

Written Exam for the B.Sc. or M.Sc. in Economics summer 2015

Development Economics

Model Answer

August 5, 2015

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

In the model answer, references are given to three texts:

Dwight H. Perkins, Steven Radelet, David L. Lindauer and Steven A. Block, 2013. “Economics of Development”, 7th edition, W.W. Norton & Company. Denoted *PRLB*.

Debraj Ray, 1998. “Development Economics”, Princeton University Press. Denoted *Ray*.

David N. Weil, 2013. “Economic Growth”, Pearson International Edition, 3rd Edition. Denoted *Weil*.

Problem A

Please, briefly

1. define and explain development accounting.

Development accounting is defined and explained in *Weil* section 7.2. Starting from a Cobb-Douglas production function in per worker terms, the productivity in two countries can be compared by creating the ratio of output in country 1 relative to the output in country 2:

$$\frac{y_1}{y_2} = \frac{A_1 k_1^\alpha h_1^{1-\alpha}}{A_2 k_2^\alpha h_2^{1-\alpha}} = \left(\frac{A_1}{A_2} \right) \left(\frac{k_1^\alpha h_1^{1-\alpha}}{k_2^\alpha h_2^{1-\alpha}} \right)$$

This equation makes concrete the idea that countries can differ in their levels of output because of differences in productivity, factor accumulation, or both. The equation also gives a method for measuring productivity differences as output and factor accumulation are observable. Thus, the equation can be rearranged to compute a measure of productivity differences:

$$\frac{A_1}{A_2} = \left(\frac{y_1}{y_2} \right) \left/ \left(\frac{k_1^\alpha h_1^{1-\alpha}}{k_2^\alpha h_2^{1-\alpha}} \right) \right.$$

This technique for breaking down differences in income into the part that is accounted for by differences in productivity and the part accounted for by differences in factor accumulation is called development accounting (*Weil* p. 205).

2. explain how income inequality may affect the accumulation of physical capital.

This is explained in *Weil* p. 400 and in *Ray* p. 215. Following *Weil*, more inequality leads to a higher level of physical capital accumulation. The reason is that more inequality leads to higher total savings because individuals' savings rates tend to rise with income. Ray has a more complex model of the relationship between individual income and the savings rate, giving rise to a less clear-cut answer, stating that "The effect of a reduction in income inequality on the rate of savings, and therefore the rate of growth, is likely to be complex" (*Ray* p. 215). The main result, however, is that given in *Weil*.

3. explain what knowledge about poverty we gain from looking at the poverty gap index in addition to the poverty headcount index.

This is explained in *PRLB* p. 186: "The head-count index, tells us what proportion of the population is poor, and the poverty gap tells us proportionately how far below the poverty line the mean income of the poor falls. The poverty gap (PG) is related to the head-count index by the relation:

$$PG = [(PL - MC)/PL] \times H$$

Where PL is the poverty line, MC is the mean consumption per capita of all individuals below the poverty line, and H is the head-count index.

In the lecture slides, the PG is given as

$$PG = \frac{1}{N} \sum_{i=1}^N \frac{PL - C_i}{PL} \times \mathbf{1}(PL > C_i)$$

Where N is the population, C_i is consumption for individual i , and $\mathbf{1}(PL > C_i)$ is the indicator function taking the value 1 if the poverty line is higher than consumption of individual i and the value 0 otherwise. The two expressions are clearly equivalent as the head-count index, H , is defined as the fraction of poor to the total population.

4. explain the differences in the leading causes of mortality between rich and poor nations.

This is explained in *PRLB* p. 308-312. The leading causes of mortality in rich nations are noncommunicable diseases such as ischemic heart disease, cerebrovascular disease and various forms of cancer (lung, colon, stomach). The leading causes of mortality in poor countries are communicable diseases such as HIV/AIDS, malaria, diarrheal diseases, childhood diseases and tuberculosis. The transition from communicable to noncommunicable diseases being the leading causes of mortality is often called the epidemiologic transition.

5. state and explain the Johnston-Mellor linkages between agriculture and manufacturing.

The Johnston-Mellor linkages are given in *PRLB* p. 606: (1) increased supplies of food for domestic consumption, (2) released labor for industry, (3) a domestic market for industrial output, (4) a supply of domestic savings, and (5) a source of foreign exchange. In contrast to the Lewis linkages the Johnston-Mellor sectoral linkages are indirect. Further, Johnston and Mellor highlight linkages that operate not only forward, in the sense of agriculture supplying inputs and foreign exchange to nonagriculture, but also backward. The third linkage can be understood as such a backward linkage that underscores the consumption externalities that become possible when agriculture is profitable and the sector itself is growing.

6. explain how a combination of specific tariffs and an overvalued exchange rate can promote import substitution policies and explain the possible impact of the policy on exports and the balance of payments.

