significant factors (at the 95 per cent level of significance). However, these equations explain only 21 per cent of the variations in population growth rates and 15 per cent of the variations in labour force growth rates. Evidently, these models omit some influential factors. If we can identify these factors, it may turn out that initial population and human capital are not such significant causes of urban growth.

It may also be observed that, in Table, 1 urban growth is correlated positively with the initial proportion of the workforce in manufacturing. This result is not supported by other BG regressions, which are not reproduced here. These other regressions do provide some support for BG's tentative conclusions, mentioned above, that urban growth was related negatively to the initial share of government employment and the level of specialisation. However, as BG note, theoretical arguments can be made to support both these results and the reverse. Also, the empirical support for these findings is sensitive to model specification.

Table 1
Some Key Results in Bradley and Gans (1998)

	Dependant variable	
Explanatory variables	Log of urban population growth, 1981-91[a]	Log of urban labour force growth, 1981-91[b]
Constant	1.058	0.542
	39.8	2.0
Population in1981 (log)	-0.009	-0.072
	-4.9	-3.7
Manufacturing workforce (%, 1981)	0.059	0.509
	2.0	1.7
Qualified workforce (%, 1981)	0.246	2.268
	2.8	2.6
State dummy variables		
NSW	-0.004	-0.107
	-0.3	-0.8
Victoria	-0.004	-0.036
	-0.3	-0.3
Queensland	0.017	0.148
	1.2	0.7
South Australia	-0.011	-0.126
	-0.8	-0.8
Western Australia	0.005	0.000
	0.3	0.0
Tasmania	-0.013	-0.191
	-0.7	-1.1
Number of observations	104	104
Adjusted R-squared	0.214	0.148

(a) Measured as log population 1991 - log population 1981.
(b) Measured as log labour force 1991 - log labour force 1981.

Note: The figures below the coefficients are t-statistics, estimated from the coefficients and standard deviations given in BG (1998).

Source: Bradley and Gans, 1998.

In the rest of this paper, we develop alternative explanations of urban growth in Australia, describe the BG and other data used to test these hypotheses, and give our results for the 1981-91 period. We provide further tests of the BG results. Finally we examine whether our main findings apply also to the 1976 -81 period.

II Why Australian Urban Areas Grow: Alternative Hypotheses

In this paper we follow the general presumption in the urban economics literature that the changes in the demand for labour are the major determinant of urban labour force growth. This reflects the view that such shifts in the demand curve are more common and larger than shifts in the supply curve. It also reflects the responsiveness of labour to changes in demand. Some Australian support for this view can be found in Debelle and Vickery (1998). As Nijkamp et al (1986) and O'Sullivan (1996) show, the practical consequence of these assumptions is that urban base and input-output models overwhelmingly dominate the models used to forecast urban growth. In these models, labour demand drives employment and labour supply is wholly endogenous. Moreover, population is often projected as a simple multiple of the workforce.

Two hypotheses emerge. (i) Labour force growth is primarily a function of the demand for goods and services produced by the local urban area. (ii) Population growth is a function of employment growth and of urban amenity, which attracts the non-working population. Of course, urban amenity may also affect economic growth directly as a source of tourism and indirectly by lowering labour wages rates.[2]

In the absence of detailed data on urban economies in the 1980s, these hypotheses cannot be tested directly. Proxy variables are required to represent the prospects of the major economic sectors in the 1980s.

As is well known, employment has shifted substantially from primary industries into service industries, especially into the tourism sector. This has reflected partly the real long-term decline in Australian commodity prices (Abelson, 1989). Between 1981 and 1991, real commodity prices fell by 38 per cent in Australian dollars, and by even more in international currency terms. They fell almost equally for rural

[2] BG's model also takes into account non-monetary reasons for people to move among cities.

commodities and other commodities. There was also declining employment intensity in the primary sector. On the other hand, increasing incomes, earlier retirements and lower real transport costs greatly encouraged domestic and international tourism and increased the range of residential retirement options. To give one example of this trend, short-term overseas arrivals increased by 153 per cent between 1981 and 1991 (and by 173 per cent between 1982 and 1992).

