

2002

An Econometric Analysis of the Returns to  
Education in the United States: Dissertation  
Summary

Olivier Deschênes  
*Princeton University*

---

# An Econometric Analysis of the Returns to Education in the United States

Olivier Deschênes

The first two chapters of this dissertation examine different aspects of the identification and estimation of the causal effect of education on labor market earnings. The last chapter appraises the extent of abusive behavior in the Unemployment Insurance program, one of the major social programs in the United States.

The first chapter quantifies the extent to which the rise in the measured return to education between 1979 and 2000 reflects a change in the causal effect of education on labor market earnings. As a basis for the empirical analysis, I developed a two-factor model of ability, schooling, and earnings that emphasizes the role of unobservable ability and heterogeneous returns to education, and tried to uncover the contribution of both factors to the changing earnings-schooling relationship. Using data from the Current Population Survey for cohorts of men born between 1930 and 1970, I found that the causal return to education increased by about 30 percent between 1979 and 2000.

The second chapter examines the causal link between family background characteristics—like parental education and family size—and the returns to education. In order to formalize the conceptual issues, I set out a model of schooling and earnings that explicitly recognizes the possibility that the returns to schooling may vary across individuals, and that part of this variation is generated by differences in familial environment. Using data from the 1973 Occupational Change in a Generation Survey, I found that men raised in larger families have substantially lower returns to education, while the combined effects of parental education are more modest. The analysis concludes that different aspects of familial environment affect schooling and earnings through different mechanisms.

The third chapter, written in collaboration with Orley Ashenfelter and David Ashmore, reports the results of a series of unique, randomized trials designed to measure whether stricter enforcement and verification of work search behavior would lead to lower unemployment claims and benefit payments in the U.S. Unemployment Insurance program. Our results provide no support for the view that the failure

to actively search for work has been a cause of overpayment in the UI system.

## CHAPTER 1 UNOBSERVED ABILITY, COMPARATIVE ADVANTAGE, AND THE RISING RETURN TO EDUCATION IN THE UNITED STATES, 1979–2000

In recent years, many researchers have attempted to measure the causal link between education and labor market earnings.<sup>1</sup> This interest is generated in part by public policy debates over investments in education, the recent availability of better data sets, and methodological advances in resolving the identification problems related to unobservable ability and endogenous schooling.<sup>2</sup> At the same time, the wage structure of the U.S. labor market changed profoundly.<sup>3</sup> Since the early 1980s, the conventional measure of the economic return to education—the schooling coefficient in a human capital earnings regression<sup>4</sup>—almost doubled. Residual wage dispersion has also been increasing during that time period—a pattern that is often attributed to a rise in the return to unobservable skills, such as motivation or cognitive ability.<sup>5</sup>

These concurrent changes in the wage structure heighten the uncertainty regarding the causal link between schooling and earnings, especially regarding changes during the last decades. One interpretation of the rising correlation between earnings and schooling is that there has been an increase in the causal effect of education on labor market earnings. This may be due to an increased demand for better-educated workers, or to the entry into the labor market of younger cohorts with higher marginal productivity of schooling (perhaps because of an improvement in school quality). An alternative interpretation of the increase in the conventionally measured return to schooling is based on unobservable variables that affect earnings and are correlated with schooling. A rise in the return to unobservable skills, or an increasing degree of ability-education sorting across cohorts, might also have contributed to a rising correlation between schooling and earnings.<sup>6</sup>

What both of these interpretations have in common is the idea that changes in the educational wage structure can occur because of year effects (or “economy-wide” effects) and composition effects (or “cohort” effects). In the first interpretation, these effects lead to a change in the average causal effect of education. In the second, they lead to time-varying “ability biases” in the observed relationship between earnings and schooling. While previous analysts have evaluated some of these explanations, the absence of a

unifying framework addressing all of these issues simultaneously has greatly limited the scope of our understanding of the recent changes in the educational wage structure.

