Policy, Research, and External Affairs

WORKING PAPERS

World Development Report

Office of the Vice President
Development Economics
The World Bank
May 1990
WPS 423

*Background paper for the 1988 World Development Report*

# Relative Price Changes and the Growth of the Public Sector

M. Shahbaz Khan



The relative size of the public sector and the rate at which its size changes may be severely underestimated in developing countries and overestimated in developed countries, if the indicator for the size of the public sector is the ratio of current public spending to GDP.

Policy, Research, and External Affairs

WORKING PAPERS

World Development Report

This paper, a background paper for the 1988 World Development Report, is a product of the Office of the Vice President, Development Economics. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact the World Development Report office, room S13-060, extension 31393 (20 pages with tables).

Policy recommendations to reduce the growth of public spending are haunted by the inevitability of:

- Wagner's law — the hypothesis that with economic development an increasing share of GDP is devoted to public spending.

- Baumol's effect — the hypothesis that as economies develop, public sector prices rise faster than prices in the general economy.

Neither of these hypotheses has adequately been tested, largely because consistent public sector prices are unavailable for most developing countries.

Khan proposes that the unavailability of consistent public sector price deflators can be overcome by econometrically estimating these series with the help of data on public spending and the widely available GDP deflator. He uses this method to test both hypotheses. An analysis of time-series data from 71 countries indicates that:

- Although data support Wagner's law in the majority of developing countries, the degree of support varies with the level of development. In response to rising income, real public sector spending rises most in the low-income economies, less in the middle-income economies, and least in the industrial market economies.

- Similarly, the average income elasticity of public spending drops from 2.2 in the low-income economies to 1.6 in the middle-income economies to about 1.0 in the industrial economies. In the long run, the size of the public sector tapers off as economies develop.

This is mainly because of changing price levels in the public sector relative to price levels in the general economy. Although Baumol's effect cannot be observed in a majority of the countries, relative prices tend to fall rapidly in the low-income countries, less rapidly in the middle-income countries, and actually start rising in the industrial economies.

This is believed to be due to the differences in technological intensity between the public and private sectors, the strength of the government in negotiating input prices, and labor market conditions as countries move through different stages of development



Produced at the PRE Dissemination Center

# Relative Price Changes and the Growth of the Public Sector

by
M. Shahbaz Khan

## Table of Contents



Thanks are due to the team members of the World Development Report 1988 for providing the intellectual stimulus for this exercise.

# RELATIVE PRICE CHANGES AND THE GROWTH OF THE PUBLIC SECTOR

Restricting the role of government in resource allocation and income distribution--two fundamental functions of efficient markets--is an important policy recommendation to countries facing the dual problem of budget deficits and negative current account balances. Virtually, all such recommendations are geared towards reducing the seemingly endless growth of government expenditure. Research economists are investigating the validity of Adolph Wagner's (1890) "law", which stipulates that economic development results in an increasing role for the government in providing public services and hence to a rising share of government expenditure in total output. And they wish to see the law repudiated. However, it is proving difficult to resolve this issue. After a comprehensive study of 115 countries, Ram (1987, p. 196) concluded that "one can find almost as much evidence in favor of ... (Wagner's) hypothesis as against it".

Academic interest in the validity of Wagner's hypothesis, however, is burdened by the more practical problem of measuring growth of government. Several authors[1] have suggested that due to low productivity growth, public sector prices may rise faster than the prices in the general economy. Baumol (1967) presented an analytical proof of this proposition showing that due to differences in productivity growth and wage equalization across sectors, cost per unit of output in a labor-intensive sector increases faster than in a technology-intensive sector. Since the public sector is often labor-intensive, this result--also called Baumol's hypothesis[2]--is often used to argue that measurements of changes in government size should correct for relative price

---

[1] See, for example, Andic and Veverka 1964 and Hinrichs 1965.

[2] Although some economists are somewhat reluctant to accept Baumol's hypothesis (Musgrave 1969, p. 85; Mueller 1987, pp. 120-21), empirical evidence does indicate a higher price increase in the government sector for most developed countries (Beck 1976, p. 17) and some developing countries (Heller 1981, p. 70).

changes, since attributing the growth in the cost of public goods to growth in government would distort the picture.[3]

But these suggestions are difficult to implement since government expenditure deflators for a vast majority of developing countries are either not available or they are difficult to calculate on a consistent basis (Heller 1981). Consequently, findings of studies analyzing government expenditure growth differ depending not only on whether the data are deflated but also on how the data are deflated. For instance, if one uses government consumption deflator to arrive at real total government expenditures, government size--measured as the ratio of real government expenditure to real GDP--is found to decline in most industrial countries, but it rises for most of the developing countries[4]. On the other hand if one takes a weighted average of government consumption deflator and the implicit deflator for private consumption expenditure, to account for the transfers portion of total government expenditure all industrial countries and most developing countries show a rise in real government expenditure with rising income[5].

Thus in order to accurately analyze the growth of government and to test the relevant hypotheses, it is necessary to first develop a consistent methodology to construct price deflators for the public sector and its components[6]. And this is a primary purpose of the present paper. The other

---

[3] While some authors argue that expenditure in current prices is a better measure of government size if it is the tax burden that needs to be assessed others argue that efforts to reduce government expenditures in the face of rising prices would mean scaling back public services.

[4] See Beck (1976) for industrial country results and Pluta (1979) for developing country results.

[5] See Beck (1979) for industrial country results and Pluta (1981) for developing country results. Both Beck and Pluta worked with small samples--Back had a sample of 13 industrial countries in his 1976 and 1979 studies, while Pluta had 13 developing countries in his 1979 study and 20 in his 1981 study. More recently Ram (1987) found that more than 60 percent of both industrial and developing countries of his 115-country sample showed rising real government expenditure in response to increasing real GDP. However, the nature of the deflator he used is not clear from his paper.

[6] It is important to mention here that the results of studies, analyzing growth of government, also differ according to how government size is defined. That is, whether one considers the changes in total expenditure, only changes in current expenditure, or changes in current expenditure excluding transfers as a measure of changing government size. However, in studying the role of

major focus of this paper, as suggested by the title, is to measure the impact of relative price changes on the growth of government as economies develop.

