Practice Solutions

Exam 1
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. Gross domestic product (GDP) is:
   A. The sum of value-added by production units minus capital gains
   B. The sales of final goods minus intermediate inputs
   C. Total income (including capital gains)
   D. None of the above

2. An increase in the price of imported goods will show up in
   A. the CPI but not the GDP deflator.
   B. GDP deflator but not the CPI.
   C. both the CPI and the GDP deflator.
   D. neither the CPI nor the GDP deflator.

3. If the number employed increases while the number unemployed does not change, the unemployment rate:
   A. will increase.
   B. will decrease.
   C. will not change.
   D. may either increase or decrease.

4. If the unemployment rate is 6 percent and the number of employed is 188 million, then the labor force equals
   A. 11.28 million
   B. 176.72 million
   C. 188 million
   D. 200 million

5. The production function feature called "constant returns to scale" means that if we:
   A. multiply capital by z_1 and labor by z_2, we multiply output by z_3.
   B. increase capital and labor by 5 percent each, we increase output by 10 percent.
   C. increase capital and labor by 10 percent each, we increase output by 10 percent.
   D. increase capital by 10 percent and increase labor by 5 percent, we increase output by 7.5 percent.

6. If the production function is $Y = 100 \times K^{0.25} \times L^{0.75}$, then the share of output going to labor is:
   A. 25 percent.
   B. 75 percent.
   C. Depends on the quantities of labor and capital.
   D. Depends on the growth rate of technological progress.

7. Assuming all else equal, if TFP is twice as high in Thailand than in Vietnam
   A. Vietnamese labor can only compete with Thai labor in low-skilled activities
   B. Average productivity of labor in Thailand must be more than double that in Vietnam
   C. The capital intensity in Thailand must be higher than in Vietnam
   D. Providing a Thai worker with same capital stock available to a Vietnamese worker would double her output

8. If disposable income is 4,000, consumption is 3,500, government spending is 1,000, and taxes (minus transfer payments) are 800, public savings equals
   A. -200
   B. 200
   C. 500
   D. 1800

9. If capital grows at 3 percent per year and labor grows and 1 percent per year, and capital's share of income is 1/3, if there is no technological progress then the growth rate of output is
   A. 3 percent
   B. 2.33 percent
   C. 1.33 percent
   D. 1.66 percent

10. If the United States is on a Balanced Growth Path, then we should expect to see
    A. output per worker, capital stock per worker, the real wage, and the real rental rate of capital grow at 2 percent per year.
    B. output per worker, the real wage, and the real rental rate of capital have grown at 2 percent per year, while the capital stock per worker has grown faster.
    C. output per worker, the real wage increase at 2 percent per year, whereas the capital stock per worker has grown faster and the rental rate of capital has stated about the same.
    D. output per worker, the real wage, capital stock per worker have all grown at about 2 percent, the real rental rate of capital has stayed about the same.

11. **Transylvania Opens Up.** A delegation from Transylvania is seeking your advice with regards to if the country should open up and allow international capital flows.

Some data about Transylvania: It is currently a closed economy, its national savings rate is 20 percent; capitals share of income is 25 percent; and the depreciation rate of the capital stock is 5 percent. Its labor force has been growing 1 percent per year over the past 10 years. And both output per worker AND capital per worker have been growing at 6 percent per year over the past 10 years. These trends are expected to continue for the indefinite future.

a. Is Transylvania on a balanced growth path? Carefully explain why or why not.

Yes it is!!! Why? Balanced growth means Y and K grow at the same rate. The data say Y/L and K/L have been growing at the same rate for the past 10 years. B.C. L is in both denominators, this $\Rightarrow$ that Y AND K have been growing at the same rate.

Thus its on a balanced growth path!!!

b. What is the real rental rate of capital in Transylvania?

So we know $\frac{Y}{K} = \left(\frac{n+g+\delta}{s}\right)$ on the B.G.P.

