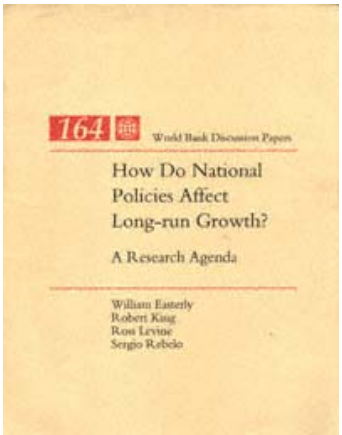


# How do national policies affect long−run growth?

# How Do National Policies Affect Long−Run Growth

A Research Agenda

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## Foreword

Developing countries as a whole registered close to zero per capita growth (unweighted average, excluding Eastern Europe) in the 1980's, the "lost decade" Some groups of countries performed much better than others—East and South Asia grew rapidly in the 80's, while Sub−Saharan Africa and Latin America contracted. Variations within regions are nearly as striking. Policymakers in stagnating economies, who once could take growth for granted, now wonder what are the keys to restoring growth potential. The World Bank has devoted an increasing share of its research effort in recent years to understanding the factors determining growth differences among nations—the 1991 World Development Report was devoted to this topic. This paper was prepared to set the agenda for a research project of the same title, being sponsored by the Macroeconomic Adjustment and Growth Division of the Country Economics Department of the World Bank. More specialized research papers on specific topics covered in this paper will be available in December 1992.

NANCY BIRDSALL
DIRECTOR
COUNTRY ECONOMICS DEPARTMENT

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## Executive Summary

Which policies, if any, strongly affect long run growth? Do policies explain why some poor countries have stagnated and others have advanced? Do policies explain successive periods of rapid growth and stagnation in the same country? To what extent do national policies—rather than external influences—explain the stagnation of many countries in Africa, Latin America, and Asia in the 1980's? This paper sets out a research agenda based on the endogenous growth literature designed to address the question "How Do National Policies Affect Long−Run Growth?".

### Policy Issues

This paper discusses five national policies:

(1) Fiscal policy . What are the growth effects of different types of taxes and public spending, such as those that affect consumption versus those that affect investment? What is the growth impact of public investment? Does fiscal mismanagement create uncertainty that lowers growth?

(2) Monetary policy. Do countries with high inflation tend to grow more slowly? Does the variance of monetary growth and inflation matter for growth?

(3) Trade intervention. Does distortionary intervention in foreign trade with tariffs and quotas have growth effects or only one−time level effects? Does instability in trade and exchange rate policy affect growth?

(4) Financial policies. Do penalties on domestic financial intermediation affect growth? How strong are the effects on growth through lower investment and those through inefficient allocation of investment?

(5) Openness to foreign capital . How do restrictions on direct foreign investment affect growth?

### Importance of the Issues

Many of the developing countries have been undergoing adjustment for several years. Progress has been made, but the recovery of growth has been slow in coming. The critical issue in the 1990's will be designing policies to enhance per capita growth. This is necessary both to improve the standard of living and to service the loans they have received in support of adjustment efforts. Identifying the critical policies for restoration of growth will help

frame policy recommendations in adjustment loans.

### Summary of Analytical Framework

This paper's analytical framework is based on the simple idea that all factors of production can be increased through investment in human or physical capital. Economic growth will be related to policies that affect the incentive to invest and that affect the efficient use of capital and intermediate inputs. Such a framework can be used to consider which policies affect the long−run growth rate, as opposed to affecting the level of income once and for all.

The framework can also be used to analyze complex interactions among policies and initial conditions. In a highly distorted economy, a minimum degree of policy reform may be needed to have any growth effect. The way policies interact will determine their net effect. For example, raising taxes may raise or lower growth depending on whether the taxes are used for government consumption or investment, whether the taxes penalize private consumption or investment, and whether the tax is easily evaded such that raising a given amount of revenue is highly distortionary.

### Empirical Methodology

The analytical framework derives testable predictions regarding the relationship between the national policies and long−run growth. We outline a variety of econometric and qualitative techniques to examine the accuracy of these predictions and determine which policies are most important in promoting growth.

We argue that researchers should use fairly aggregate indicators of national policies. We recommend this approach for two reasons. First, in examining a broad collection of policies, it is not feasible within the context of one study to construct detailed country−by−country indicators of every aspect of fiscal, monetary, trade, international capital, and domestic financial policies. But one should account for potentially important interactions among national policies, so that it is important that one include aggregate measures of all of these national policies in a study. Second, it is of interest whether one can predict the growth performance of countries by observing commonly used measures of national policies. If we can use aggregate measures of national policies to predict growth performance, then these measures will be useful target indicators in formalizing policy reform packages.

The empirical methodology described in this paper consists of cross−country and pooled tests of the theoretical predictions. Although there is a large literature that regresses average growth rates on various explanatory variables, this approach could extend this literature by (1) using an analytical framework to consider the broad range of national policies listed above and interpret the results, (2) conducting sensitivity analyses to gauge the robustness of the results, and (3) examining theoretical predictions that have not been previously tested.

The research could also examine the relationship between growth and broader measures of welfare such as social indicators and environmental measures. Preliminary evidence suggests high correlation between growth and other welfare measures, but the research could look at what factors could cause them to diverge.

## I—
## Objectives and Strategy

The belief that economic policy is a major determinant of economic growth has been expressed in the writings of economists for over 200 years. Much empirical work in the development literature has demonstrated such a link.1

For example, Table 1 shows how over the past 30 years, fast−growing countries have had less government consumption, lower inflation, less of a black market premium, and more trade than slow−growing countries.

| TABLE 1 | | |
|---|---|---|
| Cross−Country Averages: 196089 | | |
| | Fastgrowers | Slowgrowers |
| Share of investment in GDP | 0.27 | 0.17 |
| Secondary school enrollment rates | 0.27 | 0.07 |
| Primary school enrollment rates | 0.90 | 0.52 |
| Government/ GDP | 0.14 | 0.13 |
| Government consumption/ GDP | 0.08 | 0.12 |
| Inflation rate | 8.42 | 16.51 |
| Standard deviation of inflation | 8.75 | 19.38 |
| Black market exchange rate premium | 4.65 | 75.03 |
| Standard deviation of premium | 6.53 | 105.69 |
| Share of exports to GDP | 0.44 | 0.29 |
| Note: Mean per capita growth rate = 1.92 | | |
| Fastgrowers: One standard deviation greater than or equal to the mean growth rate. (cutoff= 4.0; n=12) | | |
| Slowgrowers: One standard deviation less than or equal to the mean growth rate. (cutoff = −0.2; n=15) | | |

However, the nature of the relationship between policy and growth is far from settled. Controversy continues on which policies, if any, have growth effects as opposed to one−time effects on the level of income. For example, some authors have argued that policies that induce distortions are relatively unimportant because they have only one−time effects on income that seldom amount to more than a few percentage points (e.g. Rodrik (1990)). Others question the causality of the relationship between the policy variables and growth of the type shown in Table 1. Substantial controversy remains as to which policies explain relative successes and failures, and to what extent external factors play a role relative to national policies. Other doubts exist whether the relationship between policy variables and growth is the simple linear one usually assumed, or is more complex, with thresholds for effective minimum reforms.

1 Appendix I provides a brief survey of the literature. A more extensive survey can be found in Renelt (1990).

## A—
## Growth Experience of Developing Countries

The issue of which policies affect long−run growth has become especially critical as many developing countries seek to reestablish (or in some cases, establish for the first time) conditions for growth in the 1990's, after the poor record of the 1980's.

### 1—
### Experience over 196588

Table 2 presents growth rates for 1965−89 and 1980−89 for different country classifications. Three important facts stand out: (1) growth rates over the last 25 years vary widely across countries and regions; (2) developing countries have not in general grown more rapidly than developed countries over the last 25 years; (3) the 1980's was a disastrous decade for many developing countries. Sub−Saharan Africa stands out with a poor growth record on all counts, East Asia with an outstanding growth record. However, wide divergences exist among countries in the same region. This record suggests that large variation in growth rates across countries needs to be explained; it is critical to understand the extent to which national policies can do so.

Table 2 also presents some ranges of growth rates for growth in socialist countries, illustrating the uncertainty surrounding socialist economic performance. The high values of estimates imply respectable performance, which has been interpreted by some to support the conclusion that high distortions (such as those induced by planning) do not have growth effects.2 The low estimates imply a strong effect of distortions, since investment rates for most of these countries were very high.

Preliminary analysis of developing country data indicates some suggestive regularities. We find that growth over time is not very stable—the correlation for growth in countries across successive 5−year periods is low.3 Moreover, poorer countries have more unstable growth rates, which may be related to greater policy instability in the poorest countries. The high variance of growth rates is at least suggestive that relatively frequent changes in policy may help explain changes in growth rates over successive periods (and possibly that uncertainty itself depresses growth). We will discuss the analysis of the lack of persistence in growth rates below.

### 2—
### Long−Run Experience

While this project will focus mainly on the recent period for which most of the data is available, a longer−run perspective is also helpful. Figure 1 shows some estimates of long−run growth (since 1870) in developing and developed countries for which long time−series are available. The striking fact that emerges from this graph is that growth is much more unstable for

2 Lucas (1988). However, opinion seems to be swinging towards lower estimates. IECSE is conducting research on the estimation of growth in socialist countries in transition.

3 The cross−period correlations are generally below .4 and in many cases below .2 (these results are available in Levine and Renelt (1990b)).

| Table 2: Growth rates of output per capita, 1965 to 1989 | | |
|---|---|---|
| Growth rates of output per capita, 1965 to 1989 | | |
| | GDP per capita Annual averages | |
| Country group | 1965−89 | 1980−89 |
| Low−and middle−income economies | 1.4% | 0.1% |
| Low−income economies | 0.5% | −0.2% |
| Middle−income economies | 2.1% | 0.3% |
| Sub−Saharan Africa | 0.6% | 0.5% |
| Highest − Botswana | 9.4% | 7.8% |
| Lowest − Niger | −3.2% | −4.8% |
| East Asia | 4.1% | 3.6% |
| Highest − Korea | 7.7% | 8.2% |
| Lowest − Philippines | 1.1% | −1.8% |
| South Asia | 1.7% | 2.3% |
| Highest − Pakistan | 0.1% | 3.0% |
| Lowest − Bangladesh | | |
| Latin America and the Caribbean | 1.0% | −1.2% |
| Highest − 6089 Brazil, 8089 Colombia | 4.2% | 1.3% |
| Lowest − Nicaragua | −1.8% | −3.9% |
| OECD | 2.6% | 2.0% |
| Highest − Japan | 4.5% | 1.3% |
| Lowest −6589 New Zealand, 8089 Netherlands | 1.2% | 1.4% |
| Socialist economies (low range, high range) | Low | High |
| China (196588) | | 5.4% |
| Algeria (196588) | | 2.7% |
| Yugoslavia (196588) | | 3.4% |
| Czechoslovakia (194888) | 0.8% | 3.5% |
| Hungary (194888) | 1.7% | 5.1% |
| Poland (194888) | −0.1% | 3.6% |
| Bulgaria (194880), 194888) | 2.8% | 5.5% |

| | | |
|---|---|---|
| Soviet Union (196085) | 1.6% | 4.5% |
| Average of last 5 socialist economies | 1.4% | 4.4% |
| All averages are unweighted. Oil−dominated countries have been excluded. | | |
| Sources: | | |
| Non−Socialist economies taken from WDR 1990 and updated 1989 with World Bank data Socialist economics as follows: | | |
| Algeria − from Summers and Heston (1988) | | |
| China − from Statistical Yearbook of China 1984. | | |
| Yugoslavia − from Statistical Yearbook of the SFRY, various years | | |
| Czechoslovakia, Hungary, Poland, and Bulgaria − from Fischer and Gelb (1990), UN (1948), and WDR 1990. | | |
| Soviet Union − High rate is from official numbers, and low rate is from Selyunin & Khanin (1987) | | |

developing countries than for developed countries.4 Most of the developing countries show distinctive starts and stops in their pattern of development. The most famous case, Argentina, grew slightly above the OECD average over 1870−1913, but has lagged well behind ever since (with a particularly alarming decline after 1973). Ghana had respectable growth in 1913−50, then lagged badly in 1950−73, and finally went into catastrophic negative growth after 1973 (from which it is now recovering). Of the 11 developing countries shown, only 2 show reasonably steady growth—Brazil and Colombia. Aside from the disruption of wars and other exogenous shocks, it is plausible that changes in policy regimes had much to do with shifts in growth performance. By contrast, the greater steadiness of growth in developed countries may reflect a more stable policy regime.

For other developing countries, there is some doubt whether sustained per capita growth has ever taken place. The incisive study of Reynolds (1985) concluded that per capita growth had not begun in 7 out of the 40 countries he was analyzing.5 The 1990 World Development Report defines the level of "extreme poverty" as US$275 per capita consumption in 1985 PPP prices, while US$370 per capita defines simple "poverty". According to data from Summers and Heston (1988), there are 8 countries below the extreme poverty line, while there are another 14 countries below the upper poverty line.6 If we assume that the poverty line (or the extreme poverty line) approximates the range of minimum subsistence income, this would imply that income in these countries today is not much different from what it was in the distant past.7 Government policies may help to explain why countries have failed to grow. The analysis of the growth−poverty relation will be discussed in a later section.

## B—
## Contribution to Knowledge of Policy−Related Issues

If specific policies help explain a significant portion of the substantial differences in long−run growth shown here (and thus huge differences in per capita income), this should help convince even the most reluctant statesman to adopt reforms. As Robert Lucas said. "The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else."8

Whether policy has growth effects has long been a controversial issue. In the traditional neoclassical framework, based on the work of Solow, policies have an effect only in the transition after a policy change, not in the long

run. Recent theoretical models have extended the Solow model by endogenizing technological change, making it either another form of capital or

4 The only exceptions to the steady growth pattern of the developed countries are Japan and Spain, both of whom made the transition from developing to developed countries over the period shown.

5 The countries were Afghanistan, Bangladesh, Ethiopia, Mozambique, Nepal, Sudan, and Zaire.

6 The "extremely poor" countries are Zaire, chad, Ethiopia, Somalia, Malawi, Tanzania, Ghana, and Rwanda, while the "poor" countries are Zambia, Burundi, Liberia, Niger, Burkina Faso, Guinea, Uganda, Angola, Mali, Sierra Leone, Central African Republic, Togo, Kenya, and Nigeria. It is significant that all of these countries are in Africa, suggesting there are region−wide factors that need to be considered, as will be done in one of the proposed case studies described below.

