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## Comment      Stephanie Aaronson

In “Measuring Labor Composition: A Comparison of Alternate Methodologies,” Cindy Zoghi examines the sensitivity of measured labor composition growth to changes in the method of computation. This is an interesting exercise for several reasons. Most obviously, the measure of labor composition provides information on how the productive capacity of our workforce is changing over time and also provides a framework for forecasting the growth in labor composition. In addition, in a growth accounting framework such as that used by the Bureau of Labor Statistics (BLS), MFP growth is the residual, so a change in the measurement of labor composition affects the path of MFP growth.

At the outset Zoghi describes her criteria for choosing a methodology:

If [the methodology] does not affect our productivity estimates greatly, it is desirable to select a methodology based on its clarity, simplicity, and adherence to the theoretical precepts. If, on the other hand, productivity estimates are greatly different depending on which methodology is chosen, then it is important to be cautious and understand the price we pay with our choice of methodology and the implicit assumptions we are making.

I would probably reword this a bit. I would say that the methodology should match up with theoretical precepts to the extent possible. Having taken that into account, I then agree that clarity and simplicity are desirable features of a model. In addition, since Zoghi’s work appears to be aimed at providing guidance to the BLS on how they might change their calculation of labor composition, there are two other criteria that I believe should be taken into account. The first issue is timeliness. As it is, the BLS typically publishes the official multifactor productivity data for a given year with a lag of about one and one-fourth years (so for instance, the MFP data for 2006 were released at the end of March 2008). The wait can be longer if there has been a comprehensive revision to the National Income and Product Accounts (NIPAs)—an event that will become more frequent when the Bureau of Economic Analysis (BEA) institutes flexible annual revisions. In recognition of the long wait, a few years ago the BLS began to produce a preliminary

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series using a simplified procedure. These data are typically released within five months of the end of the year. Certainly, we would not want the methodology adopted by the BLS to slow down the release of the data much. The second issue is how a given methodology affects the comparability of the data over time. Users of macroeconomic data typically want as long a time series as possible. Obviously, the availability and quality of the data on both the output side and the labor market side have changed over time, and the BLS has adapted to this reality. Any changes to the methods should continue to take this into consideration. With these criteria for evaluating any proposed changes in mind, we can turn our attention to what Zoghi actually does.

I think the most useful contribution of the chapter is its examination of alternative ways to measure work experience and to describe the impact that these alternatives have on the growth in measured labor composition. Work experience makes an appearance in two different places in the BLS' calculation of labor composition growth. First, it is one of the characteristics used to identify the labor inputs into the production function that underlies their model of labor composition. More specifically, along with education and sex it defines the groups of workers  $j$ , in the Tornqvist index of labor input (Zoghi's equation [4]):

$$\Delta \ln L = \sum_j \frac{1}{2} [s_{h_j}(t) + s_{h_j}(t-1)] \Delta \ln h_j.$$

In addition, work experience is also used in the calculation of the weights used to aggregate up labor input (the  $s_{h_j}$  in the previous equation). Specifically, the weights are computed as

$$s_{h_j} = \frac{1}{2} \left( \frac{\hat{w}_{jt} * h_{jt}}{\sum_{j=1}^J \hat{w}_{jt} * h_{jt}} + \frac{\hat{w}_{jt+1} h_{jt+1}}{\sum_{j=1}^J \hat{w}_{jt+1} h_{jt+1}} \right),$$

where  $\hat{w}_{jt}$  is the predicted value from a Mincerian wage equation that includes education and experience as well as a number of control variables.<sup>1</sup>

The data for this computation come from the Current Population Survey (CPS). However, as is well-known, the CPS does not include a variable for actual work experience. To get around this problem the BLS creates a predicted work experience variable using a 1973 file that matched individuals in the CPS with their Social Security Administration (SSA) data and data from the Internal Revenue Service. Specifically, they calculate work experience (measured as actual quarters of work) using the SSA data and then run a regression of work experience on explanatory variables in the CPS. The BLS uses the resulting coefficients to do out-of-sample predictions of actual work experience for workers in the CPS in other years. In their report

1. In calculating the predicted wage, the control variables are held constant at their mean values, so they have no impact on the growth in labor composition.

on labor composition in which they describe this procedure (BLS 1993), the BLS shows that their predicted actual experience measure outperforms potential experience in wage regressions.

