

ASSETS, GROWTH, AND WELFARE

The difficulty lies, not in the new ideas, but in escaping from the old ones which ramify...into every corner of our minds.

—John Maynard Keynes, *The General Theory of Employment, Interest, and Money*

Rapid economic growth has usually been considered the prime indicator of development. Yet, there has been dissatisfaction with using growth measured by national accounts as the yardstick (see, for example, Adelman 1975; Dasgupta 1993; Dréze and Sen 1995; Lewis 1955; Sen 1988). More meaningful is welfare, comprising consumption, human development, and environmental sustainability, and their quality, distribution, and stability. Often per capita income growth and welfare improvements go hand in hand. But sometimes they do not.

Large divergences between growth and welfare improvements may arise when growth is volatile and unsustainable. Can such divergences between growth and welfare change still arise when economic growth is sustained? That is, can countries maintain rapid growth for prolonged periods without commensurate increases in welfare? If not, the focus should be on policies that assure sustained growth—because those policies would also generally improve welfare. But if yes, the focus on growth has to be complemented with an examination of alternative patterns of (sustained) growth.

The analysis here focuses on investment patterns in three key assets: physical and the closely associated financial capital,¹ human and the closely associated social capital, and natural and the closely associated environmental capital. Technology affecting the use of these assets matters a great deal too. The central hypothesis, which is assessed empirically subsequently, is

that promoting adequate investment in all forms of capital is a way to induce more and better growth and improvements in welfare. But policies often introduce distortions that encourage either over- or underinvestments in different forms of capital. Examples of these distortions are artificially low interest rates, underpricing of natural resources, or underemphasizing basic education in public policy. Focusing mostly on physical capital accumulation to the relative neglect of human and natural capital is no guarantee to sustain growth. Some recent evidence shows little correlation between investment rates and growth rates in the short term (Easterly 1999c). Special efforts to encourage physical capital accumulation per se are likely to impose large costs.

Some policy changes in the 1980s and the early 1990s would seem to have especially raised the rate of return to physical capital, reflected by investment booms in many countries. But these reforms by themselves have not automatically assured sustained growth, to the extent that there have not been complementary investments in human and natural assets. Moreover, some countries have not generated growth—partly because of wrong regulation (for example, licensing that reduces investment incentives), and insufficient regulation (for example, for financial markets and to deal with monopolies).

Alternatively, growth induced by relatively undistorted or a balanced expansion of human, physical, and natural capital can be sustained for prolonged periods.² Balanced does not signify an equal expansion in the assets. Rather, it refers to asset accumulation in response to an undistorted policy framework. Such a pattern is more likely to reduce poverty and improve income distribution. That, in turn, creates the conditions for faster growth that improves welfare more rapidly. So, preventing underinvestment in human and natural capital is one way of promoting rapid and sustained growth.

We begin with a framework that allows us to explore these hypotheses and their implications: patterns of asset accumulation, factor productivity, and social welfare. In particular, we look at the implications of distorted asset growth for the poor. The next section provides empirical evidence from a variety of sources. In addition to a historical review of 60 countries, we provide econometric evidence from two groups of countries on the determinants of growth. Finally, we turn to the empirical evidence on a variety of (gross) subsidies, followed by an evaluation of the impacts of capital subsidies.

A Framework

Improving the quality of national accounts by including human and natural capital at shadow prices (notwithstanding the complexities in computing

them) is one way of reconciling the divergence between growth and welfare improvements. But even the limited progress in valuing these assets has not yet been incorporated into national accounts, and there still are serious conceptual problems with incorporating (and weighting) them. For these reasons, a more practical (and more modest) approach is to identify measurable growth patterns and policy instruments likely to promote greater welfare.

Three Patterns of Growth

Consider these alternatives:

- *Pattern 1.* Unsustained growth, where the economy grows with some phases of fast growth, but at a declining rate, eventually leading to stagnation or near stagnation.
- *Pattern 2.* Distorted growth bought at the expense of deteriorating natural resources, for example, from their underpricing; lagging investments in human capital, for example, inadequate safeguards regarding child labor; and subsidies to physical capital, such as tax exemptions, allowing tax arrears, giving financial grants to reward certain investments, and providing investment credit subsidies.
- *Pattern 3.* Sustained growth through undistorted or balanced asset accumulation, with public support to developing primary and secondary education, improving public health, and protecting natural capital. This prevents a decline in returns to private assets (especially physical capital) and provides the minimum and increasing levels of human capital needed to facilitate technological innovation and the growth of total factor productivity (TFP).

Pattern 1 usually is associated with slow and highly unstable or volatile growth. Slow and unstable growth prevents poverty reduction and leads to inadequate resources for investing in human capital and natural capital. That is, pattern 1 causes economic stagnation and welfare losses. Pattern 1 usually occurs in a context of poor governance and corruption that brings about low investment and inefficient allocation of public expenditures.

Compared to pattern 1, the stop-and-go growth of pattern 2 is better for welfare improvement and poverty reduction. But pattern 2 growth might depend on public support to physical capital, which is difficult to sustain. Pattern 3 is better for improving welfare and for reducing poverty. To sustain a reasonable rate of economic growth, therefore, the principal assets of the economy—physical and financial, human and social, natural and environmental—need to grow at undistorted or fairly balanced rates. The distribution of assets among the population, especially of human capital, is also

important. Stable, sustained growth is highly beneficial for the poor, who usually suffer the most in the reversals of stop-and-go growth.

