THE CAUSES AND CONSEQUENCES OF LOW INTEREST RATES IN SWITZERLAND

Alejandro Cunat, Working paper 07/01/04

Address:
Alejandro Cunat
London School of Economics and Political Science
Houghton Street
UK London WC2A 2AE
(a.cunat@ise.ac.uk)

I. INTRODUCTION

The aim of this paper is to provide an overview of possible reasons for low real interests, based on the existing theoretical literatures on economic growth and international economics. We highlight potential causes for low interest rates, discuss their empirical validity for Switzerland case, and consider the corresponding theoretical implications for the future evolution of the Swiss economy.

Economic outcomes are the result of the simultaneous interaction of many different economic forces. To better analyse the causes and consequences of low interest rates and isolate the different economic mechanisms underlying this issue, we have classified our thoughts under four different headings. Any classification of this kind is likely to be crude and inaccurate. In fact, some of the issues we discuss fall into more than one of our own headings. Nevertheless, we find this division quite useful for presentation purposes.

Economic Growth:

The interest rate is tightly linked to the return to capital. How much capital (relative to labour) a country has is the result of a long-run process in which elements such as the saving behaviour of its citizens, education, the technological progress experienced by its firms, and its demographic characteristics (population growth, age structure, immigration flows) can be of extreme importance. At the same time, the interest rate affects the economic agents' incentives to both save and invest in a country, therefore influencing the latter's future growth experience.

We review some of the most relevant growth models available in the literature. We relate them to the Swiss experience to draw some conclusions and hypotheses about the origin of Switzerland's low interest rate, as well as to speculate about the future growth path of its income per capita.

Capital Mobility:

Like most of the industrialized economies, Switzerland is fairly open to capital flows, which respond to cross-country differences in returns. Therefore, both the causes and consequences of low interest rates cannot be understood in a 'closed-economy' setup.

As we mention below, a positive net foreign asset position is a very important part of Switzerland's asset portfolio. Therefore, distinguishing between the income of factors resident in Switzerland and the income of factors owned by the Swiss becomes very important for assessing the welfare implications of the issue at hand.

International Trade:

Openness not only implies that capital moves in response to international return differentials, but also that a country's productive structure and factor prices are affected by international competition.

A country's characteristics (comparative advantage) relative to those of its foreign trading partners determine its specialisation pattern. Trade protection can also affect a country's specialisation pattern, as well as induce relevant income distribution effects, through changes in domestic commodity prices. Different sectors experience different levels of technological progress (or total factor productivity growth). Therefore, today's specialisation patterns may influence a country's future growth path and welfare.

We first review some stylised models of international trade to study the effects of trade policy on a country's production structure and factor prices. Finally, we revisit economic growth by allowing for the possibility that an economy's productions structure be affected by foreign competition.

The Financial Sector:

Switzerland's financial sector is worth studying due to its importance in terms of both economic size and international respectability. We refer the reader to chapter 3 in the Jahresbericht, where Beatrice Weder and Peter Kugler discuss these issues at length, as well as monetary (or nominal) issues.

Structure of the paper:

The next section draws some comparisons between Switzerland and the OECD to provide some background to our discussion. The subsequent sections discuss the headings mentioned above (but for the financial sector). Each of them is written in a more or less self-contained manner. We wrap up with some concluding remarks.

All through the paper, we have tried to present our arguments in as accessible a fashion as possible. However, we found it useful to include some relatively simple technical discussions here and there. For the sake of readability, however, any sophisticated material has been separated clearly from the main text, and can be neglected by the reader merely interested in the intuitions of our arguments.

A final note on how to read this paper: some readers may be surprised by the lack of internal consistency of the paper, in the sense that some of the 'models' we discuss contradict each other. We are fully aware of this problem. This is due to the fact that each model tries to highlight a particular aspect of reality. In doing so, each model simplifies reality in a crude manner, neglecting aspects emphasized by others. Needless to say, the 'truth' lies somewhere between all our models.

II. FACTS

This section establishes some factual background against which to interpret the Swiss case. Rather than making an exhaustive statistical analysis of the Swiss economy, we compare some of its main economic indicator to those of the OECD.

1. Macroeconomic Aggregates

The Swiss economy has got one of the world's highest levels of income per capita: in the year 2000, Swiss gross domestic product (measured at purchasing power parity) per capita was 10% higher than the average of the OECD (source: Penn World Tables). In comparison with other OECD countries, this seems to be due mainly to a very high physical capital-labour ratio: according to Hall and Jones (1999), the Swiss capital-labor ratio was 40% higher than the OECD average in 1988. The Swiss human capital and total factor productivity levels are comparable to those of other industrialised economies. (Sources: Barro and Lee (2001), De la Fuente and Domenech (2002), Hall and Jones (1999).)

However, in the last 40 years, the Swiss growth rate of GPD per capita has been among the lowest among industrialised countries (source: Penn World Tables). During the same period, Switzerland has displayed an investment share in GDP higher than that of the OECD average by 15% (source: Penn World Tables). This suggests that either human capital accumulation or total factor productivity growth have been lower in Switzerland than in the rest of the OECD. Data, however, are not very reliable here to draw any more accurate conclusions.