The paper measures the real growth of government by econometrically estimating price deflators for the public sector with the help of nominal government expenditure and GDP deflator series, using these deflators to create real government expenditure series for 71 countries, and estimating the income elasticity of government expenditure. Baumol's hypothesis of increasing costs in the public sector as well as Wagner's hypothesis of expanding government size are tested. Although these tests are based on time-series data, the difference in results for low-income, middle-income and industrial market economies permits some conjectures about the long-term behaviour of government size. This is particularly useful, since analysis of cross-sectional data does not permit incorporation of relative price effects on the size of government[7].

The findings of this exercise indicate that both Baumol's and Wagner's hypotheses have to be either reformulated or at least qualified in terms of the level of development of the country under consideration. Statistical tests do not support Baumol's hypothesis. Still, one can detect a certain pattern in the evolution of public sector prices relative to those in the overall economy by organizing the results according to per-capita income--level of

---

government there should be no difference between a government distributing food stamps and one that runs soup kitchens--the former will be overlooked if one excludes transfers--or between a government that subsidizes education with education coupons and one that builds and operates schools and universities--the latter would be excluded if one would consider current expenditures only. The idea is to measure the extent to which a government chooses to intervene in the working of the market. By excluding a particular category of expenditure one would bias the analysis against governments that prefer one kind of intervention instrument over the other. Therefore, this study will use total government expenditure to measure the size of government.

[7] This inability of researchers to measure the effects of changing relative prices on the changes in government size may well be the biggest problem of cross-sectional analyses. Nonetheless, like time-series studies, analysis of cross-sectional data is also fraught with problems. Gandhi [1971] reports that for developing countries income elasticities for various categories of government expenditures are less than unity--i.e., they do not support Wagner's hypothesis, while those for developed countries are greater than unity. He argues that this might be due to the choice of country groupings.

development--of the countries in the sample. In the low-income economies (LIEs) the relative prices in the public sector fall rapidly as incomes increase, in the middle-income economies (MIEs) they start to stabilize, that is, they fall less rapidly, while in the industrial market economies (INDs) they rise with rising income[8]. This U-shaped pattern of relative price movements impacts the evolution of the real size of government. Even though Wagner's law of expanding public sector with expanding income is statistically supported in 58 percent of the countries, a breakdown of the results according to the three country groups shows that the real size of government rapidly increases at lower levels of income, then stabilizes, and finally tends to fall, suggesting that in the long-run, as economies evolve the real government expenditure to GDP ratio follows a path that is more or less a mirror image of the movement of relative prices.

## METHODOLOGY

If a "true" public sector deflator, E, were available, the real growth of the public sector would be given by:

$$1) \qquad (G/E) = Ae^{gt}$$

where G is government expenditure in nominal terms, E is the deflator for government expenditure, A is a constant, t is time, e is the base of natural logarithms, and g is the estimated real annual average growth rate of government expenditure. But since E is not available for many countries, one can make use of the relation between E and the GDP deflator, D, that follows from Baumol's hypothesis:

$$2) \qquad E = cD^{a}$$

---

[8] Here and in other parts of the paper reference is made to changes in relative prices and changes in the government-expenditure-to-GDP ratios, although the estimation results are in terms of elasticities. It is therefore worthwhile to note that for two variable A and B, if the change in the ratio of A to B is negative, that is, $d(A/B) < 0$, then the elasticity of A with respect to B is less than one, that is, $d\ln A/d\ln B < 1$, and vice versa. Similarly if $d(A/B) = 0$ or $> 0$ then $d\ln A/d\ln B = 1$ or $> 1$ respectively.

where D is the GDP deflator, d is the percent change in E relative to one percent change in D, and c is a constant.

Substituting (2) in (1), taking logs of both sides, and expressing the resulting equation in first differences[9] one gets the following estimable equation:

3) $$\ln G - \ln G_{-1} = g + d(\ln D - \ln D_{-1}) + v$$

where the subscript, -1, refers to a one-period lag and v to a stochastic error term[10]. Once d has been estimated it is relatively simple to construct the required deflator series as:

4) $$E = (D/D_{-1})^{d}E_{-1}$$

where $E_0$=100 for the base year[11].

In this study such an estimated price deflator series is used to get the real government expenditure series for the 71 countries, which is then used to estimate the elasticity of government expenditure with respect to GDP from the following equation:

5) $$\ln(G/E) = a + b\ln(Y/D) + u$$

---

[9] By taking first differences, the usually high multicollinearity between t and ln(D) is virtually eliminated and consequently there is more precision in the estimation of d.

[10] Equation (3) states that the nominal growth in government expenditure is equal to the real growth in government expenditure plus the change in the price level that is appropriately adjusted to reflect the changes in the relative prices of the government sector and the general economy.

[11] The estimation of d with the help of equation (3) is termed the indirect least squares method. In this special case the reduced-form coefficient d is also the structural parameter d --the structure being defined by equations (1) and (2), since the coefficient of E in equation (1) is, by definition, restricted to one.

where ln(.) is the natural log operator, a is the intercept, b the elasticity of real government expenditure[12] with respect to real GDP, Y, and u is the stochastic error term. All other variables are as defined above.

For the remainder of the paper it will be helpful to keep in mind that Baumol's hypothesis implies that coefficient d in equation (3) be greater than unity while Wagner's hypothesis implies that coefficient b in equation (5) be greater than unity.

## ESTIMATION RESULTS

Data for 71 countries and for the time period 1970-86 were used to estimate the coefficients of equations (3) and (5).[13] In 32 countries the error term in equation (5) was found to be autoregressive, hence in these countries a generalized least squares procedure was used. Coefficients for equation (5) for all other countries, as well as the coefficients for all countries for equation (3), which showed no cases of autoregressive errors, were estimated with the help of ordinary least squares. Annex Table 1 contains the estimated values of the GDP-deflator elasticity of government-expenditure deflator, d; the real growth rates for total government expenditure and GDP; and the real income elasticity of government expenditure, b, for the 71 countries. The rest of this section contains comparisons between the estimated d and the one calculated from other published sources. This section also contains test results for Baumol's and Wagner's hypotheses.