Externalities and Asset Accumulation

All forms of capital may involve externalities. Components of human capital and natural capital often have a social value that goes beyond that accruing to the individuals using it. As (partly) public goods, they have positive spillovers that are not necessarily fully accounted for by the actions of individuals or firms. That is why public policy and other mechanisms must prevent underinvesting in them. There has been some emphasis on the positive production and technological externalities associated with physical capital accumulation (Barro and Sala-I-Martin 1995; Romer 1986). But the externalities associated with human and natural capital are much harder to account for, and are probably larger.³ Human and natural capital are important not only as factors of production, but as direct determinants of societal welfare.

Governments can use market instruments to deal with these external effects. But the issue also involves the allocation of public expenditures. Government spending typically accounts for 25–30 percent of GDP, exerting a powerful direct effect (as opposed to the effect of policies and regulations) on resource allocation and income distribution. Few countries have used market instruments successfully to account for the true social value of natural and human capital. Governments responsible for the Amazon region, for example, have exacerbated the negative environmental externalities. Public subsidies and tax incentives to large cattle producers and loggers were responsible for more than 50 percent of the deforestation in the Amazon region in the 1970s and the 1980s (Binswanger 1991). Moreover, public investments in infrastructure into the frontier areas have magnified the externalities associated with the lack of well-defined property rights in such areas.

Doing little to prevent underinvestment in human and natural assets is likely to lead to unbalanced asset accumulation, at least in the short term, by focusing on physical capital accumulation. Relying mostly on physical capital accumulation instead of balanced asset growth may increase the growth of GDP (using conventional national account methods). But welfare might not improve as fast—and it could even decline, if, for example, natural capital were to decline dramatically, or if the quality of public education and health care fell. The distributional consequences of distorted or unbalanced asset growth could also be severe, especially if the imbalance makes growth unstable, hurting the poor disproportionately.

Fast GDP growth without some degree of balanced asset augmentation may also be difficult to sustain. Unless there are very high technological spillovers or scale economies, rapid physical capital accumulation with slow growth in human capital and a depletion of natural assets would lead to declining marginal productivity of capital—as capital stocks increase relative to other productive assets (see annex 2).

Growth in Total Factor Productivity and Asset Accumulation

So far most of the emphasis in this chapter has been on asset accumulation and asset structure as a source of growth. An important set of analyses argues that the main source of growth is not asset accumulation—it is the growth of TFP (Easterly and Levine 2000; King and Rebelo 1993; Klenow and Rodríguez-Clare 1997a; Romer 1986, 1993). This conclusion, elaborated from theoretical models based on endogenous growth, is supported by earlier empirical studies showing that growth over time, especially in the United States and some other industrial countries, is indeed heavily explained by TFP.

Analyses of East Asian countries, however, suggest that TFP growth may not be as important a source of growth for developing countries as it has been for the United States and some other industrial countries. East Asian countries are practically the only developing countries that have experienced persistent, fast growth over long periods. Collins and Bosworth (1996), Kim and Lau (1994), Krugman (1996), and Young (1991, 1994, 1995) show that East Asia's rapid growth (before 1997) was based on strong asset accumulation. Two recent papers, however, point to factors that qualify these analyses. Klenow and Rodríguez-Clare (1997b) and Nelson and Pack (1998) emphasize improvement in asset measurement and methodological refinements that could significantly alter the conclusions reached by the above authors.

TFP in developing countries is potentially important for growth. It is also closely linked to asset accumulation for two reasons. First, a main vehicle of new technology is embodied in imported capital and new intermediate goods. Second, to benefit from technological progress, the level of education needs to be continually increasing both in depth and breadth. Expanding general education is more crucial in the developing countries than in the industrial countries, where it is already broad-based. But in most developing countries, general education is still insufficient to facilitate technological diffusion. So, TFP growth can be fast only if human capital rapidly broadens and deepens. That is why it is closely linked to asset accumulation and why it may be difficult to disentangle TFP and asset growth as sources of growth.

Investments in Physical Capital

Market reforms—trade and capital market liberalization, privatization, elimination of price controls, liberalization of labor and other markets—have been vital instruments in increasing the rewards to all forms of capital. Given the greater responsiveness of private investments in physical relative to human and natural capital, they have helped some countries (especially those countries not severely affected by corruption) to enjoy an investment boom, accelerating growth. Several of these reforms, for example, trade liberalization or removing anti-agricultural biases, also raise the rewards to human capital. However, in the absence of complementary investments in these assets (especially human capital), the expansion of physical capital could bring about a declining return and eventually a deceleration of growth (see annex 2). For some countries this tendency has been countered by deepening the reform process. Others have used increasing public resources to sustain distortions (thereby generating pattern 2 growth).

