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FISCAL POLICY AND ECONOMIC GROWTH: AN EMPIRICAL INVESTIGATION

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ABSTRACT

This paper describes the empirical regularities relating fiscal policy variables, the level of development and the rate of growth. We employ historical data, recent cross-section data, and newly constructed public investment series. Our main findings are: (i) there is a strong association between the development level and the fiscal structure: poor countries rely heavily on international trade taxes, while income taxes are only important in developed economies; (ii) fiscal policy is influenced by the scale of the economy, measured by its population; (iii) investment in transport and communication is consistently correlated with growth while the effects of taxation are difficult to isolate empirically.

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1. Introduction

If you ask an economist to explain the growth performance of a particular country he is likely to mention fiscal policy as being an important growth determinant. This deep-seeded belief that taxation, public investment, and other aspects of fiscal policy can contribute to growth miracles as well as to enduring stagnation has been articulated in the context of growth models during the past three decades.

Growth models, both old and new, feature simple channels that link certain taxes to the rate of growth. Increases in income taxes, for example, lower the net rate of return to private investment, making investment activities less attractive and lowering the rate of growth. It is hard to think of an influence on the private real rate of return and on the growth rate that is more direct than that of income taxes. If these do not affect the rate of growth, what does?

Unfortunately, the empirical evidence that is currently available to shed light of the importance of fiscal policy in determining growth is sparse.[1] This sparseness reflects the difficulties involved in measuring the variables that theory predicts to be important growth determinants: marginal tax rates and subsidies, and levels of public investment.

Our goal in this paper is to provide a comprehensive summary of the statistical association between measures of fiscal policy, the level of development and the rate of growth using standard data sources combined with newly created data for public investment. We will document the empirical regularities that emerge in a broad cross-section of countries with data for the period 1970 to 1988 as well those associated with the long run historical data that is available for a small set of countries. There is substantial measurement error in both of these data sets, but there is also information.

The next section of the paper reviews briefly the theoretical literature on fiscal policy and growth. Our empirical investigation starts in section 3 which uses fiscal

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[1]Prior empirical analyses of the relation between fiscal policy and growth include Garcia-Mila (1987), Grier and Tullock (1989), Koester and Kormendi (1989), Plosser (1993), and Engen and Skinner (1992).

data for the period 1970-1988 in the context of cross-section regressions made popular by the work of Barro (1991). We find that the high correlation between many fiscal variables and level of income in the beginning of the period makes it difficult to isolate the effect of fiscal policy in the context of the Barro regression. This correlation with initial income leads us to study in section 4 whether fiscal policy is endogenous in the sense of being related to characteristics such as the level of development and the overall scale of the economy.

Our empirical findings are summarized by the following list of ten stylized facts. We use the term "cross-section" to refer to our cross-section data set of aoout 100 countries for the period 1970-1988. The term "historical data" refers to our panel of annual data for 28 countries comprising the period from 1870 to 1988.

(1) The share of public investment in transport and communication is robustly correlated with growth in our cross-section when we control for the slew of variables standard in cross-section studies. This partial correlation survives when we instrument for this variable (although the resulting coefficient is implausibly high).

(2) The government's budget surplus is also consistently correlated with growth and private investment in our cross-section.

(3) The link between most other fiscal variables and growth is statistically fragile. The statistical significance of these variables in a cross-section regression context depends heavily on what other control variables are included in the regression. This fragility is partly a result of multicollinearity. Fiscal variables tend to be highly correlated with the level of income in the beginning of the period and are highly correlated among themselves (countries that have higher taxes also have higher spending).

(4) Government Revenue/GDP rises with per capita income (Wagner's Law) in both the cross-section and the historical data sets.

(5) In both of our data sets, we observe that as income rises, international trade taxes fall as a share of government revenue, while the share of income taxes rises.

(6) In our cross, section higher income countries have relatively higher health expenditures and larger social security programs.

(7) The choice of fiscal instruments seems to be related to the scale of the economy. In both of our data sets we find that as population increases the share of trade taxes in revenue falls and the share of income taxes rises. This relation continues to hold if we control for income and for the trade share.

(8) Our cross-section data shows that high population countries spend more on defense and less on transport and communication.

(9) High levels of inequality in income distribution, observed prior to 1970, were associated with higher levels of publicly provided education in the period from 1970 to 1988.

(10) There are no significant differences in the fiscal policies adopted by democracies and non-democracies once we control for the level of income.

2. The Theoretical Predictions

The development of the neoclassical model provided public finance students with a theoretical construct suitable to think about the growth effects of fiscal policy. Researchers such as Sato (1967), Krzyzaniak (1967), and Feldstein (1974) used versions of the Solow (1956) model to study the dynamic impact of taxation. More recently, Chamley (1986) and Judd (1985), among others, have used the neoclassical growth model with an endogenous savings rate developed by Cass (1965) and Koopmans (1965) as a laboratory to study fiscal policy. Diamond's (1965) overlapping generations version of the neoclassical model has also been extensively used, by Summers (1981), Auerbach and Kotlikoff (1987) and others, to examine the dynamic effects of fiscal policy.

Since in the neoclassical model steady state growth is driven by exogenous factors--the dynamics of population and of technological progress--fiscal policy can

only affect the rate of growth during the transition to the steady state. Because of this fact, the conventional wisdom based on the neoclassical model has been that differences in tax systems and in debt and expenditure policy can be important determinants of the level of output but are unlikely to have an important effect on the rate of growth.[2]

This conventional wisdom contrasts with the predictions of Eaton's (1981) stochastic growth model, which features a linear production function, as well as with those of more recent "endogenous growth" models (e.g. a version of Romer's (1986) model that admits steady state growth, the economies with convex technologies explored by Jones and Manuelli (1990) and Rebelo (1991), and the "lab-equipment model" of Rivera-Batiz and Romer (1991)). In these models fiscal policy can be one of the main determinants of the observed differences in growth experiences.

"Endogenous growth" models tend to transform the temporary growth effects of fiscal policy implied by the neoclassical model into permanent growth effects. The strength of these effects varies, however, from model to model, depending heavily on the elasticity of labor supply and on aspects of the technology to accumulate human capital and to create new goods about which very little is currently known (see Jones, Manuelli and Rossi (1993) and Stokey and Rebelo (1993)).

In order to isolate the effect of each fiscal instrument it is standard in public finance to assume that the impact of a change in a fiscal variable on government revenue or expenditure is compensated with lump sum taxes or subsidies. We describe below the long run effect of permanent changes in various fiscal instruments under this assumption.

Most growth models predict that taxes on investment and income have a detrimental effect on growth. These taxes affect the rate of growth through a simple, direct, channel: they reduce the private returns to accumulation. But not all taxes affect the rate of growth. In models with exogenous labor supply the growth rate is immune to the

[2]In the standard neoclassical model with a conventional value for the share of capital in output the transitional dynamics can only be important if the real interest rate takes on implausibly high values (King and Rebelo (1993)).

level of consumption taxes; these taxes do not distort the relative price of consumption today versus tomorrow, leaving unaffected the incentive to accumulate capital.

The effect of an increase in government consumption should also be nil if we view this component of public expenditures as leaving the productivity of the private sector unaffected. In contrast, the effect of public investment should be positive since this type of activity is likely to enhance the productivity of the private sector (Aschauer (1989), Barro (1990)).

When we change more than one instrument at a time we get a combination of these various partial effects. For example, the effects of an increase in government investment financed by income taxes is ambiguous (see Barro (1990)).

The effects of government deficits are more complex. In overlapping generations models government deficits tend to reduce the savings rate and the rate of growth (see Alogoskoufis and Ploeg (1991)). In infinite horizon models the effects of deficits depend on the variables that have to be adjusted in the future to compensate for the deficits. If a higher deficit today will later be compensated by higher consumption or income taxes the rate of growth will decline.

In the empirical analysis that we describe in the next section we pay particular attention to two of the strongest predictions of growth models: that high income taxes lower the rate of growth and that high public spending on infrastructure investment raises growth.

3. Recent Cross-Section Evidence

Our cross-section data set comprises the period 1970-1988 and combines information from five sources: Summers and Heston (1991), Barro and Wolf (1989), the Government Financial Statistics (GFS), the International Financial Statistics (IFS), and Easterly, Rodriguez and Schmidt-Hebbel (1993). Later on in this section we also explore new data for public investment that we created using information contained in World Bank reports.

GFS, which is our main source of fiscal data suffers from two relevant shortcomings: (i) it includes only Central government activities and thus excludes local governments and public enterprises (although it includes transfers from the Central government to both local governments and public enterprises); and (ii) for some years and some countries the GFS statistics are based on budget data.

A complete list of the fiscal variables that we employed, as well as their sample means and standard deviations, is included in the Appendix. Unless we state otherwise all fiscal variables are expressed as percentages of GDP and correspond to averages over the 1970-1988 period. We will explore mainly the cross section dimension of the data because Easterly, Kremer, Pritchett, and Summers (1993) show that the variability over time of country characteristics adds little explanatory power.

3.1. Measuring Marginal Tax Rates

The most important obstacle to an empirical investigation of the effects of fiscal policy on growth is that marginal tax rates and subsidies--which are the relevant variables according to theory--are not observable. To compute marginal income tax rates one would ideally use the methodology of Barro and Sahasakul (1983). However, this requires information on individual incomes and taxes that is currently publicly available only for a small set of developed countries. We have explored four approaches to measuring tax rates, each with its own problems.[3]

Statutory tax rates on income are available for a cross section of developing countries (see Sicat and Virmani (1988)). We included these tax rates in our data set, but given that tax evasion is an important phenomenon in LDC's, we suspect that these rates grossly overestimate the distortions associated with income taxation. Colombia is

[3]We also explored the possibility of computing statutory effective marginal tax rates on capital income along the lines of King and Fullerton (1984), taking advantage of the software developed by Dunn and Pellechio (1990) which can produce effective marginal tax rates for various developing countries. We found, as is common in this literature, that the effective marginal tax rates were very sensitive to the mix of assets involved in the project as well as to the choice of financing arrangements.

a representative example of tax evasion. Its personal income tax in 1984 allowed for very few deductions and credits and featured marginal tax rates that ranged between 7% and 49%. Yet, the revenue collected in 1984 represented only 1.75% of personal income.

We use the revenue from different types of taxes expressed as a fraction of GDP as a measure of the tax distortions. In the case of the income tax this would only correspond to the marginal tax rate on income if the tax were proportional. Even stronger assumptions are needed to guarantee that the fraction of revenue in GDP corresponds to marginal tax rates in the case of taxes on investment and on consumption. For this reason, we also constructed tax rates as the ratio of a specific type of revenue to the corresponding tax base (e.g. trade tax revenue/total trade or personal income tax/personal income).

We used the income-weighted marginal income tax rates computed in Easterly and Rebelo (1993), where we employ a method that combines information on the lowest and the highest statutory tax rates, on the level of income for which taxes are zero, on the distribution of income, and on the income tax revenue collected.

Finally, we computed "marginal" taxes rates by regressing the revenue from each type of tax on its tax base, as in Koester and Kormendi (1989). Unfortunately, the results of some of these regressions tend to vary significantly with the sample period employed since a significant number of LDC's reformed their tax system during the 1980's.[4] This instability is also problematic for our ratios of revenue to the tax base or to GDP.

While the statutory tax rates tend to overestimate the distortion effects of taxation, the three types of measures discussed above tend to underestimate those distortion effects. The key piece of information used in constructing those three measures is the revenue collected by the government. Taxes that generate little revenue are implicitly assumed to create small distortions. In practice, however, there are highly distortionary taxes that generate little revenue (the corporate income tax in the

[4]Countries for which the regression coefficients are unstable generally have negative slope coefficients. We discarded those countries from our sample and retained only the ones with positive "marginal" tax rates.

U.S., whose revenue is currently 2% of GNP, is often thought to be one such example).

3.2 Cross-Section Regressions

Table 1 reports the simple correlations between fiscal variables and the growth rate that are statistically significant. Existing theoretical models make no predictions about the sign of unconditional correlations. However, we will later show that the government surplus, government consumption, and the "marginal" tax rate on income (computed with a time-series regression) continue to be correlated with growth after we control for the effects of other variables.

