PART 2

CHANGES IN WEALTH

Chapter 3

Recent Genuine Saving Estimates

However sustainable development is defined,[1] achieving it is, at heart, the process of maintaining wealth for future generations. Wealth is conceived broadly to include not only the traditional measures of capital, such as produced and human capital, but also natural assets. Natural capital comprises assets such as land, forests, and subsoil resources. All three types of capital—produced, human, and natural—are key inputs to sustaining economic growth.

The standard national accounts measure the change in a country's wealth by focusing solely on produced assets. A country's provision for the future is measured by its gross national saving, which represents the total amount of produced output that is not consumed. Gross national saving, however, can say little about sustainable development, since assets depreciate over time. Net national saving equals gross national saving minus depreciation of fixed capital and is one step closer to measuring sustainability. The next step in measuring sustainability is to adjust net saving for the accumulation of other assets—human capital, the environment, and natural resources—that underpin development.

This chapter introduces the concept of *genuine* saving (formally known as adjusted net saving) first derived in Pearce and Atkinson (1993) and Hamilton (1994). It then presents and discusses the empirical calculations of genuine saving rates available for over 140 countries (tabulated in appendix 3). Genuine saving provides a much broader indicator of sustainability by valuing changes in natural resources, environmental quality, and human capital, in addition to the traditional measure of changes in produced assets provided by net saving.

Negative genuine saving rates imply that total wealth is in decline; policies leading to persistently negative genuine saving are unsustainable. In addition to serving as an indicator of sustainability, genuine saving has the advantage of presenting resource and environmental issues within a framework that finance and development planning ministries can understand. It makes the growth-environment trade-off explicit, since those countries pursuing economic growth today, at the expense of natural resources, will be notable by their depressed rates of genuine saving. Of the 140 countries where genuine saving is estimated for 2003, just over 30 have negative saving rates.

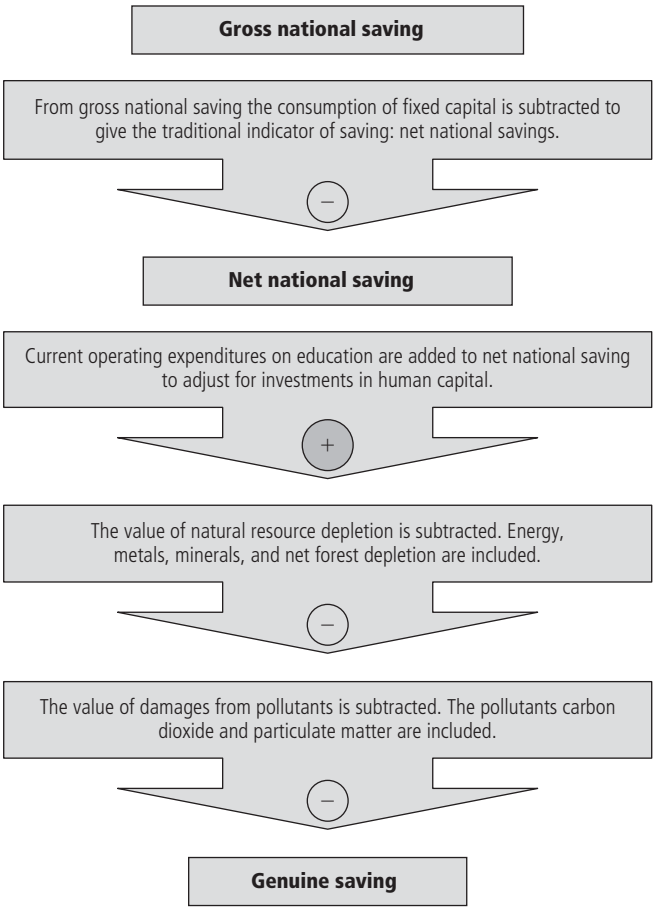
Calculating Genuine Saving

Figure 3.1 provides a flow chart describing each of the main steps in the genuine saving calculation. Starting at the top of figure 3.1, the calculation of genuine saving begins with gross national saving. Gross national saving is calculated as the difference between the gross national income (GNI) and public and private consumption plus net current transfers. From this the consumption of fixed capital is subtracted, giving the traditional measure of net national saving. Consumption of fixed capital represents the replacement value of capital used up in the process of production.

