

14.49 / 11.128 / 11.248
Problem Set #1.
Out: 2/12/02. Due: 2/21/02.

Q1. This problem asks you to work through the basic model from class except that in this case, the aggregate production function is CES (constant elasticity of substitution) rather than Cobb-Douglas:

$$GDP_t = TFP_t [(A_K K_t)^\rho + (A_H H_t)^\rho + (A_L L_t)^\rho]^{1/\rho}$$

where TFP is “total factor productivity,” K is capital, H is high-skilled labor, L is low-skilled labor, and A_K , A_H , and A_L are constants. Finally, $\rho = (\sigma - 1)/\sigma$, where σ is the elasticity of substitution among factors. By definition, $\sigma \geq 0$, and so $\rho \leq 1$.

- a. Assume that the wage of labor of type j is w_j , and that labor markets are competitive. What is w_H/w_L ?
- b. How does an increase in the overall level of technology (TFP) affect ratio of the two wages (holding factor supplies fixed)?
- c. How does an increase in the overall level of technology (TFP) affect the absolute levels of skilled and unskilled wages (holding factor supplies fixed)?
- d. Perhaps due a change in immigration policy, there is an influx of low-skilled labor into the country, with no corresponding change in the demand for skills. How will the inflow affect the high-skilled wage relative to the wage of low-skilled labor? Explain how and why the elasticity of substitution affects your answer.
- e. Now suppose that, instead of a change in the quantities of skill types, there is a skill-biased technological change (SBTC). That is, A_H/A_L goes up. How is w_H/w_L affected? How does this depend on whether the factors are strongly substitutable ($\sigma > 1$) or not? Provide some intuition for this result.
- f. Does this model exhibit capital/skill complementarity? In other words, does an increase in the capital stock affect the relative wage? Why or why not?

Q2. You're spending the evening with some of your friends in a fashionable cafe in Harvard Square. In between your second and third cups of espresso-latte-fungini, you all get into this tumultuous discussion of the rise in income inequality over the past few decades. While you try to explain the state of our knowledge, your friends interrupt and make a few claims of their own. Discuss briefly but completely. Make use of the simple framework from class where appropriate.

- a. Your friend in the Ed-school says “education differences are the key to understanding income inequality in the United States. There has been a tremendous slowdown in the rate of growth of educated workers.”

- b. A friend from Flint, Michigan, offers a different view: “the problem in the 1980's was the increase in foreign competition. The US trade policies allowed foreigners to take jobs away from Americans, and this caused the increase in inequality.”
- c. Your friend who's a computer programmer chimes in: “we live in a time of such rapid technological change. Some people have the skills to take advantage of it and others don't. Widening inequality should hardly come as a surprise.” At this point your economist friend interrupts. “No, wait a minute. If you take the time to look at the numbers, you'll see that the 1970's and 80's were a period of technological *stagnation*. Productivity growth slowed dramatically. Labor couldn't expect to see its wage continue to rise in the face of sluggish productivity.” Is either one right? Elaborate. (Hint: are they talking about the same kind of technological change?)
- d. On a break from occupying some Harvard building, a living-wage protester adds his two cents: “The issue is that the minimum wage was systematically destroyed by Ronald Reagan and Larry Summers. That’s why the income distribution has expanded so much. Technology has nothing to do with it.” Discuss. (It may help to consider the individual-income numbers Professor Levy gave in class and that a typical working year consists of about 2000 hours.)

Q3. Between 1980 and 2000, the fraction of working women in clerical positions declined sharply. There are two competing explanations for this decline. The “declining “discrimination” explanation holds that women are no longer becoming secretaries because they can now become lawyers, doctors, engineers, etc. - occupations that were relatively closed to them 20 years ago. The “technical substitution” explanation holds that fewer women are becoming secretaries because secretarial jobs are being replaced by people using their own PC's.

- a. If only one of these explanations were true, would it be possible to use wage data to determine which explanation was right? Explain.
- b. In the technical-substitution view, is the new technology complementary with skill? In answering this question, first equate “skill” with “years of schooling” and then consider other types of skill.
- c. Consider another example: supermarket checkout scanners. Is the “new” technology complementary with skill in this case? (Here let “skill” = “education” for the purposes of your answer.)

Q4. Marketing specialists believe that as a society’s income rises over time, people’s demands change from basic goods – e.g. “our family’s first car” – to goods with lots of variety that allow them to differentiate themselves from other people – “the first combination SUV/Pick-up truck on my block”. Assuming this evolution is correct, how, if at all should it influence the nature of blue collar work? And what, if any, role might computers play in this process?