---

[12] It is more accurate to use general government expenditure to measure government size, but since data on this variable are available for very few countries, this study is based on an analysis of central government data contained in the IMF Government Finance data files of the Bank Economic and Social Database (BESD). It should be noted that IMF definition of central government expenditure includes all transfers--to enterprises, other levels of government, households, etc.-- as well as expenditures related to social security schemes that are imposed, controlled, or financed by the government (see IMF 1986, pp. 16, 179-85).

[13] In some countries information for the first or last few years was missing, therefore the sample size ranged from 10 to 17 observations.

GDP-deflator elasticity of Government-Expenditure Deflator

The estimated values of the GDP-deflator elasticity of government-expenditure deflator, $\hat{d}$, are given in column (ii) of Annex Table 1; column (iii) of that table contains a comparable estimate of d, $\hat{d}^*$, that is calculated as the ratio of growth rates of government and GDP deflators given in Beck (1976) and Heller (1981)[14]--henceforth called the comparator set. Table 1 contains summary statistics for these two sets of estimates.

TABLE 1: COMPARATIVE DISTRIBUTION OF ESTIMATED GDP-DEFLATOR ELASTICITIES OF GOVERNMENT-EXPENDITURE DEFLATOR, $\hat{d}$ AND THOSE CALCULATED FROM OTHER STUDIES $\hat{d}^*$[1]

| Countries[2] | Mean | | Std. Dev. | | Test for $H_0$: d - d* = 0 | | | |
|---|---|---|---|---|---|---|---|---|
| | ($\hat{d}$) | ($\hat{d}^*$) | ($\hat{d}$) | ($\hat{d}^*$) | ($\hat{d}$-$\hat{d}^*$) | s($\hat{d}$-$\hat{d}^*$)[3] | t | Prob[4] |
| ALL | 1.01 | 1.32 | 0.60 | 0.54 | 0.31 | 0.39 | 0.79 | 0.44 |
| IND[5] | 1.49 | 1.80 | 0.37 | 0.35 | 0.31 | 0.28 | 1.11 | 0.30 |
| MIE | 0.73 | 1.01 | 0.53 | 0.41 | 0.28 | 0.48 | 0.58 | 0.57 |
| LIE | 0.41 | 0.94 | 0.18 | 0.17 | 0.53 | 0.04 | 13.3 | 0.05 |

1) Because of the unavailability of the significance levels for individual estimates of $\hat{d}^*$ the comparison disregards the estimated variances of the individual $\hat{d}$ as well.
2) Summary statistics are for countries for which both $\hat{d}$ and $\hat{d}^*$ are available. In total there are 30 such countries, 12 in the IND group, 16 in MIE and 2 in LIE.
3) This column contains the standard deviation of ($\hat{d}$-$\hat{d}^*$).
4) (1-Prob) gives the value to which the confidence level would have to be lowered in order to reject the null hypothesis.
5) IND=Industrial Market Economies, MIE=Middle Income Economies, LIE=Low Income Economies;

[14] The comparisons assume coefficient stability during the time periods covered by this study and the comparator studies as well as more or less constant shares of the different components within the government sector. Without these assumptions no comparisons would be possible since there are few studies that cover the same time periods or that use the same variable to measure government size.

The two sets of numbers are compared to see whether they can be considered samples from the same population. The hypothesis of the equivalence of the means of $\hat{d}$ and $\hat{d}^*$ is tested. The results in Table 1 indicate that such a test can be sustained with relatively high confidence.[15] Even on a less rigorous basis the similarities are quite obvious; first, the two sets have comparable ranges--0.06-2.16 in this study compared to 0.29-2.49 in the comparator set; second, the mean values of the sub-groups have the same relative size in the two sets--the INDs have the largest mean while the LIEs have the smallest mean; finally, although there are only a few instances of a one-to-one correspondence between the countries, if they are ranked according to the two sets of coefficient values 28 out of 30 countries lie on the same side of their overall mean values[16]. In other words indirectly estimated government price deflators are statistically similar to deflators calculated by conventional methods and hence can be used in their place when the latter are not available[17].

Baumol's Hypothesis

As stated above public economists have often used Baumol's (1967) analytical proof, that cost per unit of output rises faster in the labor-intensive (government) sector than in the technology-intensive (private) sector, to argue that the growth in the size of government might be exaggerated if measured by the movement of nominal government expenditure to GDP ratios. However, there is no empirical evidence in support of or against this hypothesis or on how it may apply to countries at different stages of development. In an effort to shed some light on this point Table 2 breaks down

---

[15] The same is true for the sub-groups IND and MIE, however for LIE the hypothesis has to be rejected.

[16] The Spearman's rank correlation for the two sets of values is 0.79 whereas the simple correlation coefficient is 0.77.

[17] Note that the estimator $\hat{d}$ = cov(lnE,lnD)/var(lnD) is unbiased because it is an OLS estimator. On the other hand $\hat{d}^*$, as ratio of two growth rates, can be written as cov(lnE,t)/cov(lnD,t) and, although it may be a ratio of unbiased OLS estimators, its own properties are unknown. From the values under consideration it seems that $\hat{d}^*$ systematically overestimates d. One gets the same impression on comparing the ratios of column (iv) to (v)--two growth rates--with the OLS estimated elasticities in column (vi).

the significance test for Baumol's hypothesis--that the GDP-deflator elasticity of government-expenditure deflator is larger than unity--for the sample countries by stages of development.

TABLE 2: TEST RESULTS OF BAUMOL'S HYPOTHESIS

| Statistically Significant Value of $\hat{d}$ | Countries | | | |
|---|---|---|---|---|
| | IND | MIE | LIE | ALL |
| | (percent) | | | |
| Less than or equal to 1.00 | 68 | 95 | 100 | 88 |
| Larger than 1.00 | 32 | 5 | 0 | 12 |
| Larger than 1.00 irrespective of significance | 71 | 18 | 21 | 35 |
| Number of countries | 19 | 38 | 14 | 71 |
| Median Value of $\hat{d}$ | 1.29 | 0.81 | 0.33 | 0.86 |

Note: Significance level used = 0.05

Two points are evident from the figures in Table 2. First, there is scant statistical evidence for Baumol's hypothesis--only 8 of the 71 countries show an estimated value for d that is significantly larger than unity[18]. One may argue that because of the small time periods over which the coefficients are estimated the significance tests could be misleading and one might improve on these results by using longer series. However, even disregard of the

[18] While only 5 percent of the coefficients in the INDs are statistically insignificant, the frequency of such coefficients rises to 45 percent in MIEs and 71 percent in LIEs.

underlying variations in the data does not give favorable results. Still only 25 of the 71 countries (35 percent) show any support for the hypothesis.

