Suggested Solutions

Exam 1: Version B
Spring 2016

Do not open this exam until instructed to do so.

- You have 75 minutes to complete this exam
- You may use a calculator; you may **not** use any other device (cell phone, etc.)
- You may consult one page of notes (both sides); you may not use books, notebooks, etc.
- Show your work

I understand that the honor code applies: I will not lie, cheat, or steal to gain an academic advantage, nor tolerate those who do.

Signature

Michael Waugh

Printed Name

For each question below, **write the letter of the most correct answer to the left of the question.**

1. (3 pts.) Institutions such as a country's legal system and the level of corruption in a country have been found to be:
   A. important topics for political discussion, but not economic explanations of growth.
   B. significant determinants of the rate of economic growth in a country.
   C. unrelated to the rate of economic growth in a country.
   D. important variables explaining the Golden Rule level of capital.

2. (3 pts.) If saving exceeds investment demand, and consumption is not a function of the interest rate
   A. the demand for loans exceeds the supply of loans.
   B. the interest rate will fall.
   C. the interest rate will rise.
   D. savings will fall.

3. (3 pts.) Two equivalent ways to view GDP are as the:
   A. total payments made to all workers in the economy or the total profits of all firms and business in the economy.
   B. total income of everyone in the economy or the total expenditure on the economy's output of goods and services.
   C. total profits of all firms and business in the economy of the total consumption of goods and services by households in the economy.
   D. total expenditures on all goods produced in the economy or the total income earned from producing services in the economy.

4. (3 pts.) The growth of labor productivity (Y/L) may be expressed as the rate of growth of total factor productivity (A)
   A. minus the capital share multiplied by the rate of growth of the capital-to-labor ratio.
   B. minus the rate of growth of capital productivity.
   C. plus the rate of growth of capital productivity.
   D. plus the capital share multiplied by the rate of growth of the capital-to-labor ratio.

5. (3 pts.) Assume that a bakery hires more workers and pays them wages and that the workers produce more bread. GDP increases in all of the following cases expect when the bread:
   A. is sold to other firms.
   B. is sold to households.
   C. is stored away for later sale.
   D. grows stale and is thrown away.

6. (3 pts.) Assume that the production function is Cobb-Douglas with parameter $\alpha = 0.30$. In the model developed in Chapter 3, if the labor force increases by 10 percent, then output:

   A. increases by about 7 percent.
   B. increases by about 10 percent
   C. increases by about 3 percent.
   D. does not increase since new workers are typically unemployed.

7. (3 pts.) If the adult population equals 250 million, of which 145 million are employed and 5 million are unemployed, the labor force participation rate is:

   A. 67 percent.
   B. 60 percent
   C. 58 percent
   D. 50 percent

8. (3 pts.) Given growth in technological progress (g) and the labor force (n), on a Balanced Growth Path:

   A. the real rental rate of capital is constant, the real wage grows at the rate of technological progress.
   B. the real rental rate of capital and the real wage grow at the rate of technological progress.
   C. the the real rental rate of capital and the real wage grow at the rate of technological progress and the growth of the labor force.
   D. the real rental rate of capital grows at the rate of technological progress, and the real wage grows at the rate of technological progress and the growth of the labor force.

9. (3 pts.) The CPI is determined by computing:

   A. The average of prices of all goods and services
   B. Nominal GDP relative to real GDP
   C. The price of a fixed basket of goods and services, relative to the price of the same basket in a base year.
   D. The price of a basket of goods and services that changes each year, relative to the same basket in a base year.

10. (3 pts.) In fourteenth-century Europe, the bubonic plague (or "Black Death") reduced the labor force substantially. The concepts of diminishing marginal products and profit maximizing behavior predict that

    A. the marginal product land should increase.
    B. the real wage should increase.
    C. the rental rate of land should increase.
    D. real GDP should increase.

11. (35 pts.) **Parental Leave.** Firm's often argue and lobby in Congress against laws that mandate the provision of parental leave to their employees. As a junior aide to Senator Kirsten Gillibrand(D,NY) you have been tasked to compile a portfolio describing the economic arguments for and against parental leave.

