Chapter 5

The Importance of Population Dynamics: Changes in Wealth per Capita

Adjusted net, or genuine, saving was introduced in chapter 3. As a more-inclusive measure of net saving effort, one that includes depletion and degradation of the environment, depreciation of produced assets, and investments in human capital, genuine saving provides a useful indicator of sustainable development. The underlying theory (Hamilton and Clemens 1999) shows that negative rates of genuine saving imply future declines in utility along the optimal growth path for the economy. In the real world these theoretical results imply the common-sense notion that sustained negative rates of genuine saving must lead, eventually, to declining welfare. See box 1.1 for an overview of the theoretical work linking net saving to changes in welfare.

If population is not static, then it is clearly per capita welfare that policy should aim to sustain. Genuine saving measures the real change in value of total assets rather than the change in assets per capita. Genuine saving answers an important question: Did total wealth rise or fall over the accounting period? However, it does not speak directly to the question of the sustainability of economies when there is a growing population. If genuine saving is negative, then it is clear in both total and per capita terms that wealth is declining. For a range of countries, however, it is possible that genuine saving in total could be positive while wealth per capita is declining.

A simple formula, which assumes that the population grows exogenously, makes the accounting clear. If total wealth is denoted W, population P,

and population growth rate g, then the change in wealth per capita can be shown to equal:

$$\Delta\left(\frac{W}{P}\right) = \frac{\Delta W}{P} - g \cdot \frac{W}{P} = \frac{W}{P}\left(\frac{\Delta W}{W} - g\right) \qquad (5.1)$$

If we interpret ΔW as genuine saving, then the first equality says that the change in wealth per capita equals genuine saving per capita minus a Malthusian term, the population growth rate times total wealth per capita. A growing population implies that existing wealth must be shared with each new cohort entering the population. More intuitively, the second equality in equation 5.1 says that total wealth per capita will rise or fall depending on whether the growth rate of total wealth ($\Delta W/W$) is higher or lower than the population growth rate.

This chapter applies the formula for changes in wealth per capita provided in equation 5.1 to the wealth database for the year 2000. The interplay of saving effort and population growth turns out to be quite significant.

Accounting for Changes in Wealth per Capita: A Ghanaian Example

Measuring saving and wealth in per capita terms requires some changes to the accounting framework presented in chapters 2 and 3. The first point is that we wish to measure only total *tangible* wealth, excluding intangible capital, when calculating the change in wealth per capita. Roughly speaking, the intuition behind this is that much intangible capital is *embodied* in the population.

An adjustment should be made to the calculation of adjusted net saving. The underlying accounting framework suggests that a growing population, through a Malthusian effect, as described above, should actually boost saving per person when the stock of carbon dioxide historically emitted by a given country is taken into account. This potentially offsets the effect of current emissions per person. Since no data on stocks of carbon dioxide emitted by country are available, we simplify the accounting by dropping value of emissions per person.

Table 5.1 Ghana: Calculating the Change in Wealth
— $ per capita —

Tangible wealth		Adjusted net saving	
Subsoil assets	65	Gross national saving	40
Timber resources	290	Education expenditure	7
NTFR	76	Consumption fixed capital	19
Protected areas	7	Energy depletion	0
Cropland	855	Mineral depletion	4
Pastureland	43	Net forest depletion	8
Produced capital	686		
Total tangible wealth	2022	Adjusted net saving	16
Population growth	1.7%	Δ Wealth per capita	–18

Source: Authors.
Note: Data for 2000. NTFR: nontimber forest resources.

Table 5.1 displays the detailed accounting of the change in wealth per capita in Ghana, a country with a 1.7 percent population growth rate per year. The left-hand column shows the assets that compose tangible wealth, summed to yield total tangible wealth per capita. The right-hand column breaks out the accounting of adjusted net saving. Gross national saving is added to education expenditures to yield total saving effort; consumption of fixed capital and natural resource depletion are then subtracted from this total to yield the net saving per Ghanaian, $16. The population growth rate is then multiplied by tangible wealth (the Malthusian term) and the result subtracted from adjusted net saving to yield the bottom-line change in wealth, –$18 per Ghanaian. The rate of change of total real wealth ($16/$2,022 = 0.8 percent) is less than the population growth rate.

Changes in Wealth per Capita in Selected African Countries

Table 5.2 summarizes the results of this accounting for the African countries in the wealth database. The gross national income (GNI) per capita and population growth rates are provided for reference in the table. Adjusted net saving excludes carbon dioxide emissions, as described above.