In the traditional measure of net national saving only that portion of total expenditure on education that goes toward fixed capital (such as school buildings) is included as a part of saving; the rest is treated as consumption. From the perspective of broadening the measure of wealth this is clearly unsatisfactory. Therefore, as a crude approximation, current operating expenditures on education, including wages and salaries and excluding capital investments in buildings and equipment, are added to net national saving.[2]

Natural resource depletion is then subtracted. The value of resource depletion is calculated as the total rents on resource extraction and harvest, where rents are estimated as the difference between the value of production at world prices and total costs of production, including depreciation of fixed capital and return on capital. The energy resources include oil, natural gas, and coal, while metals and minerals include bauxite, copper, gold, iron ore, lead, nickel, phosphate, silver, tin, and zinc.

Figure 3.1 Flow Chart of Genuine Saving Calculation



As a living resource, forest resources are fundamentally different from energy, metals, and minerals. The correction to the net saving rate is thus not simply rent on timber extraction, but rather rent on that portion of timber extraction that exceeds natural growth. If growth exceeds harvest, this figure is set to zero.

The genuine saving calculation also includes the value of damages from air pollution. Pollution damages can enter the national accounts in several ways. While, in theory, pollution damage to produced assets is included in depreciation figures, in practice, most statistical systems are not detailed enough to capture this. For example, acid rain damages to building materials are rarely fully accounted. The effects of pollution

on output—damage to crops, for example—are already included in the standard national accounts, although not explicitly.

Next is the adjustment for damages from carbon dioxide, using a figure for marginal global damages of $20 (1995 prices) per metric ton of carbon emitted (Fankhauser 1994).[3] This represents the present value of marginal damages to crops, infrastructure, and human health over the time that emitted carbon dioxide resides in the atmosphere—over 100 years.

Finally, the value of health damages arising from particulate matter pollution is deducted. Particulate air pollution is capable of penetrating deep into the respiratory tract and causing damage, including premature mortality. The population-weighted average level of PM_{10} (particulate matter less than 10 microns in diameter) is estimated for all cities in each country with a population in excess of 100,000. Particulate emission damage is calculated as the willingness to pay to reduce the risk of mortality attributable to PM_{10} (Pandey and others 2005).

The net result of all these adjustments is genuine saving.

Interpreting Genuine Saving Estimates

Welfare can be sustained indefinitely if gross saving just equals the sum of depreciation of produced assets, depletion of natural resources, and pollution damages. This is the well-known Hartwick rule. A persistently negative genuine saving rate implies that a country is on an unsustainable path and welfare must fall in the future.

However, we should be cautious in interpreting a positive genuine saving rate. There are some important assets omitted from the analysis for methodological and empirical reasons, which may mean that saving rates are only apparently positive. First, fisheries can be a significant resource for a local or national economy. However, it can be very difficult to measure fish stocks and to attribute ownership to one country, not least because of their mobility. Soil erosion is another important issue, especially in agrarian economies. Attaching a value to soil erosion requires detailed local data that are not widely available, and it can be extremely difficult to disentangle the economic costs of soil erosion from the physical losses (see box 3.1). Diamonds are another important resource for some countries, most significantly in Angola, Botswana, the Democratic Republic of Congo, Namibia, the Russian Federation, and

South Africa. Diamonds are excluded from the analysis because of data availability issues and the lack of free-market prices.

Box 3.1 Soil Degradation and Changes in Wealth

Ideally, adjusted net or genuine saving should include the depletion and degradation of land resources, which contribute 18 percent of total wealth in low-income countries. However, data comparability and availability do not allow for systematic inclusion of this item in the saving analysis.

For many low-income countries that depend on the natural resource base for their development, the loss of soil quality can be a major problem. The UN Convention to Combat Desertification is a policy response to this trend, and the recently published *Millennium Ecosystem Assessment* (2005) points to land degradation in drylands, in particular in Africa and Central Asia, as one of the major challenges now facing the international community. Many of the poorest countries in the world face serious land degradation problems.

