MODULE 5

Interest Rates and Growth

This module analyzes the determinants of real interest rates, aggregate savings and investment, and the rates of growth of output and per capita income. Economic issues involving choice of family size are also explored. The module begins with a review of the relationship between the aggregate capital stock and aggregate output and defines units in which the various types of capital, broadly conceived to include knowledge, technology, and social institutions, can be usefully measured. It then explores the conditions under which the allocation of the aggregate capital stock to various types and locations of capital will yield maximum output. The savings-investment process and the determination of real interest rates are then analyzed, focussing on the conditions determining the direction and magnitude of international capital flows. The module ends with a discussion of intergenerational capital accumulation and population growth, showing the conditions determining the equilibrium growth rate of per capita income. The nature and desirability of government policies to increase per capita income growth are then considered.

1. Economic Growth: A General Framework

Recall two propositions introduced in the module *The Dimensions of Economic Activity*—that aggregate output is the flow of returns from the aggregate stock of capital, and income is the portion of that output remaining after allowing for depreciation. This module extends these propositions to analyze the process by which output and income grow through time and the forces that determine real interest rates and capital flows between countries. It also considers the factors determining population growth and real income per capita.

The capital stock is very broadly defined to include not only tangible physical capital but human skills as well. What is conventionally viewed as labour is simply the hourly application of embodied human capital in the same sense that the application of physical capital to production is the hourly use of buildings and machines.

In addition, the capital stock includes both pure and applied knowledge. Knowledge is the understanding of how the physical and social world works and what machines and human skills can be used to manipulate it, possessed by or immediately accessible to someone in the society. Human capital, in contrast, is the skills embodied in the population.

Also included in the capital stock is the institutional and legal structure that governs the relationships between individuals and groups engaging in economic activity. These institutions are part of the capital stock to the extent their organizational forms and principles are understood by some individuals and, where relevant, legislated. The widespread understanding of how these institutions function along with the associated beliefs and behavior patterns forms part of the human capital stock.

Our concept of the capital stock is necessarily fuzzy, making precise measurement of the various types of capital impossible. The use of a present value measure is inappropriate because measured quantities will depend on the real interest rate, making it difficult to then use them as determinants of the real interest rate. We instead adopt a purely conceptual measure of a unit of capital as the amount that can be obtained by sacrificing one unit of an aggregate consumer good. This definition is useful as long as its abandonment does not alter any conclusions we subsequently reach. Our measure of capital, together with the assumption that the costs of producing all types of capital are independent of the quantities produced, implies that aggregate output is simply the sum of the outputs of an aggregate consumer good and all types of capital goods.

Ignoring depreciation, we can then define aggregate income as a function of the quantities of all types of capital employed:

$$Y = F(K_1, K_2, K_3, ..., K_n) \tag{1}$$

where Y is aggregate income and K_i is the quantity of the i^{th} type of capital, $i = 1, 2, 3, 4, 5, ...n$. We assume that this production function exhibits diminishing returns with respect to every capital input along with constant returns to scale. The marginal products of the various capital-types will thus satisfy the conditions:

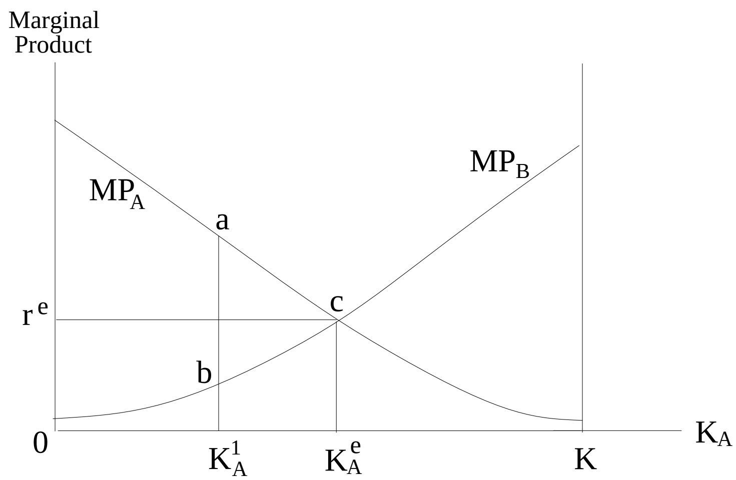
$$MP_{Ki} = \frac{\Delta Y}{\Delta K_i} > 0 \tag{2}$$

$$\frac{\Delta MP_{Ki}}{\Delta(K_i/K_j)} < 0 \tag{3}$$

$$\frac{\Delta MP_{Kj}}{\Delta(K_i/K_j)} > 0 \tag{4}$$

Given our measure of capital and the principle of diminishing returns, the most efficient division of the aggregate capital stock into the various types is the one for which the marginal products of all types of capital are equal. This can be seen from Figure 1.1 which simplifies things by assuming that output is produced with only two types of capital. The lines MP_A and MP_B trace out the marginal products of the two types of capital as the quantity of A-capital, K_A, goes from zero to K , where $K = K_A + K_B$.

Figure 1.1:

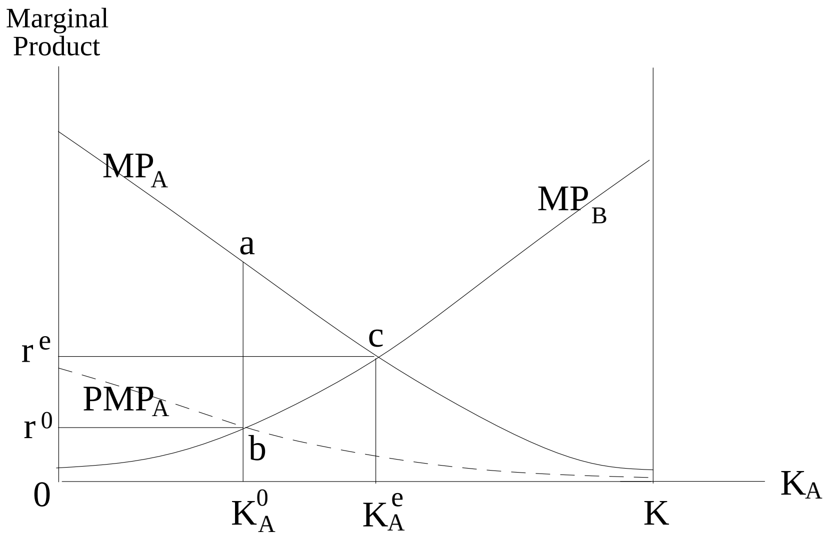


Output will be maximized when the quantity of capital of type A is K_A^e and the quantity of type B is then equal to $K - K_A^e$.

The rate of interest, denoted by r^e in Figure 1.1, is equal to the common marginal product of the two types of capital where the two curves cross at point c. It is the additional output that can be obtained in every future period by giving up one unit of consumption today and adding to the aggregate stock of capital one unit appropriately divided between capital types A and B.

