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Solutions to written exam for the B.Sc. or the M.Sc. in Economics
The Economics of the European Union

December 20, 2016

Number of questions: This exam consists of 3 questions.

1. **Which of the following statements are correct? Remember to provide a brief explanation.**
   This question relates to the following learning objectives: Knowledge: Understand and explain theoretical and applied issues of the process of Economic and Monetary Union in the EU. Skills: Be able to apply relevant macroeconomic models to the analysis of European integration and monetary union; and be able to apply the theory of optimum currency area and apply this theory to the analysis of the European Monetary Union.

   (a) UIP describes a relationship between nominal and real interest rates.

   False, UIP states that the expected rate of depreciation should be equal to the interest differential. What is described is the Fisher principle.

   (b) If the nominal exchange rate appreciates by more than the inflation differential, then the real exchange rate is appreciating.

   True, the real exchange rate is equal to the nominal exchange rate (measured as foreign currency units per unit home currency) plus home price level and minus foreign price level. So if the nominal exchange rate appreciates by more than the inflation differential, then the real exchange rate appreciates.

   (c) Mundell suggests that regions/countries form an optimum currency area if factors of production easily move across borders.

   True, Mundell focuses on labor mobility and the basic argument is that labor mobility can replace exchange rate movements in case one country is affected by a negative asymmetric shock. If unemployment increases in this country, workers will move to the the other country and the exchange rate does not need to adjust.

   (d) The risk free short-term interest rates must be the same across all EMU member states.

   False! According to UIP, interest rates must be equal if the expected rate of depreciation is zero (as it is in a monetary union). Usually we argue that government

bonds, in particular US Treasure bills, are almost risk free. But that may not be the case for all countries. We need to add risk (or a risk premium) to UIP. So, the interest rate of a risky asset is equal to the interest rate of a safe asset plus a risk premium.

(e) It is always beneficial to diversify since risk is reduced.

False, it depends on the correlation between the assets. It is optimal to add assets whose returns are negatively correlated to the returns of the assets already held in the portfolio.

2. **Financial markets in a monetary union**
This question relates to the learning objectives: Knowledge: Understand and explain theoretical and applied issues of the process of Economic and Monetary Union in the EU and explain and describe the causes of and policies designed to resolve the euro crisis. Skills: Be able to apply relevant macroeconomic models to the analysis of European integration and monetary union. Competences: Carry out economic analysis related to current issues in Europe.

(a) What is the role of financial markets?

Financial markets perform three main functions:

- Intermediation: Matching borrowers and lenders. Lenders deposit funds in financial institutions and they then re-lend funds to borrowers.
- Maturity transformation: Matching borrowers who prefer long maturities and lenders who prefer short maturities. Financial institutions issue short-term instruments such as bank deposits and bonds for savers and accept long-term instruments such as bank loans and long-term bonds to borrowers.
- Risk taking and diversification: When financial institutions lend money they expect future payments. This constitutes a risk (a default risk). A borrower may not be able to repay the loan. In order to account for this risk, financial markets provide instruments for handling this default risk and also allow lenders (and borrowers) to reduce risks by diversification.

(b) How are financial markets affected by economic integration?

There are no restrictions on capital movements in EU. The Single European Act 1986 and a 1988 directive rule out any restriction on capital movements among EU citizens. In addition, since the adoption of the Eurozone, investors do not need to consider exchange rate risks when moving capital between two Eurozone countries. Economic integration should therefore have affects on banks, bond markets and stock markets. Economic integration improves allocation efficiency leading to the same returns from saving, same borrowing costs, capital goes where it is more productive but not everyone gains. The main benefits of economic integration are returns to scale and diversification.

Returns to scale: There are three characteristics of financial markets related to returns to scale. First, scale economies means that matching and risk diversification are both easier with a large number of borrowers and lenders. In general there are massive scale economies in the finance industry. The existence of different currencies is one barrier. Therefore we expect that the creation of the single currency removes barriers to competition. Second, financial institutions and markets can be seen as networks of borrowers and lenders. Larger networks means that financial intermediaries easier and faster can match borrowers and lenders. Third, asymmetric information is a potential problem when financial markets become too large. Borrowers know more about own riskiness than the lender. The borrower therefore has incentives to conceal risks in order to obtain a loan. The lender is aware of this and may become too risk averse and refuse to lend or may overprice risk (charging a higher interest rate). As the size of the market grows, it is likely that these problems increase.

