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~~1111~~ DEMOGRAPHIC CHANGE AND THE SIZE OF THE
GOVERNMENT SECTOR

by

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Demographic Change and the Size of the
Government Sector

by

Allen C. Kelley*

ABSTRACT

This paper considers some of the analytical linkages between demographic change and aggregate government spending shares, measured as G/GNP. An exploratory empirical analysis is presented which employs international cross section data, and focusses on Western countries in the intermediate phase of economic development. The traditional independent variable (income per capita) is used to evaluate "Wagner's Law" - the tendency for government shares to increase with economic development. This model, which represents the primary empirical framework employed in the literature, is then augmented to take account of several demographic explanatory variables: total population size, location (rural-urban), density, and age distribution.

When demographic factors are taken into account to explain government expenditure shares, the other elements of "economic development" captured by the income per capita term fall notably in importance. This striking result contrasts with the usual finding in the literature where increases in per capita income account for most of the increases in the government expenditure share.

The relative role of the various individual demographic influences is also surprising. Age distributional changes (e.g. the dependency rate), which are hypothesized by many to be important, turn out to exert a relatively small quantitative impact. The strongest positive demographic force is urbanisation, the influence of which is attenuated by scale-economies associated with increasing total population size and density.

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1.0 Introduction

While the public finance literature abounds with studies which attempt to account for changes in the size of the public sector as economic development takes place, there are surprisingly few inquiries which focus on the impact of demographic factors on the course of aggregate government spending. Interestingly, leading researchers who have studied aggregate government spending have been quite vocal on the causal importance of demographic variables. The analysis of Alan T. Peacock and Jack Wiseman is representative of this sentiment.

Given our assumption about technical coefficients and standards of provision, the outstanding general determinant of the level of government becomes the size and character of the countries' population, upon which it is reasonable to suppose that future expenditures on economic, environmental and social services must depend.¹

Yet curiously, most of the researchers urging the analytic importance of population factors have typically omitted or downplayed demographic influences in their empirical inquiries, focussing instead on the more traditional economic variables.²

¹Alan T. Peacock and Jack Wiseman, The Growth of Public Expenditure in the United Kingdom (London: George Allen and Unwin, 1967), p. 140.

²Consider the following examples.

"...it would seem more promising to try to explain changes in these ratios [government expenditures to GNP] to a number of other relevant economic phenomena (e.g., such as relative number of children in the population when educational expenditures are considered)." Frederic L. Pryor, "East and West German Governmental Expenditures," Public Finance (1965), p. 346.

"Although it is clear that some functional types of public spending such as defense are relatively inelastic with respect to population, others, such as education, are relatively elastic. It is the structure of the population which appears to be a dominant factor, especially at the disaggregative level." Irving J. Goffman and Dennis J. Mahar, "The Growth of Public Expenditures in Selected Developing Nations: Six Caribbean Countries 1940-65," Public Finance (1971), pp. 67-68.

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The present paper considers some of the analytical linkages between demographic change and aggregate government spending shares. An exploratory empirical analysis is presented which employs international cross section data, and which focusses on countries in the intermediate phase of economic development. The demographic influences considered include total population size, location (urban-rural), density, and age distribution.

It is shown that failure to account for several systematic demographic changes taking place during the process of economic development can yield a biased analysis of the factors bringing about a change in the size of the government sector. Indeed, Wagner's Law, the model which has provided the most prevalent framework for analyzing empirically the factors causing an expansion of the government sector, might well be modified to come to grips with demographic influences.

It is notable that the single demographic variable -- the aggregate dependency rate -- which is most frequently cited in the demographic modelling literature as influencing the growth of the government sector turns out to exert a relatively small impact in our empirical results. In contrast, the more important demographic influences appear to be urbanization, density and total population size. The latter two variables exert a negative influence since to a certain extent they measure the scale economy effects of demographic change on the size of the government sector.

2.0 Analysis of Public Spending Shares

Wagner's Law

The most abundant literature on aggregate government spending shares focusses on the analysis and test of an hypothesis formulated in 1883 by Adolf Wagner, who put forth a "...law of increasing expansion of public, and

(footnote continued)

"...the rising proportion of urban population to total population accompanying development, all other things equal, alone is sufficient to raise the relative level of public expenditure." Richard S. Thorn, "The Evolution of Public Finances During Economic Development," The Manchester School of Economics and Social Studies(1967), p. 20.

"Population changes may also be a major determinant of the public expenditure share." Richard A. Musgrave and Peggy Musgrave, Public Finance in Theory and Practice(New York: McGraw Hill, 1973), p. 128.

particularly state activities".¹ His demand-oriented analysis predicted a relative increase in the demand for social goods as economic development took place.² Wagner's predictions applied primarily to levels of economic development above a minimum threshold, and then only when selected structural and institutional conditions were met. In very low income societies dominated by agriculture, population's primary energies are devoted to meeting the minimum basic requirements for food, shelter and clothing. Rising incomes above these low levels generate different wants, and more importantly, provide the discretionary income to meet these wants. Public goods therefore grow relative to private goods during these periods of economic development, especially during the formative years of industrialization and urbanization.

