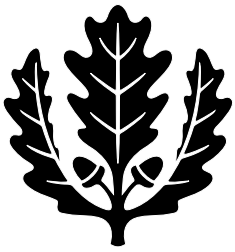
July 1999

Crowding-Out and Crowding-In Effects of the Components of Government Expenditure

Habib Ahmed
Islamic Development Bank

Stephen M. Miller
University of Connecticut



University of Connecticut

Department of Economics Working Paper Series

Crowding-Out and Crowding-In Effects of the Components of Government Expenditure

Habib Ahmed
Islamic Development Bank

Stephen M. Miller
University of Connecticut

Working Paper 1999-02

July 1999

341 Mansfield Road, Unit 1063
Storrs, CT 06269–1063
Phone: (860) 486–3022
Fax: (860) 486–4463
http://www.econ.uconn.edu/

Abstract

We examine the effects of disaggregated government expenditure on investment using fixed- and random-effect methods. Using the government budget constraint, we explore the effects of tax- and debt-financed expenditure for the full sample, and for sub-samples of developed and developing countries. In general, tax-financed government expenditure crowds out more investment than debt-financed expenditure. Expenditure on social security and welfare reduces investment in all samples while expenditure on transport and communication induces private investment in developing countries.

Journal of Economic Literature Classification: E2, E6, O4

Keywords: crowding out/crowding in. investment, government expenditure

Two different views exist on the effects of increased government expenditure on investment. The traditional view argues that government expenditure crowds out private investment. Higher government expenditure, whether financed with taxes or debt, increases the demand for goods and services, raising interest rates, making capital more expensive and, as such, reducing private investment. The non-traditional view sees government expenditure stimulating investment. The crowding in of investment occurs when the economy's resources are un- and under-employed. That may arise in many developing countries where, for example, government expenditure on infrastructure can induce private investment. We find evidence consistent with the first view for both developed and developing countries, but consistent with the second view only for developing countries.

Barro (1990) studies the effects of tax-financed government expenditure on investment and output. Higher income taxes reduce the after-tax return on private investment, and thus affect growth negatively by lowering investment. He divides tax-financed government expenditure into spending on unproductive (consumption) services (e.g., subsidizing food) and spending on productive services (e.g., building infrastructure), the latter of which includes resources devoted to property-right enhancements (e.g., spending on civil services such as police). Considering those two tax-financed expenditures, the spending on consumption services has a negative effect on growth, while the spending on productive services affects growth positively, if the growth resulting from private capital accumulation induced by higher public capital and enhanced property rights exceed the negative effect of higher taxes on growth. Thus, broad measures of government expenditure may not give the correct indication of the growth potential of certain government services. The distinction between productive and unproductive government services provides important information for an analysis of the effects of the government budget on capital formation and growth. We study the effects of disaggregated government expenditure on investment financed by both taxes and debt. In so doing, we identify types of government expenditure that crowd-in or crowd-out investment.

Much empirical work exists that examines the effect of government expenditure on economic growth. Kormendi and Meguire (1985), Grier and Tullock (1989), and Landau (1983) employ government consumption expenditure as a share of GDP from the Summers and Heston data base and find either a negative or no effect on the growth of real per capita GDP. Barro (1991) adjusts the Summers and Heston data on government consumption expenditure to GDP by

subtracting government expenditure on defense and education to GDP. He notes that even that modified measure of government consumption expenditure is far from perfect since it still includes police and fire services that affect property rights. He also constructs a measure of government investment expenditure to GDP. He finds that government consumption expenditure has a negative and significant effect on the growth of real per capita GDP, but that government investment expenditure does not have a significant effect, although the sign is positive.

