

Suggested answers for written Exam for the B.Sc. in Economics summer 2012

Macro B

Final Exam

June 23 2012
(3 hours closed-book exam)

Academic Aim: The aim of the course is to describe and explain the macroeconomic fluctuations in the short run, i.e. the business cycles around the long run growth trend, as well as various issues related to this, and to teach the methodology used in formulating and solving formal models explaining these phenomena. Students are to learn the most important stylized facts about business cycles and to acquire knowledge about theoretical dynamic models aimed at explaining these facts. In connection with this, the aim is to make students familiar with the distinction between deterministic and stochastic models. Furthermore, students are to gain an understanding of the distinction between the impulses initiating a business cycle and the propagation mechanisms that give business cycles a systematic character. Finally students are to learn how to use the models for analyzing the effects of macroeconomic stabilization policy under various assumptions regarding the exchange rate regime. To obtain a top mark in the course students should at the end of the course be able to demonstrate full capability of using the techniques of analysis taught in the course as well as a thorough understanding of the mechanisms in the business cycle models for open and closed economies, including the ability to use relevant variants and extensions of the models in order to explain the effects of various shocks and the effects of macroeconomic stabilization policies under alternative monetary and exchange rate regimes.

Problem A

1. Equation (A.1) states that the consumers utility depends on consumption and the amount of labor supplied. Consumption weights positively whereas supplying labor reduces the utility as the consumption of leisure is reduced. It could be noted that there is no limit on labor supply which gives us the interpretation of an aggregate labor supply where people may move in and out of the labor market.

It could be noted that θ is a measure of the elasticity of marginal utility of consumption with respect to consumption meaning that marginal utility increases by θ percent if C is increased by 1 percent. θ is also referred to as the coefficient of relative risk aversion Correspondingly μ , is a measure of the elasticity of marginal disutility with respect to work. meaning that marginal utility decrease by μ percent if L is increased by 1 percent.

The budget constraint says that consumption is restricted by the after tax labor income and non-labor income A higher rate of taxation, τ means that the disposal income for a given supply of labor is lower. Thus a higher tax rate means that the consumption gain by supplying more labor is reduced other things equal. Thus, a heavier taxation of labor income reduces the cost of not supplying labor.

2. The consumers problem may be solved using either Lagrange method or the substitution method.

Substituting the budget constraint into the utility function leaves us the maximization problem

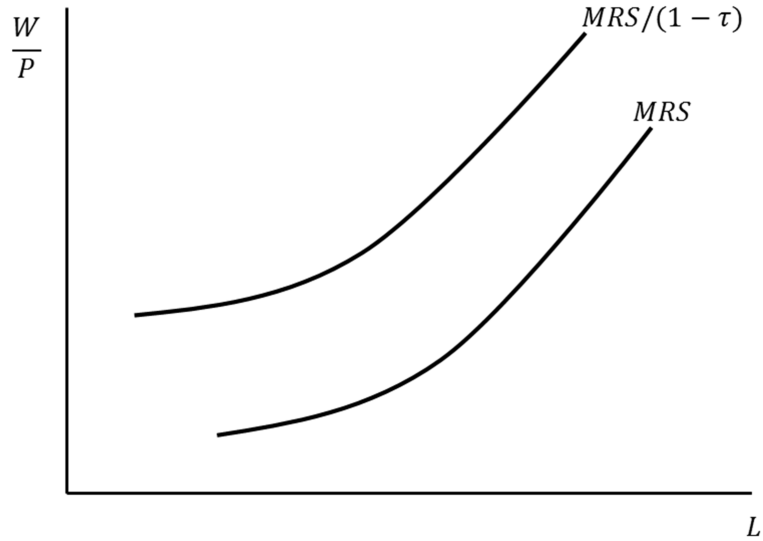
$$\max_C U = \frac{1}{1-\theta} \left[\frac{W}{P}(1-\tau)L + I \right]^{1+\theta} - \frac{1}{1+\mu} L^{1+\mu}$$

