Changes in the Experience-Earnings Profile: Robustness

Online Appendix to "Why Does Trend Growth Affect Equilibrium Employment? A New

Explanation of an Old Puzzle," *American Economic Review* (forthcoming)

Michael W. L. Elsby and Matthew D. Shapiro*

August 5, 2011

Potential vs. Actual Experience.—A potential confound to the evidence presented in Figure 3 is that we observe only potential, not actual experience in the data. A particular cause for concern is that declines in employment rates among high school dropouts in Figure 1 have led to a widening of the gap between potential and actual experience among this group of workers. Consequently, it is possible that this form of reverse causality could account for some of the flattening of the observed relationship between mean log earnings and potential experience in Figure 3, as older workers with high potential experience increasingly accumulate fewer years of actual experience, and thereby earn less.

We perform a simple exercise that we believe provides an upper bound on the magnitude of this effect. Imagine, counterfactually, that employment is i.i.d. across workers at any given point in time. In steady state, this will imply that the actual experience of a worker is equal to the employment rate multiplied by potential experience. It follows that, in this environment, accounting for the difference between potential and actual experience amounts simply to a rescaling of the horizontal axis in Figure 3A, by a proportion equal to the employment rate. This exercise provides an upper bound for the magnitude of these effects because employment is not i.i.d. across workers, but is rather persistent. In particular, by focusing on full-time, full-year workers we are considering workers who are more than averagely attached to the labor market.

Appendix Figure 1 presents the results of this exercise. It illustrates the potential

---

*Elsby: School of Economics, University of Edinburgh, 31 Buccleuch Place, Edinburgh, EH8 9JT, United Kingdom, and National Bureau of Economic Research (e-mail: mike.elsby@ed.ac.uk). Shapiro: Department of Economics, University of Michigan, Ann Arbor, MI 48109, and National Bureau of Economic Research (e-mail: shapiro@umich.edu).

experience-earnings profiles from Figure 3 for 1970 and 2000, as well as the implied actual experience-earnings profiles that would obtain by rescaling the horizontal axis by the trend employment rates in 1970 and 2000 respectively.[1] Appendix Figure 1 shows that, although some of the flattening of the experience-earnings profile can be accounted for by a widening gap between potential and actual experience, the magnitude of these effects is likely to be small. Even after accounting for an upper bound on these effects, after five to ten years of experience earnings remain around 45 log points lower in 2000 compared to 1970.

In addition to this, we also use data from the core sample of the Panel Study of Income Dynamics to explore this possibility further. The sample restrictions imposed mirror those used in the Census samples described in the main text. We focus on full time full year white male household heads aged 16 to 64 with 9 to 11 years of completed schooling. Potential experience is constructed as age minus years of completed schooling minus six.[2] Actual experience is constructed as follows. In the first year a respondent is observed, the actual experience calendar is intialized using data on the number of years worked since age 18.[3] Actual experience is then updated in each consecutive survey by adding the fraction of weeks worked in the survey year to the cumulative value of actual experience in prior years.

Appendix Figure 2 presents the results of this exercise for PSID data pertaining to the years 1967 to 1996.[4] It plots measures of average actual experience against potential experience from the method described above. Years of data are pooled into three groups to obtain larger sample sizes. The results suggest that there has indeed been a divergence between potential and actual experience in the later years of the sample, consistent with the fact that employment rates have fallen among high school dropouts. However, the magnitudes of these effects are somewhat smaller than those assumed in Appendix Figure 1. There it was assumed that the ratio of actual to potential experience was equal to 0.9 in 1970, and 0.75 in 2000, the respective trend employment rates in those two periods. The results in Appendix Figure 2 suggest that the ratio dropped from 0.9 to 0.8, suggesting that

---

[1]The trend employment rates used are 10 percent and 25 percent for 1970 and 2000 respectively (see Figure 1). More complicated corrections that account for time variation in employment rates that workers of different levels of potential experience have faced in their working lives yield very similar pictures.

[2]Years of completed schooling are available only in intervals for the years 1969 to 1974 inclusive. For those years, years of schooling equal are set equal to the value reported in 1968, if it is observed and is consistent with the intervalled variable in subsequent surveys. Otherwise, we assign the midpoint value of the intervalled data.

[3]Data on the number of years worked since age 18 is unavailable prior to 1974. Consequently, respondents who worked only prior to 1974 were excluded. For respondents who worked before and after 1974, the number of years worked is backcasted using information in the pre-1974 surveys on whether the respondent worked.

[4]The switch to a biennial survey in 1997 complicates the construction of the actual experience variable, since it does not contain data on employment in the year prior to the survey year.

the exercise underlying Appendix Figure 1 is indeed an upper bound.