The condition of maximum efficiency, where the marginal products of all types of capital are the same, will most certainly never be met in the real world. A major problem is that the returns to some types of capital, chiefly knowledge and technology, can rarely be completely captured by their inventors. A simple example where the producer of new knowledge can capture, through patent laws, secret production processes, and so forth, 30 percent of the income flow to society from the new capital is illustrated in Figure 1.2. The private return—i.e., the income flow capturable by the inventor—is given by the curve PMP_A. Investors will accumulate new capital in the form which has the highest return to them. When the private and social returns to investing in type-B capital are the same, the equilibrium quantity of A-capital will be K_A^0 and the real interest rate will be r^0 which will be lower than the socially optimal rate, shown as r^e. Output will be below the maximum possible.

Figure 1.2:



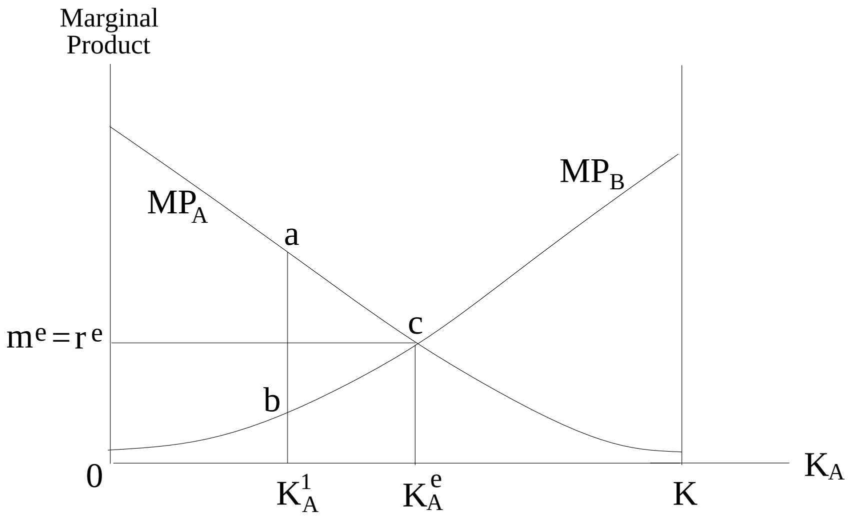
In addition to misallocation between technology and other forms forms of capital, there is misallocation of all types of capital between regions of the world and between industries within regions. Tariffs, ownership restrictions and other devices are used to favor politically powerful groups. These policies create divergences between the private and social returns to investing in types of capital other than knowledge and technology.

Per capita income depends on the level of aggregate income, which depends on the size of the capital stock, and on the size of the population that shares that aggregate income flow. Population growth obviously depends on family size. And parents will choose the size of their family based on costs and returns. Growth of per capita income thus involves a choice of how much capital per person to pass on to the next generation. This depends on total capital accumulation for the benefit of heirs, and the number of children or heirs that will share that capital. If an appropriate institutional framework is not present to permit individuals to maintain ownership over their capital and capture the social returns to it, investment can be reduced to the point where per capita income growth grinds to a halt.

2. Saving, Investment and Growth Under Perfect Efficiency

This topic examines the process of saving and investment and its effects on the rate of interest and the rate of growth of income. The perfect efficiency assumption, together with diminishing returns, implies that the real rate of interest, and the common marginal productivity of capital, is $m^e = r^e$ in Figure 2.1.

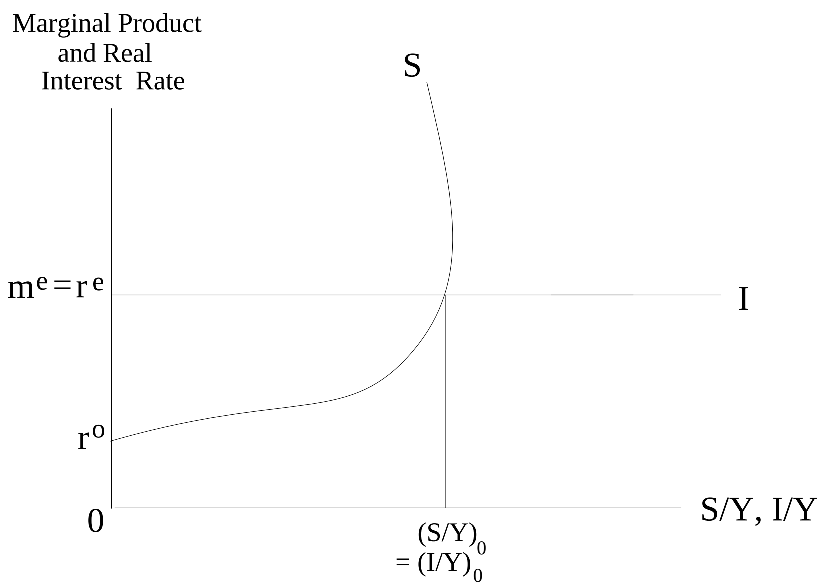
Figure 2.1:



We assume that the rate of interest will remain unchanged when all types of capital grow in the optimal proportions. This means that growth of the stocks of knowledge and technology is sufficient to avoid diminishing returns to the expansion of the aggregate stock of human and physical capital on a fixed natural resource base.

Given that new capital goods of all types can be produced in any quantity desired at a one-for-one cost in terms of consumer goods and that the marginal product of capital in the economy is independent of the level of the aggregate capital stock, the real rate of interest in the economy will be independent of the level of aggregate investment as shown by the line $r^e I$ in Figure 2.2. The horizontal axis gives the level of investment as a fraction of the level of output, and income since we ignore depreciation.

Figure 2.2:



The equilibrium level of investment will therefore be determined entirely by people's choices as to how much to save, which will depend on, among other things, the real interest rate. At zero or low levels of saving there is a positive relationship between saving and the real interest rate, given by the savings function r^0S. A rise in the real rate of interest causes people to substitute future consumption, which is now relatively cheaper, for current consumption so saving increases. As the real interest rate becomes higher and the level of savings becomes larger, the future income yielded by existing savings will increase with the interest rate. The level of wealth associated with each level of income therefore increases. Since, at higher levels of wealth, people will choose to consume more both now and in the future, the fraction of current measured income saved, S/Y, will decline. As the real interest rate rises this wealth effect will tend to offset the substitution effect causing the savings function to bend back toward vertical axis.

It is now a straight-forward exercise to determine the equilibrium growth rate of real output. Since the marginal product of capital is constant, independent of the capital stock, output will be proportional to the capital stock.

$$Y = m^e K \tag{1}$$

Given that savings represents growth of the capital stock,

$$\Delta K = I = S \tag{2}$$

where I and S are the levels of real investment and real saving. Output will increase by the amount

$$\Delta Y = m^e \Delta K = m^e S. \tag{3}$$

Dividing both sides of this equation by Y, we obtain

$$g = \frac{\Delta Y}{Y} = m^e \frac{S}{Y} \tag{4}$$

where m^e is the marginal product of capital when the stock of capital is efficiently allocated to its various uses and g is the growth rate of output.