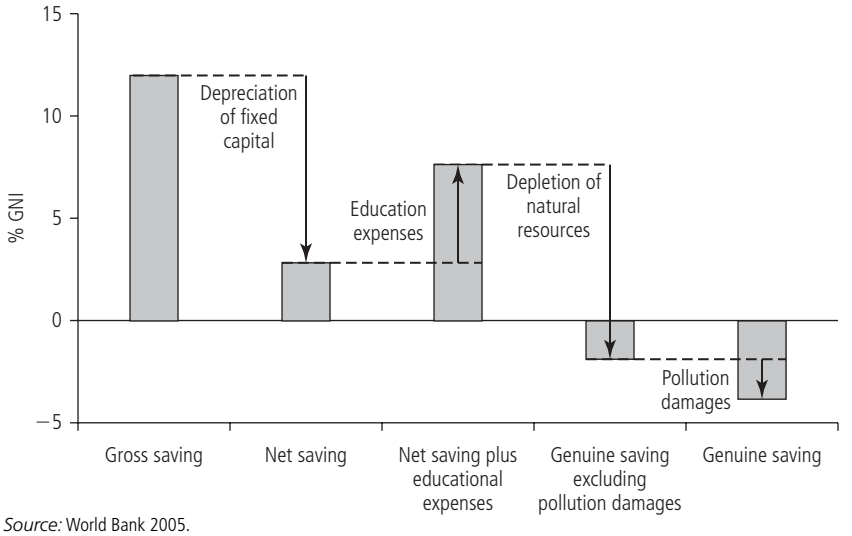
Statistical information on the cost of land degradation is not widely available, largely because the effects of erosion are complex to measure with accuracy. It is not sufficient to measure on-farm effects since the external consequences of erosion can be significant. Negative off-farm effects of erosion include siltation of dams, salinization, and loss of biodiversity. But there are also positive effects of erosion—for example, delta landscapes, such as the Nile Delta and Bangladesh, depend on the yearly deposit of soil and nutrients transported by rivers for their fertility.

It is probably safe to assume that soil erosion that goes considerably beyond natural levels has negative economic effects. Through case studies undertaken for seven developing countries in Africa, Asia, and Latin America it has been estimated that the problems of sustainable land management deduct 3 percent to 7 percent from agricultural GDP (Berry and others 2003). A study from Australia (Gretton and Salma 1996) estimates soil fertility loss equivalent to 6 percent of agricultural production. Soil losses can be significant.

The Genuine Saving Calculation: A Country Example

Figure 3.2 shows the steps in calculating genuine saving for Bolivia, one of the poorest countries in Latin America, with GDP per capita below $1,000. Bolivia is endowed with a wealth of natural resources, including minerals, oil, and huge deposits of natural gas discovered at the end of the 1990s.

Figure 3.2 Adjustments in the Genuine Saving Calculation for Bolivia (2003)



Source: World Bank 2005.

The first column in figure 3.2 shows the traditional measure of gross national saving in Bolivia, 12 percent of gross national income (GNI) in 2003. Deducting the depreciation of produced capital reveals a much lower net saving rate, less than 3 percent. Investments in education are estimated to be around 5 percent of GNI, bringing the saving rate up to nearly 8 percent as shown by the third column in figure 3.2.

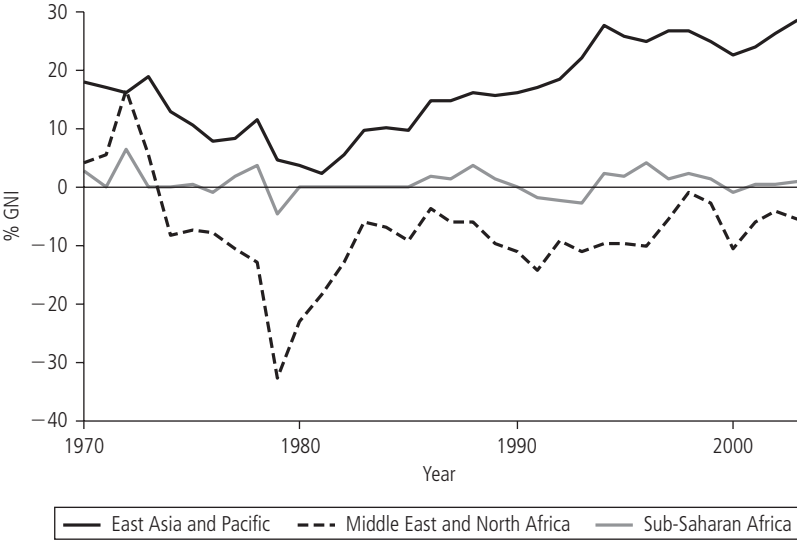
Following this, adjustments are made for depletion of natural resources. Resource rents from Bolivia's extraction of oil and gas are deducted, as well as the rents from gold, silver, lead, zinc, and tin. Depletion of energy, metals, and minerals amount to over 9 percent of the GNI. While deforestation is deemed to be a problem in Bolivia, available data suggest that net forest depletion is zero. As a result of these deductions for resource depletion, Bolivia's genuine saving rate is negative.