Our point of departure for a multivariate analysis is a version of the Barro (1991) regression. We followed Levine and Renelt (1992) in using World Bank data instead of Summers and Heston (1991) data to construct per capita income growth rates. This procedure reduces the possibility of the negative coefficient on initial income, typically found in Barro (1991)-type regressions, being an artifact of measurement error in income. Watson's (1992) finding that the least squares growth rate is more robust to differences in the serial correlation properties of the data than the geometric rate of growth led us to compute all growth rates by running a least squares regression of the logarithm of income on time.

Our basic regression, with t-statistics indicated in parenthesis, is the following[5]:

GROWTH RATE OF PER CAPITA GDP 70-88 =

0.003 - 0.004 (PER CAPITA GDP 1960) + 0.023 (PRIMARY ENROLLMENT 1960) +
(0.51) (-2.81) (3.15)

0.025 (SECONDARY ENROLLMENT 1960) - 0.003 (ASSASSINATIONS PER MILLION)
(1.88) (-1.47)

- 0.01 (REVOLUTIONS AND COUPS) - 1.157 (WAR CASUALTIES PER CAPITA)
(-1.29) (-1.67)

[5]We employ White's (1980) heteroskedasticity-consistent standard errors to compute all the t-statistics reported in the paper.

The R^2 of this regression is 0.29, while the number of observations employed is 105.

In extensions of the neoclassical growth model such as Mankiw, Romer and Weil (1992) and in endogenous growth models such as Lucas (1988) the rate of growth is a function of two state variables: the initial level of physical capital and the initial level of human capital. In models such as those of Becker, Murphy and Tamura (1990) and Azariadis and Drazen (1990) the initial level of human capital is also an important determinant of future growth. The two school enrollment variables are included as proxies for the initial level of human capital, while the initial level of income is included in lieu of the initial stock of physical capital. The motivation for the inclusion of measures of political turmoil is obvious.[6] We will latter report results that include M2/GDP in 1970 and the trade share in 1970. These variables were included to hold fixed the effects of other policies that have been shown to be robustly correlated with growth and investment by Levine and Renelt (1992) and King and Levine (1993).

When we expand this regression by including our measures of fiscal policy one at a time we find that these tend to be insignificant, often causing the coefficient on initial income to become statistically insignificant as well. There is a strong correlation between our fiscal variables and the log of per capita income, so it is difficult to disentangle the effects of fiscal variable from those of the initial level of income. This problem becomes more severe when we include more than one fiscal policy variable on the right hand side.

Figure 1 illustrates the importance the interaction between tax variables and the initial level of income. The top panel of this Figure shows the impressive negative relation between the rate of growth and the ratio of tax revenues to GDP uncovered by Plosser (1993) for OECD countries. The bottom panel of this figure shows that this negative relation disappears completely once we control for the initial level of income.

Table 2 reports the significance of various tax rate variables and of the initial level of income in extended versions of the basic regression described above, in which

[6]Data on war casualties is from Easterly, Kremer, Pritchett, and Summers (1993).

we introduce one tax variable at a time. In these regressions the sign of the coefficients on income and on the tax variables (not reported in the Table) is always negative. The significance of income is often weakened substantially when tax variables are included in the regression. Seven out of the thirteen tax measures included in this table render the initial level of income insignificant in the regression. The only tax rate variable that is significant at the 5% level is a 'marginal' income tax rate computed by using individual country time series to regress income tax revenue on GDP. This Table shows that it is difficult to disentangle the "convergence" effect discussed by Barro and Sala-i-Martin (1992) from the effects of fiscal policy. This problem remains when we include measures of other policies in the regression and/or when we include other fiscal variables.

Table 3 reports the complete set of regression coefficients for those regressions in which tax rate coefficients are significant both with the rate of growth and the ratio of private investment to GDP as dependent variables. The private investment variable was constructed as total investment from Summers and Heston (1991) minus our own measure of consolidated public investment, which we describe in more detail below.

Table 4 reports the significant partial correlations between private investment, growth and our measures of fiscal policy. In these regressions we used the same conditioning variables as before: the level of income in 1960, primary and secondary enrollment in 1960, the three measures of political instability (number of assassinations, revolts and coups and war casualties), M2/GPD in 1970 and the trade share in 1970.

The central government surplus is one of the fiscal variables whose relation with growth is most robust. The positive association between government surplus and growth can be given at least three interpretations. The first is tax smoothing which implies that high deficits are associated with periods of low growth. The second is that high deficits may just be proxying for high public debt, which in turn may signal higher taxes and lower public capital in the future.[7] The third interpretation, proposed by Fischer (1993), is that large deficits are simply a symptom of general macroeconomic

[7]Unfortunately, the unavailability of the data on public debt in LDC's prevents us from trying to separate the effects of the deficit from those of the debt.

instability which is detrimental to economic growth.

The standard deviation of the ratio of domestic taxes to consumption plus investment shows also a robust association with growth and private investment. This variable may be proxying for general instability in the economy as well as for variability associated with the tax system.

3.3 The effects of public investment

The concepts of public investment used in GFS are highly problematic for LDC's. GFS achieves 'comparability' of these concepts across countries by reporting only the investment of the Central Government. Since activities that are associated with the Central Government in some countries are carried out in other countries by public enterprises, part of the cross-sectional variation in GFS public investment may reflect arbitrary differences in institutional arrangements.[8]

To correct for this potential bias we have constructed new measures of public investment through a large scale data collection exercise on aggregate and sectoral consolidated public investment. Our consolidated measure probably overstates the amount of public investment by including investment by public firms that have activities and goals similar to those of the private sector. The error introduced by this fact is probably small compared to the bias introduced in the GFS public investment series by the arbitrary exclusion of various types of infrastructure investment carried out by public firms in LDC's.

Our data source was the large collection of World Bank reports on public investment in individual countries since 1960. An earlier exercise (Pfeffermann and

[8]The measure of government surpluses reported in GFS suffers from a similar problem as the GFS public investment data: it refers only to the central government rather than the consolidated public sector. However, the distortion in the GFS of the deficit measure is not as serious as that of the public investment measure, since central government deficits usually include transfers to the rest of the public sector to cover deficits in local governments and public enterprises. We report results with both the central government deficit and the consolidated public surplus from Easterly, Rodriguez and Schmidt-Hebbel (1993).

Madarassy (1991)) collected consolidated public investment from a selection of these reports. We expanded this list to more countries and more years: our data set comprises observations on public investment for 36 countries in the 60's, 108 countries in the 70's and 119 countries in the 80's. More importantly, we collected data on public investments by sector and by levels of government from these reports, the first time we are aware that this has been done comprehensively. We have supplemented the data we collected for aggregate public investment with other sources, including Pfeffermann and Madarassy (1991), the World Bank (1991) and the United Nations national accounts. Our public investment series can be found in the Appendix.

The correlation between Central Government Investment and Consolidated Public Sector Investment in the 1980's (the decade for which our data set is more complete) is .63, while the median difference between the two rates of investment is 7 percentage points of GDP.

We constructed decade-average public investment ratios by sector from this data and entered them into pooled regressions of decade-average per capita growth. We performed regressions using decade averages because of the sparseness of the data. The information on public investment is often available for too few years to allow us to compute meaningful averages over periods that are longer than a decade.

We used a similar set of conditioning variables in these regressions as in section 3.1. This set of variables comprises the initial level of income, and decade averages of: primary and secondary enrollment, measures of political instability (assassinations, revolts and coups and war casualties) and the ratio of government consumption to GDP.[9] We extend this regression to include one public investment variable at a time. We report three sets of results in Table 5: the basic regression, in which the conditioning variables are the Barro regressors, a version of this regression in which we include the ratio of M2 to GDP as explanatory variable, and another version of the regression in which both the value of M2/GDP and of the trade share in 1970 are included in the right hand side. In Table 6 we repeat the same analysis with private investment

[9]Government consumption serves as a proxy for taxes collected and then dissipated unproductively as in Barro (1991). When we used our other tax measures instead of government consumption the number of observations was in general greatly reduced and most of the regression coefficients became statistically insignificant.

as the dependent variable. The financial variable is often (but not always) significant in both the private investment and the growth equation. Trade is sometimes significant (especially in the investment regression), but sometimes takes the wrong (negative) sign in the growth regression.

The main results suggested by these regressions are:

1 - Transport and communication investment seem to be consistently positively correlated with growth with a very high coefficient (between .59 and .66). This type of investment is uncorrelated with private investment suggesting, surprisingly, that it raises growth by increasing the social return to private investment but not by raising private investment itself. Transport and communication investment is still significant in the growth regression when we control for private investment.

2 - Total public investment, as well as public enterprise investment, is consistently negatively correlated with private investment. This result can, however, be an artifact introduced by the fact that we constructed out private investment series by subtracting our public investment measure from total investment. Total public enterprise investment seems to have no effect on growth.

3 - General government investment is consistently positively correlated with both growth and private investment, with a coefficient of about .4 on growth and near one on private investment.

4 - Agriculture investment is consistently negatively related to private investment with a coefficient between -0.64 and -0.94.

An important qualification of our results is that we cannot exclude the possibility that the association between public investment and growth is due to reverse causation: public investment may simply be higher in periods of fast expansion.

One piece of indirect evidence against reverse causation is that *only* transport and communication investment and general government investment are robustly correlated with growth (the association between education and housing investment and growth is not

robust). If the direction of causation were from growth to public investment, we would expect all types of public investment to be associated with growth.

In order to investigate whether reverse causation is responsible for our results, we instrument for the public investment variables.[10] Fortunately, we have a natural set of instruments to use: as we will see in the next section, public investment and other fiscal variables depend on structural country characteristics like initial income, population size, and share of agriculture in GDP. Initial income is already in our basic growth regression, but the latter two variables are plausibly excluded from the growth regression. We also use continent dummies for Africa and Latin America because they are obviously exogenous and may be able to capture region-specific aspects of public investment.

The results on agriculture and public enterprise investment crowding out private investment do not remain significant in the instrumental variables regressions.

The effect of transport and communications on growth is robustly significant with instrumental variables but the size of the coefficients is disturbingly high: we obtain a coefficient of 2 for transport and communication investment and of coefficient of 0.7 for general government investment. This seems to be a common puzzling feature of aggregate empirical work on infrastructure: Aschauer (1989) and Canning and Fay (1993) also report extremely high coefficients on infrastructure measures in growth regressions.[11] A study by Bandyopadhyay and Devarajan (1993) lends some credence to the idea that public investment in transport and communication has high returns. These authors report that ex-post rates of return to World Bank projects in transport and communication are much higher than those in other sectors, even without considering indirect benefits.

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[10]We also ran the same regressions lagging the public investment variables one decade. This reduced dramatically the dimension of our sample, rendering almost all variables (including non-investment variables) insignificant.

[11]These results contrast, however, with the findings of Holtz-Eakin (1992) who finds no impact of public capital on productivity growth after controlling for fixed effects across the U.S. states.

4. Is Fiscal Policy Endogenous?

There are two branches of theoretical literature that suggest the presence of strong endogeneity elements in the choice of fiscal policy, implying that the regressions that we reported in section 3 are contaminated by simultaneous equations bias. The first of these branches studies optimal fiscal policy, usually under the assumption that the government seeks to maximize the welfare of the representative agent (see e.g. Chamley (1986), Lucas (1990), and Jones, Manuelli and Rossi (1993)). Barro (1990) discusses the implications of fiscal policy being chosen optimally in the context of a specific model. In his model there is an inverted U-shape relation between the share of government expenditures in GDP and the rate of growth whenever the rate of income tax is chosen randomly. In contrast, if governments choose the optimal income tax rate, the relation between the share of government and the rate of growth can be significantly weakened.

The second branch of research that makes policy endogenous treats it as the outcome of a political process (see e.g. Persson and Tabellini (1991), Cohen and Michel (1991) and Alesina and Rodrick (1991)). This "political economy" approach points to very few exogenous factors that can be used in the empirical analysis but has an implication that we examine below: democracies and non-democracies should, in general, implement different policies. We also discuss the relation between policy variables and inequality, since this relation is at the core of many political economy models.

We have seen in section 3 that there is a strong relation between certain elements of fiscal policy and the logarithm of initial income. Below we explore in more detail this and other possible determinants of fiscal policy.