Several recent papers examine the effects, if any, of the components of government expenditure on the growth of real per capita GDP without assigning the components of government expenditure either to productive or unproductive categories, a priori (e.g., Devarajan, Swaroop, and Zou 1996, and Miller and Russek 1997). Devarajan, Swaroop, and Zou (1996) consider a sample of developing countries from 1970 to 1990. They discover that all candidates for productive government expenditure either have no or a negative effect on the growth of real per capita GDP; only current expenditure has a positive effect. Miller and Russek (1997) consider a sample of developed and developing countries from 1975 to 1984. They find that both the method of financing and the component of government expenditure can have different effects. To wit, debt-financed increases in defense, health, and social security and welfare have negative effects on the growth of real per capita GDP in developing countries while debt-financed increases in education expenditure has a positive effect in developed countries. Easterly and Rebelo (1993) discover that public transportation and communication investment leads to higher growth in real per capita GDP in developing countries. While that finding seems to support the work of Aschauer (1989) on the linkage between public and private investment, Easterly and Rebelo (1993), interestingly, cannot find any significant relationship between public transportation and communication investment and private investment

Miller and Russek (1997) differ from prior studies in that they separate the effects of government expenditure based on the method of financing -- tax- or debt-financing. We follow that strategy of considering the differences in tax- and debt-financed changes in the components of government expenditure, but focus on the implications with respect to investment to GDP rather than to the growth of real per capita GDP.

Some empirical studies consider the effects of fiscal variables on investment, typically using aggregate fiscal measures.[i] For example, Levine and Renelt (1992) use different measures of the government budget -- including the government consumption share of GDP, the government consumption share less the defense and educational expenditure share, and the central government budget surplus -- to determine their effects on investment. They conclude that none of the fiscal variables possess a robust correlation with investment[ii]. While Levin and Renelt (1992) employ cross-section regressions, Fischer (1993) performs cross-section and pooled cross-section, time-series regressions and finds that the budget surplus associates with greater capital formation.[iii]

Aschauer (1989) uses time-series regressions with United States data to consider how public investment in equipment and structures affects private investment, concluding that public investment probably crowds in private investment. Bairam and Ward (1993) examine the relationship, if any, between investment and government expenditure for 25 OECD countries.[iv] They conclude that 24 out of the 25 countries possess a negative correlation between investment and government expenditure, with 19 countries having a significant correlation.

With the exception of Aschauer (1989) who employs United States data, the studies cited in the last two paragraphs combine private and public investment in their regressions. A recent study by Argimon, Gonzales-Paramo, and Roldan (1997) separates private from public investment. In so doing, however, they must restrict their analysis to 14 OECD countries over the 1978 to 1989 period, since the Summers and Heston data only provide a breakout of private and public investment for this restricted subset of their database. Argimon, Gonzales-Paramo, and Roldan (1997) consider the effects, if any, of public consumption and public investment on private investment, finding that public consumption and public investment associate negatively with private investment, although only the public consumption effect is significant.

---

[i] A very few studies do examine the effects of disaggregated government expenditure on economic growth, however (e.g., Miller and Russek, 1997 and Devarajan et. al., 1996).

[ii] They use the investment share of GDP from the World Bank database. This measure consolidates private and public investment.

[iii] Fischer also uses World Bank data on the capital stock and takes the change in the capital stock to generate the investment series that includes both private and public investment.

[iv] While Bairam and Ward (1993) indicate that they use private investment, the Summers and Heston database, which they use, does not provide private and public investment series for all 25 countries over the 1950 to 1988 sample. Rather, Bairam and Ward (1993) must use an investment series that includes private plus public investment.

We examine the effects of different fiscal variables on domestic investment at a more disaggregated level. By introducing a government budget constraint, we also distinguish between tax- and debt-financed expenditure. We use pooled time-series, cross-section data (39 countries over the period 1975 to 1984) to estimate our results. Fixed- and random-effects econometric techniques accommodate structural differences between countries. We divide our sample into developed and developing countries to determine if systematic differences exist between those two groups.

2. Empirical Model, Data, and Results

We employ the method of Miller and Russek (1997) to introduce the government budget constraint into our regression equations. The government budget constraint, an identity, states that the difference between total tax revenue (tx) and the sum of expenditure on different categories (exp) constitutes the budget surplus (sur). Dividing both sides of the budget constraint by gross domestic product (GDP) gives the relationship as a share of GDP.

We run two sets of regressions. One set uses total government expenditure while the other uses disaggregated expenditure items. The different categories of government expenditure considered include defense expenditure to GDP (edfs), education expenditure to GDP (eed), health expenditure to GDP (ehlh), social security and welfare expenditure to GDP (essw), economic affairs and service expenditure to GDP (eeas), transportation and communication expenditure to GDP (etc), and other expenditure to GDP (eoe).