It is unreasonable, however, to assume that the real interest rate will be unaffected by the level of investment. There are two stages in adding a unit to the capital stock—producing that unit of capital, and blending it in with the existing stocks of the other types of capital. Even though it costs the same to produce a unit of capital whether investment is large or small, it may be much more difficult to adjust existing capital to work with the newly produced capital when there are large additions to the capital stock than when only a small amount is being added. When we incorporate these *adjustment costs*, it is reasonable to assume that the amount of consumption that will have to be foregone to put an additional unit of capital in place will increase progressively as the level of aggregate investment increases.

The additional perpetual future consumption yielded by a one-unit increase in the capital stock will equal

$$FC = m^e \Delta K = r^e \tag{5}$$

where $\Delta K = 1$, while the amount of current consumption given up to obtain this increase in future consumption will equal

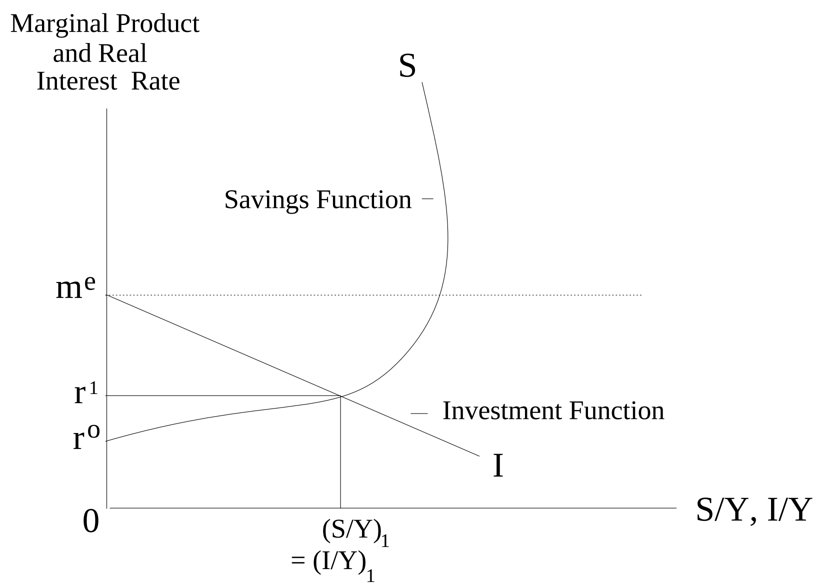
$$CC = 1 + \beta \frac{I}{Y} \tag{6}$$

where β is a parameter greater than zero. The actual rate of interest obtained will equal the perpetual future consumption that can be obtained by giving up one unit of current consumption, which will be

$$r = \frac{FC}{CC} = \frac{m^e}{1 + \beta\,(I/Y)}. \tag{7}$$

The rate of interest will be equal the marginal productivity of capital when investment is zero and fall below it by increasing amounts as the ratio of investment to income increases as shown by the investment function $m^e I$ in Figure 2.3. The equilibrium interest rate will be where this curve crosses the savings function $r^0 S$.

Figure 2.3:

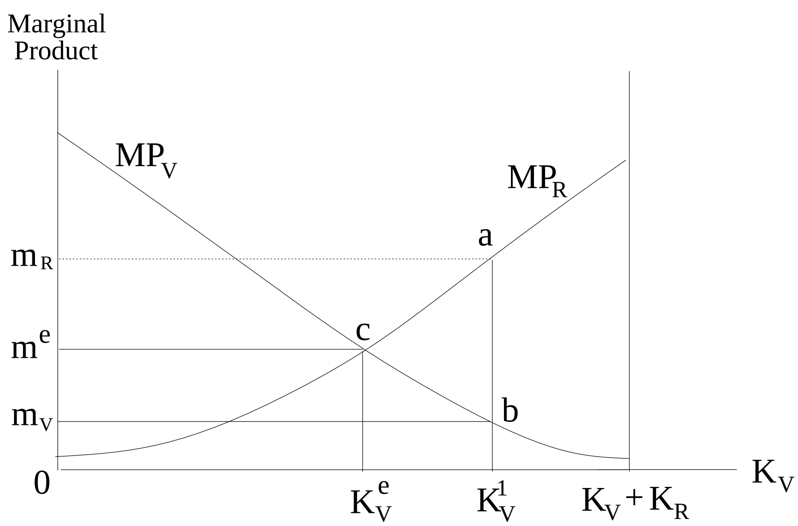


Since the marginal product of capital is m^e regardless of the size of the capital stock, output will continue to be proportional to the capital stock as in equation (1) and will still increase per year according to equation (3). So the growth rate of output will still be given by equation (4), although it will be lower when we allow for adjustment costs because the level of saving and investment will be lower.

3. Saving, Investment and Growth With Imperfect Efficiency

We now relax the assumption in that the aggregate stock of capital is efficiently allocated among all types of capital. The efficient mix of the two types of capital occurs at point c in Figure 3.1.

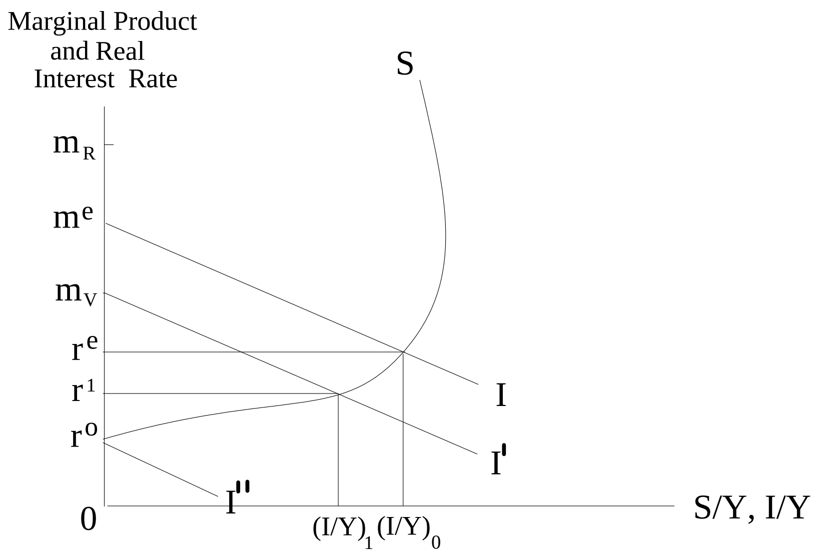
Figure 3.1:



Those types of capital whose quantities cannot grow optimally as the aggregate capital stock expands, given the public good features of knowledge and technology, are denoted by K_R. The unrestricted or variable forms of capital, for which private returns equal social returns, are denoted by K_V. When the restricted forms of capital cannot expand optimally as the total capital stock increases the equilibrium will move to a point such as b. The distance *ab* shows the gain in output that could be obtained if the economy could have one more unit of K_R and one less unit of K_V.

