

## “Skill-Intensity of Occupations, Labor Market Polarization, and Occupational Allocation of College Graduates”

Dissertation by Barbara Pertold-Gebicka

### Report

I read Barbara Pertold-Gebicka’s dissertation with great interest. It is a concise work centered around the problem of measuring skill intensity of occupations. The dissertation focuses on various economic problems that rely on a valid measure of skill intensity of occupations: the optimal level of college graduates financed by public education funds, the problem of over-skilling, the relationship between skill biased technological progress and the earnings distribution, the phenomenon of polarization in jobs and earnings. The different papers give a good overview about the relevance of the economic problems and the state of the literature. In addition they contribute very interesting new applications for the Czech Republic, the United States, and a group of European countries.

In her dissertation Barbara demonstrated that she masters economic theory as well as state of the art econometric estimation methods in careful empirical applications. The first two chapters use a theoretical production function model for multiple occupations that employ workers of two skill types. The market equilibrium determined by the model motivates the measure of skill intensity of occupations and comparative statics in equilibrium guides the interpretation of the results. The empirical analyses in all three chapters are based on detailed micro-data well suited for the study. In all papers novel contributions to the literature are pointed out, although I think some improvement could be made on this part. See the discussion below.

Overall my impression is that Barbara Pertold-Gebick presents very careful work in her dissertation, which clearly draft warrants a dissertation defense and the eventual award of a doctoral degree. I have some overall comments on the presentation and framing of the papers as well as more detailed comments on the single chapters, which are listed below.

### General comments:

The dissertation papers should point out more specifically where they stand with respect to the models presented in Acemoglu and Autor (2010). Their chapter in the recent Handbook of Labor Economics, which discusses in detail the state of the literature and refers to unsolved research questions, is likely to be highly influential and will be used as a benchmark against which to compare the relevance of new research in this area.

Therefore it would be important that each paper clearly emphasizes its relation to Acemoglu and Autor (2010) with respect to the research questions, with respect to the modeling strategy, and with respect to the novelty of the findings. Which aspects of the models are taken from Acemoglu and Autor (2010), which are different and what is the motivation for changing the setup?

Barbara does a good job in motivating and linking the empirical analysis of her papers to research questions of general interest in economics. I think that these connections are very well chosen and very useful. What I would like to see more is a discussion of the policy implications that can be derived from the empirical results, or the interpretation of the results in the light of the general questions. It is important to leave the readers with the impression that the paper provides a convincing answer to a relevant economic question, which is supported by the theoretical and empirical analysis.

### Detailed comments:

#### Chapter 1: College Degree Supply and Occupational Allocation of Graduates – the Case of the Czech Republic

This paper studies how skill biased technological change and increase in the supply of skilled labor affect the allocation of college graduates to different occupations across regions in the Czech Republic. The analysis uses a method of categorizing occupations as “college” and “non-college” based on the wage premium of college graduates employed in this occupation. The method was first introduced by Gottschalk and Hansen (2003), who propose an analytical framework for its motivation. According to this model technical progress in skill intensive occupation should increase induce college educated workers to move to these occupations, which reduces college workers’ employment in non-college occupations. This paper extends the model to allow also for exogenous increase in the relative supply of college educated workers. The overall effect of allocation of different skill types to different occupations should therefore be determined by the effects of both skill biased technological progress and increase in the supply of college educated workers.

This model is empirically tested in a cross-regional study of the Czech Republic. The main econometric model tests how changes in the shares of college educated workers at the local level affect the probability the college graduates find jobs in college occupations.

- The paper would benefit from more detailed information about the post secondary education system in the Czech Republic and its changes over time. Were new universities established during the observation period, and where were they located? How many new students were admitted in each region? What percentage of entering students graduate? Did this percentage change over time?
- A central assumption in the model is that there is no mobility of workers across regions. They can only move between occupations within the same region. This is a very strong assumption and the paper tries to present some evidence that mobility, even for higher educated individuals, is limited in the Czech Republic. But the discussion of the arguments is very confusing and not easy to follow. As I understand it, individuals have to move to study at a university, because not all regions have their own university, and after graduation a large fraction of them moves they must move back to achieve a distribution of college graduates across regions. How are these location choices determined?