7 This argument was suggested by Lant Pritchett.

8 Lucas (1998), p. 5.

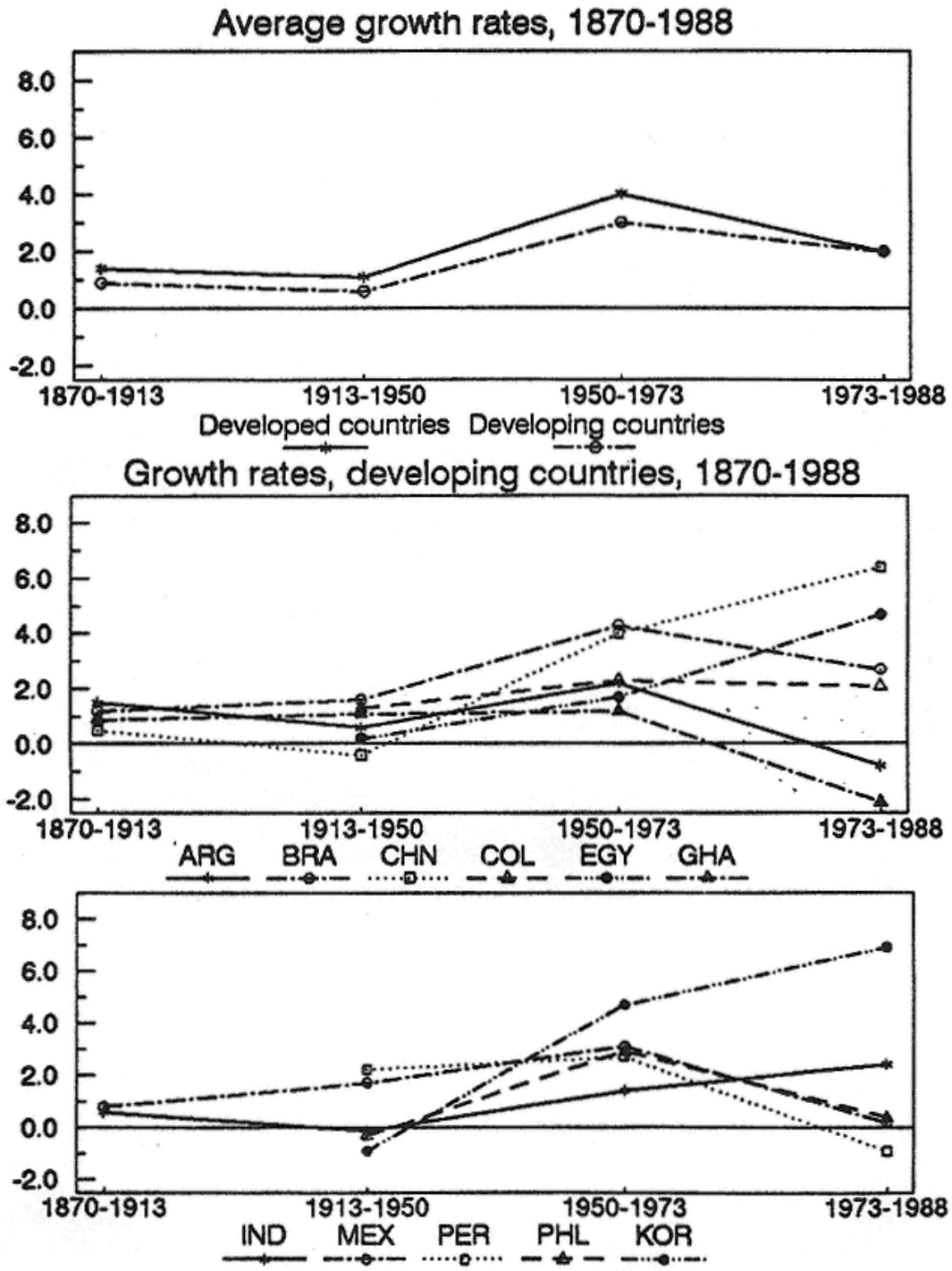
Average growth rates, 1870-1988
8.0
6.0
4.0
2.0
0.0
-2.0
1870-1913
1913-1950
1950-1973
1973-1988
Developed countries
Developing countries
Growth rates, developing countries, 1870-1988
ARG
BRA
CHN
COL
EGY
GHA
IND
MEX
PER
PHL
KOR

Figure 1

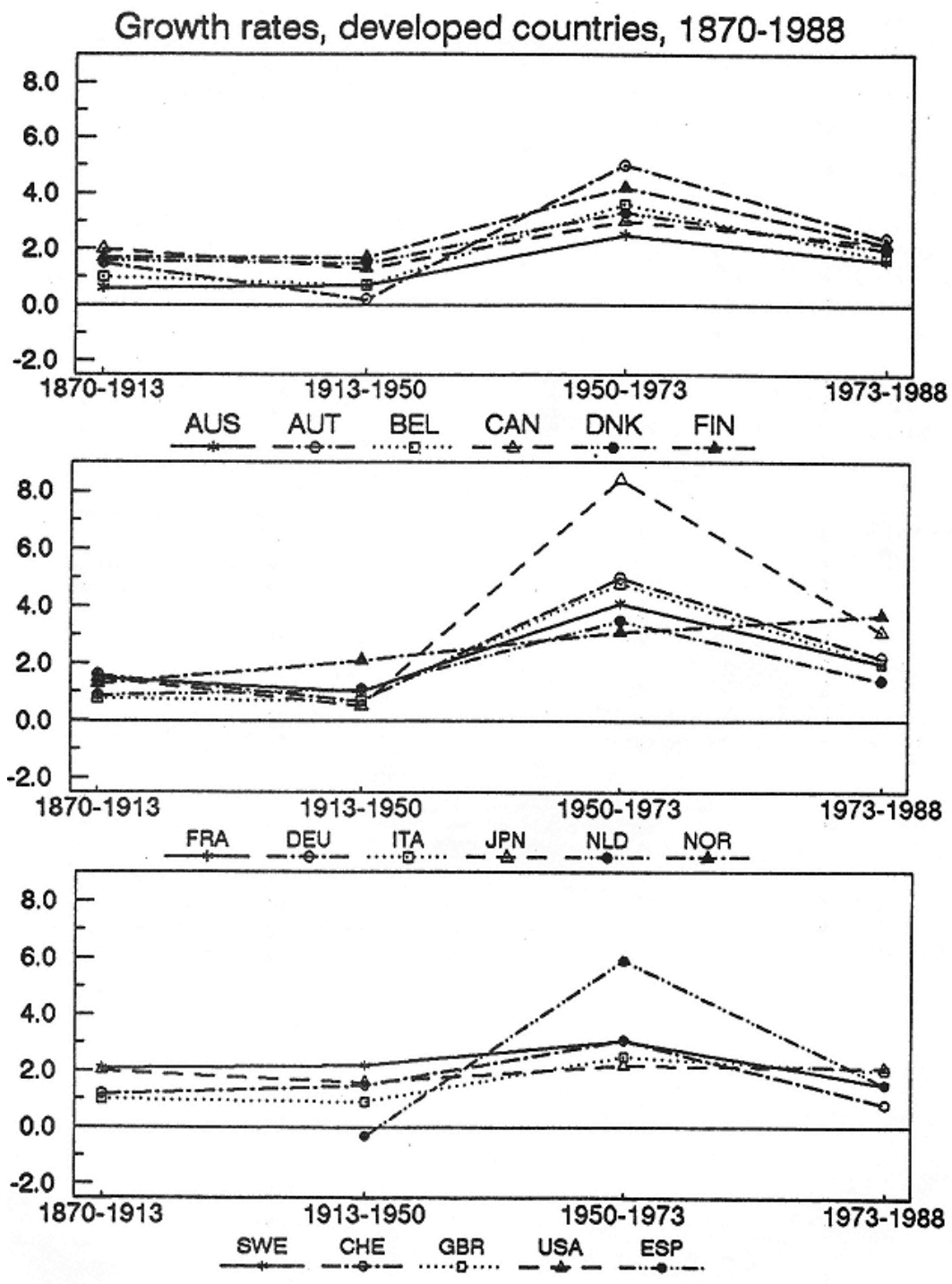


Figure 1
(continued)

hypothesizing spillovers from physical and human capital investments. In the simple model that we use in this paper, all factors of production can be accumulated. Such a model implies long−run growth effects both from the overall incentive to accumulate capital (related to overall taxes, macroeconomic stability, etc.) and from distortion of resource allocation. In this model, fiscal, monetary, trade, and financial policies can affect the level and efficiency of factor accumulation and thus steady−state growth rates.9

## C—
## Empirical Methodology

An important and influential strand of empirical research on economic growth has focused on "growth accounting": estimating the proportion of growth attributable to changes in labor and capital inputs, with the residual assumed to represent total factor productivity growth. This paper proposes a different approach. Instead of analyzing the "factor sources of growth", this agenda suggests analyzing the "policy sources of growth".

The framework we set out yields testable implications regarding each policy and also illustrate the implications for growth of interactions among policies. Research could investigate the predictions from theory in an effort to better understand the relationship between national policies and long−run growth.

There is also a substantial literature using cross−country and time−series analyses to search for empirical links between long−run growth rates and economic, political, and institutional variables.10 It is difficult to compare effects of policies from this literature, since authors study different sets of countries, over different years, use different explanatory variables, measure policy indicators differently, and employ different data sets. In addition, most investigators consider only a small number of explanatory variables in attempting to establish a statistically significant relationship between growth and a particular variable of interest For example, many authors who examine the relationship between fiscal policy and growth omit variables measuring trade and monetary policies, while authors who study the importance of trade policy commonly omit fiscal and international financial policy variables.

Thus, we suggest a number of extensions. First, test a set of hypotheses emerging from a common framework. Second, by compiling a comprehensive data base, compare new findings to past findings and discover the sources of important discrepancies. This will help extract the most reliable inferences. Third, consider a broad range of national policies. This will allow one to quantify which national policies are most important in determining growth and to address important interactions among policies. Fourth, conduct detailed sensitivity analyses to gauge the confidence one should have in the findings and to uncover new areas for economic research.11

9 However, the consequences of the level effects in the neoclassical model approach the growth effects of the "new" model a s the capital share become large.

10 Appendix I contains a survey of the theoretical and empirical growth literature. See also the reviews by Chenery, Robinson, and Syrquin (1986), Chapter 1 and Levine and Renelt (1990b).

11 See the original work by Leamer (1985) and its application to growth by Levine and Renelt (1990a).

## D—
## Relevance of the Agenda to Policy

The present model used by most World Bank economists assumes a linear relationship between investment and growth (the incremental capital−output ratio—ICOR). The ICOR is often assumed to improve (i.e. decline) in response to reforms such as trade or financial liberalization. Although often criticized for the lack of a clear theoretical foundation, the ICOR model is a useful first approximation to capture the link between investment and growth. However, it gives little guidance to evaluate what kind of reforms are likely to raise growth for a given investment rate, or what the magnitude of such growth effects might be. It also omits the effect of changes in the level and efficient allocation of human capital. Research could make a useful contribution by providing a framework to explicitly connect policies to efficiency and growth.

| **Box 1: Measurement of growth** |
| --- |
| We generally assume that GDP is the appropriate measure of national output, and that it is measured correctly in the available date. However, we should take note of serous measurement issues that have been raised in the literature, and use existing work in the field to avoid drawing conclusions based on spurious growth in output. |
| One difficulty that has been mentioned in the literature is that GDP is uncorrected for depreciation of capital assets and depletion of natural resources (International Economics Department (1989), Ah mad Et, al. (1989)) Data on depreciation and depletion are generally scant for developing countries, and definition al issues are formidable. Nevertheless, a few rough corrections could be made. For example, it has been noted that output growth in oil producing countries is biased since extraction of oil is essentially conversion of an asset into cash rather than true production. Taking this and environmental degradation into account, Repetto et.al. (1989) lowered the estimate of growth in Indonesia from 7 percent to 4 percent over 1971−84. In cases where countries with large mineral sectors are being studies, the project will examine growth in the non−mineral sector to see how much it differs from the usual growth estimates. |
| Another problem with measurement of both levels and growth rates of GDP is changes in relative sectoral prices across countries and over time. Drastically different relative prices or misaligned exchange rates makes dollar GDP incomparable across countries—this problem has been addressed in the International Comparisons Project (Summers and Heston (1988)). A similar problem is that constant−price growth rates in a single country are not robust to changes in the base year, since the weighting of different sectors can change drastically with a change in the base year (Azam, Guillamont, and Guillamont (1988). In the countries we analyze, we will look at the robustness of growth rates and income levels across different methodologies. |

The results from a research agenda like this should be helpful in evaluating long−run growth effects of adjustment packages. Although the importance of long−run growth is universally acknowledged, little analytical effort is spent on evaluating the growth consequences of policies relative to their short−run macroeconomic impacts. It is well known that policies to reduce macroeconomic imbalances could reduce long−run growth. For example, many debtor countries followed the combination of raising import taxes and reducing public infrastructure investment in response to the cutoff of external financing after 1982 even though it may well have reduced growth potential ((Corbo et al. (1987), Easterly (1989), Sachs (1990)).

This research would also contribute to the academic debate on the size and sign of the long−run effects of macroeconomic adjustment and structural reforms (e.g. Rodrik (1990), Sachs (1987)). The bringing together of a diverse group of academic economists and Bank staff should

generate fresh insights into the relationship between policy and growth.

## II—
## Design of the Research Agenda

The strategy followed in the agenda is to set out and test the simplest possible framework under which policies

have growth effects. This framework generally has unambiguous predictions as to which policies have growth effects, and the sign of those effects. We recognize that the framework leaves out numerous interactions that may complicate the relationships set out here. Indeed, whole branches of macroeconomics, public finance, international trade, and finance are devoted to analyzing the magnitude and signs of most of the effects predicted here. Nevertheless, we argue that the broad brush treatment given by the framework of this agenda is a useful starting point. The policymaker and country economist do not have the luxury of analyzing effects in isolation but must evaluate a set of policies together. For this, a simple framework is needed if the analysis is not to quickly become intractable.

## A— Analytical Framework

In this section, we set out a theoretical framework relating specific policies to growth. We present first policies that affect growth by affecting the level of investment, then policies that affect the efficiency of investment. Some of the policies enumerated above affect both the level and efficiency of investment, and will be discussed in both sections.