4.1 Cross-section Evidence: 1970-88

Table 7 display the correlations between fiscal variables and the logarithm of real per capita GDP in 1970 that are statistically significant. This Table shows that developed countries tend to rely more on income taxes and less on international trade taxes. These patterns of association between the level of development and the character

of the fiscal system are similar to those identified by Tanzi (1987,1992) and discussed in Burgess and Stern (1993). In addition, the cross-section data suggests that health and social security expenditures increase with the level of income while most other types of government expenditures are negatively associated with the level of development.

To investigate the presence of scale effects we regressed our fiscal variables on the values in 1970 of the logarithm population, the logarithm of real per capita GDP, the trade share and the share of agriculture in GDP (the latter variable was found by Tanzi (1992) to be highly correlated with the fiscal structure). We found that the ratio of social security contributions to total revenue is positively related to population, while the revenue share of taxes on international trade is negatively related to population. On the expenditure side, we also found strong scale effects: the share of public spending on capital formation, transport and communication, agriculture and general public services falls with increased population size. In contrast, the share of defense is positively associated with population size.

These scale effects associated with government expenditures are likely to be related to nonconvexities in either the benefits or the costs of publicly provided goods and services. If a government service has the non-rival consumption property of a pure public good--defense is the classic example--then there is more incentive to provide it in a large scale economy. On the other hand, if there are high setup costs but low marginal costs to providing a particular public service, then the amount of spending per capita for a given per capita level of that service would fall with increased scale.

We also regressed our measure of consolidated public investment on the logarithms of initial income and of population and on the share of agriculture (the trade share was excluded from the set of regressors because it seems less relevant for public investment and was usually insignificant when we included it in the regression). We found that total public investment falls with per capita income. Investment in public enterprises, in particular, is inversely related to income. We also found scale effects: countries with higher population have lower transport and communication investment.[12]

[12]These results suggest that we should go back to the regressions in section 3 and use variables such as per capita income in 1960, population, the share of agriculture in

We investigated the political economy literature implication that fiscal policy should be different across democracies and non-democracies. For this purpose we adopted the classification of countries into political regimes of Alesina and Rodrick (1991) and complemented it with the classification provided by Cukierman and Webb (1993).[13] The fiscal policy variables that are significantly different between democracies and non-democracies are essentially the same reported in Table 7 as being significantly correlated with per capita income. This is due to the high correlation between the democracy dummy and the level of income in 1970 (0.68). The vast majority of the democracies in our sample are rich countries: there are only three democracies with income below the cross-section median in 1970.

We were surprised to find that the character of the political system does not seem to matter in terms of fiscal policy once we control for income. We can only find one fiscal variable that is statistically different between democracies and non-democracies after controlling for income: aid revenue (which, presumably, says more about the behavior of donors than recipients).

Since the distribution of income is a central element in political economy theories we examined the relation between fiscal policy variables and the degree of inequality in income distribution. We searched for the fiscal variables that were significantly correlated at the 5% level (controlling for income) with at least three of the following measures of inequality: the share of the upper decile in income, the ratio of the richest quintile to the poorest 40%, the share of the middle quintile, the Gini coefficient, and the Theil index. These inequality measures, compiled in Clarke (1992), were all computed with data prior to 1970 so that our correlations may be interpreted as the effect of inequality on fiscal policy. We found that countries with

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GDP, the trade share, etc. to instrument for fiscal policy. We reported already in section 3.3 the instrumental variable results that we obtained in the case of public investment. When we tried to use the same instruments with the GFS variables we were unsuccessful: all the explanatory variables in the regression became insignificant, indicating that the instruments do not seem adequate.

[13]Cukierman and Webb (1993) provide a yearly classification of the political regimes for the countries in their sample. We classified a country as a democracy, whenever, during the time period 1970-1988, it was a democracy more than 50% of the time; otherwise it is a non-democracy.

greater initial inequality prior to 1970 implement higher levels of public expenditure in education as a fraction of GDP in the period from 1970 to 1988.

4.2 Long Run Evidence: 1870-1988

In order to investigate further the relation between fiscal policy, the level of development and the scale of the economy we constructed a panel that comprises annual data for the period from 1870 to 1988 and includes a total of 28 countries.[14] This data was spliced together from various sources: Mitchell (1975, 1982, 1983), Maddison (1982), and Liesner (1989). To obtain a long term series for real per capita GDP we used the Summers and Heston (1991) data for the period 1950-1988 and extended it backwards in time using the growth rate of real per capita GDP implied by our historical sources.

We divided income and the various fiscal variables in different classes and plotted the median of income against the median of the various fiscal variables for each class (the dashed lines around the median represent 95% confidence bands). These classes were constructed so as to have an identical number of observations.

We found three interesting (but not surprising) patterns in the evolution of fiscal variables. Figure 2 shows the remarkable increase in the share of government revenue in national income that has occurred between 1870 and 1988. This increase in the importance of government in the economy has been explored in the large literature on "Wagner's Law" (see e.g. Ram (1987)).

Figure 3 shows that the importance of custom taxes as a source of government revenue declines sharply with the level of income. This decline is particularly striking in the U.S. where the importance of custom taxes in revenue drops from about 100% in the end of the 18th century to approximately zero in 1988.[15] Figure 4 documents

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[14]The countries in our sample are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Greece, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Peru, Portugal, Spain, Sweden, Switzerland, United Kingdom, Uruguay, USA, and Venezuela.

[15]Our data for the U.S. includes only taxation at the Federal level. The taxation of

that the importance of the income tax as a source of government revenue rises with income.

Figures 5 and 6 were constructed by classifying population size and income classified in three classes each and depicting the median share of income and custom tax revenue in overall revenue for the nine resulting classes. These figures show a striking association between population size and the importance of taxes on income and on international trade similar to the one suggested by our cross-section data: countries with higher population tend to resort less to trade taxes and more to income taxes.

Table 8 shows the results of a pooled time-series cross-section regressions in which we try to relate the evolution of the shares of income tax revenue and custom tax revenue in total revenue and the share of government revenue in GDP to a set of explanatory variables. These variables, measured at the annual frequency, include the logarithm of real per capita GDP, the logarithm of population, dummies for the two World Wars and a time trend.

The coefficient on the logarithm of real per capita GDP has the expected sign: positive for the income tax and government revenue ratios and negative for the share of custom taxes. There is a significant time trend that points to a gradual increase over time in the importance of government revenue in GNP and of income tax revenue in overall revenue. This trend also suggests a gradual decline in the importance of custom taxes.

Table 8 confirms the result that was already suggested by Figures 5 and 6 and by our cross-section data: the logarithm of population is a significant explanatory variable. Population is positively related to the importance of income taxes and of government revenue, while it is negatively related the custom revenue share. This effect of population does not disappear when we introduce the share of trade in GNP in the regression, thus suggesting the presence of a scale effect associated with population on the character of the tax system. The trade share is negatively associated with customs revenue, since international trade is important in countries with low

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business activity in general and of banking, in particular, was an important source of revenue in some U.S. states during the 19th century (see Wallis, Sylla and Legler (1993)).

customs taxes.

The effects of the level of income and of the level of population on the character of the fiscal system are surely related to the administrative and compliance costs of taxation. These costs are not small: in a study for Canada, Vaillancourt (1989) estimated that the total private and government operating costs associated with the income tax and the social security payments represent 7.1% of the revenue collected. In a similar study for the U.K. in the period 1986-87, Sandford, Godwin and Hardwick (1989) estimated that these costs represent 4.93% of revenue.

It is plausible that custom taxes require little or no overhead expenditures but are costly to administer per unit of tax collected. Income taxes imply high overhead costs for establishing income reporting, surveillance, and withholding systems, but once such overhead costs are paid, the marginal cost of an additional unit of tax collected is low. Under these circumstances, a government in a small scale economy (low population size, low income, or both) would prefer to use custom taxes, while a government in a large economy would find it worthwhile to bear the fixed costs of collecting income taxes.

5. Further Directions

The empirical regularities summarized in this paper suggest a number of lines of further inquiry. One is the influence of economic scale on the choice of fiscal instruments. The literature has often noted the dependence of fiscal structure on income, but has not interpreted this relation as having anything to do with the scale of the economy. Our results on population, income, and fiscal structure suggest that scale matters. In order to be consistent with these scale effects, theoretical analyses of the choice of fiscal systems will have to take into account the cost of administering different tax systems, as well as the lumpiness of some types of expenditures. Distributional objectives are an additional consideration for the design of fiscal system: we found evidence that inequality affects education spending.

The evidence that tax rates matter for growth is disturbingly fragile. This empirical fragility contrasts sharply with the robustness of the theoretical predictions: most growth models predict that income and investment taxes are detrimental to growth. Our results on the dependence of both growth and tax policy on initial income help explain why it is do difficult to isolate the effects of tax policy on growth. One avenue for further empirical research is to search for natural experiments in which there are large changes in tax policy, where the covariation with income does not constitute a problem.

Our results on public investment in transport and communication seem to lend support from developing country experiences to Aschauer's (1989) contention that public spending on infrastructure has supernormal returns. We have some suggestive evidence that causality runs from infrastructure to growth, but further work is necessary to address both causality questions and the surprising high magnitude of coefficients on public infrastructure spending. Much more data collection on infrastructure is needed, given the paucity of data on comprehensive infrastructure spending in most countries; our public investment data set is a beginning in this regard.

Causality questions also affect the study of other fiscal policy -growth linkages, given our results on fiscal policy, income and population size. Further exploration of the determinants of government taxes and spending can suggest variables that can be used as instruments for fiscal policy, allowing us to identify the structural relations between policy and growth.

TABLE 1

SIMPLE CORRELATIONS OF FISCAL VARIABLES WITH PER CAPITA GROWTH RATE, 1970-88

Averages 1970-1988	
Central Government Surplus/GDP	0.36
Consolidated Public Surplus/GDP	0.36
Revenue Components as Shares of GDP	
Total Revenue including Grants	0.22
Total Revenue	0.27
Tax Revenue	0.20
Non-Tax Revenue	0.34
Current Revenue	0.27
Social Security Contributions	0.18
Expenditure Components as Shares of GDP:	
Government Consumption (Barro-Wolf(1989))	-0.28
Government Consumption Excluding Defense and Education (Barro-Wolf(1989))	-0.32
General Public Services	-0.30
Expenditures on Social Security	0.19
Government Transfers (Barro-Wolf(1989))	0.23
Other Tax Variables:	
"Marginal" Income Tax Rate from Regression of Income Tax Revenue on GDP	-0.26
Standard Deviation of Ratio of Domestic Taxes to Consumption plus Investment	-0.39
Standard Deviation of Ratio of International Trade Taxes to Imports plus Exports	-0.18

TABLE 2
SIGNIFICANCE OF TAX RATE VARIABLES AND INITIAL INCOME
IN BARRO REGRESSION, 1970-88 CROSS-SECTION

Tax Rate	Significance Level of Income	Significance Level of Tax Rate
Tax Rates Computed with Time Series Regressions:		
Koester-Kormendi (1989) "marginal" tax rate	.014	.194
"Marginal" income tax rate from time series regression on GDP	.015	.047
"Marginal" tax rate from time series of total revenue on GDP	.013	.121
Tax Rates Computed as Ratios of Tax Revenue to Tax Base:		
Taxes on Income, Profits and Capital Gains/GDP	.093	.353
International Trade Taxes/(Imports+Exports)	.158	.243
Individual Income Taxes/Personal Income	.057	.098
Sicat-Virmani Statutory Tax Rates:		
On first bracket	.043	.432
On .75 x Average family income	.045	.386
On 2 x Average family income	.074	.958
On 3 x Average family income	.101	.587
On highest bracket	.075	.687
Easterly-Rebelo (1993) Marginal Tax Rate	.077	.880
Basic Regression with no Fiscal Variables	.006	

