Online Appendix for Stepping Stone and Option Value in a Model of Postsecondary Education

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March 21, 2014

*The views expressed in this article are mine and do not necessarily represent the views of the Federal Reserve Bank of Richmond or the Federal Reserve System.
1 Accounting for Low Enrollment and Graduation rates at 4-year Colleges when Returns to Graduation are High

Several studies claimed that there is under investment in education. Judd (2000) combines CAPM techniques with the indivisibility of human capital to compare the return to 4-year college graduation with assets of similar risk to find an excess of return to the college investment option. Heckman et al. (2008) evaluate the Internal Rate of Return of the 4-year college investment option relative to work, to find that since 1960 Internal Rates of Return have been around 10% or higher depending on the cohort and different specifications of labor markets and taxes. Cunha et al. (2005), using data from NLSY/1979, extend the analysis to evaluate the Internal Rate of Return for the marginal student, the agent with the lowest observable measures of ability that enrolls in 4-year college, to find an unexplained wedge in returns.\footnote{Cunha et al. (2005) concluded that this wedge is explained by non-pecuniary costs of education, namely, tastes for school, risk aversion, and other.}

The evidence presented in this paper points in a different direction: the wedge in returns is explained by the existence of academic 2-year colleges (in fact it is actually more general because vocational schools explain the wedge in returns for students that enroll in academic 2-year colleges) as high-school graduates sort across the different enrollment alternatives. In particular, high-school graduates that enroll in 4-year colleges have measures of observables that lie above of those that enroll in academic 2-year colleges. It follows that the high-school graduate with the lowest measures of observables that enrolls in 4-year colleges is indifferent with enrollment at academic 2-year colleges as opposed to be indifferent with joining the labor-force. Using the parameterized version of the model it is possible to quantify the return for this marginal student and how much of average returns for the population that enrolls in 4-year colleges is explained by the return of the marginal student. The return for the student at the threshold between academic 2-year colleges and 4-year colleges is 2.56% which accounts for 63% of the measured average return to 4-year college enrollment. To obtain a monetary value for the return for the marginal student recall that $\Sigma_i(p)$ is the compensating variation of enrollment in institution $i$ relative to joining the workforce and that is measured in units of $h^w$, the wage for agents with no degree. It follows that the monetary value in 1984 dollars is simply $\Sigma_i(p) \times 16454.41$. Then, the monetary value of enrollment for the marginal student is 96,600 dollars.\footnote{See also the Handbook of Economics of Education (Heckman et al. (2006)).}
2 Reasons to Use NLS-72

The choice of NLS-72 over other data sets is not an arbitrary one. *High school and Beyond*, or HS&B, follows a cohort from 1982 to 1990. *National Education Longitudinal Study of 1988*, or NELS:88, follows a cohort from 1992 to 2000. Relative to NLS-72 and HS&B, NLS-72 presents longer horizon wage information (13 years vs. 8 years after high-school graduation in the newer data sets). Also, the design of the questionnaire of NLS-72 included questions regarding the type of 2-year college education at any point in time (broadly speaking, 2-year colleges are a combination of academic 2-year colleges and vocational school). These questions where not available in the newer data sets. Lastly, NLS-72 has a more detailed analysis of the cost structure of post-secondary education. An alternative would be to use *National Longitudinal Survey of the Youth*, or NLSY, that presents better life-cycle earnings information but that requires extensive data mining (in particular, there is no straightforward way to disentangle vocational school from academic 2-year colleges). Further, many community colleges have extended their scope to offer both types of programs making increasingly difficult to distinguish one from the other.

3 Construction of Data set from NLS-72

The *National Longitudinal Study of the High School Class of 1972*, or NLS-72, is a panel that follows the educational histories of high seniors in 1972. Participants in the study were selected when they were seniors in high school in the spring of 1972, and in a supplementary sample drawn in 1973. The records include the "Base Year" survey; follow-up surveys in 1973, 1974, 1976, 1979, and 1986.

The analysis in this paper is specialized to high-school graduates as high-school dropouts are not allowed to enroll in 4-year colleges so these agents were dropped from the sample. Also, this paper contains no theory as to why agents have discontinuous spells of education. Why do these people work first? Or why some of them drop, work for a while, and then enroll again? Tastes, learning and credit constraints can be touted as possible explanations. Further, there is no clear pattern in terms of observable measures of ability that explain discontinuities. As so, agents with discontinuous spells of education were excluded. Also, data limitations do not allow for an analysis of how graduate school fits into the model logic and so agents that pursued graduate education were also excluded.

The paper relies on observable measures of ability to link priors to data. The variables used here are: race, gender, socioeconomic status of family, maximum educational Level of father, rank in high-school class and location of high-school. Agents with missing values for
any of these variables were discarded.

The cost of education present many missing values. Instead of excluding these observations a cost regression was performed to predict these values. The regression runs cost of education on observable measures of ability and geographic location of students and then the estimates are used to compute the expected cost of education for agents presenting missing values.

References