Although the use of a measure of actual work experience variable no doubt improves the BLS' labor composition index, the benefit has certainly declined over time as the relationship between actual experience and the explanatory variables has evolved. It is true that the model still captures the changes in work experience due to change in the explanatory variables. For instance, the fact that women have fewer children now than they did in 1973 and that children are negatively correlated with work experience will cause predicted work experience to be higher in recent years. However, this method cannot capture the fact that conditional on having had a child, women are more likely to work.<sup>2</sup>

Recognizing that the data are out of date, Zoghi proposes two alternatives. First, she calculates an alternative measure of work experience using the Survey of Income and Program Participation (SIPP).<sup>3</sup> This work is described more fully in an earlier paper she wrote on the topic (Zoghi 2006). In the original paper Zoghi provides a discussion of the pros and cons of this measure, which she does not repeat in this chapter, but it is useful for evaluation purposes.<sup>4</sup> She notes that the questions are retrospective and that short breaks from work may not be captured. I would add that short spells of employment may also be forgotten. Another problem Zoghi raises is that the questions only register experience if a person works at least six months straight. As a result the measure may understate the experience for part-year workers, such as students and other seasonal workers. Offsetting this somewhat is the fact that a spell of work lasting at least six months is counted as a full year of work. In this chapter Zoghi asserts that the SIPP/CPS measure *overstates* experience. Her argument seems to be based on the fact that a Canadian study with administrative data shows lower experience than that reported in the SIPP. However, I am not convinced by this argument. Canada has a lower labor force participation rate than the United States and conditional on employment Canadians work fewer hours per year, so it would make sense that work experience in Canada would be less than here (Heisz and LaRochelle-Côté 2003).

Even if the quality of the SIPP data were high, it could take considerable effort for the BLS to produce a consistent series—an issue that Zoghi does not raise. First, the SIPP only starts in 1984, so the BLS would need

2. Other limitations of the matched data can be found in BLS (1993) and Zoghi (2006).

3. In her chapter, Zoghi uses the SIPP panels from 1984, 1987, 1990, 1993, 1996, 1999, and 2001.

4. The SIPP asks individuals the year in which they first worked at least six months straight at a regular job or business and whether they have worked continuously since then. If they have not worked continuously, they are asked the number of years in which they worked at least six months straight.

to come up with a method for imputing work experience in history, perhaps using some combination of the SIPP and the 1973 SSA data. Second, the future of the SIPP is uncertain. The SIPP recently survived an attempt to kill it—at least the second in its history. Although there is likely to be an alternative source of data on experience available in the future, this would require further work on the part of the BLS. So we certainly have to take into account the potential burden using the SIPP imposes. Finally, the SIPP has historically been released with a fairly long delay. The Census has said that the newly reworked SIPP will be available with a shorter delay—nine months—which may or may not hold up the processing of the MFP data.

Given her own criticism of the SIPP data, and perhaps with some of my own in mind, Zoghi also computes labor composition using age instead of work experience. Age has long been noted to be a poor proxy for experience (cf. Mincer [1974], for starters). Nonetheless, it is not clear a priori that using age is worse than the current BLS method. Using age in conjunction with education, as is the case here, yields something akin to potential experience. In the current method, the explanatory variables in the experience regression for men consist of a polynomial in potential experience, education dummies, and interactions. Since the coefficients do not change over time, and education has not changed much in recent years, I suspect that movements in the experience variable are dominated by changes in the age distribution.

So how do these alternative proxies for work experience affect measured labor composition growth? Zoghi's results are as one would expect. Labor composition growth is the same whether one uses age or the SSA-based work experience variable—9.5 percent between 1984 and 2004. In contrast, using the SIPP implies about 2 1/4 pp (percentage points) higher growth in labor composition. This is consistent with actual experience rising more quickly than would be expected simply by the aging of the baby boomers—in particular, as women's experience rose, even conditional on other explanatory variables.

These results are based on the current BLS methodology, which uses predicted wages in calculating the weights. However, Zoghi also explores the implications of using actual wages. There are several reasons to use predicted wages. First, the results are easy to interpret. According to the theory underlying the model of labor composition, the weights represent the marginal productivity of labor. As modeled by the BLS, movements in predicted wages are due solely to changes in education and experience, arguably the two most important factors affecting the marginal productivity of labor. Second, using a predicted value gets around the problem that many education/experience/sex groups have small cell sizes (according to Zoghi, 1/4 of the cells contain fewer than five observations). Of course, the BLS specification may exclude some factors that affect productivity and the results depend on the proxy for work experience.

The use of actual rather than predicted wages makes sense from a theoretic-

cal standpoint. Under the assumptions of the production function framework that underlies the BLS' growth accounting framework, wages are equal to the marginal product of labor—no special transformation is required. However, this still leaves the question of whether it is feasible to use actual wages, given the small cell sizes. Although Zoghi uses the more stable median rather than mean wages, the small cell sizes could still be a problem. When using age, Zoghi groups people into five-year intervals instead of single years, which should ameliorate the problem somewhat, albeit at the cost of losing some information about changes in the age distribution. Unfortunately, she does not address this issue very clearly.