Second, whether one takes into account the underlying variation in the data or disregards it, the industrial market economies are most likely to show support for Baumol's hypothesis. In fact, if one disregards significance test 79 percent of the INDs show rising relative prices in the public sector, compared to only 18 and 21 percent in the middle-income economies and the low-income economies respectively. This is an interesting result in itself but by considering the relative size of the average values of the estimated coefficients for the three groups--the median for IND is 1.29, for MIE 0.81, and for LIE 0.33--one can detect a certain pattern in the movement of relative prices. The estimated elasticities indicate that in the long-run as incomes rise the relative prices in the public sector first fall rapidly, then they start stabilizing and finally, as economies are industrialized, they start to rise.

This apparent contradiction of Baumol's hypothesis can in fact be explained by the basic assumptions of the hypothesis. The conditions for Baumol's "effect" to be realized are a) higher productivity growth in the technology-intensive private sector and b) equal wage increases across sectors. These two conditions will, probably, be met in the industrial market economies but not in the other two country groups. In fact in some of the low-income countries it might be the public sector that is relatively technology intensive, since the government has easier access to capital and to foreign technology. In the middle-income economies this technological "superiority" of the public sector may be relatively lower, because the private sector is more mature and has increasing access to capital and technology, but the public sector may still be more technology intensive.

Similarly, there is evidence that in developing countries wages in the public sector are lower than in the private sector (Heller and Tate 1983). Not only do the public sector wages remain lower in developing countries, there is also indication that in some of these countries the wage gap between the

government and the private sector is widening (Lindauer, Meesook, and Suebsaeng 1988). In other words even the second condition for the validity of Baumol's hypothesis--of equal wage increases across sectors--is not met in the developing countries. This is understandable, since concurrent wage increases across sectors can only occur under conditions of full or near-full employment and developing countries are usually marred with high unemployment.

In addition to wages and salaries, government expenditure in developing countries is mainly composed of purchases of goods and of capital investments. How the price movements for these items affect the total government expenditure price level is not clear. It might be conjectured that the government in developing countries, as a large and reliable costumer, is in a position of extracting price concessions from its suppliers and thus keeping its costs down. However, there is no indication that the governments in developing countries follow this policy.

In short, Baumol's hypothesis depends upon the existence of higher productivity growth in the non-public sector and similar rise in wages across sectors. These conditions in turn require not only a well-developed and technology-intensive private sector but also near-full employment. The degree to which these characteristics are present is in fact a measure of a country's development level. The fact that Baumol's hypothesis is mostly applicable in industrial market economies should therefore not come as a surprise.

Wagner's Law

The impact of this peculiar behavior of relative prices can be seen in the movement of real government expenditure and the empirical evidence for Wagner's hypothesis. Column (vi) in Annex Table 1 contains the estimated income elasticity of government expenditure--the coefficient b in equation 5--for the 71 countries in our sample. A value for b that is significantly larger than one will support Wagner's hypothesis, that increases in national income lead to proportionately larger increases in government expenditure. Table 3 contains a summary of the test results arranged by the three country groups in the sample.

TABLE 3: TEST RESULTS OF WAGNER'S HYPOTHESIS

| Statistically Significant Value of $\hat{b}$ | Countries | | | |
|---|---|---|---|---|
| | IND | MIE | LIE | ALL |
| | (percent) | | | |
| Less than or equal to 1.00 | 53 | 45 | 21 | 42 |
| Larger than 1.00 | 47 | 55 | 79 | 58 |
| Larger than 1.00 irrespective of significance | 53 | 71 | 93 | 70 |
| Number of Countries | 19 | 38 | 14 | 71 |
| Median Value for $\hat{b}$ | 1.04 | 1.63 | 2.23 | 1.60 |

Note: Significance level used = 0.05

Although the results seem to support Wagner's Law--58 percent of the countries have income elasticity of government expenditure that is significantly larger than one and if one disregards the variances of the estimated coefficients, the percentage of favorable cases goes up to 70 percent--the more interesting aspect of this exercise is revealed on examining the breakdown of these results. Both the average coefficients for the three groups as well as the relative frequency of coefficient values that are significantly larger than one indicate that the rate at which real government size expands with increasing income decreases as countries develop. The median income elasticity of government expenditure, for instance, declines from 2.2 for low-income economies to 1.6 for middle-income economies to around 1 for industrial market economies. Similarly, the percent of countries that show a significantly larger-than-one value for $\hat{b}$ drops from almost 80 percent in the LIE to 55 percent in the MIE to 47 percent in the IND. In other words, the relationship between income and government expenditure in the long-run takes on a form that is almost a mirror image of the movement of relative prices; as

countries pass through the different stages of development the size of government--measured as the ratio of real government expenditure to GDP--first rapidly expands, then it starts to stabilize and finally as the countries industrialize it starts shrinking.

The reason for this pattern, obviously, lies in the movement of relative prices. As we saw earlier the public sector price level relative to the price level in the overall economy follows a U-shaped evolutionary path. In early stages of development the relative prices in the public sector decrease but at later stages of development they start to rise. Consequently, even though the nominal government expenditure to GDP ratio may increase, as documented in some studies[19], in real terms it would show a quadratic movement.

It is important to point out that the results on government expenditure growth reported here are broadly consistent with those presented in other studies. As was noted at the beginning of this paper, analyses of time-series data often favor the hypothesis of rising real government expenditures in response to rising income with a somewhat similar dichotomy between the developing and developed countries in terms of the behavior of government expenditure to GDP ratio (Beck 1976; Pluta 1979; and Ram 1987)[20]. However, none of these studies explicitly explore the impact of changing relative prices on real government size or the likely form of the relationship between real government expenditure and real gross national product as countries move from one development stage to another.[21]

---

[19] See, for instance, Peacock 1985.

[20] Actually, the results of the present study show a slight improvement over Ram's 1987 analysis--probably one of the more comprehensive studies on the subject. On analyzing real time-series data for the period 1960-80, Ram found that 64 percent of his 115 countries--65 percent of the developing countries and 62 percent of the developed countries--had a larger-than-one government expenditure elasticity of GDP. In comparison, the present study finds that 70 percent of the 71 country sample--77 percent of the developing countries and 53 percent of the developed countries--show a larger than one value of the elasticity.