The effects on investment and growth of these restrictions on the expansion of certain types of capital is shown in Figure 3.2. The marginal product of capital in the economy under optimal conditions is given by m^e. The investment function in the perfect efficiency case is $m^e I$ and the equilibrium fraction of output saved and invested is $(I/Y)_0$.

Figure 3.2:



When the stock of unrestricted capital expands through time relative to the stock of the restricted forms of capital the marginal product of the unrestricted capital gradually falls to m_V and the investment function shifts down to, say, $m_V I'$. At this point investment will have fallen to $(I/Y)_1$ and the rate of interest in the economy will have fallen to r^1. Meanwhile, the marginal product of the restricted forms of capital will have risen to m_R.

If the restricted types of capital do not expand at all, the ratio of K_V to K_R rate will eventually increase to the point where the marginal product of variable capital has fallen to r^0 and the investment function has shifted down to $r^0 I''$, at which point saving and investment (and economic growth) will cease.

It turns out, however, that some expansion of knowledge and technology, the restricted forms of capital, will inevitably occur without the conscious investment through *learning by doing*. Moreover, inventors can typically capture some, albeit small, part of the social returns to their inventions. As this expansion of the restricted forms of capital takes place, at given levels of investment in unrestricted capital, the marginal product of the unrestricted capital types, and the investment function in Figure 3.2, will shift upward, causing the ratio of savings and investment to output to rise along with the equilibrium real interest rate. This will tend to offset the downward shift of the investment function consequent on the expansion of unrestricted capital.

We might expect a *steady state* rate of growth, where the growth rate remains constant through time as the process of saving, investment and capital stock expansion takes place, to occur at an interest rate and investment-to-output level where the upward effect of the expansion of the restricted forms of capital on the investment function just offsets the downward effect of the expansion of the variable forms of capital. At this steady state equilibrium point, shown at r^1 and $(I/Y)_1$, the capital stock and output will grow at a constant rate. The growth of aggregate output will then be given by

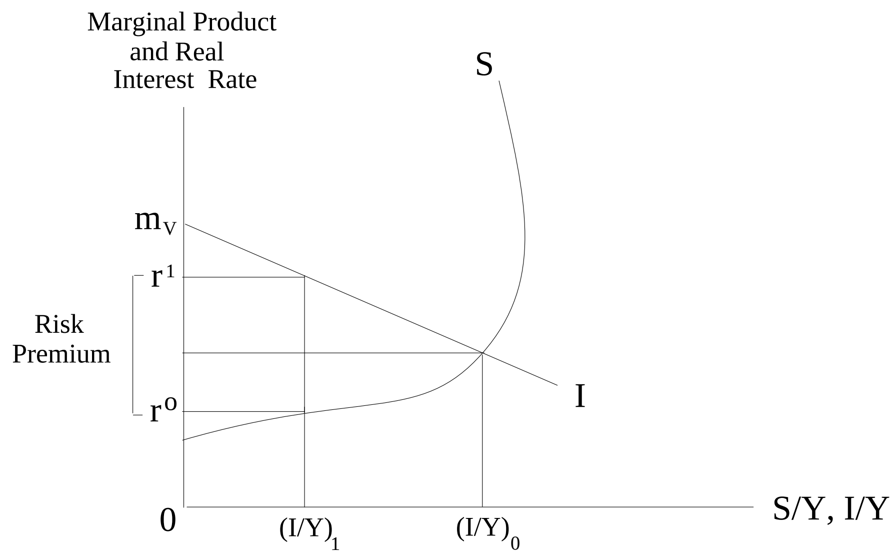
$$g = \frac{\Delta Y}{Y} = m^* \frac{S}{Y} \tag{1}$$

where m^* is the an average of the steady-state marginal products of all types of capital. And per-capital income growth will equal g minus the rate of population growth.

The extent of restriction of the growth of knowledge forms of capital will depend on the country's underlying institutions. Patent laws may be better enforced in some countries than others. Also, government restrictions on market activity may prevent capture of the returns to innovation. Every change in the economy benefits some people and hurts others—efficient changes are those from which the gainers gain more than the losers lose. If the losers from particular innovations, be they labour unions or competitors, have the political power to impede their adoption, the ability of inventors to acquire the benefits from new knowledge and technology can be drastically reduced. As a result, the investment function will be further downward to the left than otherwise, leading to less savings and a lower growth rate.

Things can be worse. In countries where property rights are not secure, capital stock can be destroyed or stolen. When the uncertainty about future returns is high, the private returns to all capital, not just knowledge and technology, will be below the social return. A risk premium will be added to the interest rate, as shown in Figure 3.3. Saving will occur on the basis of the risk-free interest rate r^0 while investment will be based on the risk-inclusive interest rate r^1. The result will be a lower overall level of investment in all types of capital than otherwise and, again, a lower rate of income growth.

Figure 3.3:

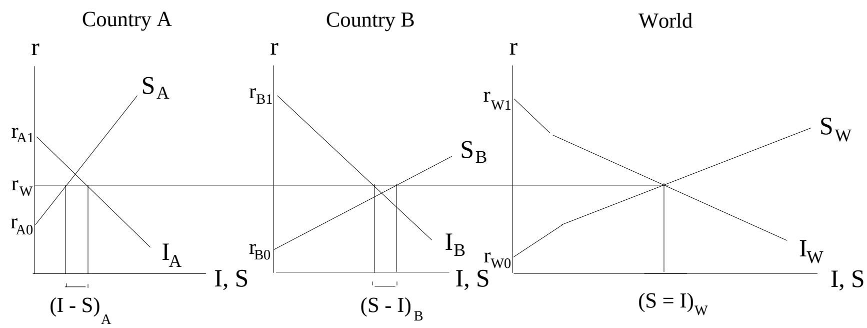


4. Real Interest Rates and Growth in a World of Two Big Countries

Thus far we have assumed a single country that is unconnected with the rest of the world or, alternatively, that consists of the entire world. We now focus on a world of two countries, both of major size. The countries trade with each other and the residents of each country own capital employed in the other country.