To reflect these trends, we developed three simple proxy variables.

- **Inland towns**. Most inland towns have two significant disadvantages. They are significantly affected by adverse primary sector performance and they have a relatively harsh climate. The latter matters increasingly as amenity determines residential location.
- **Coastal commodity towns**. These are towns that rely to a significant extent on commodity production or trade, for example Bundaberg or Gladstone in Queensland or Newcastle and Wollongong in NSW.
- **Tourist urban areas**. Areas attractive to short or long-stay visitors are likely to experience relatively high growth rates. However, there is considerable disparity between these areas. Some towns, notably those on the NSW coast north of Sydney and along the southern Queensland coast are highly attractive and relatively accessible to tourists and retirees. Other towns in colder coastal areas or inland also have tourist attractions, but the attractions are usually weaker. As discussed below, we used dummy variables to represent *major* and *minor* tourism towns respectively.

A further critical issue arises over the definition of urban areas. As the technical literature acknowledges, the definitions are often arbitrary. In our data set, some 'towns' are development suburbs on the fringes of large cities, not independent urban

areas. As discussed below, we use a dummy variable to represent these **growth suburbs**. Because of planning restrictions on development in built-up areas, population growth is generally higher in fringe areas than in established areas. This would occur as the demand for housing space increases, even if there were no overall increase in city population.

III Data Sources

Our analysis uses and extends the data set developed by BG (1998). The BG data include estimated populations and labour forces for 104 Australian Urban Centres in 1976, 1981 and 1991, derived from Census data collected by the Australian Bureau of Statistics (ABS). BG used Urban Centre data because these are better indicators of urban size than the ABS Statistical Local Areas or Local Government Areas. Urban Centre boundaries are adjusted at each Census count in an attempt to deal with suburbanisation. Between 1981 and 1991, the average rate of population growth for these centres was 23 per cent. This included 12 urban areas with negative population growth and 13 areas with growth rates of 50 per cent or more (including five areas in which population growth exceeded 100 per cent).

The BG data include a wealth of other information about these urban centres, focussing on the conditions in 1981. Of relevance to this analysis are the qualified population (the percentage of the population with post-secondary qualifications), manufacturing and government employment as percentages of the workforce, and BG's estimated degree of economic specialisation in an urban area using a modified Herfindahl index.

For our analysis, five dummy variables are needed for inland urban areas, coastal commodity areas, major and minor tourism areas, and suburban growth areas.

Inland urban areas are defined as all towns more than about 50 kilometres from the coast. This includes such towns as Toowoomba (Qld.) and Sale (Vic.), but excludes Nambour (Qld.) and Maitland (NSW). Just over a third of the towns in the data set (37 in total) are defined as inland urban areas.

Coastal commodity urban areas are towns whose economy is substantially affected by commodity production or trade. These includes the sugar or mineral oriented towns in northern Queensland, the steel towns in NSW and South Australia, some rural coastal towns in Victoria, and the three port cities (Augusta, Lincoln and Pirie) in South Australia. Nearly a quarter of the data set (23 areas) is designated coastal commodity towns.

Major tourism areas are defined as Sydney and all coastal urban areas north to the Queensland border and major coastal tourism towns in southern Queensland as advised by the Queensland Tourist Board. Minor tourism towns include most other coastal towns close to major cities, several coastal towns in northern Queensland, and inland towns such as Canberra, Mildura, Bathurst and Dubbo. The designations were determined by reference to internet information provided by the towns, the advice of the editor of the *Australian Planner* (Richard Cardew), and discussions with colleagues who have resided in various states. Fifteen towns were designated major tourism areas and 22 towns were considered to be minor tourism areas.