We also include a trade variable, defined as the import plus export share of GDP (opn), because Levine and Renelt (1992), using sensitivity analysis, find that only trade variables (such as the import plus export share of GDP and other measures of openness) explain investment robustly. We estimate the following regression equations:

(1) $$ivt_{ct} = a_1 + a_2\, tx_{ct} + a_3\, exp_{ct} + a_4\, opn_{ct} + v_{ct}\,, \text{ and}$$

(2) $$ivt_{ct} = b_1 + b_2\, tx_{ct} + b_3\, edfs_{ct} + b_4\, eed_{ct} + b_5\, ehlh_{ct} + b_6\, essw_{ct} + b_7\, eeas_{ct} + b_8\, etc_{ct} + b_9\, eoe_{ct} + b_{10}\, opn_{ct} + v_{ct},$$

where ivt is the investment share of GDP, and c and t indicate country and time period, respectively. Note that because the government budget constraint is an identity, we must omit one of the fiscal variables. In equations (1) and (2), we omit the government surplus to GDP (sur). Including total tax revenue and excluding the government surplus from the regression implies that

the coefficients of different expenditure items show the effects of debt-financed increases in expenditure on investment.[v] For example, the coefficient a_3 in equation (1) captures the effect of a change in government expenditure on investment, holding taxes constant. Since taxes do not adjust, the increase in government expenditure implies a decrease in the government surplus. Thus, the increase in government expenditure is financed with government debt -- either money or bonds. Similarly, to examine the effects of tax-financed expenditure on investment, we modify equations (1) and (2) by including the government surplus and excluding total tax revenue from the regression. Now, the coefficient a_3 measures the effect of an increase in government expenditure on investment, holding the surplus constant. In other words, the increase in government expenditure is financed by higher taxes such that the surplus does not change.

The standard method in empirical country studies estimates regression equations with ordinary least squares (OLS) (e.g., Levine and Renelt, 1992, Fischer, 1993), which assumes that the omitted variables are independent of the regressors and are independently, identically distributed. Such estimation, however, can create problems of interpretation if country-specific characteristics, such as political regimes, policy changes, and so on that affect investment, are not considered (see Levine and Zervos, 1993, p. 420). If those omitted country-specific variables (both observed and unobserved) correlate with the explanatory variables, then OLS produces biased and inconsistent coefficient estimates (see Hsiao, 1986). The use of panel data, however, provides an approach to address that problem.

Suppose we omit country-specific variables that correlate with the included regressors. Then the fixed-effect model produces unbiased and consistent estimates of the coefficients. Without that adjustment, OLS produces biased and inconsistent estimates.[vi]

The fixed-effect model assumes that differences across units reflect parametric shifts in the regression equation. Such an interpretation becomes more appropriate when the problem at hand uses the whole population rather than a sample from it. If the problem examines only a sample from a larger population, then the fixed-effect model may properly apply only to the differences within that sample. In such cases, the random-effect model may be appropriate. Since our sample

---

[v] All variables in the regressions are deflated by GDP. Future reference to those variables omits the mention of the deflation by GDP. That is, investment means investment to GDP.

[vi] Another method of excluding unobserved country-specific variables estimates the first-differenced regression (see Hsiao, 1986, and Westbrook and Tybout, 1993).

considers 39 countries over a particular time period, the random-effect model deserves consideration. The random-effect model, however, also produces biased estimates if the omitted country-specific variables correlate with the included regressors.

We use different test statistics to compare the alternative specifications. An F-test judges the performance of the fixed-effect model against the OLS model (Greene 1990, p. 484). A Lagrange-Multiplier test due to Bruesch and Pagan (1980) assesses the random-effect model against the OLS model (Greene 1990, p. 491-92). Finally, a Wald criterion due to Hausman (1978) appraises the fixed-effect model against the random-effect model (Greene 1990, p. 495).