The data told to us is n, δ, s, but what is g?

Well on a balanced growth path, on 2/22 we argued that $\frac{\Delta Y/L}{Y/L}$ or the growth rate in output per worker equalls the rate of technological progess: g.

Next page...

So, since Y/L has been growing at 6 percent AND its on a balanced growth path, $g = 6\%$

11 b continued . . . .

$n = 1\%$

δ (depreciation rate) $= 5\%$

s (savings rate) $= 20\%$

$g = 6\%$ — which we <u>infer</u> from growth in Y/L and that its on a BGP.

$$\frac{Y}{K} = \frac{1 + 6 + 5}{20} = \frac{12}{20}$$

The rental rate is $\frac{R}{P} = MPK = \alpha \frac{Y}{K}$ so

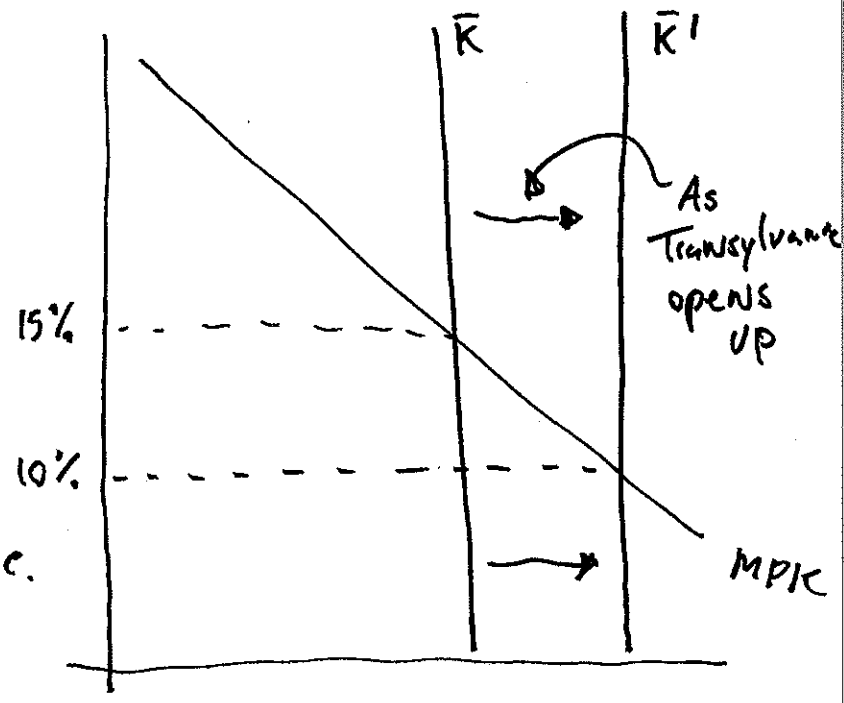
$$\frac{R}{P} = \left(\frac{1}{4}\right) \times \frac{12}{20} = 0.15$$

α

This is the real rental rate in T.

c. Assume that the rental rate on capital in the rest of the world (i.e. everywhere but Transylvania) is 10 percent. If Transylvania allows international capital flows (both into Transylvania and out of Transylvania), in what direction should we see capital flow? Describe how you would expect the returns to change given your answer.

We should expect to see capital to flow in ... Why? From perspective of firms, they can acquire capital cheaper abroad, than at home. Thus International Capital will flow in. Returns between ~~the two countries~~ will equilibrate at 10%



d. Does opening up to international capital markets have any ...
- Implications for the short term growth in real wages in Transylvania?
- Implications for long-term growth in real wages?

First, How to answer short run and long run...

* Stuff in Ch. 3 was <u>all</u> about short run in the sense that everything ($K, L, A, \ldots$) was held fixed. Thus, apply those tools to the short run.

* Long run is all about growth and specifically Balanced Growth, so apply those tools to the long run....