Import substitution (IS) is implemented by protective tariffs and import quotas. In addition exchange-rate management may be used. IS strategies often employed overvalued exchange rates as a policy instrument. The goal is not to make all imports cheaper because the intent of IS is to protect domestic industries. Overvalued exchange rates are used to make capital goods and other critical imports, such as food or fuel, cheaper in terms of domestic currency. Nonessential imports are kept out of the domestic market via high tariffs and quotas (*PRLB* p. 723). Overvalued exchange rates increases imports and decreases exports, often leading to trade balance deficits. This is shown in Figure 19-3:

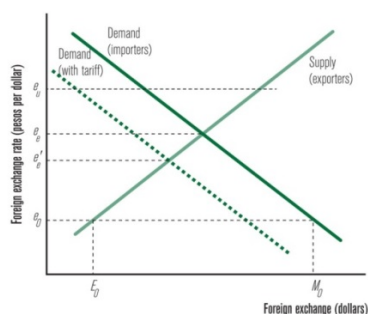


FIGURE 19-3 Overvalued and Undervalued Exchange Rates

7. explain the difference between a commercial project appraisal and an economic project appraisal.

This is explained in *PRLB* p. 356: “When a private firm undertakes investment analysis, it conducts a commercial project appraisal based on market prices and focusing on profitability. When governments consider public investments, they want to measure the full economic impact of the investment on the country. To do so, they must use shadow prices when market prices do not fully reflect true scarcity values. This kind of evaluation is called economic project appraisal. To estimate shadow prices, market prices must be adjusted to reflect full opportunity costs.”

Problem B

Please describe possible links between inequality and economic growth. The description should include details about how high levels of inequality may retard economic growth, because such inequalities create a political demand for redistribution that can only be met by imposing taxes on income.

Answer: The links between inequality and economic growth are described in *PRLB* chapter 6, *Weil* chapter 13 and *Ray* chapter 7. The links can be divided into

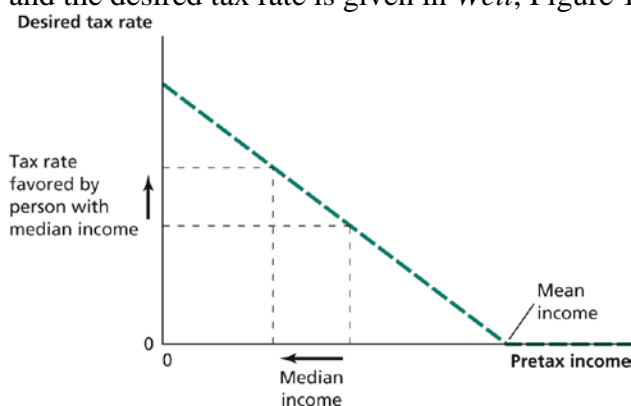
- (i) from growth to inequality, and
- (ii) from inequality to growth.

(i) The main link from growth to inequality is given by Kuznets' inverted-U hypothesis. According to *Weil* (p. 395-398) "Kuznets reasoned that economic growth –represented by the arrival of new technologies and changes in the structure of the economy [structural transformation]—would initially raise the rate of return to skills because skilled workers are better than unskilled workers at adapting to new modes of production. Similarly, new technologies will raise the rate of return to physical capital because technologies are often embodied in new capital goods. Because skills and capital are found at the high end of the income distribution, this increase in the rate of return to them would raise income inequality. Over time, however, new forces would begin to operate. First, the distribution of qualities that determine income inequality would change over time in a way that would lower inequality. The higher return to skills would induce unskilled workers to get an education, and workers would migrate out of regions or sectors that were falling behind into fast growing areas (structural transformation). Second, as technological progress and structural change slowed down, the rates of return to skills would decline, a trend that also reduce income inequality." *Ray* makes a similar argument in section 7.2.3 with uneven and compensatory changes: Uneven changes are sector or skill specific growth spurts while compensatory changes are results of linkages spreading incomes as demands for all sorts of goods and services rise.

(ii) There are 4 explicit links from inequality to economic growth:

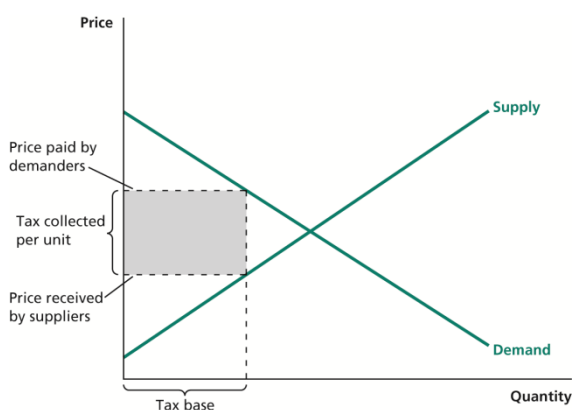
1. Inequality increases savings and thereby accumulation of physical capital, as explained in Problem A2. Hence, this link relates high inequality to high growth.
2. A more unequal distribution of income leads to lower human capital accumulation. An important reason is that human capital is embodied (installed in a specific person). Consequently, human capital cannot be used as collateral, leading to a missing (financial) capital market. Therefore, poor people have to fund educational choices out of retained earnings, wealth or abstention from currently productive work. Because they are poor the marginal cost of doing so may be prohibitively high, exceeding the marginal return. In the end poorer people underinvest in human capital, leading to lower total human capital accumulation in economies with more unequal income distribution. This link relates high inequality to low growth.
3. A more unequal distribution of income may also lead to crime and risk of violent conflicts (sociopolitical unrest). The risk of destruction of output and loss of ownership of capital implies lower expected return on investment. This leads to lower capital accumulation even without actual conflict. This link relates high inequality to low growth.
4. The redistribution link is given in *Weil* p. 404-405 and in *Ray* section 7.2.5. Here it is assumed that inequality leads to a desire for redistribution. This comes about because an individual with pretax income above the mean would prefer a redistributive tax rate of zero while individuals with pretax income below the mean will want a positive tax rate. The specific desired tax rate