A summer intern complied some information that may be of use: the national savings rate is 20 percent; labor's share of income is 2/3.; and the depreciation rate of the capital stock is 5 percent. Capital has been growing at 2 percent per year. Unfortunately, the summer intern only partially completed table below.

		Contribution to growth of Y/L	
	Y/L	A	$\alpha K/L$
1990–2015	2.00	4/3	2/3

a. (7 pts.) As a first task, please complete the summer intern's work by filling in the table above.

Easy $\frac{\Delta Y}{L} = \frac{\Delta A}{A} + \alpha \frac{\Delta K/L}{K/L}$ => if $\Delta Y/Y$ is 2 & $\alpha \frac{\Delta K/L}{K/L}$ is $\frac{2}{3}$

b. (7 pts.) Is this country on balanced growth path? Carefully explain why or why not.

Yes. Definition of Balanced growth is where K and Y grow at the same rate. This implies that K/L and Y/L grow at the same rate. So all we need to do is check,

$$\frac{\Delta K/L}{K/L} = \left(\frac{1}{\alpha}\right) \times \left(\alpha \frac{\Delta k/L}{k/L}\right)$$

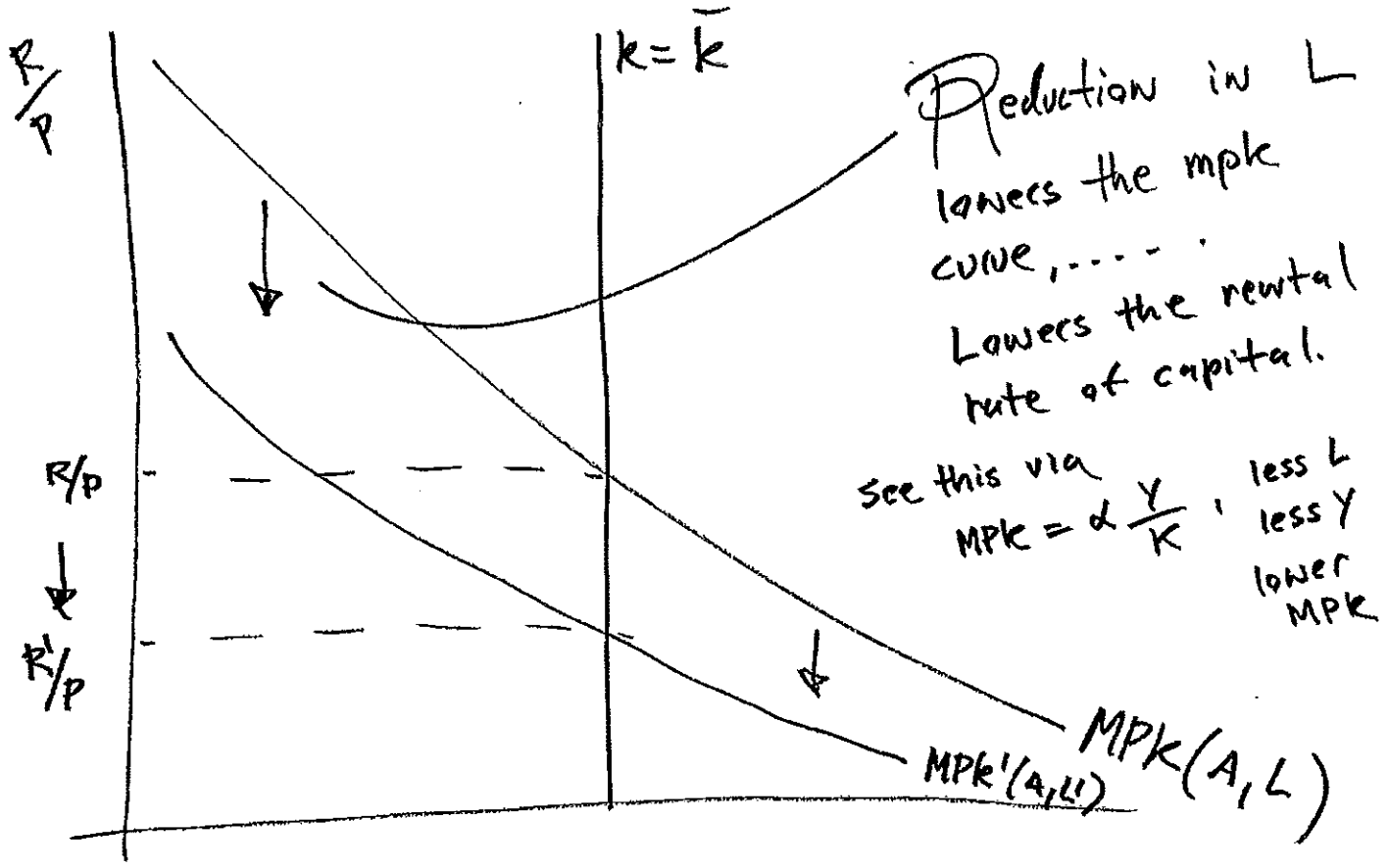
$= 3 \times \frac{2}{3} = 2$ So K/L is growing at 2 percent