We assemble annual data on 39 countries for the period of 1975 to 1984 from two sources.[vii] Data on gross domestic investment, imports and exports of goods and non-financial services, and GDP come from the World Bank data tape and information on central government revenue and expenditure come from the data tape on Government Finance Statistics compiled by International Monetary Fund. We note that the gross domestic investment reported by the World Bank includes both private and public investment. Government expenditure categories include total expenditure, defense expenditure, education expenditure, health expenditure, social security and welfare expenditure, economic affairs and service expenditure, and transportation and communication expenditure. From those expenditure items, we create a residual other expenditure. We further note that the expenditure data from the Government Financial Statistics include both current and capital spending. We divide the variables by GDP to calculate GDP shares.

We estimate two specifications of equations (1) and (2) with OLS, fixed-effect, and random-effect models for three sets of data, one with the full sample of 39 countries, another including 23 developing countries, and the last constituting of 16 developed countries. One specification includes total taxes (and excludes the government surplus) to see the effect of debt-financed government expenditure on investment; the other specification includes the government surplus (and excludes total taxes) to analyze the effect of tax-financed government expenditure. Of

---

[vii] We use the data set from Miller and Russek (1997), who give a more-detailed discussion of the data in their appendix. The countries included in our analysis are Australia (D), Austria (D), Barbados, Belgium (D), Botswana, Brazil, Canada (D), Chile, Costa Rica, Denmark (D), El Salvador, Finland (D), France (D), Germany (D), Iceland (D), Indonesia, Iran, Israel, Korea, Liberia, Luxembourg (D), Malawi, Mauritius, Morocco, Netherlands (D), New Zealand, Paraguay, Spain (D), Sri Lanka, Swaziland, Sweden (D), Switzerland (D), Thailand, Tunisia, United Kingdom (D), United States (D), Uruguay, Venezuela, and Zambia. A (D) denotes countries included in the developed country sub-sample; the remaining countries belong to the developing country sub-sample.

the three models, the fixed-effect model dominates in all cases. As such, we only report results from the fixed-effect, along with the relevant test statistics in Tables 1-4.

As noted above, our measure of investment includes private and public investment and the government expenditure measures include current and capital spending. As a result, we must interpret our findings carefully. When government expenditure rises, some of that increase, but not all, is capital spending. Moreover, the domestic investment includes government capital spending. Thus, some positive correlation is expected between government expenditure, or its components, and investment expenditure. Such induced correlation, however, should be less than one. As a consequence, we shall focus on those results where the effects are negative or larger than one, if positive.[viii]

Table 1 reports the results of debt-financed aggregate government expenditure. Several observations emerge. First, the openness variable has a significant positive effect on investment in the full sample. That result, which matches the finding in Levine and Renelt (1992), however, carries over only to the developing country sub-sample. So, the robust result found by Levine and Renelt (1992) does not hold for developed countries. Second, while debt-financed total government expenditure has no significant effect for the full sample, it has a positive effect in developing countries and a negative effect in developed countries. That seeming contradiction resolves itself when we look at the effects of disaggregated government expenditure on investment for the two groups of countries in due course. Finally, an increase in taxes holding government expenditure constant (i.e., a higher surplus or a lower deficit) reduces the investment share of GDP in the full-sample and in the developing countries.[ix]

[viii] One referee notes that we use central-(federal-)government data on taxes and spending. These data exclude state and local information as well as information of state-owned enterprises. Were we to use consolidated data on central and state-and-local governments, however, our sample would be reduced to a handful of countries, since few countries report the breakdown of government spending at the state-and-local level. This same referee argues that if these three sources are positively correlated, then a $1 rise in central-government investment spending could correspond to a larger than $1 increase in central, state-and-local, and state-owned enterprise investment spending. As a result, we may find coefficients greater than one, according to this referee. While we grant the referee the theoretical point, we do not think that it is a practical concern. We reiterate that the government spending series that we use in our regression analysis incorporate both consumption and investment spending. Thus, a $1 increase in a government-spending category does not mean a $1 increase in government investment spending. Nonetheless, this referee has a good point and the reader needs to interpret our findings carefully.

[ix] Developed countries exhibit a positive effect for an increase in taxes, although only at the 20-percent significance level.

Table 2 reports the findings of tax-financed aggregate government expenditure. In that case, total government expenditure crowds out investment in all three samples. Thus, to the extent that debt-financed government expenditure has a positive effect on investment (i.e., for developing countries), that is reversed when the government expenditure is financed with taxes. Of course, those results reflect aggregate government expenditure. We really need to examine the effects of the different components of government expenditure, to which we now turn.