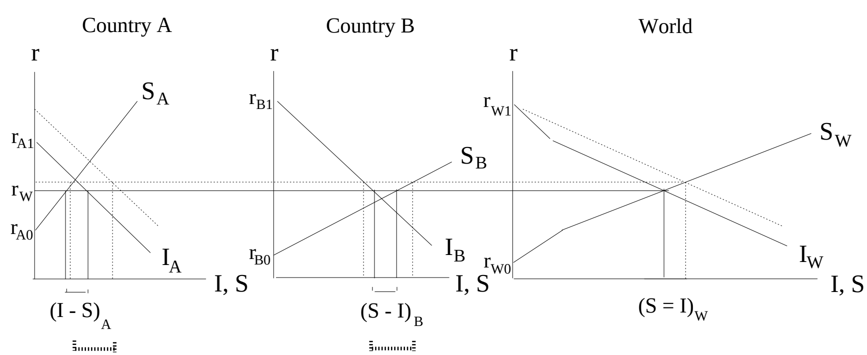
The savings, investment and growth process is analyzed with reference to Figure 4.1. The two countries' investment functions are given by $r_{A1}I_A$ and $r_{B1}I_B$ and their savings functions by $r_{A0}S_A$ and $r_{B0}S_B$. The world investment and savings functions are the horizontal summations of the two countries' respective functions. Because the institutions in the two countries differ, neither their investment functions nor their savings functions cross the vertical axes at the same interest rate levels. And the slopes of the respective functions also differ across countries.

Figure 4.1:



The world real interest rate is determined at r_W by the intersection of the world savings and investment functions. We assume that the risk of holding assets is the same in both countries, so their domestic interest rates both equal the world interest rate. At that world interest rate there is an excess of investment over savings in country A and an equal excess of savings over investment in country B. There is a *net capital inflow* into Country A because part of Country A's investment is undertaken using savings from Country B.

Figure 4.2:



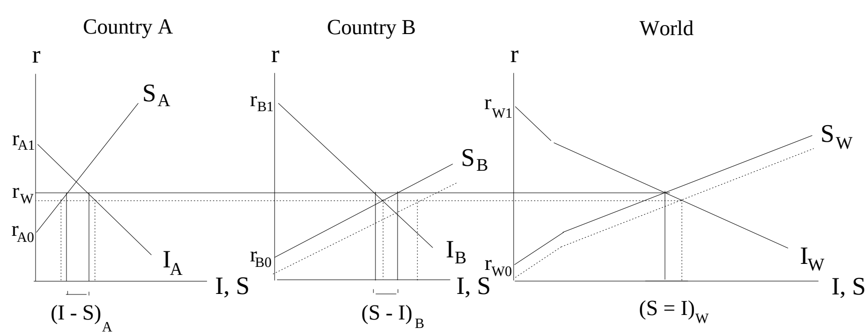
Now suppose that there is a technological shock in country A that raises its expected marginal product of capital. This could result from an institutional change, from a random discovery within the existing institutional framework, or simply from a change in investors' expectations. The effect is shown by the dotted lines in Figure 4.2. The upward shift of Country A's investment function causes the world investment function to shift to the right. Investment increases relative to savings in Country A and declines by an equal amount relative to savings in Country B. The net capital flow from B to A therefore increases.

Thus, an actual or expected improvement of productivity in one country increases world investment and the world interest rate. World savings also rise, with capital flowing into the country in which the expected return to capital increased.

If the world is in a steady state growth equilibrium the growth of all types of capital will be in a balance that will hold the world real interest rate constant. Still, technological growth may differentially affect the returns to capital in the two countries. As growth occurs the new technology may use natural resources that are more plentiful in one of the countries. The investment function of that country, say Country A, will shift to the right and the investment function of the other country will shift to the left by an equal amount. There will be an equivalent change in the net capital flow.

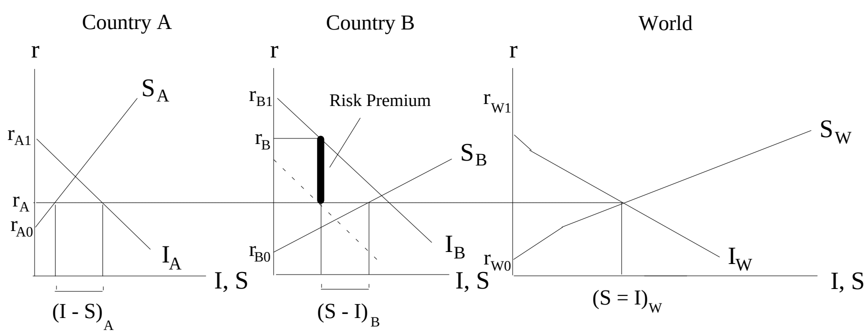
Now suppose that the residents of one of the countries, say Country B, decide to shift consumption from the present to the future by saving a greater fraction of their income. The curve $r_{B0}S_B$ will shift to the right in Figure 4.3, along with the world savings function. The world interest rate will fall and the level of investment will increase in both countries. Savings will increase relative to investment in Country B and decline relative to investment by an equal amount in Country A. The net capital flow from Country B to Country A will increase.

Figure 4.3:



Finally, let us relax our assumption that the risk from holding assets is the same in the two countries. Suppose that government policy is less predictable in Country B than Country A. Or, alternatively, suppose that Country B is specialized in industries that are inherently more risky than others in the world economy. A risk premium will be required to induce world residents to invest in Country B. That country's risk adjusted investment function is given by the dotted line in Figure 4.4. The world investment function is now the horizontal sum of the risk-comparable individual country investment functions. The savings functions in the two countries are defined at a risk-comparable interest rate so that the interest rate relevant for savings in Country B is Country A's interest rate. The interest rate in Country A is now r_A and the interest rate in Country B is r_B, which differs from r_A by the risk premium.

Figure 4.4:

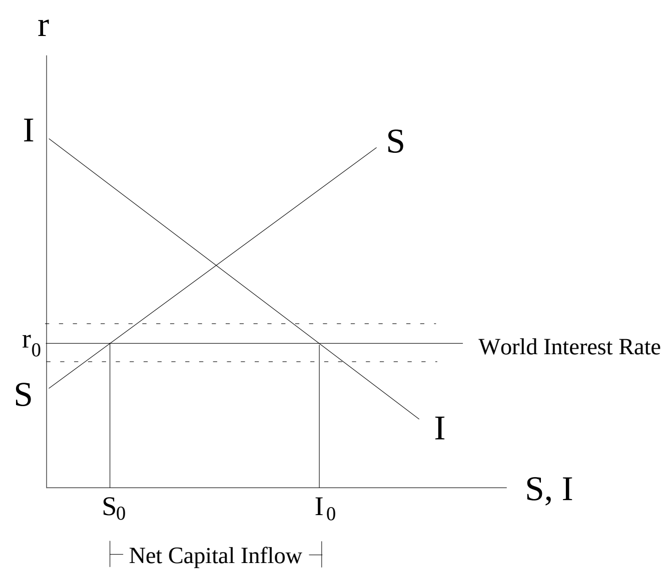


Changes in the risks of investing in the two countries are a further factor leading to changes in world interest rates and net capital flows. The response of interest rates and net capital flows to changes in risk is identical to the response to all other shocks to the individual countries' investment functions. The analysis is the same except that it must now be kept in mind that the world savings and investment functions are the horizontal summations of risk-comparable functions in the individual countries.