TABLE 3

TAX RATES, GROWTH AND PRIVATE INVESTMENT

Independent Variables:	Dependent Variable: Growth Rate of Per Capita GDP		Dependent Variable: Ratio of Private Investment to GDP	
Constant	0.010 (1.109)	0.0008 (0.16)	0.086 (4.32)	0.087 (4.127)
GDP per capita, 1960	-6.46e-3 (-2.25)	-2.89e-3 (-1.93)	8.42e-3 (0.91)	-5.8e-3 (-0.79)
Primary enrollment, 1960	0.0247 (2.24)	0.025 (3.01)	0.083 (3.44)	0.073 (2.91)
Secondary enrollment, 1960	0.0439 (2.09)	0.031 (1.95)	-0.051 (-0.53)	-0.022 (-0.36)
Assassinations per million, 1970-85	-65.7 (-1.69)	-65.4 (-2.03)	482.6 (1.55)	-70.3 (-1.07)
Revolutions and Coups, 1970-85	-0.0054 (-0.39)	-0.009 (-1.01)	-0.038 (-1.33)	0.015 (0.509)
War Casualties Per Capita 1970-88	-1.436 (-2.225)	3.28 (1.33)	5.88 (0.993)	-3.63 (-4.77)
"Marginal" Income Tax Rate with respect to GDP	-0.064 (-2.04)			-0.193 (-3.30)
Ratio of Individual Income Taxes to Personal Income		-0.103 (-1.68)		
Ratio of Domestic Taxes to Consumption plus Investment			-0.737 (-2.702)	
Number of Observations	53	74	57	43
R^2	0.362	0.261	0.468	0.378

TABLE 4

PARTIAL CORRELATIONS BETWEEN FISCAL AGGREGATES, GROWTH AND PRIVATE INVESTMENT

Significant Partial Correlations with Growth

Fiscal Variable:	Basic Regression	Basic Regression with M2/GDP	Basic Regression with M2/GDP and Trade share
Central Government Surplus/GDP	0.142 (3.13)	0.133 (2.41)	0.129 (2.22)
Non-Tax Revenue/GDP	0.170 (2.72)	0.056 (0.66)	0.106 (1.14)
Capital Revenue/GDP	1.584 (5.36)	1.710 (3.07)	1.810 (2.93)
Real Government Consumption Net of Education and Defense Expenditure/Real GDP	-0.098 (-2.68)	-0.064 (-1.35)	-0.075 (-1.56)
"Marginal" Income Tax Rate from Time Series Regression on GDP	-0.064 (-2.04)	-0.069 (-1.62)	-0.051 (-1.19)
Standard Deviation of Ratio of Domestic Taxes to Consumption+Investment	-0.674 (-4.35)	-0.670 (-3.40)	-0.646 (-3.13)
Sicat-Virmani Statutory Income Tax Rates on 3 × Average Family Income	0.0001 (0.55)	-0.0005 (-1.86)	-0.0007 (-2.13)
Expenditure on General Public Services/GDP	-0.236 (-3.38)	-0.150 (-1.22)	-0.240 (-1.78)

TABLE 4 (cont.)

PARTIAL CORRELATIONS BETWEEN FISCAL AGGREGATES, GROWTH AND PRIVATE INVESTMENT

Significant Partial Correlations with Private Investment

Fiscal Variable:	Basic Regression	Basic Regression with M2/GDP	Basic Regression with M2/GDP and Trade share
Central Government Surplus/GDP	0.694 (2.75)	0.781 (2.27)	0.814 (2.50)
Ratio of Real Government Consumption to Real GDP	-0.267 (-1.42)	-0.595 (-2.08)	-0.664 (-1.85)
Real Government Consumption Net of Education and Defense Expenditure/Real GDP	-0.551 (-2.08)	-0.962 (-2.66)	-0.948 (-2.48)
Standard Deviation of International Trade Taxes/(Imports + Exports)	-1.380 (-2.36)	-1.244 (-1.65)	-1.740 (-2.00)
Domestic Taxes/GDP	-0.772 (-2.32)	-0.889 (-2.13)	-0.820 (-2.09)
Domestic Taxes/(Consumption + Investment)	-0.737 (-2.70)	-0.723 (-2.11)	-0.602 (-1.86)
Standard Deviation of Domestic Taxes/(Consumption + Investment)	-2.091 (-1.75)	-3.880 (-2.71)	-3.772 (-2.96)
"Marginal" Income Tax with respect to GDP	-0.193 (-3.30)	-0.225 (-2.43)	-0.177 (-2.07)
Sicat-Virmani Statutory Income Tax Rates on Average Family Income	-0.002 (-1.34)	-0.002 (-1.17)	-0.003 (-2.47)
Expenditure on General Public Services/GDP	-0.748 (-1.57)	-1.642 (-2.50)	-1.755 (-2.64)

TABLE 5

REGRESSIONS OF PER CAPITA GROWTH ON PUBLIC INVESTMENT AND CONDITIONING VARIABLES

(Pooled Regressions with Decade Averages)

Ratios To GDP:	Basic Regression	Basic Regression with M2/GDP	Basic Regression with M2/GDP and Trade Share
Total Consolidated Public Investment	0.040 (1.02)	-0.00007 (-0.002)	-0.004 (-0.089)
Sectoral Public Investment:			
Agriculture	-0.231 (-1.13)	-0.34 (-1.50)	-0.304 (-1.36)
Education	1.490 (2.26)	1.10 (1.54)	1.18 (1.60)
Health	0.011 (0.02)	-0.40 (-0.54)	-0.37 (-0.49)
Housing and Urban Infrastructure	1.49 (2.82)	0.88 (1.46)	0.91 (1.48)
Transport and Communication	0.661 (2.48)	0.588 (2.53)	0.626 (2.48)
Industry and Mining	0.218 (1.39)	0.089 (0.589)	0.082 (0.53)
Public Investment by Level of Government			
General Government	0.453 (4.13)	0.402 (3.43)	0.388 (3.18)
Public Enterprises	-0.001 (-0.01)	-0.124 (-1.09)	-0.13 (-1.15)

TABLE 6

REGRESSIONS OF PRIVATE INVESTMENT ON PUBLIC INVESTMENT AND CONDITIONING VARIABLES

(Pooled Regressions with Decade Averages)

Ratios to GDP:	Basic Regression	Basic Regression with M2/GDP	Basic Regression with M2/GDP and Trade Share
Total Consolidated Public Investment	-0.194 (-2.08)	-0.223 (-2.19)	-0.241 (-2.57)
Sectoral Public Investment:			
Agriculture	-0.943 (-2.64)	-0.66 (-1.98)	-0.74 (-2.24)
Education	1.987 (1.29)	2.28 (1.56)	1.96 (1.40)
Health	0.027 (0.02)	2.56 (2.31)	2.29 (1.95)
Housing and Urban Infrastructure	2.108 (1.65)	1.26 (1.00)	1.01 (0.85)
Transport and Communication	0.001 (0.00)	0.053 (0.13)	-0.17 (-0.43)
Industry and Mining	-0.351 (-1.35)	-0.449 (-1.37)	-0.359 (-1.14)
Public Investment by Level of Government			
General Government	1.008 (3.89)	0.775 (2.89)	0.771 (2.88)
Public Enterprises	-0.623 (-3.40)	-0.630 (-3.07)	-0.630 (-3.04)

TABLE 7

SIGNIFICANT CORRELATIONS OF FISCAL STRUCTURE VARIABLES WITH THE LOG OF PER CAPITA INCOME IN 1970

Averages, 1970-1988	
Aggregate Variable:	
Consolidated Public Sector Surplus/GDP	0.49
Total Revenue/GDP	0.55
Grants/GDP	-0.27
Total Expenditure and lending minus repayments/GDP	0.35
Revenue Components as Share of Total Revenue (excluding grants):	
Tax Revenue	0.21
Non-Tax Revenue	-0.17
Taxes on Income, Profits and Capital Gains	0.35
Social Security Contribution	0.58
Taxes on International Trade and Transactions	-0.75
Payroll Taxes	0.31
Expenditure Components as Share of Total Expenditure:	
General Public Services	-0.59
Education	-0.41
Health	0.36
Social Security and Welfare	0.78
Recreation, Culture and Religion	-0.28
Agriculture, Forestry, Fishing and Hunting	-0.54
Fuel and Energy	-0.32
Transportation and Communication	-0.32
Sicat-Virmani Statutory Tax Rates:	
On 0.75 x Average Family Income	0.46
On Average Family Income	0.47
On 2 x Average Family Income	0.46
On 3 x Average Family Income	0.44
Other Variables:	
Ratio of Individual Income Taxes to Personal Income	0.59
Ratio of Income Taxes to GDP	0.51
Ratio of Domestic Taxes to Consumption plus Investment	0.48
Ratio of Trade Taxes to Exports plus Imports	-0.77
Standard Deviation of Ratio of Trade Taxes to Exports plus Imports	-0.50
"Marginal" Tax Rate (Koester and Kormendi (1989))	0.30
"Marginal" Tax Rate from Regression of Tax Revenue on GDP	0.39

TABLE 8

POOLED CROSS-SECTION TIME SERIES REGRESSION

WITH HISTORICAL DATA: 1870-1988

	Income Tax Revenue / Total Tax Revenue		Customs Tax Revenue / Total Tax Revenue		Government Revenue / GNP
Constant	-3.241 (-6.573)	-0.153 (-0.272)	3.039 (9.836)	5.310 (14.852)	-2.310 (-16.783)
Log of Real Per Capita GDP	0.063 (7.590)	0.101 (10.592)	-0.067 (-9.196)	-0.041 (-5.791)	0.017 (6.260)
Log of Population	0.021 (5.169)	0.032 (6.157)	-0.035 (-10.512)	-0.041 (-10.939)	0.003 (2.450)
World War I	-0.015 (-0.516)	0.021 (0.523)	0.008 (0.386)	-0.046 (-2.020)	-0.029 (-2.846)
Word War II	0.051 (3.396)	0.037 (2.100)	-0.046 (-3.056)	-0.043 (-2.477)	-0.005 (-0.833)
Time Trend	0.002 (5.490)	-.0002 (-0.780)	-0.001 (-6.473)	-0.002 (-11.858)	0.001 (15.200)
$\frac{(Exports+Imports)}{GDP}$	-	0.055 (1.830)	-	-0.096 (-5.916)	-
Number of Observations	894	696	1560	962	1383
R^2	0.31	0.32	0.23	0.42	0.37

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APPENDIX

SUMMARY STATISTICS
CROSS SECTION VARIABLES: 1970-88

Variable	Source	N° of Obs.	Mean	Standard Deviation	Maximum	Minimum
Variables Expressed as Percentage of GDP:						
Central Government Surplus	GFS	98	-0.046	0.047	0.054	-0.222
Consolidated Public Sector Surplus	ERS	53	-0.050	0.038	0.040	-0.138
Revenue:						
Total Revenue and Grants	GFS	102	0.265	0.108	0.558	0.096
Taxes on Inc., Profits and Capital Gains	GFS	103	0.060	0.048	0.262	0.000
Social Security Contributions	GFS	103	0.031	0.041	0.188	0.000
Employers Payroll or Manpower Taxes	GFS	101	0.002	0.006	0.036	0.000
Taxes on Property	GFS	103	0.005	0.006	0.039	0.000
Domestic Taxes on Goods and Services	GFS	103	0.058	0.040	0.190	0.000
Taxes on Int. Trade and Transactions	GFS	103	0.043	0.039	0.215	0.000
Other Taxes	GFS	102	0.005	0.007	0.044	0.000
Total Revenue	GFS	103	0.243	0.105	0.537	0.078
Tax Revenue	GFS	103	0.203	0.092	0.468	0.059
Non-Tax Revenue	GFS	102	0.038	0.043	0.349	0.000
Capital Revenue	GFS	100	0.001	0.003	0.024	0.000
Current Revenue	GFS	102	0.242	0.105	0.537	0.078
Grants	GFS	100	0.021	0.043	0.259	0.000
Expenditures:						
General Public Services	GFS	86	0.039	0.029	0.142	0.003
Defense	GFS	86	0.027	0.030	0.230	0.000
Education	GFS	87	0.034	0.018	0.074	0.000
Health	GFS	87	0.020	0.015	0.068	0.002
Social Security and Welfare	GFS	86	0.051	0.056	0.208	0.000
Housing and Community Amenities	GFS	86	0.007	0.006	0.027	0.000
Recreation, Culture and Religion	GFS	85	0.004	0.004	0.029	0.000
Agriculture, Forestry, Fishing and Hunting	GFS	84	0.018	0.014	0.076	0.000
Mining, Manufacturing and Construction	GFS	84	0.007	0.012	0.075	0.000
Fuel and Energy	GFS	82	0.005	0.006	0.025	0.000
Transport and Communication	GFS	84	0.023	0.017	0.121	0.000
Other Expenditures	GFS	84	0.013	0.013	0.069	0.001
Current Expenditure	GFS	94	0.234	0.104	0.614	0.078
Gross Fixed Capital Formation	GFS	79	0.033	0.032	0.220	0.000
Capital Expenditure	GFS	94	0.058	0.049	0.325	0.000
Total Expenditure minus Lending plus Repayment	GFS	97	0.308	0.120	0.702	0.108

SUMMARY STATISTICS
CROSS SECTION VARIABLES: 1970-88 (cont.)

