ECO2143 Macroeconomic Theory II
Final examination: April 28, 2010
University of Ottawa
Professor: Louis Hotte
Time allotted: 3 hours; Calculator allowed

Attention: *Not all questionnaires are the same. This is questionnaire* ***A****. On the answer sheet, you must indicate the letter of your questionnaire with the course's number as follows:* ***ECO2143A****. You must answer according to* ***the material seen in this course****. Read all answer choices before choosing your answer.* GOOD LUCK!

QUESTIONNAIRE A

I. MULTIPLE CHOICE QUESTIONS (3 points each)

1. Which of the following is most likely TRUE.
   (a) There is firm evidence that a fiscal stimulus can take an economy out of a recession.
   (b) In 1933, stock market prices collapsed in the six months after president Roosevelt took office because he wanted to reduce inflation.
   (c) If the government suddenly announces a large increase in its expenditures to be made twelve months from now, businesses may react by increasing their investments within the coming six months. ✓
   (d) Business investment did not react to the Canadian stimulus package announced in January 2009 because it was already well anticipated before December 2008.

2. Which of the following is TRUE?
   (a) According to the Malthusian model of population and economic growth, a technological improvement leads to higher standards of living in the long run.
   (b) The Malthusian model of population and economic growth is useful to explain increases in standards of living in the industrialized world over the last 200 years.
   (c) A drop in the mortality rate can lead to lower fertility through the effect of increased incentives to invest in a child's education. ✓
   (d) A drop in the mortality rate can only lead to higher population growth in the long run.
   (e) Better access to contraceptives is the leading explanation for lower population growth in today's developed world.

3. Suppose that a country experiences a large reduction in its capital stock, say due to the effect of a military conflict that has just ended. Assume no other effect from this event on the economy. Within the context of the basic Solow model without technological growth, which of the following will occur as the economy adjusts to this situation (all in per capita terms)?
   (a) Zero growth for some time, followed by a gradually increasing growth rate.
   (b) High growth for some time, followed by slow but sustainable growth in the long run.
   (c) Low growth for some time, followed by slow but sustainable growth in the long run.
   (d) Some growth for some time, followed by zero growth in the long run. ✓
   (e) Positive growth, followed by negative growth, and then zero growth.

4. Below is a list of market failures that call for direct government intervention in the economy (somewhat uncontroversially). Which one is NOT really meant to make markets more efficient?
   (a) Public good provision
   (b) Externalities
   (c) Monopolies
   (d) Coordination
   (e) Income distribution ✓

5. Which of the following is clearly FALSE?
   (a) During the 1950s and 1960s, increased government intervention was predominantly considered suspect, in part due to the low growth experience of the Soviet Union during the 1920s and 30s. ✓
   (b) During the 1950s and 1960s, increased government intervention was predominantly considered desirable, in part due to the fact that the 1930's depression was seen as large market failure.
   (c) During the 1980s and 1990s, increased government intervention was predominantly considered suspect, in part due to the low growth experience of the socialist economies from the 1960s on.
   (d) During the 1980s and 1990s, an important wave of privatization of state enterprizes has swept across most of the world economies.

6. Assume a world economy composed of only two countries, countries A and B, and two types of goods being produced, goods 1 and 2. Labor-hour is the only type of input and each country is endowed with the same total amount of labor-hours and population size. Country A requires 3 hours to produce each unit of good 1 and 9 hours for each unit of good 2. Country B requires 1 hour to produce each unit of good 1 and 3 hours for each unit of good 2. Which of the following is FALSE.
   (a) In country A, the opportunity cost of good 2 is 3 units of good 1.
   (b) In country B, the opportunity cost of good 2 is 3 units of good 1.
   (c) In autarky, country B is richer than country A.
   (d) With trade, country B is richer than country A.
   (e) Both countries can be made strictly better off by trading at a price of 3 units of good 1 per unit of good 2. ✓

7. Take the world economy of question 6 with the following sole modification: due to a technological improvement, Country A now requires 1 hour to produce one unit of good 1. Which of the following is generally TRUE?
   (a) Trade makes country A richer than country B.
   (b) Both countries can gain by trading at a price of 3 units of good 1 per unit of good 2.
   (c) Both countries can gain by trading at a price of 6 units of good 1 per unit of good 2. ✓
   (d) Both countries can gain by trading at a price of 10 units of good 1 per unit of good 2.
   (e) When country A becomes more productive, its resulting higher competitiveness will necessarily make country B poorer under trade.