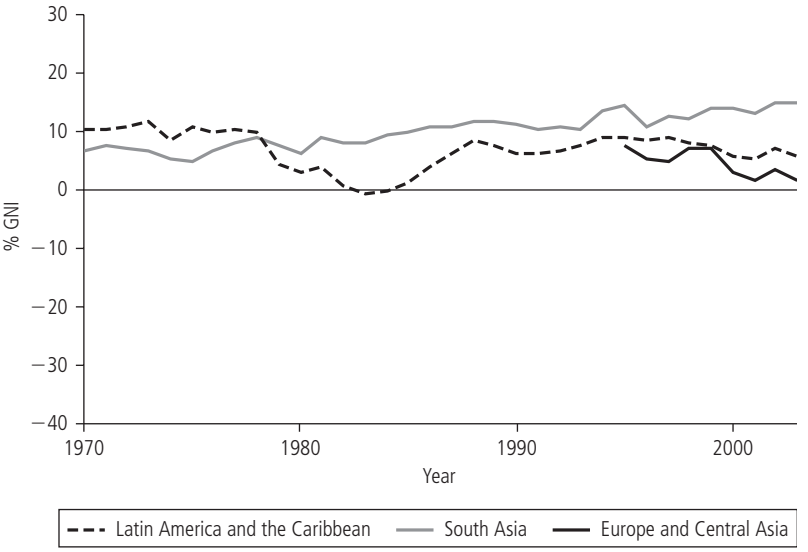
Finally, the deduction for pollution damages leads to a bottom-line estimate of Bolivia's genuine saving rate of minus 3.8 percent of GNI. Bolivia is currently on an unsustainable development path.

Regional Disparities

The calculation of aggregate genuine saving rates by region reveals some striking differences between regions of the world as shown

Figure 3.3 Genuine Saving Rates by Region





Source: World Bank 2005.

in figure 3.3. The Middle East and North Africa stands out for its consistently negative saving rate, reflecting high dependence on petroleum extraction. However, not all countries in the region have negative genuine saving rates. Jordan, Morocco, and Tunisia had consistently positive genuine saving rates over the period, exceeding 15 percent of GNI.

Regional genuine saving rates are highly sensitive to changes in world oil prices. The Iranian revolution from 1978 to 1979 followed by the Iran-Iraq war in 1980 resulted in crude oil prices more than doubling from $14 in 1978 to $35 per barrel in 1981. This is clearly shown in figure 3.3—genuine saving rates dipped in the region, largely owing to the consumption of sharply increased oil rents.

In stark contrast to the Middle East and North Africa stands the East Asia and Pacific region, with recent aggregate genuine saving figures nearing 30 percent, driven largely by China. This diverse region has enjoyed steady economic growth and progress toward poverty reduction. From 1999 to 2004, the number of East Asians living on less than $2 a day fell from 50 to 34 percent, or by about 250 million people. The boom in economic performance from the second half of the 1980s until the Asian financial crisis in 1997 is reflected in the genuine saving numbers, largely driven by increases in gross national saving.

In Sub-Saharan Africa, the poorest region in the world, the number of people living in extreme poverty has almost doubled, from 164 million in 1981 to 314 million today. Genuine saving rates in the region have been hovering around zero. The aggregation masks wide disparities between countries in the region. Positive genuine saving rates in countries such as Kenya, Tanzania, and South Africa are offset by strongly negative genuine saving rates in resource-dependent countries such as Nigeria and Angola, which have genuine saving rates of minus 30 percent.