Growth Accounting

Assume a country's aggregate output Y is determined by the following production function:

$$Y = AK^{\alpha}H^{\beta}L^{1-\alpha-\beta},$$

where A denotes total factor productivity, K denotes physical capital, H denotes human capital, and L denotes labour. α and β are parameters between zero and one, and represent the income shares, respectively, of physical and human capital. We can rewrite this equation in per capita terms as

$$Y/L = A(K/L)^{\alpha}(H/L)^{\beta}.$$

Output per capita depends on productivity, and the amounts of physical and human capital per capita available in the economy. Denoting the growth rate of a variable x with $\gamma(x)$,

$$\gamma(Y/L) = \gamma(A) + \alpha\gamma(K/L) + \beta\gamma(H/L).$$

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2. International Finance

Switzerland's share of foreign assets in its total wealth (20%) is among the largest in the world (source: Kraay *et al.* (2000)). This has been achieved through a persistent positive difference between savings and domestic investment, accompanied (necessarily) by a persistent current account surplus. For example, during the period 1988-1993, Switzerland's average current account surplus was 5%, whereas any other major OECD economy, with the exception of Japan, exhibited a current account deficit (source: Mauro (1995)).

This process of 'exporting capital' has been parallel to a persistent negative interest rate differential, *i.e.* a lower interest rate in Switzerland than in the OECD. (See, for example, chapter 3 in the Jahresbericht).

An Identity from the National Accounts

The national accounts yield the following expression as an identity:

$$S + (T - G) = I + (X - M),$$

where S denotes private savings, T-G the government's budget surplus (public savings), I investment, and X-M net exports. In other words, an economy's savings must finance domestic investment and any excess of exports over imports. Assuming T-$G = 0$,

$$S - I = X - M.$$

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3. Microeconomics

Finally, on the microeconomic side, it is worth noting that subsidies to the Swiss farming sector are far larger than in the OECD: in the period 2000-2002, for example, the estimated annual value of transfers from consumers and taxpayers to farmers amounted to *circa* 40% of the value of gross farm output for the OECD, and to *circa* 80% for Switzerland (source: OECD).

III. ECONOMIC GROWTH

The facts listed in Section II suggest that one salient feature distinguishing the Swiss economy from the rest of the OECD is the former's high savings rate. This section addresses this issue within standard models of economic growth. We also speculate about the long-run consequences of low interest rates.

1. The Solow-Swan Model: High saving rates as a source of low interest rates

The simplest analytical framework to understand the long-run behaviour of economies is the time-honoured *Solow-Swan model* (Solow (1956), Swan (1956)), which analyses an economy's saving and capital accumulation behaviour over time. The key economic mechanism put forward here is that of *diminishing marginal productivity*: successive increases in a country's capital-labour ratio imply ever lower increases in output. In other words, the first units of capital available to a worker are very productive, whereas the last ones run the risk of becoming superfluous.

In this model, a high savings rate implies a high capital-labour ratio and a high level of income per capita in the long run.[1] As for the return to capital, diminishing marginal productivity implies a low rate of return if the capital-labour ratio is particularly high: the profitability of the marginal unit of capital is low, given that it contributes to produce little output.

Is a high savings rate good or bad in terms of welfare? The Solow-Swan model does not provide a good answer to this question, since it is not based on utility (welfare) maximising individuals. In principle, a high level of income per capita should grant a high level of consumption per capita. However, an economy that saves (and invests) a lot may save too much: a very high capital-labour ratio renders the marginal unit of capital quite unproductive, and that capital may be too costly to maintain in terms of resources.

In theory, reducing a high-saving economy's capital-labour ratio may even raise its level of consumption per capita, since the resources released from the maintenance of the scrapped capital might be larger than the production yielded by the latter. In this case, the economy is said to be *dynamically inefficient.*

One final lesson worth extracting from the Solow-Swan model is the fact that the growth rate of a country depends on how far it is from its long-run equilibrium. The further away it is, that is the lower its capital-labour ratio, the lower the importance of diminishing marginal productivity, and therefore the higher its growth rate. When a country is instead close to its long-run equilibrium, an additional unit of capital translates into little additional output, and growth therefore slows down considerably.

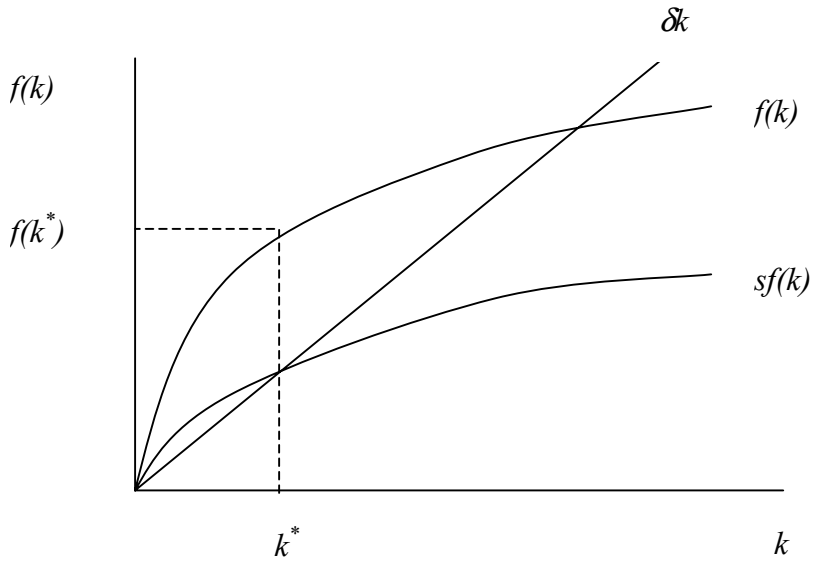
[1] Mankiw *et al.* (1992) present empirical evidence supporting this theory.