11d

Short run.... hold A, L, fixed...

$\frac{W}{P} = MPL = (1-\alpha)\frac{Y}{L}$ ↑ from capital inflow.

So as capital flows in, more k means higher GDP, thus real wages will increase.

Long Run

In the L.R. on a balanced growth path....

We know that

$\frac{\Delta Y/L}{Y/L} = g$

Growth in output per worker depends only on g

Then $\frac{W}{P} = MPL = (1-\alpha)\frac{Y}{L}$, thus

Growth in real wages depends only on g.

So ~~Even~~ This opening up and the capital inflow, will Not have an effect on L.R. growth in real wages.!!!

12. **Feel the Bern.** Senator Bernard "Bernie" Sanders (I, VT) as part of his Presidential platform is proposing a single payer health care system. Senator Sanders system is expected to cost 1.39 trillion, per year. He proposes that various tax increases will make this plan deficit neutral. That is all costs will be completely offset by tax increases leaving the deficit unchanged.

a. Working with our model developed in Chapter 3, carefully explain the impact of Senator Sander's health care system on investment and the real interest rate—if at all. If not, please carefully explain why not.

Chapter 3 argued National Savings (S) = Investment

or $Y - T - B(Y-T) + (G - T) = I(r)$

An increase in G and T will leave public savings (G-T) unchanged. However, Consumers still face the tax burden. This means disposable income decreases, and thus Private Savings decreases. Thus National Savings will decrease ... See Next Page....

b. Extending our work in Chapter 3, assume that the marginal propensity to consume decreases with an increase in the real interest rate. If at all, how would this change regarding the effects on investment and the real interest rate in Part a? Please provide a qualitative ranking as to how the changes (if at all) in investment compare with Part a.

First, Investment ~~and~~ will still decrease and the real interest rate will still increase. However, it will not be as large of an effect as Part a would suggest....

Why? See Next Page....

12a Continued

Recap...