The first order condition is

$$\frac{\partial U}{\partial L} = \left[\frac{W}{P}(1-\tau) + I \right]^{-\theta} \frac{W}{P}(1-\tau) - L^\mu = C^{-\theta} \frac{W}{P}(1-\tau) - L^\mu = 0$$

(A.3) follows directly

3. (A.3) states that the marginal rate of substitution between consumption and labor, MRS is equal to the relative price between the two. Supplying an additional unit of labor results in an income after taxation of $W(1 - \tau)$ and the cost of acquiring an additional unit of consumption is P . MRS expresses how much consumption has to increase in order to make the consumer supply an additional unit of labor. It is seen that an increase in the tax rate leads to a reduction in the after tax real wage. Accordingly in optimum the labor supply is lower. (A.3) entail a connection between the labor supply and the real wage which may be solved for L . Thus (A.3) implicitly describes the labor supply. The labor supply curve is upward sloping because the marginal disutility from working is increasing in L . Thus a higher compensation (a higher real wage) is needed in order to stimulate labor supply. With a higher tax rate the net-compensation from work is reduced and accordingly the labor supply curve shifts to the left.



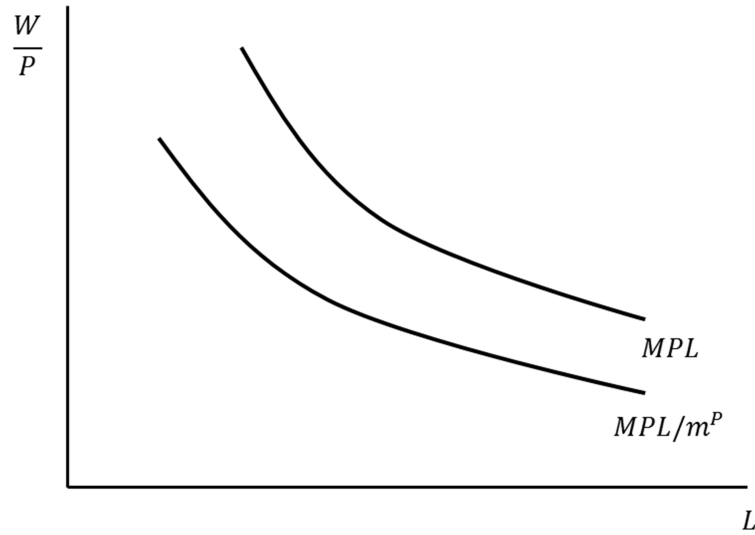
4. When product markets are imperfect producers have to take the demand curve on the goods market into consideration. They have to account for that selling an additional unit of goods leads to a lower price on all sales. The mark-up factor sums up this effect. If competition is perfect $m^p = 1$ and if competition is imperfect $m^p > 1$.

Profit maximizing companies set prices as a markup over marginal costs. As labor is the only input in production we have that total cost are $W \cdot L$. Thus $MC = \partial(W \cdot L)/\partial Y = W \cdot \partial(L)/\partial Y = W/MPL$. The marginal product of labor $MPL = dY/dL = (1 - \alpha)BL^{-\alpha} = (1 - \alpha)Y/L$.

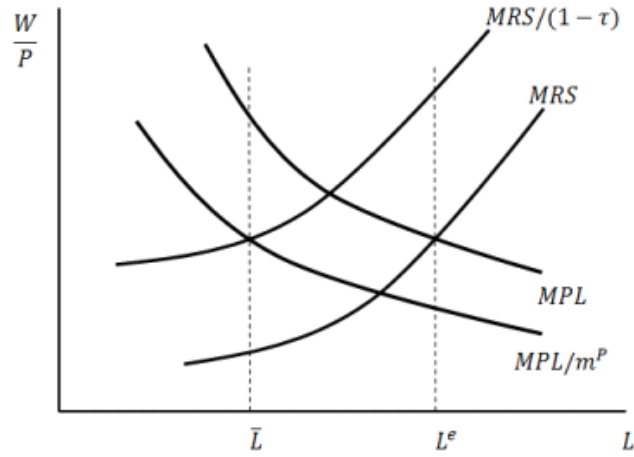
Combining these two expressions we have (A.5) and from that we see directly that (A.5) entails a connection between the labor demand and the real wage, W/P

The labor demand curve is downward sloping as MPL is declining in L .