### 1— Policies That Affect Incentives to Capital Accumulation

We first present a model in which the level of investment is the only economic variable that affects long−run growth—we abstract from any investment allocation issues. Policies in this framework alter growth by affecting the level of investment.

We assume that output (Y) is proportional to "capital" (K), which is broadly defined to include physical and human capital:12

$$Y = A K \tag{1}$$

The coefficient A is assumed not to vary either over time or across countries. Labor implicitly enters the model through K, since human capital is utilized only to the extent that people are in

the labor force and are employed. That is, if k is human capital per person and N is number of employed persons, then the component of K due to human capital is equal to kN.

We assume an economy closed to inflows or outflows of capital, so the rate of saving and

12 This production function was suggested by Rebelo (1991), and used in the work of Barro (1990,1991) and King and Rebelo (1990).It bears a resemblance to the linear output−capital models long used in the development literature.

the rate of investment are equal.13 If the economywide rate of accumulation of new capital (and saving) is a fixed proportion of output, i, then growth of output g will be given by:

$$g = iA - \delta \tag{2}$$

where $\delta$ is the rate of depreciation of capital. We should stress again that investment, i, is broader than the conventional definition since we include also human capital accumulation.14 We see that growth depends only on the economywide level of investment, i, and the technologically fixed parameters, A and $\delta$ .

We are omitting an explicit description of how population growth enters the model, although it will be included in the empirical implementation.15 Since population growth is considered to be exogenously fixed for the purposes of this proposal, it does not affect the policy−growth relationships we set out whether we interpret growth as per capita or gross output growth.16

Since growth depends only on investment, we need to analyze how policy affects investment We assume that economic agents maximize the present value of their future welfare extending indefinitely into the future. This is a useful first approximation to the plausible notion that investors must be rewarded with adequate returns to their capital in order to willingly postpone consumption.17 With investment responding in this way, the common growth rate of output, consumption, and capital will then be given by:

13 This assumption will be maintained throughout the analysis except for the consideration of direct foreign investment The assumption of a dosed capital market does not role out capital flows such as official credits, aid, or rationed commercial loans, which can be easily accomodated in this framework. Few developing economies are integrated with international capital markets, so the simplifying assumption of a closed capital market seems reasonable. For those that are open, the model would need to incorporate complications such as adjustment costs of investment. Similar effects of policy obtain in such an open capital market model (details available upon request).

14 This creates a potential measurement problem for "investment," to which we propose several imperfect but workable solutions. One is to try to directly measure human capital investment (such as education and health spending); this will generally only be possible in restricted samples. Another is to assume that in the long run, the policies we are considering do not affect the composition of investment between human and physical capital; this is restrictive, but permits the use of the conventional investment rate as a proxy for all investment. Finally, other proxies for human capital investment can be used, such as enrollment rates and health indicators. We will experiment with all three approaches and test applicable restrictions. In cases where the measurement problems prove insuperable, we can still use the reduced form relation between growth and policies to be presented next.

15 If labor supply is exogenous, then it will grow with population. To see the effect of population growth on per capita output growth, we need to make an assumption about the degree of spillover of capital across generations. If there is complete spillover (so that each new person is endowed with the existing average, k), then population growth is neutral—there is no effect on per capita growth of higher population growth. If there is zero or less than complete spillover, then higher population growth lowers per capita output growth.

16 There is a rich literature on economic determinants of fertility and population growth (see, for example, Birdsall (1989)). We omit the potential feedback from policy to population growth in order to limit the scope of the proposal, assuming that such feedback effects are small in comparison to the direct policy effects on growth that we analyze.

17 Evidence on the response of saving to rates of return is inconclusive (see Gersovitz (1988) and Herbal, Web and Corsets (1990)).

$$g = (A - \delta - \rho)/\sigma \tag{3}$$

where $\rho$ is the rate of discount and $I/\sigma$ is the intertemporal elasticity of substitution.18

Growth is given by the difference between the net rate of return on capital ($A-\delta$) and the rate of discount $\rho$, times the intertemporal elasticity of substitution. The higher is the rate of return to capital, the higher is growth. Since many policies affect how much of the return to capital investors can retain, this will be the channel through

which such policies affect growth.

**a—**
**Fiscal Policy**

We consider first a universal tax on income, r. The after−tax rate of return to capital becomes A(l−τ ), so growth will be given by:

$$(4) \quad g = (A(1-\tau) - \delta - \rho)/\sigma$$

The model makes a simple, testable prediction: growth is negatively and linearly related to the income tax rate, with coefficient −A/σ . This assumes that the revenues from the tax are not used for anything that itself increases the economy's capital, such as government investment It also assumes that the tax cannot be evaded. Since government capital and tax evasion both affect the efficiency of investment, the implications of these will be explored in the next section.19

We next note that a tax on output, such as a sales tax of rate t, will have the same effect as an income tax in this framework. An output tax applied to investment purchases will imply a net rate of return of A/(l+t). Thus, an output tax shifts down the net rate of return the same way an income tax does.20

However, if the sales tax on output applies only to consumption, then there will be no growth effect Since no tax is paid on investment, there is no effect on the rate of return, and

18 We are assuming that all individuals have identical preferences, so we are abstracting from the savings and investment effects of distributional shifts stressed by, e.g., Taylor (1983).

19 Note that if the tax revenues are implicitly or explicitly transferred back: to consumers, the tax would not affect the overall rate of saving and investment if private saving were a fixed ratio to private income. However, with endogenous investment and saving, the growth effects of higher taxes are the same regardless of whether the revenues from the tax are consumed by the government, transferred back to consumers, or otherwise "wasted".

20 An output tax of rate t is equivalent to an income tax of rate t/(1+t).

thus no effect on growth. This model makes the strong prediction that taxing investment (through a general income or output tax) lowers growth, while taxing consumption does not.21

The implication that investment taxes harm growth while consumption taxes do not could also be examined with cross−country data on the price of investment goods and consumption goods from Summers and Heston (1988), since prices can be assumed to reflect implicit taxes. De Long and Summers (1990) have put the relative price of producers' durables into a cross−section growth regression. Their finding that a low price of producers' durables is associated with high growth is suggestive. We suggest exploring these results further with disaggregated data on relative prices of different types of investment goods, and by separating out the effects of investment prices and consumption prices.

**b—**
**Monetary Policy**

Monetary policy in developing countries is often driven by the financing needs created by the public sector deficit22 The inflation created by monetary growth operates as a tax on holdings of money. It is reasonable to suppose that money is used to purchase investment goods, and money must be held for some minimum period to

make the transaction. Inflation will thus act like an output tax on investment purchases, and the effects on growth will be essentially equivalent to those described for the output tax in the previous section:

$$g = (A/(1+\beta\pi)-\delta-\rho)/\sigma \tag{5}$$

where $\pi$ is the inflation rate and $\beta$ is a parameter reflecting the average length of time that money must be held in advance of investment transactions. Thus we have the strong prediction that there is a negative relationship between growth and inflation.23

This representation of the long−run growth effects of monetary policy as equivalent to a marginal tax is no doubt too simple. As we will examine in the next section, inflation may cause resources to shift between sectors. In addition, the effect of monetary policy will depend on fiscal policy decisions, so that it is impossible to treat them separately. With both income taxes and the inflation rate, the growth relationship becomes

$$g = \frac{A(1-\tau)/(1+\beta\pi) - \rho - \delta}{\sigma} \tag{6}$$

21 The relative merit of consumption and income taxes has been extensively debated in the public finance literature within the context of the traditional neoclassical model (see Atkinson and Stiglitz (1960) for a discussion). Note that the strong conclusion of no growth effect of consumption taxes would be overturned if labor supply were highly responsive to real wages and the revenues from the consumption tax were completely transferred back to taxpayers. Our hypothesis depends on the Joint probability of these two conditions being low.

22 The consistency relation between government revenue, spending, borrowing, growth and the inflation tax is stressed by Anand and van Wijnbergen (1989) and van Wijnbergen (1989).

23 This is analogous to results obtained for the neoclassical model by Stockman (1981. See also Mino (1990).

**Box 2: How does growth begin? Why does growth stop?**

It is also useful to consider models in which growth take place at all because of bad policies. As mentioned in the introduction, not all developing countries show evidence of sustained per capita growth. Other economies that previously had experienced growth seem to have ground to a half in the last decades (for example, we see zero per capita growth for Argentina 196888, Nigeria 196087, and the Philippines 197586). We present here some basic models in which policy determines not only the level of growth, but whether growth takes place at all. (See also Nelson (1956), Azariadis and Drazen (1990), Becker, Murphy, and Tamura (1990), Murphy, Shleifer, and Vishny (1989), Rebelo (1990), and Easterly (1990a)).

a. Economies with poverty traps

In section II.A.1, we assumed that, other−things equal, all countries should have the same saving rate. In reality poor countries, in particular those with income levels near the poverty line, tend to have very low rates of saving. This phenomenon can be easily captured by introducing into the utility function the 'subsistence' level of consumption, such that savings goes to zero as income approaches subsistence. This formulation makes the rate of savings very inelastic when the level of income is near subsistence. The growth rate of income for an economy with these preferences

is:

(1) $$g = \frac{A(1-\tau)-\rho-\delta}{\sigma}(1-\kappa/K)$$

where $\kappa$ is the capital stock that is consistent with the subsistence consumption level. In developed economies the term $\kappa/K$ is close to zero and so the rate of growth is basically that given by equation (4).

Policies that increase $\tau$ in such a way that $A(1-\tau) < \rho + \delta$ will make the economy converge toward the "poverty trap" $\kappa$. Once the capital stock is near $\kappa$ a policy change that makes $A(1-\tau) > \rho + \delta$ will lead the economy to expand. But this recovery process can be very slow. It can take a long time for the rate of expansion to increase significantly and the brush with poverty will leave permanent scars. A period in which $\tau$ is temporarily high will make the income level in the economy permanently lower.

b. Models with fixed factors

So far we have assumed that fixed factors do not enter into production. However, a model in which fixed factors become unimportant only at higher income levels, which seems broadly plausible in light of modern industrial development, would give similar results. Jones and Manuelli (1990) have proposed a production function of this type. This model has the interesting property that policy can cause an economy to best stuck in zero per capita growth, where fixed factors prevent growth as they do in the Solow model. This would happen if the tax rate (or an equivalent penalty) on capital accumulation is high. A low tendency to save and/or high rate of population growth would make the zero growth equilibrium more likely.

The intuition behind the nature of the zero growth trap in the Jones−Manuelli is straightforward. As the capital−labor ratio rises,the after−tax marginal product of capital will gradually decline to a constant, which depends on the technology and on the level of the tax rate. If this constant (the minimum after−tax rate of return to capital) is greater than the sum of the population growth rate and the rate of discount, then consumers will find it worthwhile to keep increasing the capital−labor ratio,and growth will ensue. If the condition does not hold (because taxes are high, for example), then consumers will not have sufficient incentive to indefinitely raise the capital−labor ratio, and output per worker will stagnate. This is a similar result to the model of section a, although here stagnation could take place at any income level, not just at subsistence income.

Both of the models of this section imply inequalities involving the tax rate, which suggests an important policy lesson. A minimum threshold for reform may be needed to have any effect on growth.

This indicates that the growth effects of inflation are smaller, the larger is the fiscal tax rate, and vice versa. Given these complexities, individual researchers will be encouraged to look also at interaction terms between inflation and other policy indicators, as well as at alternative measures of monetary policy.

## 2— Policies That Affect Efficiency of Resource Allocation

In this section, we consider policies that affect the efficiency of investment In other words, the policies considered here have an effect on growth even if investment is unchanged. These results are particularly interesting because they challenge the common presumption that efficiency matters only for the level of income, not for the rate of growth in the long run. If we consider the reduced form relation between growth and policy for the policies in this section, the relationships will generally be nonlinear, unlike the simple linear relationships implied by the policies in the previous section.

We need to generalize the model of section 1 to consider two types of capital K1, and K2 :

$$Y = A\,F(K_1,K_2) \tag{7}$$

where A is a technologically fixed parameter and F is a function capturing how the two types of capital can be combined to produce output We assume that this function displays all the usual properties: constant returns to scale and a diminishing marginal product of each input. Note that any policy that affects the two types of capital the same way will have the same effects as those described in the previous section. However, we want to consider policies that penalize one of the types of capital relative to another.

The two types of capital will be given various interpretations depending on the policy described. We will assume that the relative price of the two types of capital is fixed (at unity), either because they represent two alternative uses of the same good, or because they are traded internationally. In the absence of any policy intervention, producers in competitive markets would equate the marginal products of the two types of capital:

$$F_1 = F_2 \tag{8}$$

Using (8), we can solve for the ratio of K1 to K2 and rewrite (7) as follows:

$$Y = A\phi K \tag{9}$$

where K is the total value of the two types of capital (=K1 +K2 ), and is a function of the parameters of the function F, reflecting the efficient allocation of capital.

In the fixed rate of investment case, the rate of growth will be given by:

$$g = iA\phi - \delta \tag{10}$$

where i is the sum of the investments made in the two types of capital goods.24 Note that growth now depends on the efficiency parameter $\phi$ , even though A is still fixed.

If the rate of investment is endogenous, then growth will be given by the following:

$$g = (F_2 - \delta - \rho)/\sigma \tag{11}$$

Growth will respond to the net marginal product of capital (we could put the marginal product of either type of capital, since they are equal according to (8)), as in the previous model.

These growth equations are the same as before, with the exception of the efficiency parameter σ . Policies that penalize one type of capital relative to another will lower this parameter and result in lower growth, even if investment is unchanged. Growth would also fall with endogenous investment, since the social rate of return to capital will fall with distortionary policies.

**a—**
**Fiscal Policy**

i—
Differential Taxes

We consider now a tax that applies to some types of capital goods but not others. One example would be given where K1 is interpreted to be human capital and K2 physical capital, and τ is a tax that applies to labor income (income from human capital) but not to profits (income from physical capital). Another example would be where income from capital in the formal sector (K1 ) is visible to the tax authorities and subject to tax, whereas income from capital in the informal sector (K2 ) can be hidden from the authorities and evades the tax. In any case of this type, the after−tax marginal products of the two types of capital will be equated:

$$(12) \qquad (1-\tau)\, F_1 = F_2$$

The tax introduces inefficiency, because it induces too much of the second type of capital to be held, and too little of the first type. Thus, higher differential taxes will induce lower growth both for a given rate of investment, and in a reduced form relation where investment is endogenous. In terms of the equations above, the efficiency parameter ϕ will be a negative (generally nonlinear) function of the tax rate:

$$(13) \qquad g = A\,\phi(\tau)\, i - \delta \qquad\qquad \phi' < 0$$

This model would suggest an equation considerably different from that usually tested in the literature: there would be an interaction term between the investment rate and a nonlinear function of the tax rate.