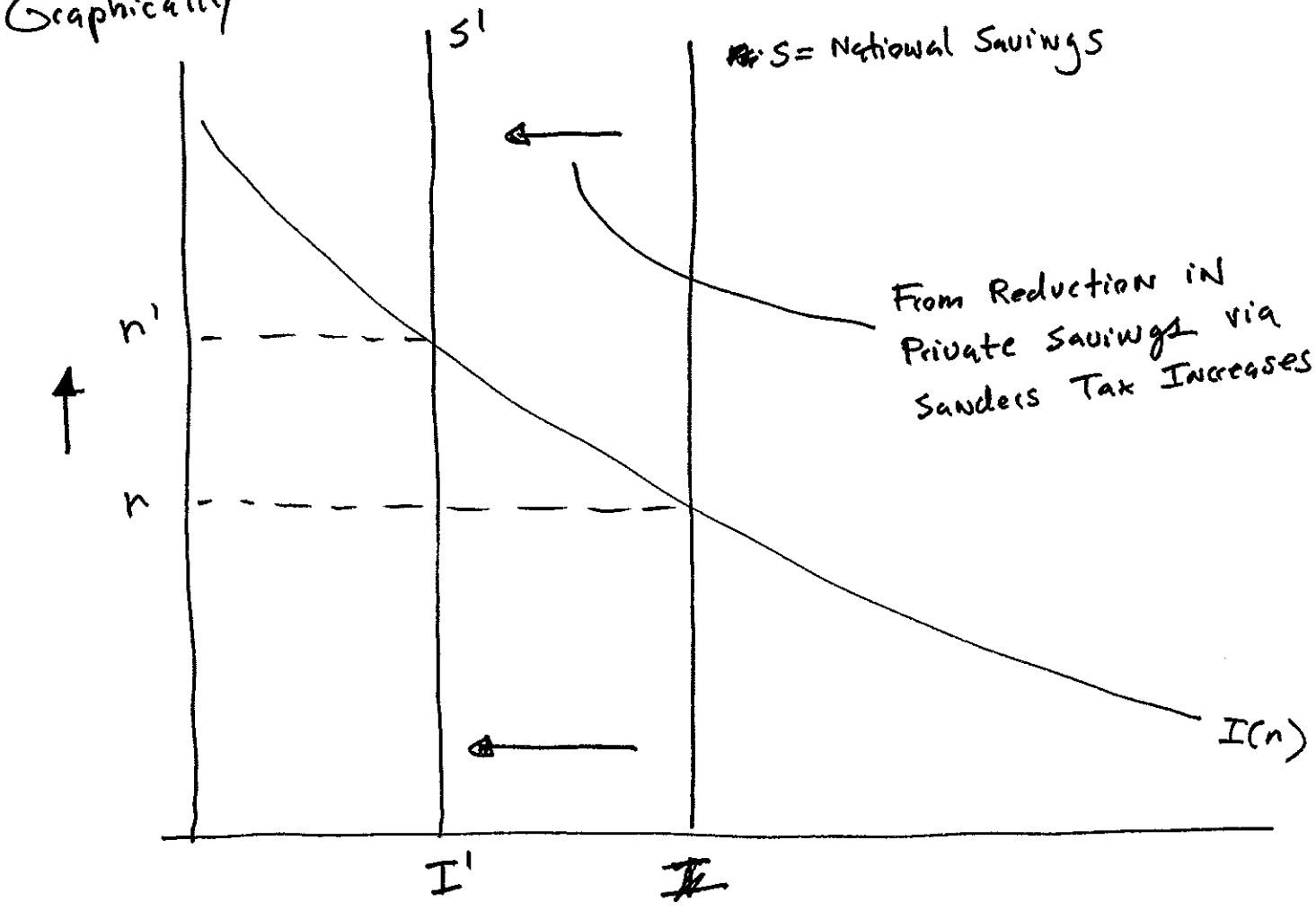
$$\underbrace{Y - T - \beta(Y - \tau)}_{\text{Private Savings}} + \underbrace{(T - G)}_{\text{Public Savings}} = I(r)$$

Private Savings ↓ as Taxes ↑

Public Savings Unchanged...

$\Rightarrow$ National Savings ↓

Graphically



So Investment ↓ as National Savings ↓

Real Interest Rate ↑ as the supply of funds shrinks.