***The Solow-Swan Model*[2]**

The long-run equilibrium in the Solow-Swan model is characterized by the following equation:

$$sf(k) = \delta k,$$

where s denotes the savings rate (S/Y), $f(k)$ denotes a neoclassical aggregate production function, which depends positively on the capital-labour ratio $k = K/L$, and δ denotes the depreciation rate. (We are assuming implicitly there is neither population growth nor technological progress.) As long as $sf(k) > \delta k$, an economy's capital-labour ratio (and its income per capita) will grow: gross investment (that is, the creation of additional units of capital) is greater than the amount of capital that 'vanishes' through depreciation.



Notice the concave shape of $f(k)$, which reflects the diminishing marginal productivity of capital. The long-run equilibrium takes place at the intersection of $sf(k)$ with δk, yielding the long-run capital-labour ratio k^* and income per capita level. Long-run consumption per capita is given by the difference between $f(k^*)$ and $sf(k^*)$. A higher savings rate s would imply a higher k^* and $f(k^*)$, but not necessarily a higher level of long-run consumption per capita.

[2] See Barro and Sala-i-Martin (1995) for a detailed explanation of the Solow-Swan model.

2. The Neoclassical Growth Model: Patience and the taxation of capital income

The neoclassical (or Ramsey-Cass-Koopmans) growth model is a sophisticated version of the Solow-Swan model, in which individuals make welfare maximising decisions. This rules out the dynamic inefficiency problem discussed above, but frames the dynamic behaviour of countries in a very similar fashion: in the long run, an economy's equilibrium is characterised by a situation in which the rate of return to capital (that is, the reward to saving) equals the individuals' rate of time preference (that is, the premium at which consumption today is priced over consumption tomorrow).

If individuals have a low time preference (that is, if they are very patient), the equilibrium return to capital will be equally low. This can only happen when the capital-labour ratio (and the income per capita level) is very high, due to the diminishing marginal productivity of capital. Therefore, if countries display different degrees of patience, they will exhibit different capital-labour ratios and income per capita levels.

Establishing international comparisons of rates of time preference is a daunting task. However, cross-country differences in the taxation of the return to capital may have similar effects on cross-country differences in capital-labour ratios. With capital income taxation, the economy's equilibrium is characterised by a situation in which the after-tax rate of return to capital equals the individuals' rate of time preference. Assuming that all countries share the same rate of time preference, a country with low capital income taxation will require a lower before-tax rate of return to capital (*i.e.*, a higher capital-labour ratio) to be in its long-run equilibrium.

Like in the Solow-Swan model, an economy's growth rate depends on the distance from its long-run equilibrium. The further away, the lower its capital-labour ratio, and therefore the higher the return to capital. The closer to the long-run equilibrium an economy is, the smaller the difference between its incentive to invest and its cost of foregoing current consumption, and therefore the lower the growth rate.[3] Open-economy versions of the neoclassical model yielding similar predictions can be found, for example, in Barro *et al.* (1995), Cunat and Maffezzoli (2001), and Ventura (1995).

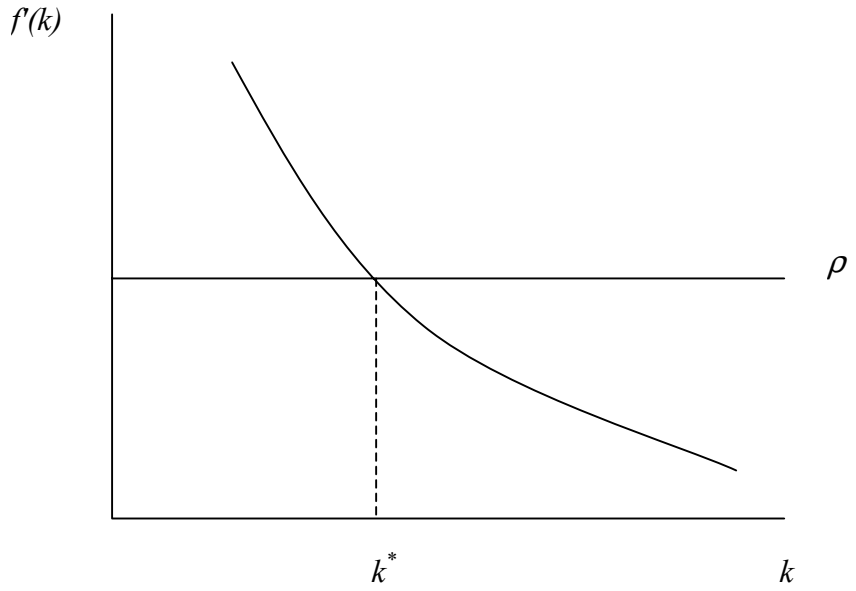
[3] Empirical support for the neoclassical growth model has been found by Barro (1991) and Barro and Sala-i-Martin (1992), among others.

