

Midterm Exam I: Answer Sheet

Instructions: Read the entire exam over carefully before beginning. The value of each question is given. Allocate your time efficiently given the price schedule that is imposed. There are no trick questions. Try to be concise and use graphs wherever possible.

1. (35 %) Suppose that the Board of Trustees of the University decided that graduation rates are too low. To remedy this they impose targets on the administration for graduation rates, and furthermore, they make compensation depend on achieving these targets. Specifically, the compensation for the President in year t , B_t , now equals

$$B_t = \begin{cases} 0 & \text{if } R_t < \bar{R}_t \\ \bar{B} + \alpha(R_t - \bar{R}_t) & \text{if } R_t \geq \bar{R}_t \end{cases}$$

where $\bar{B} > 0$, R_t is the actual graduation rate in year t , \bar{R}_t is the target rate for year t , and $\alpha > 0$ is a positive constant. Draw the President's bonus function in a diagram with B on the vertical axis and R on the horizontal axis.

brief answer The bonus function looks like figure 1

- (a) *How will implementation of this plan affect the quality of teaching at the University? Explain.*

brief answer Because the President's reward depends on graduation rates, teaching will suffer. Resources will go to people who pass students, not people who teach well. Pressure to dumb down courses. Notice that faculty would be given similar incentives to fulfill the targets, but this might cause good faculty to leave the university if they dislike dumbing down and passing students who do not deserve to pass.

- (b) *How will implementation of this plan affect the admissions process at the University? Explain.*

brief answer Admissions would be tightened to prevent enrollment of students who would be unlikely to graduate. But this may not be successful, since the decline in the quality of teaching (in part a) would reduce the pool of students who would like to study at the university. So while standards may rise, the quality of student admissions might still decline. Notice also that the President does not want students so good that they all graduate because that would be a hard act to follow in subsequent years. The President wants a class from which it is easy to hit the graduation target.

- (c) *Why would the trustees ever set $\alpha > 0$? Explain.*

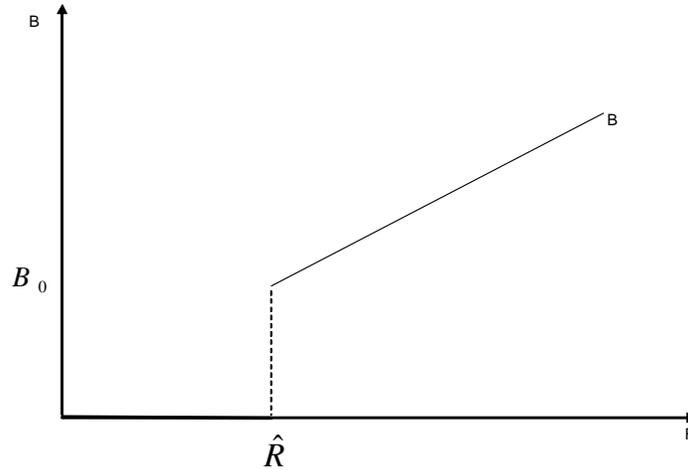


Figure 1: Bonus Function for the President

brief answer If the trustees set $\alpha = 0$ then the President would never allow $R_t > \hat{R}_t$. Otherwise the target would be set even higher in the future. The President would prefer to have a "safety factor." But if the target is easy to achieve the trustees would want a higher rate of graduation. So they set $\alpha > 0$ to provide some incentive to reveal if he is good at raising R .

- (d) *What will be the President's biggest concern when meeting with the Board of Trustees each year? Explain.*

brief answer The President's biggest concern would be convincing the trustees to not raise the target rate. The President wants an easy target that is easy to fulfill. So he will try to convince the trustees that achieving \hat{R} is really difficult.

- (e) *Suppose that some faculty develop a new teaching technology that may improve learning. Would the university be more likely or less likely to adopt this technology given the Board's graduation rate policy? Explain.*

brief answer Not likely. Implementing an innovation is costly and could jeopardize graduation rates in the short run. Faculty may not use it well immediately. Even if learning improves, and graduation rates rise, the trustees will just raise targets higher in the future. So the downside risk falls on the President, but the upside gains will be taxed away by the trustees.

2. (30%) *"The Soviet Growth Model was effective at extensive growth but ineffective at intensive growth." What is the difference between extensive and intensive growth? (of course the answer to this question already appeared on the web but apparently many people do not bother to look at previous exams).*

brief answer Extensive growth is due to greater accumulation of inputs. Intensive growth refers to gains due to greater efficiency in the use of inputs. Technically, the latter involves increases in total factor productivity or technical change. It is the residual after

deducting the contribution of input growth. Suppose that the production function can be written as $Y_t = A_t F(K_t, L_t)$, where Y is output, K is capital, L is labor, and A_t measures the level of efficiency of production at time t . Then the growth rate of output can be written as:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \eta_K \frac{\dot{K}}{K} + \eta_L \frac{\dot{L}}{L} \quad (1)$$

where the η_K is capital's share of output and similarly for η_L . Extensive growth relies on growth of factor inputs, and intensive growth relies on growth in the efficiency of their use, i.e., on $\frac{\dot{A}}{A}$.

