Expanding the Measure of Wealth

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Expanding measurements of national wealth to embrace natural and human resources can help to guide policies for sustainable development.

NATURAL resources count, but people count for more. This is a lesson that Adam Smith understood when he wrote *An Inquiry into the Nature and Causes of the Wealth of Nations* 220 years ago. This message is reinforced by a forthcoming World Bank analysis, *Monitoring Environmental Progress: Expanding the Measure of Wealth*. The questions posed by Adam Smith have taken on a modern twist: we now wish to inquire about not only the nature of wealth but also how to sustain it. Questions of sustainability link directly to policy concerns in natural resource management and the use of resource rents as a source of development finance.

Sustainable development has never lacked definitions, but perhaps the simplest equates it with well-being that does not decline over time. From this it is a natural leap for economists to think in terms of the stocks of assets—natural and man-made—that support well-being. Because concerns about sustainability are by their nature concerns about the future, this suggests that wealth, broadly conceived, is fundamental to the question of sustainable development.

However, some components of natural wealth will always be both intrinsically important and difficult to value in economic terms—the life-support functions of natural systems, biological diversity, and the ozone layer are the sorts of examples of critical natural capital that come to mind. Environmental economists are learning more about how to value marginal damages to critical natural capital (Dixon and others, 1994), but this is not the same as bringing it into a complete set of wealth accounts. In what follows, therefore, we will concentrate on the instrumental or use values of natural wealth. This is not quite as narrow as it sounds, for we have attempted to value, or calculate the opportunity cost of, such important elements of natural capital as nontimber forest benefits and protected areas.

As described in the box, the approach to measuring total wealth combines elements of bottom-up valuation for agricultural land, forests and protected areas, minerals and fossil fuels, produced assets, and urban land, and top-down valuation for human resources. It is important to emphasize at the outset that "human resources" combines the value of raw labor, human capital, and social capital. Human capital is generally conceived as the return to education. "Social capital" (Serageldin and Steer, 1994), which is difficult both to define and to measure, is an amalgam of individual and institutional relationships that determines why one society is more effective than another in transforming a given endowment of assets into sustained well-being.

As the first edition of *Monitoring Environmental Progress*, which was subtitled *A Report on Work in Progress* (World Bank, 1995), emphasized, expanding the measure of wealth also suggests a new paradigm of economic development: development objectives are to be met by portfolio management, where the constituents of the portfolio are natural resources, produced assets, and human resources. In this paradigm, balancing the different components of the portfolio—in total and at the margin (Hamilton, 1994)—becomes an important policy consideration for developing countries.

Regional wealth patterns

The table presents preliminary estimates of total wealth, based on the second

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The wealth accountant's toolkit

Measuring the total wealth of a country necessarily involves some heroic assumptions. The first choice a wealth accountant confronts is the discount rate: a social rate of 4 percent per annum is used throughout the measurements the World Bank makes in *Monitoring Environmental Progress: Expanding the Measure of Wealth.* Total wealth is the sum of the following components.

Minerals and fossil fuels are valued by taking the present value of a constant stream of resource-specific rents (or, to be more precise, economic profits—the gross profit on extraction *less* depreciation of produced assets and return on capital) over the life of proved and probable reserves.

Timber is valued as the present value of an infinite stream of constant resource rents where the rate of harvest is less than annual natural growth (the mean annual increment). Where timber harvest is not sustainable because harvest exceeds growth, a "reserve life" is calculated and the timber resource is treated in the same manner as a mineral.

Nontimber benefits of forests are valued by assuming that 10 percent of forested area will yield an infinite stream of benefits in the form of nontimber products, hunting, recreation and tourism. Per-hectare values of nontimber benefits vary between $112 and $145 in developing and developed countries.

Cropland is valued as an infinite stream of land rents, where land productivity is projected by region up to the year 2025 and held constant thereafter. Individual rental rates for rice, wheat, and maize are multiplied by production values at world prices to arrive at per-hectare unit rents for cereal lands; other arable land is valued at 80 percent of this rate.