The Neoclassical Growth Model[4]

The long-run equilibrium in the neoclassical growth model is given by the following condition:

$r = \rho$,

where r denotes the return to capital and ρ denotes the rate of time preference: the economy is only in its steady state when the return to saving and investing in capital r equals the subjective price ρ at which individuals discount the utility they derive from future consumption. If we had $r > \rho$, the return to saving would larger than its opportunity cost, and it would pay for this economy to keep on accumulating.



The graph plots the marginal productivity of capital $r = f'(k)$ against the economy's capital-labour ratio. Notice $f'(k)$ is decreasing due to the diminishing marginal productivity of capital. The long-run equilibrium is given by the intersection of $f'(k)$ with ρ, yielding the long-run capital-labour ratio k^*. As long as $f'(k) > \rho$, an economy has an incentive to raise its capital-labour ratio. But doing so pushes $f'(k)$ down towards ρ, until such incentive disappears. Notice that a more patient economy, that is an economy with a lower ρ, would have an equilibrium with a higher k^* and a lower r.

[4] See Barro and Sala-i-Martin (1995) for a detailed explanation of the neoclassical model.

3. The Overlapping Generations Model: A test of the dynamic inefficiency problem

As we mentioned above, the Ramsey-Cass-Koopmans model rules out dynamic inefficiencies. However, it does so on the basis of some not so credible assumptions, such as the idea that individuals are infinitely lived. *The overlapping generations model* (Samuelson (1958) and Diamond (1965)) reproduces many of the results of the Ramsey-Cass-Koopmans model, but avoids the assumption that agents face infinite-time horizons.

This actually reintroduces the possibility of dynamic inefficiencies. Since households have a finite horizon, whereas the economy goes on forever, maximization of welfare by individuals may not be equivalent to the maximization of long-run consumption by society:

Imagine that you are young and work today, and must live on non-wage income tomorrow, when you are old. Your children will face the same problem tomorrow, and so on. Obviously, one solution to the problem consists in your saving part of today's wage income, investing it in capital, and living on that capital tomorrow. Oversaving can occur in this economy, for example, if depreciation of capital is large enough: too many resources are invested in capital by today's young having to provide for their own consumption tomorrow.[5]

Abel, Mankiw, Summers and Zeckhauser (1989) depart from these intuitions to construct an empirical test of dynamic inefficiency. In its simplified version, the test implies that an economy is dynamically inefficient if the share of capital income in aggregate income (*i.e.*, the income generated by capital as a proportion of total income) is lower than the share of investment in aggregate income (*i.e.*, the resources implied by capital as a proportion of total income). They reject the presence of dynamic inefficiencies in a sample of OECD countries (that does not include Switzerland).

4. The AK-Model of Endogenous Growth: The long-run implications of low interest rates

One important problem shared by the previous models is that they do not explain why countries grow in the long run. Therefore, although they are quite useful to interpret some growth related phenomena such as cross-country differences in income per capita levels, they are silent about the long-run growth implications of, say, low interest rates. The so-called *AK-model*, due to Rebelo (1991), is the simplest of an alternative class of models that attempt to address this other type of issues.

From a theoretical perspective, the key difference between the AK-model and the models above is the absence of the diminishing marginal productivity of capital. In

[5] A welfare-enhancing policy would be, for example, forcing tomorrow's young generation to provide for tomorrow's old generation's consumption, and so on.

comparison with the neoclassical growth model, this implies that differences between the return to capital and the rate of time preference can be permanent, leading to an always positive growth rate of output per capita.

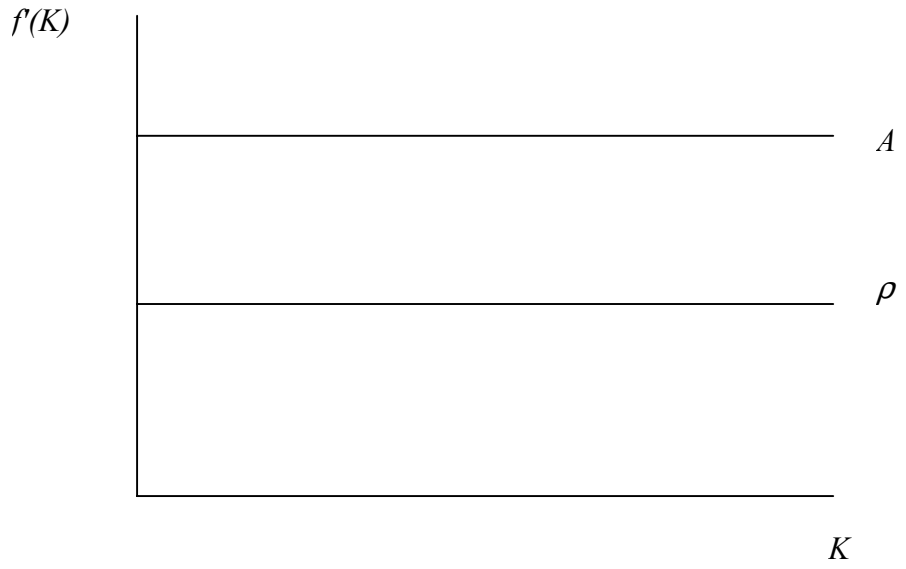
This long-run growth rate is in fact a function of the difference between the return to capital (the incentive to save and invest) and the rate of time preference (the cost of delaying consumption to the future). Therefore, a lower return to capital reduces a country's long-run growth rate relative to the rest of the world.[6]

The AK-Model[7]

In the simplest version of the AK-model there is only one production factor, capital. Output is a linear function of capital:

$Y = AK$,

where A is a positive constant reflecting anything (technology, taxation, institutions, etc.) that might affect the marginal productivity of capital. Notice that the latter is constant, since the second derivative of Y with respect to K is zero. (In the neoclassical growth model, this derivative is negative.)