Table 3 reports the effects of debt-financed components of government expenditure on investment. Now, limiting our discussion to those government expenditure items that affect investment significantly at the 5-percent significance level, we observe that when considering all countries, expenditure on social security and welfare crowds out investment, while expenditure on transport and communication crowds in investment. That latter effect needs careful interpretation, as noted above, since a portion of transport and communication expenditure is capital spending. What is of interest, however, is that the coefficient of transport and communication expenditure significantly exceeds one. Thus, even if every dollar of transportation and communication expenditure appears in total domestic investment, which it does not, transportation and communication expenditure associates with additional higher private domestic investment. The developing countries yield the same outcome. For the developed countries, however, the significance of transport and communication expenditure disappears, but health expenditure and other expenditure also crowd out investment.[x]

Table 4 reports the effects of tax-financed components of government expenditure on investment. When considering the full sample and the 5-percent significance level, all government expenditure items crowd out investment except transportation and communication expenditure, which crowds in investment. For developing countries, government expenditure on transportation and communication still induces investment and government expenditure on social security and welfare still reduces investment. Once again, the coefficient of transportation and communication expenditure significantly exceeds one for the full and the developing-country samples only. Now, expenditure on defense reduces investment in developing countries. In developed countries, tax-financed expenditures on health, social security and welfare, and other expenditure all reduce investment.

Finally, the disaggregated results help to resolve the seeming contradiction for aggregate government expenditure reported in Table 1. To wit, debt-financed aggregate government expenditure associates with higher investment in developing countries and lower investment in developed countries. Our disaggregated results show that only transportation and communication expenditure significantly crowds in investment, and then only in developing countries. Thus, the positive link between aggregate government expenditure and domestic investment in developing countries results from the strong, large effect of transportation and communication expenditure. No strong, positive link exists for developed countries and, thus, the negative effect of aggregate government expenditure emerges.

3. Conclusion

As noted in the introduction, two different views exist on the effect of government expenditure on investment -- the traditional crowding out and the non-traditional crowding in views. Our empirical findings support both views of how government expenditure effects domestic investment. Several government expenditure items crowd out investment. One expenditure item, transport and communication expenditure, crowds in investment in developing countries.

Our results also produce several other conclusions. First, the openness variable has a significantly positive effect on investment only for developing countries. For developed countries, openness does not significantly affect investment. Thus, the robust finding of Levine and Renelt (1992) that openness affects investment, their second conclusion, does not hold when the sample is divided into developed and developing countries.

Second, expenditure on transport and communication, as just noted, crowds in investment for developing countries only. That finding may suggest that there may be an optimal level of government expenditure. Devarajan, Swaroop, and Zou (1996) rationalize their findings of either no or negative effects of the components of government expenditure on the growth of real per capita GDP by arguing that the level of expenditure in the categories of negative effects must have gone beyond the optimum level. Devarajan, Swaroop, and Zou (1996) state that "Seemingly productive expenditures may be unproductive if there is an excessive amount of them." (338). We find that transportation and communication expenditure significantly crowds in investment to GDP

---

[x] Debt-financed defense and education expenditure have negative effects, if the significance level moves to

for developing countries in our sample; Devarajan, Swaroop, and Zou (1996) find either a negative or no effect of transportation and communication expenditure on growth rate of real per capita GDP, contrary to the work of Easterly and Rebelo (1993).

Another explanation for our transportation and communication expenditure result appears especially appropriate, however. Fernald (1999) examines the effects of the growth of roads on productivity in the United States. He concludes that "… the massive road-building of the 1950's and 1960's offered a one-time boost to the level of productivity, rather than a path to continuing rapid growth in productivity." (p. 621). This interpretation suggests that transportation and communication expenditure may stimulate private investment during the initial build-up of transportation and communication infrastructure. Once the basic structure exists, however, further effects may diminish or disappear. This may explain our finding of a positive effect only in developing countries, where the transportation and communication infrastructures are still in their initial build-up.

Third, tax-financed government expenditure, in general, crowds out investment more frequently than debt-financed government expenditure. That finding may suggest the existence of liquidity constraints within the economy.