[21] There is, of course, a whole group of studies that examine the relation ship on the basis of cross-sectional data but since one cannot incorporate changes in relative prices in cross-sectional analyses results from these studies cannot be considered comparable to what is presented here. Further none of these studies allows for a quadratic relationship between the

A final point needs to be made regarding the implication of this study that because relative prices in the public sector drop in developing countries this sector must be experiencing productivity gains. Since analysis of government expenditure is an analysis of the input side rather than the output side--output quantities and output prices for the public sector are virtually impossible to measure--the changes in input prices may not necessarily measure changes in productivity as such, unless the implicit assumption holds, that changes in real government expenditure adequatly reflect changes in public sector output. Without recourse to concrete examples, one can safely presume, that in many developing countries this might not be the case.

## SUMMARY AND CONCLUSIONS

A number of points have been investigated by this study. First, It has been demonstrated that to analyze real size of government one does not necessarily need price deflators for the public sector. On the basis of current government expenditure and the general GDP deflator one can econometrically estimate a price deflator series that can then be used to calculate constant government expenditures.

Second, statistical tests do not support the generally held notion of increasing costs per unit output (Baumol's hypothesis) in the public sector. However, if one is willing to overlook the relatively large variances of the estimated coefficients--and so refrain from making probability statements--one can detect a certain pattern in the evolution of public sector prices relative to those in the overall economy as countries pass through different development stages. In most of the low-income and middle-income countries the

---

government expenditure to GDP ratio and level of development--with the possible exception of Musgrave (1969, p.119). On analysing tax-to-GNP ratios on the basis of cross-sectional data for a group of 30 to 40 countries, he discovered that the elasticity of this ratio with respect to income, first rises, then declines and eventually becomes negative. Since tax and expenditure are highly correlated, one can consider this finding as somewhat similar to that of the present study.

GDP-deflator elasticity of government expenditure deflator, $\hat{d}$, is less than one, while in most industrial market economies it is larger than one. The average values of estimated coefficients for these three country groups indicate that in LIEs the relative prices in the public sector actually fall as incomes increase, in the MIEs they start to stabilize--i.e., they fall less rapidly--while in the INDs they rise with rising income. The apparent refutation of Baumol's hypothesis in the developing countries can in fact be explained with the help of the two basic requirements of the hypothesis; a) higher productivity growth in the private (technology-intensive) sector and b) equal wage increases across sectors; these conditions are more easily met in the industrial market economies than in the other two country groups.

Finally, the pattern of relative price movements has its parallel in the changes in the real size of government. Even though Wagner's law of expanding public sector with expanding income is statistically supported in 58 percent of the countries, a breakdown of the results according to the three country groups shows that the real size of government rapidly increases at lower levels of income, then stabilizes, and finally tends to fall, suggesting that in the long-run the real government expenditure to GDP ratio follows a quadratic developmental path as economies evolve from developing to developed countries.

BIBLIOGRAPHY

Andic, Suphan and Jindrich Veverka, "The Growth of Government Expenditures in Germany since Unification" Financzarchiv Vol. 23, January 1964, 178.

Baumol, William, J. "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis" American Economic Review Vol. 57, June 1967, 415-26.

Beck, Morris "The Expanding Public Sector: Some Contrary Evidence" National Tax Journal Vol. 29 March 1976, 15-21.

_____ "Public Sector Growth: A Real Perspective" Public Finance Vol 34, 1979, 313-356.

Candhi, Ved P. "Wagner's Law of Public Expenditure: Do Recent Cross-Section Studies Confirm It?" Public Finance Vol. 26, 1971, 44-56.

Heller, Peter S. "Diverging Trends in the Shares of Nominal and Real Government Expenditure in GDP: Implications for Policy" National Tax Journal Vol 34, 1981, 61-74.

_____ and Alan A. Tate "Government Employment and Pay: Some International Comparisons" IMF Occasional Paper No. 24, 1983.

Hinrichs, Harley H. "Determinants of Government Revenue Shares among Less-Developed Countries" Economic Journal Vol.75, September 1965, 546-56.

International Monetary Fund, A Manual of Government Finance Statistics, 1986.

Lindauer, D. L., O. A. Meesook, and P. Suebsaeng "Government Wage Policy in Africa: Some Findings and Policy Issues" The World Bank Research Observer Vol. 3, January 1988, 1-25

Mueller, Dennis C. "The Growth of Government: A Public Choice Perspective" IMF Staff Papers Vol. 34, March 1987, 115-49.

Musgrave, Richard, A., Fiscal Systems, 1969, New Haven.

Peacock, Alan "The Political Economy of Public Spending or Coping with Public Sector Growth in Western Countries" Paper presented to a National Conference of the Institute of Public Administration, Dublin, Ireland Public Expenditure: The Key Issues November 1985.

Pluta, Joseph E. "The Declining Public Sector Thesis: An Additional Test and Implications for Developing Regions" Social and Economic Studies Vol. 28, December 1979.

_____ "Real Public Sector Growth and Decline in Developing Countries" Public Finance Vol. 36, 1981, 439-51

Ram, Rati "Wagner's Hypothesis in Time-series and Cross-section Data: Evidence from 'Real' Data for 115 Countries" The Review of Economics and Statistics, Vol. LXIX, May 1987, 194-204.