On examination of the data set, we found that although the Urban Centre concept was designed to include suburban areas in the cities, this goal had not been achieved completely. Several development suburbs were designated as independent urban areas. These included Central Coast and Richmond-Windsor (Sydney suburbs), Beenleigh (Brisbane), Craigieburn, Cranbourne and Melton (Melbourne), Gawler (Adelaide), Karratha and Mandura (Perth) and so on. Following the advice of Cardew,

16 urban areas in the data set are identified as potential suburban growth areas in the 1980s. These include some suburbs, such as Richmond-Windsor (Sydney) and Kwinana (Perth), where little growth actually occurred.

Notwithstanding the advice and research on which the designations are based, some designations in each category involve inevitably an element of judgement. We believe that most of these designations would be generally agreed. Moreover, sensitivity tests, in which the values of some explanatory dummy variables were adjusted, indicated that the results were not sensitive to these adjustments. The more important issue is the definition of the urban areas themselves. As we will see, the results are sensitive to the inclusion or exclusion of certain areas from the analysis.

IV Empirical Model and Results

The basic model that we test is:

$$\text{Log } (y_{91}/y_{81})_i = f \text{ (economic changes, initial conditions, log } (y_{81}/y_{76}))_i \qquad (1)$$

The dependent variable is the log of the ratio of the population (or labour force) in 1991 to 1981 in each urban area i. This form of dependent variable was chosen because it has a more normal distribution than the percentage change variable, $(y_{91}-y_{81})/y_{91}$. It also allows direct comparison with BG's results as they used this variable form. The economic changes are modelled with the dummy proxies described above. The initial conditions are the log of population in 1981 (reflecting quality of city life in BG's analysis), the percentages of the workforce with tertiary education or in manufacturing or government, and the adapted Herfindahl specialisation index in 1981. The third potential explanatory factor is the previous rate of growth of the dependent variable.

A statistical issue in this analysis is heteroscedascity. In some regressions the variance of the residual increases with the value of the dependent variable. In order to deal with this, all t-statistics shown below are estimated using White's heteroscedastic-consistent covariance matrix. This ensures that the reported coefficient is significant at the 95 per cent level at the standard value of 1.95.

Another important issue is the choice of urban areas for inclusion in the analysis. Obviously, it would be desirable to include all 104 areas in the BG data set. However, we exclude Kawana Waters (Queensland) from all regressions because the growth rate from 1981 to 1991 was an extraordinary 175 per cent on top of a very small base (5241 people) and there are no 1976 data for the town. Thus our sample base is 103 urban areas. Secondly, we make sensitivity runs that exclude the two largest urban areas (Sydney and Melbourne) and the four smallest in 1981 (Sawtell, Craigieburn, Ocean Grove and Caboulture). There are good reasons for this. The data set underestimates the real growth of Sydney and Melbourne by excluding some of their growth suburbs. On the other hand, the four areas with the lowest populations (all less than 7000 people in 1981) experienced exceptionally high rates of growth in the 1980s from their very low base. We would not want the results to be unduly influenced by these exceptional cases. Thirdly, for the 1976-81 period, further sensitivity tests were done excluding Central Coast (NSW) and Karatha (Western Australia), both of which had extraordinary growth rates far in excess of other urban areas in this period.

We discuss below the empirical results. Tables 2 and 3 show models of population and labour force growth for the 1981-91 period. Table 4 shows results for 1976-81. As will be seen, the results provide strong support for the hypotheses developed above.

Urban population growth 1981-91 (Table 2)

Regression R1 shows that our five main explanatory variables explain 65 per cent of the variations in the log of urban population growth rates between 1981 and 1991. All coefficients are of the expected sign, of a plausible order of magnitude, and significant at the 95 per cent level of significance (most are significant at the 99 per cent level). Over the ten year period, population growth rates were an estimated 8.2 per cent lower in inland towns and 12.6 per cent lower in coastal commodity towns, holding all other factors constant.[3] On the other hand, population growth rates rose by an estimated 27.3 per cent in major tourist areas and by 18.1 per cent in minor tourist areas. The population of suburban development areas increased by 33.2 per cent more than in other areas.