The purpose of this paper is to quantify the changes in the causal effect of education on labor market earnings during the last two decades in the United States. I begin by setting out a model describing the relationship between earnings and schooling in the context of repeated cross-sectional data, with unobserved absolute ability and heterogeneous returns to education. If the schooling decisions of individuals are influenced by unobserved ability, the average causal effect of education embedded in the conventional estimate of the return to education will be confounded. The two-factor model illustrates how the intertemporal changes in the average causal effect and in the confounding elements can be decomposed into year-specific and cohort-specific factors. Changes in the conventional measure of the return to education are potentially confounded through two distinct channels: 1) changes in the return to unobserved ability over time, and 2) changes in the mapping between ability and completed education across cohorts.

A key implication of the model is that if people who have higher returns to education tend to acquire more schooling (i.e., if there are comparative advantage incentives in schooling decisions), the observed relationship between earnings and schooling will be convex (Mincer 1974, Rosen 1977). Moreover, for a fixed cohort of individuals the degree of convexity will increase over time if the year-specific component of the causal return to education rises. This simple prediction of the model separately identifies the year-specific causal return to education from the year-specific return to unobserved ability, using the coefficients from an augmented human capital earnings regression.

The empirical analysis is based on repeated cross-sectional data from the Current Population Survey for cohorts of men born between 1930 and 1970. I begin by documenting the marked increase in the convexity of the relationship between log earnings and schooling over the 1980s and 1990s that was noted by Mincer (1996). I then make use of these changes within the U.S. wage structure to identify the parameters of the model. I find that the two-factor model of ability, schooling, and earnings provides a relatively accurate description of the changes in the educational wage structure over the last 20 years. The estimates imply an increase in the causal return to education of about 30 percent between 1979 and 2000, as opposed to 50 percent for the conventional estimate of the return to schooling. The return to unobserved ability followed a different pattern, increasing by about 10 percent over

the 1980s and decreasing by the same amount over the 1990s. The estimates indicate an important increasing inter-cohort trend in the correlation between educational attainment and individual-specific returns to education. This is consistent with a model where returns to schooling vary across individuals, and where comparative advantage incentives play a more significant role in the schooling decisions of younger cohorts. Taken as a whole, the evidence in this paper provides no indication that the rise in the conventional measure of the return to education is due to a time-varying unobserved ability bias.

## **CHAPTER 2 ESTIMATING THE EFFECTS OF FAMILY BACKGROUND ON THE RETURN TO EDUCATION**

Economists have long been interested in the effects of family environment on the subsequent labor market success of individuals.<sup>7</sup> Part of this interest stems from the strong correlation between the educational attainment of parents and children, which may contribute to the transmission of socioeconomic status and inequality across generations. In recent years, this attention has been heightened by a major transformation of the American family, and by the increasing role of education as a determinant of economic well-being.<sup>8</sup>

Recent studies of the causal association between schooling and earnings have emphasized the heterogeneity in the economic return to an additional year of education across otherwise comparable individuals.<sup>9</sup> Despite increased attention to the possibility of heterogeneous returns to education across individuals, there is still considerable uncertainty about the mechanism generating this heterogeneity. Part of this uncertainty is attributable to the absence of a formal model that explicitly recognizes the possibility that the causal return to schooling varies with observable characteristics, like family background variables.

This paper examines the relationship between family background characteristics and the return to schooling subsequently received by individuals in the labor market. The paper begins by documenting several features of the relationship between family background factors, educational attainment, and earnings. Using a large sample from the 1973 Occupational Change in a Generation Survey, I find that men raised by better-educated parents acquire more schooling and have higher earnings, while those raised in larger families are less educated and have lower earnings. Next, I show that the negative effect of

family size varies with the gender composition of the sibling group. In particular, holding family size and background constant, I find that men raised with more sisters have substantially lower schooling and earnings. These patterns are robust to a wide variety of specifications.