8. According to the data that we have studied in the course, which of the following can be said about economic growth and trade openness.
   (a) Poor economies tend to grow faster when they are closed.
   (b) There does not seem to be any link between the degree of trade openness and the speed of convergence of poor economies with the rich world.
   (c) Trade openness seems to be a necessary prerequisite for the convergence of poor economies with the rich world. ✓
   (d) It is difficult to find examples of countries that began to grow faster after opening up their economy to the rest of the world.
   (e) There are many examples of countries that became rich while being virtually closed to trade with the rest of the world.

9. Suppose that the yearly returns to education are the following: 13.4% for grades 1 to 4, 10.1% for grades 5 to 8, and 6.8% beyond 8 years. What fraction of wages is due to human capital for a worker who has nine years of education?
   (a) 25.5%
   (b) 40.5%
   (c) 50.5%
   (d) 61.5% ✓
   (e) None of the above is anywhere close to the real value.

10. Suppose that there are only two goods produced in the world: corn and restaurant meals. Corn is traded on world markets but not restaurant meals. The following table provides information about output quantities and prices for countries MEX and CAN.

Country	corn output per capita	rest. meal output per capita	price corn local currency	price rest. meal local currency
CAN	8	2	2	9
MEX	4	1	1	2

What should we expect the market exchange rate between pesos of country MEX and dollars ($) of country CAN to be (assume no-arbitrage possibilities)?
   (a) 1$/peso
   (b) 2$/peso ✓
   (c) 3$/peso
   (d) 4$/peso
   (e) 5$/peso

11. (Question (10) continued.) What should the purchasing power parity adjusted exchange rate be?
   (a) 2$/peso
   (b) 2.833$/peso ✓
   (c) 3$/peso
   (d) 3.167$/peso
   (e) 3.75$/peso

II. PROBLEMS

1. (40 points) Capital mobility and economic growth

Assume that the output per capita of a country is given by $y = Ak^{\alpha}$. (Note that this implies that the marginal product of capital is equal to $\alpha Ak^{\alpha-1}$.)

a) **(10)** Assume that the country is CLOSED to the rest of the world such that its capital is NOT mobile. Assuming a savings rate of γ and a capital depreciation rate of δ, derive the long-run output per capita. How does it depend on the savings rate? (To be solved with equations. No graphic.)

Answer: The long-run equilibrium is determined by the investment being equal to capital depreciation, that is,

$$\gamma Ak^{\alpha} = \delta k.$$

Rearranging this equation, we get

$$k^{SS} = \left(\frac{\gamma A}{\delta}\right)^{\frac{1}{1-\alpha}}.$$

This leads to a long-run income per capital equal to

$$y^{SS} = A^{\frac{1}{1-\alpha}} \left(\frac{\gamma}{\delta}\right)^{\frac{\alpha}{1-\alpha}}.$$

We therefore see that the long-run output per capita depends positively on the savings rate. This suggests that in order to raise income, people must reduce their consumption.

b) **(10)** Assume now that capital is perfectly mobile with the rest of the world. State clearly and briefly what the law of one price for capital movements says. Show that the equilibrium stock of capital is independent of the country's savings rate. (To be solved with equations. No graphic.) Explain intuitively.

Answer: The law of one price says that with perfect mobility of capital between one country and the rest of the world, the return to capital in the one country must be equal to the one in the rest of the world. If this were not the case, investors would move their capital to where the return is highest, thus re-establishing the equality in capital returns.

In a competitive economy, the rate of return to capital must be equal to its marginal product, that is,

$$r = \alpha Ak^{\alpha-1}.$$

If r^W denotes the (given) return to capital on world markets, the law of one price implies that $r = r^W$, and thus

$$r^W = \alpha Ak^{\alpha-1}.$$

This implies that the stock of capital in the country is given by

$$k^{SS} = \left(\frac{\alpha A}{r^W}\right)^{\frac{1}{1-\alpha}}.$$

We therefore see that the stock of capital does not depend on the country's savings rate.

c) **(5)** Does your answer to (b) imply that countries that save more are no better off than countries that save nothing when capital is perfectly mobile? Explain.

Answer: No. A country that has a relatively low savings rate may benefit from an influx of capital from the rest of the world as it potentially increases local wages a lot.

However, another part of the additional output will have to be used to repay the foreign owners of capital. So countries with relatively high savings rates will also benefit from additional income coming from their investments in foreign countries.