Finally, expenditure on social security and welfare crowds out investment for both tax- and debt-financed increases and in both developed and developing countries. That is the only category of government expenditure that had such a consistent (negative) effect on investment across all specifications

---

the 20-percent level.

Table 1: Fixed-Effect Model for Debt-Financed Aggregate Government Expenditure (Dependent variable: Investment Share of GDP)

	All Countries	Developing Countries	Developed Countries
tx	-0.266*	-0.413*	0.225
	(-2.67)	(-3.35)	(1.51)
exp	-0.072	0.196***	-0.630*
	(-0.86)	(1.75)	(-6.28)
opn	0.166*	0.252*	0.027
	(5.68)	(6.42)	(0.91)
F-test	9.22*	8.79*	14.05*
	(38,348)	(22,204)	(15,141)
Wald-test	14.78*	21.15*	6.73***
	(3)	(3)	(3)
SEE	0.042	0.049	0.018

NOTE: Numbers in parentheses are t statistics. The degrees of freedom for the F-tests are given in parentheses; they test the fixed-effect model against the ordinary least squares model, which is the null hypothesis. The Wald tests are chi-squared distributions with degrees of freedom given in the parentheses; they test the fixed-effect against the random-effect model, which is the null hypothesis. Green (1990, Ch. 16) provides the various test statistics and their interpretation. SEE is the standard error of the regression.

* means significant at the 1-percent level.
** means significant at the 5-percent level.
*** means significant at the 10-percent level.

Table 2: Fixed-Effect Model for Tax-Financed Aggregate Government Expenditure (Dependent variable: Investment Share of GDP)

	All Countries	Developing Countries	Developed Countries
sur	-0.266*	-0.413*	0.225
	(-2.67)	(-3.35)	(1.51)
exp	-0.338*	-0.217***	-0.405*
	(-3.94)	(-1.96)	(-4.04)
opn	0.166*	0.252*	0.027
	(5.68)	(6.42)	(0.91)
F-test	9.22*	8.79*	14.05*
	(38,348)	(22,204)	(15,141)
Wald-test	14.78*	21.15*	6.73***
	(3)	(3)	(3)
SEE	0.042	0.049	0.018

NOTE: See Table 1.

* means significant at the 1-percent level.
** means significant at the 5-percent level.
*** means significant at the 10-percent level.

Table 3: Fixed-Effect Model for Debt-Financed Government Expenditure (Dependent variable: Investment Share of GDP)

	All Countries	Developing Countries	Developed Countries
tx	-0.177***	-0.305**	0.259***
	(-1.87)	(-2.47)	(1.79)
edfs	-0.344	-0.299	-1.138
	(-1.52)	(-1.06)	(-1.44)
eed	-0.683***	-0.675	-1.507***
	(-1.68)	(-1.32)	(-1.84)
ehlh	-0.663***	-0.483	-1.101*
	(-1.80)	(-0.89)	(-3.22)
essw	-1.034*	-0.939*	-0.765*
	(-5.70)	(-2.67)	(-4.82)
eeas	-0.157	-0.003	0.480
	(-0.89)	(0.01)	(1.19)
etc	2.153*	2.035*	0.232
	(6.29)	(4.71)	(0.24)
eoe	-0.141	0.033	-0.791*
	(-1.22)	(0.21)	(-4.52)
opn	0.165*	0.227*	0.157
	(6.19)	(6.07)	(0.48)
F-test	8.44*	8.35*	5.17*
	(38,342)	(22,198)	(15,135)
Wald-test	61.64*	37.92*	31.86*
	(9)	(9)	(9)
SEE	0.038	0.046	0.017

NOTE: See Table 1.

* means significant at the 1-percent level.
** means significant at the 5-percent level.
*** means significant at the 10-percent level.