The contribution of this paper is to develop and implement a formal model of schooling and earnings to interpret these patterns. In light of the recent instrumental variable studies of the causal effect of education, the return to schooling is allowed to vary across individuals, and in particular with the observable characteristics of the family. This distinguishes the current paper from most of the literature, which typically assumes that the return to schooling is constant across the population or is a single random variable. A key implication of the model is that family background can potentially affect both the payoff to an additional year spent in school and the level of acquired schooling. Therefore, a complete assessment of the link between family background and the return to schooling must examine the effects of family background on both the marginal benefit and the marginal cost of schooling.<sup>10</sup>

An extensive body of literature has clearly established that the identification of the causal relationship between schooling and earnings requires an exogenous source of variation in educational choices. It follows naturally that the identification of the parameters describing the costs and benefits of schooling requires two types of exclusion restrictions. The identification of the parameters in the marginal benefit function requires the existence of an observable variable affecting schooling choice only through its effect on the cost of schooling (i.e., an instrumental variable for schooling). Similarly, the identification of the parameters from the marginal cost function requires the existence of an observable variable affecting schooling choice only through its effect on the benefit to schooling. In this study, measures of school quality are used as variables that affect the benefit—but not the cost of—schooling, conditional on family background characteristics. Then, following Butcher and Case (1994), I exploit the randomness embodied in the gender composition among siblings, holding family size constant as a variable influencing only the cost of schooling. These two exclusion restrictions allow the estimation of both the average causal effect of education, and the parameters describing the effect of family background on the return to schooling. Moreover, since the effects of gender composition on educational attainment are presumably larger for poorer families (conditional on family size), it is possible to test the assumption that sibling gender composition has

an independent effect on earnings. The results of a series of specification tests provide no evidence against the hypothesis that, conditional on family size, sibling gender composition is an exogenous determinant of schooling.

The results can be summarized as follows: First, men raised in larger families have significantly lower returns to education.<sup>11</sup> This finding is entirely attributable to the lower benefits per year of education received by individuals raised with more siblings (i.e., it is not related to differences in the costs of schooling). The combined effects of parental education on the returns to schooling are more modest. Men who were brought up by better-educated fathers have higher marginal returns to schooling, while those with better-educated mothers have lower marginal returns to schooling. In other words, the individual's education and father's education are q-complements in the production of earnings capacity, while the individual's education and mother's education are q-substitutes. In addition to their opposite signs, the analysis suggests that these effects of parental education operate through distinct mechanisms relating familial environment and returns to education. Father's education is associated with higher benefits per year of education, while mother's education is associated with lower costs per year of education, consequently raising education levels but lowering the marginal return.

### **CHAPTER 3 DO UNEMPLOYMENT INSURANCE CLAIMANTS ACTIVELY SEEK WORK? EVIDENCE FROM RANDOMIZED TRIALS IN FOUR U.S. STATES**

In the last two decades, U.S. policies have moved from the use of incentives to the use of sanctions to promote work effort in social programs. This orientation shift in public policies has been documented by Jencks (1992), who, like Murray (1984), argues that it has been based, in part, on the perception that these programs are riddled with abuse. Surprisingly, except for anecdotes, there is very little systematic evidence of the extent to which sanctions applied to abusive use of social entitlements result in greater work effort.

In this paper, we report the results of the only field test of which we are aware that uses randomized trials to measure whether stricter enforcement and verification of work search behavior alone decreases unemployment claims and benefits paid in the U.S. unemployment insurance (UI) program. These experiments, which we implemented in four sites in Connecticut, Massachusetts, Virginia, and Tennessee,

were designed to explicitly test claims based on nonexperimental data, summarized in Burgess and Kingston (1987),<sup>12</sup> that a prime cause of overpayments is the failure of claimants to actively seek work.

Our results provide no support for the view that the failure to actively search for work has been a cause of overpayments in the UI system. These results provide a much-needed complement to the results of other UI system experiments reported by Meyer (1995), who first brought these unique field experiments to broad attention. The treatments in the experiments Meyer (1995) surveys incorporated elements of both work search verification and a system designed to teach workers how better to search for jobs. The experiment reported here incorporated only the element of work search verification, and we find that the treatments provided no benefits. Taken together, the results of both sets of experiments imply that providing workers with subsidized job search assistance may be a relatively inexpensive way to provide cost effective, but small, benefits to both workers and society.