Diversification: Free capital mobility within EU implies that financial markets can offer almost unbounded possibilities for diversification, the more so the bigger they are. Diversification leads to more choice to borrowers and lenders and a possibility to reduce overall risk. The effects of a single currency includes the fact that the euro eliminates currency risk within Eurozone, more competition as national currencies acted as non-tariff barriers, better exploitation of scale economies. With the emergence of large financial institutions and markets there is a potential for diversification to shrink.

(c) There is a debate in EU and EMU about regulation and supervision of the financial sector and how banking failures should be carried out, at the national level or at the EU level. Describe the issues and discuss the main arguments for and against centralization.

There are three main issues on the agenda today concerning (i) regulation, (ii) supervision and (iii) resolution. The question is whether these should be carried out at the EU level or at a national level.

- Regulation: The EU solution is settled, regulation of banks and financial institutions is designed at the EU level. Since there is free mobility of goods, services, assets and people in EU, the risk is that national regulations could hamper capital mobility and increase home bias, investors would prefer to invest in their home country instead of investing abroad.
- Supervision: Arguments for keeping supervision at the national level includes:
  - Information asymmetry between supervisor and supervisee. Financial institutions have an information advantage knowing more about its business than the supervisor. If supervision is national, it is less likely that financial institutions can hide any difficulties they may have. Supervisors know

more about their banks and financial institutions at a national level than on the EU level.
  - A strong argument is also that unless national supervision proves to be impossible or inefficient, then it should be decentralized.
- Supervision: Arguments for centralized supervision includes:
  - Banks and financial institutions are likely to become multinational as a result of economic integration. Therefore, supervision cannot be national. If banks become multinational it means that several national supervisors become involved. The risk is that different national supervisors operate differently and may have different views on how the banks operate and the risks involved. It is therefore more efficient with a single supervisor.
  - If supervision is national the closeness of supervisor and supervisee may be a problem, close connections may lead to lax supervision.
  - Common market requires equality of treatment. This is more likely to be the case if supervision is at the EU level.
  - ECB will be involved if banks require support. Therefore, supervision should be centralized. Oversight and resolution should be centralized.
- Resolution: The main argument for national resolution is that bank failures are costly, involve political decisions by the national government, may have effects on taxes and expenditures and banks may even be nationalized. Therefore the argument is that bank resolution should be delegated to to a national administration or authority operating under the authority of national government.
- Resolution: There are also strong arguments for centralization including
  - National banks tend to be strong and powerful and may have influence on their governments implying that tax payers may end up providing resources for bank resolution.
  - Governments may act to protect national banks and financial institutions.
  - National governments may not have the means to prevent bank failures, banks could be "to large to fail". Also, ECB is the lender of last resort and it makes sense that resolution is centralized, at least for Eurozone member states.

3. **Economic growth in a monetary union**

This question relates to the following learning objectives: Knowledge: Understand and explain theoretical and applied issues of the process of Economic and Monetary Union in the EU. Skills: Be able to explain and apply economic growth theory and its relevance for the European Union. Competences: Carry out economic analysis related to current issues in Europe.

(a) Describe the Solow growth model (the Solow diagram) including the main assumptions underlying the model.

The basic underlying assumptions include: Infinite number of firms producing the same good using two factors of production, labor and capital. Constant returns to scale production function (Cobb-Douglas production function). Firms maximize profits under the assumption of full competition implying that firms are price takers. Closed economy and constant savings rate.

In the standard Solow model without technological progress, output growth is equal to population growth and output per capita growth is zero. Adding technological progress to the model, output growth per capita is equal to the growth rate of technology.

Under these assumption we can illustrate the Solow model in the following graph. Note that we transform the production function to pewr worker terms, on the vertical axis we have output per worker and on the horizontal axis we have the capital-labor ratio. In the graph we use the following notation: δ is the depreciation rate (a constant depreciation of the capital-labor stock each year) which is a straight line since the depreciation per worker increases in proportion to the amount of capital per worker. s is the constant savings rate which multiplied to income (output per worker) is the $s(GDP/L)$-curve. GDP/L-curve is production per worker (in the graph we have assumed a Cobb-Douglas production function). Equilibrium is at K/L^* (point A in the graph). The reason is that at this point, the capital-labor ratio is constant, the inflow of new investment (which is equal to savings) just balances the depreciation of the capital-labor stock. To the left of this point, savings exceed depreciation and the capital-labor stock is increasing whereas to the right depreciation exceeds investment and the capital-labor stock is decreasing.