Wagner, Adolf Finanzwissenshaft, Leipzig, 1890

ANNEX TABLE 1: MEASURES OF REAL GOVERNMENT EXPENDITURE AND INCOME GROWTH

| Country | GDP Deflator Elasticity of Government Expenditure Deflator (d) | | Real Annual Average Growth Rate (percent) | | Income Elasticity of Govt. Exp. (b) | N |
|---|---|---|---|---|---|---|
| | This Study | Other Studies(1) | Govt. Exp. | GDP | | |
| (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
| **INDUSTRIAL MARKET ECONOMIES** | | | | | | |
| Australia | 1.52 ** | NA | 0.75 | 3.28 | 0.11 | 17 |
| | (0.24) | | (2.39) | (0.77) | (0.11) | |
| Austria | 1.84 ** | 2.49 | 0.40 | 3.05 | 0.19 * | 16 |
| | (0.38) | | (2.2) | (0.59) | (0.08) | |
| Belgium | 1.29 * | NA | 3.24 | 2.32 | 1.53 ** | 16 |
| | (0.32) | | (2.19) | (0.74) | (0.09) | |
| Canada | 1.93 ** | 2.25 | -1.28 | 4.31 | -0.49 | 13 |
| | (0.21) | | (2.27) | (1.28) | (0.11) | |
| Denmark | 1.43 * | 1.81 | 0.17 | 2.22 | 0.04 | 16 |
| | (0.43) | | (3.8) | (0.81) | (0.19) | |
| Finland | 1.34 * | 1.69 | 1.23 | 3.02 | 0.44 * | 14 |
| | (0.27) | | (2.97) | (0.97) | (0.08) | |
| France | 1.80 ** | 1.51 | -2.87 | 2.31 | -1.08 | 14 |
| | (0.27) | | (2.59) | (0.52) | (0.2) | |
| Iceland | 0.85 * | NA | 9.06 | 2.71 | 2.66 ** | 14 |
| | (0.19) | | (7.06) | (1.84) | (0.43) | |
| Ireland | 1.09 * | 1.35 | 5.53 | 3.65 | 1.54 ** | 15 |
| | (0.25) | | (3.29) | (0.99) | (0.12) | |
| Italy | 0.87 * | NA | 8.56 | 2.02 | 3.96 ** | 14 |
| | (0.29) | | (4.29) | (0.99) | (0.25) | |
| Luxemberg | -0.04 | NA | 12.71 | 2.12 | 3.90 ** | 15 |
| | (0.24) | | (2.11) | (1.21) | (0.98) | |
| Netherland | 1.72 ** | 2.27 | 0.46 | 1.57 | 0.22 * | 14 |
| | (0.17) | | (1.03) | (0.05) | (0.06) | |
| Norway | 0.32 * | NA | 10.36 | 3.99 | 2.64 ** | 15 |
| | (0.17) | | (1.48) | (0.64) | (0.1) | |
| Spain | 1.14 * | NA | 5.07 | 3.01 | 1.47 ** | 15 |
| | (0.22) | | (3.05) | (0.79) | (0.2) | |
| Sweden | 1.39 * | 1.69 | 1.79 | 1.92 | 1.04 * | 17 |
| | (0.33) | | (2.96) | (0.66) | (0.18) | |
| Switzerland | 1.07 * | 1.37 | 3.57 | 1.10 | 0.73 | 15 |
| | (0.37) | | (2.11) | (1.03) | (0.6) | |
| United Kingdom | 1.08 * | 1.59 | 2.51 | 1.79 | 1.49 ** | 16 |
| | (0.14) | | (1.73) | (0.75) | (0.16) | |
| United States | 1.05 * | 1.71 | 3.94 | 2.59 | 1.55 ** | 15 |
| | (0.29) | | (1.99) | (0.71) | (0.11) | |
| W. Germany | 2.16 ** | 1.91 | -1.09 | 2.25 | -0.38 | 16 |
| | (0.33) | | (1.57) | (0.53) | (0.12) | |
| GROUP MEDIAN | 1.29 | 1.70 | 2.51 | 2.31 | 1.04 | |

(CONTD)

ANNEX TABLE 1: MEASURES OF REAL GOVERNMENT EXPENDITURE AND INCOME GROWTH

| Country | GDP Deflator Elasticity of Government Expenditure Deflator (d) | | Real Annual Average Growth Rate (percent) | | Income Elasticity of Govt. Exp. (b) | N |
|---|---|---|---|---|---|---|
| | This Study | Other Studies(1) | Govt. Exp. | GDP | | |
| (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
| | | | MIDDLE-INCOME ECONOMIES | | | |
| Argentina | 0.97 * (0.05) | NA | 10.58 (6.48) | 1.10 (3.5) | 3.53 ** (0.99) | 14 |
| Bahamas | 0.33 (0.49) | NA | 9.31 (3.82) | 1.62 (2.23) | 1.85 ** (0.35) | 14 |
| Barbados | 0.83 * (0.28) | NA | 4.70 (3.7) | 1.40 (1.8) | 2.02 ** (0.26) | 14 |
| Brazil | 1.00 * (0.06) | 0.92 (5) | 8.23 (3.4) | 6.10 (1.8) | 1.27 ** (0.07) | 16 |
| Cameroon | 1.98 (1.32) | NA | 1.92 (12.78) | 9.31 (2.71) | 0.30 * (0.09) | 11 |
| Chile | 0.91 * (0.03) | NA | 5.28 (3.2) | 1.51 (2.21) | 1.32 ** (0.41) | 15 |
| Colombia | 0.72 (0.41) | NA | 11.54 (8.49) | 4.38 (1.46) | 2.50 ** (0.26) | 13 |
| Costa Rica | 0.29 (0.17) | 0.86 (2) | 20.95 (4.16) | 3.30 (2.2) | 4.55 ** (0 95) | 15 |
| Cyprus | 0.11 (0.14) | 0.87 (2) | 15.54 (3.6) | 10.18 (3.59) | 1.16 * (0.16) | 17 |
| Dom. Republic | 0.81 * (0.22) | 0.29 (2) | 3.84 (3.2) | 4.11 (1.97) | 0.84 * (0.12) | 14 |
| Egypt | 0.56 (0.74) | NA | 8.82 (9.91) | 6.93 (2.76) | 1.32 ** (0.12) | 12 |
| Gabon | 0.18 (0.54) | NA | 21.26 (12.52) | 5.52 (7.92) | 1.65 * (0.45) | 11 |
| Greece | 1.77 * (0.69) | 2.27 | -5.22 (11.46) | 2.86 (2.05) | -1.41 (0.24) | 14 |
| Guatemala | 2.50 ** (0.73) | NA | -8.95 (7.7) | 3.34 (2.56) | -1.45 (0.32) | 12 |
| Guyana | 0.52 (0.47) | NA | 12.15 (5.93) | 1.35 (4.34) | 5.94 ** (1.02) | 12 |
| Indonesia | 1.11 * (0.19) | 0.98 (2) | 7.99 (3.64) | 5.74 (2.05) | 1.22 ** (0.09) | 15 |
| Israel | 0.86 * (0.06) | NA | 16.42 (4.9) | 3.25 (2.54) | 4.59 ** (0.44) | 14 |
| Korea | 1.29 * (0.24) | 1.38 (3) | 4.49 (3.75) | 7.96 (1.83) | 0.58 * (0.05) | 16 |
| Liberia | 0.26 (0.68) | 0.55 (3) | 6.88 (5.36) | -0.35 (4.12) | 3.72 * (1.97) | 13 |
| Malaysia | 0.06 (0.4) | 0.88 (2) | 13.83 (3.53) | 6.70 (2.3) | 2.24 ** (0.13) | 14 |