Moreover, as developing countries participate more in global markets, national (and subnational) governments can engage in competition to attract capital by artificially creating favorable conditions, as seen in recent evidence on subsidies to attract foreign investments in industrial and developing countries. (For a review of countries such as Argentina, Brazil, Canada, China, India, Malaysia, Singapore, and the United States, as well as Western Europe, see Oman 2000; also the next section.) There is a variety of evidence of incentives and subsidies relating to investments in industries such as the automobile industry from various regions or in the overexploitation through the underpricing of natural resources as in mining or forestry. A mechanism to increase the attractiveness of domestic and foreign investments is to “give away” human and natural resources at low costs, for example, by allowing child labor; not enforcing health and sanitation regulations in the workplace; not regulating banks and other financial institutions; not enforcing environmental regulations; and giving away mining, water, and logging rights.⁴

In some countries these capital subsidies and tax exemptions may offset the firms’ costs associated with misgovernance and corruption that reduce their incentives to invest in productive activities (see chapter 6). This suggests that by reducing corruption and misgovernance, it may be possible for countries to save resources. In addition to governance, another ingredient that can play a positive role in enhancing quality growth is the strength of informal institutions in a country, often referred to as social capital (box 2.1).

Box 2.1. Social Capital

The notion of social capital has received a lot of attention from scholars and development professionals of late. The phenomena grouped under the rubric of social capital have included trust, cooperative norms, voting, participation in referenda, and horizontal associational activities in diverse groups.

How does social capital affect economic performance?

- Fewer resources have to be spent to protect against fraud in economic transactions, which would almost be a corollary of high-trust environments.
- There is less need for entrepreneurs to monitor suppliers and workers, freeing more resources for innovative activity.
- Interpersonal trust can substitute for formal property rights.
- The greater confidence in government policy is good for investment.
- A higher degree of trust seems important for human capital accumulation. Galor and Zeira (1993) suggest that higher trust is associated with higher enrollment in secondary education.
- Trust and civic participation are also associated with better performance of government institutions, including those for public education.
- Community or cooperative action by local groups can alleviate "the tragedy of the commons," overexploitation, and undermaintenance (Ostrom 1990).
- Greater links among individuals facilitate better information flows and faster diffusion of innovation (Besley and Case 1994; Foster and Rosenzweig 1995; Rogers 1983).
- Social capital may act as informal insurance, much the same as the diversification of a portfolio. Risk sharing by many households can act as a social safety net and enable them to undertake higher-risk and higher-return activities (Narayan and Pritchett 1999).

But can social capital be measured, and what is its effectiveness in contributing to growth? And are there policy interventions that can contribute to its

formation? Evidence involving both aggregate cross-country and within-county microdata is accumulating to suggest the potential of social capital. Knack and Keefer (1997) use data from the World Values Survey for 29 market economies over 1980–94 to probe the importance of trust and civic involvement. After controlling for initial per capita income, human capital, and capital goods prices, they found that both social capital indexes show significant links to economic growth. They also found that trust is even more important for poorer countries with weak legal systems and financial sectors. A policy implication: establishing formal legal and credit institutions is especially important in low-trust societies.

The concept of social capital has generated discussions and debates. Its proponents claim it to be as important as—or encompassing—physical, human, and natural capital. Others see this focus as excessive and inappropriate. Some of the work in the area is also criticized for leaving out important social dimensions. Temple and Johnson (1998) suggest a general perspective: simply that society matters. They analyze the data on socioeconomic variables compiled by Adelman and Taft-Morris (1967) and show that several social variables have significant explanatory power for predicting long-term economic growth. These variables go beyond the "trust variables" typically studied by researchers in social capital. Among these variables, the ones important in capturing differences in social arrangements include the extent of mass communication (newspapers and radios), the character of basic social organization, the modernization of outlook, the extent of social mobility, and the importance of the indigenous middle class.

Some key readings are Dasgupta and Serageldin (1999), Narayan and Pritchett (1999), and Woolcock (1998). See also two sets of articles that appeared in special sections of *World Development* (Evans 1996) and the *Journal of International Development* (Harriss 1997). Included in the latter is an article critical of the World Bank's use of the notion of social capital (Fox 1997).

Investments in Human and Natural Capital

The other side of the coin of special incentives to physical and financial capital is the insufficient attention paid to human capital and the rapid destruction of various forms of natural capital through overexploitation. Efforts to raise artificially the incentives to investment in physical and financial capital could be linked to insufficient investment in human and natural capital.

The private sector contributes to human capital accumulation—through training, private schools, and private health care. But private schooling and private health care go mostly to the better-off, who can afford to pay for their human capital up-front. Most people, particularly low- and middle-income people, depend on public support to accumulate human capital. Imperfections in capital markets prevent them from borrowing against future earnings, making this dependence even more marked.

Growth in physical capital may spill over into human capital through private investment in research and development and training in higher technologies—that is, in knowledge-driven growth. But to sustain this growth, a large (and growing) part of the work force must have enough general schooling to acquire skills and technology and participate in the expansion of research and development activities. So, publicly provided general schooling and privately generated knowledge are complementary. If the quality and coverage of general schooling do not increase fast enough, knowledge-driven growth may be stifled, particularly in poorer countries where most of the labor force does not have primary school education (chapter 3).

Growth without complementary environmental policies may damage the environment as the accumulation of physical capital accelerates. This is especially likely in countries with comparative advantages in natural resource-intensive industries that also require a lot of physical capital for their exploitation, such as mining, forestry, and fisheries. Preventing excessive environmental and natural resource degradation also depends on public policies and investments. Many environmental resources have social values—as inputs in production and as consumption—that are generally well above those that the private sector considers in its resource allocations. When natural resources are plentiful, degrading natural capital is not likely to have much effect on the productivity of physical capital. But after natural resources fall below certain thresholds, further degradation could reduce the productivity of physical capital (chapter 4).