5. Saving and Investment in a Small Country

The essential feature of small-country analysis is that the country is too small to have a significant effect on world saving, world investment, or the world interest rate. World wide shocks impact on the small country but nothing that happens in the small country has any significant effect on the rest of the world.

Figure 5.1:



Suppose that a small country has the investment and savings functions II and SS in Figure 5.1. The world interest rate, r_0, is determined in the rest of the world and independent of investment and saving in the small country. The country's investment exceeds its savings with the result that it is a net importer of capital. A rise in the world interest rate will cause the country's investment to decline and its savings to increase, reducing the net capital inflow.

Figure 5.2 presents the case where domestic savings exceed world asset holders' investment in the country at the existing world interest rate so that there is an equilibrium net capital outflow.

Figure 5.2:

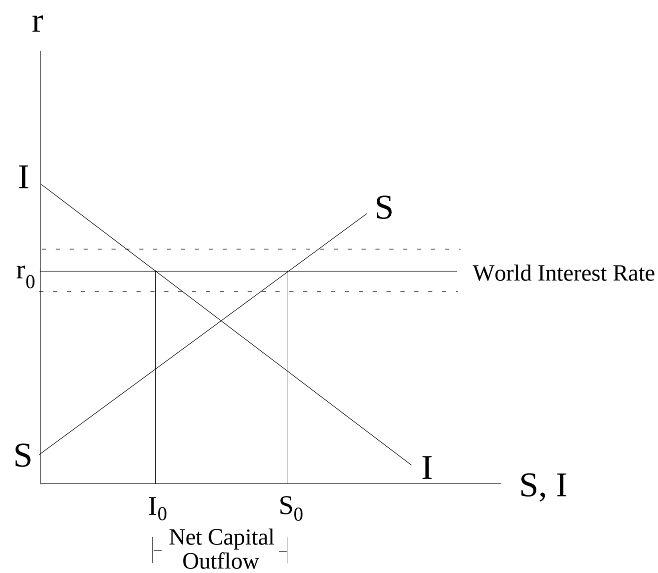


Figure 5.3:

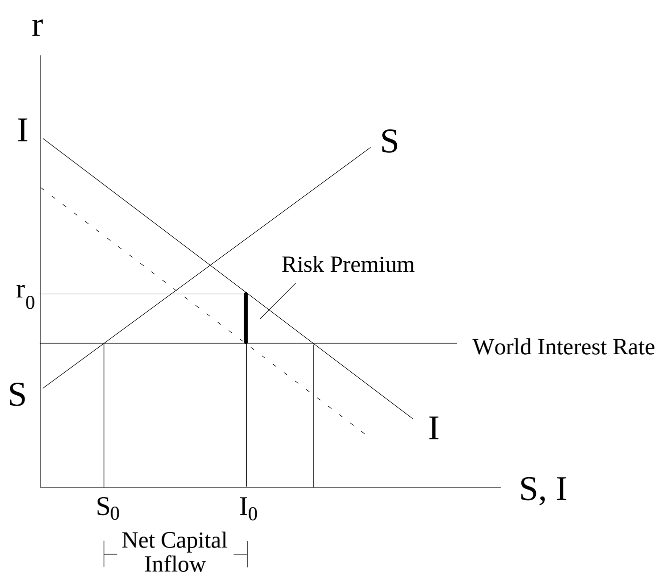


Figure 5.4:

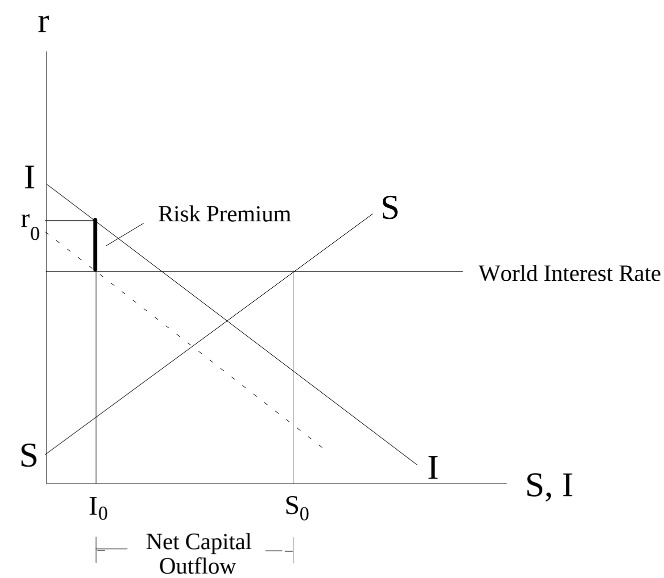


Figure 5.5:

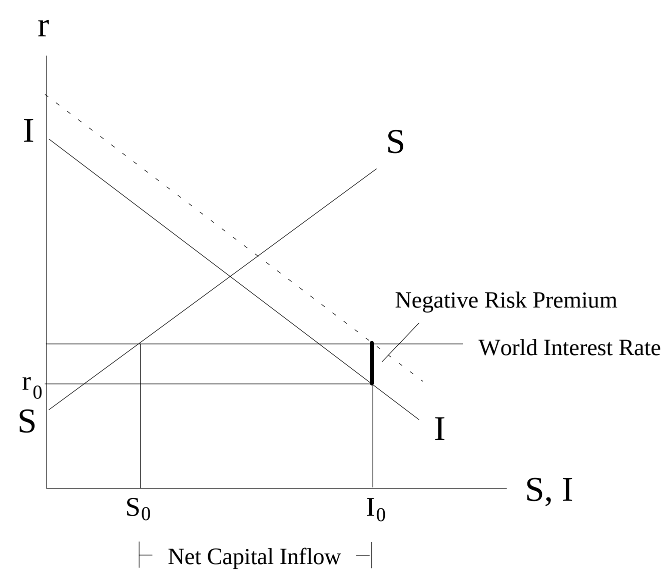


Figure 5.6:

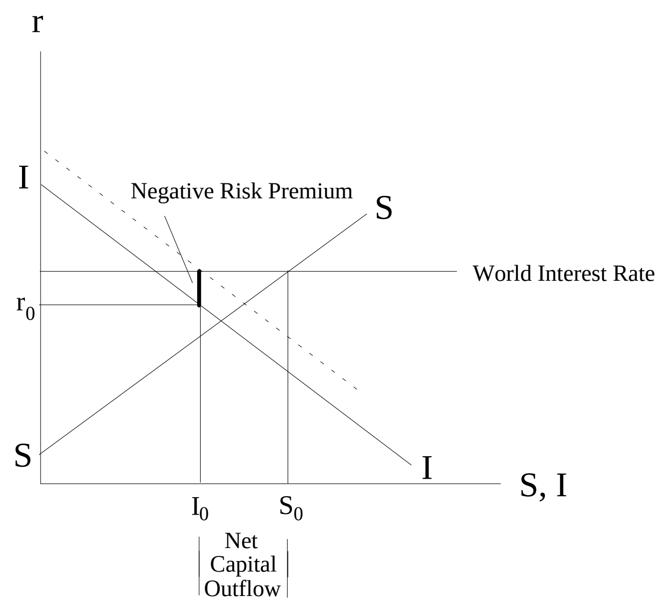


Figure 5.3 and Figure 5.4 model the situation where the small country's economy is a more risky place to invest than the rest-of-world economy. In both cases there is a risk premium which reduces investment and the domestic interest rate exceeds the world interest rate by that risk premium.