(CONTD)

ANNEX TABLE 1: MEASURES OF REAL GOVERNMENT EXPENDITURE AND INCOME GROWTH

| Country | GDP Deflator Elasticity of Government Expenditure Deflator (d) | | Real Annual Average Growth Rate (percent) | | Income Elasticity of Govt. Exp. (b) | N |
|---|---|---|---|---|---|---|
| | This Study | Other Studies(1) | Govt. Exp. | GDP | | |
| (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
| **Malta** | 0.95 * | NA | 8.05 | 8.30 | 0.82 * | 13 |
| | (0.51) | | (3.24) | (2.3) | (0.08) | |
| **Mexico** | 0.68 * | 1.15 (4) | 19.78 | 4.59 | 3.65 * | 14 |
| | (0.17) | | (5.62) | (2.68) | (0.54) | |
| **Morocco** | 1.60 * | 1.03 (2) | 2.37 | 4.31 | 0.78 * | 16 |
| | (0.44) | | (4.11) | (2.4) | (0.33) | |
| **Nicaragua** | 0.80 * | NA | 14.59 | 0.48 | 1.16 | 17 |
| | (0.11) | | (4.71) | (3.74) | (1.03) | |
| **Oman** | 1.00 * | NA | 6.36 | 6.32 | 0.90 * | 14 |
| | (0.12) | | (4.16) | (3.52) | (0.18) | |
| **Panama** | 2.84 ** | NA | -5.63 | 4.06 | -0.96 | 13 |
| | (0.69) | | (4.66) | (1.99) | (0.13) | |
| Paraguay | 0.14 | 0.95 (2) | 16.65 | 6.38 | 2.40 ** | 14 |
| | (0.16) | | (3.31) | (1.86) | (0.2) | |
| Singapore | 0.94 | 1.00 (2) | 6.88 | 7.10 | 1.01 * | 14 |
| | (0.66) | | (4.39) | (3.03) | (0.21) | |
| South Africa | 0.09 | NA | 17.10 | 2.70 | 6.00 ** | 13 |
| | (0.26) | | (3.51) | (1.04) | (0.41) | |
| Syria | 0.89 | NA | 13.01 | 8.27 | 1.60 ** | 10 |
| | (1.05) | | (15.25) | (5.55) | (0.17) | |
| Thailand | 0.11 | 1.18 (3) | 14.78 | 6.31 | 2.49 ** | 14 |
| | (0.24) | | (2.37) | (1.39) | (0.06) | |
| Tunisia | 0.82 * | 1.15 (2) | 11.30 | 4.98 | 2.07 ** | 13 |
| | (0.25) | | (2.71) | (1.19) | (0.11) | |
| Turkey | 0.75 * | NA | 13.23 | 5.40 | 2.47 ** | 16 |
| | (0.12) | | (4.14) | (1.84) | (0.27) | |
| Uruguay | 0.71 * | 0.73 (2) | 14.66 | 1.56 | 3.39 ** | 15 |
| | (0.15) | | (7.27) | (2.06) | (1.1) | |
| Venezuela | 0.72 * | NA | 7.27 | 2.22 | 2.61 ** | 16 |
| | (0.28) | | (3.98) | (2.62) | (0.36) | |
| Yemen Arab Rep. | 0.23 | NA | 21.88 | 6.66 | 3.64 ** | 13 |
| | (0.55) | | (8.91) | (4.17) | (0.29) | |
| Yugoslavia | 0.71 * | NA | 5.56 | 4.34 | 0.52 | 16 |
| | (0.23) | | (7.55) | (3.56) | (0.36) | |
| Zimbabwe | 1.34 | NA | 2.08 | 2.87 | 0.46 * | 11 |
| | (0.78) | | (9.4) | (2.79) | (0.18) | |
| GROUP MEDIAN | 0.81 | 0.96 | 9.07 | 4.36 | 1.63 | |

(CONTD)

ANNEX TABLE 1: MEASURES OF REAL GOVERNMENT EXPENDITURE AND INCOME GROWTH

| Country | GDP Deflator Elasticity of Government Expenditure Deflator (d) | | Real Annual Average Growth Rate (percent) | | Income Elasticity of Govt. Exp. (b) | N |
|---|---|---|---|---|---|---|
| | This Study | Other Studies(1) | Govt. Exp. | GDP | | |
| (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
| **LOW-INCOME ECONOMIES** | | | | | | |
| Burkina Faso | 1.06<br>(0.65) | NA | 4.64<br>(6.35) | 3.58<br>(2.7) | 1.70 **<br>(0.22) | 13 |
| Burma | 0.02<br>(0.09) | NA | 11.06<br>(1.3) | 5.46<br>(1.1) | 2.06 **<br>(0.12) | 13 |
| Ethiopia | -0.32<br>(0.57) | NA | 15.69<br>(3.31) | 2.39<br>(2) | 7.02 **<br>(0.88) | 10 |
| Gambia | 1.78 *<br>(0.54) | NA | 1.88<br>(6.45) | 4.60<br>(4.12) | 0.69<br>(0.42) | 11 |
| Haiti | 0.81<br>(0.48) | NA | 6.60<br>(5.29) | 2.64<br>(3.21) | 2.40 **<br>(0.4) | 11 |
| India | -0.10<br>(0.27) | NA | 15.88<br>(2.15) | 4.81<br>(1.15) | 3.49 **<br>(0.17) | 13 |
| Mali | -1.27<br>(1.19) | NA | 30.29<br>(10.03) | 1.10<br>(3.09) | 12.72 **<br>(5.25) | 10 |
| Nepal | 0.32<br>(0.19) | NA | 14.72<br>(2.09) | 2.91<br>(1.45) | 5.08 **<br>(0.27) | 14 |
| Pakistan | 0.58 *<br>(0.28) | 1.12 (2) | 12.58<br>(3.24) | 5.96<br>(1.53) | 1.92 **<br>(0.06) | 14 |
| Senegal | 1.25 *<br>(0.4) | NA | 5.29<br>(4.43) | 3.00<br>(2.37) | 1.61 **<br>(0.22) | 12 |
| Sri Lanka | 0.23<br>(0.52) | 0.77 (2) | 15.18<br>(7.28) | 4.69<br>(3.17) | 3.52 **<br>(0.15) | 16 |
| Tanzania | -0.87<br>(0.62) | NA | 32.72<br>(10.16) | 2.26<br>(2.89) | 13.60 **<br>(1.45) | 14 |
| Togo | 0.34<br>(0.64) | NA | 5.45<br>(4.53) | 1.59<br>(3.31) | 1.10<br>(0.72) | 10 |
| Zaire | 0.91 *<br>(0.2) | NA | 1.10<br>(7.61) | -0.05<br>(3.74) | 1.77 *<br>(0.86) | 13 |
| GROUP MEDIAN | 0.33 | 0.94 | 11.82 | 2.96 | 2.23 | |