Table 4: Fixed-Effect Model for Tax-Financed Government Expenditure (Dependent variable: Investment Share of GDP)

	All Countries	Developing Countries	Developed Countries
sur	-0.177***	-0.305**	0.259***
	(-1.87)	(-2.47)	(1.79)
edfs	-0.522**	-0.605*	-0.879
	(-2.53)	(-2.37)	(-1.09)
eed	-0.860**	-0.980***	-1.248
	(-2.03)	(-1.84)	(-1.48)
ehlh	-0.840**	-0.788	-0.842*
	(-2.27)	(-1.43)	(-2.61)
essw	-1.211*	-1.244*	-0.506*
	(-6.52)	(-3.51)	(-3.63)
eeas	-0.334**	-0.302	0.739***
	(-2.03)	(-1.39)	(1.85)
etc	1.975*	1.730*	0.491
	(5.45)	(3.75)	(0.51)
eoe	-0.319*	-0.273***	-0.532*
	(-2.78)	(-1.87)	(-2.86)
opn	0.165*	0.227*	0.157
	(6.19)	(6.07)	(0.48)
F-test	8.44*	8.35*	5.17*
	(38,342)	(22,198)	(15,135)
Wald-test	61.64*	37.92*	31.86*
	(9)	(9)	(9)
SEE	0.038	0.046	0.017

NOTE: See Table 1.

* means significant at the 1-percent level.
** means significant at the 5-percent level.
*** means significant at the 10-percent level.

References

Argimon, Isabel, Jose M. Gonzales-Paramo, and Jose M. Roldan (1997), "Evidence of Public Spending Crowding-Out from a Panel of OECD Countries," *Applied Economics*, 29, 1001-11.

Aschauer, David A. (1989), "Does Private Capital Crowd Out Private Capital," *Journal of Monetary Economics*, 24, 171-88.

Bairam, Erkin, and Bert Ward (1993), "The Externality Effect of Government Expenditure on Investment in OECD Countries," *Applied Economics*, 25, 711-16.

Barro, Robert J. (1990), "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy*, 98,103-25.

Barro, Robert J. (1991), "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics*, 106, 407-44.

Bruesch, T. S., and A. R. Pagan (1980), "Lagrange Multiplier Test and its Applications to Model Specification in Econometrics," *Review of Economic Studies*, 47, 239-53.

Devarajan, Shantayanan, Vinaya Swaroop, and Heng-fu Zou (1996), "The Composition of Public Expenditure and Economic Growth", *Journal of Monetary Economics*, 37, 313-344.

Easterly, William, and Sergio Rebelo (1993), "Fiscal Policy and Economic Growth: An Empirical Investigation," *Journal of Monetary Economics*, 32, 417-58.

Fernald, John G. (1999), "Roads to Prosperity: Assessing the Link Between Public Capital and Productivity," *American Economic Review* 89, 619-38.

Fischer, Stanley (1993), "The Role of Macroeconomic Factors in Growth", *Journal of Monetary Economics*, 32, 485-512.

Greene, William H. (1990), *Econometric Analysis*, MacMillan, New York.

Grier, Kevin B. and Gordon Tullock (1989), "An Empirical Analysis of Cross-National Economic Growth, 1951-1980," *Journal of Monetary Economics*, 24, 259-76.

Hausman, Jerry A. (1978), "Specification Tests in Econometrics," *Econometrica*, 46, 69-85.

Hsiao, Cheng (1986), *Analysis of Panel Data*, Econometric Society Monographs No. 11, Cambridge University Press.

Kormendi, Roger and Philip Meguire (1985) "Macroeconomic Determinants of Growth: Cross-Country Evidence," *Journal of Monetary Economics*, 16, 141-63.

Landau, Daniel (1983), "Government Expenditure and Economic Growth: A Cross-Country Study," *Southern Economic Journal*, 49, 783-92.

Levine, Ross, and David Renelt (1992), "A Sensitivity Analysis of Cross-Country Growth Regressions", *American Economic Review*, 82, 942-63.

Levine, Ross, and Sara J. Zervos (1993), "What We Have Learned About Policy and Growth from Cross-Country Regressions", *American Economic Review*, Paper and Proceedings, 83, 426-30.

Miller, Stephen M., and Frank S. Russek (1997), "Fiscal Structures and Economic Growth," *Economic Inquiry*, 35, 603-13.

Westbrook, M. Daniel, and James R. Tybout (1993), "Estimating Returns to Scale with Large, Imperfect Panels: An Application to Chilean Manufacturing Industries," *The World Bank Economic Review*, 7, 85-112.