Equation R2 tests the impacts of the initial (1981) population levels and qualified population on urban population growth. As measured by the adjusted-R squares in R2 and R1, these variables have minimal impact on the overall level of explanation. Moreover, the coefficient for human capital has the wrong sign and is insignificant. This finding is replicated in other regressions not reported here, for example one with our five basic explanatory factors plus human capital and the workforce in manufacturing as potential explanators.[4] It may be observed that the coefficient for initial population has the expected sign and is significant at the 95 per cent level in R1. But this effect depends critically on inclusion of the two largest and four smallest urban areas in the data set. When these are excluded, as in equations R3 and R5, the initial level of population is not a significant explanatory variable.

[3] Given the functional form of the regressions, the percentage change associated with any dummy variable equals e^{β}-1 where β is the coefficient reported in the regression.

[4] Our finding, in contrast to BG, that initial human capital is not an important factor in urban growth may be due to the relationship between our explanatory factors and human capital. In inland areas, only 16.0 per cent of the population have tertiary education qualifications. In our major tourism areas, the proportion rises to 18.4 per cent.

Table 2
Explanations of Urban Population Growth (log pop. 1991 - log pop.1981)

Explanatory variable	R1	R2	R3[a]	R4	R5[a]	R6
Constant	0.122	0.460	0.223	0.303	0.292	0.112
	4.8	3.2	1.7	4.7	2.1	3.6
Inland town[b]	-0.079	-0.110	-0.082	-0.069	-0.077	-0.076
	-2.8	-3.3	-2.6	-2.6	-2.6	-2.6
Coastal commodity town[b]	-0.119	-0.139	-0.117	-0.123	-0.123	-0.115
	-4.9	-5.0	-4.8	-5.2	-4.9	-4.7
Major tourism town[b]	0.241	0.232	0.245	0.203	0.220	0.175
	5.3	5.8	5.4	4.2	4.9	3.0
Minor tourism town[b]	0.166	0.149	0.162	0.166	0.166	0.148
	6.4	5.4	5.9	6.8	6.4	5.1
City growth suburb[b]	0.287	0.247	0.245	0.292	0.244	0.228
	5.5	4.9	4.5	6.1	4.8	4.4
Log Population in 1981		-0.026	-0.010		-0.008	
		-2.2	-0.8		-0.7	
Qualified workforce (% 1981)		-0.312				
		-0.7				
Manufacturing workforce (% 1981)				0.046		
				0.3		
Government workforce (% 1981)				-0.351	-0.324	
				-2.7	-2.7	
Urban specialisation (1981)				-0.834		
				-1.8		
Urban growth 1976-81[c]						0.193
						0.95
Number of observations[d]	103	103	97	103	97	103
Adjusted R-squared	0.651	0.669	0.663	0.673	0.682	0.665

(a) Excludes Sydney, Melbourne, Sawtell, Craigieburn, Ocean Grove, Caboulture.
(b) Dummy variable.
(c) Log.pop.1981 - log.pop.1976.
(d) All regressions exclude Kawana Waters.

Equation R4 tests whether urban population growth was correlated with the initial government or manufacturing workforce or the amount of specialisation in an urban area. We find, consistently with BG, that urban areas with higher initial proportions of government workers grew more slowly in the 1980s. Regression R5, which excludes the largest and smallest urban areas, confirms this. Population growth was not correlated with the initial manufacturing workforce. Also, although equation (R4) indicates that urban growth might have been related to specialisation, this result

is not replicated in other runs. More especially, if specialisation is important, it should influence labour force growth, but it does not (see equation R10 in Table 3).

Finally we examine whether inclusion of the past growth rate in the model would improve its explanatory power. In an unreported regression, we find that past (1976-81) population growth rates explain only 25 per cent of the 1981-91 growth rates. Our explanatory model predicts much better than a simple extrapolation model. Equation R6 shows that including past urban growth in the model adds very little to the overall level of explanation shown in equation R1 and that the coefficient for past growth is not significant.