While degrading natural capital is likely to reduce welfare, its impact on economic growth is subject to debate (see the exchange between Daly,

Solow, and Stiglitz in Daly 1997). That impact hinges on the substitution of other assets for natural capital (see annex 2). Some recent evidence implies that human capital, but not physical capital, can substitute for natural capital. So, economies that expand human capital can reduce the dependence of output growth on natural capital. The high levels of human capital permit the economy to diversify into activities progressively less intensive in natural capital. For example, a country with a high level of human capital can specialize in knowledge-intensive activities, making the exploitation of natural capital less essential for sustaining income growth.

But degrading natural capital is likely to be devastating for the poor, who generally have little human capital and continue to depend on natural capital (soils, natural water sources, fisheries) for their incomes, even in middle-income economies. Because the poor have few possibilities for substituting other assets for natural resources, the degradation of those resources could lead to irreversible vicious circles of poverty and environmental destruction (see López 1997 for an analysis of the dynamic features of natural resource degradation and institutional change for the rural poor).⁵

Distorted Asset Growth and the Poor

The poor, due to their lack of assets, would have more difficulties than the rich in smoothing their consumption in bad times. Close to the limits of subsistence, they usually work in activities hit most by economic cycles (agriculture, construction). So, unstable growth can have harsh effects for them, and an economic crisis can so degrade their human and natural assets that they may not be able to benefit from subsequent booms (see annex 2).

The economy of the poor is often separate in many ways from the modern economy, but the demand for their products depends at least in part on the modern economy (exchange rates, for example, affect the prices of their export products). Instability in the modern economy thus affects the incentives for the poor, and a deterioration of these incentives hurts the poor. Even if incentives return to original levels, the poor may not be able to take advantage of them. This implies two possible alternative equilibria: a sustained growth equilibrium and a stagnant subsistence equilibrium. During bust times, the poor lose the assets needed to maintain consumption at subsistence levels and to respond to stronger incentives in the next boom.

Some developing countries, for example, in Latin America, have a relatively high income inequality especially because of the skewed distribution of physical capital, education, and land. Expanding education could change that. Making education less concentrated through, say, reallocating public

spending toward basic and secondary schooling, is probably the least controversial asset redistribution, and likely the most feasible.

Asset inequality affects social welfare through two mechanisms. One is a direct effect: large segments of the population have few assets and consume little, while a minority has large amounts of assets and consumes a lot (see annex 2). The other is indirect: asset inequality has been shown to reduce the potential for economic growth and poverty reduction through a variety of channels (see, for example, Alesina and Rodrik 1994; Deininger and Squire 1998; Persson and Tabellini 1994; Ravallion and Sen 1994 on asset inequality and growth and chapter 3 and annex table A3.5 for a literature review).

Even small changes in income distribution can have large effects on the extent and depth of poverty in developing countries (Lundberg and Squire 1999). Several studies have tried to establish a relationship between income distribution and growth. However, as Lundberg and Squire argue, growth and inequality should be analyzed as joint endogenous variables. How asset inequality affects both growth and income distribution is closely related to the way that the level and composition of public spending on education and health affect the inequality of human capital.

Skewed distributions of education are unlikely to produce the best growth outcomes.⁶ If human capital is relatively concentrated, any further concentration would slow growth, while efforts to improve its distribution would benefit growth (chapter 3). An economy with a small number of highly educated people and a large number that is illiterate may find it difficult to sustain high rates of return to physical capital, because the potential technological spillovers associated with capital accumulation may not materialize. Greater access to secondary and higher education would allow for more technological spillovers.

Empirical Evidence

In this section we provide four types of evidence as follows:

- *Experience in 60 developing countries.* Growth experience has often followed patterns 1 and 2, relying mostly on a rise in investment in physical capital, while investment in human capital has lagged and investment in natural capital has been mostly negative (see box 2.2).
- *Econometric evidence.* Growth based mostly on physical capital expansion is unlikely to be sustainable. The possible positive spillovers of physical capital investment do not seem to be sufficient to maintain a stable rate of growth in the absence of significant expansion in human capital and a sustainable use of natural capital.

Box 2.2. Alternative Approaches to Sustain Growth: Brazil, Chile, and the Republic of Korea

Two approaches to pursue sustained growth might be noted:

- *Approach 1.* Increasingly large policy and expenditure distortions (incentives and subsidies) in favor of capital (pattern 2 growth).
- *Approach 2.* High levels of support to the growth of other assets as well, particularly human capital (pattern 3 growth).

Approach 1 implies that maintaining a high growth rate requires that the pro-capital bias has to be increasing over time. Apart from being less effective than approach 2 in sustaining long-run growth, this approach means unstable growth in the short run and increasing concentrations of income and wealth. The second approach is more likely to sustain a reasonable growth rate in the long run, reducing short-run instability and promoting equity.

Favoring Physical Capital

Most countries use a combination of these two approaches with different emphases. Brazil, like several others, at times seems to have used approach 1. Reviews of several countries show examples of public allocations to support the profitability of capital through direct financial subsidies to domestic and foreign investors; efforts to build infrastructure and services with public monies oriented to expand particular industries and develop environmentally sensitive areas; as well as credit, tax, and price policies in favor of capital. In many countries, the allocation of public resources to education has emphasized subsidies to tertiary education and underinvested in primary and secondary schools.