The marginal productivity of capital, that is the return to capital, is now A. Notice that this economy always grows at a positive rate, and never converges to a long-run capital level K^*. The larger the difference between the incentive to save A and the opportunity cost of saving ρ, the higher the economy's growth rate. By the same token, a lower return to capital A implies a lower long-run growth rate.

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[6] Acemoglu and Ventura (2001) provide an open-economy version of the AK-model that yields insights similar to those of the neoclassical growth model.
[7] See Barro and Sala-i-Martin (1995) for a detailed explanation of the AK-model.

IV. CAPITAL MOBILITY

1. The Swiss Current Account

As we mentioned in Section II, Switzerland has got not only one of the world's highest capital-labour ratios in the world, but also one of the largest shares of foreign assets in wealth. In comparison with the rest of the world, the Swiss seem to be saving far beyond their domestic investment opportunities. This translates into the acquisition of net foreign assets through current account surpluses, which entitle their Swiss owners to part of other countries' future output.

Why is Switzerland running current account surpluses permanently? Several explanations are possible, but all of them revolve around the ideas we discussed in the previous section:

i. A high degree of patience in comparison to its trading partners implies the Swiss are happy to finance today's rest of the world's consumption in exchange for future repayment.

ii. Switzerland has one of the world's highest incomes per capita. This might indicate that the Swiss are close to their steady state, and that the growth perspectives of Swiss GDP relative to those of not-so-rich countries are not so great. Hence it might be worth for Swiss savers to invest abroad and obtain a higher return than to invest domestically.

iii. Capital mobility therefore prevents the Swiss interest rate from falling even more: Swiss investors avoid the curse of capital's diminishing marginal productivity by exporting capital to the rest of the world.

A Comparative Advantage Model of the Current Account[8]

Assume there are two countries in the world, denoted by $j = H,F$. (H stands for Home, and F stands for Foreign. Foreign can be interpreted as the rest of the world.) There are two periods, $i = 1,2$. To simplify, we assume away production: each country receives a perishable endowment Y_{ij} in each period. We assume each country is populated by a representative consumer who maximises utility

$$U_j\left(C_{1j}, C_{2j}\right) = \log C_{1j} + \beta_j \log C_{2j},$$

$0 < \beta_j = 1/(1+\rho_j) < 1,$ subject to the following budget constraint:

$$p_{1j}C_{1j} + p_{2j}C_{2j} = p_{1j}Y_{1j} + p_{2j}Y_{2j}.$$

[8] See Obstfeld and Rogoff (1995) for a detailed explanation.

Notice that the ratio p_2/p_1 represents the price of tomorrow's consumption in terms of today's consumption, that is, $1/(1+r)$.

It is easy to show that each country's equilibrium autarky relative price is given by

$$\frac{p_{2j}}{p_{1j}} = \frac{1}{1+r_j} = \beta_j \left(\frac{Y_{2j}}{Y_{1j}} \right)^{-1} .$$

Hence, a country's autarky interest rate depends negatively on the patience of consumers, reflected by β_j, and positively on the country's growth rate, reflected by Y_2/Y_1.

Provided countries have different autarky price ratios (interest rates), they have an incentive to trade intertemporally. Assume $p_{2H}/p_{1H} > p_{2F}/p_{1F}$ ($r_H < r_F$). Then country H has an incentive to export some of its period-one output in exchange for some of country F's period-two output. Hence, country H (country F) will run a trade surplus $Y_{1H} - C_{1H} > 0$ (trade deficit $Y_{1F} - C_{1F} < 0$) in period *1*, and a trade deficit $Y_{2H} - C_{2H} < 0$ (trade surplus $Y_{2F} - C_{2F} > 0$) in period *2*.