Y/L is growing at 2 percent

=> Y and k grow at same rate!!!

Then A must be growing at 4/3

c. (7 pts.) In the short-run (i.e. with factors of production and technology fixed), if one thinks of mandated parental leave as resulting in a reduction in labor force (less people to work), how does the real rental rate on capital change, if at all? Carefully explain why or why not. If the owners of capital took this "short-view," would they still be against parental leave?



Owners of capital would not be happy with this scenario as less workers makes their capital less productive, thus the marginal Product of capital declines. Since capital is fixed, this ⇒ the price of capital or the R/P will decline.

d. (7 pts.) In the long-run (i.e. with factors of production and technology growing in a balanced fashion), if parental leave incentives adults to have more children, this will lead to faster growth in the labor force. How does this affect (if at all) the real rental rate on capital? If the owners of capital took this "long-view," would they still be against parental leave?

On the balanced growth path, we know ...

$\frac{Y}{K} = \frac{n+g+\delta}{s}$, and then $\frac{R}{P} = MPK = \alpha\frac{Y}{K}$

Now an increase in the growth rate of labor force, so "n" increases, implies the MPK ↑, and R/P ↑.

If owners of capital took this "Long-View" then they would actually benefit from parental leave.

e. (7 pts.) In helping Senator Gillibrand prepare congressional testimony on this subject, provide a **quantitative** comparison of today's real rental rate on capital with the long-run, real rental rate on capital associated with a one percentage point increase in the growth rate of the labor force. Assume that other factors such as technological progress, savings rates, etc. will not change.

Today

$\frac{R}{P} = \underbrace{\left(\frac{1}{3}\right)}_{\alpha} \times \left(\frac{n+g+5}{20}\right)$

What is n+g??? The problem tells us that K is growing at 2 percent. K grows at rate n+g on the BGP. Thus n+g = 2

Today

$$\frac{R}{P} = \left(\frac{1}{3}\right) \times \left(\frac{2+5}{20}\right) = \frac{7}{60}$$

$$= 0.11\overline{6}$$

Future.

So a one percentage point increase =>
$n + g = 3$, Thus the real rental rate is

$$\frac{R}{P} = \left(\frac{1}{3}\right)\left(\frac{3+5}{20}\right) = \frac{8}{60}$$

$$= 0.13\overline{3}$$

12. (35 pts.) **Make America Great Again.** Donald J. Trump's Presidential platform outlines a substantial tax decrease by reducing tax rates for a large majority of Americans. This tax reduction will be off-set by a substantial reduction in government spending. That is Trump's tax plan is deficit neutral.

    a. (7 pts.) Working with our model developed in Chapter 3, carefully explain the impact of Trump's tax plan on investment and the real interest rate—if at all. If not, please carefully explain why not.