The after−tax rate of return to capital (either (l−τ )F1 or F2 ) will fall, inducing lower growth also when investment is endogenous as in (11):

24 We continue to assume a closed capital market so that investment equals saving. If the capital market were fully open and there were adjustment costs to investment in the two goods, we would get similar policy effects to those discussed below.

$$(14) \qquad g = (F_2(\tau) - \delta - \rho)/\sigma \qquad\qquad F_2' < 0$$

The testable hypothesis is that a tax rate applying only to some investment goods but not to others lowers growth, both for a given rate of investment and when the investment rate is chosen optimally.

For example, with a CES function with a high elasticity of substitution, the relationship between the rate of tax and growth is that shown in figure 2.25 The efficiency implications of the tax rate (i.e. the effect on growth with a fixed investment rate) at first are small, then increase sharply as the tax rate rises. This shape also has the interesting implication that growth stays above a certain minimum no matter how high the tax rate, which reflects the possibility of substituting away from the highly taxed input Since the curve is flat at high tax rates, this implies a certain minimum threshold reduction in taxes must be achieved to have a significant growth effect when one starts with a high tax rate.

The relation between output and income taxes is analogous to the previous section. A sales tax which applies to investment purchases of type 1 capital goods, but not type 2 capital goods, will act the same as a tax on income from type 1 capital.26 Thus, a sales tax on formal sector purchases that can be evaded in the informal sector will have the same efficiency−lowering effects as the income tax above.

The results for consumption taxes are also analogous to the previous section. A tax that distorts consumption decisions has no effect on growth in this model, because it does not affect the allocation of investment. Thus, a sales tax that applies only to some consumption goods and not others, while lowering the efficiency of consumption and harming consumer welfare, would not lower the rate of growth in the long run.

ii—
Public Spending Financed with Distortionary Taxes

An inadequate level of essential public capital−such as roads, telephones, water supply systems, etc.—is also a distortion affecting efficiency of resource use. If such public capital can only be financed by distortionary taxes of the type discussed in the previous section, then one has a complex tradeoff between the two distortions.

The production function could be expanded to be:

$$Y = A\,F(K_1, K_2, K_g) \tag{15}$$

where Kg is government capital. The parameter on Kg in this equation will vary across countries or regions if the productivity of government capital varies (this can be tested in the pooled timeseries regressions). We assume government capital is financed with a fixed share sg of the

25 The picture shown is with an elasticity of substitution−3. While a high elasticity may seem unreasonable in an economy with only 2 capital goods, with many capital goods it is likely that there are close substitutes to any capital good that is taxed. This model assumes only 2 types of inputs for simplicity. With multiple capital inputs, there could be multiple tax differentials. A decrease in one tax rate in isolation could increase the overall level of distortion (for an example, see Easterly (1990c)).

26 This equivalence is noted in Atkinson and Stiglitz (1980).

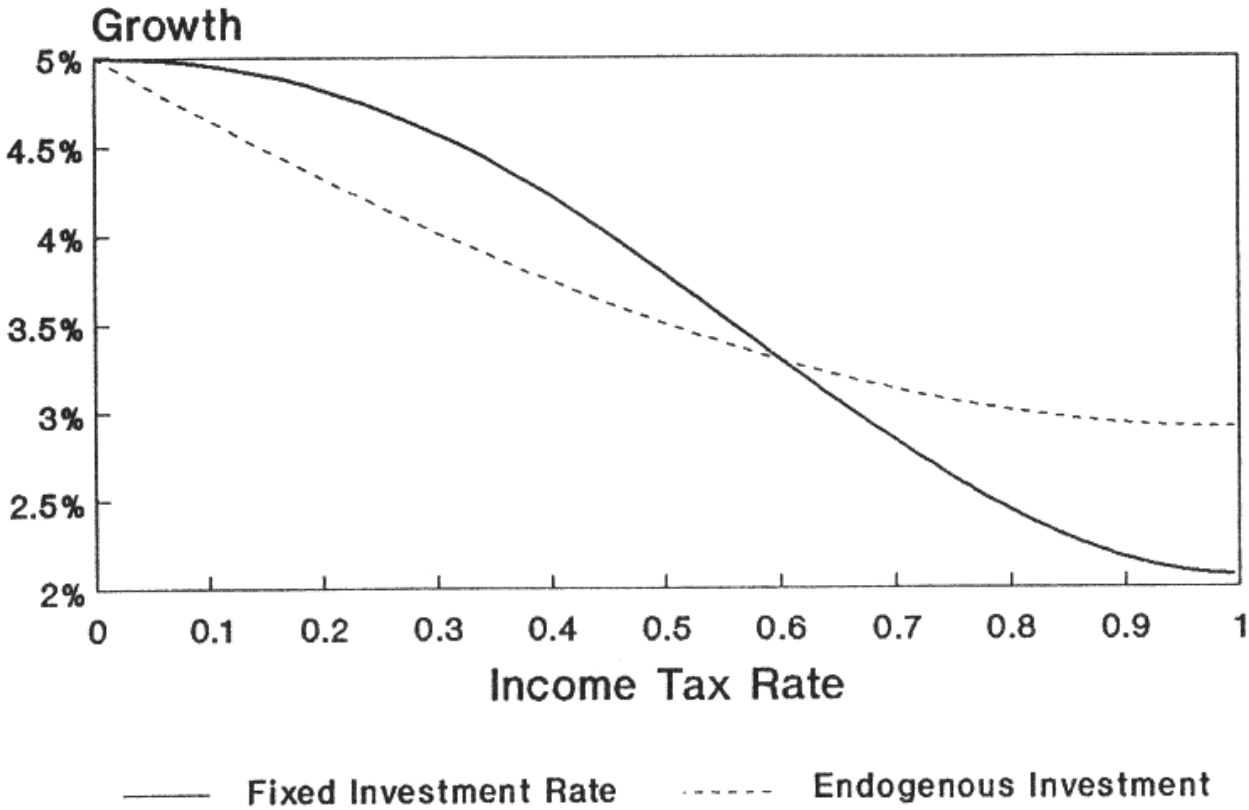


Figure 2
Growth and Distortionary Income Tax Rate

revenues from a tax on formal sector income, to use the example from the previous section. If we reinterpret total capital K from equation (9) as including government capital Kg , then the efficiency parameter ϕ and the marginal product of private capital F2 will be a positive function of the share of productive government spending Sg . Efficiency ϕ will be a positive function of τ at low levels of the tax rate and a negative function at high levels. At a low level of taxes, the marginal product of new public capital will generally be higher than the distortionary loss of output caused by the tax, while the opposite will be true at high levels.

This implies the following equation for growth with a given investment rate:

(16) $g = A\,\phi(\tau,s_g)\,i - \delta \qquad \phi_1 > 0 \text{ at low } \tau,\ \phi_1 < 0 \text{ at high } \tau,\ \phi_2 > 0$

The testable prediction is that growth for a fixed investment rate is higher, the higher the share of government revenue going to productive investment, and is related nonlinearly to the tax rate. With endogenous investment, the equation becomes:

(17) $g = (F_2(\tau,s_g) - \delta - \rho)/\sigma \qquad F_{21}>0 \text{ at low } \tau,\ F_{21}<0 \text{ at high } \tau,\ F_{22}>0$

Growth is nonlinearly related to the tax rate (positively at low levels, negatively at high levels), and positively related to the share of government spending going to investment.

iii—
Uncertainty and Fiscal Policy

a— Fiscal Policy

Uncertainty about marginal tax rates can also have growth effects. If the marginal tax rate on the taxed capital good is uncertain (because of macroeconomic instability, for example), risk averse investors will substitute out of the capital good with the uncertain private return and into the other capital good. This uncertainty has an additional negative effect on the economy's growth rate from the distortion induced by the tax itself. In particular, assuming the tax rate on the first capital good is random with an expected value of $\tau$ , this will introduce a positive risk premium, P, into the equation that determines the allocation of resources:

$$E[(1-\tau)F_1] = E[F_2] + P(VAR(\tau); \tau) \quad (18)$$

where E[] is the expected value operator. P increases when the variance of the tax rate, VAR($\tau$ ), rises. Thus an increase in the variance of the tax induces a substitution into capital good 2, which lowers the marginal product of capital and the economy's growth rate.27

The testable prediction emerging from this analysis is that increased uncertainty regarding the private returns to investment across capital goods alters the allocation of resources and lowers the economy's growth rate for a given investment rate.28 This uncertainty may reflect high and variable fiscal deficits, an "overhang" of external debt, possibilities of expropriation, uncertainty

27 See the textbook by Ingersoll (1987) for a formal derivation.

28 There are some circumstances when tax uncertainty will not alter savings decisions. This occurs if tax revenues are completely rebated with certainty, tax uncertainty is uncorrelated with other policies and productivity shocks, and agents are identical.

regarding tax enforcement, or uncertainty about the tax rate in specific sectors of the economy.29 For example, individuals have to decide how much time and resources to invest in human capital and how much to invest in physical capital. If there is more uncertainty regarding the private returns to physical capital, the uncertainty will cause too much human capital investment and lower growth. Various empirical proxies for these risks will be used to measure the risk associated with tax uncertainty including the variability of the fiscal deficit, the external debt ratio, the variance of average tax rates, variations in the sectoral composition of tax revenues, and measures of political uncertainty that have been used to quantify the uncertain returns to easily appropriated investments [Barro (1991)].

It is worth emphasizing the interactions between tax uncertainty and other policies. The magnitude of the risk premium in equation (18) depends on the existence and level of policy distortions besides tax uncertainty. Thus, the growth effects of increased tax uncertainty depend on the marginal tax rate and other policies.30 Similarly, in the case where tax revenues can be spent on activities that increase the return to private investment, the magnitude of the risk premium in equation (18) and the growth effects of increased tax uncertainty will depend on the manner in which government resources are spent. The potential importance of these interactions and interrelationships among policies will be examined empirically by including interaction terms in the cross−country and pooled studies.

**b—**
**Monetary Policy**

With more than one type of capital good, inflation may have an efficiency impact, in addition to the effect on growth through the level of investment described in the previous section. This would be true if some investment goods required money to be used to purchase them, while others did not. For example, if there is a subsistence or household sector that does not use currency for transactions, then inflation ($\pi$ ) will act as a tax on capital in the modern sector but not in the subsistence sector. Growth will be lowered for a given rate of investment the same

way as described for a tax on one type of investment good in the previous section:

$$g = A\,\phi(\pi)\,i - \delta \qquad \phi' < 0 \tag{19}$$

Uncertainty about inflation can also slow growth by distorting investment decisions if inflation affects sectors differentially. The inflation tax and uncertainty about inflation will cause investors to devote a smaller fraction of their investments to the sector (which we assume to be K1 ) affected by the inflation tax, which reduces economic growth. Formally,

$$[(1-\tau)/(1+\beta\pi)]E(F_1) = E(F_2) + P(VAR(\pi); \pi, \tau) \tag{20}$$

29 For the role of the external debt overhang in creating uncertainty, see Sachs (1988). On uncertainty induced by unstable policies, it is interesting to recall the higher variance of growth rates in low income countries (Section I.A.1). This raises the interesting possibility that policy uncertainty could contribute to a low−income "trap" of the kind dicussed in Box 2.

30 For example, uncertainty about taxes has less negative impact on growth the higher is the expected marginal tax rate. This is because a high tax rate itself lowers growth so much that the additional effect from uncertainty is small.

where $\pi$ = inflation, VAR($\pi$ ) = variance of inflation, P() is the risk premium associated with uncertain inflation, and E() is the expected value operator. Empirically, the variance of inflation and of growth rates of monetary aggregates can be used to measure monetary policy uncertainty.

Again, it is worth noting that interactions between inflation uncertainty, the inflation rate, and fiscal policy may be empirically important. The risk premium depends on policies other than inflation uncertainty, and the growth effects of inflation uncertainty will depend on the level of other policy distortions.31 Indeed, higher inflation alone could induce greater uncertainty about future marginal taxes because inflation can interfere with the value of collected taxes. Examination of these policy interactions will be an important component of the empirical inquiry.

### c— Financial Policy

Policies toward domestic financial market activities can also have important growth effects in this model. Financial market policies affect growth by interfering with the ability of financial markets to manage risk, evaluate and monitor firms, gather information, and mobilize resources.

As the discussion above has already indicated, differential uncertainty about the rate of return to investment can reduce growth by distorting the allocation of investment. Assume that sector one is composed of firms that receive productivity shocks.32 Individuals can diversify away the risk of productivity shocks by investing in a financial intermediary (such as a bank) that owns or lends to many firms. However, if investors cannot diversify away this risk by investing in many sector one firms because policies interfere with the ability of financial markets to allocate risk, then the return to investing in sector one, F1 , becomes random. This will alter the allocation of investment:

$$E(F_1) = E(F_2) + P(VAR(F_1)), \tag{21}$$

where P is a risk premium that increases when the variance of returns to sector one firms rises, VAR(F1 ).

Uncertainty plays the same role in preventing the efficient allocation of capital (where F1 = F2 ) that a tax does.

The empirical prediction illustrated in equation (21) is that financial market policies that interfere with the ability of financial markets to help investors diversify risk can reduce growth for a given rate of investment by altering allocation decisions.33 The types of financial policies that can inhibit financial market activities include direct taxes on financial institutions, high reserve requirements, interest rate controls, direction of credit toward favored sectors and other less

31 For example, in the model above, the risk premium becomes smaller if the inflation rate is higher or marginal tax rates are higher for a given variance of inflation because higher inflation itself reduces investment in the currency−using sector. Thus, this predicts that the higher the inflation rate or the higher the fiscal tax rate, the smaller is the negative effect of increased inflation uncertainty on growth.

32 Sector two firms can also receive shocks. The important point is that one sector is riskier than another, so that uncertainty can alter allocation decisions.