Variable	Source	N° Obs	Mean	Standard Deviation	Maximum	Minimum
Variables Expressed as Percentage of GDP:						
Government Expenditures	SH	48	0.300	0.107	0.519	0.098
Real Government Consumption/Real GDP	BW	112	0.187	0.068	0.380	0.047
Gross Real Public Investment/Real GDP	BW	98	0.108	0.054	0.245	0.001
Other Variables						
Sicat-Virmani (1988) Statutory Tax Rates:						
On First Income Bracket		51	18.814	17.378	66.000	0.000
On .75 × Average Family Income		51	8.688	8.521	36.000	0.000
On Average Family Income		51	15.065	15.644	60.000	0.000
On 2 × Average Family Income		52	28.502	19.029	71.000	2.200
On 3 × Average Family Income		52	34.187	20.035	95.500	2.200
On Highest Income Bracket		52	61.552	15.507	95.500	25.000
Individual Income Taxes/Personal Income		80	0.039	0.037	0.136	0.000
"Marginal" Income Tax Rate, Easterly and Rebelo (1993)		32	0.064	0.051	0.187	0.001
"Marginal" Tax Rate, Koester-Kormendi (1989)		63	0.308	0.221	0.142	-0.008
Domestic Taxes/(Consumption+Investment)		82	0.074	0.051	0.215	0.009
Standard Deviation of Domestic Taxes/(Consumption+Investment)		82	0.014	0.013	0.079	0.002
International Trade Taxes/(Imports+ Exports)		89	0.065	0.045	0.192	0.001
Standard Deviation of International Trade Taxes/(Imports+Exports)		89	0.018	0.015	0.080	0.001
"Marginal" Income Tax Rate Computed with Time Series Regression on GDP		60	0.109	0.099	0.376	0.002
"Marginal" Tax Rate Computed with Time Series Regression of Tax Revenue on GDP		69	0.293	0.179	0.826	-0.123

Sources: GFS - Government Financial Statistics; BW - Barro and Wolf (1989); SH - Summers and Heston (1991); ERS - Easterly, Rodriguez and Schmidt-Hebbel (1993).

SUMMARY STATISTICS
PUBLIC INVESTMENT VARIABLES

(Decade Averages, 1960's, 1970's and 1980's)

Variables Expressed As Percentage of GDP:	N° Obs.	Mean	Standard Deviation	Maximum	Minimum
Aggregate Data:					
Total Consolidated Public Investment	258	0.0917	0.0522	0.3268	0.0182
Private Investment	212	0.1193	0.0668	0.4405	0.0055
Public Enterprise Investment	99	0.0424	0.0250	0.1326	0.0024
Public Investment by General Government	121	0.0519	0.0334	0.2014	0.0154
Sectoral Data:					
Public Investment in Transport and Communication	112	0.0224	0.0152	0.1026	0.0012
Public Investment in Agriculture	133	0.0144	0.0126	0.0932	0.0002
Public Investment in Education	121	0.0060	0.0057	0.0376	0.0002
Public Investment in Health	111	0.0037	0.0038	0.0241	0.0002
Public Investment in Housing and Urban Infrastructure	88	0.0056	0.0066	0.0341	0.0000
Public Investment in Industry and Mining	89	0.0131	0.0176	0.1071	0.0000

Summary statistics on historical data set

	Per capita GDP (US$ in 1985 PPP prices)			*Government revenue share in GDP*				*Customs tax share in revenue*				*Income tax share in revenue*			
Country name	*Period*	*Level at beginning of period*	*Level at end of period*	*Period*	*Median*	*Min*	*Max*	*Period*	*Median*	*Min*	*Max*	*Period*	*Median*	*Min*	*Max*
Argentina	1900-1988	1752	4030	1935-75	8%	4%	12%	1895-1975	48%	29%	71%	1895-1975	16%	2%	37%
Australia	1890-1988	3909	13321	1901-86	18%	2%	28%	#N/A	#N/A	#N/A	#N/A	1949-86	38%	28%	45%
Austria	1870-1988	1273	11201	1924-75	18%	9%	24%	1870-1975	6%	0%	25%	#N/A	#N/A	#N/A	#N/A
Belgium	1870-1988	2066	11495	1924-75	19%	13%	25%	1870-1955	8%	1%	17%	#N/A	#N/A	#N/A	#N/A
Brazil	1870-1987	331	4441	1870-1975	9%	6%	22%	1900-75	31%	3%	64%	1923-1975	26%	2%	38%
Canada	1870-1988	1792	16272	1926-88	26%	14%	41%	#N/A	#N/A	#N/A	#N/A	1918-86	21%	3%	32%
Chile	1908-1988	1706	4099	1940-75	14%	14%	21%	1895-1975	41%	6%	100%	1895-1975	26%	1%	52%
Colombia	1925-1988	966	3568	1945-75	8%	5%	11%	1928-75	28%	12%	56%	1928-75	44%	5%	56%
Denmark	1870-1988	1403	12089	1870-1975	6%	6%	33%	1891-1975	17%	1%	49%	1870-1975	24%	12%	64%
Finland	1870-1988	824	12360	1926-75	20%	9%	28%	1883-1975	35%	2%	51%	1934-75	30%	17%	37%
France	1870-1988	1373	12190	1949-75	22%	2%	24%	1870-1975	11%	0%	27%	#N/A	#N/A	#N/A	#N/A
Germany	1870-1988	1235	12604	1872-1975	7%	2%	31%	1872-1975	13%	0%	36%	1920-75	44%	22%	59%
Great Britain	1870-1988	2223	11982	1885-1975	18%	6%	38%	1870-1964	21%	9%	29%	#N/A	#N/A	#N/A	#N/A
Greece	1950-1988	1225	5857	1928-75	17%	11%	21%	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Italy	1870-1988	1417	11741	1870-1975	12%	4%	17%	1870-1975	8%	0%	15%	#N/A	#N/A	#N/A	#N/A
Japan	1930-1988	1596	12209	1930-86	15%	11%	28%	#N/A	#N/A	#N/A	#N/A	1887-1986	14%	1%	40%
Mexico	1895-1988	1113	4996	1926-75	8%	6%	13%	1925-75	24%	10%	39%	1925-75	26%	9%	42%
Netherlands	1900-1988	2400	11468	1900-75	9%	5%	34%	1870-1975	8%	0%	22%	#N/A	#N/A	#N/A	#N/A
New Zealand	1950-1988	5608	9864	1931-75	26%	17%	35%	1870-1975	28%	6%	46%	1893-1975	23%	2%	70%
Norway	1870-1988	1117	14976	1870-1975	7%	3%	21%	1870-1975	37%	1%	76%	1893-1975	27%	6%	90%
Peru	1950-1988	1642	2847	1942-75	13%	11%	17%	1899-1975	25%	8%	39%	#N/A	#N/A	#N/A	#N/A
Portugal	1870-1988	487	5321	1879-1975	11%	5%	16%	1879-1975	32%	10%	44%	#N/A	#N/A	#N/A	#N/A
Spain	1950-1988	1823	7406	1906-75	9%	5%	15%	1870-1975	12%	4%	22%	#N/A	#N/A	#N/A	#N/A
Sweden	1870-1988	926	12991	#N/A	#N/A	#N/A	#N/A	1881-1975	17%	2%	50%	1881-1975	25%	5%	55%
Switzerland	1870-1988	2316	16155	1913-88	7%	2%	11%	1870-1975	65%	11%	100%	1916-75	24%	6%	82%
Uruguay	1935-1988	3186	5163	1955-75	11%	10%	15%	1895-1975	58%	6%	100%	#N/A	#N/A	#N/A	#N/A
USA	1870-1988	2067	18339	1889-1975	5%	1%	23%	1870-1975	15%	1%	60%	1916-75	63%	17%	76%
Venezuela	1950-1987	2921	5717	1950-75	23%	19%	36%	1910-75	34%	3%	100%	#N/A	#N/A	#N/A	#N/A

Public Investment Data

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Total Consolidated Public Investment			Private Investment			Public Enterprise Investment			Public Investment by General Government		
		1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s
1	Antigua and Barbuda		0.054	0.050		0.143	0.204						
2	Argentina		0.087	0.062		0.126	0.087						
3	Australia		0.076	0.068		0.169	0.177		0.039	0.041		0.037	0.027
4	Austria											0.048	0.034
5	Bahamas	0.082	0.050	0.023	0.344	0.137							
6	Bangladesh		0.053	0.078		0.046	0.059						
7	Barbados		0.057	0.046									0.043
8	Belize		0.095	0.080		0.176	0.116		0.020	0.036			
9	Benin		0.082	0.056		0.045	0.065						
10	Bolivia	0.110	0.091	0.060	0.071	0.080	0.045		0.068	0.055		0.030	0.027
11	Botswana		0.156	0.146		0.246	0.253		0.042	0.045		0.110	0.112
12	Brazil		0.083	0.063		0.140	0.126			0.041			0.025
13	Bulgaria			0.186			0.152						0.084
14	Burkino Faso		0.136	0.094			0.191						
15	Burundi	0.039	0.073	0.137	0.013	0.013	0.014		0.025	0.063			
16	Cameroon		0.114	0.153		0.079	0.085		0.077	0.115		0.038	0.053
17	Canada											0.034	0.026
18	Central African	0.055	0.099	0.103	0.115		0.026						
19	Chad			0.073									
20	Chile		0.079	0.060		0.070	0.097		0.019	0.032		0.033	0.027
21	China		0.181	0.178		0.163	0.169						
22	Colombia	0.041	0.055	0.074	0.154	0.105	0.099			0.031			0.043
23	Comoros			0.209			0.065						
24	Congo	0.130	0.117	0.101									
25	Costa Rica	0.044	0.069	0.066	0.137	0.155	0.138		0.033	0.037		0.038	0.035
26	Cote d'Ivoire	0.078	0.141	0.076	0.089	0.082	0.099		0.071		0.053	0.077	
27	Cyprus		0.040	0.050									
28	Dominica		0.137	0.153		0.103	0.215		0.053	0.029			
29	Dominican Rep	0.046	0.065	0.052	0.086	0.143	0.166		0.012	0.017		0.052	0.026
30	Ecuador	0.052	0.078	0.087	0.075	0.132	0.113		0.029	0.028		0.054	0.052
31	Egypt		0.171	0.183		0.051	0.077						
32	El Salvador	0.031	0.052	0.045	0.099	0.117	0.081						
33	Equatorial Guinea			0.131			0.036						0.131
34	Ethiopia		0.052	0.103		0.040	0.019		0.024			0.027	
35	Fiji		0.094	0.089		0.162	0.131		0.047	0.052		0.047	0.037
36	Gabon		0.120	0.141		0.195	0.175						
37	Ghana		0.048	0.043			0.041						
38	Greece		0.065	0.067		0.202	0.123		0.026	0.029		0.039	0.033
39	Greneda			0.203			0.179						
40	Guatemala	0.029	0.041	0.041	0.097	0.119							
41	Guinea			0.062			0.107						0.062
42	Guinea Bissau			0.291			0.019						
43	Guyana	0.107	0.173	0.227	0.098	0.062	0.038	0.047	0.054		0.060	0.079	0.130
44	Haiti	0.021	0.064	0.081	0.020	0.053	0.060		0.030	0.031			
45	Honduras	0.035	0.056	0.084	0.112	0.155	0.097		0.018	0.059		0.039	0.033
46	Hong Kong		0.035	0.043		0.265	0.260						
47	Hungary		0.297	0.207			0.037						
48	Iceland		0.046	0.036									
49	India	0.067	0.071	0.100	0.127	0.093	0.101		0.024			0.038	0.048

