

THE RELATION BETWEEN URBAN AND RURAL POPULATIONS: EMPIRICS AND IMPLICATIONS

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“God made the country, and man made the town”

WILLIAM COWPER, *Town and Country*

Policies aimed at increasing farm efficiency through amalgamation and those directed at decentralization of population require a clear understanding of the relationship, both functionally and empirically, between rural populations and the towns which they surround. In this article we show that rural towns have evolved as service centres for the surrounding population and that there is a definite numerical relationship between the population in the rural sector and that in the related urban service centres. Policy implications of these findings are then deduced.

1 THE PROBLEM

Although much research effort has been devoted to the agricultural sector in isolation, very little attention has been paid to the interaction of this sector with the rural towns and cities which are located within it. The aspect of this rural-urban nexus which this paper treats is the relationship of populations in urban and rural towns, both functionally and empirically. The aim is to put forward a framework for thought and to provide some data for the making of demographic policy decisions on rural areas. In so doing, we draw a great deal from the ideas first put forward by Christaller¹. For the benefit of readers unfamiliar with these ideas, we will digress momentarily for a brief and truncated exegesis thereof.

2 THE FRAMEWORK

2.1 TYPES OF TOWNS

Christaller classifies towns into two categories—“central settlements” and “dispersed places”². Dispersed places will not concern us too much here except to note that they exist in relation to specific resources or

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¹ Walter Christaller, *Central Places in Southern Germany* (Trans. C. W. Baskin), (Englewood Cliffs: Prentice Hall, 1966). This classic, originally published in 1933, was not available in English until this 1966 edition.

² *Ibid*, p. 16.

activities—for example tourist, mining, shipping, industrial complexes or a number of other factors not typical of Australia such as monasteries, universities or craft industries.

But, in this article, the primary concern is with central places which exist almost exclusively as providers of services for the rural population surrounding them³. It is not readily apparent to all that most of the towns west of the Divide—with the exception of the dispersed places as above—do in fact exist almost solely to serve the agricultural population of the region. To some this assertion smacks of physiocracy, or, worse, smells of agricultural fundamentalism. But let dissenters ask themselves what would happen to Crookwell, Cloncurry or Coolamon if all the surrounding population were to go off on some latter-day crusade (the reader is left to muse on the possibilities). Or to labour the point—put the question in reverse and try to imagine why Crookwell could have come into existence without agriculture to support it.

Now it is obvious enough to even a casual observer that there is a hierarchy in the size and type (exemplified by the range of services offered) of rural towns and that this occurs in relation to fairly well demarcated regions. We go on to describe this phenomenon.

2.2 SIZE AND FUNCTIONAL HIERARCHY

Since it has been shown that size and number of functions performed by a central place are highly correlated we can talk of the two interchangeably⁴. Broadly speaking, (an important qualification follows) the size and hence the number of services provided is determined by the “extent of the market”⁵ for the services which they provide. Thus a village occurs where sufficient demand for its limited range of services exists. But a town, which provides a more extensive array of services, must draw on a much larger population. Towns, then, be they rural or industrial, grow in size and complexity only as the number of people which they serve increases⁶. An example of this principle is the provision of medical services. A village has no doctor because the population it serves is not sufficient to provide an adequate income for one. But a town of say, two thousand people, together with the surrounding rural population, could support two doctors. Furthermore, a town of twenty thousand people which serves a much larger rural-urban population would have sufficient demand for a limited range of specialist practitioners. But an obstetrician would make a meagre living at Thredbo.

³ Services also includes the supply of goods manufactured elsewhere.

⁴ B. J. Garner, “Models of Urban Geography and Settlement Location”, in R. J. Chorley and P. H. Haggett, *ed.*, *Socio-Economics Models in Geography* (London: Methuen; University Paperbacks, 1970), Ch. 9.

⁵ This venerable principle was first enunciated by Adam Smith, *Wealth of Nations* (London: Routledge, 1890), pp. 13–17.

⁶ As one writer puts it “towns cannot exist by taking in their own washing”.

This exposition, however, ignores the effect on the extent of the market which results from the increasing distance of consumers from the central place when consumers are spatially separated. This increasing distance results in increasing costs to potential consumers, both monetary and psychic (mainly due to the discomfort of travel). Every good or service, offered by a central place has a range, termed the "economic distance" by Christaller,⁷ beyond which it will not be purchased from that central place because the costs of transport and the discomfort involved become too great. This means that each central place has a definite and limited "complementary region"⁸.