Zoghi compares the growth in labor composition using actual versus imputed wages for two different proxies of experience. Using the SIPP-based experience measure and actual wages suggests about 1/2 pp slower growth in labor composition than when imputed wages are used. This suggests that factors other than education and experience generally held down actual wages relative to predicted wages, when predicted wages are computed using the relatively fast-growing SIPP-based experience measure. Not surprisingly, using age and actual wages increases the growth in labor composition by nearly 1 pp, relative to using predicted wages computed with age, since age understates the increase in experience, and hence the predicted wage is likely to be understated.<sup>5</sup>

The last question raised in the chapter is how to define the groups into which workers are divided. The advantage of the current BLS methodology, which uses education, experience, and sex, is that it is parsimonious and fits easily into a human capital framework. Having a limited number of categories makes it easy to understand past changes in labor composition and fairly easy to project it forward. However, the current groups may leave out important characteristics that contribute to labor productivity. These factors then get lumped into MFP, making it even more of a black box than it otherwise would be.

Zoghi describes in detail a number of possible characteristics that could be used to differentiate labor, including union status, firm size, and geography, before deciding to add occupation and industry to the current set of characteristics. Although her analysis of the different potential groupings is reasonable, it is not completely clear how she decides upon the existing categories plus industry and occupation. Perhaps it is because other analyses of labor composition, most notably Jorgenson, Gollop, and Fraumeni (1987), have used these characteristics.

This raises the question of whether the productivity associated with the

5. The revisions to measured labor composition imply offsetting revisions to MFP growth. The labor composition indices calculated using the SIPP measure of experience and the labor composition index calculated using age and actual wages suggest lower MFP growth between 1984 and 2004. These three indices also imply a larger step up in MFP growth after 1995 (on the order of 5 basis points) than does the current measure.

occupation and industry composition of jobs really represents the inherent productivity of the workers or not. There are differing opinions on this matter. In early work on the topic Denison argued that occupation was closely related to education and need not be treated separately (see Denison 1985; BLS 1993). However, Jorgenson, Gollop, and Fraumeni (1987) do include occupation in the labor composition index. With respect to industry, Jorgenson, Gollop, and Fraumeni occupy a middle ground in which shifts across industries are not attributed to labor composition but rather are viewed separately as the effect of resource allocation. Zoghi apparently feels that adding another category is an appropriate treatment for industry shifts, and in this I concur, although whether these shifts should be considered resource allocation or something else is beyond the scope of our discussion. Nonetheless, by identifying changes in productivity due to industry shifts, we unpack a bit more the black box that is MFP growth.

However, even if we agree in principle on where in the growth accounting system shifts in occupation or industry belong, the question of whether it is really feasible to perform this analysis as part of the BLS' regular multifactor productivity release is left open. It can be difficult to make the industry and especially the occupation variables consistent over time, particularly at the level of detail available in the CPS. Another problem is whether there is sufficient data. When incorporating industry and occupation, not only does Zoghi use the five-year age categories, she also drops gender as one of the groups. Using age while omitting gender seems particularly problematic given the differences in work experience for men and women at a given age. Jorgenson, Gollop, and Fraumeni use data from the decennial censuses to deal with small cell size problems, although this may be more work than the BLS wants.

One worker/job characteristic that Zoghi does not explore is class. The BLS' measure treats self-employed and unpaid family workers as if they had the same marginal product as wage and salary workers. In contrast, other estimates of labor composition growth, notably Denison (1985) and Jorgenson, Gollop and Fraumeni (1987) have identified workers by class, and Jorgenson, Gollop, and Fraumeni have a very elaborate method for dealing with the earnings of self-employed workers. Although I think that the BLS choices in this regard are reasonable, it seems strange that Zoghi does not at least raise this as an issue.

Zoghi's premise is that when different methodologies yield similar outcomes, the BLS should adopt the simplest procedures possible. Thus, she favors using the median wage in the weight rather than the predicted wage. Moreover, given what she sees as the problems with existing measures of work experience she also favors using age, despite the fact that the SIPP experience measure yields a significantly different picture of labor composition growth. As I noted, my own guidelines are similar although not exactly the same as Zoghi's. Therefore, while I agree with her that using the median

wage appears to be a worthwhile trade-off, I cannot agree with using age as the proxy for experience. It is too far away from the desired concept. Zoghi dismisses the SIPP measure in part because she feels that it is not a good measure of experience, but I do not think that she has presented evidence that sufficiently discredits it. As described earlier, I recognize the problems that exist in developing a measure of experience over time. However, the BLS has overcome such problems in the construction of other variables. Given the centrality of work experience to the human capital model that underlies our thinking about labor composition growth, it seems worth the effort. I would prefer to see the BLS put effort into developing a reasonable measure of experience rather than trying to add the shifts in industry composition, which presents its own host of challenges, both theoretical and practical.

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