NOTES: 1) The figures in this column are calculated from Beck (1976) for Industrial Market Economies and Greece; and from Heller (1981) for Middle- and Low-Income Economies. The time periods are following: Beck's: 1950-52 to 1968-70; Heller's: (2) 1973-77, (3) 1974-77, (4) 1972-76, (5) 1973-75.

* Coefficients are significantly greater than ZERO at the 5 percent level.
** Coefficients are significantly greater than ONE at the 5 percent level.
Parentheses below the coefficient estimates contain the standard errors.

PRE Working Paper Series

| | Title | Author | Date | Contact for paper |
|---|---|---|---|---|
| WPS402 | The GATT as International Discipline Over Trade Restrictions: A Public Choice Approach | J. Michael Finger | March 1990 | N. Artis 38010 |
| WPS403 | Innovative Agricultural Extension for Women: A Case Study of Cameroon | S. Tjip Walker | | |
| WPS404 | Chile's Labor Markets in an Era of Adjustment | Luis A. Riveros | April 1990 | R. Luz 34303 |
| WPS405 | Investments in Solid Waste Management: Opportunities for Environmental Improvement | Carl Bartone<br>Janis Bernstein<br>Frederick Wright | April 1990 | S. Cumine 33735 |
| WPS406 | Township, Village, and Private Industry in China's Economic Reform | William Byrd<br>Alan Gelb | April 1990 | K. Chen 38966 |
| WPS407 | Public Enterprise Reform: A Challenge for the World Bank | Ahmed Galal | April 1990 | G. Orraca-Tetteh 37646 |
| WPS408 | Methodological Issues in Evaluating Debt-Reducing Deals | Stijn Claessens<br>Ishac Diwan | May 1990 | S. King-Watson 33730 |
| WPS409 | Financial Policy and Corporate Investment in Imperfect Capital Markets: The Case of Korea | Mansoor Dailami | April 1990 | M. Raggambi 37657 |
| WPS410 | The Cost of Capital and Investment in Developing Countries | Alan Auerbach | April 1990 | A. Bhalla 37699 |
| WPS411 | Institutional Dimensions of Poverty Reduction | Lawrence F. Salmen | May 1990 | E. Madrona 37496 |
| WPS412 | Exchange Rate Policy in Developing Countries | W. Max Corden | May 1990 | M. Corden 39175 |
| WPS413 | Supporting Safe Motherhood: A Review of Financial Trends Full Report | L. M. Howard | May 1990 | S. Ainsworth 31091 |
| WPS414 | Supporting Safe Motherhood: A Review of Financial Trends Summary | L. M. Howard | May 1990 | S. Ainsworth 31091 |
| WPS415 | How Good (or Bad) are Country Projections? | Norman Hicks<br>Michel Vaugeois | April 1990 | M. Berg 31058 |

PRE Working Paper Series

| | Title | Author | Date | Contact for paper |
|---|---|---|---|---|
| WPS416 | World Bank Efforts at Poverty Measurement in the Third World: The Living Standards Measurement Study | Paul Glewwe | | |
| WPS417 | Modeling the Macroeconomic Requirements of Policy Reform | William Easterly<br>E. C. Hwa<br>Piyabha Kongsamut<br>Jan Zizek | May 1990 | R. Luz<br>34303 |
| WPS418 | Does Devaluation Hurt Private Investment? The Indonesian Case | Ajay Chhibber<br>Nemat Shafik | May 1990 | M. Colinet<br>33490 |
| WPS419 | The Design and Sequencing of Trade and Investment Policy Reform: An Institutional Analysis | Brian Levy | | |
| WPS420 | Making Bank Irrigation Investments More Sustainable | Gerald T. O'Mara | May 1990 | C. Spooner<br>30464 |
| WPS421 | Taxation of Financial Intermediation: Measurement Principles and Application to Five African Countries | Christophe Chamley<br>Patrick Honohan | May 1990 | W. Pitayato-nakarn<br>37666 |
| WPS422 | Civil Service Reform and the World Bank | Barbara Nunberg<br>John Nellis | | |
| WPS423 | Relative Price Changes and the Growth of the Public Sector | M. Shahbaz Khan | May 1990 | WDR Office<br>31393 |
| WPS424 | Mexico's External Debt Restructuring in 1989-1990: An Economic Analysis | Sweder van Wijnbergen | | |
| WPS425 | The Earmarking of Government Revenues in Colombia | William A. McCleary<br>Evamaria Uribe Tobon | | |
| WPS426 | Growth-Oriented Adjustment Programs: A Statistical Analysis | Riccardo Faini<br>Jaime de Melo<br>Abdel Senhadji-Semlali<br>Julie Stanton | | |
| WPS427 | Exchange Reform, Parallel Markets and Inflation in Africa: The Case of Ghana | Ajay Chhibber<br>Nemat Shafik | | |
| WPS428 | Perestroyka and Its Implications for European Socialist Countries | Bela Balassa | May 1990 | N. Campbell<br>33769 |