Pastureland is treated similarly to cropland—rental rates are derived from the value of beef, pork, milk, and wool production at world prices.

Protected areas are valued at their opportunity costs at the per-hectare rate for pastureland. Fish are excluded from the analysis, partly for data reasons and partly because poor management has driven rents to zero in so many of the world's fisheries.

Produced assets are calculated using a perpetual inventory model, with investment data and an assumed life table for assets being the major inputs. Urban land is valued as a fixed proportion of produced assets.

Human resources are measured residually. The wealth value of returns to both labor and capital is measured as the present value of the following: non-agricultural GNP, *plus* agricultural wages, *minus* rents on minerals and fossil fuels, and *minus* depreciation of produced assets. Agricultural wages include proprietors' income and exclude resource rents; agriculture includes hunting, fishing, and logging. The present value is taken over the mean productive years of the population: the lesser of 65 years or life expectancy at age one, *minus* the mean age of the population. Subtracting produced assets, derived from the perpetual inventory model, and urban land from this present value yields the value of human resources at current exchange rates. This is then revalued using the purchasing power parity rate to obtain the final value of human resources.

Wealth per capita and components, by region, 1994

	Total wealth	Human resources	Produced assets	Natural capital	Agricultural land	Forests and protected areas	Minerals and fossil fuels
	(dollars per capita)				(percentage of natural capital)		
North America	325,274	247,892	61,953	15,429	53	25	22
Pacific OECD [1]	302,389	205,156	89,786	7,447	63	22	15
Western Europe	236,164	175,570	54,990	5,604	68	23	9
Middle East	146,243	55,898	27,304	63,041	11	1	88
South America	94,086	69,548	15,872	8,666	52	23	25
Eastern Europe and Central Asia	62,500	30,530	22,256	9,714	50	12	38
North Africa	54,185	37,034	14,348	2,803	37	2	61
Central America	51,612	40,628	7,801	3,182	77	22	1
Caribbean	47,338	32,429	9,863	5,046	83	5	12
East Asia	46,076	35,207	7,220	3,649	78	9	13
East and Southern Africa	29,863	19,526	7,345	2,992	65	22	13
West Africa	22,036	13,231	4,097	4,708	75	10	15
South Asia	21,704	13,959	4,123	3,622	90	4	6

Source: Authors' estimates. Figures are preliminary, first-round estimates.
[1] Members of the Organization for Economic Cooperation and Development in the Pacific region: Australia, Japan, and New Zealand.

(forthcoming) edition of *Monitoring Environmental Progress*, for 13 regions. There are major differences between regions not only in their total wealth but also in the composition of that wealth. Aggregate wealth—consisting of human resources, natural capital, and produced assets—varies from nearly $22,000 per capita in the world's poorest regions—South Asia and West Africa—to more than $325,000 per capita in North America. If the four wealthiest regions in the table (basically the member countries of the Organization for Economic Cooperation and Development (OECD) *plus* the oil exporting countries of the Middle East) are excluded, the remaining regions, which account for the majority of the world's countries and population, vary in wealth by a factor of just over 4, ranging between $22,000 and $94,000 per capita.

What accounts for the large spread in wealth estimates, especially between OECD countries and the rest of the world? The answer is largely human resources and their role in creating and transforming wealth. Natural capital, for example, has the smallest spread between rich and poor countries when measured in dollar terms—about 5 to 1 (excluding the oil rich Middle East). In fact, most regions have per capita natural capital values of between $3,000 and $10,000, or roughly a 3 to 1 spread between the richest and the poorest. In contrast, the spread for produced assets is about 22 to 1, and for human resources, about 19 to 1. There is an important story here: natural capital, the base for all life, is much more equitably distributed than other forms of capital. What matters is how this resource is managed and whether the rents from the natural capital endowment are invested or consumed.