Selection.—Additional potential confounds relate to forms of selection that vary over time. We highlight two of these possibilities here. First, since the fraction of each cohort of workers that are high school dropouts has fallen over time, it is natural to conjecture that dropouts have become increasingly lower skilled over time. An implication would be that, at any given point in time, measured experience-earnings profiles among dropouts would overstate the return to experience, since older dropouts are of higher quality than their younger counterparts for a reason unrelated to their accumulation of experience. Thus, selection of this sort could lead to a spurious flattening of the experience profile if the dropout rate were to fall over time at a decreasing rate.

Recent research suggests that this is unlikely to be a concern over the sample period. In fact, the notion that high school dropouts have become increasingly lower skilled over time receives little support in careful analyses of graduation rates in the U.S. Heckman and Paul A. LaFontaine (2010) demonstrate that most of the decline in headline dropout rates among white males (e.g. from the National Center of Education Statistics) can be attributed to increases in the fraction of GED recipients in successive cohorts. In addition, Heckman and Rubinstein (2001) and Heckman and LaFontaine (2010) argue that, while such GED recipients exhibit similar cognitive ability to high school graduates, their labor market outcomes mirror those of high school dropouts. This suggests that compositional changes related to increased take up of the GED are unlikely to explain our results for dropouts.[5]

A second potential form of selection can arise if there are heterogeneous returns to experience across workers. In such an environment, one would expect individuals with high returns to labor market experience to be more likely to choose to work. Since the experience-earnings profiles in Figure 3 depict the average returns to experience among those that choose to work, it is likely that they overstate the average return to experience among the entire working and non-working population.

This source of selection also may vary over time. As employment rates fall among high school dropouts, the measured return to experience that we observe will report the average returns for an increasingly select group of workers. Consequently, we would anticipate this form of selection to lead us to observe a steepening of experience-earnings profiles, as the only workers who choose to work will be those with increasingly higher returns to experience.

---

[5]Although high school dropouts are our main focus, it is worth noting that the grouping of individuals with a GED qualification with high school graduates may lead to some spurious steepening of the measured experience-earnings profile for high school graduates. This would tend to work against our ability to account for increases in nonemployment among high school graduates.

Comparison with Previous Literature.—A number of studies in the literature on wage inequality has estimated the "experience premium," measured as the log wage gap between experienced workers (typically with 25 years of experience) and less experienced workers (5 years of experience) using CPS data (see, for example, Katz and Autor, 1999; Weinberg, 2005; Autor, Katz and Kearney, 2008). These studies all have documented evidence for a rise in the experience premium among high school graduates and college graduates over time. We confirm that these findings are consistent with our estimates from Census and ACS data. Appendix Figure 3 addresses this question by plotting the experience premium by education group across time using the Census/ACS underlying Figure 3, as well as for comparable CPS samples.

The picture painted in Appendix Figure 3 is a relatively reassuring one: Despite some differences in the measured levels of the experience premium in the two different sources of data, the trends in the experience premium by skill are consistent over time.[6] As reported in the above-cited studies, the experience premium among high school and college graduates has trended upward over time in both the CPS and Census/ACS samples we use. However, consistent with the impression in Figure 3A that the experience-earnings profile for dropouts has flattened over time, the experience premium among high school dropouts has trended downward since 1970 in both data sources. Thus, our empirical work confirms earlier findings in the literature that the return to experience for workers who have at least a high school education have enjoyed an increase in the return to experience. Our work has the new and important finding, however, that the workers with the lowest educational attainment have faced a decrease in the returns to experience.[7]

References

[1] **Autor, David H., Lawrence F. Katz, and Melissa S. Kearney.** 2008. "Trends in U.S. Wage Inequality: Revising the Revisionists." *Review of Economics and Statistics* 90:300–323.

---

[6]While the 25/5 experience premium is a commonly used measure, the high frequency movements observed in the CPS estimates should be treated with caution due to the low sample sizes available in the CPS. The standard errors around each datapoint in Figure 6 averaged 0.16 for dropouts, 0.09 for high school graduates, 0.12 for some college, and 0.14 for college graduates.

[7]An additional useful implication of this finding is that it is also consistent with evidence reported in Lemieux (2006, Figure 1) that, aggregated across all education groups, the experience-earnings profile has been quite stable since the early to mid 1970s. The simple reason is that increased returns to experience among higher skilled workers have been offset by the declines in returns to experience that we document for high school dropouts.

[2] **Heckman, James J., and Paul A. LaFontaine.** 2010. "The American High School Graduation Rate: Trends and Levels." *Review of Economics and Statistics* 92:244–262.