33 Levine (1990, 1991) demonstrates this formally for specific financial institutions.

direct intrusions. Some financial policies may also directly distort resources by favoring one type of capital relative to another (for example, a credit subsidy for certain types of investments). In the individual case studies, attempts will be made to gather direct measures of these policies. In the cross−country analyses, aggregate measures of the performance of the financial system will be used.34

Financial markets do more than manage risk. They evaluate firms, monitor managers, collect and process information about the national and global economy, and mobilize capital. These traits are captured by Greenwood and Jovanovic (1990), Greenwald and Stiglitz (1989, 1990), and Levine (1990, 1991). In the context of this proposal's model, these financial market traits imply that restrictive financial market policies can reduce growth for a given investment rate by worsening the allocation of resources. Since financial market policies can both influence the uncertainty faced by investors and the rate of return to private investment, the growth effects of financial market policies will depend on other policies and the growth affects of other national policies will depend on financial market policies.35 Again, these potentially important interactions among policies would be an important and novel part of an empirical inquiry.

**d—**
**Trade Intervention and Exchange Rate Policy**

To consider the effects of trade policy, we now interpret the two capital goods as representing two different types of goods that are both traded internationally (with price ratio fixed at one for convenience). The second type of capital good K2 is made up of the domestically produced good, used for domestic consumption, investment, and exports. The first type of capital good, K1 is imported from abroad. An import tariff (or an equivalent quota) now operates as a differential tax on the first type of capital good. As in the case of a domestic tax differentially applied, a higher import tariff T lowers growth for a given rate of investment; the relationship is nonlinear:

$$g = A\,\phi(T)\,i - \delta \qquad \phi' < 0 \tag{22}$$

Also the tariff distortion will only lower growth if it applies to investment goods (and intermediate goods); tariffs that distort only consumption decisions have a negative welfare impact but no effect on long−run growth. The testable prediction is that the average tariff rate on investment goods and intermediate inputs should enter in a growth equation as an interaction term with investment.

While this result was framed in terms of a single import good, it would also hold for differential tariffs (or quotas) on different types of imported capital (or intermediate) goods. For example, we could interpret the two types of capital goods as both imported, while the domestic output is only used for consumption and exports. Then a higher tariff on one of the imported

34 There are problems with existing empirical proxies of financial market policies. The proxies will be discussed below, but they include identification of severely negative real interest rates, ratios of very broad money measures to GDP, and the fraction of all financial assets held by the central bank.

35 In this model, for example, fiscal and inflation taxes have larger growth effects in an economy with well−functioning financial markets than in an economy with highly restrictive financial market policies. The growth effects of policy interactions is demonstrated formally in Levine (1991).

goods will introduce a differential between their before−tax marginal products, lowering growth for a given amount of investment. This suggests that measures of dispersion of tariffs should also enter the growth equation in interaction with the investment rate.

We should also note that uncertainty as to tariff rates will have the same depressing effect on growth (for given investment) as tax uncertainty, suggesting that a measure of variance of tariff rates (or import quotas) over time should be added to the equation. This implies that temporary import liberalization will not help growth.36

Finally, the effect of exchange rate controls could be examined in this framework. Rationing of foreign exchange at the official exchange rate often leads to the emergence of a black market, where foreign currency is sold at a large premium over the official rate. If allocation of foreign exchange at the official rate is made for some types of imported inputs but not for others, then the black market exchange rate premium acts like a differential tax on those inputs for which no foreign exchange is allocated.37 Again, the relationship between the black market premium p and growth will be nonlinear, albeit always negative:

$$g = A\,\phi(p)\,i - \delta \qquad \phi' < 0 \tag{23}$$

**e—**
**Policies on Foreign Direct Investment**

The discussion of foreign direct investment often refers to the special benefits thought to be embodied in foreign capital—technological and commercial know—how and other human capital attributes of foreign specialists, the advanced technology embodied in physical capital investments made by foreign firms, etc.38 With this in mind, a natural way to treat foreign direct investment is as a separate factor of production that complements domestic capital.

In terms of the model that we are using in this section, we can think of capital type 1 as the stock of cumulative foreign direct investment, while capital type 2 is the capital stock owned and operated by nationals. Since capital type 1 contains unique features associated with foreign investment, nationals do not have the option of investing in it; conversely, foreigners cannot invest in type 2 capital. We also continue to maintain the assumption that nationals do not have access to international capital markets. We will study only the case of endogenous investment and saving by nationals.

Since foreign nationals have the option of investing their money at the international interest rate, the equilibrium condition for the stock of foreign investment will be that its marginal

36 A literature on uncertainty and investment supports this conclusion (e.g. van Wijnbergen (1985) and Rodrik (1989)).

37 This assumes that the authorities can enforce that the inputs imported at the official rate are used in production and not simply resold on the black market. If inputs are freely traded on the black market, then the allocation of foreign exchange at the official rate simply generates pure rents, with no efficiency implications. However, generally resources are used to evade the controls of the authorities, or used to lobby to receive the rents, in which case the efficiency effects described continue to hold. A large literature on rent−seeking and smuggling makes these points (e.g. Krueger (1974)).

38 See Helleiner (1989) and Inotai (1990) for a survey. See also the discussion in Appendix I.

product be equal to the international interest rate.39 We consider policies that levy a differential income tax on the income from foreign capital, which implies that it is the after−tax marginal product that is equated to the international interest rate:

$$(24) \qquad (1-\tau)\, A\, F_1 = r^*$$

The marginal product of type 1 capital (foreign investment) will be higher the lower is the ratio of foreign to domestic capital. A higher tax on foreign investment will require a higher marginal product from foreign capital, and thus will imply a lower ratio of foreign to domestic capital in the long−run.

With endogenous investment, the growth rate of the economy will be given by:

$$(25) \qquad g = (A\, F_2(\tau) - \delta - \rho)/\sigma \qquad F_2' < 0$$

Citizens in the economy will accumulate type 2 capital at a rate that depends on the marginal product of that capital. More foreign investment (because of lower taxes, for example) implies a higher marginal product of domestic capital, so it will imply a higher growth rate. (The ratio of foreign to domestic capital will be fixed in the long run by (24) and thus the two types of capital will grow at the same rate.) The theory thus makes a strong prediction: taxation of foreign capital will decrease foreign investment and lower growth.40

**f— Sectoral Policies**

The model of distortions can be applied naturally to the consideration of sectoral policies. Equation (7) can be used to think of policies that affect the relative prices of different types of investment goods, such as physical versus human capital, or equipment versus structures. Disaggregated data from Summers and Heston (1988) can be used to examine the relative prices of different types of physical investment goods as measures of price distortions. In testing the predictions of the model, one could exploit also the disaggregated data on quantities of investment by type available from this data set.

Equation (7) is also a useful short−cut to think of the sectoral composition of inputs to aggregate production.41 For example, type 1 capital could be interpreted as being made up of manufacturing goods and type 2 capital as being made up of agricultural goods (although we

39 Of course, this determination of foreign direct investment is oversimplified for the purposes of clarity. Lizondo (1990) contains a survey of the theory.

40 This argument could be taken to an extreme, implying that subsidizing foreign capital would actually raise growth. There are two caveats that should be made to this conclusion. First, subsidies of foreign capital must be financed—such as by a tax on domestic capital. With Cobb−Douglas production, for example, growth would decline with an increase in the subsidy rate financed by an increase in the tax rate on domestic capital. Second, an increase in the growth rate achieved by a subsidy on foreign investment actually worsens welfare, since it induces investment whose return does not cover the opportunity cost to the economy of the capital, which is given by the international interest rate, r. There is a long tradition in the literature recognizing this kind of "immiserizing growth", e.g. Bhagwati and Brecher (1980), and Brecher and Diaz−Alejandro (1977). The same conclusion holds true for any other distortion (such as tariffs) that acts as a subsidy to foreign investment.

41 Although we speak of all inputs as "capital", this framework can also be used to analyze distortions of prices of intermediate inputs.Such distortions have analogous effects on growth to those of distortions of capital goods prices.

continue to think of output as one composite good). The wedge between marginal products of the two types can be interpreted as a differential tax that distorts the relative price of the two sectors. The tax may be implicit rather than explicit, as could arise from quantity rationing, price controls, differences in effective protection rates, etc. Relative price data from Summers and Heston (1988) could be used also to assess sectoral relative price distortions.42 World Bank data on the sectoral composition of output like that used by Syrquin and Chenery (1989) can be used to examine whether the structure of output (relative to a "normal" structure) is related to such sectoral distortions.43 Other direct measures of sectoral distortions could also be used, such as the measures of differential taxation of agriculture developed by Krueger, Schiff, and Valdes (1988).

The disaggregated data will be used in the examination of each of the policy areas listed above. The relative price and quantity data will be related to broad measures of the various policies to assess the sectoral implications of policies. For example, one would test whether the existence of financial repression is associated with relatively expensive capital goods, relatively cheap industrial goods, etc. The resulting effects on growth can then be examined in cross−country regressions.

#### g—
#### Interactions among Resource Allocation Policies

For simplicity, we have so far presented interaction effects as involving at most two policies together. Of course, in real world applications, there are many policies that affect many types of capital goods in different ways. In particular, some policies may have offsetting effects on growth. For example, one policy may penalize one type of capital while another policy subsidizes it, with zero net effect. While such an exact offset is unlikely, the total effect of a set of distortionary policies on growth will be generally less than the sum of the individual policy effects. In the empirical implementation, it is important to include interaction terms among the policies to capture these offsets.

### B—
### Synthetic Issues

Some issues cut across policy areas:

#### 1—
#### Growth and Welfare

A major preoccupation of the development literature is the extent to which per capita income growth translates into welfare improvements for the poor and for the population as a whole. There are three elements that will be considered: (1) how the additional income arising from growth is distributed, (2) how much income is correlated

with social indicators, and (3) how

42 An analogous exercise is that of Dollar (1990), who looked at the price of the same consumption basket relative to a benchmark country from Summers and Heston (1988) as a measure of trade policy distortion (including a correction for variation of nontradable prices across countries). De Long and Summers (1990) is also relevant here.

43 A well−known regularity discussed by Chenery and Syrquin (1989) is the tendency of the share of industry to rise and agriculture to fall as per capita income rises. The approach of the "patterns" literature associated with these authors is to associate deviations from this path with policy regimes and other factors. We would follow this approach to examine specifically the effect of sectoral distortions. We may also examine the predictions of different models for the trend in the agricultural share. For example, Rebelo (1991) presents a model in which some sectors use fixed factors (like agriculture using land), while other sectors use only reproducible inputs. Sustained growth is still possible, and the share of the fixed factor sectors will fall under some parameter configurations.

income growth relates to the environment.44 While recognizing the large literature on these issues, the project will examine fresh evidence for the relationship between welfare and growth. This is important both to assess whether raising income growth is a sensible policy objective, and to identify any feedback effects on growth from the social consequences of the growth process.

**a—**
**Inequality and Growth**

Table 3 shows a comparison of per capita incomes of the poorest 20 percent of the population and the average per capita income for those countries that have data on income distribution. The table shows a high degree of correlation (.77) between the per capita income and the income of the poorest part of the population—differences in inequality do not dominate differences in per capita income across countries. If we think of per capita income as the sum of past growth, this suggest that growth dominates redistribution as a factor in the income of the poor.

But the outliers give pause to the notion that cross−sectional growth differences are all that matters—the income of the poorest fifth in Brazil is only sixty percent of that in Morocco, despite Brazilian per capita income being two and a half times larger. Similarly, the poorest in Botswana are slightly worse off than in India, even though Botswana's per capita income is three times larger. However, even in these outliers, the relationship between growth and inequality is unclear—would Botswana's poor be better off if the country had not grown?

A large literature has found similar patterns to that displayed in table 1, both intertemporally and cross−sectionally. Fields' (1989) survey of the literature indicates strong evidence of reduction in absolute poverty being associated with growth, with poverty "more apt to decrease the more rapid is economic growth".45 The notion that absolute poverty tends to increase with economic growth has been decisively refuted. The 1990 WDR found that income of the poorest tenth grew more rapidly than per capita income in 9 out of 11 developing country growth episodes. But outliers still exist—in Costa Rica, the poor suffered an absolute decline in income despite average per capita growth of 3.5 percent over 197186.46

The famous Kuznets hypothesis that inequality first rises and then falls with income has also been examined in the literature. Cross−section studies have tended to confirm it, while intertemporal studies—which seem more appropriate—have found little evidence for it (Fields (1989), WDR 1990).

Other studies have looked at how inequality itself may lower growth because it tends to lead to policies that harm growth. Alesina and Rodrik (1991) found that higher inequality tends to lower growth in the subsample of

democracies but is insignificant in nondemocratic countries. Almost identical results were found by Persson and Tabellini (1991), although the significance of

44 We do not consider another issue in this section that was briefly mentioned elsewhere in this proposal: growth could be immiserizing because policy distortions may exist that cause too much investment.

45 Fields (1989), p. 174.

46 WDR 1990, p. 48.

Table 3
Inequality and growth

| | Percent share of income of lowest 20 percent (various years, 1980's) | Per capita income 1988 | Per capita income lowest 20 percent |
|---|---|---|---|
| Bangladesh | 9.3 | 170 | 79 |
| India | 8.1 | 340 | 138 |
| Pakistan | 7.8 | 350 | 137 |
| Ghana | 6.5 | 400 | 130 |
| Sri Lanka | 4.8 | 420 | 101 |
| Indonesia | 8.8 | 440 | 194 |
| Philippines | 5.5 | 630 | 173 |
| Cote d'Ivoire | 5.0 | 770 | 193 |
| Morocco | 9.8 | 830 | 407 |
| Guatemala | 5.5 | 900 | 248 |
| Botswana | 2.5 | 1010 | 126 |
| Jamaica | 5.4 | 1070 | 289 |
| Colombia | 4.0 | 1180 | 236 |
| Peru | 4.4 | 1300 | 286 |
| Costa Rica | 3.3 | 1690 | 279 |
| Poland | 9.7 | 1860 | 902 |
| Malaysia | 4.6 | 1940 | 446 |
| Brazil | 2.4 | 2160 | 259 |
| Hungary | 10.9 | 2460 | 1341 |

| | | | |
|---|---|---|---|
| Yugoslavia | 6.1 | 2520 | 769 |
| Venezuela | 4.7 | 3250 | 764 |

Correlation Coefficient, per capita income and income of lowest quintile: 0.77

Source: World Development Report 1990

inequality was rather marginal. Lindert and Williamson (1984) present evidence against the Kaldor hypothesis that, because it is the rich that save, inequality is necessary for high saving and growth.

The project would consider inequality in two ways. First, measures of inequality (e.g. the ratio of the income share of the top to the bottom quintile) will themselves be tried as dependent variables as part of each policy task, to examine whether the same policies that affect growth also affect inequality. Second, inequality measures will be used as independent variables in growth equations to test whether higher inequality can make a given policy more or less damaging to growth. The synthesis task will explore further the empirical regularities between income growth and inequality to address the effectiveness of per capita growth as an instrument to reduce poverty.