Urban labour force growth 1981-91 (Table 3)

As would be expected, our models of labour force growth produce similar results.[5] The levels of explanation are comparable with, but slightly below, those for population growth. In equation R7, all coefficients are plausible, have the expected sign, and are significant at the 95 per cent level, except for the inland area dummy variable. This latter observation suggests that the labour force in inland areas was more stable than other population elements. Presumably, older residents migrated increasingly to the coast. The high coefficient on city growth suburbs may be interpreted as increasing decentralisation of metropolitan employment.

Equation R8 suggests that the labour force growth may be related negatively to initial population. However, equations R9 and R11, which omit the two largest and four smallest towns, indicate that this relationship is not significant even at the 90 per cent level of significance. Nor is there any evidence that labour force growth is

[5] The correlation between population and labour force growth rates between 1981 and 1991 is 0.98.

Table 3
Explanations of Urban Labour Force Growth (log LF 1991 - log LF 1981)

Explanatory variable	R7	R8	R9[a]	R10	R11[a]	R12
Constant	0.119	0.621	0.463	0.184	0.516	0.105
	2.5	3.5	2.1	1.3	2.3	2.1
Inland town[b]	-0.054	-0.010	-0.068	-0.052	-0.068	-0.049
	-1.2	-2.4	-1.7	-1.4	-1.7	-1.1
Coastal commodity town[b]	-0.087	-0.117	-0.089	-0.093	-0.093	-0.083
	-2.1	-3.1	-2.5	-2.3	-2.5	-2.0
Major tourism town[b]	0.280	0.261	0.273	0.260	0.253	0.195
	5.1	6.3	6.2	4.0	5.5	2.9
Minor tourism town[b]	0.206	0.177	0.191	0.211	0.195	0.182
	5.8	5.5	6.0	5.6	6.2	4.8
City growth suburb[b]	0.349	0.287	0.289	0.345	0.288	0.273
	5.3	5.2	4.9	5.9	5.0	4.1
Log Population in 1981		-0.042	-0.033		-0.032	
		-2.5	-1.5		-1.4	
Qualified workforce (%, 1981)		-0.196				
		-0.4				
Manufacturing workforce (%, 1981)				-0.044		
				-0.2		
Government workforce (%, 1981)				-0.349	-0.252	
				-2.0	-1.6	
Urban specialisation (1981)				0.330		
				0.3		
Urban growth 1976-81[c]						0.248
						1.1
Number of observations[d]	103	103	97	103	97	103
Adjusted R-squared	0.574	0.611	0.586	0.576	0.591	0.592

(a) Excludes Sydney, Melbourne, Sawtell, Craigieburn, Ocean Grove, Caboulture.
(b) Dummy variable.
(c) Log.pop.1981 - log.pop.1976.
(d) All regressions exclude Kawana Waters.

correlated with the initial level of human capital, the proportion of the workforce in manufacturing, or the level of urban specialisation. There is, however, weak support for a negative relationship between labour force growth and the percentage of the initial workforce in government.

In an unreported regression, we find that past (1976-81) rates of labour force change explain only 14 per cent of the 1981-91 labour force changes. Thus equation R7 provides a value added explanation compared with a naïve extrapolation forecast.

In regression R12, the coefficient on past labour force growth is not significant and the overall explanation little higher than in R7.

Population and labour force growth, 1976-81, Table 4

Finally, we review briefly whether 1976-81 urban growth rates were related to economic prospects, as reflected in our proxy variables, and the initial level of population (quality of life). We cannot test whether the 1976-81 growth rates were related to initial conditions or past growth rates as we do not have these latter data.

But, first, were the economic conditions in the second half of the 1970s similar to those in the 1980s? They were for tourism. The second half of the 1970s was a period of significant tourist growth. For example, short-term overseas arrivals increased by 77 per cent between 1976 and 1981, almost exactly the same high annual rate of the 1980s. Retirement to the coast was also popular in the 1970s. In metropolitan areas, many of the development suburbs in the 1980s would also have been growth suburbs in the late 1970s. The main difference between the 1980s and 1970s lay in the commodity price outlook. Because of the commodity price booms in 1973-74 and 1980-81, movements in commodity price indices in the 1970s are especially sensitive to choice of years. Over some periods, commodity prices fell in real terms; in others they rose. However, overall the 1970s were a period of greater confidence in the long run future of commodity prices than the 1980s.