It is also apparent that the complementary regions of the larger central places overlap those of the smaller. The typical spatial pattern is that of a series of contiguous, reasonably identifiable major regions each related to a major town and providing a large range of services in which nestle smaller and smaller regions and their central places which provide a diminishing range of services. We proceed to outline the kinds of services provided, generally and particularly.

2.3 THE ANATOMY OF A CENTRAL PLACE

The work force of a central place may be classified into two categories—*basic* and *non-basic*⁹. The basic sector is that which provides directly the services required by the complementary population (the population of the complementary region). The non-basic component is that which services the basic. One example is the housepainter who maintains the houses of people in the basic sector. Another example is the services provided in a suburban shopping centre in a large town, used solely by the urban people. This is in fact a central place, more broadly defined.

Specific services provided by towns fall into the following broad categories:

- (1) Trade—mainly retailing.
- (2) Banking and insurance.
- (3) Repairs and maintenance—mainly vehicles, machinery and buildings.
- (4) Cultural (including sporting and entertainment) and spiritual.
- (5) Professional services—medical, legal, educational, etc.
- (6) Governmental services—local, state, and federal.

We see then, that the primary function of central places is the provision of services rather than the production of goods—bakers being the only exception which comes to mind. There is a tendency, even amongst

⁷ W. Christaller, *op cit.* p. 52.

⁸ *Ibid*, p. 21.

⁹ D. F. Schreiner, "Community Services in a Dynamic Economy", in A. C. Ball and E. O. Heady, *ed.*, *Size, Structure and Future of Farms* (Iowa: Iowa State U.P., 1971), p. 341.

policymakers, to assume that towns exist basically in relation to industry and the production of tangible goods. It will be seen later that this attitude may adversely influence policy decisions. We go on to discuss the formation of central places.

2.4 THE GENESIS OF CENTRAL PLACES

One might still ask why all the services provided by a central place are concentrated in one area rather than scattered randomly all over the place—a solicitor here, a church there and a supermarket at the five-mile. The simple answer is that the provider of a service will attract more customers if he locates next to an existing service (of the same kind or different) and provided that the customers are evenly distributed over the region¹⁰. The location of inns next to churches in English medieval towns is a nice example of this principle¹¹. This, of course, begs the question of why the church located at that point in the first place, but such an enquiry would take us too far from the central theme of the paper¹². We proceed to discuss one of the most important issues of the paper—the determinants and results of changes in size of central places.

2.5 CHANGES IN SIZE—CAUSE AND EFFECTS

The main determinant of growth or decline of central places in the long run is the level of income in the complementary region. The aggregate income is, however, determined by two factors, the number of people multiplied by their average income. Thus a change in the demand for the services of a central place due to change in total income can result from changes in the population or average income or both. During the last rural recession, probably not many people left the land but rural towns were apparently sharply affected.

Income also affects the size distribution of central places in a region. The demand for the services of larger towns, which provide a more expensive and extensive array of goods and services, will rise as the level of income rises. It is probably safe to presume that the income elasticity of demand for cosmetic surgery is greater than for bread or onions. This will make the larger towns grow relatively more than smaller places.

Another influence which affects the demand for the services of central places is the increase in the amount of purchased inputs for use in

¹⁰ For a proof of this proposition see B. Berry, *Commercial Structure and Commercial Blight* (Department of Geography: University of Chicago, Research Paper No. 85, 1963).

¹¹ E. Smith and O. Cook, *British Churches* (London: Dutton Vista, 1964), p. 16.

¹² For further reading on this issue see G. S. Goldstein and L. N. Moses, "A Survey of Urban Economics", *Journal of Ec. Literature*, Vol. 51, No. 2 (June, 1973), pp. 481–486.

agriculture. This has resulted either from changes in technology or from their more economical availability as a result of the economics of large scale production and distributions. Examples are tractors and many other types of machinery, fertilizers, pesticides, etc., together with the associated services in repairing the former and distributing the latter.

A further factor which impinges on the relative growth of different sized central places is the cost of transport. The car has probably caused a long-run relative decline in smaller central places and a relative growth of the larger. This change is dramatically illustrated intra-urbanly by the decline of corner shops and the growth of supermarket complexes with their attendant carpark desolations.

2.6 THE EMPLOYMENT MULTIPLIER

Following from the previous discussion, it can be seen that, at any point in time, there is a definite relationship between the population in the central place and that in the complementary region. This relationship is called the "employment multiplier"¹³. This relationship implies that changes in the complementary population will exert pressure for changes in the urban population and of the same proportion as the multiplier. If x urban people are required to service one rural person, then a change of one in the rural population will result, *ceteris paribus*, in the need for or redundancy of x urban people. This is a two part process. The basic sector will be first affected and thence the non-basic sector who serve them.