### b—
### Growth and Other Welfare Indicators

Per capita income shows a high degree of correlation with social indicators such as life expectancy, daily calorie supply, low birth weight, secondary enrollment, infant mortality, maternal mortality, and access to safe drinking water and sanitation services (table 4). The correlation is less strong between income and the crude death rate, population per physician, primary enrollment, and literacy ratios. There is also a correlation between percent changes in calorie supply, population per physician, and infant mortality and income growth, while percent changes in primary and secondary enrollment, literacy, life expectancy, and the crude death rate are essentially uncorrelated with growth.47

Simple correlations may understate the relation between social indicators and income because the relationship may be nonlinear, as suggested by Ingram (1989). He confirmed a statistical relationship that implies that life expectancy, primary enrollment, and daily calorie intake improve rapidly as income rises from low levels, then level off as income rises beyond a certain middle income threshhold. This is plausible since these indicators are inherently bounded. This helps to explain Ingram's finding of strong unconditional convergence across countries in social indicators, even though he finds no evidence of unconditional convergence in incomes.

However, there are sizeable outliers to the income−social indicator relationship. The WDR 1990 noted a striking phenomenon—a major improvement in life expectancy and primary enrollment in Africa over 196585 despite negative growth in per capita consumption.48 Conversely, Pakistan registered little improvement in net enrollment over 196585 (it was still only 43 percent in 1985) despite per capita growth of 2.5 percent over the period.49

The relationship between growth and improvements in social indicators supports the study of growth as a generally useful proxy for broader notions of welfare improvement. However, the existence of large outliers suggests an examination of factors that can cause social improvement and growth to diverge. Social indicators to some extent reflect conscious choices made by the government and by private individuals. For example, the allocation of public expenditure has a major impact on many indicators. In each of the policy studies, we will develop one or more social indicators to be tested as dependent variables along with per capita growth as functions of policies. Some of the social indicators may also be proxies for the level or rate of accumulation of human capital, which suggests their inclusion on the right hand side of those equations that also include physical

capital investment.

47 Work for the 1991 WDR by Surjit Bhalla found reasonable correlations between changes in per capita income and changes in educational attainment, infant mortality, and political liberty, although the last correlation is rather weak. However, he cites other studies that claim a high correlation between per capita income and political and civil liberty (Dasgupta and Weale (1990), Scully (1988)). Looking at infant mortality, the 1991 WDR found evidence that both income growth and government health expenditure explain its decline in developing countries (King and Rosenzweig (1991), Bhalla and Gill (1991)). Correlations between changes in indicators can be seen as a stronger test of association given the possibility of spurious correlations between variables with trends.

48 WDR 1990, p. 40 Another social indicator, per capita daily calorie supply, did fall in 16 African countries over 196586. (WDR 1990, table 28).

49 ibid., p. 43.

Table 4
**Income and Social Indicators**

| | 1985 Correlation between per capita income and level of: | Correlation bet, 196585 per capita growth and percent change 196585 in |
|---|---|---|
| Life expectancy | .67 | .02 |
| Crude death rate | −.31 | .01 |
| Daily calorie supply per capita | .70 | .33 |
| Babies with low birth weight (%) | −.52 | |
| Primary enrollment | .28 | −.15 |
| Secondary enrollment | .76 | −.09 |
| Population per physician | −.35 | −.33 |
| Infant mortality rate | −.64 | −.40 |
| Maternal mortality rate | −.43 | |
| Percent of population with access | | |
| to safe drinking water | .66 | |
| to sanitation services | .60 | |
| Female literacy ratio | .14 | |
| Male literacy ratio | .18 | |
| Deforestation | | −.11 |

### c—
### Growth and the Environment

Another important welfare indicator is the state of the environment. The poor quality and great scarcity of data has inhibited quantitative work relating growth to environmental degradation. Table 4 shows that one of the few quantitative measures available, the percent rate of deforestation, shows little correlation with aggregate growth (and in fact is the "wrong" sign compared to the popular perception that growth causes deforestation). However, this is just as likely to reflect the unreliability of the data as any lack of relationship between growth and deforestation.

Some recent research on industrial countries has suggested that, with proper policies, reasonable economic growth can be compatible with preserving the For example, the rapid fall in energy use in the OECD countries (23 percent fall in energy requirements per unit of GDP over 197087) suggests that other inputs can be elastically substituted for exhaustible resources if price incentives are sufficiently strong (Pearce (1990)). However, this process should not be seen as costless—some have argued that environmental regulations lowered productivity growth in the U.S. in the 70's and 80's (Jorgenson and Wilcoxen (1989)).

In the developing world, deforestation, soil erosion, and pollution have imposed significant economic costs, both measured and unmeasured. It is conceptually unclear whether higher economic growth worsens or improves the environment. The tradeoff in welfare between conventional income and environmental quality is also unclear (and may differ across countries or across income levels). While higher growth implies higher growth in demand for exhaustible resources, it also may imply a shift away from use of exhaustible resources. For example, deforestation in the Sahel and the Philippines is associated with consumption of fuelwood by the poorest segment of the population—increased income could lead to substitution of less environmentally costly forms of energy for fuelwood. Rising income could also lead to greater demand for environmental preservation.51

### 2—
### Persistence of Growth Rates

A surprising fact is the low persistence of countries' growth performance across periods, as mentioned in the first section. Table 5 shows the cross−section correlation between growth in subsequent decades to be around .3. This captures the persistence of relative performance, since the correlation is with respect to deviations from the average for all countries. In other words, this correlation measures the degree to which being an above−average performer one period is a good predictor of being an above−average performer the following period. Since this correlation is with respect to the period average, it removes any common global trends in growth rates. Several hypotheses could explain the low persistence of relative performance.

Policies. While policy regimes are commonly thought to be highly persistent, this is not true for all policies, as shown in table 5. The government current expenditure variables—consumption and education spending—are the most persistent, far more so than growth.

50 See the useful survey of Pearce (1990) and the heuristic treatment of Anderson (1990).

51 We have worked out an example in which natural resources (assumed to be in fixed supply) not used in production enter the utility function. Sustained growth requires that the elasticity of substitution in production between reproducible inputs (capital) and natural resources be greater than one. With a Cobb−Douglas utility function, the use of natural resources in production goes asymptotically to zero in the optimal plan, i.e. all natural resources are preserved for their utility value. Whether the market can replicate the optimal plan depends on appropriate pricing of natural resources.

Table 5
**Persistence of policies and growth performance**

| | Cross−section Correlation between 1960s and 1970s | Cross−Section Correlation between 1970s and 1980s |
|---|---|---|
| Per capita Growth | .26 | .32 |
| Black market premium | .62 | .45 |
| Inflation | .40 | .41 |
| Labor force growth | .70 | .79 |
| Government Consumption/GDP | .76 | .64 |
| Government Education Spending/GDP | .75 | .74 |
| Government Investment Spending/GDP | | .49 |
| Real interest rates | .48 | .32 |
| Trade orientation | .56 | |
| Comparing 197385 with 196373, based on 1987 WDR List of four categories: | | |
| 1. strongly outward oriented | | |
| 2. moderately outward oriented | | |
| 3. moderately inward oriented | | |
| 4. strongly inward oriented | | |

However, government investment, trade orientation, inflation, the black market premium, and real interest rates are not very persistent (although still more persistent than growth).52 We will examine the ability of policies to explain the low growth persistence by examining the standard errors of pooled time−series cross−section regressions that use decennial averages for growth rates and policy variables.

Random error. A stochastic growth model, such as that of Rebelo (1991a), implies that growth will be given by a component dependent on policies and a stochastic term reflecting random shocks (such as those to the rate of return to capital). The policy component itself is less than perfectly persistent, as noted above. A plausible variance level in the stochastic term could

52 Most of these "policy" measures contain endogenous elements. However, it seems plausible that cross−country variation in, for example, inflation, black market premia, and real interest rates is mainly due to policy choices on money creation, exchange rate controls, and interest rate controls, respectively.

explain a significant portion of the low persistence of growth rates. We performed some Monte Carlo simulations that indicate that the observed low persistence of growth rates, combined with persistence of about .6 of policies, could be reproduced with a standard deviation of 1.7 percentage points on growth rates. The project will explore further the amount of random variation underlying growth rates. The random error could be interpreted as cyclical

movements, random technological or natural shocks (such as a drought), or external shocks.53

External shocks. External shocks represent one particular type of random error that could cause low persistence in growth rates. However, studies such as Mitra et al. (1990) and Balassa and McCarthy (1984) have found little evidence for strong effects of external shocks on growth rates.54

Transitional dynamics. Some models in this proposal would imply transitional dynamics that could cause growth to be unstable over time even with unchanged policies. For example, initially rapid and then decelerating growth could arise from transitional dynamics in an initial situation where there are imbalances between the quantities and rates of return of different types of capital. Transitional dynamics could be incorporated in the analysis by, among other things, including income level or initial capital stocks as an independent variable.

## C—
## Empirical Methodology

Empirical analysis should use formal econometric techniques in evaluating the predictions of the analytical framework. This section (1) repeats the main hypotheses, (2) discusses measures of national policies and, (3) outlines the cross−country procedures.

Since the empirical predictions have already been discussed in the Analytical Framework section above, Table 6 simply collects the major hypotheses that could be tested.

The major themes that emerge from the analytical framework are (1) national policies or uncertainty about national policies affect long−run growth (and do not just have one−time level effects) by altering the level of investment; (2) policies also affect growth by distorting the allocation of resources; and (3) there are important linkages among policies. For example, for a given level of investment, distortionary taxes like inflation tend to slow growth but productive government expenditures can contribute to faster growth. Thus, the growth effects of more inflation may depend on how the resources from the inflation tax are spent. In addition, the model indicates that policies that affect the allocation of resources generally have non−linear effects on growth.

Some indicators of national policies are provided in Table 7; Table 8 lists international data sources. We recognize that there are conceptual and statistical problems with these

53 In the Monte Carlo simulation, we assumed that the random error was serially uncorrelated. Serial correlation of an error in the level of output (like a cyclical error term) could induce negative autocorrelation of growth rates, which would make observing a low cross−period correlation more likely. The simulation is also constrained to reproduce the observed cross−sectional variance. The help of Lant Pritchett on this simulation is gratefully acknowledged.

54 See the Summary of this issue in Bhalla (1991 WDR, chapter 2).

measures. Research is needed to design and construct more accurate measures of fiscal, monetary, trade and financial policies. Also, since the listed indicators are commonly used, it is useful to determine whether these variables reliably predict growth. If these policy indicators are useful in explaining growth, then they may be useful target indicators in formalizing policy reform packages.

Empirical implementation should update earlier datasets. For example, the compilation of census data on educational attainment by Psacharopoulos and Arriagada (1986) could be updated with 1990 census observations in some countries.

From the WDR 1991 database, one could use the following variables:

1. Estimates of factor inputs (capital stock, labor force, arable land, and mean education of the working population for 68 countries). Some of the specifications that will be tested include factor accumulation on the right hand side so as to test for the effect of policies on efficiency. The factor input data will be useful in this regard.

2. Welfare indicators (infant mortality, female/male ratios, mean index of civil and political liberties). These and other indicators will be useful to examine the correlation between growth and more general welfare improvement.

3. Data on project economic rates of return used in a recent paper by Kaufmann (1991).

4. Government expenditures for health and education (original source is IMF and UNESCO); private spending on health (available for 19 countries, original source is United Nations). The government spending data will be important for the analysis of fiscal policies; the private health spending will be useful in measuring factor inputs.

5. Trade policy indicators (average tariff rates, nontariff barriers (UNCTAD), index of trade liberatlization—196084 (Papageorgiou, Choksi, Michaely), index of trade liberalization—197888 (Halevi, Thomas), price distortion index (modified version of Dollar (1991).

6. Direct foreign investment flows (55 countries, 197089).

7. Political indicators (irregular executive transfers).

8. Measures of inequality (35 countries).

| Table 6<br>Summary List of Hypotheses to be Tested | | |
|---|---|---|
| See table 4 for lists of the concepts to be used, and table 5 for a preliminary list of sources. The statements in bold type give the econometric implications; the same hypotheses will be tested less formally in the qualitative studies. Note that some of the econometric implications refer to the reduced form relation between growth and policies, while others refer to the structural equation with growth as the dependent variable and both investment and policy variables on the right hand side. | | |
| I. Fiscal and Monetary Policies | | |
| | A. | Uniform income, output, sales, and inflation taxes (whose revenues are not spent on productive human and physical capital Investments) slow growth by reducing the investment rate. Tax and inflation rate measures will be significantly negative in a growth regression that excludes the investment rate, as well as in an investment regression. |
| | B. | Taxes (including the inflation tax) that differentially affect productive sectors slow growth for a given rate of investment by distorting resource allocation. Tax and inflation rate measures will also be significantly negative as an interaction term (possibly nonlinear with investment in a growth regression. |
| | C. | Consumption taxes have no growth effects. Measures of the consumption tax rate will not be significant in growth regressions. |

| | | |
|---|---|---|
| | D. | Shifting government expenditures to productive public goods increases growth for a given investment rate, and for a given tax rate and tax structure. The share of education, health, and physical capital investment in government spending will be significantly positive in a growth regression that includes the investment rate. |
| | E. | Taxes spent on productive investments have positive or negative growth effects depending on the distortion induced by the taxes and whether the provision of public goods is too low or too high. There will be a positively sloped portion of the tax rate−growth relation at low tax rates in the nonlinear interaction term of B above. |
| | F. | Uncertainty about fiscal and monetary policy reduces growth by distorting the allocation of investment. The variability of fiscal deficits, revenues, and inflation rates will be significantly negative in a growth regression that includes the investment rate. |
| II. Trade Policies and Policies on International Capital Flows | | |
| | A. | Distortions of domestic prices by tariffs, quotas, and exchange rate restrictions (or uncertainly about these policies) slow growth for a given rate of investment by distorting resource allocation. Measures of the average level and dispersion of tariffs and quotas, the black market exchange rate premium, and their variance over time will be significantly negative as an interaction form with investment in a growth regression. |
| | B. | Restrictions or differential taxes on foreign investment (or uncertainty about these policies) slow growth. A dummy variable or tax rate variable measuring openness to foreign capital will be significantly positive in a growth regression. |
| III. Financial Sector Policies | | |
| | | Impediments to domestic financial market activities (such as interest rate controls, directed credit, high reserve requirements, and other taxes) retard risk pooling, informational processing, and resource mobilization. This lowers growth both by reducing investment and distorting the allocation of investment. Reserve requirements, and a dummy variable for countries with highly negative real interest rates will be significantly negative in a growth regression, with or without investment included. |