Table 4 shows three population growth regressions and three labour force regressions. All use the same six explanatory variables, the five economic proxies and the log of the initial (1976) population. The difference is the sample of towns used. Equations R14 and R17 exclude Central Coast and Karatha. Equations R15 and R18 exclude in addition the two largest and four smallest towns. As we will see, some results are sensitive to the sample set.

Table 4
Explaining Urban Population and Labour Force Growth (1976-81)

Explanatory variable	Population growth[a]			Labour force growth[b]		
	R13	R14[c]	R15[d]	R16	R17[c]	R18[d]
Constant	0.0245	0.437	0.281	0.128	0.323	0.027
	1.2	4.2	3.0	0.5	1.7	0.1
Inland town[e]	-0.038	-0.086	-0.063	-0.027	-0.079	-0.052
	-0.8	-3.0	-2.1	-0.5	-2.0	-1.3
Coastal commodity town[e]	-0.027	-0.081	-0.067	-0.040	-0.105	-0.092
	-0.7	-3.3	-2.6	-0.8	-2.7	-2.3
Major tourism town[e]	0.327	0.230	0.285	0.307	0.208	0.282
	3.6	6.5	9.1	3.1	3.8	6.7
Minor tourism town[e]	0.083	0.059	0.075	0.057	0.034	0.056
	2.7	2.3	3.0	1.6	1.1	1.8
City growth suburb[e]	0.275	0.136	0.168	0.284	0.130	0.183
	2.6	2.4	2.8	2.5	2.1	3.0
Population in 1976 ('000)	-0.018	-0.031	-0.018	0.000	0.013	0.013
	-1.1	-3.6	-2.5	0.0	0.7	0.5
Number of observations[f]	103	101	95	103	101	95
Adjusted R-squared	0.566	0.621	0.632	0.411	0.038	0.416

(a) Log population 1981 - log population 1976
(b) Log labour force 1981 - log labour force 1976
(a) Excludes Central Coast and Karatha
(b) Excludes Central Coast, Karatha , Sydney, Melbourne, Sawtell, Craigieburn, Ocean Grove, Caboulture
(c) Dummy variable.
(d) All regressions exclude Kawana Waters.

Overall the regressions provide a similar level of explanation for 1976-81 population growth as for 1981-91 population growth. They perform slightly less well for labour force changes. The results also show that similar forces influenced urban growth in the second half of the 1970s as in the 1980s.

As for the 1981-91 results, major tourism towns and city growth suburbs were major attractors to both population and employment, regardless of the sample used. The coefficient for minor tourism towns is also significant at the 95 per cent level in all population regressions, but not for the labour force. All coefficients for inland and coastal commodity towns are (as before) negative and over half are significant at the 95 per cent level. If the two outliers, Central Coast and Karatha are excluded, as in

equations R14 and R17, all these coefficients are significant at the 95 per cent level. In two regressions R14 and R15, the initial population level is related negatively and significantly to population growth. However, this is not the case in equation R13. Nor is any significant relationship is found in any regression between labour force growth and the initial population.

V Conclusions

In this paper we have found that urban population and employment growth rates in the 1980s were correlated strongly and positively with tourism and amenity areas and with suburban growth areas. They were negatively related to inland areas and coastal commodity areas. It also appears that urban growth was negatively related to the initial proportion of the labour force working in government. In our view, these correlations reflect causal economic processes.

Urban growth models are almost certainly period specific. Tourism, amenity and suburban growth were also found to be important positive influences on urban growth rates in the second half of the 1970s. Commodity related impacts were weaker in this more commodity optimistic period.

Generally, our findings are consistent with mainstream urban economics, which suggests that urban growth depends principally on the demand for labour and the demand for amenity. Our findings do not support other Australian (and US) empirical work, which suggests that urban growth is related to the initial level of population or human capital.

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