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

Development Economics

Model Answer

June 10, 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 growth accounting.
   Growth accounting is defined and explained in *Weil* section 7.2. Starting from a Cobb-Douglas macro production function in per worker terms $y = Ak^{\alpha}h^{1-\alpha}$ we take the of the log-transform derivative with respect to time to get $\hat{y} = \hat{A} + \alpha\hat{k} + (1-\alpha)\hat{h}$, where hats indicate growth rates. This shows that the growth rate of output ($\hat{y}$) is the sum of the growth rate of productivity ($\hat{A}$) and the growth rate of factors of production ($\alpha\hat{k} + (1-\alpha)\hat{h}$). We use this to get an estimate of the growth rate of productivity (the Solow residual):
   growth rate of productivity = growth rate of output – growth rate of factors of production ($\hat{A} = \hat{y} + (\alpha\hat{k} + (1-\alpha)\hat{h})$). "The technique for deriving the growth rate of productivity is called growth accounting." (*Weil* p. 213).

2. explain how income inequality may affect the accumulation of human capital.
   This is explained in Weil p. 401-404 and in Ray p. 237. 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 accumulation in economies with more unequal income distribution.

3. explain what is measured by the poverty headcount index and calculate the overall poverty headcount in a country with 100 million people in which the poverty headcount index among the 15 million minority people is 70 percent while the poverty headcount index is 10 percent among the 85 million majority people.
   The poverty headcount index is given in *PRLB* p. 185. The poverty headcount index is the (percentage) share of the population in a country who are below the poverty line (regardless of the definition and measurement of the line). If the country has Np poor people and a population of N, the headcount index is Np/N or $100*Np/N$. The headcount index is additively separable. Thus in the example the headcount index is $0.7*(15/100)+0.1*(85/100) = 0.19$ or 19%.

4. explain three points we take home from the Preston curves.
   The Preston curve is shown in *PRLB* p. 316. The three points to take home are: (1) People in richer countries can expect to live longer than those in poor countries. (2) There have been dramatic improvements in the health of populations over time. These improvements have been greatest among the poorest countries. If all the improvements in health were driven by aggregate income growth, countries would have moved along the Preston Curve over time. The upward shift of the curve suggests that factors other than income are important. (3) There are several countries where life expectancy is substantially lower than its predicted level: HIV/AIDS and inequality in the middle income countries are prime explanations.
5. give four of the causes of the food crisis of 2005-2009.
   10 causes are given and discussed in PRLB p. 659: (1) Growth in demand from China and India, (2) speculation on financial markets, (3) export restrictions, (4) weather shocks, (5) decreased productivity (6) low interest rates, (7) depreciation of the US dollar, (8) rising oil prices, (9)

declining food stockpiles and (10) demand for biofuels.
The lecture slides have the following listing:

•	Wheat:	Failed harvests in Australia, Europe and FSU
		at a time with historically low grain reserves
•	Maize:	Increasing demand for fodder and increasing demand for
		(subsidized) biofuels
•	Rice:	Distortionary trade interventions and panic buying
		in a thin market
•	Common:	High prices on oil
		Depreciation of the US dollar
		Low grain reserves
		Speculation in food markets

6. explain why an expansion of credit from formal financial institutions to large informal lenders may not improve the terms of credit for small borrowers with no access to formal credit.
This is a variation of question 8 in *Ray* Chapter 14 (p. 588). The answer can be based on the model of default and credit rationing (*Ray* section 14.3.5). In an arrangement (a contract) where the binding constraint is the participation constraint for the small borrowers, the only way to improve the terms of credit for the borrowers is by improving their outside options. If the expansion of formal credit does not improve the outside options there will be no improvement in the conditions for the small borrowers.