As a generalization, based on the data in the table, we may safely assert that wealthy regions tend to be rich in both human resources and produced assets, while there is a fairly constant contribution of natural capital to total wealth across all regions. There are two notable (and not unexpected) exceptions: the high value for natural capital in the Middle East (owing to its oil reserves) and the large value for produced assets in the Pacific OECD countries (largely owing to Japan's capital stock *plus* smaller contributions from Australia and New Zealand).

Natural capital, which tends to have higher dollar values per capita in richer countries, accounts for a lower percentage share of national wealth in the same countries because of the relatively greater

importance of human resources and produced assets. At the extremes, both Western Europe and West Africa have roughly the same per capita dollar value for natural capital—about $5,000—yet these resources account for more than 20 percent of West Africa's wealth and less than 2 percent of Western Europe's.

The composition of natural capital also exhibits a clear pattern: agricultural land (cropland and pasture) accounts for between 50 and 90 percent of the total value of natural capital (again, with the exception of the Middle East), while minerals and fossil fuels account for between 5 and 25 percent of the total, and forests and protected areas make up the balance.

Clearly, natural capital, including the land resource, is important in most countries. For poor countries, growth in wealth is connected to use of products of the land and the rents that are extracted from the natural resource base. These uses are reflected in the growth of produced assets and human resources. Both produced assets and human capital can be created as a result of conscious decisions. And, as seen in the table, these are the forms of capital that account for most of a nation's wealth and potential for economic (and social) growth.

The chart makes this last point quite clearly, by comparing the composition of wealth in high-income countries with that in low-income primary product (nonfuel) exporters. For a country to move from the latter group into the former, proper resource management, investment of resource rents, and balanced accumulation of both human resources and produced assets will be required. Note that, as a share of wealth, produced assets are not obviously deficient in low-income countries.

Human resources and capital

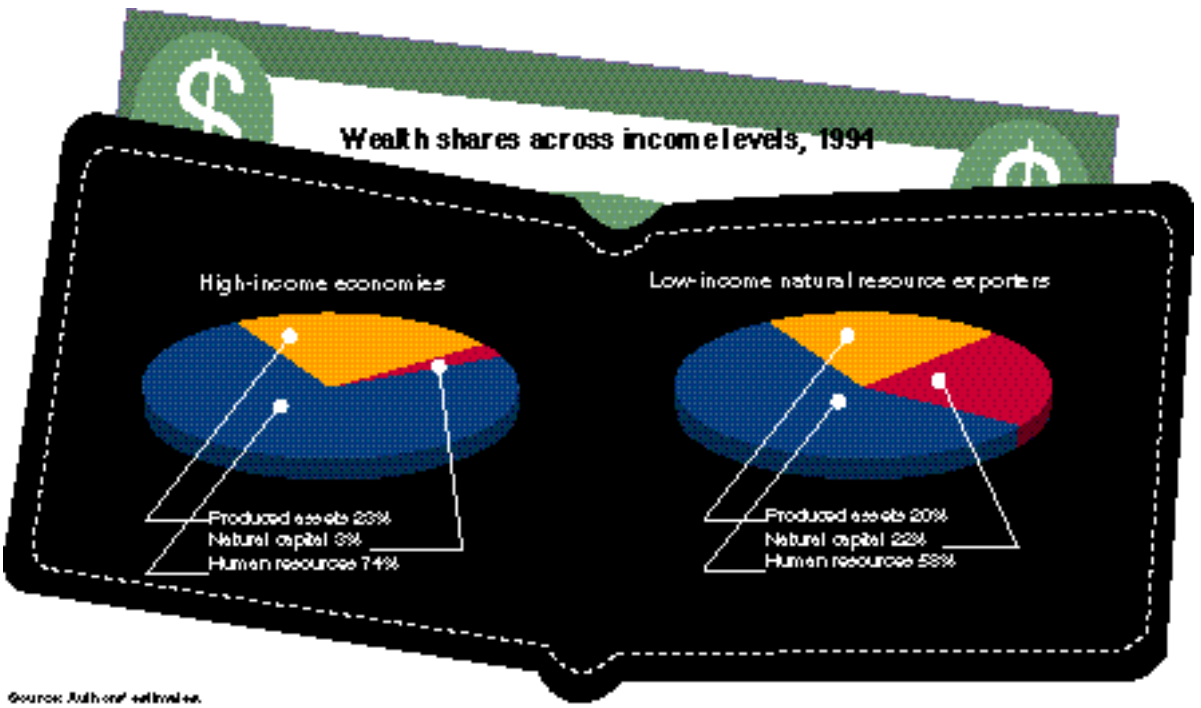
Because human resources are so dominant in the wealth figures, and because they are derived residually, it is important to corroborate these estimates. A reasonable proposition would be that human capital—the return to education—should explain a large amount of the variation we see in human resource values. If we relate country-level per capita human resource estimates for 1994 to a physical measure of human capital—mean years of education per capita—in 1992, we find support for this proposition. Specifically, we find that increasing returns are derived from the accumulation of years of education in the population.

