

Some of the following problems are adapted from Jones and Vollrath (2024, Ch.5–6). To practice for the exams, **please show your work.**

1. **TFUs.** Determine whether the following statements are **true**, **false**, or **uncertain**, and justify your answer in no more than one paragraph. Please be concise.
 - (a) If innovations aren't drastic in the Schumpeterian model (formally, if $(1+\gamma)^{1-\alpha} \leq \frac{1}{\alpha}$), the economy won't grow in the long run.
 - (b) All else equal, profits of active intermediate good producers grow faster in the Schumpeterian model than those of active intermediate good producers in the Romer model.
 - (c) Along a balanced growth path of the Schumpeterian model, the innovation step size (γ) affects both the *level* and the *growth rate* of GDP per capita.

2. **Romer vs. Schumpeterian.** An economy begins in steady state. The normal innovation process is unchanged (g_A depends on L and A as before), but a breakthrough changes the importance of intermediate goods in the production function. Suppose, for example, that the introduction of AI means that computers are able to manage more of the production process, so the size of α is now permanently higher.
 - (a) Suppose the economy was described by the **Romer** model. Given the structure of that model, discuss what happens to each of the following things and why:
 - i. The share of workers devoted to research, s_R .
 - ii. The growth rate of productivity in the long run, g_A .
 - iii. The markup that each intermediate good firm can charge.
 - iv. The level of GDP per capita in the long run.
 - (b) Now suppose instead that the economy was described by the **Schumpeterian** model. Given the structure of that model, discuss what happens to each of the following things and why:
 - i. The share of workers devoted to research, s_R .
 - ii. The growth rate of productivity in the long run, g_A .
 - iii. The markup that each intermediate good firm can charge.
 - iv. The level of GDP per capita in the long run.

3. **Markups.** In our baseline Schumpeterian model, we assumed that innovations were drastic and that the leading firm charge the monopoly price, $p_N = r/\alpha$, meaning their markup over marginal cost was $1/\alpha$. Without worrying about the microeconomics of how the markup is set, let the price that the leading firm can charge be $p_N = \mu r$, where μ is the markup over marginal cost.
 - (a) Using $p_N = \mu r$, solve for the profits of the leading firm.
 - (b) Using your result from (a), solve for the allocation of workers to research, s_R .
 - (c) How does the size of μ influence the size of s_R ? Explain in words the logic behind this relationship.

Jones, Charles I. and Dietrich Vollrath. 2024. *Introduction to economic growth*. New York: W.W. Norton & Company, fourth ed.