7. explain how an undervalued exchange rate can be related to outward-orientation and export promotion and explain the possible impact of the policy on imports and the balance of payments.
This is shown in PRLB, Figure 19-3. An undervalued exchange rate makes all imports more expensive and, at the same time, makes exports more profitable by increasing their price in domestic currency. Undervalued exchange rates help stimulate exports and provide protection to firms competing with imports by raising the price of competitive products. (*PRLB* p. 724). The impact is (probably) increased exports, decreased imports and thus an increase in net-exports and the balance of payments (understood as the current account).
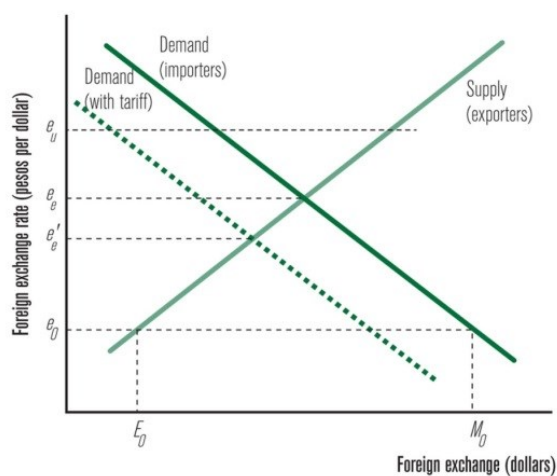

FIGURE 19-3 Overvalued and Undervalued
Exchange Rates

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Problem B
Consider a situation in which a trader is lending to a farmer and the farmer's output is sold to the trader at an agreed price. In the model we have a set of market prices for inputs and outputs. The direct input price is normalized to 1, and we note that the farmer needs to borrow money to pay for all inputs. The trader's opportunity cost for loans is the market interest rate i, while the market output price is denoted p. A contract between the farmer and the trader specifies an interest rate on the loan and a price for the output. Given these prices the farmer determines the loan size, and hence the input and output in his farm production. In addition to the contract option the farmer has an outside option giving him a profit of A.

Show that the loan will be advanced at a rate of interest that is below the opportunity cost of funds for the trader, and all profits are made by the trader by buying output at a discounted price. Also discuss what may happen to the contract interest rate, production and the farmers profit if the government imposes a minimum output price to be paid by all traders.

Answer: The answer can be given graphically or algebraically. Below, I first give the algebraic solution as it was distributed in a selective answer to the review questions for Lecture 12. Only parts of the algebraic solution are given in the text (*Ray* p. 527), so a precise derivation of the solution cannot be expected.

We start by considering the maximal profit that can be made at market prices. This is the solution that would be obtained if the trader operated the farm, or if the farmer had access to the credit and output markets. This solution is obtained by standard profit maximization in which the input in production equals the loan size and the prices equals the market prices:

$$\max_L \quad \Pi(p,i) = pQ(L) - (1+i)L, \quad Q' > 0, Q'' < 0$$

Profit is maximized when marginal revenue equals marginal cost, and this gives rise to the optimal loan (input), $\hat{L} = L(p,i)$ and the maximal profit

$$\hat{S} = \Pi^*(p,i) = pQ(L(p,i)) - (1+i)L(p,i)$$

The trader's problem is to offer the farmer a price contract at which the farmer will choose the (marked based) optimal loan size and at the same time minimize the farmers share of the profit. This maximizes the traders share of the maximal profit.

The profit function is homogenous of degree 1 in input and output prices. Thus, we know that if the contract has prices given by

$$p^* = pt, (1+i^*) = (1+i)t$$

then the profit to the farmer is

$$\Pi^*(p^*,i^*) = t\Pi^*(p,i)$$

Thus, this set of prices will induce the farmer to demand the optimal loan size and produce the optimal output. By this we can solve for t using the participation constraint

$$t\Pi^*(p,i) = A \Rightarrow t = A/\Pi^*(p,i) = A/\hat{S}$$

This shows that the farmer gets the share t of the maximal profit (this equals A) while the trader gets $(1-t)$ of the profit ($\hat{S} - A$). The contract has a subsidized loan $i^*-i = (i+1)(t-1) < 0$ *for* $0 < t < 1$ and a tax on output $p^*-p = p(t-1) < 0$ *for* $0 < t < 1$. As stated in *Ray* (p. 572), to the farmer this is equal to a profits tax of t per dollar.