Three public good categories were singled out by Wagner to account for this shift in relative societal preferences. First, there is an increasing demand for the regulative and protective activity of the state. Higher levels of economic development increase the level of communicability between different units of society in general, and economic segments in particular. There are also increases in the strains of living and higher criminality.³ Second, there is an increasing demand for cultural and welfare expenditures: education, health, and income redistribution. Some researchers emphasize the demand for higher productivity associated with a more complex industrial

¹ Adolf Wagner, "Three Extracts on Public Finance," in R. A. Musgrave and Alan T. Peacock (eds.), Classics in the Theory of Public Finance (London: Macmillan, 1958).

² Given the impreciseness of Wagner's own formulation, up to five different versions of his hypothesis have been expounded and tested. These versions are reviewed by V. P. Gandhi, "Wagner's Law of Public Expenditure: Do Recent Cross-Section Studies Confirm It?", Public Finance (1971), pp. 44-56.

It appears that a consensus is emerging on which version can be profitably used, namely, that the government share is taken as a function of per capita income. This model has been most frequently tested with the use of cross-section data. See also Richard A. Musgrave, Fiscal Systems (New Haven: Yale University Press, 1969).

³ See Frederick L. Pryor, "East and West German Governmental Expenditures," op. cit., p. 303; R. M. Bird, "Wagner's 'Law' of Expanding State Activity," Public Finance (1971), p. 2. For an extension of this analysis into what has recently been termed by sociologists as a higher level of functional differentiation within societal structure, consult Ruth C. Young and Isao Fujimoto, "Social Differentiation in Latin America," Economic Development and Cultural Change (April 1965), pp. 344-354.

Other Hypotheses

Many authors have ventured additional reasons to buttress Wagner's prediction of an increasing size of the public sector relative to total economic activity. Jeffrey G. Williamson, for example, points to the Keynesian stagnation thesis, whereby "...there is a shrinking of investment opportunities, and in order to support the Keynesian full employment level of income, an increasing amount of government expenditure is necessary to compensate for the dearth in private investment outlays".¹ Williamson also cites the Kuznets-Clark sectoral productivity argument which relies on the notion that the rate of productivity increase in service industries (including public services) is less than that in manufacturing and agriculture. Thus, "...if public services are a function of output, a greater share of government expenditure would result with increases in income or average labor productivity."² Williamson finally argues that the rise in the government's share over time can be explained in part by rising labor costs (relative to capital) as economic development takes place, coupled with the relatively labor-intensive production characteristics of the public sector.³

Historical arguments and evidence have also been advanced to explain aggregate government expenditure shares. In examining British economic history, Alan T. Peacock and Jack Wiseman conclude that the main determinant of government share expansion is a relaxation of the supply (or taxation) constraint.⁴ The supply constraint is most readily relaxed during periods of social upheaval, notably during wars.⁵ Their argument, based on the notion of a "tolerable level of taxation," is partially mitigated by the evidence of S. P. Gupta, who showed for several countries that deficit- (as opposed to taxation-) financed spending during the Great Depression had a

¹ Jeffrey G. Williamson, "Public Expenditure and Revenue: An International Comparison," The Manchester School of Economics and Social Studies (January 1961), p. 46.

² Ibid., p. 47. See also W. Baumol, "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," American Economic Review (June 1967), p. 415-426; R. A. Malt and W. E. Oates, "The Rising Cost of Local Public Services: Some Evidence and Reflections," National Tax Journal (June 1969), pp. 185-202.

³ Ibid.

⁴ Alan T. Peacock and Jack Wiseman, The Growth of ..., op. cit. Wagner admitted the possibility of a supply constraint. "Financial stringency may hamper the expansion of state activities, causing their extent to be conditioned by revenue rather than the other way round, as is more usual." Adolf Wagner, "Three Extracts...", op. cit., p. 8. He discounted its importance, however. "...in the long run the desire for development of a progressive people will always overcome these financial difficulties". Ibid., p. 8.

⁵ Peacock's and Wiseman's argument is sometimes referred to as the "displacement effect".

similar post-episodic expansion in the size of the government sector.¹

Finally, semi-political arguments have entered the literature to explain changing government shares over time. J. M. Buchanan and G. Tullock argue that public services will be oversupplied under a system of majority voting since taxes are borne by all members of the group while benefits accrue to a subset only.² The Musgraves argue in the same vein that voters may favor expenditure legislation since they are sometimes unaware of the full opportunity cost, or they imagine that someone else will bear the cost. Thus, the "...less visible the taxes, the more likely it is that expenditures will be considered costless and therefore tend to be over-expanded."³ A conspicuous dissenter in this politically-oriented over-production theme is J. K. Galbraith, who argues that advertising by producers of private goods creates an imbalance in the preferences of people toward private and away from public goods.⁴

The Empirics

Almost all studies of the government expenditure share carry some amount of empirical research. Attention has focussed on the testing of Wagner's Law in its aggregative and disaggregative forms. A. M. Martin and W. A. Lewis pioneered this research, and used classification and rank correlation as their technique of analysis.⁵ Their work has been criticized by Jeffrey G. Williamson, and he and most subsequent authors have employed more rigorous statistical procedures and larger sample sizes.⁶ Cross section analysis

¹S. P. Gupta, "Public Expenditure...", op. cit. Instead of raising the "tolerable burden" of taxation, Gupta argues that social upheavals raise the "desired level" of public services. This, in turn, relaxes the supply constraint. A similar argument is advanced by Eva Mueller, "Public Attitude Toward Fiscal Program," Quarterly Journal of Economics (May 1963), pp. 210-235.