The situation where the small country is a less risky place to invest than the rest of the world is modeled in Figure 5.5 and Figure 5.6. The negative risk premium increases investment, increasing the net capital inflow in Figure 5.5 and reducing the net capital outflow in Figure 5.6.

The effects of shifts in world investment toward or away from the small country can be easily seen from these figures. A shift of investment toward the country may result from a perceived decline in the riskiness of investing in that country or may be a result of on-going changes in world technology that favour the particular natural resources with which the country is endowed.

Shocks to the level of investment in the small country are completely absorbed by changes in the net inflow or outflow of capital, with no effect on domestic saving.

Figure 5.7:

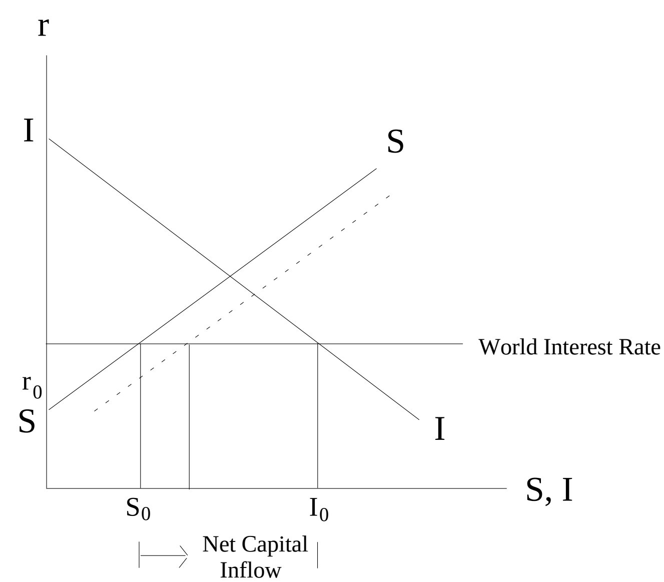
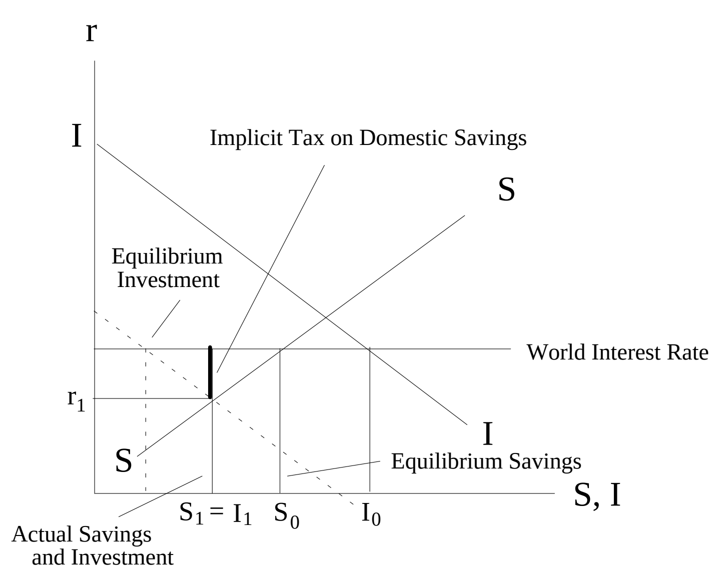


Figure 5.8:



It is a straightforward extension to show, in Figure 5.7, that changes in savings in the small country will have no effect on that country's investment or output growth (although they will affect the growth of the domestic residents' wealth).

Shocks to savings need not always be based on a change in the residents' desired intertemporal allocation of consumption. One can imagine a situation where there is an implicit tax on saving of domestic residents reflecting the government's failure to provide secure property rights. Almost always, however, this sort of institutional breakdown will affect domestic investment even more than domestic saving.

History is replete with examples of situations where investment in the domestic economy declines as a result of domestic turmoil or failure to enforce property rights and the government institutes controls over the purchase of foreign assets by domestic residents to prevent domestic savings from being invested abroad instead of in the domestic economy. This type of situation is illustrated in Figure 5.8.

In that figure the investment function shifts to the left because, for example, a new government comes to power and adopts policies that will expropriate private property. An equilibrium net capital inflow turns into an equilibrium net capital outflow. The government then uses direct controls over the purchase of foreign assets to prevent domestic savings from going abroad. The actual net capital outflow is restricted at zero. This is equivalent to a tax on domestic savings equal to the difference between the rate of interest received by domestic residents, r_1, and the world real interest rate.

6. Per Capita Income Growth

The aggregate income of residents of the small economy will depend upon how much capital stock they own and on the marginal productivity of that capital. Since the allocation of capital among its various component types and across industries and countries is always far from perfect, the marginal products of capital will differ across capital types and uses. We will assume that the world economy is on a steady-state growth path along which these marginal products, though different, are constant.

We can think of domestic residents as earning an income composed of the sum of the of the quantities of the various types of capital they own multiplied by the respective marginal products:

$$Y = m_{DR}K_{DR} + m_{DV}K_{DV} + m_{FR}K_{FR} + m_{FV}K_{FV} \tag{1}$$

where the m-terms are the marginal products and the K-terms are the quantities of capital owned, with the $_D$ and $_F$ subscripts referring to whether the capital is employed in the domestic or foreign economy and the $_R$ and $_V$ subscripts referring to whether the capital is of a type whose growth is restricted by non-capturability of returns to investment and other institutional restrictions or freely variable in the sense that the private and social returns to investing in it are equal.

Note that the marginal products in the equation above are the social, not the private, marginal products because all the output flow from the capital accrues to someone in the society, though not necessarily to the individual who made the investment to produce that capital or who technically owns it. We can think of any person to whom returns from a particular piece of capital accrue as in fact owning some corresponding portion of that capital, even though some other person may hold the title to it.

Aggregate domestic wealth will, of course, be highest if people are able to allocate their income to the purchase of the various goods and services in the most efficient manner. The module *Rents and Externalities* deals with these issues.

Given the domestic interest rate, which will almost certainly be below the marginal products of all types of capital, domestic residents will save an equilibrium and, we assume, constant fraction of their income. As a result domestic income will grow at the rate

$$\frac{\Delta Y}{Y} = m^* \frac{\Delta K}{Y} = m^* \frac{S}{Y} \tag{2}$$

where m^* is an average of the marginal products of the various types of capital owned by domestic residents and S/Y is the fraction of income saved. Policies that can improve efficiency and increase m^* will increase the growth rate.