Over the past two decades, the standard deviation of annual growth rates has been more than the average growth rate (table 2.1). Such instability could be due in part to the varying capacity of the public sector to generate resources needed to continue to support physical capital in relative

terms. Also, the relatively small support to the social sectors would seem to have contributed to social inequity.

Attention to Human Capital

Korea also seems to have subsidized investors starting before the 1990s. Its subsidies were selective, focusing mostly on a few industries at a time—aiming at developing a few industries into exporters within a reasonable time. Some favored industries have become leaders in causing growth spillovers to others. While this approach was problematic in many ways, it implied relatively less of an explicit financial burden on the public sector. In addition, the allocation of public resources to education has prioritized basic education. This has allowed the public sector to support a fast buildup of human capital, along with a rapid decline of the education Gini coefficient (chapter 3). This has also balanced the incentives for the growth of physical and human assets, has permitted income inequality to remain at acceptable levels, and has helped poverty to decline.

There was sustained economic growth during the 1980s and the 1990s through 1997. Growth was relatively stable—possibly in part because the public sector maintained its support to both human and physical capital over the years.

Relative Neutrality

Since the early 1980s, Chile's public sector has generally abstained from directly favoring physical capital. Nor have the social sectors, particularly education and health, received special support, except for the period 1997–2000. The public sector has not taken on any significant role in especially orienting growth strategy in these areas. However, Chile has low taxation on using its natural resources, providing strong incentives for foreign investors to exploit mining, forestry, and fisheries.

(box continues on following page)

Box 2.2 continued

There was a boom in 1987–95, which benefited from a large acceleration of investment in physical capital, with human capital lagging behind. The lack of dependence of capital on direct public subsidies may have led to stable growth rates in an eight-year expansion.

Table 2.1. Selected Variables for Brazil, Chile, and Korea

Variable	Brazil	Chile	Korea
<i>GDP growth (percent per year)</i>			
Average level	2.8	5.9	7.6
Coefficient of variation ^a	1.4	0.9	0.4
<i>Public expenditures on education and health (percentage of GDP)</i>			
Average level	2.9	5.6	3.4
Trend over time	0.1	-0.1	0.0
<i>Gross domestic investment (percentage of GDP)</i>			
Average level	20.5	19.7	32.6
Trend over time	-0.1	0.6	0.4
<i>Memo items (latest available year)</i>			
Poverty (percentage below US\$1 a day)	23.6	15.0	—
Gini coefficient of income	0.60	0.59	0.32
Gini coefficient of education	0.39	0.31	0.22
Illiteracy (percent)	16.7	4.8	2.0
Infant mortality (per 1,000)	34.0	11.0	9.0

— Not available.

Note: The values are for 1978–97, except for expenditures on education and health, which are for 1980–97 (1980–94 for Brazil), and specific years for some variables.

a. Standard deviation of the growth rate divided by the growth rate.

Source: Various issues of the World Bank's *World Development Indicators* and the International Monetary Fund's *Government Finance Statistics Yearbook*.

- *Evidence on subsidies.* Industrial and developing countries have spent public resources on subsidies. In the case of capital, they involve a variety of mechanisms including tax concessions, credit subsidies, and grants. These subsidies absorb a sizable share of government revenues, which in developing countries seem comparable to what is spent on education, health, and social sectors.
- *Impact of subsidies.* A finding in the literature is that capital subsidies have not contributed to increased productivity and have only modest effects on growth. Moreover, their effects on growth seem short-lived.

Reforms and Unbalanced Growth in 60 Countries

A review of 60 countries in the late 1980s and 1990s shows that about 16 of the countries were considered serious reformers in implementing a set of policy changes (table 2.2). The other 44 countries did not implement such a set of reforms over the period. Reformers already had higher rates of physical capital accumulation in the 1980s than the nonreformers.⁷ Although a controlled experiment would better reveal counterfactuals, the contrast is suggestive. In the 1990s, the rates of physical capital accumulation increased by about 70 percent for reformers but declined for nonreformers. But the growth of human capital apparently has not increased much—for either reformers or nonreformers. Spending on education as a share of GDP was lower for reformers than for nonreformers, increasing modestly for both groups in the 1990s.⁸

Although deforestation rates, a rough proxy for natural resource degradation, were lower for reformers than for nonreformers in both periods, the deforestation by reformers almost doubled in the 1990s while that by nonreformers increased only slightly.

Thus, reformers have significantly accelerated economic growth over the 1990s. This growth seems to be based on an increase in physical capital accumulation while, relatively speaking, investments in human and natural capital lagged.

Table 2.2. Review of Development Indicators for 60 Reformers and Nonreformers, Selected Years

<i>Development indicator</i>	<i>Years</i>	<i>16 reformers</i>	<i>44 nonreformers</i>
Per capita GDP growth rate (percent)	1984–89	2.8	–0.5
	1990s	3.5	0.1
Physical capital stock (per worker) growth rate (percent)	1984–89	2.1	0.0
	1990s	3.5	–0.5
Deforestation rate (percent)	1984–89	0.7	1.2
	1990s	1.1	1.4
Education spending as a percentage of GDP	1984–89	3.2	4.6
	1990s	3.5	4.7

Note: Reformers in this table are defined based on the speed of integration index (World Bank 1996a). Countries that implemented significant economic reforms (reformers) in the late 1980s or early 1990s by this measure are Argentina, Bolivia, Chile, China, Ghana, Indonesia, Korea, Malaysia, Mauritius, Mexico, Morocco, Nepal, Peru, Philippines, Sri Lanka, and Thailand.