[3] **Heckman, James J., and Yona Rubinstein.** 2001. "The Importance of Noncognitive Skills: Lessons from the GED Testing Program." *American Economic Review* 91:145–149.

[4] **Katz, Lawrence F. and David H. Autor.** 1999. "Changes in the Wage Structure and Earnings Inequality." In *Handbook of Labor Economics*, Volume 3, edited by O. Ashenfelter and D. Card, 1463–1555. Elsevier.

[5] **Lemieux, Thomas.** 2006. "Postsecondary Education and Increasing Wage Inequality." *American Economic Review* 96:195–199.

[6] **Weinberg, Bruce A.** 2005. "Experience and Technology Adoption." http://www.econ.ohio-state.edu/weinberg/.

Appendix Figure 1. Potential vs. Actual Experience and Changes in Experience-Earnings Profiles among High School Dropouts


9-11 Years of Education
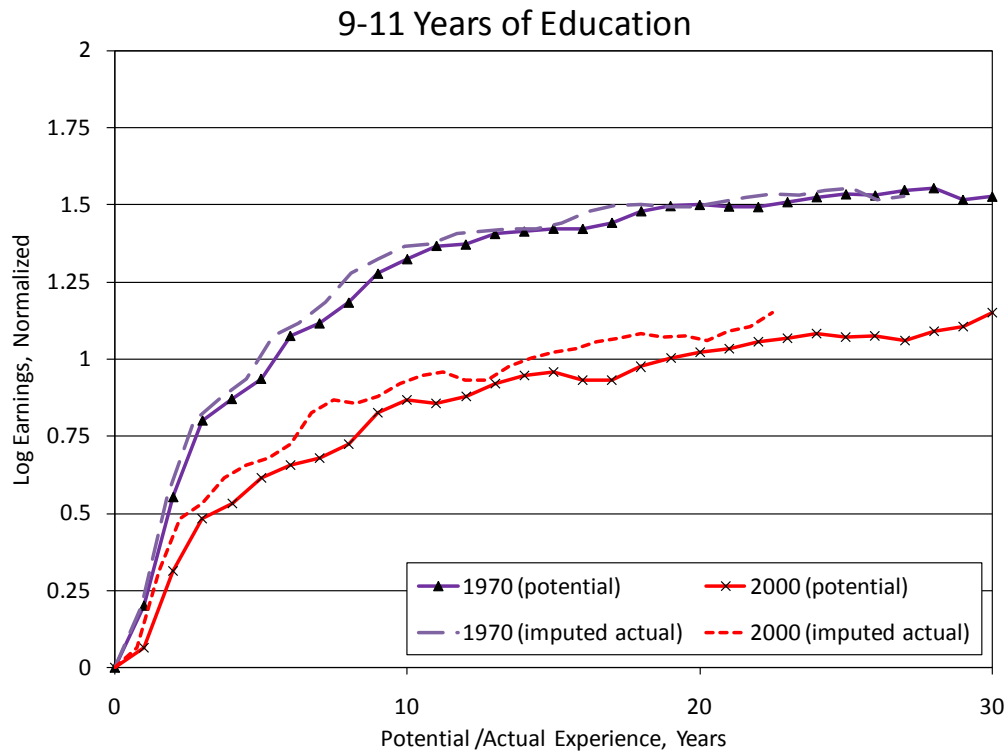
Notes: Non-dashed lines are cross-sectional potential experience-earnings profiles among full-time, full-year white males aged 16 to 64 from the 1970 and 2000 decennial Censuses replicated from Figure 3A. Dashed lines represent actual experience-earnings profiles that would be observed under steady state employment rates of 90 percent in 1970 and 75 percent in 2000, assuming that employment is i.i.d. across workers.