As we explained in the previous section, this multiplier will change over time in response to changes in income, technology, the demand for purchased inputs on farms and the mode of and cost of transport.

We see also that there is a mutuality between the urban and rural sectors which is often overlooked. The two sectors are part of one system and changes in one will have consequences in the other. Compartmentalization of agricultural research is not without cost, in both rural and urban areas.

The remainder of this paper is an attempt to ascertain the employment multiplier, or, more humanly, the relation between urban and rural populations, and to examine the nature of changes in this relationship.

3 THE EMPIRICAL ANALYSIS

3.1 THE METHOD

In this study, twelve statistical subdivisions west of the Divide (excluding the Far West and the three bordering on the Murray) were chosen as

¹³ D. F. Schreiner, *op cit.*, p. 342.

units of observations in the hope that these would provide a relatively homogeneous sample of areas (regions) in which the towns exist mainly as service centres for surrounding population¹⁴. Simple linear regression was used to relate the population in towns greater than 2,000 people to the population in the remainder of the region and other relevant factors¹⁵.

Initially cross-section data was used and this was later supplemented with time series analysis to see whether the results applied over time¹⁶. The time series analysis was done for the Lachlan and Central Macquarie regions because they have shown the least structural change over the period. Included also in this analysis were farm income and trend variables. *Changes* in population in each sector were also regressed as well as the totals. It was not possible to include any other relevant variables because only five census observations were available since 1947. It was considered unwise to go back further than this as structural changes would be too great.

3.2 RESULTS

The results are summarized in table 1. The variables U_{CS} and U_{CS}' refer to the cross-sectional urban data for the twelve regions from the 1966 and 1971 censuses. U_{LTD} and U_{CTD} refer to first differences in the census data for the Lachlan and Central Macquarie regions. U_{LT} and U_{CT} refer to total populations for the same regions. U_{LL} and U_{CL} indicate lagged (by one period) urban data for both subdivisions. R refers to the corresponding rural populations; T is the trend variable and Y is the average net farm income in the current and preceding years (except for 1947 where data was not available).

¹⁴ It is difficult to justify completely this choice of the unit of observation. Mainly one is constrained by lack of data in doing otherwise. Hopefully the subdivisions approximate to a "region"—that is to say an area bounded by the limits of the "economic distance" of the largest town. Some obviously do: some may not.

¹⁵ Where a town with less than 2,000 people was an obviously important central place it was included. Again the choice of 2,000 as the limit is a difficult one. It was originally chosen as the lower limit in which policy makers in decentralization would be interested. To some extent I think it does result in underestimation of the employment multiplier. However this would be compensated to an unknown extent by the fact that rural people do live in towns. The analysis also assumes that family size in both sections is similar.

¹⁶ The reader is reminded that the time series analysis is merely a check on the validity of the implications of the cross-sectional results. It is designed to see whether the employment multiplier, derived cross-sectionally, applies also over time, after allowing for the changes mentioned in Section 2. The intention is *not* to measure any changes in the multiplier *per se* resulting from the effects of income, purchased inputs, etc.

TABLE 1

Regression Results on Cross-Section and Time Series Estimates of Rural/Urban Multiplier

EQN		a	R	T	Y	"t" value	R ²		
1	..	U _{CS}	6,809	0.953*	..	..	2.3	..	0.73
2	..	U _{CS'}	- 845	1.174†	..	..	3.5	..	0.86
3	..	U _{LTD}	1,880	0.213°	..	..	2.3	..	0.72
4	..	U _{CTD}	3,312	- 0.294	..	..	- 0.74	..	0.21
5	..	U _{CT}	60,772	- 0.973	..	..	- 0.81	..	0.25
6	..	U _{LT}	21,109	0.201	..	..	0.23	..	0.03
7	..	U _{LL}	20,606	0.450	..	..	0.41	..	0.08
8	..	U _{CL}	36,259	- 0.149	..	..	- 0.21	..	0.02
9	..	U _{CT}	39,093	- 0.420	489.3	..	- 0.57	2.24	0.88
10	..	U _{CT}	86,121	- 2.686†	..	82.8†	- 130.0	116.7	0.99
11	..	U _{LT}	18,861	- 0.181	295.5°	..	0.76	5.0	0.96
12	..	U _{LT}	113,357	- 3.005	..	97.5*	- 6.3	7.1	0.98

* — 5 per cent level.

† — 1 per cent significance level.

° — 10 per cent level.