Source: Author's calculations.

Are the increases in educational spending by reformers enough to sustain the new growth rates? Will the acceleration in degrading natural capital seriously hurt the sustainability of growth for reformers and nonreformers alike? To answer these questions we need to know how spending improves human capital, how deepening physical and human capital affects growth, and how losing natural capital can affect growth.

Econometric Evidence: 20 Middle-Income Countries

Country econometric analysis of growth in 20 mostly middle-income countries over 1970–92 shows the following (see annex table A2.1 and López, Thomas, and Wang 1998):⁹

- The marginal productivity of capital, given other asset levels, declines with increases in physical capital. Economies of scale and technological spillovers from investment in physical capital apparently may not be enough to offset the declining marginal productivity of physical capital. This suggests that growth based primarily on physical capital accumulation may not be sustained in the long run.
- Human capital, represented here by formal education, would seem to have a powerful positive effect on economic growth in reform episodes, but not in the absence of reforms. This implies that education would not contribute much to the productivity of physical capital in overregulated economies with little space for markets. But it could do much to boost the marginal productivity of physical capital and economic growth in a market-friendly framework. This confirms our hypothesis presented earlier that human capital accumulation at sufficient speed can induce sustained growth. At the same time, this evidence suggests that key market reforms are a necessary condition to achieve long-run sustained growth.
- In nonreforming economies and episodes, economic growth rates are not sustained, regardless of the additions to human capital, according to these results. Instead, they face stagnation after periods of moderate growth, triggered by favorable exogenous shocks that temporarily spur the returns to physical capital.
- The good economic growth rates in reform episodes can be sustained if human capital grows fast enough to offset the declining marginal returns to capital caused by physical capital accumulation. Per capita growth of about 4 percent a year, according to these estimates, can be sustained if per capita human capital expands at about 1.7–1.8 percent a year.

So the pace of growth based mostly on physical capital accumulation—to the neglect of human capital—would not seem to be sustained. Market reforms can accelerate growth. But if the reforms are not accompanied by investments in human capital, growth is likely to flag. Countries that implement market reforms have a chance of sustained growth. Nonreformers do not.

Econometric Evidence: 70 Developing Countries

The previous study did not consider natural capital as a determinant of growth, but few of the 20 countries analyzed earlier show a heavy dependence on natural capital as a source of income. A related study of 70 developing countries that includes both middle-income and poor countries, including several Sub-Saharan nations, considers natural, physical, and human capital as factors affecting growth (López, Thomas, and Thomas 1998; see also note 8).¹⁰

Unlike most previous studies, this one uses a flexible functional form (translog for the growth equations) that allows for nonlinear effects of the explanatory variables and for interactive effects across these variables. The interactive effects are extremely important in elucidating interasset substitution or complementarity in the growth process (see annex tables A2.2 and A2.3).

- According to these estimates, the rate of economic growth on average declines with increases in the stocks of physical capital—for constant human and natural capital—but not for all countries. Countries that have very low physical-capital-to-labor ratios tend to have their growth rates increase. So, in capital-poor countries, capital accumulation at first tends to speed growth even faster. But after reaching a certain capital intensity, further physical capital accumulation—for given human and natural capital—has a declining effect on economic growth.
- Human capital on average would seem to boost the rate of economic growth, though this link is smaller than in the previous study. As human capital increases, the positive link to economic growth becomes larger. At low levels of human capital, its link to economic growth is negligible, but at higher levels of human capital it becomes larger, with the marginal effect of the stock of human capital on growth always increasing.
- To sustain economic growth, human capital can to some extent substitute for natural capital, but physical capital may not. The growth rate of countries with high levels of human capital is much

less sensitive to losses of natural capital. But that of human-capital-poor countries is highly sensitive to those losses. For them, natural capital is crucial for sustaining rapid economic growth. They therefore need to invest in human capital to reduce their dependency on natural capital.

These results suggest that growth especially based on physical capital accumulation tends to be difficult to sustain. Economies of scale and technological spillover arising from physical capital accumulation exist, but may not be sufficient to sustain growth. Physical capital accumulation needs to be accompanied by an expansion of human capital to permit sustained growth.¹¹ Disinvestment in natural capital hurts the sustainability of growth, especially in human-capital-poor countries. This result, that physical capital accumulation alone may not sustain growth, is consistent with recent empirical studies (Barro and Sala-I-Martin 1996; Jones 1995; Mankiw, Romer, and Weil 1992; Young 1994, 1995).

Evidence on Subsidies

The evidence accumulated over the last decade indicates that government subsidies to industries, agriculture, and infrastructure worldwide are large. Table A2.4 in annex 2 presents some examples that illustrate both the size and impact of such subsidies. The data are fragmented and partial, making it difficult to put in perspective the real magnitude of these subsidies relative to GDP and relative to government expenditures. In addition, the available data only include direct subsidies involving financial outlays (or foregone tax revenues) for the public sector. The evidence on indirect subsidies, such as the giveaway of public lands and natural resources, is mostly anecdotal. The available evidence, however, permits us to derive lower-bound estimates of the financial subsidies, at least for some countries.