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Total Consolidated Public Investment			Private Investment			Public Enterprise Investment			Public Investment by General Government		
		1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s
50	Indonesia		0.083	0.102		0.126	0.109		0.055	0.058		0.028	0.047
51	Israel		0.108	0.039		0.164							
52	Jamaica		0.098	0.124			0.020			0.073			0.055
53	Japan		0.092	0.079		0.237	0.212		0.038	0.025		0.054	0.054
54	Jordan		0.176	0.146									
55	Kenya		0.087	0.084		0.127	0.118			0.050			0.040
56	Korea		0.059	0.070		0.196	0.221						
57	Lao. People's Democratic Republic												0.076
58	Lebanon										0.035	0.032	
59	Lesotho		0.117	0.137			0.234					0.155	0.151
60	Liberia		0.078	0.079									
61	Libya											0.201	0.194
62	Madagascar		0.058	0.078									
63	Malawi	0.075	0.134	0.099	0.063	0.090	0.051					0.077	0.081
64	Malaysia		0.081	0.146		0.143	0.159		0.009	0.055		0.081	0.096
65	Mali		0.021	0.145			0.106						
66	Malta		0.091	0.060		0.145	0.199		0.024	0.029		0.068	0.030
67	Mauritania	0.086	0.122	0.271	0.131	0.169	0.047		0.002			0.091	
68	Mauritius		0.076	0.077		0.192	0.133					0.089	0.075
69	Mexico		0.077	0.076		0.126	0.128						
70	Montserrat		0.125	0.094		0.232	0.276						
71	Morocco	0.081	0.117	0.100	0.043	0.079	0.122	0.018	0.016		0.064	0.082	0.055
72	Mozambique			0.153			0.014						
73	Myanamar(Bur	0.072	0.069	0.126	0.167	0.094	0.043	0.034	0.050	0.133	0.038	0.019	0.030
74	Nepal		0.043	0.077		0.105	0.102						
75	Netherlands											0.039	0.027
76	New Zealand		0.086	0.068									
77	Nicaragua	0.041	0.062		0.147	0.131			0.027			0.030	
78	Niger	0.043	0.051	0.089	0.045		0.005						
79	Nigeria		0.062	0.124			0.047					0.123	
80	Norway											0.047	0.033
81	Pakistan		0.091	0.093		0.059	0.077		0.083	0.056		0.035	0.036
82	Panama	0.040	0.108	0.087	0.137	0.160	0.124						
83	Papua New Guinea		0.090	0.067			0.179			0.019			0.042
84	Paraguay	0.044	0.050	0.063	0.092	0.147	0.184	0.039	0.025			0.020	
85	Peru	0.042	0.050	0.056	0.088	0.118	0.154		0.048	0.033		0.023	0.029
86	Philippines		0.052	0.055		0.174	0.144		0.012	0.024		0.050	0.033
87	Poland		0.073	0.202			0.014						
88	Portugal		0.111	0.119		0.104	0.207		0.086	0.078		0.029	0.041
89	Rwanda		0.027	0.098			0.104						
90	Sao Tome and Principe			0.111			0.034						
91	Senegal	0.057	0.061	0.040	0.059	0.114	0.080						0.043
92	Seychelles			0.117			0.100						
93	Sierra Leone		0.051	0.050		0.056	0.061			0.013		0.065	0.030
94	Singapore	0.057	0.090	0.131	0.073	0.250	0.289						
95	Soloman Islands		0.080	0.063			0.255			0.051			0.078
96	South Africa	0.093	0.130	0.101	0.144	0.142	0.138	0.019	0.044	0.045	0.074	0.086	0.056
97	Spain		0.033	0.030									
98	Sri Lanka	0.070	0.073	0.137	0.084	0.089	0.122	0.030	0.042	0.107		0.040	0.052

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Total Consolidated Public Investment			Private Investment			Public Enterprise Investment			Public Investment by General Government		
		1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s
99	St Christopher and Nevis			0.118			0.017			0.022			
100	St Lucia		0.091	0.101		0.441	0.331						
101	St. Vincent		0.105	0.114		0.177	0.172						
102	Sudan		0.047	0.052		0.075	0.086		0.028	0.030		0.035	0.018
103	Suriname		0.093	0.053	0.243	0.184	0.106				0.055	0.052	
104	Swaziland			0.126			0.160						
105	Sweden		0.086	0.052		0.130	0.139		0.049	0.026		0.037	0.028
106	Syria		0.149	0.137		0.038	0.070						
107	Taiwan		0.121	0.103		0.132	0.123		0.085	0.064		0.036	0.038
108	Tanzania		0.081	0.068		0.116	0.101		0.049	0.045		0.054	0.038
109	Thailand	0.077	0.066	0.079	0.163	0.164	0.159		0.022	0.035		0.044	0.043
110	The Gambia	0.051	0.081	0.128	0.044	0.076	0.075						
111	Togo		0.129	0.121			0.112						
112	Trinidad and Tobago		0.115	0.101									
113	Tunisia		0.144	0.148		0.105	0.126		0.097	0.098		0.046	0.050
114	Turkey	0.084	0.100	0.118	0.084	0.106	0.089		0.053	0.059			0.065
115	U.S.A		0.028	0.022		0.178	0.176		0.008	0.006		0.020	0.015
116	Uganda		0.032	0.052									
117	United Kingdom		0.073	0.038		0.115	0.129		0.032	0.020		0.041	0.018
118	Uruguay	0.018	0.045	0.042	0.111	0.083	0.071		0.024	0.023		0.024	0.024
119	Venezuela	0.056	0.104	0.122		0.182	0.090			0.044			0.018
120	Yemen, Arab Republic o		0.070	0.136									
121	Yemen, People's Democ		0.310	0.327									
122	Yugoslavia		0.250	0.234		0.064	0.053						
123	Zaire	0.038	0.049	0.043	0.043	0.054	0.064			0.025	0.021	0.028	0.018
124	Zambia		0.246	0.132			0.028			0.094			0.038
125	Zimbabwe		0.072	0.083		0.112	0.095		0.037	0.070		0.047	0.042

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Sectoral Public Investment in:											
		Transport and Commun			Agriculture			Education			Health		
		1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s
1	Antigua and Barbuda												
2	Argentina		0.021	0.019		0.000			0.002	0.003		0.004	
3	Australia												
4	Austria												
5	Bahamas	0.044	0.014		0.000	0.001		0.008	0.007		0.001	0.001	
6	Bangladesh			0.011			0.026			0.003			0.004
7	Barbados												
8	Belize												
9	Benin												
10	Bolivia	0.038	0.014	0.023	0.002	0.003	0.007			0.001			0.002
11	Botswana		0.039	0.029		0.009	0.012		0.018	0.022		0.004	0.003
12	Brazil		0.021	0.010		0.004	0.003		0.004	0.001		0.006	0.000
13	Bulgaria												
14	Burkino Faso						0.018			0.003			0.004
15	Burundi		0.017			0.020	0.024						
16	Cameroon						0.014			0.012			
17	Canada												
18	Central African Republic												
19	Chad												
20	Chile												
21	China												
22	Colombia	0.023	0.017	0.013	0.009	0.012	0.001	0.003	0.005	0.003	0.002	0.002	0.003
23	Comoros			0.103			0.030			0.038			0.012
24	Congo				0.007	0.035	0.015	0.002	0.011		0.002	0.010	
25	Costa Rica	0.017	0.026	0.026		0.002	0.010	0.003	0.005	0.003	0.007	0.005	
26	Cote d'Ivoire		0.043			0.054			0.014				
27	Cyprus												
28	Dominica			0.099			0.025			0.004			0.009
29	Dominican Republic					0.007	0.008		0.000	0.001			
30	Ecuador	0.022	0.028		0.005	0.009		0.003	0.004		0.001	0.003	
31	Egypt		0.049	0.044		0.016	0.015		0.008	0.009		0.002	0.003
32	El Salvador	0.011	0.014	0.008	0.002	0.006	0.011	0.003	0.004	0.001	0.002	0.002	0.002
33	Equatorial Guinea			0.027			0.031			0.016			0.015
34	Ethiopia		0.018	0.017		0.020	0.023		0.003	0.004		0.002	0.003
35	Fiji												
36	Gabon					0.007	0.009						
37	Ghana			0.016			0.004			0.003			0.003
38	Greece												
39	Grenada												
40	Guatemala	0.011	0.010		0.002	0.003		0.001	0.002		0.001	0.002	
41	Guinea												
42	Guinea Bissau			0.048			0.056			0.026			0.023
43	Guyana	0.047	0.028	0.035	0.016	0.041	0.093	0.011	0.009	0.015	0.001	0.001	0.008
44	Haiti	0.006	0.026	0.029	0.003	0.009	0.013	0.001	0.003	0.009	0.004	0.004	0.008
45	Honduras	0.016	0.026	0.026	0.001	0.003	0.014	0.001	0.003	0.003	0.003	0.003	0.007
46	Hong Kong												
47	Hungary												
48	Iceland												
49	India		0.011	0.013		0.011	0.011						

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Sectoral Public Investment in:											
		Transport and Commun			Agriculture			Education			Health		
		1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s
50	Indonesia					0.008	0.008		0.008	0.013		0.003	0.004
51	Israel												
52	Jamaica			0.032			0.016			0.008			0.002
53	Japan												
54	Jordan												
55	Kenya		0.026	0.017		0.013	0.005		0.004	0.006		0.004	0.003
56	Korea												
57	Lao, People's Democratic Republic												
58	Lebanon												
59	Lesotho												
60	Liberia												
61	Libya												
62	Madagascar												
63	Malawi	0.025	0.035	0.033	0.016	0.022	0.020	0.008	0.014	0.011	0.001	0.007	0.005
64	Malaysia		0.018			0.018	0.016		0.007	0.013		0.002	0.002
65	Mali			0.028			0.042			0.003			0.011
66	Malta												
67	Mauritania					0.006							
68	Mauritius		0.006	0.024		0.015	0.011			0.002			0.002
69	Mexico		0.014	0.010		0.017	0.011			0.002			0.004
70	Montserrat												
71	Morocco	0.014	0.015	0.023	0.031	0.033	0.009	0.004	0.006	0.007	0.001	0.001	0.001
72	Mozambique			0.015			0.035			0.004			0.002
73	Myanamar(Bur	0.010	0.009		0.010	0.009							
74	Nepal		0.012	0.014		0.010	0.021		0.004	0.010		0.003	0.003
75	Netherlands												
76	New Zealand												
77	Nicaragua		0.018			0.003			0.003			0.003	
78	Niger			0.019	0.006		0.031	0.007		0.004	0.001		0.004
79	Nigeria						0.011			0.007			0.002
80	Norway												
81	Pakistan												
82	Panama				0.002	0.005		0.005	0.007		0.006	0.009	
83	Papua New Guinea												
84	Paraguay	0.022	0.015		0.001	0.002		0.001	0.001		0.004	0.002	
85	Peru	0.012	0.010	0.011	0.008	0.011	0.008	0.001	0.001	0.001	0.000	0.002	0.004
86	Philippines			0.011		0.007	0.006		0.002	0.002		0.000	0.000
87	Poland												
88	Portugal												
89	Rwanda			0.007			0.019			0.006			0.003
90	Sao Tome and Principe												
91	Senegal			0.009	0.017	0.026	0.015			0.002			0.003
92	Seychelles												
93	Sierra Leone		0.008	0.006		0.005	0.013		0.006	0.003		0.002	0.001
94	Singapore	0.009	0.013					0.003	0.001		0.000	0.001	
95	Soloman Islands		0.034	0.022		0.020	0.015		0.003	0.005		0.003	0.005
96	South Africa												
97	Spain												
98	Sri Lanka				0.030	0.018	0.036	0.006	0.006	0.018	0.005	0.005	0.024