If product markets are characterized by imperfections the mark-up factor $m^p > 1$. Thus, the labor demand curve shift to the left in case of market imperfections. At the going nominal wage it is optimal to produce and supply less than if product markets were perfectly competitive.



5. The reason why natural employment in case of distortions \bar{L} is lower than the efficient equilibrium employment L^e where there are no distortions is that *ceteris paribus* labor supply is reduced due to the taxation, cf. above. Also labor demand is reduced due to the distortions on product markets, cf. above.
6. Due to distortions we have that $MPL > MRS$ at an employment level of \bar{L} . Thus, at \bar{L} the additional amount of output/income exceeds the amount

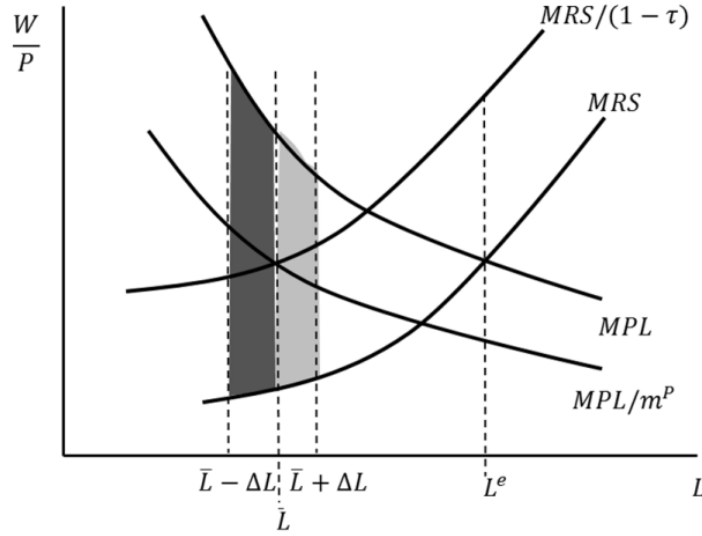


necessary to compensate workers for supplying the additional labor. From a social viewpoint it is desirable to expand employment until $MRS = MPL$ and $L = L^e$. The income generated through higher employment is larger than the income needed to compensate workers for the loss of leisure when increasing the work effort. With an employment level below L^e some workers are forced off their labor supply curve (some workers are experiencing involuntary unemployment). They are willing to work at the going wage rate but can not find employment.

It follows from the discussion above that it is welfare improving to increase employment from \bar{L} to $\bar{L} + \Delta L$ and that a decline in employment from \bar{L} to $\bar{L} - \Delta L$ is welfare reducing. Note also that the wedge between MPL and MRS is declining in L as long as $L < L^e$. Therefore a decline in employment is associated with a larger drop in social welfare than an equally sized increase in employment.

In the figure the welfare gain from an increase employment from \bar{L} to $\bar{L} + \Delta L$ is shown as the light grey area. The welfare loss from a decrease in employment from \bar{L} to $\bar{L} - \Delta L$ is shown as the dark grey area. It is seen that the light gray "gain" area is smaller than the dark gray "loss" area so that the welfare gain from an increase in employment is smaller than the welfare loss from an equally sized decrease in employment. Accordingly from

a society point of view a stable employment \bar{L} is preferable to a situation where employment fluctuates symmetrically around \bar{L} . Also it is preferable that the fluctuations, ΔL , becomes as small as possible. Thus we have a foundation for securing a stable employment \bar{L} . In essence this result is due to our assumptions on declining marginal products in production and declining marginal utility from consumption and increasing marginal disutility from work.