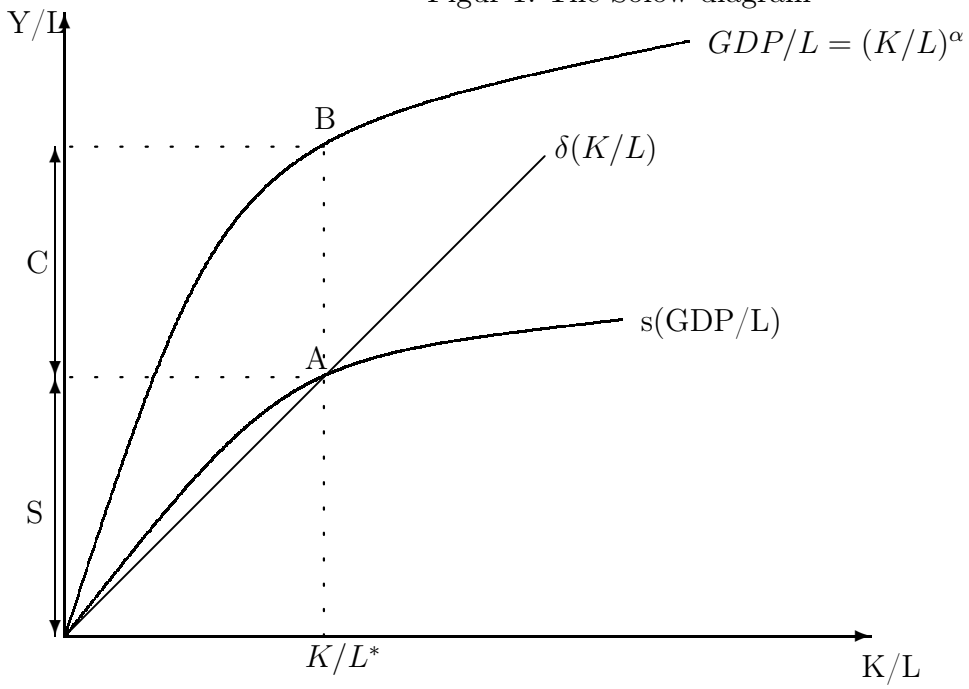
The distance between the horizontal axis and point A gives us total savings (per worker) and the distance between points A and B is consumption (per worker).

(b) Describe how economic integration affects economic growth.

There are several reasons why economic integration affects economic growth. The basic argument is that economic integration improves the efficiency of the economies since factors of production are used more efficient. This leads to higher output (an increase in output per worker). This is the allocation effect. As a consequence (if the savings rate is constant) this leads to higher investments per worker. For a constant depreciation rate this means that the capital per worker ratio starts to increase to a higher level. During this process, output per worker growth exceeds the long-term growth rate. This is the medium-term growth effect.

(c) Use the Solow diagram to illustrate the allocation effect and the medium-run growth effect.