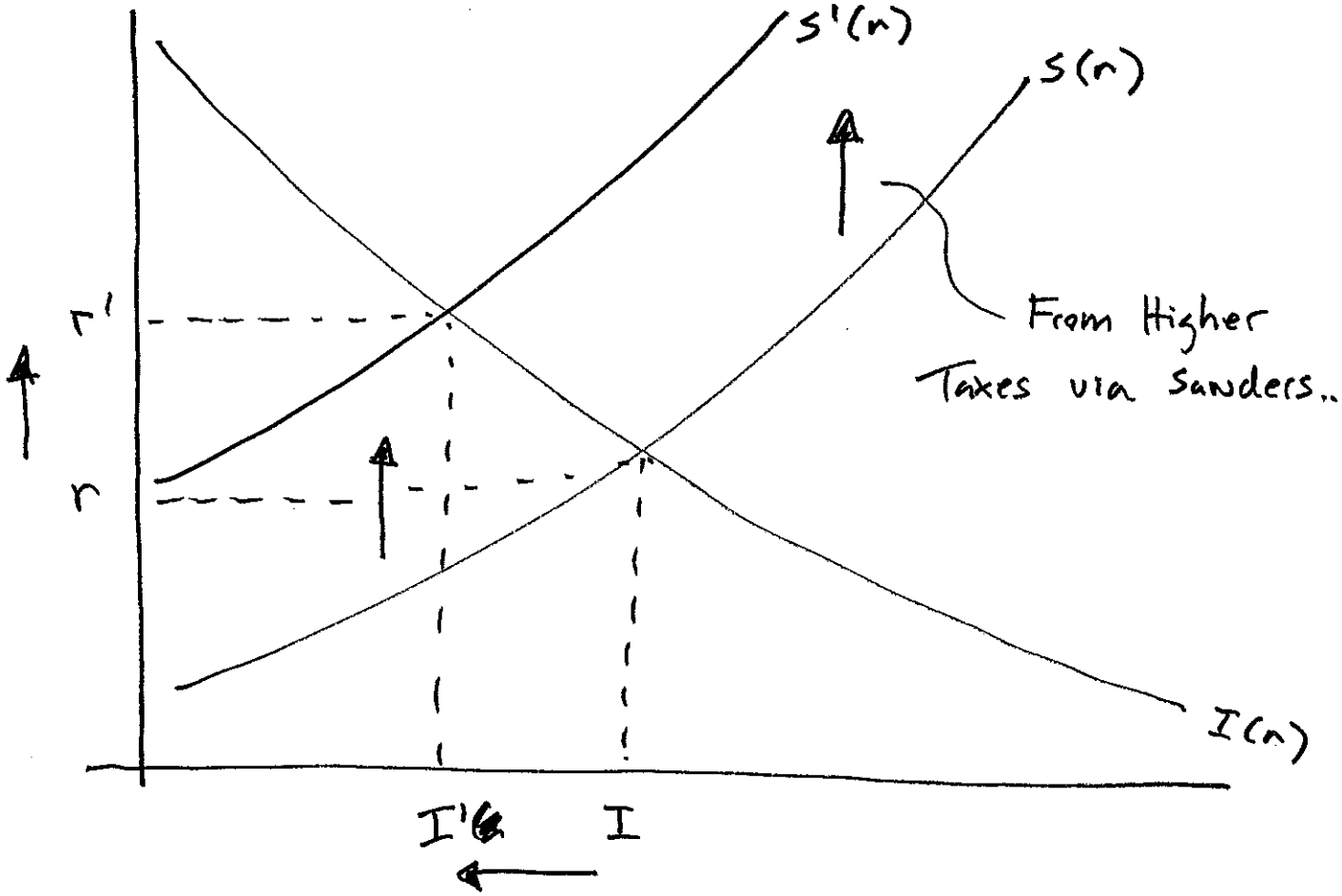
12b Continued

The phrase "marginal propensity to consume decreases with an increase in real interest rate" implies.....

$$\underbrace{Y - T - B(r)(Y-T)} + (T - G) = I(r)$$

This means as $r \uparrow$, $B(r) \downarrow$

and, thus, Private Savings increases with the real interest rate... then National Savings increases with the real interst rate. So now our Figure is...



12 b Continued

How do I know that the decrease in investment will not be as large as A

and

increase in real interest rate will not be as large as A

In Part A, the higher tax burden T results in a $(1-B)T$ decrease in national savings.

In Part B, the higher tax burden T results in $(1-\beta(r))T$, and because $\beta(r)$ increases with the real interest rate, the reductions in National savings must be smaller. Because $S = I$, the reduction in investment must be smaller. This also implies the increase in real interst rate is smaller.

Intuition: The higher interest rates induce consumers to supply more funds for investment. Thus investment does not shrink as much.

c. Suggest a fiscal solution that funds Senator Sander's health care system which does not lead to any adverse effects on real interest rates or investment.

The simple answer is not to increase taxes, but cut spending elsewhere.

Suppose $G = G_d + G_H$

G_d: defense; G_H: Health Care.

So . . . . . .

$$Y - T - \beta(Y-T) + (T - (G_d + G_H)) = I(r)$$

If Sanders keeps taxes unchanged, but cuts defense spending one-for-one with increases in health care, then G is unchanged, T is unchanged, National Savings is unchanged $\Rightarrow$ Investment and real interest rate is unchanged.