Sample exam questions: Computable General Equilibrium (lectures 1-5)

Conceptual problems:

Below is a sample list of questions that may be asked on the exam. Usually answering questions requires constructing a sound economic argument, i.e. not only answering what would likely happen, but why do you think so. You may supplement your answers with graphs. It is not necessary to provide mathematical derivations.

1. Consider a 2x2 static general equilibrium model (1 household, 2 goods A and B and 2 factors of production capital - K and labor - L) of a closed economy. The production functions of the two goods and the utility function of the household is of the Cobb-Douglas type. Share parameters of the utility function are both 0.5 while production of good A is more capital intensive than production of good B. The household endowments of K and L are fixed and the household does not derive any utility from leisure. Consider a moderate increase of the endowment of K. Describe the likely effects on:
   (a) the production of goods
   (b) the prices of goods and prices of factors of production
   (c) the utility level
2. Consider a 2x2 static general equilibrium model (2 households - 1 and 2, 2 goods A and B and 2 factors of production capital - K and labor - L) of a **simple open economy** (imports are perfect substitutes to domestic production). The production functions of the two goods and the utility function of the household is of the Cobb-Douglas type. Share parameters of the utility function of both households 0.5 while production of good A is more capital intensive than production of good B. The household 1 owns the total endowment of K and the household 2 owns the total endowment of L and it does not derive any utility from leisure. The exogeneous world prices of goods A and B are initially 1 and the country initially exports good A and imports good B. Consider a 10% increase in the world price of good A. Describe the effects:
   (a) the domestic production of goods A and B
   (b) the wages of factors of production
   (c) the utility level of household 1 and household 2 (think of the effects in (b) on real wages)
3. Consider a 2x2 static general equilibrium model **with a government** (1 consumer household, 2 goods A and B and 2 factors of production capital - K and labor - L) of a simple closed economy. The production functions of the two goods and the utility function of the household is of the Cobb-Douglas type. Share parameters of the utility function of both households 0.5 while production of good A is more capital intensive than production of good B. The household owns the endowments of K and L. Structure of government expenditure is 0.2 on good A and 0.8 on good B. The government income is entirely derived from taxes levied on income of houeholds. The budget is balanced (government spends all its earnings by adjusting consumption keeping the goods shares constant). Consider a 20% increase in the income tax rate. Desribe the likely effects on:
   (a) the domestic production of goods A and B and their prices (what will happen with demand for those goods)
   (b) the wages of factors of production
   (c) the overall government spending and the the utility level of the household.
4. Consider a 2x2 static general equilibrium model with a government (1 consumer household, 2 goods A and B and 2 factors of production capital - K and labor - L) of a simple closed economy and **savings driven investment.** The production functions of the two goods and the utility function of the household is of the Cobb-Douglas type. Share parameters of the utility function of both households 0.5 while production of good A is more capital intensive than production of good B. The household owns the endowments of K and L and the household saves a constant fraction of its income. Structure of government expenditure is 0.2 on good A and 0.8 on good B. Investment goods are produced using a Cobb-Douglas technology with shares of 0.8 on good A and 0.2 on good B. The government income is entirely derived from taxes levied on income of houeholds. Government consumption is fixed at the initial level and initially the budget is balanced (but the government can run a deficit or surplus if the revenues change). Consider a 20% increase in the income tax rate. Desribe the likely effects on:
   (a) government revenues and government budget
   (b) level of investment
   (c) production of goods A and B and their prices
   (d) utility of the household
5. Describe the differences between the Keynesian closure of the labor market and the classical closure, in particular explain the mechanism of the adjustment of wages and employment/unemployment under the two closures.
6. Explain the consumer optimization problem when leisure is one of the factors affecting consumer utility.

Computational problems:

1. For a Cobb-Douglas production function of the form:

$$q = f(K, L) = AK^{\alpha}L^{\beta}$$

solve (a) the cost minimisation problem given wage w and rental rate of capital r and (b) profit maximisation problems given wage w, the rental rate of capital r and the price of the produced good p. For what values of $\alpha$and β the profit maxmisation problem has a solution?

2. For a household with a utility function:

$$U(x, L) = x^{\beta}L^{1-\beta},$$

where x is a consumption goods and L is leisure solve the utility maximisation problem. Assume that the endowment of leisure is $\bar{L}$. In particular find:

   (a) the Walrasian demand for consumption good x given its price p and the wage rate w.

   (b) the supply of labor given p and the wage rate w.

3. Solve the utility maximisation problem and find the Walrasian demanda constant elasticity of substitution utlility function:

$$u(x_1, x_2) = (x_1^{\rho} + x_2^{\rho})^{1/\rho}.$$

given prices of the consumption goods p_1 and p_2 as well as consumer income I.

4. Find the consumer price index (price of aggregate consumption) when consumer utility function is:

$$U(x_1, x_2) = x_1^{\beta}x_2^{1-\beta}.$$