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The college earnings premium and changes in college enrollment: Testing models of expectation formation☆

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ABSTRACT

This paper studies how students build expectations of the future price of college skills when making college enrollment decisions. I compare several possible proxies for students' expectations of the lifetime earnings gains from college. Students may base their expectations on the earnings of current workers or they may have some information about future earnings. Since 1970, a forecast of future earnings based on static expectations has been a poor predictor of the ex post college premium for successive cohorts. Nonetheless, high relative earnings for college-educated workers at the time a student graduates high school increases his probability of enrolling in college, while his cohort's future realized earnings do not. A 10 percentage point increase in the contemporaneous college premium is associated with a 1 percentage point rise in college enrollment rates, controlling for tuition and student characteristics.

1. Introduction

From 1980 to 2002, workers with a college degree moved from earning 45% more than workers with only a high school diploma to earning 94% more. This change in the price of college skills alters the cost-benefit tradeoff for students who are considering enrolling in college. However, when students make this choice they are uncertain about future skill prices. Do students graduating high school now expect these new high prices to persist throughout their working lives? Did high school graduates in 1980 anticipate the future rise in prices? The supply of college-educated workers adjusts mainly through the education choices of young people entering the labor force. If these young workers over- or underestimate future skill prices they may not make optimal investments in education. In addition to being individually costly, these mistakes slow the pace at which the supply of high-skill workers adjusts to changes in labor demand.

I consider how students build their expectations of future skill prices when deciding whether to enroll in college. I begin with a simple model where students choose whether to enroll in college based on the costs of attendance, including tuition, effort costs, and the opportunity cost not working, their expected delayed payoff of higher lifetime earnings with a college degree, and heterogeneous abilities that complement education. At the time they make this choice, students must build expectations of their future earnings with different levels of education. I compare three models of student belief formation, static expectations, adaptive expectations, and perfect foresight, and test which assumption best fits observed patterns of college enrollment.

These models of belief formation represent some of the most common assumptions in the existing literature on college enrollment choices. For example, Laitner (2000) and Fang (2006) model enrollment choices assuming students perfectly forecast future changes in the return to a degree. In contrast, Heckman et al. (1998) and Lee et al. (2015) model enrollment choices as a sequence of steady states, which is more aligned with a static expectations assumption where enrollment choices depend on contemporaneous returns to a college degree. Each model provides an appealingly clear mapping from observed data to expected earnings. They also reflect extreme assumptions about the information available to students: high school graduates forecast the future either perfectly or not at all. In an intermediate case where students have a noisy signal about future skill prices, which I will explore, we might expect both the current college premium and the perfect foresight projection to have some influence on college enrollment rates.

I use data from the Current Population Survey March Supplement from 1964 to 2015 to construct average lifetime earnings with and without a college degree for each cohort of men graduating high school over this period. I first consider the case of static expectations, where students believe that skill prices will remain at their current levels. For this case, I use earnings for working men of all ages at the time each

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cohort graduates high school to forecast what they will earn at each age in the future. I also test an adaptive expectations model, a refinement of static expectations where students respond to a weighted average of current and past college premiums. Finally, for the earlier cohorts in the sample, I use observed realized earnings in all years to construct expected earnings under the assumption that students fully anticipate future skill prices. I use data from the CPS October Schooling Supplement to estimate the probability that an individual student will enroll in college, conditional on these measures of the expected earnings gain from a college degree and on other covariates.

I find that the static expectations assumption fits observed patterns of college enrollment between 1970 and 1995 far better than the perfect foresight case. In fact, the perfect foresight measure has a weak negative correlation with college enrollment rates over time, suggesting that students have no information about the future path of the college premium. Moreover, past earnings gaps have no effect on enrollment when included along with contemporaneous earnings, suggesting that static expectations is a better description of student belief formation than an adaptive expectations model.

Changes in the static expectations measure of the college premium have a substantial effect on college enrollment choices. On average, a 10% increase in the relative lifetime earnings for college-educated workers, $9,300 in 1980, raises the probability that a high school graduate will attend college by about 1 percentage point. If students responded to future earnings patterns instead of contemporaneous ones, college enrollment rates would have been 6 percentage points higher in 1980, and 2.6 percentage points lower in 1970. The identification of this relationship comes primarily from changes in the expected college premium over time, although I also allow expectations to vary by race. The static expectations measure of the expected lifetime gains to college fell through most of the 1970s, rose rapidly in the 1980s and 1990s, and has remained flat or declined slightly since 2002. While many factors that influence college enrollment have shifted over this period, this unique trend in the expected college premium allows me to isolate its effect. The estimated relationship between the return to college and college enrollment is robust to controlling for the demographics of high school graduates, college tuition, and family income.