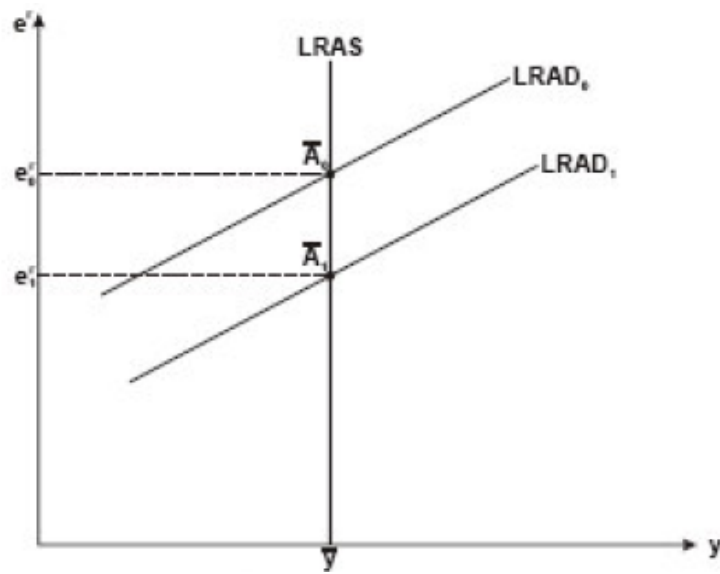
7. Assuming that policy makers pursue an employment level above the natural level; $L > \bar{L}$ corresponds to assuming that policy makers strive to achieve $y > \bar{y}$, see (A.4). An activity level above the natural will drive up inflation. The reason is that if expectations are static in each period economic agent will realize, that the actual inflation level is above the expected level. Thus inflation expectations are revised upwards leading to higher wage demands and subsequently to a higher price level as producers are setting prices as a mark-up on marginal cost.

Problem B

1. There are several reasons why Ricardian equivalence is not likely to hold in practice. Below is a list of items that can be mentioned and elaborated
 - Consumers may not be able to understand the governments intertemporal budget constraint.
 - Some consumers may be credit rationed.
 - The interest rate faced by the government and the consumers may not be identical.
 - In practice taxation leads to distortions. Taxes are distortionary not lump sum.
 - Consumers are not identical and taxes are redistributive in nature.
2. When information is perfect the central bank is able to respond directly to the specific shock. If the central bank is only focusing on inflation and output it is "throwing away" valuable information that could be used to stabilize the economy. For instance when information is perfect the central bank is able to distinguish between e.g. a positive supply shocks that is due to an increase in total factor productivity and a positive shock to the economy's supply side that is due to an increase in product market competition. This may be a reason why central banks do not rely solely on e.g. a strictly rule based monetary policy such as the Taylor rule but leave some room for discretionary initiatives/deviations in policy relative to the rule.

Demand shocks may be stabilized perfectly since they do not raise a dilemma between stabilizing output and stabilizing inflation. Supply shocks on the other hand raises a dilemma for the central bank. A negative supply shock for example reduces output while at the same time increase inflation. In that case a lowering of the monetary policy rate in order to stimulate demand will lead to higher inflation bringing inflation further away from target. In that case the optimal response depends on the weights in the social loss function attached to fluctuations in employment and inflation.

It could be noted that in practice it has proven difficult to distinguish between demand side and supply side shocks



3. A permanent increase in domestic government consumption causes a downward (rightward) shift in the LRAD curve. Accordingly, the real exchange rate appreciates so that competitiveness is eroded. As result the real trade balance (net exports) deteriorates. Domestic goods face tougher competition on both home and export markets. Since structural output is unaffected the increase in public consumption has to crowd out other parts of demand. In the long run the real interest rate is tied to the foreign real interest rate. Hence, private consumption and investments in the domestic economy is unaffected. Accordingly crowding out has to take place via net exports.