Table 5.2 Africa: Change in Wealth per Capita 2000
— $ per capita —

	GNI per capita	Population growth rate (%)	Adjusted net saving per capita	Change in wealth per capita	Saving gap (% GNI)
Benin	360	2.6	14	–42	11.5
Botswana	2,925	1.7	1,021	814	
Burkina Faso	230	2.5	15	–36	15.8
Burundi	97	1.9	–10	–37	37.7
Cameroon	548	2.2	–8	–152	27.7
Cape Verde	1,195	2.7	43	–81	6.8
Chad	174	3.1	–8	–74	42.6
Comoros	367	2.5	–17	–73	19.9
Congo, Rep. of	660	3.2	–227	–727	110.2
Côte d'Ivoire	625	2.3	–5	–100	16.0
Ethiopia	101	2.4	–4	–27	27.1
Gabon	3,370	2.3	–1,183	–2,241	66.5
Gambia, The	305	3.4	–5	–45	14.6
Ghana	255	1.7	16	–18	7.2
Kenya	343	2.3	40	–11	3.2
Madagascar	245	3.1	9	–56	22.7
Malawi	162	2.1	–2	–29	18.2
Mali	221	2.4	20	–47	21.2
Mauritania	382	2.9	–30	–147	38.4
Mauritius	3,697	1.1	645	514	
Mozambique	195	2.2	15	–20	10.0
Namibia	1,820	3.2	392	140	
Niger	166	3.3	–10	–83	50.3
Nigeria	297	2.4	–97	–210	70.6
Rwanda	233	2.9	14	–60	26.0
Senegal	449	2.6	31	–27	6.1
Seychelles	7,089	0.9	1,162	904	
South Africa	2,837	2.5	246	–2	0.1
Swaziland	1,375	2.5	129	8	
Togo	285	4.0	–20	–88	30.8
Zambia	312	2.0	–13	–63	20.4
Zimbabwe	550	2.0	53	–4	0.7

Source: Authors.
Note: All dollars at market exchange rates.

The table introduces a new performance indicator, the *saving gap* as a share of GNI. This is a measure of how much extra saving effort would be required in order for a country to break even with zero change in wealth per capita. It is calculated by identifying negative changes in wealth per capita, a measure of how far countries are from the break-even point, then dividing this by GNI per capita. South Africa is effectively at the point where wealth creation just offsets population growth.

This table shows that the generally high rates of population growth in African countries translate into very few countries with growing wealth per capita—Botswana,[1] Mauritius, Namibia, Seychelles, and Swaziland. These positive examples show that a Malthusian outcome is not inevitable. Sound resource policies combined with sound macroeconomic policies can lead to wealth creation.

A long list of African countries exhibits positive net saving per capita, but negative changes in total wealth per capita. These include Benin, Burkina Faso, Cape Verde, Ghana, Kenya, Madagascar, Mali, Mozambique, Rwanda, Senegal, and Zimbabwe. Population growth is outstripping wealth creation in these countries.

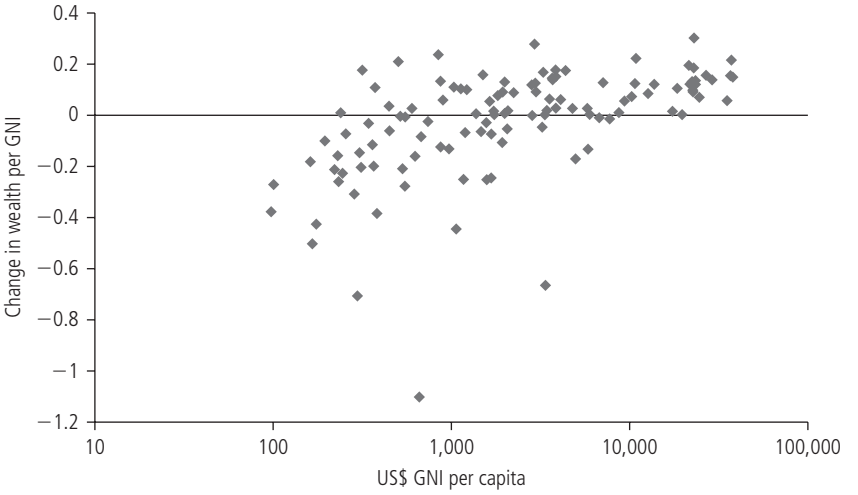
The oil states—the Republic of Congo, Gabon, and Nigeria—stand out in table 5.2 for enormous saving gaps (more than 100 percent of GNI in the case of the Republic of Congo). These countries are both running down total assets (as measured by negative adjusted net saving) and experiencing the immiserating effects of high population growth rates.

Changes in Wealth per Capita Across Countries

Figures 5.1 and 5.2 summarize changes in wealth per capita across all 118 countries in the database. The first figure scatters change in wealth per capita as a share of GNI against GNI per capita. The aim is to see how saving performance is linked to levels of income. The second figure looks at the correlation of net saving per capita with population growth rates.

As figure 5.1 shows, the broad picture is that the rich are getting richer while the poor are getting poorer. There is an upward trend to the scatter,

Figure 5.1 Change in Wealth per GNI vs. GNI per Capita, 2000



Source: Authors. Data on GNI per capita are from World Bank 2005.