Several earlier papers have considered the relationship between college enrollment rates and average earnings for workers with and without a college degree. Freeman (1975, 1976) finds a positive relationship between the difference in log earnings and the share of young American men enrolling in college from 1951 to 1973. In contrast, Kane (1994) finds this earnings ratio is not an important predictor of enrollment choices and cannot explain differences in college enrollment rates between black and white men and women between 1973 and 1988.[1] Heckman et al. (1998) and Laitner (2000) model how an increase in the returns to schooling, through a less progressive income tax in Heckman, Lochner, and Taber and through skill-biased technological change in Laitner, could theoretically increase educational attainment. Buchinsky and Leslie (2010) present a theory on how that adjustment will depend on the way students build their expectations of future skill prices under uncertainty, while Heckman et al. (2006) point out how dramatically the ex ante static expectation of the returns to college and the ex post realized returns have diverged over the past 40 years. Finally, Wiswall and Zafar (2015b) present experimental evidence that students update their beliefs about their own education-contingent future earnings in reasonable ways in response to accurate information about current population average earnings. This result is consistent with my finding that students rely on the current labor market to form beliefs about their own future earnings.

The key contribution of this paper is to test which model of belief formation best fits the observed patterns of college enrollment over time. I also find that a careful, theory-driven specification of the expected college premium is important when measuring the response of college enrollment. My static expectations measure of the discounted lifetime earnings gains from college, which places more weight on the current earnings of younger workers, has a large, positive, and statistically significant effect on college enrollment, which contrasts with some of the earlier work that had considered a simpler ratio of average earnings for all workers. Finally, I build on earlier work by considering a longer time horizon that covers both increases and decreases in the relative earnings of college-educated workers, which allows me to better identify the role of the college premium.

The next section presents a simple model in which high school graduates decide whether to enroll in college based on the costs of college, their expectation of their future earnings with and without a college degree, and their own abilities, which affect their potential earnings and complement college skills. Section 3 summarizes my data and the trends in relative earnings and college enrollment. An important limitation of the Current Population Survey is that it does not include a measure of individual cognitive skills, which theory suggests will correlate with education.[2] Section 4 details several approaches for constructing expected future lifetime earnings at each level of education, and discusses the consequences of not measuring ability in the earnings estimates. Section 5 estimates the relationship between expected relative lifetime earnings and college attendance and Section 6 concludes.

2. The labor market and college choice

High school students choosing whether to enroll in college must compare the costs of attendance to their expected earnings gains. The expected monetary return to a college education will vary over time and across individuals, incorporating changes in the expected market price of college skills and differences in individual abilities that complement education. I assume that students know their own ability by the end of high school,[3] and that they forecast the market return to college over their working lives using the best information available to them.

I consider an economy with only two types of workers: those with a high school education and those with a college education. Earnings vary across workers, based on education, age, and other demographics, and over time. The model therefore has two time concepts: an individual's working life and calendar. Throughout, s denotes age, or a year of working life, and t denotes calendar time, which identifies cohorts of high school graduates and snapshots of the labor market.

2.1. Determinants of earnings

The first step in building students' expectations of future earnings is to specify the determinants of earnings for each type of worker in each year. I consider a generalized Mincer (1974) model of earnings determination with only two levels of schooling in which the effects of experience vary by education. Log annual earnings in year t for workers with a high school education depend on a polynomial in experience at age s, x_{is}, a single-dimensional measure of individual ability, θ_i, and other worker characteristics, z_i,

$$log(y^0_{ist}) = z_i\alpha_t + \gamma^0_t(x_{is}) + \theta_i + u_{is}, \quad (1)$$

[1] A related set of papers study the effect of idiosyncratic expectations of the return to college within a cohort rather than changes in the market price of college skills over time. Freeman (1976), Manski and Wise (1983), Dominitz and Manski (1996), and Attanasio and Kaufmann (2009) survey students about their subjective expected future earnings at different education levels and find that students who expect greater gains from college are more likely to enroll. Rosen and Willis (1979) and Cunha and Heckman (2007) find that, within a cohort of high school graduates, individuals' college enrollment choices depend on their idiosyncratic ex post returns to college.

[2] This limitation is shared with all long-running and representative cross-sectional surveys of U.S. earnings.

[3] The framework and conclusions are the same if people continue to learn about their ability during college and their working lives and forecast their expected earnings with their best guess of their ability at the time they graduate high school.