In the remainder of the paper we set the stage for our analysis with a brief description of previous research on UI work search rules and the details of operation of the current US system. Next, we discuss our experimental design, the nature of the experimental treatment, and our data collection procedures. Since randomization is so important for our estimation procedure, and since there is some evidence that several field experiments have not been properly randomized, we next report tests of the effectiveness of our simple randomization technique. Finally, we report the effect of the experimental treatment on claimant qualification rates, benefit payments, and claim durations. We conclude with a brief discussion of the implications of our findings.

## NOTES

1. See, for example, Angrist and Krueger (1991), Ashenfelter and Rouse (1998), and Meghir and Palme (1999). Card (1999, 2000) presents a review of recent studies.
2. Most advancements relate to the estimation of models with heterogeneous treatment effect using instrumental variables. See Angrist and Imbens (1995), Heckman and Vytlačil (1998), Card (1999, 2000), and Heckman, Tobias, and Vytlačil (2000).
3. See Katz and Autor (1999) for an extensive overview of recent studies of the wage structure in the United States.
4. Mincer (1974) showed that the schooling coefficient in a log earnings regression can be interpreted as the “return to education” if the only costs of schooling are foregone earnings and if the return to schooling is independent of

schooling levels. In this paper, I will refer to this estimate as the “conventional measure of the return to schooling.”

5. See Juhn, Murphy, and Pierce (1993).
6. See Taber (1990), Blackburn and Neumark (1993), and Murnane, Willett, and Levy (1995).
7. See, for example, Becker (1964), Taubman (1977), and Griliches (1979).
8. See, for example, Haveman and Wolfe (1993), Mayer (1997), and Danziger and Waldfogel (2000).
9. See the evidence contained in Card and Krueger (1992), Heckman, Layne-Farrar, and Todd (1996), Altonji and Dunn (1996), and Ashenfelter and Rouse (1998). Heckman and Vytlačil (1998) and Card (1999) discuss theoretical models of heterogeneous returns to education.
10. This possibility was overlooked by Altonji and Dunn (1996) and Ashenfelter and Rouse (1998), who analyzed interactions of schooling and parental education in earnings regressions.
11. Black (1989) documents similar patterns in the relationship between number of siblings and various aptitude test scores.
12. See also Kingston, Burgess, and St-Louis (1986), and Wolf and Greenberg (1986).

## REFERENCES

- Altonji, Joseph G., and Thomas Dunn. 1996. “The Effects of Family Background Characteristics on the Return to Schooling.” *Review of Economics and Statistics* 78: 665–671.
- Angrist, Joshua D., and Alan B. Krueger. 1991. “Does Compulsory School Attendance Affect Schooling and Earnings.” *Quarterly Journal of Economics* 106: 974–1014.
- Angrist, Joshua D., and Guido W. Imbens. 1995. “Two-Stage Least Squares Estimation of Average Causal Effects in Models with Variable Treatment Intensity.” *Journal of the American Statistical Association* 90: 431–442.
- Ashenfelter, Orley, and Cecilia E. Rouse. 1998. “Income, Schooling and Ability: Evidence from a New Sample of Twins.” *Quarterly Journal of Economics* 113: 253–284.
- Becker, Gary S. 1975. *Human Capital*. Second Edition. Chicago, Illinois: University of Chicago Press.
- Blackburn, McKinley, and David Neumark. 1993. “Omitted-Ability Bias and the Increase in the Returns to Schooling.” *Journal of Labor Economics* 11: 521–544.
- Blake, Judith. 1989. *Family Size and Achievement*. Berkeley, California: University of California Press.
- Butcher, Kristin F., and Anne Case. 1994. “The Effect of Siblings’ Sex Composition on Women’s Education and Earnings.” *Quarterly Journal of Economics* 109: 531–563.
- Card, David, and Alan B. Krueger. 1992. “Does School Quality Matter: Returns to Education and the Characteristics of Public Schools in the United States.” *Journal of Political Economy* 100: 1–40.
- Card, David. 1999. “The Causal Effect of Education on Earnings.” In *Handbook of Labor Economics*, volume