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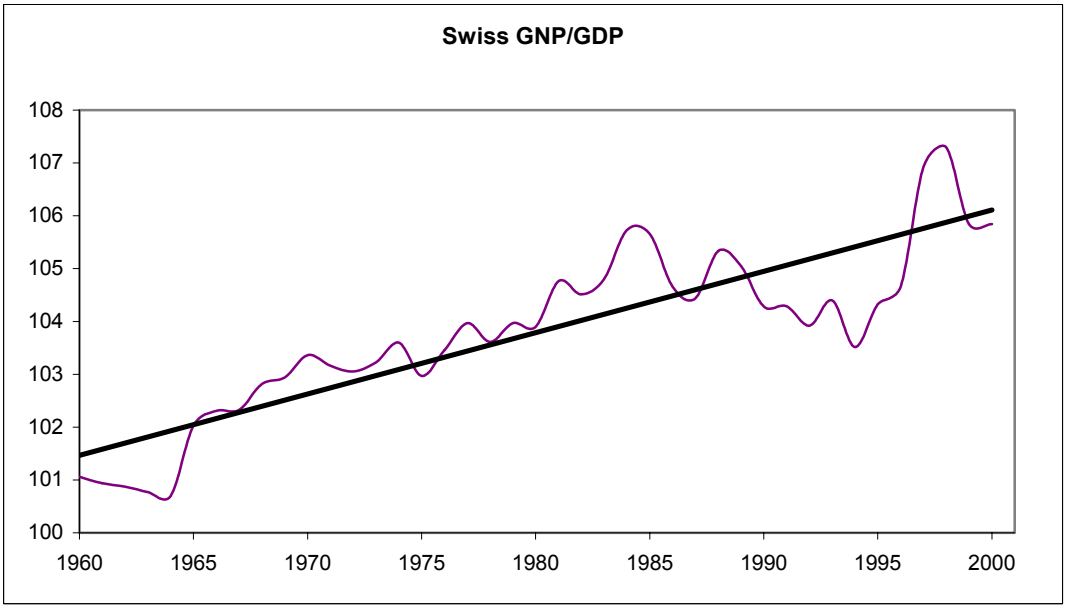
2. Gross Domestic Product and Gross National Product

For a capital-exporting country, *gross domestic product* (GDP), a measure of income accruing to the production factors resident in a country, probably underestimates its welfare. *Gross national product* (GNP), a measure of income accruing to the production factors owned by a country, is a more accurate measure.



In fact, we should expect GNP to be significantly higher than GDP for Switzerland, and their difference should grow over time. The figure above confirms our thoughts:[9] the ratio of Swiss GNP to GDP has been growing steadily over time since the 1960's. In the year 2000, Switzerland's GNP was in fact 5% larger than its GDP. Other sources (the National Accounts data published by the Swiss National Bank since 1990) display larger differences between GNP and GDP: for example, in 2000 GNP is estimated to be 8% higher than GDP.

3. Low Interest Rates, High Wages, and Foreign Direct Investment

From a real perspective, a low interest rate is likely to reflect a relative abundance of capital to labour. Hence, associated with the low Swiss interest rate comes the high Swill wage rate. This implies that Switzerland is likely to be at a comparative disadvantage with foreign competitors in labour-intensive activities.

This might explain why Switzerland is such an important foreign direct investor: Swiss firms have an incentive to 'slice' the production process into capital-intensive and labour-intensive activities, and outsource the labour-intensive ones to labour-abundant countries. This is known as *vertical foreign direct investment* (FDI).[10] To the extent that these outsourced labour-intensive activities are subject to high productivity growth, Swiss multinationals are 'importing' productivity growth through their FDI activities.

There is a downside to this argument, however. A high capital-labour ratio is also likely to make human capital expensive in Switzerland. This implies that Switzerland may be also at a comparative disadvantage in human-capital intensive activities. The dynamic consequences of this phenomenon may be worrisome for the Swiss growth perspectives, since technological progress tends to be associated with the presence of a strong human-capital intensive sector.[11]

[9] The data source is the Penn World Tables 6.1.
[10] See Helpman (1984).
[11] See Grossman and Helpman (1991).

V. INTERNATIONAL TRADE

1. The Heckscher-Ohlin Model: The effects of protecting labour-intensive sectors

The *Heckscher-Ohlin model emphasizes* cross-country differences in factor endowments (say capital-labour ratios) as one of the main determinants of international specialisation patterns: under free trade, a country that has a much higher capital-labour ratio than the world average is likely to export (import) goods whose production requires a high (low) capital-labour ratio.[12]

This model suggests that protection of labour-intensive sectors (mainly services) may be one of the reasons for low interest rates in Switzerland.[13] Any measure that props up the domestic price of labour intensive goods relative to capital-intensive goods will raise the wage more than proportionally, and reduce the return to capital more than proportionally. (This is the so-called *Stolper-Samuelson Theorem*.)

Why does this happen? An increase (reduction) in the relative price of a good raises (reduces) the demand for the factors used to produce it. If the protected good uses lots of labour relative to capital, and the non-protected good uses lots of capital relative to labour, protection implies an increase in the demand for labour relative to the demand for capital. Therefore, the return to labour must increase, and the return to capital must fall.

Cunat and Maffezzoli (2001, 2003) combine the Heckscher-Ohlin argument sketched above with the neoclassical growth model discussed in Section III. They show that an increase in trade protection reduces a capital-abundant country's income per capita by a significant amount due to its negative effect on the return to capital.

The Stolper-Samuelson Theorem[14]

Consider a small open economy that produces two traded goods, denoted by $i = 1,2$, with two production factors, capital and labour, denoted by $j = K,L$. Production factors are internationally immobile, but can move freely across sectors within the country. All markets are competitive. We assume that technologies exhibit the 'no factor intensity reversal' property: at any wage-rental ratio w/r, say sector *2* uses a higher capital-labour ratio than sector *1*.