Figur 1: The Solow diagram



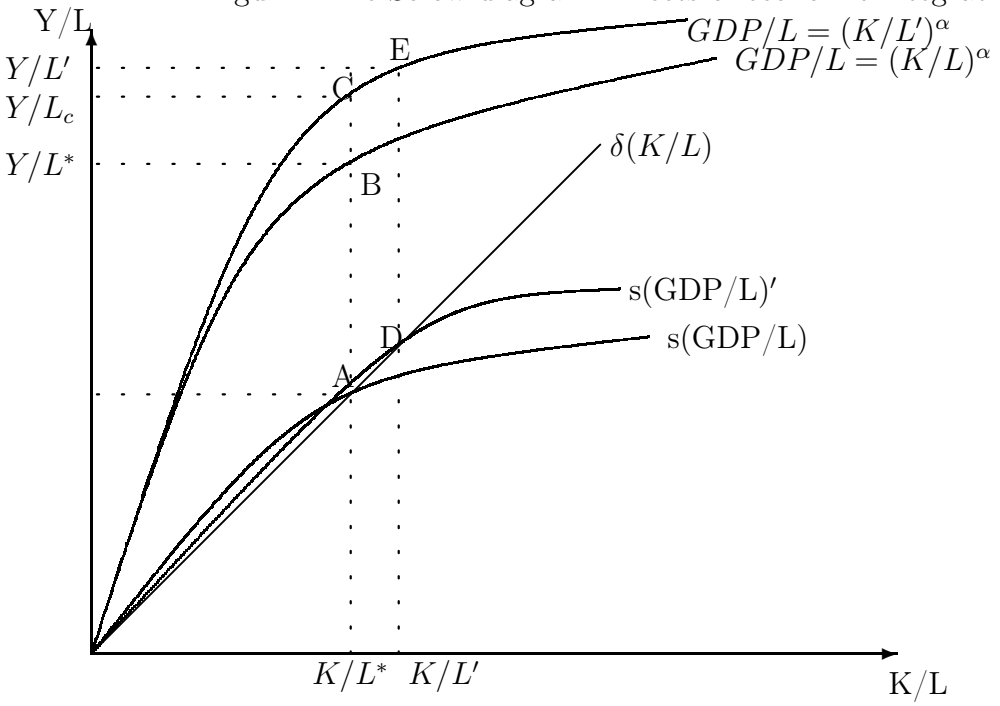
In order to illustrate the allocation and the medium-term growth effects we use the Solow model. The allocation effect is illustrated by a shift in the production function (for a given capital-labor ratio we now produce more output). This shift in the production function is illustrated in the graph below. There will now be a new equilibrium (at point D). The shift in the production function also implies that the savings-function rotates up. The allocation effect is the distance between points B and C, for given inputs we now produce more output per worker.

The second effect is called a medium term growth bonus (the movement from point C to point E in the graph). At the initial equilibrium at point A with the new production function GDP/L' investments exceed depreciation. Therefore the capital-labor ratio will increase until we have reached the new equilibrium at point D. This is a movement along the production function from point C to point E. During this process, economic growth exceeds the long-run economic growth.

(d) Are there other possible effects of economic integration on economic growth?

Another possibility is that the savings rate will change as a result of economic integration. In the Solow model used above we have assumed a constant savings rate. If economic integration leads to an increase in the savings rate, the common market makes it easier, cheaper and safer to invest in EU and in the Eurozone. This effect can be illustrated in the Solow model as a shift in the savings rate s, the savings rate will increase. If the savings rate increases then the savings function will rotate upwards in the Solow model above leading to a new equilibrium with a

Figur 2: The Solow diagram: Effects of economic integration



higher capital-labor ratio. Note that the long-term growth rate is unaffected, it is still determined by the rate by which technology is increasing, but the short-term growth rate will increase above the long-term rate as the economy moves to its new long-run equilibrium. The medium-term growth effect is then the movement from the initial equilibrium at point A to point D (as before) and the growth effect is the movement from point B to a new point on the initial production function below point E.

(e) What 'footprints' would these growth effects leave in the data? Have we observed such effects in countries that have joined EU at a later stage?

It is very difficult to measure the allocation and the medium-term growth effects directly. Instead we need to look at countries joining EU at a later stage, Portugal and Spain joined the EU in 1986 for example. According to the Solow model, there should be a sudden and direct jump in the capital-labor ratio in these countries joining EU. We expect that the aggregate investment to GDP ratio should increase in these countries when they joined EU. This is the first footprint. The allocation effect is also likely to increase the return on capital, using capital and labor more efficiently should increase the returns on investments. This effect should manifest itself as increases in stock prices. This is the second footprint. The third footprint should be an increase in foreign direct investments. If the business climate improves, investments become easire, cheaper and safer, then we expect foreign direct investments as a ratio to GDP to increase.

Looking at the evidence (comparing new member states to France as is done in the textbook) we find that stock market index in particular but also foreign direct investments tend to increase when a country joined EU. This holds for Portugal and Spain and for the Baltic states. Greece does not follow the same pattern although foreign direct investments to GDP ratio exceeds that of France.