

The Quantity and Quality of Schooling and U.S. Labor Productivity Growth (1870–2000)¹

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This paper accounts for the contribution of the quantity and quality of schooling to worker productivity growth in the United States from 1870 to 2000. Schooling investments rose dramatically over the period before leveling off around 1970. Schooling likely caused 30 to 40 percent of the fivefold rise in worker productivity from 1870 to 1970 and produced a “wave pattern” in productivity growth (previously attributed solely to the timing and diffusion of important technological innovations). The results suggest that about 1 percent of the century-long 1.6-percent growth rate in worker productivity is sustainable. *Journal of Economic Literature* Classification Numbers: O47, J24. © 2002 Elsevier Science (USA)

INTRODUCTION

The behavior of labor-productivity growth during the last quarter of the twentieth century has been concerning and puzzling. From 1972 to 1995, the U.S. economy experienced a “productivity slowdown”—with an annual productivity growth rate of about 1 percent. This was almost a percentage point lower than the 1.86-percent growth rate from 1913 to 1972 (Gordon, 2000, Table 1, p. 53). Over the last five years of the century, productivity growth rebounded to levels above 2.5 percent. This raises the question of what long-run labor productivity growth will be in this century. Is labor productivity likely to grow faster or slower than it did in the twentieth century?

The answer to this question must begin with an explanation of growth during the twentieth century. Identifying the underlying sources of historical

¹ I have benefited from the comments of Orazio Attansio, Paul Beaudry, Mark Bills, David Bivin, Rima Ganguly, Boyan Jovanovic, Bill Lord, Yan Qin, Steve Russell, Bob Sandy, and Martin Spechler.



growth provides a reasonable foundation for considering the prospects for future growth. It is particularly important to identify how much of the growth in the twentieth century was “transitional,” and therefore not likely to be sustained indefinitely into the next century.

There is reason to suspect that a portion of the growth in the last century was unsustainable. The share of resources devoted to education increased dramatically over the twentieth century and then leveled off toward the end of the century. Since investment shares cannot rise indefinitely, this source of growth must be viewed as transitional. Thus, if education investment was an important source of past growth, one would naturally expect slower growth in the future.

This paper attempts to identify the underlying sources of historical growth by using a neoclassical growth framework to decompose growth into transitional growth, resulting from physical and human capital accumulation, and sustainable growth due to exogenous technological change. Our approach differs from previous theoretical growth accounting work by (i) accounting for changes in *both* the quality and quantity of education investments in U.S. history, (ii) identifying the *causal* role of schooling, (iii) exploring whether micro-econometric estimates of the effects of schooling are consistent with macroeconomic observations of productivity growth and interest rates, and (iv) attempting to explain the rise in the quantity of schooling within a microeconomic model of the family.

Many recent theoretical and policy papers *assume* school spending has important effects on worker productivity and economic growth.² The empirical justification for this common assumption is questionable. Macro-econometric evidence on the causal link between schooling and growth is mixed and subject to problems of measurement and interpretation.³ After a critical review of this literature, Krueger and Lindahl (2000) doubt that cross-country growth regressions will be “very informative insofar as the benefit of education is concerned” (p. 37). The micro-econometric literature has also reached mixed conclusions about the causal effects of school spending (see the review in Section 2).

The numerical simulation model presented here helps to resolve the debate over school spending. Micro-econometric estimates of schooling effects can be incorporated to see if they are consistent with macroeconomic observations such as the rise in school spending, the rates of return to physical and human capital, and the growth in labor productivity over the century. Consistency with aggregate observations can then be used as a criterion to evaluate the validity of different micro-econometric

²See, for example, Lord (1989), Glomm and Ravikumar (1992), Kaganovich and Zilcha (1999), and Fernandez and Rogerson (1998).

³See Krueger and Lindahl’s (2000) survey and the references within.

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