Appendix Figure 2. Actual vs. Potential Experience among High School Dropouts in the Panel Study of Income Dynamics
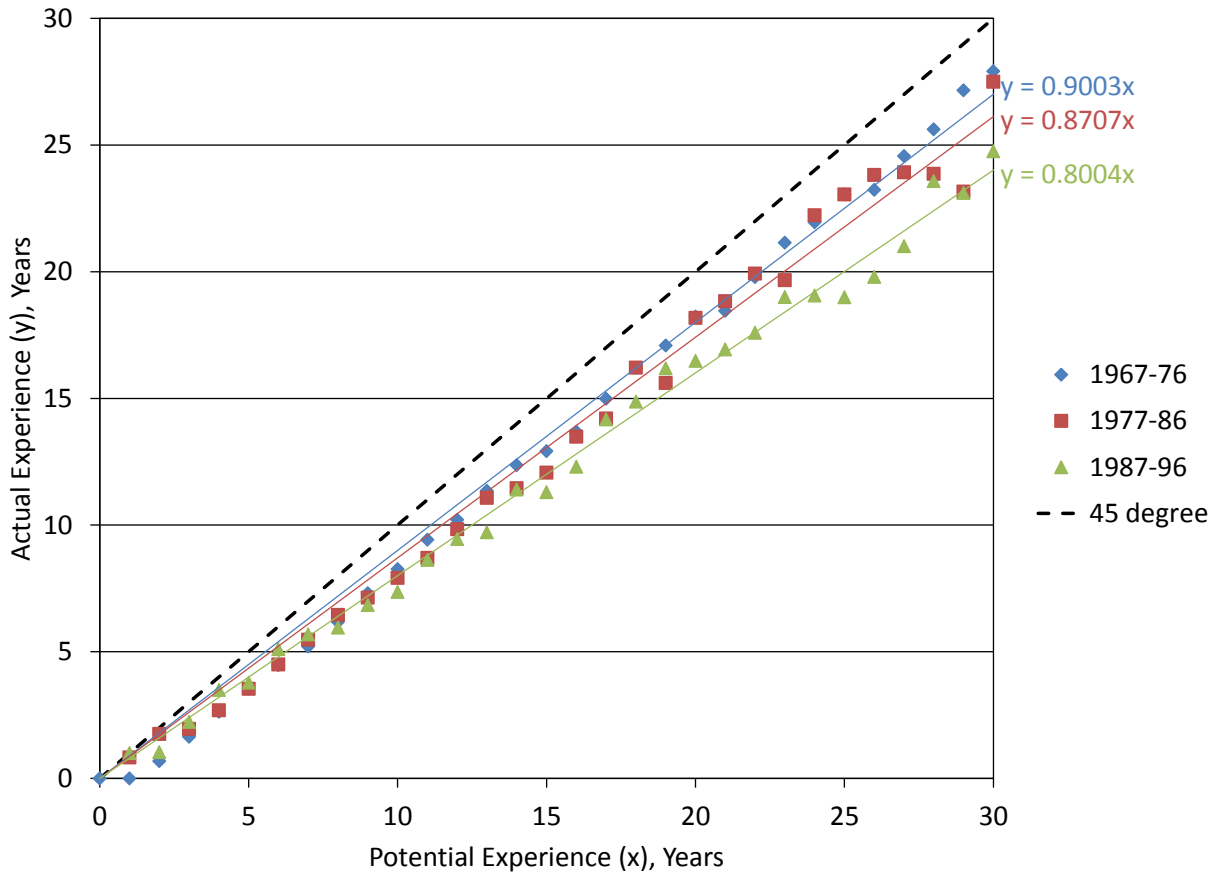
Notes: Measures of average actual experience against potential experience for pooled years from the Panel Study of Income Dynamics. Non-dashed straight lines represent least squares regressions with the intercept constrained to equal zero. For details on the construction of the measures of actual and potential experience, see Appendix B.

Appendix Figure 3. 25/5 Experience Premium by Education: Census vs. Current Population Survey