²J. M. Buchanan and G. Tullock, The Calculus of Consent (Ann Arbor: University of Michigan Press, 1962), chapter 10. Buchanan and Tullock's argument can be illustrated by the following scenario. "...any one voter will join in coalition with a majority (say 51 out of 100) to gain support for their particular interest. The marginal cost to the 51, however, will be 51 per cent of the total cost, since the 49 per cent borne by the others... is disregarded. Thus, oversupply results because part of the cost is imposed on non-beneficiaries". R. A. Musgrave and Peggy Musgrave, "Theory and Practice...", op. cit., p. 99.

³Ibid., p. 100.

⁴J. K. Galbraith, The Affluent Society (Boston: Houghton Mifflin Co., 1958), p. 261. See also Anthony Downs, "Why the Government Budget is Too Small in a Democracy," in Edmund S. Phelps (ed.), Private Wants and Public Needs (New York: W. W. Norton, 1965), pp. 76-95.

⁵A. M. Martin and W. A. Lewis, "Patterns of Public Revenue and Expenditure," The Manchester School of Economics and Social Studies (September 1956), pp. 203-244.

⁶Jeffrey G. Williamson, "Public Expenditure...", op. cit.

employing international country data is most prevalent in the empirics, although there are a few time series studies. Almost all authors use a simple univariate regression of government expenditure share (either aggregate or by component) and per capita income, and employ either a linear or log-linear specification.¹

The results of these investigations can be categorized into two groups. One group is in basic agreement with Wagner's hypothesis;² the other group contends that there is no systematic relationship between expenditure share and per capita gross national product over all ranges of the latter variable.³ V. P. Gandhi attributes these divergent results to differences in the sample. Specifically, he notes that those researchers who found a positive relationship utilized both developed and developing countries in their sample, whereas those researchers who found an absence of a relationship utilized primarily developing countries in their sample.⁴ R.A. Musgrave agrees that the systematic influences of development on government expenditure share are to be found in countries in the intermediate range of development.⁵ Williamson additionally finds support for a non-linear relationship. His results summarize quite well much of the empirical literature.

From low income to middle income the share increases rapidly with respect to per capita income while the rate of change lessens with movements to high income nations. ...The value for developed countries is somewhat lower than that for less developed countries which may suggest that the income elasticity of expenditure declines with the level of development...⁶

¹Thorn employs a multiple regression model which, in addition to per capita income, employs certain political factors as dummy variables -- e.g., whether the country was a British dependency, and whether the government was highly centralized. Richard S. Thorn, "The Evolution...", op. cit.

²A. M. Martin and W. A. Lewis, "Patterns of ...," op. cit.; Jeffrey G. Williamson, "Public Expenditure...", op. cit.; Richard S. Thorn, "The Evolution of...", op. cit.; S. P. Gupta, "Public Expenditure...", op. cit.

³S. Lall, "A Note on ...," op. cit.; Richard A. Musgrave, Fiscal Systems, op. cit.; J. R. Lotz, "Patterns of Government Spending in Developing Countries," mimeo.

⁴V. P. Gandhi, "Wagner's Law...", op. cit., p. 47.

⁵Richard A. Musgrave, Fiscal Systems, op. cit., p. 111.

⁶Jeffrey G. Williamson, "Public Expenditure...", op. cit., pp. 49-50.

Thus, the general finding is that at very low income levels, variance in per capita income explains only a small part of changing government shares. This is consistent with Wagner's theorizing, and with much of the discussion which has followed. At very high income levels, there is a reduction in the rate of expansion of the government share, a reduction which not only occurs logically, but is based on systematic factors as well. In the intermediate range of economic development, rising government expenditure shares are associated with expanding output per capita.¹

The prevalence of cross section studies in identifying regularities of government expenditure shares and economic development is based on the scarcity of appropriate time series information. However, for the few countries for which time series data are available, Wagner's hypothesis of an increasing share of government expenditure with rising per capita income is confirmed.² Individual studies on Canada, Japan, Sweden, United Kingdom, and Norway point toward this conclusion.³

3.0 Demographic Change and Aggregate Government Spending

Even though the literature which expounds and tests Wagner's Law has almost without exception omitted any explicit treatment of demographic factors while at the same time has emphasized the importance of population variables, there are indeed several studies which identify quite clearly the role of population on the level of government spending. This is the literature on aggregate economic-demographic models which attempts to delineate the role of population on economic development. Most of these modelling studies are sufficiently aggregative that they do not incorporate a government sector, but several notable exceptions can be cited: the pioneering work of Ansley Coale and Edgar Hoover, the TEMPO models by Steven Enke and his associates, and most

¹This logistic growth function of government expenditure shares with respect to income per capita has been clearly stated and defended by B. P. Herber. He predicts less than proportionate rise in government spending as a proportion of national income in both the pre-industrial and post-industrial stages of economic growth. B. P. Herber, Modern Public Finance (Homewood, Ill: Richard D. Irwin, 1967), p. 149. In the pre-industrial stage, the output of subsistence private goods will expand more rapidly than public goods; during the post-industrial stage "... governments will have already provided those economic goods which it can provide with an efficiency advantage". Ibid., p. 149.