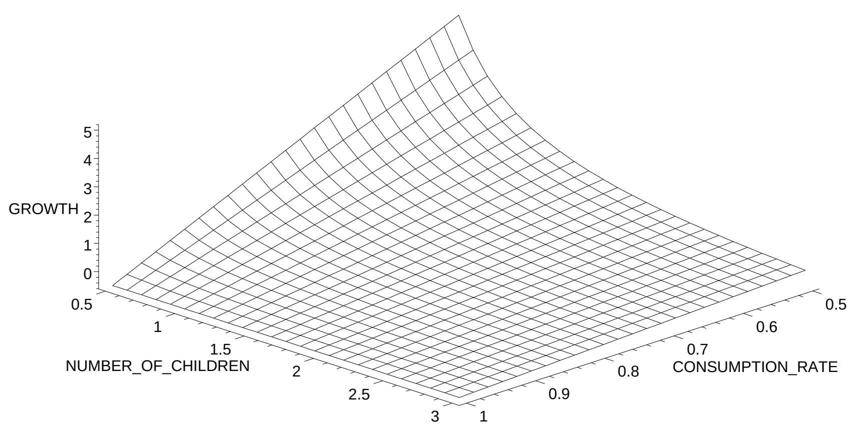
The growth rate can also be increased by increasing S/Y which depends on domestic residents' choices and hence partly on their preferences. Forcing people to save more will not necessarily make them better off.

Per capita income and wealth depend not only on the level of aggregate income but on the size of the population that must share that income. Population growth depends on people's choices as to family size. In a modern society in which people have substantial human capital embodied in them, a decision to raise more children implies a simultaneous decision to either consume less in one's lifetime or embody less human capital in those children.

Nevertheless, not all human capital growth requires conscious investment. Much is learned from simply observing the behavior of one's parents and others in society. In primitive societies in which work tasks are relatively simple, this automatic accumulation of human capital may be sufficient for children to achieve the same knowledge and skill levels as their parents. As a result, the opportunity cost of increasing family size may be small. Moreover, children may be able to work and produce more than their subsistence at an early age, so that having a larger family may enable parents to increase their consumption.

We concentrate on advanced societies where conscious positive investment in children is necessary to give them the same human capital as their parents.

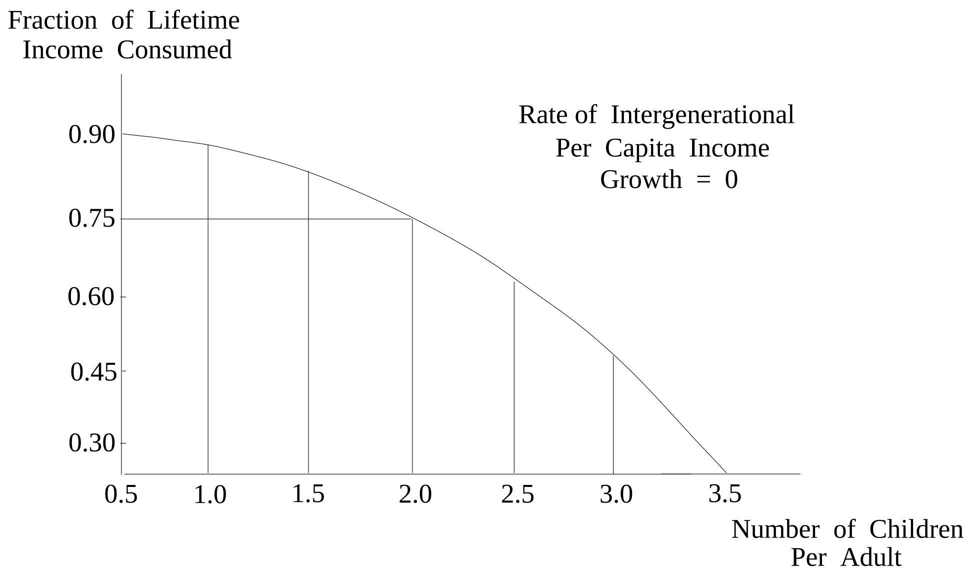
Figure 6.1:



The current generation's budget constraint is modeled in Figure 6.1. The number of children raised per adult and the fraction of lifetime income consumed by the current generation are on the two bottom axes. The percentage growth of income per person from the current generation to the next is shown on the vertical axis. Zero percentage growth means that the next generation has the same per capita income as the current generation.

The tradeoff between fraction of income consumed and number of children raised per adult on condition that the next generation have the same per capita income as the current one is illustrated in Figure 6.2.

Figure 6.2:



The current generation must choose some point on the opportunity surface in Figure 6.1. That point will determine the number of children raised per adult, the fraction of current lifetime income consumed and the percentage growth of per capital income from this generation to the next. Each member of the current generation will choose the point that maximizes his/her utility.

How can we increase the rate of growth of the per capita income of a country's residents? The obvious first step is to make the institutional changes necessary to achieve the most efficient allocation of investment among the various types and locations of capital so that output can be maximized. This will shift the entire opportunity surface in Figure 6.1 outward.

The key to maximizing the growth rate is to always channel investment to the projects having the highest social present value—that is, to where the future social returns discounted to the present at market interest rates is greatest. The problem is that it is extremely difficult to calculate the social returns to many investments. And the allocation of capital among types and locations is heavily influenced by government restrictions. Removal of these requires major institutional changes that only be made through the political system and cannot be easily forced upon a community.

Another obvious but even more difficult step is to increase the growth of a community' s per capita income by forced savings and restrictions of population growth. The problem here is that the society's decisions as to how much to save and how many children to have are based on the free choice of its members. Should its government interfere with these private choices? If private choices are distorted by misinformation and government restrictions a good case can be made for removing these distortions. Beyond that, policies of forced saving and restrictions on family size involve philosophical issues that go beyond economics.

Study Questions

1. A fiscal or other expansion in Canada that increases the level of investment in the country will raise domestic interest rates. True or False: Explain your answer.

2. The wealth of the residents of a small country does not depend on the amount of investment in that country, but rather, on the amount of savings. True or False: Explain your answer.

3. Consider a country that gives a monthly "family allowance" payment to mothers for each child they are raising and at the same time imposes a 50% "death duty" on the value of the estate of every person when they die. What might be the effect of these policies on the growth of per capita income? Would it be in the interests of the country to abolish these policies?

References

Since this module takes a different approach than most textbooks, no readings are directly useful on a topic by topic basis. Some background on the nature of institutions can nevertheless be obtained by reading

Douglass C. North, *Institutions, Institutional Change and Economic Performance*, Cambridge University Press, 1990, pp. 3-69.

An excellent more traditional textbook presentation of growth theory can be found in

N. Gregory Mankiw, *Macroeconomics*, 1992, 1994 or 1997 edition, Worth Publishers, Chapter 4.