Sources of data: Australian Bureau of Statistics, *Census of Population and Housing (1947-1971)*; *New South Wales: Handbook of Local Statistics; National Income and Expenditure (1948-9 to 1971-2)*.

It can be seen that in both cross-sectional analysis (Eqns. (1) and (2)), the relation between urban and rural populations is statistically significant and that variation in rural population "explain" around 80 per cent of the variation in urban population. Finally, the results indicate an employment multiplier of around one (the coefficient of R) in each period. The data thus far support our original hypothesis of a close relationship between urban and rural populations, as indicated by the high R² in each equation. We go on to see if changes over time in the rural population induce changes in the urban population of the same order as this relationship, after allowing in some cases for changes in the urban population induced by changes in income and trend factors.

The next four equations ((3) to (8)) attempt to test if such is the case. The first two show the relationship between *changes* in the populations of each sector from the 1947 to the 1971 censuses. The latter two relate total populations in the two subdivisions. As indicated earlier, these two subdivisions were chosen because, as far as could be ascertained, they had the least "non-central" activity and the least structural change of the twelve chosen. It is apparent that the data fail to support the hypothesis of a change in the urban population equal to the multiplier in response to a unit change in the rural population, even when allowance is made for multiplier shifters. The only relationship approaching statistical significance is equation (3) for the Lachlan region and then the relation is only 0.2 (but with an R² of 72 per cent). The next three are all below this value—the two for the Central Macquarie being negative. All are non-significant. However these results give us insufficient grounds for rejecting the hypothesis. Firstly one could not expect unlagged data to show up a relationship between the two. It takes time for adjustments in urban population in response to changes in rural

population to take place, and the analysis makes no allowance for this lag. But as equations (7) and (8) show, even when data is lagged, the results do not substantiate the hypothesis. Secondly, and even more importantly, the population of the towns is actually growing instead of declining as would be predicated by the original hypothesis. This is partly due to non-central activities being established; partly to their use as retirement places for rural people (whose social life would often be previously related to the town); and partly because the multiplier itself is expected to grow over time and counteract the effect of declining rural population.

The final set of equations (7) to (10) is an attempt to catch the effect of some of these factors. Unfortunately, however, the limited number of observations and availability of data restricted the variables to net farm income and a "catch-all" trend variable. The latter probably combines all the urban growth factors mentioned previously. It can be seen that net farm income (averaged over 2 years) is an important influence on urban population as hypothesised. In both regions it is statistically significant; in the Central Macquarie region it is highly so. The trend variable is only significant at the 10 and 15 per cent levels. It is not however, a very satisfactory variable because of the multiplicity of interpretations which can be put upon it.

In summary, we have shown that at the present time there is an approximate one to one relation between rural populations and the population in towns greater than two thousand people who service them, based on cross-sectional analysis. This relationship was not shown to be maintained in a time series analysis, but this could not be expected due to a number of influences. One of these influences, net farm income, was shown to be a significant factor in influencing the population of urban service centres.

4 IMPLICATIONS

A number of policy implications emerge from the preliminary discussion and the results. The first is that amalgamation of rural holdings and the consequent decline in rural population is working against the aims of decentralization policy. As we have seen, for every rural person who "adjusts", there is a potential overall loss of one person from the towns which service him¹⁷. It may prove cheaper, in terms of monetary and social costs, to induce people to stay in agriculture than to induce industry into urban areas. This employment multiplier provides part of the necessary data to make such a calculation.

Another aspect of the concomitant long-term decline of rural and urban populations is that the quality of life in both sectors declines with the reduction in population. Smaller towns must provide less and more

¹⁷ This broad statement ignores the fact that while farmers who leave will reduce the demand for "non-farm" services, the increase in farm size which results may actually increase the demand for "farm" services as a result of substitution of capital for labour.

expensive recreational and cultural facilities, given economics of scale in their provision. Also one would expect that the people with the greatest ability in providing their services to local government in the towns and to organizing community activities would tend to be the first to leave.

The current debate about the impact of small scale farming involves the results also. One of the benefits from small farms outside rural towns is that they increase the demand for services in the town—provided that the farmers come from elsewhere and not merely move out of the town to the farms. The above figure for the multiplier gives us a basis from which to estimate these benefits.

Again the multiplier provides a rough estimate (if we assume that the employment multiplier of the rural sector is of the same order as that of the new industries) of the number of additional people required to service those people induced into towns by decentralization.

Finally we see that it may be that increased incomes together with mechanization on farms will lead to a greater demand for urban services, which will tend to counteract the effects on service towns of declining rural population.