- (a) *Describe the basic features of the Soviet Growth Model and explain why they would be more effective in generating extensive growth rather than intensive growth.*

brief answer The SGM was designed to mobilize inputs. In particular, the planners could shift labor from the countryside to the cities via collectivization, and generate savings by controlling the composition of output, depressing consumption and increasing savings. Consumption could be limited to engage in more capital accumulation. Planners decided how much of output would go to consumption. On the other hand, taut plans discouraged innovation due to cost of not fulfilling plan. Ratchet effect taxed away gains to innovators. Lack of competition and sellers market also reduced incentives to innovate. Foreign Trade monopoly insulated enterprises from foreign competition also reducing incentive to innovate either to be able to export more or due to competition from imports.

- (b) *Economists often speak of an "extensive growth trap." Explain what is meant by this term. What would you expect to find in an economy that is stuck in such a trap? What specific features of the STE contributed to these economies getting stuck in the extensive growth trap?*

brief answer The extensive growth trap arises because over time it becomes more and more difficult to mobilize resources. Extensive growth requires high input growth. In the early stages of industrialization high input growth can be achieved by shifting labor from traditional sectors, e.g., the countryside, to the modern sector. High growth in the labor force can be achieved by moving people from agriculture to industry. But as this reserve is used up, labor force participation reaches an upper limit. After that, labor force growth is constrained by fertility. One can still accumulate capital at a high rate, but now the capital-labor ratio will rise, and if this causes the marginal product of capital to fall, then the growth of output will lag. Note that if you continue to accumulate capital but labor growth slows then K/L will rise. This will cause the marginal product of capital to fall and the marginal product of labor to rise. That will cause η_K in equation (1) to fall and η_L in equation (1) to rise. The question is whether the latter increase will offset the former decrease. If the elasticity of substitution is low, then this will indeed happen. The only way to grow faster is to accumulate more capital, but this causes the return to capital to fall further – hence, it is a trap. Another way to see it: note that $\frac{I}{K} = \frac{I}{Y} \frac{Y}{K}$, where I is investment, Y is output, and K is the capital stock. Extensive growth implies that capital grows faster than income, so $\frac{Y}{K}$ must be decreasing over time. Thus for constant growth rates of the capital stock the investment-output ratio must

rise continuously. In other words the share of investment in total output must keep increasing. This is the trap. So we would expect to find $\frac{I}{Y}$ increasing in an economy stuck in the trap. As for features, there are too many factors to mention in my brief answer. But the fact that investment decisions were not based on the rate of return is critical. In the extensive growth trap the rate of return to capital is falling faster than the capital-output ratio is rising. In a market economy this would cause people to invest in other activities. But there is no capital market in the STE. And the emphasis on growth forces planners to keep devoting more resources to capital accumulation to maintain output growth. One might also point to the effects of limited entry of new firms which are often the source of innovation.

(c) *Why would you expect the Soviet Growth Model to become less effective over time?*

brief answer Because the low-hanging fruit are picked first. For example, shifting labor from low-productivity agriculture to cities. Or raising female labor participation. Moreover, as the economy gets more industrialized it becomes more complex. Simply building more factories becomes more and more difficult. Once you have mobilized effectively it is hard to sacrifice any further. At that point you need to do things better to grow, and that means intensive growth.

3. (35%) *The collapse of Soviet-type economies was associated with a loss of central control. Yet many (most) of the reforms that were implemented to improve performance in Soviet-type economies involved decentralizing economic decision-making. What explains this seeming paradox (refrain from employing the stupidity explanation)?*

brief answer Decentralizing reforms were implemented because it was felt that directors had more information about production than central planners. So this would cause them to innovate and adapt production techniques. The economy became more complex over time as industrialization proceeded. Improved efficiency was needed and it was thought that if directors had more autonomy they would innovate. The weakening of central control was not really a consequence of the reforms as of the decrease in the willingness to use extreme actions to enforce regime values.

(a) *Why did central control weaken over time?*

brief answer Central control weakened over time because the economy became more complex and because the leaders became increasingly unwilling to engage in purges of top officials. The system stabilized over time, but this reduced fear. Greater complexity meant that it was harder to know what is happening in the economy. As the threat of purges decreased, the center had to pay more to obtain resources and to obtain allegiance. Also, as contact increased with the west it became harder to enforce sacrifice. And as people learned more about the west they realized that the STE was not as successful as they were told.

(b) *What effect did the weakening of central control have on performance? Try to be specific. How did this further destabilize the system?*

brief answer When central control weakens enterprise directors can increasingly act contra to the plan. If agents are able to divert resources from their planned uses then shortages arise. Furthermore, as central control weakened agents need greater positive incentives to fulfill plans. If the center has to pay more to get agents to fulfill plans, the revenues available to the center decline as a share of total revenue. This causes budget problems. This further destabilized the system because it led to more money financing, greater repressed inflation and hence more shortages. Such shortages cause longer queues and more time stolen from work. But this weakens the power of material incentives, so they must be increased even more.

- (c) *Why were the economic reforms that were designed to decentralize decision-making ineffective at improving performance? Try to be specific.*

brief answer The key point is that prices were not liberalized. Directors had more autonomy but they faced prices that did not reflect opportunity costs. Hence, actions that seemed beneficial given distorted prices could actually make allocations even worse. Decentralized decision-making works only when prices reflect opportunity costs. But with distorted prices enterprise directors did not have sufficient information to improve allocation. One can point to many examples of diversion and second-economy activity, but these cause welfare to fall only because the controlled prices are distorted. The problem is not that timber is diverted from boxcars to housing, per se, but that the timber price is below opportunity cost and the boxcar prices is controlled, so that the timber is diverted from high value uses to lower value uses.