

## 2. The Solow model (35 points)

a) (20 points) A country is described by the Solow model, with a production function of  $y = k^{1/3}$ . Suppose that today,  $k$  is equal to 600. The fraction of output invested is 30% and the depreciation rate is 2%. How does the output per worker today compare with the steady-state one? Explain your conclusion.

Investment is  $i = \delta k^{1/3} = 0,3 \cdot (600)^{1/3} = 2,53$   
Depreciation is  $d = \delta k = 0,02 \cdot 600 = 12$   
The total change in capital is  
thus:  $\Delta k = i - d = 2,53 - 12 = -9,47 < 0$   
Since the stock of capital is

decreasing, this means that output per worker today is larger than the S-S one.

b) (15 points) Suppose that the national production function for the Canadian economy can be expressed as  $Y = AK^\alpha L^{1-\alpha}$ , where each variable is as described in class. Explain how one could estimate the value of parameter  $\alpha$  for Canada. Be as complete as possible while remaining clear and concise.

In a competitive market for capital, its return must be equal to its marginal product, i.e.,  $r = MPK \Rightarrow r = \alpha AK^{\alpha-1} L^{1-\alpha}$ . This implies

$$\frac{rK}{Y} = \frac{\alpha AK^{\alpha} L^{1-\alpha}}{AK^{\alpha} L^{1-\alpha}} = \alpha$$

Since  $rK$  = total revenue from capital in the economy,  $\alpha$  can be estimated by calculating the ratio of aggregate capital income over GDP. Such numbers are easily found in people's income & tax filings.