Competitive cost conditions imply

[12] See Davis and Weinstein (2001a, 2001b, 2001c) for empirical support of the Heckscher-Ohlin model.
[13] Domestic policy measures can reproduce the effects of trade policy instruments. *E.g.*, an import tariff is equivalent to the combination of a subsidy on domestic production and a tax on domestic consumption.
[14] See Jones (1965) or Dixit and Norman (1980).

$$wa_{Li}\left(\frac{w}{r}\right)+ra_{Ki}\left(\frac{w}{r}\right)=p_i,$$

where a_{ji} denotes the requirement of factor j per unit of good i, which is a function of the wage-rental ratio w/r; and p_i denotes the price of good i.

Changes in relative prices must induce changes that maintain these equalities if production of both goods is to continue:

$$\theta_{Li}\gamma(w)+\theta_{Ki}\gamma(r)=\gamma(p_i)-[\theta_{Li}\gamma(a_{Li})+\theta_{Ki}\gamma(a_{Ki})],$$

where $\theta_{Li} = wa_{Li}/p_i$, $\theta_{Ki} = ra_{Ki}/p_i$, and γ denotes a growth rate. The cost minimisation conditions guarantee that for small changes the terms in square brackets equal zero. Thus,

$$\theta_{Li}\gamma(w)+\theta_{Ki}\gamma(r)=\gamma(p_i).$$

Keeping in mind $\theta_{Li} = 1 - \theta_{Ki}$,

$$\gamma(p_1)-\gamma(p_2)=(\theta_{L1}-\theta_{L2})[\gamma(w)-\gamma(r)].$$

Recall, good *1* is labour-intensive relative to good *2*. Therefore, $0 < \theta_{L1} - \theta_{L2} < 1$. Assume $\gamma(p_1) > 0$, and $\gamma(p_2) = 0$. Then,

$$\gamma(r)<\gamma(p_2)=0<\gamma(p_1)<\gamma(w).$$

The return to labour (capital) rises (falls) relative to the prices of both goods.

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2. The Ricardo-Viner Model: The effects of protecting the farming sector

Another sector that is favoured by protection in Switzerland is farming: as we mentioned in Section II, subsidies to the Swiss farming sector are much larger than in the OECD. A good workhorse to study this issue is the so-called *Ricardo-Viner or Specific-Factors model*, due to Jones (1971) and Samuelson (1971). This framework assumes that capital and land are sector-specific to, say, manufacturing (the exporting sector) and agriculture (the protected sector), respectively. A third production factor, labour, moves freely across sectors.

In this model, an increase in the relative price of the agricultural good raises the return to its specific factor, and reduces the return to the other sector's specific factor. What is the intuition underlying this result?

Again, trade protection raises the relative price of the protected sector, which pulls labour away from the exporting sector. The return to land increases because its profitability has risen for two reasons. First, the good produced with land is more

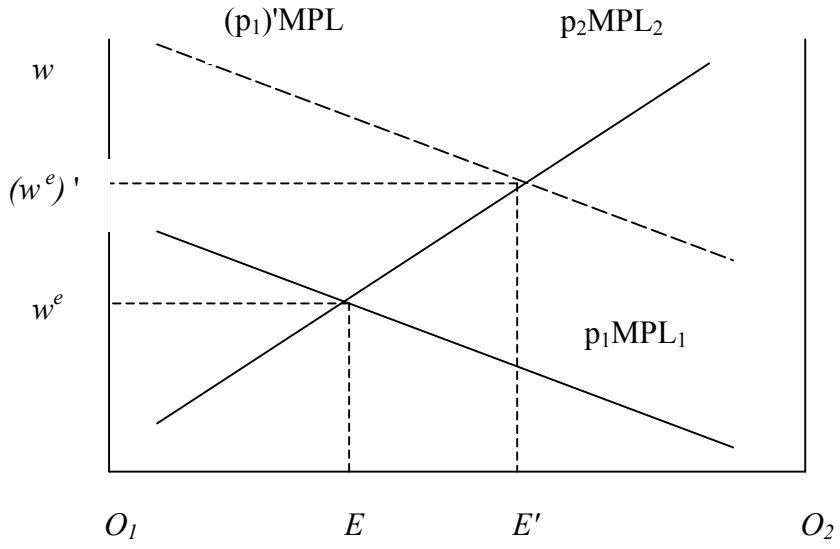
expensive now. Second, the protected sector's labour-intensity has risen, leading to a higher marginal productivity of land.

What happens in the exporting sector? As we already mentioned, the exporting sector loses labour to the protected sector, which implies that the capital-intensity used in manufacturing is higher now. At the same time, the relative price of manufacturing goods has fallen. These two reasons lead to a lower return to capital.

The Specific-Factors Model[15]

Consider a small open economy that produces two goods, denoted by $j = 1,2$. Good *1* is produced with land and labour, and good *2* is produced with capital and labour. (Production functions are neoclassical, and exhibit constant returns to scale and diminishing marginal productivity.) Labour is therefore a mobile factor that can be used in either sector, whereas land and capital are both sector-specific factors.