A. 9-11 Years of Education

B. 12 Years of Education

C. 13-15 Years of Education

D. 16+ Years of Education
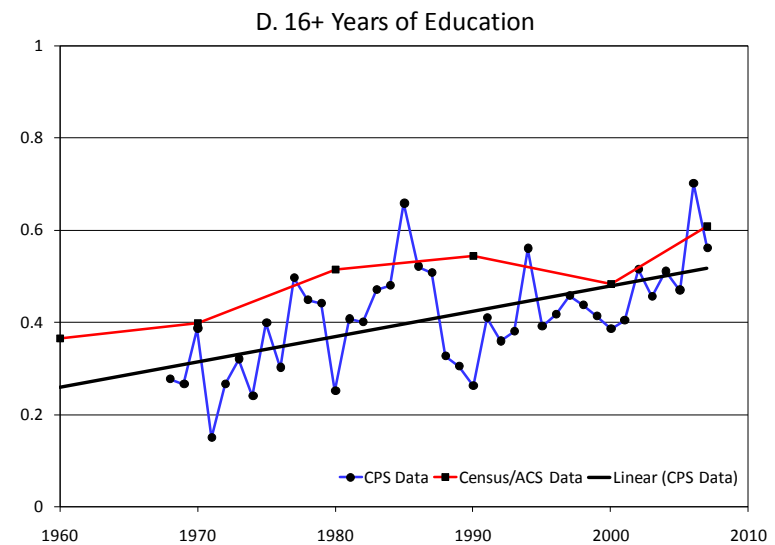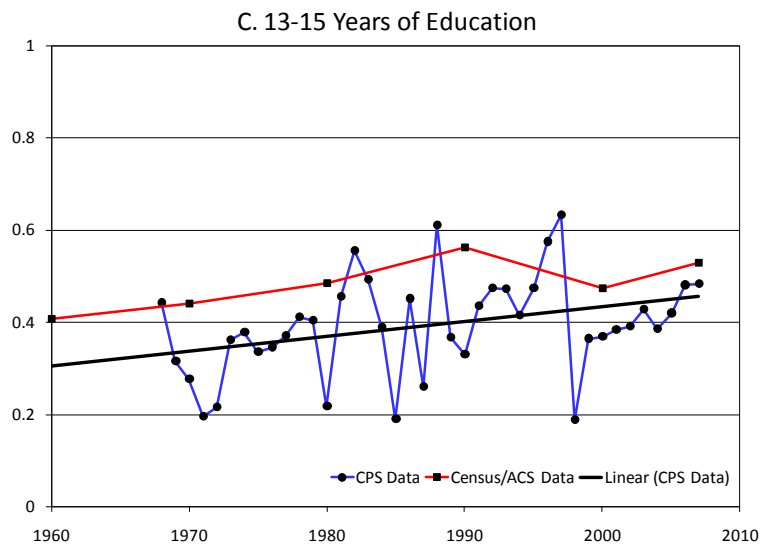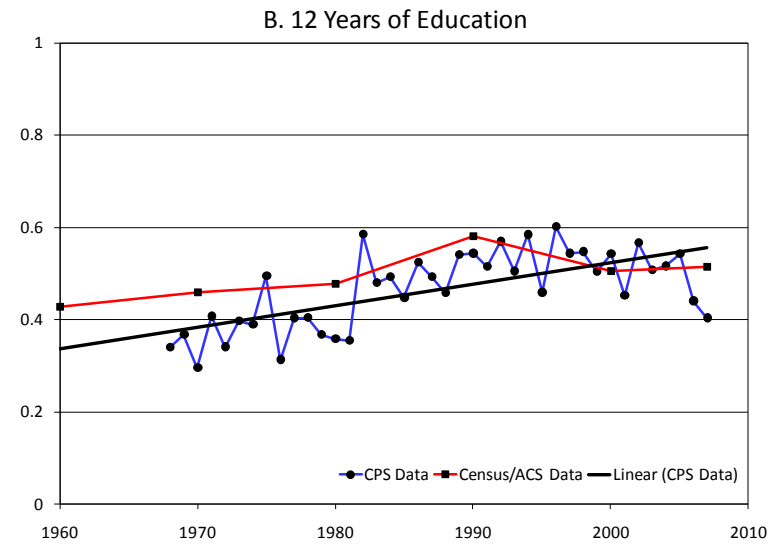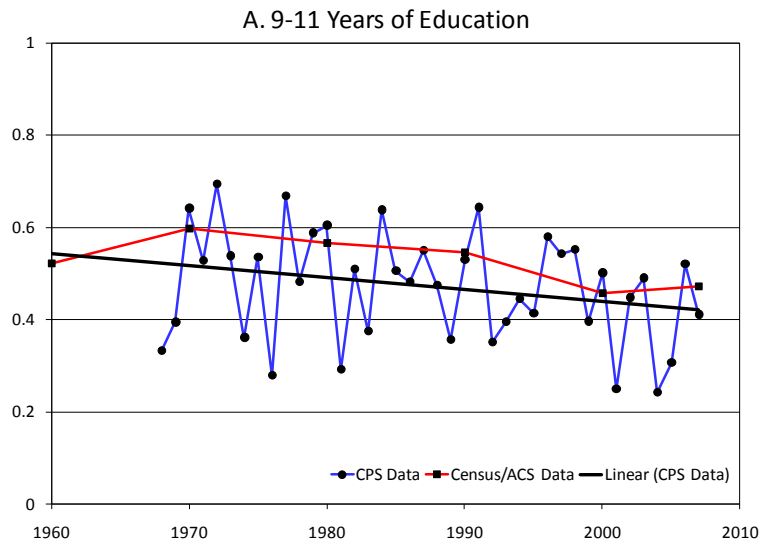
Notes: The 25/5 experience premium is defined as the difference in mean log earnings among workers with 25 vs. 5 years of experience among full-time, full-year white males aged 16 to 64. Data are taken from the decennial Censuses from 1960 to 2000, pooled 2001 to 2007 American Community Surveys, and March Current Population Survey microdata. The black bold lines plot linear time trends of CPS data.