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Sectoral Public Investment in:											
		Transport and Commun			Agriculture			Education			Health		
		1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s	1960s	1970s	1980s
99	St Christopher and Nevis			0.025			0.012			0.008			0.002
100	St Lucia			0.037			0.020			0.004			
101	St. Vincent			0.017			0.020			0.003			0.002
102	Sudan		0.009	0.007		0.015	0.012						
103	Suriname		0.023	0.015		0.017	0.020		0.006	0.004		0.002	0.003
104	Swaziland			0.037			0.029			0.025			0.003
105	Sweden												
106	Syria					0.027			0.004				
107	Taiwan												
108	Tanzania		0.012	0.009		0.010	0.013		0.004	0.003			
109	Thailand	0.029	0.020	0.027	0.011	0.009	0.013	0.008	0.005	0.008	0.001	0.001	0.002
110	The Gambia	0.019	0.036	0.049	0.007	0.013	0.023	0.004	0.007	0.012	0.002	0.003	0.010
111	Togo												
112	Trinidad and Tobago												
113	Tunisia												
114	Turkey	0.019	0.024	0.041	0.015	0.010	0.010	0.010	0.006	0.004	0.003	0.002	0.002
115	U.S.A												
116	Uganda												
117	United Kingdom												
118	Uruguay		0.023	0.023					0.001	0.001		0.001	0.001
119	Venezuela	0.021	0.020		0.005	0.007		0.003	0.003		0.006	0.005	
120	Yemen, Arab Republic of												
121	Yemen, People's Democratic Republic of												
122	Yugoslavia		0.040	0.032		0.011	0.012		0.011	0.008		0.008	0.007
123	Zaire	0.001	0.006	0.010	0.003	0.003	0.003	0.002	0.001	0.002	0.003	0.000	0.002
124	Zambia						0.035			0.007			0.004
125	Zimbabwe			0.018		0.008	0.012		0.002	0.003		0.001	0.001

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Sectoral Public Investment in: Housing & Urban Infras			Industry and Mining		
		1960s	1970s	1980s	1960s	1970s	1980s
1	Antigua and Barbuda						
2	Argentina		0.000			0.008	0.003
3	Australia						
4	Austria						
5	Bahamas	0.000	0.000				
6	Bangladesh			0.004			0.010
7	Barbados						
8	Belize						
9	Benin						
10	Bolivia	0.005	0.003	0.006	0.041	0.037	0.020
11	Botswana		0.030	0.022		0.016	0.021
12	Brazil			0.000		0.014	0.007
13	Bulgaria						
14	Burkino Faso						0.005
15	Burundi		0.003				
16	Cameroon			0.022			
17	Canada						
18	Central African Republic						
19	Chad						
20	Chile						
21	China						
22	Colombia	0.002	0.001		0.002	0.002	
23	Comoros			0.012			0.002
24	Congo				0.017	0.022	
25	Costa Rica	0.004	0.003	0.003			
26	Cote d'Ivoire		0.019			0.008	
27	Cyprus						
28	Dominica			0.007			0.002
29	Dominican Republic		0.002	0.003		0.007	0.004
30	Ecuador					0.000	
31	Egypt		0.025	0.034		0.035	0.011
32	El Salvador	0.004	0.003	0.013			
33	Equatorial Guinea						0.003
34	Ethiopia						
35	Fiji						
36	Gabon						
37	Ghana						0.001
38	Greece						
39	Greneda						
40	Guatemala	0.004	0.002				
41	Guinea						
42	Guinea Bissau						
43	Guyana	0.001	0.002	0.003	0.008	0.020	0.039
44	Haiti		0.000	0.001		0.003	0.006
45	Honduras	0.002	0.001	0.001			
46	Hong Kong						
47	Hungary						
48	Iceland						
49	India					0.022	0.031

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

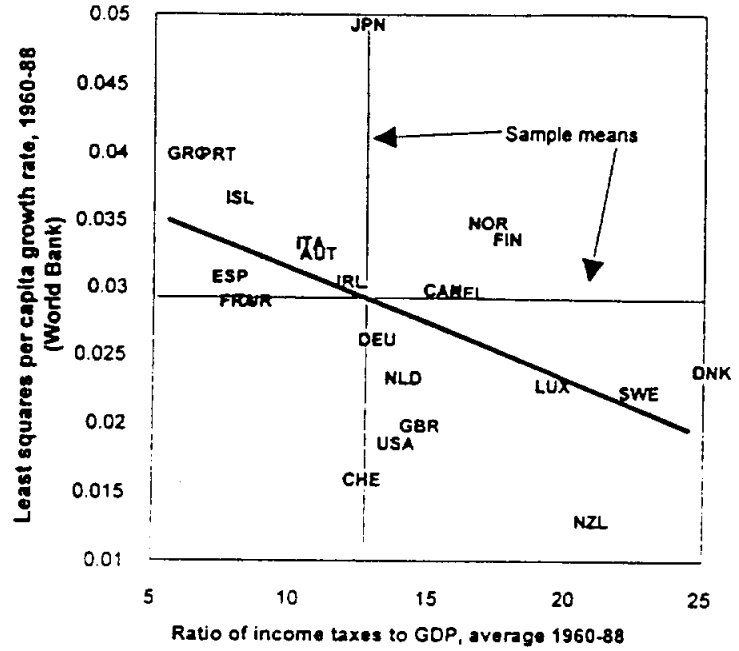
No.	Country	Sectoral Public Investment in: Housing & Urban Infras			Industry and Mining		
		1960s	1970s	1980s	1960s	1970s	1980s
50	Indonesia					0.009	0.013
51	Israel						
52	Jamaica			0.002			0.009
53	Japan						
54	Jordan						
55	Kenya		0.005			0.007	0.001
56	Korea						
57	Lao, People's Democratic Republic						
58	Lebanon						
59	Lesotho						
60	Liberia						
61	Libya						
62	Madagascar						
63	Malawi	0.003	0.001	0.001	0.005	0.010	0.008
64	Malaysia		0.002	0.005		0.011	0.014
65	Mali			0.009			0.008
66	Malta						
67	Mauritania					0.049	
68	Mauritius		0.007	0.005			
69	Mexico			0.002			0.004
70	Montserrat						
71	Morocco	0.001	0.001	0.002	0.010	0.011	
72	Mozambique						
73	Myanamar(Burma)				0.013	0.023	
74	Nepal					0.003	0.006
75	Netherlands						
76	New Zealand						
77	Nicaragua		0.010				
78	Niger	0.003		0.002			0.002
79	Nigeria			0.002			
80	Norway						
81	Pakistan						
82	Panama	0.005	0.004				
83	Papua New Guinea						
84	Paraguay	0.005	0.004		0.003	0.003	
85	Peru	0.002	0.002	0.002			
86	Philippines		0.002	0.003			0.001
87	Poland						
88	Portugal						
89	Rwanda						0.015
90	Sao Tome and Principe						
91	Senegal			0.001			0.004
92	Seychelles						
93	Sierra Leone			0.000			0.000
94	Singapore	0.012	0.017		0.013	0.019	
95	Soloman Islands		0.004				
96	South Africa						
97	Spain						
98	Sri Lanka	0.006	0.006	0.003	0.002	0.001	0.002

Public Investment Data (contd.)

All series are decade averages expressed as ratio to GDP. See text for details

No.	Country	Sectoral Public Investment in: Housing & Urban Infras			Industry and Mining		
		1960s	1970s	1980s	1960s	1970s	1980s
99	St Christopher and Nevis			0.006			0.009
100	St Lucia			0.008			0.007
101	St. Vincent			0.001			0.003
102	Sudan					0.009	0.010
103	Suriname		0.008	0.008		0.004	0.004
104	Swaziland						0.004
105	Sweden						
106	Syria						
107	Taiwan						
108	Tanzania					0.009	0.019
109	Thailand				0.002	0.001	0.001
110	The Gambia		0.010	0.014	0.000	0.001	0.006
111	Togo						
112	Trinidad and Tobago						
113	Tunisia						
114	Turkey	0.003	0.003	0.002	0.017	0.030	0.030
115	U.S.A						
116	Uganda						
117	United Kingdom						
118	Uruguay			0.001			
119	Venezuela	0.007	0.008		0.006	0.014	
120	Yemen, Arab Republic of						
121	Yemen, People's Democratic Republic of						
122	Yugoslavia					0.107	0.105
123	Zaire			0.001			
124	Zambia						0.012
125	Zimbabwe		0.015	0.010		0.022	0.024

Figure 1: Per capita growth and income tax rates with and without controlling for income, OECD countries, 1960-88