will be higher for individuals with lower pretax income. The relation between the pretax income and the desired tax rate is given in *Weil*, Figure 13.12:



The tax rate in a country is assumed determined by a political process involving voting. Thus, the tax rate in the country will be the rate that is optimal for the voter with the median level of pretax income (the median voter).

A higher tax rate may have negative effects on economic growth for two reasons: (1) lower capital accumulation if taxes are imposed on the margin, as explained in *Ray* p. 218, and (2) lower efficiency, as explained in *Weil* p. 406.



The overall outcome of the model with political redistribution is that higher pretax inequality leads to lower economic growth.

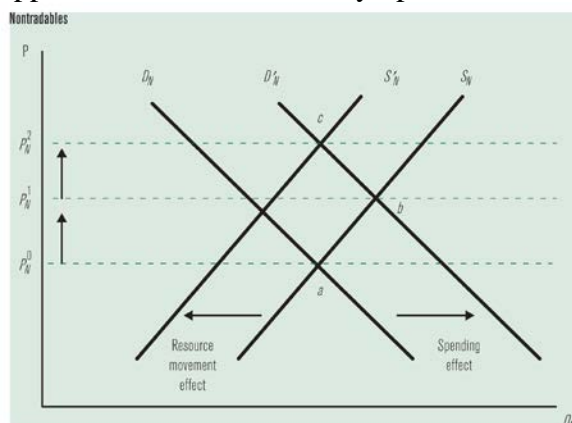
Problem C

In an economy with three sectors; two tradable sectors and one non-tradable sector, please explain the Dutch Disease phenomenon following a sudden increase in world market prices in one of the tradable sectors. Give examples of policies that may counter the Dutch Disease.

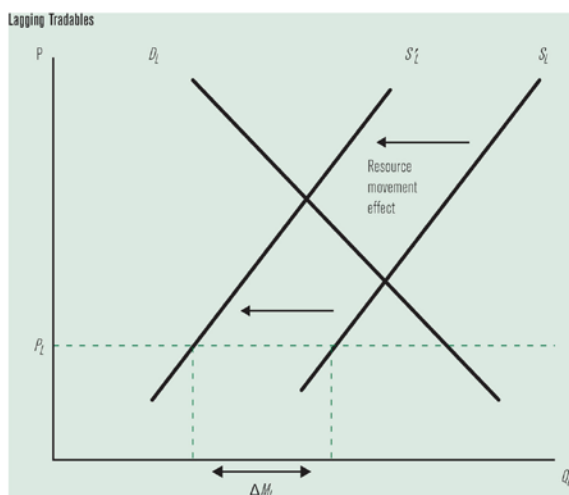
Answer: The Dutch Disease phenomenon is explained in *PRLB* p. 693-703. The following answer follows the presentation given in *PRLB* Box 18-1.

1. The effect of the sudden increase in world market prices on one of the tradable goods (say, the booming good) is an increase in the production and thus supply of this good. This gives rise to an increase in exports at the new world market price, such that the country enjoys “a windfall of new income”.

2. If some of the windfall income is spent on nontradables there will be an increasing demand for nontradables. At the same time the increasing supply in the booming tradable sector will require that workers migrate from the non-booming sectors (the nontradables and the lagging tradable sector). The spending effect (increasing demand) and the resource movement effect will jointly increase the price of the nontradable good, illustrated in the Figure below. Thus, the effects generate inflation and also causes the real exchange rate to appreciate. The inflation and real appreciation are the initial symptoms of Dutch disease.



3. The outflow of workers from the lagging tradables sector will decrease supply. As the price in this sector is fixed by the world market the decreasing supply leads to either decreasing exports or increasing imports of that good, shown in the Figure below.



The decreased supply in the lagging tradables sector is an important part of why the Dutch disease is considered an illness. When workers leave that sector they may not return. Often Dutch disease is observed when the booming tradables sector is mining (or other extractive industries) while the lagging sector is agriculture. Resources (workers) are reallocated from agriculture to mining when world market prices on metals or precious stones are high for a short period, while the workers do not return to agriculture when the prices on metals and precious stones are low. If the workers returned after the price hikes there would be no illness.

Dutch disease can be prevented by avoiding or reversing the initial real appreciation of the currency. This can be accomplished by a devaluation of the currency accompanied by restraints on government spending and money creation to curb the inflation. The restraint on government spending is a "standard" counter-cyclical fiscal policy harnessing the booming sector windfall gain.