- I cannot understand the evidence presented in Table 7 in the appendix. Across all regions the number of college graduates born between 1956 and 1965, who should already have finished their education, increases between 1991 and 2001 by about 10%. Where do the extra graduates aged between 30 and 40 come from if there is no mobility. Why are Prague and Brno left out of the table?
- The model is formulated for a single closed economy. Even if there is no migration of individuals across regions, there is certainly trade of goods and mobility of capital within the country. Should these elements not be captured by the model? Can we observe skill intensive occupations that move from one region to another along with technological progress?
- The model assumes a fixed distribution preference parameters for the labor supply functions. If number of college graduates increases exogenously this might lead to shift in the distribution of preference parameters, however. With the expansion of higher education, individuals with different preferences might enter the pool of college graduates. What would allowing for a shift in preferences imply for the model predictions?
- I would like to see more documentation of the definition of college and non-college occupations across regions and over time, as this is a central part of the paper. Which occupations switch from non-college to college and vice versa over time? How large is the overall college premium and how large is it in the college occupations?
- The paper presents to types of regression results. A cross sectional regression for 2001 and pooled regressions for the years 2000-2008. The puzzling result is that the coefficient for the share of college graduates switches between both regressions. This result should be investigated more closely. What exactly is the difference between the regressions in columns 1-3 in table 1 and table 2? Is 2001 an exceptional year? Or are different measures of college occupations used in both tables? Why are cross sectional results not presented for all single years? Is the negative coefficient consistent across periods? I do not think that the results can be interpreted in a meaningful way before this issue is resolved.
- The paper is motivated as taking account of two effects on the distribution of college graduates across occupations: the effect of skill biased technological change and the effect of an increase in college graduates. In the end, however, only one parameter measuring the combined effect is estimated. This is somewhat disappointing. A direction to strengthen this paper would be to try to disentangle both effects better in the analysis. Possibly by exploiting more sources of exogenous variation, such as region-specific funding for college education or business subsidies.

## Chapter 2: Measuring Skill Intensity of Occupations with Imperfect Substitutability Across Skill Types

This paper measures occupation specific productivities of college and high school graduates in a model that allows for imperfect substitution of skill types within occupations. The model used in this paper extends the Gottschalk and Hansen (2003)

framework by introducing CES production functions instead of Cobb-Douglas at the occupational level. The empirical application estimates occupation specific elasticities of substitution between college and high school graduates and uses this measure to document the polarization of earnings growth in the US.

- The model introduces CES production functions in each occupation, but it does not provide a connection to the production function for the aggregate economy. This is a major disadvantage when we want to interpret the occupation specific elasticities of substitution. The literature reports estimates for the aggregate elasticity of substitution of about 1.5 between college and high school graduates. But unless we can derive an aggregate elasticity from the occupation-specific estimates of in this paper, we cannot say much about comparability.
- Although the model used in this paper allows for very flexible substitution effects within occupation, it does not say anything about substitution across occupations. It seems more plausible that differently skilled workers are imperfect substitutes across occupations rather than within. A medical doctor will always need a nurse, but nurses with different degrees could still perform the same tasks.
- A related point is substitution between labor and capital. I guess my question is, how much might disregarding any other sources of substitution in the estimation model bias the occupation specific elasticities of substitution?
- The estimation results allow a ranking of the skill intensity of occupations. An alternative ranking could be based on the occupation-specific college wage premia defined in the first paper. How closely would the two rankings be related?
- The estimation results imply that two thirds of the occupations are characterized by an elasticity of substitution of 0 (college and high school graduates are complements) or infinity (college and high school graduates are perfect substitutes). For the remaining occupations the elasticities are between 0.5 and 10. How much of the results in the empirical analysis is driven by the three different groups occupations? What would change if we assumed infinite, or zero, or an elasticity of substitution between zero and one for all of them?
- The estimation sample in this paper consists of young college or high school graduates with less than 10 years of labor market experience. Is this selected sample representative of the overall population? What can be said about the external validity of the results?

### Chapter 3: Job Market Polarization and Employment Protection in Europe

This paper uses the estimated elasticities of substitution for different occupations to derive measures of skill intensity of occupations in 12 European countries. The resulting rankings of skill intensity and its change over time is used to contribute to the discussion of job polarization across Europe. It is shown that based on the skill intensity measure different patterns of job polarization can be identified for European regions.

- One concern with the used strategy is obviously the transferability of the estimated elasticities of substitution from the United States to the European setting. Given that there is a certain amount of heterogeneity in the degree of

substitutability of high school and college graduates across occupations in the US, there might also be a lot of heterogeneity within Europe.

- Another concern is that education systems differ within Europe and also between Europe and the US. The distinction between college and high school graduated in the American setting might not be comparable to European degrees.
- To study job polarization using skill types it might be more straight forward to distinguish between three rather than two skill types, to see whether medium skilled individuals are differently affected than high skilled or low skilled.
- This paper uses a different strategy and defines 5 categories of skill intensity based on the occupational ranking. In a way the definition of these categories is rather arbitrary. What would happen if 4, or 6, or 7 groups were chosen?