The graphical explanation is from *Ray* Figures 14.6 and 14.7. The main idea is to show that the trader wishes to offer a contract that generates the competitive input and output measured in production units (as this is the efficient outcome) and subsequently pay the farmer as little as possible. The profit tax is the solution.
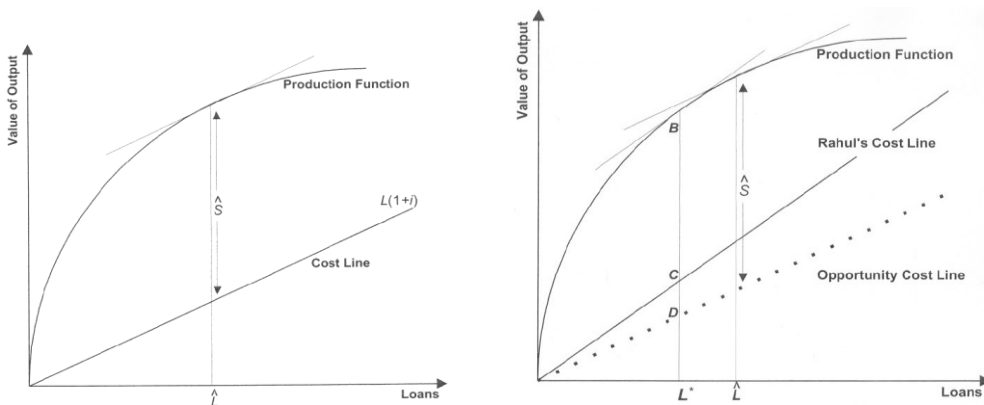
If the government introduces a minimum output price then the contract will be restricted. However, the farmer will still only get a profit of A because his outside option has not changed. The traders problem changes as the output price is now given such that he can only control the interest rate. The contract solution will no longer reach the market efficient level. Instead the interest rate offered to the farmer will be higher than before. Consequently, input and production will be lower such that the profit for the trader will be lower.

Problem C
Please discuss the advantages and disadvantages of import substitution policies. Give examples of how import substitution policies can be implemented and explain how a combination of specific tariffs and an overvalued exchange rate is an import substitution policy. Please briefly explain the possible impact of the tariff and exchange rate policies on exports and the balance of payments.

Answer: The answer for this should be based on *PRLB*, mainly chapter 19 (Trade Policy).
The idea underlying import substitution policies (IS) is just like structural transformation: For sustained economic development, countries need to shift from primary production to manufacturers to prevent prolonged specialization in low-productivity activities. The reason why countries should not specialize in low-productivity activities (primrary products) is the Prebish-Singer hypothesis of declining terms-of-trade for primary products relative to manufactured products (*PRLB* p. 688-693). The main argument for import substitution is a protection of the young industries, so-called infant industry protection. The Infant industry protection argument rests on assumptions of learning by

doing and/or economies of scale and political economy motives, stressing that domestic firms are necessary for increasing tax revenues and import substitution is important for the balance of trade.

Import substitution has the potential to be an effective strategy for certain sectors over a limited period of time. Almost all countries have tried it at one stage or another, and many have achieved some success. The problems were that the basic conditions for prolonged success were not met (*PRLB* p. 724). First, instead of learning to compete, firms and industries required protection indefinitely. Moreover, the protective regime is a set of incentives that reward political lobbying, corruption and bribery more than economic efficiency and competitiveness. This is known as rent-seeking behavior (*PRLB* p. 725). Second, most developing counties have relatively small markets, either because incomes are low or populations are relatively small. This makes them poor candidates for IS because the domestic market quickly becomes saturated. A limited market means that firms cannot take advantage of economies of scale (*PRLB* p. 724). Third, by reducing the commercial links with the rest of the world, import substitution countries limit their exposure to new technologies and ideas (PRLB p. 725).

Import substitution 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 was not to make all imports cheaper because the intent of IS is to protect domestic industries. Overvalued exchange rates were 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, which is also the basis for Question A7. As such, overvalued exchange rates creates excess demand for the foreign currency and it becomes necessary to ratio foreign exchange, requiring licenses and administrative controls to oversee them. Such licenses essentially become a source of rent seeking and corruption. Overvalued exchange rates also give rise to black markets for foreign exchange (*PRLB* p. 723).