²Richard N. Thorn, who has reviewed the literature most extensively, notes "The time series data, for the few countries where long time series exist, support the hypothesis of the first proposition without exception." Richard S. Thorn, "The Evolution...", op. cit., p. 34. See also Simon Kuznets, "Quantitative Aspects of the Economic Growth of Nations: The Share and Structure of Consumption," Economic Development and Cultural Change (January 1962), pp. 1-92.

³For Canada, see R. M. Bird, "Wagner's Law...", op. cit., p. 5; for Japan, see

recently the exploratory study of Canada by Frank T. Denton and Byron G. Spencer.¹ This section briefly summarizes and evaluates these efforts, and then presents several hypotheses on the interactions of demographic factors and aggregate government spending.

Models of Demographic Influences and Government Spending

The three models cited above are all in the neoclassical tradition. Increases in the level and/or the efficiency of capital and labor are thought to be chiefly responsible for propelling a nation through the development process. The labor force is augmented by an exogenously given population growth rate, and in the TEMPO model, by the formation of human capital. The capital stock grows over time by positive net investment, which in turn is for the most part financed out of whatever savings the economy is able to generate. This is a crucial point. Under the assumption of sufficient outlets for investment, what an economy saves can be invested in economic development. If a less developed country is unable to generate sufficient saving (in either the public or private sectors), it tends to stagnate. Much of the impact of population on economic development, through its role in the public sector, hinges on its effect on saving and the productivity of investment.

This is clearly revealed in the Coale and Hoover study of India. Economic growth in their model is determined by the level of "growth outlays", the weighted sum of productive and relatively unproductive government spending and private investment. Unproductive private investment primarily includes outlays on housing; unproductive public investment constitutes expenditures on social services, education and health. While strictly speaking their model does not have a clearly identified public sector, the impact of population on public spending, and the impact of the latter on economic growth is quite well revealed. In particular, the bulk of government spending is on relatively unproductive social-service outlays. They assume that these outlays per person of the existing population capture a constant share of total GNP, and that increases in this share are due to the requirements of additional population. In essence, population growth results in unproductive government spending to

(footnote continued) Kolchi Emi, Government Fiscal Activity and Economic Growth in Japan 1869-1960 (Tokyo: Kinokuniya Bookstore Co., 1963); for Sweden see Erik Hook, "The Expansion of the Public Sector -- A Study of the Development of Public Civil Expenditures in Sweden During the Years 1912 - 1958," Public Finance (1962), pp. ; for the United Kingdom, see Alan T. Peacock and Jack Wiseman, The Growth..., op. cit., p. 458; and for Norway, see Lief Johansen, Public Economics (Chicago: Rand McNally, 1968), p. 153.

¹ Ansley J. Coale and Edgar M. Hoover, Population Growth and Economic Development in Low-Income Countries (Princeton: Princeton University Press, 1958); William

bring the new population up to the standards of the existing population in terms of social services. This incremental government spending is financed at the expense of high productivity growth outlays -- either productive government spending (e.g., expenditures on the development plan), or direct private investment. Therefore, population-sensitive unproductive government spending has first claim on growth outlays; that which is left over contributes primarily to economic progress.

Nothing can be said precisely on the impact of population growth on aggregate government shares in their model, since the division between private and public productive investment is not specified. However, it can be shown that an accelerating rate of population growth will result in a rise in the government's welfare expenditures as a share of GNP, and that this increase of government spending is financed totally at the expense of productive growth outlays. Moreover, if private and government productive investment grow at roughly the same rate over time, then rising population growth rates will increase government's share in total output. An increase in the growth of population not only stimulates the growth of government's share, but through shifting the composition of government spending toward relatively unproductive forms, population growth has an adverse impact on economic development.¹

The impact of population on government's expenditure share in the Denton and Spencer simulation model is straightforward and unequivocal. Government spending is divided into three categories: education, health and other. The first two categories generate a production of government services according to constant age-specific per capita demands by the population; the third category is invariant to population change, and grows as a constant proportion of income. The government meets these three demands within the framework of a balanced budget; that is, taxes rise and fall to accommodate the total demand for government services. All government expenditures are on current account; the creation of physical capital is undertaken entirely by the private sector.