An alternative explanation can be made by comparing the GDP of a country with its GNP, all in per capita terms. We have

$$GNP_t = GDP_t + rB_t^f,$$

where B^f denotes the country's net holding of foreign assets. A country with a relatively high savings rate will have $B_t^f > 0$, whereas one with a relatively low savings rate will have $B_t^f < 0$. We therefore see that even though two countries may have the same GDP per capita with perfect capital mobility (since their capital stocks are equal), the country with the high savings rate will have a higher GNP due to its interest income receipts from foreign countries.

***

We have seen that the current account balance of an open economy was given by the following identity:

$$B_{t+1}^f - B_t^f = rB_t^f + NX_t, \tag{1}$$

where B_t^f denotes net foreign asset holdings, r is the rate of interest on assets, and NX_t is net exports.

d) **(5)** Explain intuitively <u>in words</u> what identity (1) means.

Answer: The variables on the left-hand side (LHS) of the identity denote *stock* values. The difference is the change in net foreign asset holdings between two consecutive years. For example, if the country is a net debtor with respect to the rest of the world – i.e. $B_t^f < 0$ – a positive value for LHS indicates a reduction in its foreign liabilities.

The right-hand side (RHS) variables are *flow* values. They indicate what causes net foreign asset holdings to increase in a given year. For instance, if $B_t^f < 0$, then the country must export more than it imports in to cover interest payments rB_t^f on its net foreign debt.

e) **(10)** Is it always better to have a positive current account balance? Answer from the perspective of Canada's experience over the past 50 years or so.

Answer: Not necessarily. A positive current account balance in Canada means that Canadian savers are investing more in foreign countries than foreigners are investing in Canada. As a result, the stock of capital in Canada is lower than it would be with, say, a zero current account balance. A lower stock of capital leads to lower wages for workers. The advantage with a positive current account balance is that savers may obtain a better return by investing abroad, as well as diversifying the risk.

From the 1960s to the early 2000s, Canada has generally had negative current account balance. However, its foreign debt to GDP ratio has not increased because the additional capital allowed workers to be more productive.

2. (27 points) Population growth and economic growth

Consider the Solow model with population growth, as studied in class. Assume that population can grow at two different rates: n_1 and n_2, where $n_1 > n_2$. The population growth rate depends on the level of output per capita (and therefore the level of capital per capita). Specifically, population grows at (high) rate n_1 when $k < \bar{k}$ and at (low) rate n_2 when $k \geq \bar{k}$. We assume that $(n_1 + \delta)\bar{k} > \gamma f(\bar{k})$ and $(n_2 + \delta)\bar{k} < \gamma f(\bar{k})$.

a) **(15)** Using a graphical analysis, explain why this model leads to bleak predictions regarding the problem of high population growth in poor countries.

Answer: (See accompanying graphic.) In this problem, the population growth rate is *endogenous*, i.e. it depends on the income per worker. More specifically, the line $(n+\delta)k$ is given by $(n_1 + \delta)k$ when income per capita is below $f(\bar{k})$, and given by $(n_2 + \delta)k$ when income per capita is above $f(\bar{k})$. Note that with $n_2 < n_1$, we simply represent the fact that population growth decreases with income.

There are two possible steady-state equilibria: one at k_1^{SS} with a low income per capita; the other at k_2^{SS} with a high income per capita. This is another instance of a *development trap*: A country that starts off poor has a higher population growth and therefore stays poor because of the *capital dilution* effect. A country that start off rich stays rich because of its lower population growth. In order to sustainably improve the standards of living in the poor country, we would need to find a way to make its capital stock jump above the threshold $\bar{k}$ for a while, say with outside development aid or foreign investment.

b) **(12)** Why do poorer countries tend to have higher population growth? Is better access to contraceptives likely to solve the problem?

Answer: Poorer countries tend to have higher population growth in part because their fertility rate is higher.

The fertility rate is higher for various reasons. One reason is called the *insurance* argument: If parents want to make almost sure that they have at least one surviving son, they will compensate for the high mortality rate by having too many children. Another factor is the fact that if females receive little education and do not work, then the *opportunity cost* of having children is low. A third reason is the fact that with under-developed *financial markets*, parents may want more children to look after them when they get old. Finally, when the mortality rate is high, there is less incentives to *invest in the education* of a child, thereby further reducing the opportunity cost of having one.

Another factor is the *timing* between the mortality transition and the fertility transition. In LDCs, the drop in the mortality rate is often happening so fast that parents do not yet realize that they should adjust their fertility rate to a lower level.

Studies show that easy access to contraceptives can lower the fertility rate. However, this solution is not a panacea. Contraceptives will help only as long as parents *desire* less children, which tends to be difficult for the reasons mentioned above.