It is important to note that these remain gross estimates. They do not consider the net magnitude after accounting for taxes or other offsetting distortions. These estimates also do not differentiate between cases where such subsidies might be justified on social grounds and where they might not be. Together with taxes, they influence the implicit tax rates, introducing elements of nontransparency, discrimination across different activities, and pressures on scarce resources—rendering them distortionary.

During the early 1990s, industrial (OECD) countries spent an estimated US\$490–\$615 billion a year in subsidizing agriculture (US\$335 billion), energy (US\$70–\$80 billion), and road transport (US\$85–\$200 billion) (de Moor and Calamai 1997). The total is about 2.5–3.0 percent of the total

GDP of OECD countries and about 7.6–9.1 percent of the total government expenditures. Developing countries spent US\$220–\$270 billion per year in subsidizing energy, road transportation, agriculture, and water during the early 1990s. These amount to some 4.3–5.2 percent of GDP and 19–24 percent of total government expenditures. These subsidy estimates point to possible distortions, and do not necessarily suggest overinvestment in these sectors in the aggregate.

On the one side, these are probably only a part of all subsidies, as subsidies to manufacturing are not included here. On the other, some of these subsidies (especially for energy) concern consumer demand and not corporate production, which is our primary focus. However, a significant part of the energy subsidies seem to be captured by corporate entities, and the above estimates might still be close to representing corporate subsidies.

From a different estimation, corporate subsidies in the United States in 1996 were US\$170–\$200 billion (Collins 1996), or 2.3–2.7 percent of GDP and 10–12 percent of total government expenditures. Government subsidies to Fortune 500 corporations, which in 1997 recorded profits of US\$325 billion, were about US\$75 billion—comprising government grants, cut-rate insurance, subsidized loans, and loan guarantees (Moore 1999).

Apart from the energy and agriculture subsidies, countries provide subsidies directly to manufacturing industries. The evidence suggests that these industrial subsidies may be larger than the energy and agriculture subsidies. Subsidies to foreign investors seem to be significant in a number of country cases. Preferential tax treatment for foreign firms sometimes costs the government in foregone tax revenues. Competition for foreign investments is, in some cases, a reason for these subsidies, which have gone to investors in mining and various industries ranging from automobile to steel (*Aviation Week and Space Technology* 1999; Castaneda 1997; *La Nacion* 1997, June 10; Sieh Lee 1998; Oman 2000; also table A2.4 in annex 2). They are essentially discriminatory in nature and raise the question of the effectiveness of favoring some over others.

These admittedly partial data suggest the significance of the corporate subsidies as a proportion of government expenditures—with implications for capital subsidies, although we have not been able to disentangle fully capital and corporate subsidies. In the previous sections we have emphasized a less distorted or a more neutral asset growth pattern that includes the expansion of human and natural assets along with physical. These subsidies compete for scarce public resources with alternative uses. The question is whether or not they could be better spent from a social viewpoint on the sector in question or in other areas such as building human capital and in preventing a rapid deterioration of the natural capital. It is also possible that the corporate subsidies contribute to a sustained expansion of

investment in physical capital, increasing economic efficiency and productivity and generating positive social spillovers. If this is true, the case against subsidies would diminish.

The Impact of Subsidies

Recent studies based on industry or microfirm data have examined how corporate subsidies affect long-term economic growth and productivity. By and large they suggest that government subsidies to industries have a modest impact on firms' investment and growth in the first year, but over the medium run have little effect on growth. Capital subsidies also seem to induce a negative effect on total factor productivity of the industries that receive subsidies. Beason and Weinstein (1996) for Japan; Bergström (1998) for Sweden; Bregman, Fuss, and Regev (1999) for Israel; Fakin (1995) for Poland; Fournier and Rasmussen (1986) for the United States; Harris (1991) for Ireland; and Lee (1996) for Korea conclude that corporate subsidies are inappropriate if increasing national income and productivity is the goal (see also table A2.4 in annex 2).

The papers by Bregman, Fuss, and Regev (1999) and Bergström (1998) are particularly important because they use detailed firm-level panel data. Bregman, Fuss, and Regev (1999) found that capital subsidization induced efficiency losses ranging from 5 to 15 percent. They also show that the subsidies were basically incorporated into profits or rents, as the subsidized firms earned higher rates of return than those that were not subsidized. Similarly, Bergström (1998) found little evidence that subsidies affect productivity. Their effects on the growth rate of firms seemed temporary. This finding is consistent with the point in this chapter that capital subsidies could only offer a temporary relief to decreasing rates of economic growth associated with distorted asset growth.

Conclusions

This chapter presented a framework for the augmentation of three main assets: human, physical, and natural capital. Its main hypothesis: sustained growth and welfare improvement require the efficient expansion and use of all three assets. However, countries can be tempted to subsidize physical capital. The evidence is that such subsidies (tax exemptions, direct subsidies, easy access to natural resources, and so on) comprise large shares of government expenditures and of GDP. Such an approach is unlikely to produce sustained growth. It also neglects human and natural assets, which

directly contribute to welfare. So, such growth may provide only a small contribution to welfare.