(footnote continued) E. McFarland, James P. Bennett, and Richard A. Brown, Description of the TEMPO II Budget Allocation and Human Resources Model (Santa Barbara, California: General Electric Company, Tempo Center for Advanced Studies, 1973); Frank T. Denton and Byron G. Spencer, "Some Government Budget Consequences of Population Change," Department of Economics, McMaster University, Hamilton, Ontario, Canada, January 1974, *mimo*.

¹Their model is made more complicated by their introduction of age-distributional considerations. Rising population growth rates result in a population with a young age distribution. The young age cohort (say 0 - 15) requires scarce growth outlays now, but contributes output only when this population cohort enters the labor force. This lagged effect reinforces the generalizations noted above.

The level of saving is determined as a constant share of disposable income.

In such a model, increases in population-sensitive demands for public services, notably educational and health services, generate an increase in government's output share, and exert a negative impact on the rate of capital formation and economic growth. The most powerful influence is felt through the "dependency effect" -- the educational needs of the young population and the health needs of the aged. These government needs are financed entirely out of private investment and economic growth. No substitution within the government budget is permitted.

The TEMPO II budget allocation and human resources model delineates well the impact of population on government's spending share. Government spending is divided into eight categories, six of which grow according to a targeted expenditure rate (inputs), and two, education and family planning, which grow according to targeted outputs.¹ Government deficits are financed primarily out of private investment through public borrowing, and to a lesser extent by money creation. If public spending goals, together with private investment and consumption demands, exceed aggregate supply (determined by augmented capital and labor stocks), then balance is forced by each sector taking a reduction proportionate to its share in the total demand. Since in the government sector it is assumed that the education and family planning goals are always realized, then any reductions in aggregate government spending due to economy-wide supply constraints may (although not necessarily) be absorbed at the expense of other government outlays.² In practice, applications of the TEMPO II framework tend to take government demands as priority claims on total output; their model permits (but does not require) these claims to be met entirely at the expense of private-sector outputs.

In one important sense the TEMPO II model is somewhat more satisfactory than the previous two paradigms. TEMPO II allows for the financing of population-sensitive government expenditures by other categories within the government expenditure budget; thus, total government expenditure shares may

¹Inputs associated with these targeted outputs are derived from a simple production function.

²It is worth emphasizing, however, that increasing demands for public population-sensitive outputs are not met through a deterioration in their quality, as measured by, say, cost per member of the population receiving the service. No substitution is permitted in this dimension. For example, rising pressures to provide increased public education to an expanding school-aged population will not be met by lowering the cost per pupil. There will not be any tendency toward larger class sizes, more intensive use of the capital stock(double shifting), and so forth.

not necessarily increase with rising demands for public services. Whether this outcome prevails depends on the assumptions employed by the users of the TEMPO II planning framework. Most users are in government planning offices, who plausibly assign a priority claim to government services; thus, in applying TEMPO II, government shares will likely increase with rising population pressures.

Some Hypotheses on Demographic-Government Spending Interactions

Population's impact on aggregate government expenditure shares can be divided, on the one hand, into the demographic impacts on the supply of (revenue) versus the demand for (expenditure) government services, and on the other hand, into the impacts by the type of specific demographic influence. In terms of the latter, attention below will be confined to four demographic influences: population's age distribution, location (urban-rural), density (population per hectare), and size. In terms of the former, attention will focus primarily on the impact of demographic change on the demand for public services.¹

It should be noted that our discussion will deal primarily with aggregate expenditure shares. This emphasis derives from two considerations. First, tests of Wagner's Law have been almost exclusively confined to aggregate data. We wish to compare our demographically-augmented tests of Wagner's Law with those many studies which have omitted any consideration of population influences on government spending shares. Second, cross section data on the individual components of government spending are particularly subject to measurement errors and difficulties of non comparable classifications.

Changing Age Distribution

The direct impact of a changing age distribution on government spending is to shift the demand for government services toward those categories sensitive to the needs of the population in the relatively expanding age cohorts. In a situation of rising population growth rates with a concomitant expansion in the young, dependent population (e.g., those under 15), there will

¹The impact of demographic factors on supply are more indirect, less pervasive, and probably quantitatively less important. This issue is being examined by Professor Bruce Bolnick of Duke University.

be an increase in the demand for youth-related public services, most notably education. Similarly, in a situation of declining population growth rates, where there is a rise in the proportion of the elderly population and a resulting expansion in the demand for public services for certain types of housing, medical care, and so forth.

Economic-demographic models have generally represented this set of hypotheses well. However, most models have been quite restrictive in their hypotheses on how increases in the population-induced demands for public services are financed. The most prevalent conjecture is that these population-induced demands result in increases in total government spending which, in turn, is financed by taxation or borrowing. This represents a somewhat extreme assumption on the behavioral response of government. In particular, it assumes that government demands represent priority claims on total output; that government services do not deteriorate in quality in response to increased demands; that an expansion in one category of public spending is not financed at the expense of other expenditure categories; and that positive technical change in the public sector does not provide the resources to meet new demands. A relaxation of any or all of these assumptions opens up the possibility that increases in the dependency rate (the proportion of the population, say, below 15 and above 64) will have a relatively small impact on the government expenditure shares. This hypothesis will be explored below.