Use loanable Funds equilibrium....

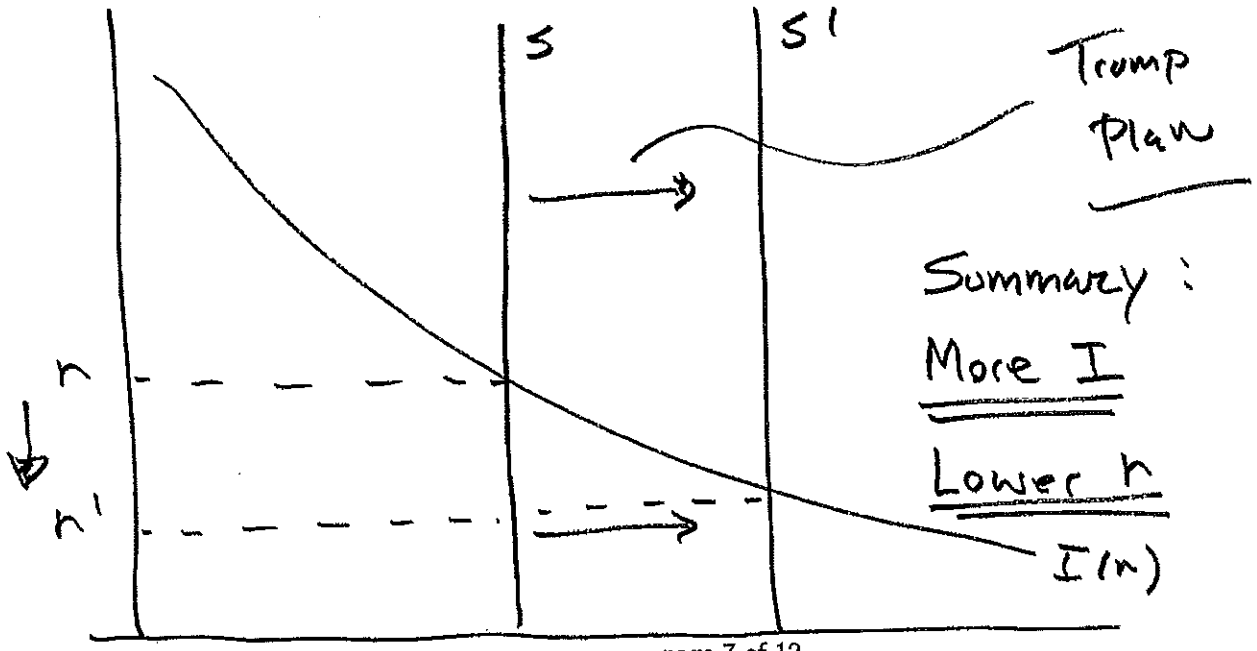
$$\underbrace{Y - T - \overbrace{\beta(Y-T)}^{C}}_{\text{Private Savings}} + \underbrace{(T-G)}_{\text{Public Savings}} = I(r)$$

Private Savings: Increases as Tax burden is alleviated

Public Savings: No Change

Why the reduction in T will be with a reduction in G.

National Savings ↑ = Investment ↑



Summary:

More I

Lower r

b. (7 pts.) Working with our model developed in Chapter 3, carefully explain the impact of Trump's tax plan on real GDP. If not, please carefully explain why not.

No change

$$Y = F(\bar{K}, \bar{L})$$

K is fixed in Short run / Ch. 3

L is fixed in short run / Ch. 3

If K and L are not changing then GDP or Y can not change...

c. (7 pts.) Given your answers in Part **a.** and Part **b.** carefully explain how Trump's tax plan is changing each expenditure component of GDP.

The expenditure side of GDP is this...

$Y = C + I + G$

Trump says this is ↓

Part (a) argued that I ↑

$C = \beta(Y - T)$.

"T" is decreasing, thus Consumption is ↑

So.....