South Asia displays consistently strong genuine saving rates. The regional aggregate genuine saving rate has been fluctuating between 10 and 15 percent since 1985, with India dominating the aggregate figure. Nepal is the region's new strong saver with genuine saving rates reaching nearly 30 percent in 2003. Nepal's gross national saving rate has been steadily increasing from the 1990s to the present day.

Latin American genuine saving rates have remained fairly constant throughout the 1990s. The large economies in the region, Mexico and Brazil, have positive genuine saving rates in excess of 5 percent. However, for the region's largest oil producer, República Bolivariana de Venezuela, saving rates tell a different story. Like many other oil producers, República Bolivariana de Venezuela's genuine saving rate has been persistently negative since the late 1970s.

Regional genuine saving data for Eastern Europe and Central Asia are only available from 1995. Saving rates have fallen from over

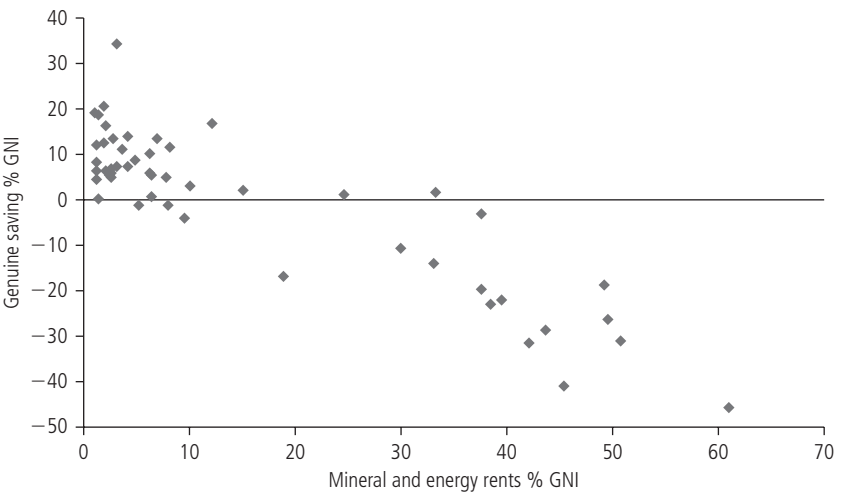
7.7 percent in 1995 to 1.7 percent in 2003. Of the 23 countries for which data were available in the region, 17 have positive genuine saving rates in 2003, averaging around 10 percent of GNI. However, the oil states of Azerbaijan, Kazakhstan, Uzbekistan, Turkmenistan, and the Russian Federation all have persistently negative genuine saving rates, thus pulling the regional aggregate downwards.

Consuming Resource Rents

Stocks of exhaustible resources such as oil represent a potential source of development finance. The question for countries with resource endowments is whether to consume these resource rents, providing current welfare but at a cost to future generations, or to invest the rents in other assets. Figure 3.4 scatters genuine saving rates against mineral and energy rents for resource-rich countries (defined as countries with exhaustible resource shares in excess of 1 percent of GNI).

Figure 3.4 shows that as resource rents increase as a percentage of GNI, genuine saving rates tend to decline. This implies that a significant proportion of natural resource rents are being consumed rather than

Figure 3.4 Genuine Saving and Exhaustible Resource Share (share 2003)



Source: World Bank 2005.

invested in other productive assets. Chapter 4 explores this issue further and finds that the consumption rather than investment of resource rents is common in resource-rich countries.

Income and Saving

Genuine saving estimates for the 1970s reveal a worrying trend: rich countries had considerably higher saving rates than poorer countries, implying a potentially wider divergence in income and wealth between high-income and low-income countries. In 1970, high-income countries were saving 15 percent more of their GNI than low-income countries. Genuine saving rates for low-income countries were positive in aggregate, but only equal to 4 percent of GNI. However, as shown in figure 3.5, genuine saving rates have converged over time. In fact, in 2003 high-income countries were saving less as a percentage of GNI than both low- and middle-income countries. High-income countries saving rates as a percentage of GNI have declined over time, while saving rates for low- and middle-income countries have increased.

Figure 3.5 Genuine Saving Rates by Income Group

Source: World Bank 2005.