This analysis therefore conveys a positive policy message: human resources can be built by investing in education. This is important, because the other constituents of human resources—raw labor and social capital—appear to be much less susceptible to policy intervention. Raw labor is a pure endowment, whose price is determined by local market conditions. Social capital can certainly be destroyed by bad policies, but we still have a lot to learn about how it can be fostered and built.

Conclusions

Expanding the measure of wealth sheds new light on the model of development that has guided the lending and advice given by development institutions. This fresh analysis of the elements of wealth and the determinants of future well-being suggests a number of conclusions:

- Agricultural land is the dominant natural resource across all income classes, making up more than 50 percent of natural capital, with the exception of the Middle Eastern oil exporters. This is especially the case for low-income countries, where agricultural land constitutes more than 80 percent of natural wealth. It must be emphasized again, however, that use value is the predominant method of valuing natural resources in these estimates.
- Natural capital is important regionally, making up more than 10 percent of total wealth in the Caribbean, East and Southern Africa, Eastern Europe and Central Asia, the Middle East, South Asia, and West Africa.
- Human resources, including the returns to raw labor, are the dominant component of wealth, comprising between



Source: Author estimates.

40 and nearly 80 percent of the total in all regions.

The policy implications of this analysis include the following:

• Given the large share of agricultural land in the natural capital of low-income countries, sound management of this land is of great importance. As a corollary, policies favoring the growth of rural incomes are also essential.

• The capture and reinvestment of economic rents from mineral and petroleum resources is a significant issue in many middle-income countries.

There is no simple explanation of how a country's natural resource wealth affects its economic growth. While there is some evidence that the most resource-intensive economies have grown more slowly than their peers since the 1970s, in the end the transformation of resource wealth into income growth depends on sound policy—in particular, the effectiveness of public investment of resource rents. Chief among the quality investments available to governments is investment in human capital—in both the education and health sectors.

It must be emphasized that the analysis of aggregate wealth presented here ignores the distribution of wealth within countries. Issues for many countries will therefore include not only the management of existing wealth but also the policies affecting its distribution. Analyzing aggregate wealth also masks the important contribution of social capital to economic development.

Perhaps the key policy question from the analysis is raised by the chart: how does a low-income, resource-exporting country transform itself into a high-income country? There is no single policy prescription, but elements of the answer must include depleting exhaustible resources and investing the rents effectively, managing renewable resources (forests, fisheries, and agricultural land) sustainably, investing in produced assets, and increasing investment in human capital.

Natural wealth can be an important source of development finance, but there is no guarantee that development based on harvesting bountiful natural resources will lead to development that is sustainable and equitable. Only sound policies can transform the former into the latter. F&D

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