$\langle$ ↑, I ↑, G ↓. Trump's plan causes a reallocation of economic activity away from government and into the private sector.

How to verify that GDP does not change using the expenditure side...

$$C + I + G$$

$$C + \underbrace{(Y - T - B(Y-T) + T - G)}_{\text{This is National savings which = Investment}} + G$$

$$\cancel{B(Y-T)} + \cancel{(Y-T)} - \cancel{B(Y-T)} + \cancel{T} - \cancel{G} + \cancel{G}$$

$$\| \quad \text{Lots of stuff Cancells...}$$

$$Y$$

Thus GDP does not change.

d. (7 pts.) Consider the following premise: People work more as their after-tax income rises.

Carefully describe how this premise interacts with Trump's plan, if at all. That is describe how will investment, the real interest rate, and real GDP change (if at all). Please provide a qualitative ranking with respect to your answer in Part **a.** and Part **b.**.

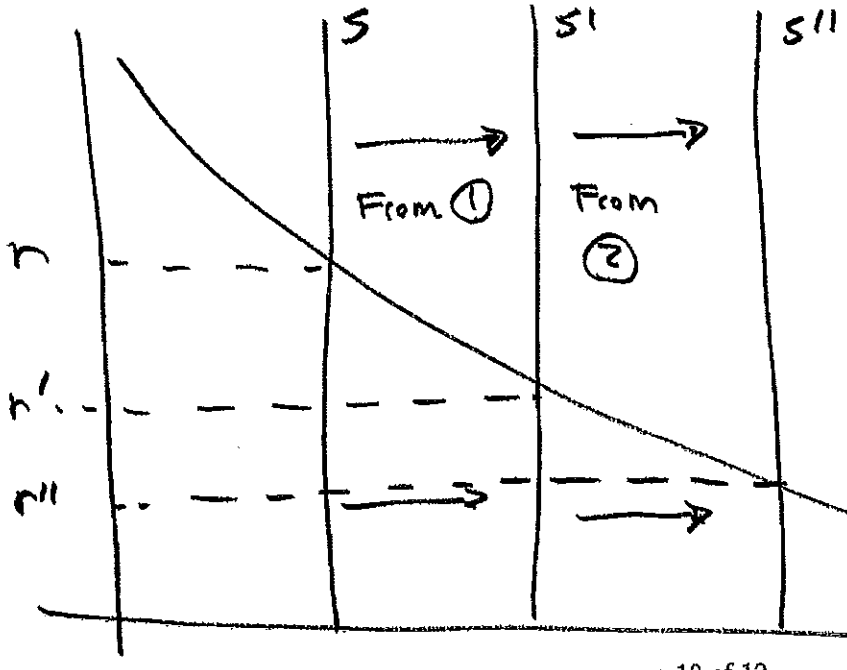
There are various ways to get at this, I will illustrate what is easiest....

$$\underbrace{Y - T - \beta(Y-T) + (T-G)}_{\text{National Savings will increase}} = \underbrace{I(r)}_{\text{It's easiest to assume the I does not change with L, but if you did this then it is fine/good.}}$$

For two reasons

(1) Lower taxes

(2) More people working → More GDP as $Y = F(K, L)$, $L\uparrow$, $Y\uparrow$



Summary - - - - - -

GDP: (A+B) No Change

(C) GDP ↑

GDP: (A+B) No Change

(C) Increases

Investment: (A+B) Increases

(C) Increases by more

Real Interest Rate: (A+B) Decreases

(C) Decreases by more

Note, this is where holding the investment curve fixed is critical. If it shifts it is plausible that n ↑.

e. (7 pts.) Speculate how Trump's plan might effect real GDP in the future (within the boundaries of our class material). Be as clear and specific as possible.

The easiest way is to think about how investment today relates to capital in the future

$$K_{t+1} = (1-\delta)K_t + I_t$$

More Capital in the Future

More Investment

$$GDP_{Real} = F(K, L)$$

So if we have higher K in future, this means more Y in the future.