Location

Two factors largely explain an increase in the demand for government services associated with urbanization. The first is the substitution of monetized government services for largely non-monetized comparable services provided by the extended family and the village. This point is summarized well by Jeffrey G. Williamson.

...[with urbanization] disappears the informal security of the family and village. Urban populations must be supplied with formal social security, unemployment insurance, a complex cosmopolitan political machinery, and formal protection to replace the family and village functions.¹

The second attribute of urbanization that influences the demand² for public services relates to external diseconomies, on the one hand, and economies

¹Jeffrey G. Williamson, "Public Expenditure...", *op. cit.*, p. 46.

²Unlike the other demographic variables considered, urbanization might also capture some supply impacts (taxation capacity) as they relate to government spending.

of scale, on the other hand. Examples of external diseconomies include the need for rising health expenditures per person as the number of interactions between persons increases. A similar argument can be made to explain rising costs of communication and social organization which result in relatively rapid expansion of expenditures for law and order, and for governing. In contrast, scale economies associated with urbanization derive from the more efficient use of public services of a lumpy type -- roads, sanitation facilities, and so forth.

While the net impact of these offsetting influences of urbanization on public expenditure shares remains an empirical issue, we would hypothesize that the positive impacts strongly dominate the economies of scale associated with urbanization, especially to the extent that alternative variables measuring scale economies are incorporated in the empirical analysis.

Density and Total Population Size

The two final demographic influences of population on government expenditure shares are captured by population density and population size. Both represent in slightly different ways the economies of scale of providing government services: sanitation, transportation, health, education, recreation, multi-storied public housing, and so forth. Diseconomies of scale arising from congestion and the rising costs of communication may offset these scale economies, but over most feasible ranges of the density-total population size variable, we would expect a negative impact of this combined demographic variable on government expenditure shares.

Hypotheses Summarized

We expect demographic factors, typically suppressed in studies of government spending, to exert a quantitatively important impact on the share of government expenditures. We have little a priori expectation on the elasticity of the government expenditure share with respect to income per capita since, after controlling for many of the influences associated with systematic demographic change, much of what has previously been subsumed under "income per capita" and "development" may now turn out to be related to demographic factors. Indeed, while the elasticities of government spending shares with respect to total expenditure per person may be positive when demographic factors are excluded from the analysis, this result could well be moderated or even overturned in a demographically-augmented model. Finally, in contrast to most economic-demographic analyses which examine the role of government, we do not

hypothesize a strong positive association of government spending shares resulting from an increase in the dependency rate. We have more confidence in the need for and ability of governments to respond to the same sorts of substitution and economizing influences in the face of budget constraints as is documented in studies of the private sector.

4.0 The Empirical Analysis and Results

The Data

The data are taken from United Nations publications and are for the period 1961 - 1963.¹ These represent the latest dates for which a sufficiently large sample of required demographic information was available. (All of the results of the 1971 censuses are not yet published or available.)

The countries included in the sample were those Western nations in the intermediate stage of economic development, with per capita incomes in the \$250 - \$2,250 range, and for which all of the demographic data used in this study were available.² This is around the per capita income range employed for most studies of Wagner's Law. It would have been interesting to include all countries in the empirical analysis, and to hypothesize, say, a logistic function whereby an attempt might be made to estimate the lower and upper asymptotes of government expenditure shares. This logistic-curve hypothesis would have been consistent with some of the literature on the subject although, to our knowledge, such a function has not yet been fitted to government expenditure shares. However, for several reasons use of the logistic curve seemed inappropriate in our case. First, we wished to make our analysis consistent with other studies, thereby providing a basis for comparison. Second, while a logistic curve may be appropriate in per capita income, it is not at all obvious that this functional form should be postulated for the demographic variables used in this study. (The logistic model requires a transformation

¹ The data are taken from various issues of the United Nations Demographic Yearbook and Statistical Yearbook.

² The countries included in the analysis are Canada, Sweden, Switzerland, New Zealand, Denmark, France, Norway, Israel, Netherlands, Venezuela, Austria, Puerto Rico, Ireland, Trinidad and Tobago, Chile, Japan, Union of South Africa, Panama, Colombia, Fiji, Costa Rica, Mexico, Barbados, Guatemala, Iran, and Portugal. Germany and the U.K. were omitted from the analysis, given their unusually high degree of centralization of government expenditures. See the discussion below, p. 16.

of the dependent variable.) Finally, the quality of the data are relatively dubious in very low-income nations, thereby making it particularly difficult to isolate systematic influences.¹

One of the difficulties in studying government expenditure shares involves the lack of complete comparability of federal government expenditure statistics across countries. In particular, the degree of "confederation" -- the extent to which public expenditures are centralized at the federal level -- varies somewhat in the sample we have analyzed. Short of examining in great detail the government accounts on a country-by-country basis, and making what would often be quite arbitrary adjustments in order to transform the measures for greater comparability, we see little hope of adequately accommodating this data deficiency. However, fragmentary evidence can be amassed which show that this data problem is not important in our case. Specifically, if the measurement error in the government expenditure share variable is not correlated with the independent variables used in our analysis, then at least we have unbiased estimates. To examine this issue, we have used an index of confederation compiled by Lotz and Morss, the ratio of local to total taxes.² (Unfortunately their index was not available for all of the countries we wished to study, and thus we could not explicitly incorporate their confederation measure into our empirical analysis.) For those countries in our sample where their index and our data coincided, we examined the relationship of their measure with the key independent variables in our model, as well as the residuals from our fitted complete model (Equation 4b in Table 2). No significant correlation was discovered. While we admit that there may be some errors in our models due to the inability to obtain ideal measures of government spending, in our particular case the differential degree of confederation problem does not appear to constrain an interpretation of the results.