The equilibrium of this model can be depicted by the following graph:

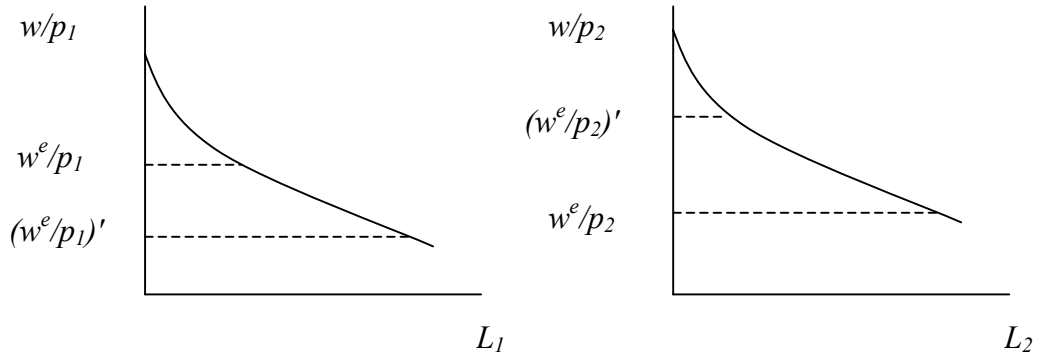


The distance O_1O_2 measures the economy's labour endowment. From origin O_1 (origin O_2) we measure the allocation of labour to sector *1* (sector *2*). The solid downward (upward) sloping curve represents the value of the marginal productivity of labour in sector *1* (sector *2*). The equilibrium takes place at the intersection of the two solid curves, which is where both sectors are willing to pay the same wage w and we have full employment of labour. The distance O_1E (EO_2) measures the equilibrium allocation of labour to sector *1* (sector *2*). w^e denotes the equilibrium wage.

[15] See Dixit and Norman (1980) or Jones (1971) for rigorous discussions.

Assume the price of good *1* rises exogenously. The value of sector *1*'s marginal productivity of labour rises, shifting the corresponding curve upwards, proportionally to the price increase (see dashed line). The new equilibrium implies a higher wage $(w^e)'$ and a reallocation of labour from sector *2* to sector *1*. Notice that the equilibrium wage rises proportionally less than p_1.

What about the returns to land and capital?



The small graphs plot the marginal productivity of labour in sector *1* (left) and *2* (right). The return to each sector-specific factor is represented by the area delimited by the vertical axis, the marginal productivity curve, and the dashed horizontal line. Notice that the return to sector *1*'s specific factor (land) rises (relative to the prices of both goods), whereas the return to sector *2*'s specific factor (capital) falls (relative to the prices of both goods). The overall effect on the wage is ambiguous: w rises relative to p_2, but falls relative to p_1.

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3. The Balassa-Samuelson Effect[16]

Productivity growth in the traded (manufacturing) sector and the non-tradability of many labour-intensive sectors (services) may also explain the fall in the return to capital:

An increase in the manufacturing sector's productivity raises income in a country. However, any increase in income is spent on both manufacturing goods, whose prices are pretty much constrained by foreign competition, and on non-traded goods, which by definition do not face any competition from abroad. Thus, the increase in the demand for non-traded sectors is met by a rise in their prices. Again, under the (reasonable) assumption that non-traded sectors are labour-intensive, the rise in their relative price may lead to a fall in the return to capital.

[16] See Obstfeld and Rogoff (1995).

4. Trade Protection, Specialisation Patterns and Economic Growth

Abstracting from the effects that trade protection may have on economic growth through its effect on the return to capital, there is an additional effect that works through its effect on the economy's production structure:

Trade protection shifts production factors from the exporting sector towards the protected sector: given that trade protection raises the domestic price in the protected sectors (and reduces the domestic price in the exporting sectors), profit-maximising firms find it optimal to reduce its presence in the exporting sectors and enter the protected ones.

Why should one worry about a country's production pattern? It turns out that different sectors are subject to different rates of productivity growth. This implies that international trade and trade policy can affect an economy's future welfare through a country's production pattern.[17] Countries that have got a strong presence of 'technology-backward' sectors (such as agriculture and services) are likely to experience a low growth rate of technical progress leading in turn to a low growth rate of income per capita.

[17] See, for example, Lucas (1988) and Young (1991).

VI. CONCLUDING REMARKS

Potential reasons for low real interest rates can be found in high aggregate saving rates, low capital taxation, and the evolution (protection, productivity growth) of particular economic sectors in the economy. Casual evidence seems to suggest that the Swiss population have got a somewhat high degree of patience, and that their farming sector benefits from strong government protection.

To the extent that low interest rates are due to a high degree of patience leading to a high capital-labor ratio, the Swiss growth perspectives should not be negative: in this case, a low interest rate would only reflect that the Swiss need less of an incentive to save (and accumulate capital) than other countries. However, if the low interest rates are due to distortions in Switzerland's productive structure, then the Swiss growth perspectives are likely to fall short of those of their neighbours. Without further empirical study, however, it is hard to tell whether these features are quantitatively important enough relative to other OECD countries to explain a consistently lower interest rate.

Many years of high savings and low domestic interest rates imply that investors have had an incentive to invest their savings abroad so as to profit from higher returns in the rest of the world. The measurement of economic indicators representing Switzerland's welfare should therefore take into account this phenomenon. The right "flow" variable to measure Swiss income is GNP (not GDP). The appropriate measure of Switzerland's wealth needs to encompass not only the stock of capital (physical and human) within the country's borders, but also the net foreign assets held by its citizens.

Finally, as Weder and Kugler highlight in chapter 3 of the Jahresbericht, the considerations discussed in this report deal with the *real* return to capital, but cannot explain the behaviour of *nominal* interest rates, which seems to be at the core of the Swiss “interest rate island”.

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