| **Table 7: Data for analysis of policy and growth** |
|---|
| MEASURES OF OUTPUT, EMPLOYMENT, AND POPULATION GROWTH |
| Gross output growth (GNP and GDP) |
| Robustness checks:4 |
| alternative base years |
| excluding extraction of exhaustible resources |
| Population growth |

| |
|---|
| Labor force growth |
| Employment growth (man−hours where available, which will be seldom) |
| **MEASURES OF PRIVATE FACTOR ACCUMULATION** |
| Private investment in physical capital |
| Private education spending |
| Measures of enrollment (primary, secondary, higher−level) |
| Measures of human capital stock from previous studies |
| Measures of health (such as infant mortality and life expectancy) |
| **MEASURES OF POLICY** |
| Fiscal policy |
| Fiscal deficits: |
| consolidated nonfinancial public sector deficits |
| structural deficit |
| variance of overall and structural deficit |
| Public revenue policy (levels and variances): |
| Consumption taxes—bases and rates |
| Domestic sales taxes on production inputs and investment goods |
| Income taxes |
| —corporate |
| —household |
| Import taxes |
| Export taxes |
| Revenue of commodity marketing boards |
| Public spending: |
| Physical capital formation |
| —infrastructure (utilities, communications, transport) |
| —other |
| Education |
| —teacher salaries |
| —primary/secondary/higher−level |

| |
|---|
| —other |

*(table continued on next page)*

| Table 7 (continuation) |
|---|
| Health |
| —basic health |
| —other |
| Goods subsidies |
| Monetary policy |
| Mean rate of monetary growth, inflation |
| Variance of monetary growth, inflation |
| Trade intervention |
| Percent of imports subject to licensing |
| —consumption |
| —intermediate inputs |
| —capital goods |
| Average tariff rate and measures of dispersion |
| —consumption |
| —intermediate inputs |
| —investment |
| Ratio domestic producer price/world price for major commodities |
| Black market exchange rate premium (mean and variance) |
| Trade policy indicators (see sources below) |
| Financial sector policies |
| Differential domestic deposit rate and international interest rate |
| Real domestic deposit interest rate |
| Spread between deposit and lending rate |
| Ex−post reserve requirement (bank reserves/deposits) |
| Interest rate on government bonds |
| Subsidized credits (amounts and interest rates) |

| |
|---|
| Share of total financial assets held by central bank |
| Openness to foreign capital |
| Direct foreign investment flows |
| Other net capital flows |
| Restrictions on direct foreign investment, foreign borrowing, and capital export (and variance of restrictions over time). |

| **Table 8: Internationally available data sources** | |
|---|---|
| Gross output growth (GNP and GDP) | International Financial Statistics (IFS), IMF; World Bank data, Summers and Heston (1988) |
| Population growth | IFS, World Bank data, Summers and Heston (1988) |
| Labor force growth | World Bank data |
| Employment growth, hours | ILO |
| Private investment in physical capital | Pfeffermann & Madarassy (1989), Honohan & Atiyas (1989) |
| Private saving | Honohan & Atiyas (1989); World Bank data; Schmidt−Hebbel, Webb, and Corsetti (forthcoming) |
| Private financial saving | Honohan & Atiyas (1989) |
| Private education spending | Lau, Jamison & Louat (1990) |
| Measures of enrollment | UNESCO, Barro and Wolf (1989), World Development Report (WDR) 1991 |
| Measures of human capital stock | Jamison & Lau (1982), Bhalla (1990), Psacharapoulos & Arriagada (1986), Lau, Jamison and Louat (1990). |
| Measures of health (such as life expectancy) | World Bank data, WHO, FAO, UN Statistical Office |
| Fiscal deficits | ERS (1989), Easterly (1989) |
| Public revenue | Government Financial Statistics (GFS), IMF; ERS, WDR (1988) |
| Taxes − consumption, corporate, export, import, and income | GFS |
| Public expenditure | GFS, ERS, WDR (1988) |
| Education | GFS, UNESCO, Summers and Heston |

| | |
|---|---|
| | (1988) |
| Health | GFS |
| Goods subsidies | GFS |
| Defense | GFS, Barro and Wolf (1989) |
| Investment | GFS, Barro and Wolf (1989), ERS, WDR (1988) |
| Mean, variance of monetary growth, inflation | IFS |
| Trade intervention measures | |
| Percent of imports subject to licensing | Papageorgiou, Michaely, Choksi (1990) study on trade liberalization |
| Average tariff rate and measures of dipersion | |
| Measures of trade openness/intervention | Dollar (1990), Bhalla (1990), Leamer (1988), Levine and Renelt (1990a), Balassa (1985), Halevi (1989), WDR (1987) |
| Foreign direct investment flows and stocks | IFS; IMF Research Department |
| Ratio of domestic producer price to world price | FAO, ERS (1989) |
| Black market exchange rate premium | Levine and Renelt (1990a) |
| Financial sector policies | |
| Differential domestic deposit rate and intl rates | IFS, Gelb (1989) |
| Real domestic deposit interest rate | Gelb (1989), Easterly (1989) |
| Spread between deposit and lending rate | IFS |
| Ratio of M3 to GDP | IFS |
| Ex−post reserve requirement | IFS |
| Interest rate on govt bonds | IFS, Easterly (1989) |
| Ratio of financial assets held by Central Bank | IFS, WDR (1989) |
| Note: We will rely also on Bank reports and national sources. This preliminary listing shows only international data sources. | |
| Abbreviation: ERS: Easterly, Rodriguez, and Schmidt−Hebbel (1989) research project | |

in progress.

Cross−country regression techniques and pooled cross−country, time−series procedures could be used to examine the predictions from the analytical framework summarized in Table 3. The studies should include the broadest possible collection of countries (usually between 60100 countries depending on the sample period and the data). Cross country analyses could use data averaged over long periods (between 2535 years). The pooled regressions could use data averaged over fewer years in order to include multiple observations from each country. The data are averaged to abstract from cyclical fluctuations and thus focus on longer−run components of the data.

The research could be organized so that each study focuses on a key component of national policies. This organization has two important objectives. First, a researcher focussing on trade policy, for example, can specialize in designing improved measures of trade policy and also on modifying the analytical framework to draw sharper predictions on the effects of trade policy on growth, whether these effects work through the level of investment or the allocation of resources or both, and potential interactions with other policies. Thus, specialization will hopefully serve to improve our understanding of the growth effects of each national policy and highlight the most important interactions among policies. The second objective of organizing the studies around particular policies is to keep the individual research tasks feasible. After working on the relationship between one national policy and growth, a researcher may develop many indicators and many predictions regarding potential interactions with other policies. To examine these predictions and gauge the growth effects of a single policy, it will be very difficult to consider all of the policy indicators constructed for the other national policies. Continual interactions among the individual researchers will allow the "trade" researcher to use the one or two best "financial policy" indicators in his evaluation of the effects of trade policy.

An essential aspect of any empirical investigation should be carefully testing the robustness of the findings. Levine and Renelt (1990a) show that many conclusions from past cross−country growth regressions are sensitive to slight alterations in the list of policy indicators included as explanatory variables. This is part of the motivation for simultaneously examining the growth effects of a broad collection of national policies. Other types of diagnostic testing should also be encouraged [e.g., Leamer (1983, 1985)]. If certain policy indicators are found to be highly correlated with each other so that some do not have an independently strong correlation with growth, this might allow us to investigate the linkages between policy and growth in terms of "policy packages" (however, Table 9 shows that policy correlations are not as great as usually assumed.)

Grier and Tullock (1989) show that important additional information can be extracted from the data by using pooled cross−section, time−series analyses instead of simple cross−country regressions. Using data averaged over five years or over ten years yields more data points, which allow the identification of different effects of policy between continents. The scope of pooled analyses could be expanded by (1) studying the 19601990 and 19701990 periods when more detailed data are available compared to the 19511980 period studied by Grier and Tullock (1989), (2) using an analytical framework to interpret the results, (3) considering a broad array of national policies and their potential interactions, and (4) conducting detailed sensitivity analyses.

**Table 9**
**MATRIX OF CORRELATIONS ACROSS POLICIES ***

| | Government Consumption Share of GDP | | | Government Expenditure on Education | | | Inflation | | | Financial Repression Dummy | | | Public Investment Share of G | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60's | 70's | 80's | 60's | 70's | 80's | 60's | 70's | 80's | 60's | 70's | 80's | 70's | 80' |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Black Market Exchange Rate Premium** | −0.06 | −0.04 | −0.09<br>*−0.18* | 0.21 | 0.29 | −0.10<br>*0.06* | −0.10 | 0.57 | 0.31<br>*0.36* | 0.24 | 0.37 | 0.63<br>*0.46* | 0.22 | −0.<br>*0.2* |
| **Government Consumption Share of GDP** | | | | 0.13 | 0.54 | 0.59<br>*0.55* | −0.08 | −0.00 | −0.04<br>*−0.06* | 0.32 | −0.08 | −0.10<br>*−0.16* | 0.45 | 0.2<br>*0.4* |
| **Government Expenditure on Education** | | | | | | | −0.08 | 0.09 | 0.01<br>*−0.07* | −0.06 | 0.16<br>0.47 | 0.09<br>*−0.02* | 0.33 | −0.<br>*0.3* |
| **Inflation** | | | | | | | | | | 0.22 | 0.47 | 0.41<br>*0.46* | −0.01 | −0.<br>*−0* |
| **Financial Repression Dummy** | | | | | | | | | | | | | 0.05 | −0.<br>*0.0* |
| **Pub Investment Share of GDP** | | | | | | | | | | | | | | |

**Note:** Correlations shown are for corresponding time periods (i.e., 60's vs 60's etc..)
Correlations in italics are for whole time periods (i.e., 60's80's vs 60's80's, 70's80's vs 70's80's).
Correlations in italics for per capita income are 70's vs 70's80's for Investment and 60's vs 60's80's for the rest.
Financial Repression Dummy = 1 if average real deposit interest rate < −5, 0 otherwise.
Trade dummy values: 1 = strongly outward oriented, 2 = moderately outward oriented, 3 = moderately inward oriented, 4
2= strongly inward oriented.

* Only developing countries are included.

## III— Conclusion

This paper presented a research agenda designed to identify the importance of national policies for long−run growth.

After documenting the growth experience of developing countries over the past 25 years and discussing the importance of research that dissects the effects of national policies on growth for the World Bank, we construct an analytical framework that yields empirically testable predictions regarding the affect of fiscal policy, monetary policy, trade policy, domestic financial policies, and policies toward direct foreign investment on the rate of per capita income growth. The analytical framework highlights the potential importance of interactions among policies and the effects of uncertainty regarding these national policies. For example, a decrease in tax rates on financial intermediaries may have different implications for growth in a country with a well−developed tax system from a country with a debilitated tax system; uncertainty about monetary policy may not only alter investment incentives, but the effect of this uncertainty on the level and form of investment may depend importantly on policies toward financial markets. In addition to emphasizing the importance of analyzing interactions among policies, the analytical framework distinguishes two channels via which policies influence growth: by affecting incentives to invest in human and physical capital and by affecting the efficiency with which inputs are allocated. For example, trade intervention and restrictive policies on direct foreign investment may importantly distort the sectors toward which resources are allocated in ways that reduce productive efficiency and

growth. In addition, fiscal policy may directly tax the accumulation of physical and human capital, so that economies accumulate less physical and human resources, lowering the rate of economic development. Thus, this framework provides a rich array of empirical predictions regarding the complex relationship between national policies and long−run growth.

The paper goes on to describe how to examine empirically the predictions of the analytical framework. We provide a list of data sources, discuss alternative measures of national policies, and document a series of cross−sectional and pooled cross−section, time−series techniques that would help uncover important links between national policies and long−run growth. We believe that results from conducting the research suggested in this paper would help policy makers design policy packages that promote improvements in human welfare over the next decades.

## Appendix I—
## Brief Survey of Empirical and Theoretical Literature on Growth

The formal study of economic growth and the public policies necessary to encourage sustained increases in output began over three hundred years ago.55 Indeed much of the recent work on growth can be viewed as refining and formalizing the basic economic insights of classical and development economists. For example, the organizing theme of John Stuart Mill's Principles of Political Economy (1848) is a production function based on land, labor, capital, and the productivity of these inputs. He notes that the "increase of production . . . is a result of the increase of the [inputs] themselves, or of their productiveness."56 Using the simplifying assumptions of constant returns to scale, diminishing returns to each factor, and the existence of exogenous factors such as land, labor, and "productiveness," Solow (1956), Swan (1956), Cass (1965), and Koopmans (1965) turned Mill's framework into one of economics' major theoretical paradigms: the neoclassical growth model. The "new" growth literature builds on the neoclassical growth model by examining the implications of scale economies, externalities, and by making technology, labor, and human capital endogenously produced inputs.

This review follows a thin and selective thread from the major classical economists to the neoclassical growth model to the endogenous growth models of the last five years. We also note the contributions of development economists to the study of growth. Indeed, many development economists moved away from the neoclassical growth model for the same reasons that the "new" growth economists modified it: the neoclassical growth model failed to explain important aspects of economic development.57

The neoclassical growth model provided a framework for the growth accounting literature's attempts to quantify the contribution to growth of each physical input and "productiveness."58 Analyses by Norsworthy (1984), Chenery et al. (1986), and Maddison (1987) suggest that physical factor inputs account for only 50−70 percent of the growth rate of output. Although there are arguments as to the precise percentage [see: Jorgenson, Gollop, and Fraumeni (1987) and Baily and Schultze (1990)] and the accuracy of growth accounting procedures [see Nelson (1981)], "productiveness" or technological change as it is currently termed appears to be an important component of growth. Interestingly, John Stuart Mill seems to have predicted this finding, arguing that ultimately the key to increasing per capita output is "improvements in the productive arts." Since the neoclassical growth model assumes that the rate of technological change is given exogenously, it does not provide a useful framework for understanding the economic forces and policies behind an important component of growth: technological change.59

55 Sir William Petty (1676), for example, measured, compared, and discussed changes in the standards of living in France and England.

56 Quoted from Abramovitz (1989) p. 13 with the full quote on page 5.

57 The complaint that the "new" growth literature is not really "new," and does not adequately acknowledge the contributions of the development literature, has considerable justification. This in itself does not lessen the usefulness of the "new" models for studying growth in developing countries.