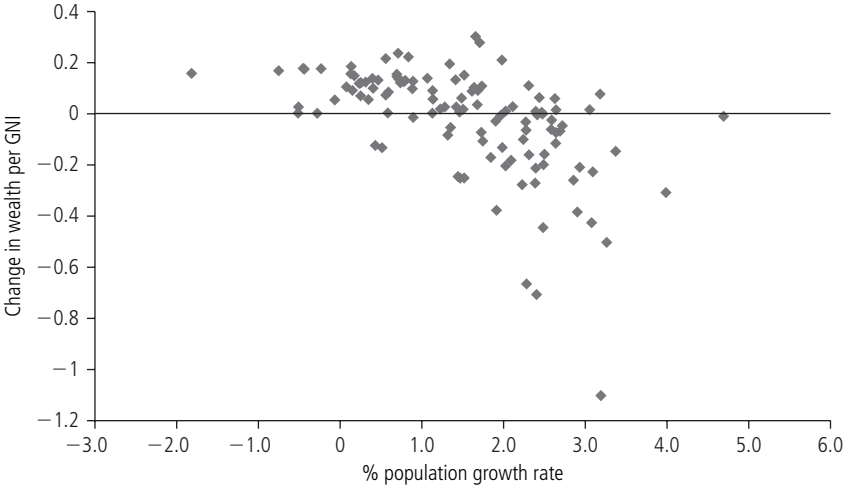
and the majority of countries with GNI of less than $1,000 per person have declines in wealth per capita. Low levels of saving in poor countries are well-known phenomena, but factoring in population growth accentuates this trend markedly.

The downward trend in figure 5.2 shows that high population growth rates are associated with lower net accumulation of wealth per person. Empirically, the majority of countries with population growth rates above 1.5 percent a year are on a path of declining wealth per capita. The figure shows a cluster of countries with population growth rates between 2 percent and 3 percent and positive accumulation of wealth per capita. Countries such as Namibia, the Philippines, and Jordan show that, as noted above, Malthusian outcomes are not inevitable.

The table in appendix 4 reports results on changes in wealth per capita and saving gaps across all countries in the database, using the same structure as table 5.2.

The oil producers joining the list of countries with high saving gaps (greater than 10 percent of GNI) include Syria, Iran, Ecuador, Algeria, República Bolivariana de Venezuela, and Trinidad and Tobago. Both in total and on a per capita basis these countries are running down their assets. Studies of historical data have shown that

Figure 5.2 Change in Wealth per GNI vs. Population Growth Rate, 2000



Source: Authors. Data on population growth are from World Bank 2005.

countries combining high dependence on resource extraction and negative net saving rates have lagged the growth performance of other countries (Atkinson and Hamilton 2003).

Finally, many of the countries of Eastern Europe and Central Asia are experiencing population declines, which raises saving per capita according to the formula underlying the saving calculation. These countries include Bulgaria, Estonia, Georgia, Hungary, Latvia, Moldova, Romania, and the Russian Federation. While, in principle, shrinking populations increase assets per capita, there is no guarantee that this will increase welfare per capita if these assets are not used efficiently.

Conclusions

Before drawing the main conclusions from this analysis, it is important to note some alternative models of adjusted net saving. First, one of the largest potential factors offsetting dissaving is technological change. If technological change can be considered to be exogenous, then the effect of growth in total factor productivity has to be built into the saving

analysis. While for high-income countries the adjustment to saving could be very large,[2] total factor productivity growth in low-income countries has been extremely low or negative.

Second, if population growth were endogenous, then this could potentially have an impact on countries' prospects for future welfare. For example, if fertility were negatively related to wealth per person, then countries that are calculated to have negative changes in wealth per capita could potentially face higher birthrates and a downward spiral of immiseration. This would tend to emphasize the importance of the figures presented here.

The Ghanaian example shows that it is indeed possible to have positive genuine saving in total, but declining wealth per person. Countries with high population growth rates are effectively on a treadmill, and need to create new wealth just to maintain existing levels of wealth per capita.

Table 5.2 suggests very large saving gaps in Sub-Saharan Africa when population growth is taken into account. Excluding the oil states, saving gaps in many countries are on the order of 10–50 percent of GNI. Against this must be set the realization that reigning in government consumption by even a few percentage points of GNI is extremely painful and often politically perilous. Macroeconomic policies alone seem unlikely to close the gap.

The table in appendix 4 shows that large saving gaps are not strictly a Sub-Saharan African phenomenon. Selected countries in the Middle East and North Africa, Latin America and the Caribbean, East Asia, and South Asia also have significant saving gaps. Although wealth data are lacking, given their sharply negative genuine saving rates (reported in chapter 3) and moderate population growth rates, it is highly likely that the oil states in Central Asia (Azerbaijan, Kazakhstan, and Uzbekistan) also face large saving gaps.

Against this rather bleak picture there are the examples of countries that, even in the face of high population growth rates, have managed to achieve positive rates of wealth accumulation per capita. Policy clearly matters, both in the resource and macroeconomic domains. The next chapter examines, using historical data, whether the model of saving presented here is overstringent in its assumptions about the effects of population growth.

Endnotes

1. Botswana has relatively low population growth and a sizable increase in wealth per capita, but the lack of data on diamonds in the wealth database means that this is a highly distorted picture.

2. Weitzman and Löfgren (1997) calculate a boost to United States GDP on the order of 40 percent from exogenous technological changes. Total factor productivity measures the contribution to economic growth that cannot be strictly attributed to accumulation of produced capital or labor.