The variables employed in our analysis, and their means & standard deviations are presented in Table 1.

The Results

We begin by discussing our two complete models, each providing a different measure of the dependency rate, and then move to an examination of the relative

¹Hollis B. Chenery and Lance Taylor, "Development Patterns: Among Countries and Over Time," Review of Economics and Statistics (November 1968), pp. 391-416.

²J. R. Lotz and Elliott R. Morss, "A Theory of Tax Level Determinants for Developing Countries," Economic Development and Cultural Change (April 1970), pp. 328-341.

Table 1

Variable Name	Abbreviation	Mean	Standard Deviation
Per Capita Income	Y/TP	\$870	\$540
Total Population	TP	12,151,249	19,755,154
Density (TP/sq. km.)	D	94.46	131.50
Urbanization(Urban Population/TP)	U	.527	.164
Government Expenditure Share(%G/GDP)	G	17.72	6.69
Child' Dependency Rate (% 0-14/15-64)	D ₁₁	64.93	21.81
Aged Dependency Rate (% 65+/15/64)	D ₁₂	11.40	4.96
Total Dependency Rate (D ₁₁ + D ₁₂)	D ₁₃	76.44	17.91
Per Capita Income Squared	(Y/TP) ²	1,038,460.72	1,137,713.48

importance of the various demographic variables on both aggregate government expenditure shares, and on the interpretation of the "traditional", single-variable specification of Wagner's Law.

Equations 4a and 4b in Table 2 present two alternative versions of the complete model. Equation 4a includes a measure of the aggregate dependency rate ($D_{13} = D_{11} + D_{12}$), and Equation 4b reveals the individual impacts of the two separate components of the dependent population ($D_{11} = 0 - 14/TP$; $D_{12} = 65+/TP$). In both models the income per capita terms are jointly significant, with a non-linearity as predicted by Wagner and as documented by several researchers.¹ Urbanization exerts a positive and quantitatively large impact on government spending shares. Scale economies, measured jointly by density and total population size, are statistically significant. In contrast, the dependency-rate exerts a quantitatively small, and in two of the three cases, a statistically

¹ A 95% confidence level was used throughout. In all cases a one-tailed test was employed, given the hypotheses presented in Section 3.0. Joint tests were also calculated for the two income terms, the two separate dependency rates (D_{11} and D_{12}), and the two scale-economy terms (D and TP).

Table 2
Summary of Regression Results Explaining Government Expenditure Shares

Eq. No.	Constant	Y/TP	(Y/TP) ²	U	D ₁₁	D ₁₂	D ₁₃	D	TP	R ²
<u>Traditional Test of Wagner's Law</u>										
1	3.7586	.03116 [*] (2.90)	-.00001266 [*] (-2.49)							.3401
<u>Demographically Augmented Models</u>										
<u>Urbanization</u>										
2	-.2553	.02245 ^{*#} (2.01)	-.00001006 ^{*#} (-2.00)	16.8596 [*] (1.90)						.4328
<u>Urbanization, Dependency</u>										
3a	-6.3998	.02537 ^{*#} (2.13)	-.00001081 ^{*#} (-2.09)	16.3927 [*] (1.82)			.06062 (.76)			.4478
3b	-18.4510	.02004 [#] (1.72)	-.00000930 ^{*#} (-1.88)	19.2349 [*] (2.22)	.1487 ⁺ (1.66)	.7542 ^{*+} (1.97)				.5283
<u>Urbanization, Dependency, Density, Total Population</u>										
4a	5.1126	.01908 [#] (1.67)	-.00000982 ^{*#} (-2.04)	23.3466 [*] (2.58)			-.04413 (-.53)	-.01543 ^{*+} (-1.94)	-.000000105 ^{*+} (-1.75)	.5936
4b	-7.0329	.01505 [#] (1.38)	-.00000872 ^{*#} (-1.93)	25.0193 [*] (2.94)	.0467 ⁺ (.52)	.6250 ^{*+} (1.79)		-.01628 ^{*+} (-2.19)	-.000000089 ⁺ (-1.59)	.6654