- 3A, Orley Ashenfelter and David Card, eds. New York: Elsevier Science.
- Danziger, Sheldon, and Jane Waldfogel. 2000. *Securing the Future: Investing in Children from Birth to College*, Sheldon Danziger and Jane Waldfogel, eds. New York: Russell Sage Foundation.
- Griliches, Zvi. 1979. "Siblings Models and Data in Economics: Beginnings of a Survey." *Journal of Political Economy* 87: S37–S64.
- Haveman, Robert, and Barbara Wolfe. 1993. "Children's Prospects and Children's Policy." *Journal of Economic Perspective* 7: 153–174.
- Heckman, James J., Anne Layne-Farrar, and Petra Todd. 1996. "Does Measured School Quality Really Matter? An Examination of the Earnings-Quality Relationship." In *Does Money Matter? The Effects of School Resources on Student Achievement and Adult Success*, Gary Burtless, ed. Washington, D.C.: Brookings Institution.
- Heckman, James J., and Edward Vytlacil. 1998. "Instrumental Variables Methods for the Correlated Random Coefficient Model: Estimating the Rate of Return to Schooling When the Return is Correlated with Schooling." *Journal of Human Resources* 23: 974–987.
- Jencks, Christopher. 1992. *Rethinking Social Policy*. Cambridge, Massachusetts: Harvard University Press.
- Juhn, Chinhui, Kevin M. Murphy, and Brooks Pierce. 1993. "Wage Inequality and the Rise in the Returns to Skill." *Journal of Political Economy* 101: 410–42.
- Katz, Lawrence F., and David Autor. 1999. "Changes in the Wage Structure and Earnings Inequality." In *Handbook of Labor Economics*, volume 3A, Orley Ashenfelter and David Card, eds. New York: Elsevier Science.
- Kingston, Jerry L., Paul L. Burgess, and Robert D. St-Louis. 1986. "Unemployment Insurance Overpayments: Evidence and Implications." *Industrial and Labor Relations Review* 39: 323–336.
- Mayer, Suzan E. 1997. *What Money Can't Buy: Family Income and Children's Life Chances*. Cambridge, Massachusetts: Harvard University Press.
- Meghir, Costas, and Marten Palme. 1999. "Assessing the Effect of Schooling on Earnings Using a Social Experiment." Working Paper, University College London.
- Meyer, Bruce D. 1995. "Lessons From The U.S. Unemployment Insurance Experiments." *Journal Of Economic Literature* vol. XXXIII. Pp. 91–131.
- Mincer, Jacob. 1974. *Schooling, Experience and Earnings*. New York: Columbia University Press.
- . 1996. "Changes in Wage Inequality 1970–1990." Working Paper No. 5823, National Bureau of Economic Research, Cambridge, Massachusetts.
- Murnane, Richard, J., John B. Willett, and Frank Levy. 1995. "The Growing Importance of Cognitive Skills in Wage Determination." *Review of Economics and Statistics* 77: 251–266.
- Murray, Charles. 1984. *Losing Ground*. New York: Basic Books Publishers.
- Rosen, Sherwin. 1977. "Human Capital: A Survey of Empirical Research." In *Research in Labor Economics*, volume 1, Ronald Ehrenberg, ed. Greenwich, Connecticut: JAI Press.
- Taber, Christopher. 1999. "The Rising College Premium in the Eighties: Return to College or Return to Unobserved Ability?" Photocopy, Northwestern University, Evanston, Illinois.
- Taubman, Paul. 1977. *Kinometrics: The Determinants of Socio-Economic Success Within and Between Families*. Amsterdam, North-Holland: Elsevier Science.
- Wolf, Douglas, and David Greenberg. 1986. "The Dynamics of Welfare Fraud: An Econometric Duration Model in Discrete Time." *Journal Of Human Resources* vol. XXI: 437–455.