Investing a greater part of national savings in the expansion of human and social assets—and the sustainable use of natural assets—could contribute to more growth and better growth in the long run. This sustained growth, attending to all three assets, is more likely to increase welfare. This could be because investments in human and natural capital contribute to welfare directly and because investment in such assets helps to improve the distribution of income and reduces the instability of growth. That is why a relatively undistorted or balanced approach to the accumulation of all assets is likely to be superior to a primary focus on physical and financial capital.

Notes

1. Financial capital here does not refer to the development of financial institutions and the deepening of financial markets in a economy, which are desirable in supporting development (see chapter 5).
2. As discussed later, balanced asset growth does not imply that all assets should grow at the same rate. The focus of balanced growth, as the term is used in this chapter, is on the composition of assets, rather than on the sectoral composition of output, which is the common convention (Hirschman 1958; Nurkse 1953).
3. The lack of balance in asset growth arises as a consequence of externalities and market failures. Physical capital is perhaps less subject to externalities than human and natural capital. Imperfections in credit markets prevent the poor from investing in their education at desired levels even if they can obtain a high rate of return. Externalities affecting natural capital, including the environment, are extremely pervasive. Also, investments in human and natural capital require a long time to mature relative to most investments in physical capital. Capital market imperfections are likely to affect the financing of the former more negatively than the financing of the latter. Thus, the private market economy tends to concentrate more on the accumulation of physical capital than of the other two assets. Other reasons that could lead to unbalanced asset growth emphasized in the literature are coordination failures. These are caused by agent interactions that are not fully mediated by market prices (see, for example, Stiglitz 1975 for an early model of multiple equilibria arising from imperfect information concerning ability and education and Murphy, Shleifer, and Vishny 1989 and Rodriguez 1993 for intersectoral coordination failures).
4. Other examples of subsidies to capital are abundant. Argentina and Mexico provided monopoly rights to privatized telephone companies for prolonged periods. Brazil gave subsidies and tax concessions to invest in automobiles (*Financial Times*, July 21, 1999). Chile has subsidized tree planting by a few large

corporations to support the expansion of the private pulp and paper industry. Since the early 1980s, China has provided tax exemptions and tax reductions to foreign investors. In Central and Eastern Europe, direct government subsidies take the form of tax arrears that amount to 5–10 percent of GDP and increase by about 2 percent of GDP every year (Schaffer 1995). In Brazil, rubber producers received large subsidies from the government. Eight companies received R\$5 billion (US\$2 billion) (*Gazeta Mercantil*, May 21, 1999). In Korea, two major steel producers received US\$6 billion in 1993–99 in government subsidies, according to the U.S. complaints filed with the World Trade Organization (*New Steel* 1998). Herrera (1992) discussed in detail the regressive impact of the lack of regulation in the privatized telephone system in Argentina. See table A2.4 in annex 2.

5. Because multiple equilibria and irreversible processes are likely outcomes, there is scope for public policy interventions aimed at avoiding vicious cycles of poverty and environmental degradation.
6. The distribution of education is measured by Gini coefficients and standard deviations of education (see chapter 3 for details of these measures and López, Thomas, and Wang 1998 for a statistical analysis).
7. The average growth rate in domestic investment among the most aggressive reformers was much higher during the 1990s, after the reforms had been implemented, than in the 1970s and 1980s. In Argentina, Bolivia, Chile, and Peru, four of the most aggressive reformers in Latin America, the growth of gross investment during 1990–97 was more than 9 percent a year, almost three times the historical rates (IDB 1998).
8. In table 2.2 we use expenditures on education as a percentage of GDP instead of per capita expenditures because the underlying stock of education is likely to be positively related to GDP. Thus, a change in the share of education expenditures in GDP is likely to be more closely related to the rate of growth in human capital than the level of expenditure per capita.
9. This study was based on an explicit growth theoretic behavioral model. This is important because the estimating empirical equations derived from such a model suggest a specification that is relatively free from the simultaneous equation bias that has affected some previous studies. In particular, the empirical model consists of explaining annual growth rates by lagged stocks of assets rather than by rates of change of assets as is usually done. This considerably reduces contemporaneous correlation with the error term that usually leads to serious difficulties in deriving causality from the results. Moreover, the fact that we use country fixed effects could decrease the possibility of bias due to omitted country-specific variables, another important source of difficulty in interpreting causal relationships. Controlling for omitted variable biases and simultaneous equation biases suggests that we are in large measure addressing causality problems. Finally, the study used a detailed analysis of the policy reforms of the various countries over the two decades considered, so that the coefficients estimated were allowed to vary systematically across policy regimes. This allowed

the study to show that the weak impacts of education on growth reported by other studies was right only under certain closed economy and distorted policy regimes, but not for market-friendly environments. For more details about the estimating procedure see annex 2.

10. This study used forest area as a proxy for natural capital. Loss of forest cover is usually associated with watershed deterioration, loss of commercial logging species, water depletion, and soil erosion, all crucial for production, and is likely to be a good proxy for the degradation of natural capital.
11. This finding is not necessarily inconsistent with the literature on growth convergence, which generally finds slow convergence across countries. In fact, we find that a stable growth rate can be maintained indefinitely if physical *and* human capital grow at balanced (not equal) rates. The problem is only that the rate of economic growth declines as the stock of physical capital increases for a *given* level of human capital, or if human capital expands at a speed below a minimum required rate.