* Significant at the 95% level, using a one-tailed test

Significant at the 95% level, using a joint test of income per capita terms

+ Significant at the 95% level, using a joint test of D₁₁ and D₁₂ terms

+ Significant at the 95% level, using a joint test of D and TP terms

insignificant impact on aggregate government shares. Interestingly, the aggregate dependency rate included in equation 4a (D_{13}) -- the measure most commonly used in economic-demographic models -- has no impact at all, and even reveals the wrong sign. As we have argued elsewhere, the aggregate dependency rate may conceal much of what this measure is designed to reveal; Equation 4b is thus added to display the separate dependency-rate impacts.¹ Here the only notable influence on government spending shares is attributed to increases in the proportion of the population in the elderly cohort, not the young cohort. This is at variance with much of the speculation in the literature. The results are consistent, however, with the possibility that the elderly are able to exert their demands through an increase in the government's budget, whereas the increased demands by the young cohort are financed in large part by other means: by lower quality of services (e.g., larger class sizes in school), at the expense of other government expenditure categories, and so forth. Substitution possibilities (e.g., quantity-quality tradeoffs) may be relatively greater for D_{11} -type services.

A comparison of the results moving from the "traditional" test of Wagner's Law (Equation 1) with subsequent demographically-augmented models (Equations 2 - 4) is illuminating. Not only does the explanation of the total variance in government expenditure shares greatly increase in the demographically-augmented models (r^2 from .34 to .67), but the size of the expenditure-share elasticities, as well as their statistical significance, declines progressively as additional demographic elements are appended to the empirical framework. For example, the coefficient on the income per capita term in Equation 1 declines from a value of .31 to a value of .15 in equation 4b.

A similar and somewhat more striking result is obtained by comparing the government share expenditure elasticities with respect to per capita income in Equations 1 and 4b, respectively. In equation 1 the elasticity is .45; in Equation 4b the elasticity is -.004. (Both are evaluated at the mean level of per capita income.) Thus, when we employ the traditional test of Wagner's law, the expenditure elasticity is in the order of magnitude found in several other studies: it is positive, statistically significant, and quantitatively important. However, when demographic elements are taken into account, the role of income per capita falls notably in importance. Demographic change, therefore accounts for most if not all of the change in government expenditure shares, and the other elements of "economic development" captured by income per capita are relatively unimportant.

¹ Allen C. Kelley, "Population Growth, the Dependency Rate, and the Pace of Economic Development," Population Studies (November 1973), pp. 405-414.

It is difficult to assess the relative quantitative importance of the various demographic factors which account for changes in government expenditure shares. One approach would be to compare government expenditure share elasticities of each of the demographic variables. This approach is inadequate, however, since these elasticities indicate only the sensitivity of government shares to a unit change in each of the demographic variables; the elasticities do not capture the rate at which a particular form of demographic change varies during the course of economic development. Put differently, the overall importance of each demographic variable in accounting for changes in government shares depends on the combined influence of the rate at which demographic change takes place, and the sensitivity of government shares to each element of demographic change (the elasticity).

One method to obtain such an impression would be to construct a broadly plausible normalized index of changes in each of the demographic variables -- a change which for each variable represents about the same degree of variation in the sample population. As an experiment, we shall take this normalized index as one half of the standard deviation of each demographic variable, and then compute the resulting change in government shares associated with this change, making the calculations at the mean value of each variable. The resulting computations for Equation 4b yield: $U = 2.05$; $D_{11} = .51$; $D_{12} = 1.55$; $TP = -.88$; $D = -1.07$.

Urbanization exerts the strongest positive demographic influence on government shares. This influence is notably attenuated by economies of scale associated with expanding population size and density. Of the age-dependency effects, the one most commonly highlighted -- child dependency -- turns out to be relatively unimportant; it exerts only one third the impact associated with the remaining component of aggregate dependency, the 65+ cohort. Thus, the more important age-distributional consequence on the government share occurs at later stages of economic development, during the phase of declining birth rates, and not in early stages of economic development, as is highlighted in much of the economic-demographic modelling literature.

The results of our exploratory empirical excursion should be put into perspective. While our findings are somewhat striking given their variance with the hypotheses and empirical results most commonly found in the literature, they require some qualification. First, there is room

for a more complex model where income per capita and certain elements of demographic change are treated endogenously, resulting in a multi-equation framework. Second, our findings apply to long-run equilibrium positions given the data base we have employed. They are not applicable to short-run adjustments, in which the influence of demographic change may be somewhat different. Finally, even though the per capita income variable may appear to be unimportant when demographic influences are taken into account, there may still be quantitatively important offsetting correlates of economic development which are not fully revealed in the per capita income measure.

Even with these qualifications, the present study has established a case that failure to account for the many facets of demographic change may lead to a quite incomplete and even biased reckoning of the factors explaining changes in the size of the government share. Moreover, given the non-linearities in our model together with the existence of both positive and negative demographic influences, Wagner's "Law" is seen to result from the complex interaction of economic and demographic changes which need not necessarily bring about an "...increasing expansion of public, and particularly state activities..." as economic development takes place. Wagner's analysis is based largely on conjectures relating to the economic determinants of the government's share. In contrast, it may be possible that the systematic characteristics of the demographic transition (with the regular sequencing of total population, density, and age-distributional changes) represents an equally or more plausible scenario explaining his observed empirical generalization.

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