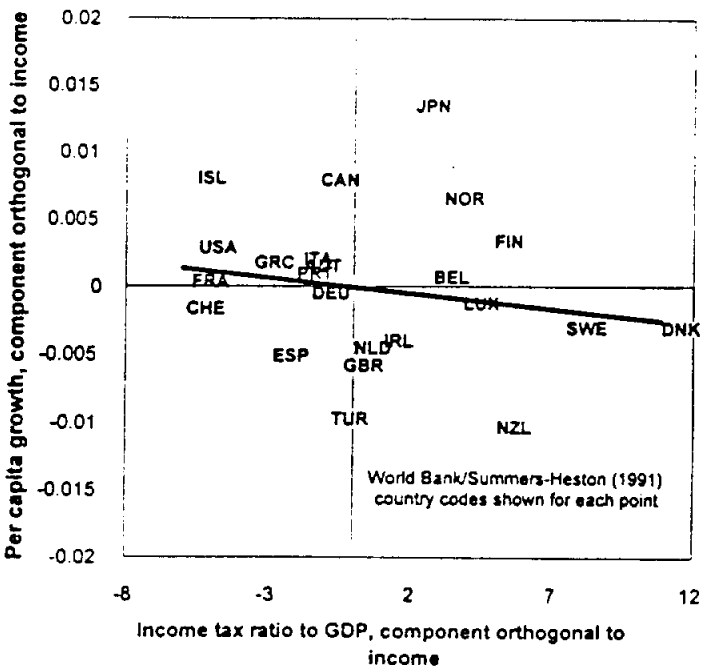


Figure 2: Wagner's Law
Income and Size of Government,1870-1988

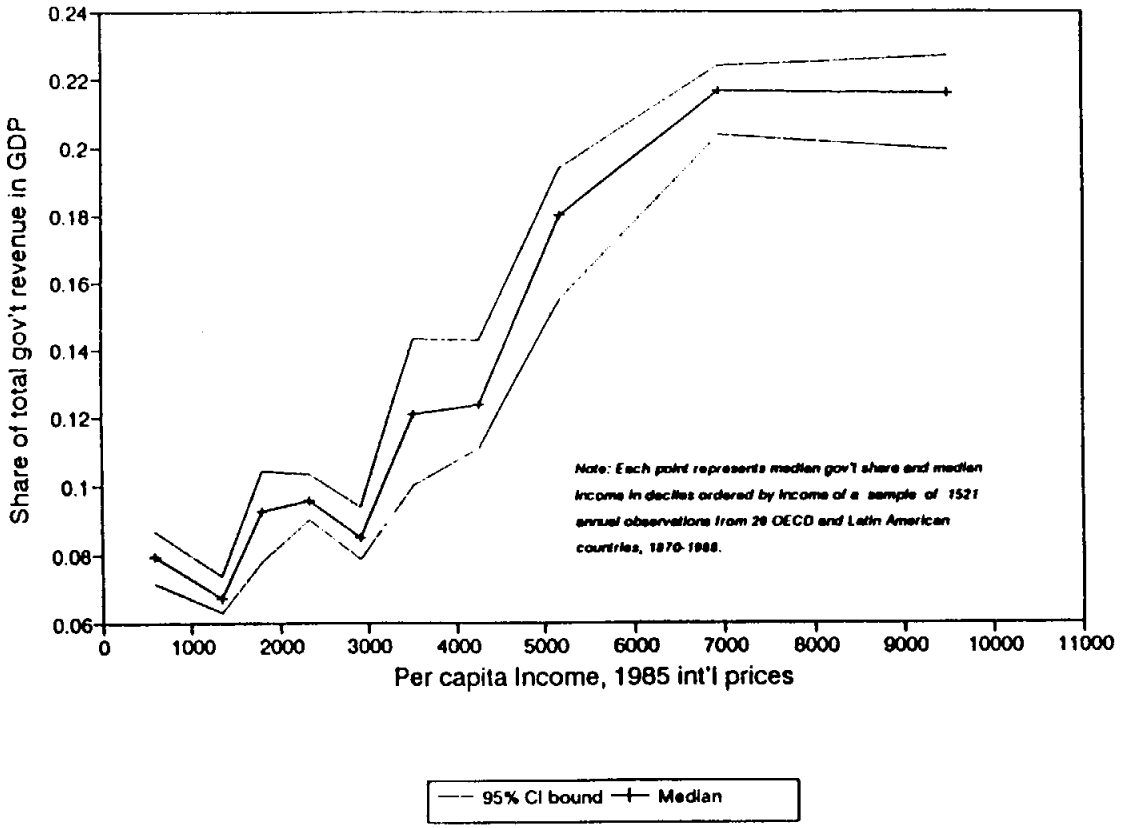


Figure 3: Per Capita Income and Share of Custom Taxes, 1870-1988

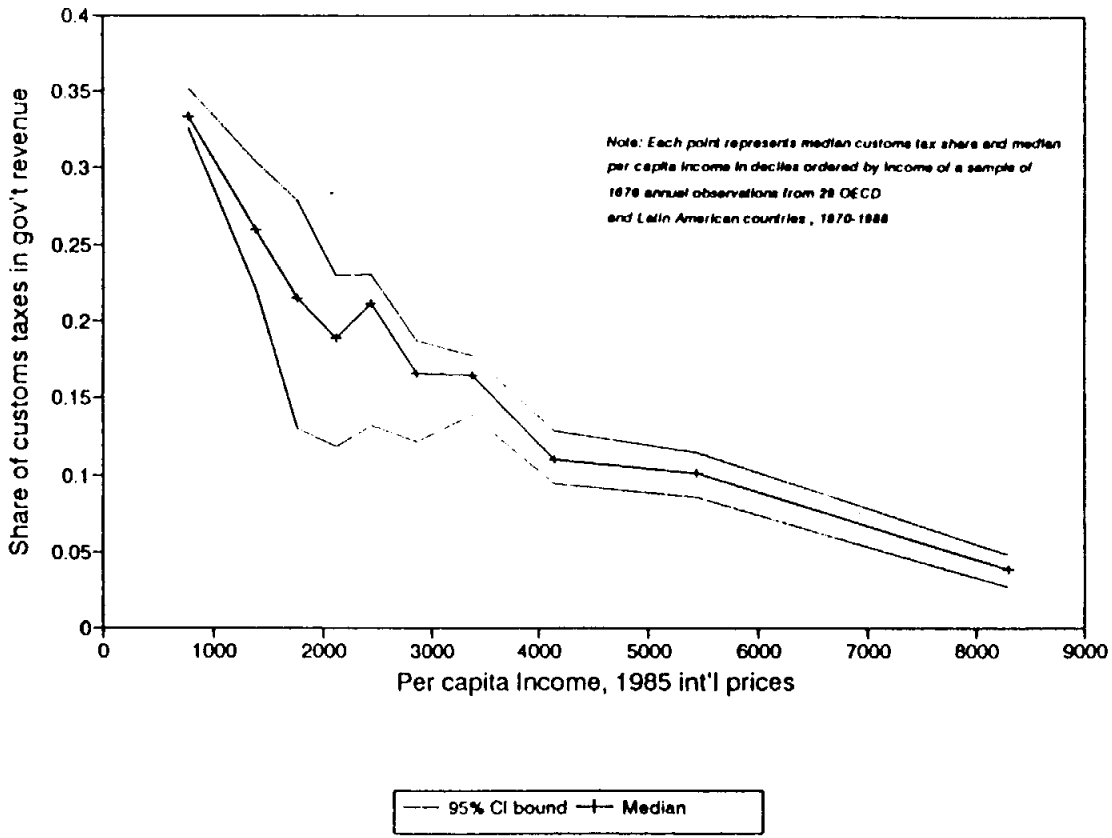


Figure 4: Per Capita Income and Share of Income Taxes, 1870-1988

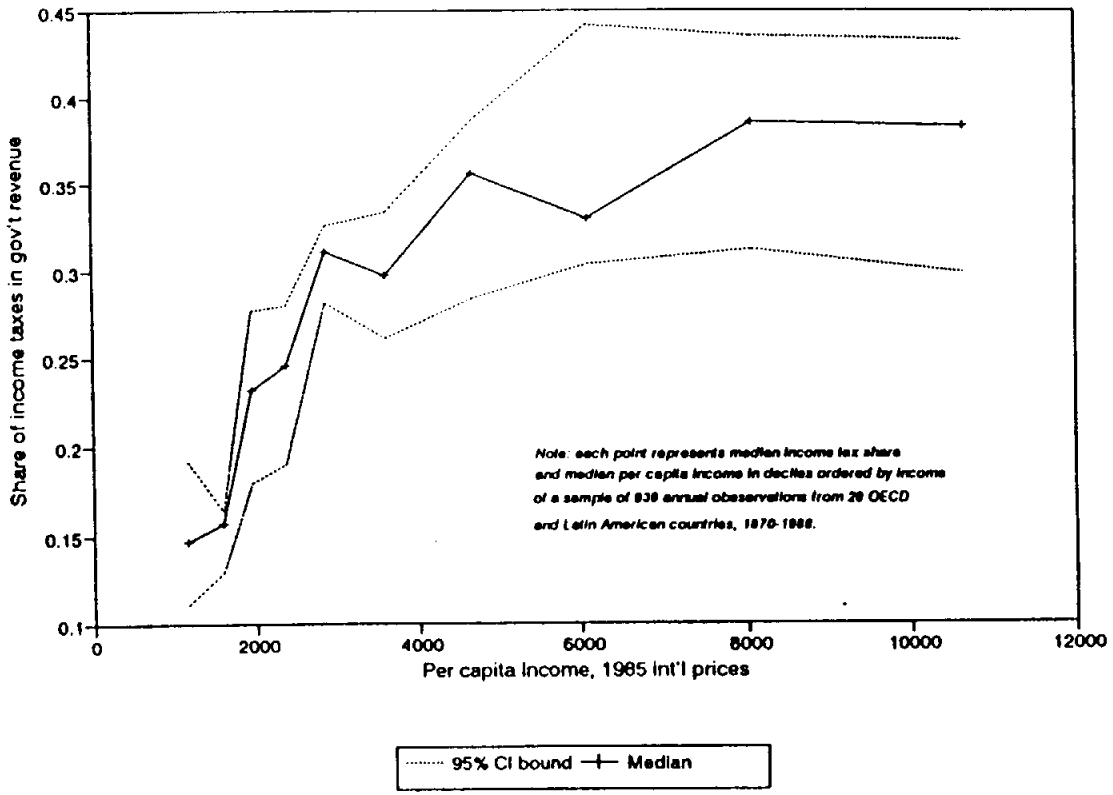


Figure 5: Income, population size, and share of customs in revenue, 1870-1988

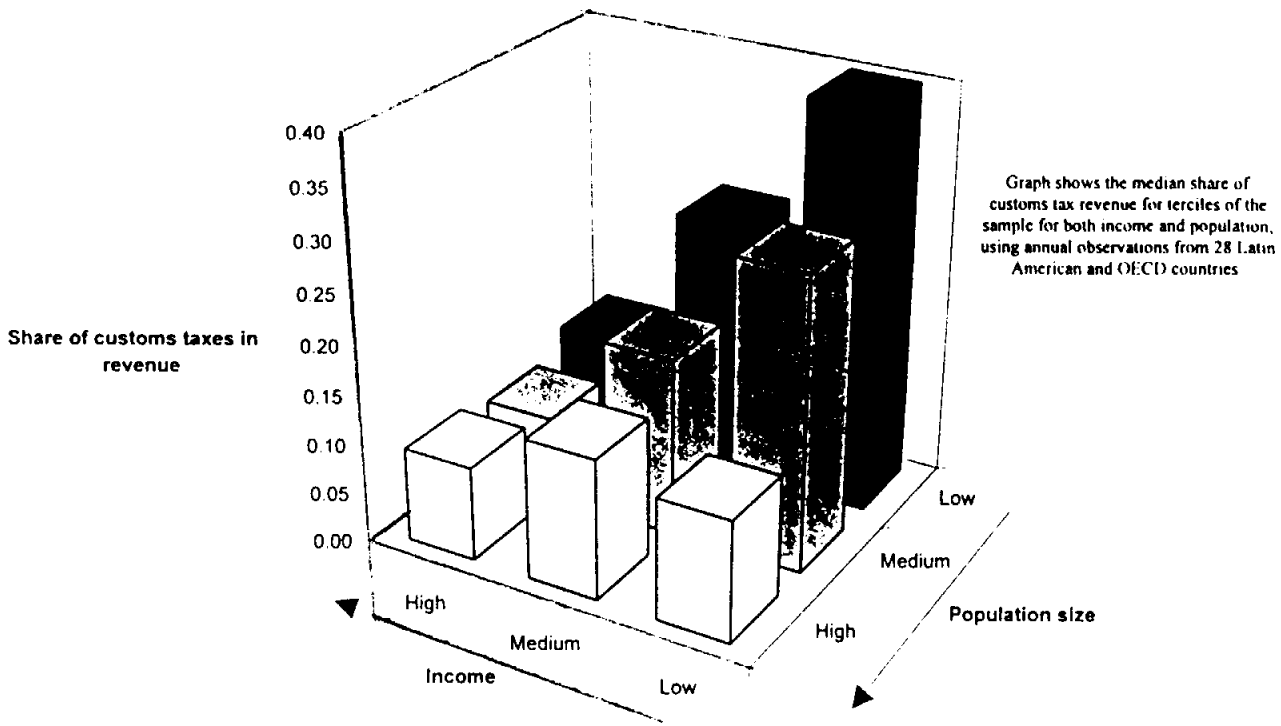
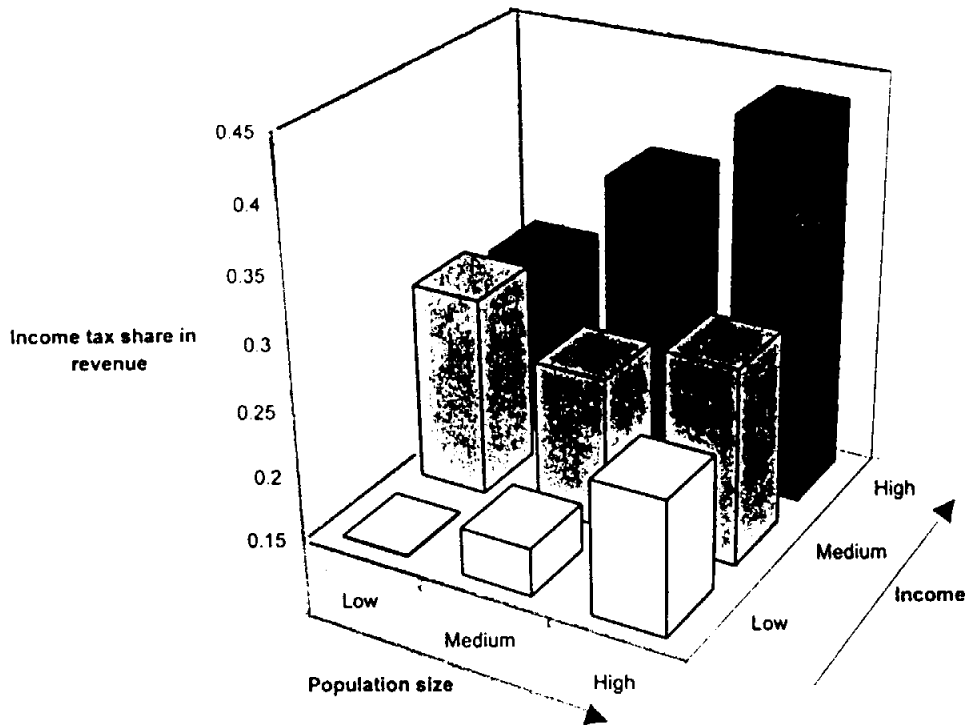


Figure 6: Income, population size, and share of income taxes in revenue, 1870-1988



Graph shows the median share of income tax revenue for terciles of the sample for both income and population, using annual observations from 28 Latin American and OECD countries