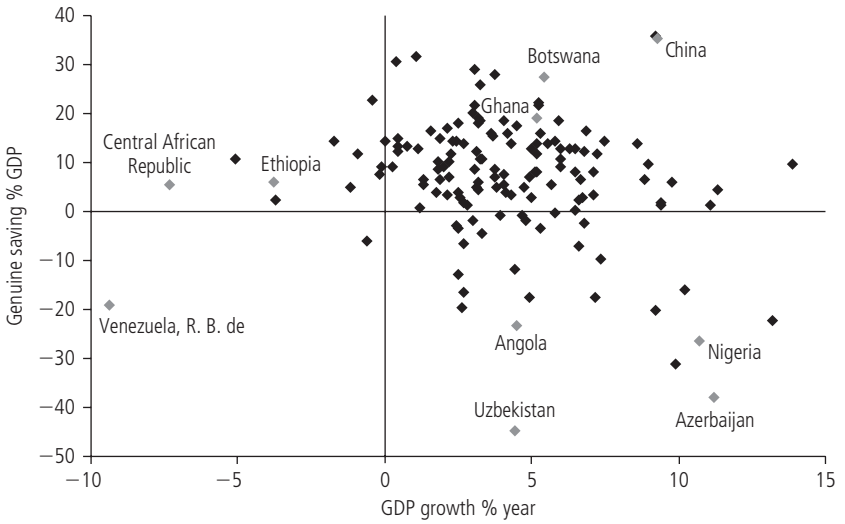
Saving and Growth

Figure 3.6 scatters genuine saving rates (as percentage of GDP) against GDP growth in 2003. Countries in the top-right quadrant have positive GDP growth rates and positive genuine saving rates. These economies are growing and, according to the genuine saving measure, not at the expense of future generations. This points to a positive future for countries like Botswana, China, and Ghana, all of whom have strong economic growth and positive genuine saving rates.

Countries in the top-left-hand quadrant of figure 3.6 are experiencing contracting economies with declining GDP. However, these countries have positive genuine saving rates, implying they are still investing for the future.

Traditional indicators of economic growth would suggest that those countries in the bottom-right-hand corner of figure 3.6 are doing well—economic growth is positive. However, when genuine saving is taken into consideration, this optimistic story changes. Countries such as Nigeria, Angola, Uzbekistan, and Azerbaijan all have growing economies, but negative genuine saving rates may be imperiling future generations.

Figure 3.6 Genuine Saving Rates against Economic Growth (2003)



Source: World Bank 2005.

Countries in the bottom-left-hand quadrant face the biggest challenge. These economies are currently shrinking, while at the same time future welfare prospects are being reduced as a result of negative genuine saving rates. República Bolivariana de Venezuela is a case in point—persistent negative levels of economic growth[4] and genuine saving paint a troubling picture for future welfare.

Conclusions

Genuine saving provides an indicator of sustainability. There are many countries for which negative genuine saving rates are a reality (see appendix 3). In addition, those countries with low positive levels of genuine saving may also be pursuing a policy mix that will result in declining welfare over time, since measures of the depreciation of key assets may be masked by lack of data and methodological limitations.

Genuine saving rates differ widely throughout the world as shown by the regional aggregates in figure 3.3. The evidence suggests that while resource-rich countries have the potential to achieve sustainable development if resource rents are appropriately invested, many are not doing so, as shown in figure 3.4.

Genuine saving is useful to policy makers not only as an indicator of sustainability, but as a means of presenting resource and environmental issues within a framework familiar to finance and development planning ministries. It underlines the need to boost domestic saving, and hence, the need for sound macroeconomic policies, and it highlights the fiscal aspects of environment and resource management, since collecting resource royalties and charging pollution taxes are basic ways to both raise development finance and ensure efficient use of the environment.

Endnotes

1. See Pearce (1993) for a discussion on the definition of sustainable development.

2. For a further discussion of accounting for human capital in the genuine saving calculation see World Bank (1996).

3. Tol (2005) reviewed over 100 estimates of the marginal damage cost of carbon dioxide emissions. He found a large range of uncertainty: the median cost was found to be $14 per ton of carbon and the mean to be $93/tC. On balance the use of the Fankhauser (1994) estimate of $20/tC appears to be reasonable.

4. República Bolivariana de Venezuela GDP has declined by 11 percent between 1993 and 2003.