58 The pioneers in this field are Abramovitz, Dennison, Jorgenson, and Kendrick. Also see the influential work of Kuznets (1966).

59 Efforts were made to better understand technological innovation within the context of the neoclassical growth model by considering heterogeneous agents [Pasinetti (1962) and Meade and Hahn (1965) and by making endogenous the choice between labor and capital augmenting technological innovations [Kennedy (1964)]. See also Atkinson and Stiglitz (1969), Binswanger (1974), Dasgupta and Stiglitz (1980).

A limitation of the neoclassical growth model is that the steady state per capita growth rate is zero if the exogenously given rate of technological change is set to zero. The investment share does not affect steady state growth in the neoclassical growth model. Therefore, economic policy does not influence steady−state growth; economic policy only affects the level of economic output or the transition to the steady state. Since King and Rebelo (1989) demonstrate that interest rates in many countries would have to be absurdly high for transitional dynamics to explain the observed differences in cross−country growth rates, the standard neoclassical growth model does not appear to be the appropriate model for understanding sustained differences in cross country growth rates or the growth effects of policy.60

Recent models seek to extend the neoclassical growth model such that growth is responsive to policy. Building on work by Arrow (1962) and Phelps (1966), Romer (1986) makes technological change endogenous by assuming that technology is a public good but that private investment in capital increases the level of technology available to all entrepreneurs. The externality associated with investment overturns the assumption of diminishing marginal returns to investment and yields a production function with increasing returns to scale, such that there is steady−state growth when there is sufficient investment. In Romer's (1986) model a higher investment rate will accelerate economic growth. Therefore, economic policies that alter the investment rate will affect economic growth.61

Similarly, Lucas (1988) builds a model based on Uzawa (1962) with increasing returns that arise from external effects associated with human capital. Lucas emphasizes that workers interact with colleagues such that each individual's "productiveness" depends on the human capital of others. Thus, private investment in human capital by an individual increases his own productiveness but also increases the human capital and productiveness of others. The externality associated with human capital produces an aggregate production function that has increasing returns to scale. The resulting production function implies that if the economy invests a sufficient amount of resources in human capital accumulation, the economy will enjoy long−run steady state growth. Consequently, alterations in the incentives to invest in human capital have long−run growth implications. The importance of human capital in economic development has been the subject of massive theoretical and empirical study.62

In the Romer (1986) and Lucas (1988) models, policy can reduce long−run growth by impeding investment in human and physical capital, so that the rate of technological advancement or human capital accumulation slows. In addition, because there are externalities to human and physical capital investment in these models, appropriate public policies can help private agents internalize these externalities and thereby accelerate long−run growth. Thus, the overall policy regime of a country, including taxes, property rights, and macroeconomic distortions, can alter savings and investment allocation decisions in ways that alter long−run growth. Nevertheless, policy can only have growth

60 Mankiw et al (1990) find a larger role for transitional dynamics in the neoclassical model by assuming a much higher capital share (including human capital).

61 In a different model, Scott (1989) argues that the act of investment itself creates new investment opportunities. Therefore, increasing investment can have dynamic effects that raise the economy's growth rate.

62 See, for example, theoretical treatments by Schultz (1961,1963), Becker (1964), and Ben−Porath (1967). Microeconomic evidence is provided by Psacharopoulos (1985), Jamison and Lau (1982) and Griliches (1964,1977). Rosenzweig and Schultz (1983), and Psacharopoulos and Arriagada (1986) conduct detailed examinations of the effects of human capital accumulation in developing countries, and DeTray (1987) studies the implications of government policy. Lau, Jamison, and Louat (1990) empirically examine the role of education in developing countries using an aggregate production function approach. Also, see the reviews by Schultz (1988) and Psacharopoulos (1988). Further work is being done for the World Development Report 1991.

effects in these models if there are externalities to investment. Recent empirical attempts at identifying external effects associated with investment in physical or human capital have had some success, but the findings have been challenged.63

In attempting to understand the economic forces and public policies that influence technological advancement, recent work has also followed Schumpeter (1911, 1942) who argued that invention—the advancement of knowledge—and innovation—the implementation of such knowledge— depend on the lure of profits. In terms of invention, the energizing role of monopolistic profits and market scale is the central component of Romer's (1987,1990) recent characterization of economic growth.64 The invention of new technologies increases the productive capabilities of the economy, while the technology producer receives monopolistic profits. Since technology is invented by profit maximizing firms, public policies regarding patents, property rights, and taxes influence the allocation of resources to the invention of new technologies.65

In terms of innovation, Schmitz (1989) formalizes the economic incentives behind the adoption of technology for productive endeavors and the adaption of the technology for particular environments. Since many developing countries do not enjoy a comparative advantage in inventing new technologies, carefully studying the economic incentives and public policies underlying the exploitation and adoption of existing technologies for domestic commercial purposes seems to be particularly relevant.66 It seems clear that a country's overall policy regime will affect the rate of economic innovation by altering the incentives underlying the adoption of new technologies for production.67

These "new" growth models provide a rich environment in which to study the role of government. Not surprisingly, these models yield policy conclusions that are similar to many classical and development economists. Economists since John Stuart Mill have argued that if there are externalities associated with investment in physical and human capital or if there is clear need for public goods, the government can have beneficial growth effects by supporting the provision of services whose social benefits exceed private benefits, such as education and scientific research.68 Many economists have argued the importance of secure property rights to promote savings and investment, the need for institutions to support economic activity.on a large scale, and the desirability that taxes not be overly burdensome, arbitrary, or distortionary.69

63 See: Romer (1987), Benhabib and Jovanovic (1989), Scott (1989), and Caballero and Lyons (1989).

64 Romer's work builds on models by Shell (1967), and Ethier (1982).

65 Schmookler (1966) also focused on the endogenous creation of technology. Empirical studies of technological change have been conducted by Nishimizu and Page (1986), and Nishimizu and Robinson (1986).

66 Many economists have studied the adaptation of technologies created by industrialized economies by developing countries. Bliss (1989) reviews the role of trade in transferring technologies internationally; Cardoso and Dornbusch (1989) discuss the role of private capital flows in diffusing new ideas; while Helleiner (1989) surveys the literature on transnational corporations, direct foreign investment and the adaptation of technology internationally. For some alternative viewpoints on adaptation and innovation, see Katz (1980), Rosenberg (1990), Fransman (1986), Lall(1990), and Baumol (1989).

67 See Grossman and Helpman (1989a,b).

68 See Mill (1948, p. 948), Samuelson (1954), and Atkinson and Stiglitz (1980).

69 Morris and Adelman(1988), Olson (1982), and North (1989) discuss the role of institutions in economic development.

Within the context of simple endogenous growth models, Rebelo (1991) exemplifies the effects of taxation on growth. However, modelling and measuring the full complexities of fiscal policy is difficult even within the simple models of the "new" growth literature. Some of these complexities have recently been captured by Barro (1990) and Easterly (1990b). On one hand, governments may provide growth−promoting public goods and design taxes to close the gap between private and social costs. On the other hand, governments may waste funds, funnel resources to endeavors that do not encourage growth, and impose taxes and regulations that distort private decisions. Aggregate measures of government size will not capture the important implications of where government expenditures are allocated and whether these expenditures are efficiently transformed into public goods and services. Furthermore, even if government funds are always spent efficiently on growth−promoting goods, there may be complex, non−linear tradeoffs between the beneficial effects of government services and the deleterious implications of distortionary taxes. Growth increases with taxation and well−focussed government expenditures at low levels and then decreases as the distortionary effects of taxation exceed the beneficial effects of public goods. Linear, cross−country regressions will not appropriately capture these relationships.

Empirically, large cross−country regressions have begun to identify empirical ties between aggregate measures of fiscal policy and growth although the results are not yet conclusive.70* Barro (1991) finds that government consumption expenditures less defense and education payments seem to be negatively related to growth. In addition, Levine and Renelt (1990a) identify specifications when government expenditures on capital goods, education, defense spending, and measures of tax sources and deficits enter as suggested by theory. But, because these results are sensitive to the "other variables" included in the regression and the time−period over which the analysis is conducted, more empirical work is needed to sort−out the relationships between aggregate measures of fiscal policy and growth.71

In the area of trade policy, Adam Smith (1776) argued that international trade may enhance productivity by allowing economic players to specialize in activities that would be unprofitable in smaller markets and by allowing countries to exploit economies of scale in their areas of comparative advantage. These ideas were further developed by Mill (1848) and Schumpeter (1911,1942), and the relationship between trade, economies of scale, and growth has been studied extensively.72 Within the context of "new" growth models, Rivera−Batiz and Romer (1989) and Grossman and Helpman (1989a,b) have constructed endogenous growth models in which openness to international trade can accelerate technological improvements by increasing the size of the market available to technology producers and allowing those countries with a comparative advantage in technology production to specialize in this key industry. Similarly, Krueger (1974), Grossman and Helpman (1989b), and Murphy, Shleifer, and Vishny (1990) argue that trade distortions may divert talented people out of productive activities and into rent−seeking endeavors that slow technological innovation. On the other hand, Krugman (1988) notes that externalities in human capital accumulation can overturn the typical positive effects of trade. Opening to trade could induce a country to specialize in activities with small external human capital effects. Such a country could

be better off in autarky where domestic production includes goods with more significant externalities although the reverse could also be true.

70 See Landau (1983,1986), Barro (1989), Romer (1989), Easterly and Wetzel (1989), Kormendi and Meguire (1985), Grier and Tullock (1989), Diamond (1989), Ram (1985), and Koester and Kormendi (1989).

71 For a detailed discussion of past empirical work on policy and growth and for recommendation on how to improve the design and implementation of cross−country growth studies, see Levine and Renelt (1990b).

72 See: Kuznets (1960), Balassa (1965), Denison (1967), Corden (1971), and Tybout, de Melo, and Corbo (1990).

The empirical ties between trade and growth, however, are mixed. Large multicountry−case studies document generally favorable linkages between trade liberalization and growth.73 Empirical studies that attempt to relate continuous, objective, internationally comparable measures of trade policy with growth, however, have thus far met with only mixed success.74 Levine and Renelt (1990a) find a two−step relationship between trade and growth: the share of trade in GDP is reliably positively correlated with the share of investment in GDP which is itself reliably correlated with growth, but the trade share is not independently correlated with growth if one controls for the investment share. More detailed empirical studies might be better able to elucidate the ties between trade policy and growth.

Direct foreign investment has received less attention than trade in the growth literature. Findlay (1978) studies the effects of policies restricting direct foreign investments and international capital flows in a standard growth model. This is extended to an endogenous growth model in Wang (1990). More general discussions of policies toward direct foreign investment are provided in the books by Wallace (1990), Cable and Persaud (1987), and Moran (1986), and in the survey by Helleiner (1989).

Just as governments may resort to taxes on trade to raise revenues, governments often finance expenditures via money creation and taxes on financial market activities. The role of money in economic activity is one of the most frequently studied issues in economics.75 Cross−country empirical studies that use measures of average inflation rates, M1 growth, and domestic credit creation, and the standard deviations of inflation M1 growth, and domestic credit creation have thus far met with mixed results in identifying strong ties between these measures of monetary policy and growth.76 Since the negative effects of inflation on growth may be non−linear in the sense that it may take very high inflation rates to interfere with economic activity, additional empirical studies of the growth effects of inflationary finance could be a profitable area of inquiry.

The theoretical links between financial markets and growth are also strong. Schumpeter (1911) argued that well−functioning capital markets were necessary if entrepreneurs were going to raise capital for new technology−improving projects, and this theme was echoed and extended by McKinnon (1973), Shaw (1973), and many others.77 Recent efforts by Levine (1990, 1991) at examining financial policies in an endogenous growth model similarly demonstrate the potentially harmful effects on growth of taxing financial market activities. Empirically, Goldsmith (1969), McKinnon (1973), and Gelb (1989) find a positive relationship between measures of domestic financial market activity and growth; however, the direction of causality has not been established.

73 See Krueger (1978), Bhagwati (1978), Balassa and Associates (1982), and the World Bank (1987).

74 Negative effects of trade intervention have been identified by Krueger (1983), Havrylyshyn (1985), Edwards (1989), and Dollar (1990), but Pack (1988), Pritchett (forthcoming), Rodrik (1988), and Levine and Renelt (1990a) question the strength of these findings. See also Romer (1990), Balassa (1978,1985), Tyler (1985), Feder (1983), Kavoussi (1984), Ram (1985), Moschos (1989), World Bank Development Report (1987), and DeLong and Summers (1990).

75 See the extensive review by Orphanides and Solow (1990).

76 See Fischer (1983), Grier and Tullock (1989), Kormendi and Meguire (1985), and Levine and Renelt (1990a).

77 On capital markets in developing countries see Von Pischke,et. al. (1983), Bardhan and Srinivasan (1971), Braverman and Srinivasan (1981), Braverman and Stiglitz (1982), and the review by Bell (1988).

In sum, this brief review of the growth literature raises at least four important themes.78 First, the broad forces behind economic growth —accumulation of produced factors, specialization, economies of scale, and externalities—were sketched−out by the classical economists long ago. Second, these same forces have been used by the development literature to study various aspects of economic growth. Third, by building on the insights of growth and development economists, the "new" theoretical literature on growth is also contributing models that identify specific channels through which national policies may have effects on long−run growth rates. Finally, the empirical work on linking national policies to growth is still evolving, and many basic issues regarding the long−run relationship between policy and growth including the effects on growth of government size, the allocation of public expenditures, the financing of fiscal expenditures, trade policy, and international capital flows— remain to be more conclusively resolved. There seem to be important opportunities to evaluate empirically the theoretically predicted channels from policy to growth by improving the design of cross−country growth studies and by conducting more detailed longitudinal case studies.

78 We should emphasize again the narrow selectivity of this review, and for that matter, of the "new" growth literature. For example, important issues such as income distribution [Kuznets (1956−57), Adelman and Morris (1973), Robinson (1976), Nelson (1981), Sen (1981a,b), Kanbur (1987), Adelman and Robinson (1978), health and nutrition [Selowsky and Taylor (1973), Stiglitz (1976), Lau, Lin, Yotopoulos (1978), Bliss and Stern (1978), and Behrman and Deolalikar (1987,1988)], and the structural evolution of economies (Kuznets(1966), Taylor (1969,1983), Chenery and Taylor(1968)], have not yet received much attention by the "new" growth literature.

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