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Robert Topel is the Isidore Brown and Gladys J. Brown Distinguished Service Professor of Economics in the Booth School of Business of The University of Chicago, where he also Director of the George J. Stigler Center for the Study of the Economy and the State and Director of the University of Chicago Energy Policy Institute. Among various other positions, he is also a Research Associate of the National Bureau of Economic Research and a Fellow of the Society of Labor Economists.

Topel specializes in microeconomics, which is the study of markets and prices, and in the application of statistics to economic data. He is the author of numerous articles in leading economic journals including *The Journal of Political Economy*, *The American Economic Review*, *The Rand Journal of Economics*, *The Journal of Law and Economics*, and *The Quarterly Journal of Economics*, as well as several books on the application of economic theory to policy issues. From 1993 to 2003, he served as Editor of *The Journal of Political Economy*, one of the leading journals in economics. He has also served as on the Editorial Board of the *American Economic Review* (1992-93), and was co-editor of the *Journal of Labor Economics* (1982-92). Among his recent honors, he is the recipient (with K.M. Murphy) of the 2005 Eugene Garfield Award for contributions to the economics of medical research, and the 2006 Kenneth Arrow Award from International Association of Health Economists, recognizing outstanding research in Health Economics.

The Economic Impact of Education

My presentation will provide an overview of the private and social returns to education. Among the issues I will cover are the following:

- How large are the private monetary returns to schooling, and how have those returns varied over time?
- Do individual investment decisions respond to changes in returns—that is, is the supply of human capital responsive to its price?
- What factors have caused the private monetary returns to schooling to rise, especially in the US?
- How do education and skills affect labor market outcomes such as labor force participation and unemployment?
- Is there convincing evidence that the social returns to education exceed the private returns—which would justify the substantial subsidy that education enjoys worldwide?
- What is the contribution of education and schooling to economic growth?

The private monetary return to schooling—the percentage increase in earnings that accompanies an additional year of schooling—is one of the most widely studied empirical magnitudes in economics. The consensus estimate is that this return is quite substantial—on the order of 8 to 15 percent—with the US currently at the high end of this range. Recent US data indicate that four years of college education raise earnings by about 65 percent, which translates to a compounded return of around 13 percent per year. Remarkably, these high returns are not peculiar to high levels of schooling—estimates indicate that incremental returns to (say) the 10th year are comparable to those for the 16th.

The sharp and sustained rise in the private returns to education provides is the basis for an interesting and important empirical experiment—to what extent do higher returns encourage individuals to invest? The evidence is that college attendance in the US increased as the demand for “skills” increased and the returns to college rose. Similarly in Sweden—where most wages are the outcome of centralized wage setting—equity-motivated efforts to suppress the returns to schooling and inequality generally had the unintended consequence of discouraging college attendance. When wage restrictions were relaxed somewhat after 1990 and the returns to education rebounded, the fraction of young Swedes attending college correspondingly rose.

Education is almost universally subsidized by government, usually in the form of (free) public provision of schooling. To an economist, a positive case for such subsidies requires that the social benefits of schooling exceed the private ones—a case of positive “externalities.” For example, additional schooling for my neighbor may raise my productivity because we interact, or perhaps he’s just more interesting to talk to. Then schooling choices based only on private returns would lead to a



population with too little schooling compared to the social optimum. The government can improve things by subsidizing education or by other policies (like minimum schooling requirements and standards) that increase individual investments in education.

The notion that positive externalities exist is intuitively compelling, but convincing evidence is more difficult to establish. As my colleague Gary Becker put it over 35 years ago: “Economists (and others) have generally had little success in estimating the social effects of different investments, and, unfortunately, education is no exception.”

To shed some light on this issue, and also the connection of education to economy-wide productivity growth, I examine the connection between growth in education and per-capita income in a large sample of countries since 1950 and in US states since 1940. Do countries and regions that invest heavily in human capital—for example by raising the average educational attainment of their workforce—enjoy unusually high rates of economic growth? The answer in both international and US data appears to be “yes.” From this it might seem to follow that the path to local and national economic development is through policies that encourage investments in education, especially if there is compelling evidence that the social returns (as measured by the impact of education on economic growth) substantially exceed private returns. On this point the data are less convincing—the social returns to schooling, as reflected in productivity, earnings and per-capita incomes, do not appear to be much larger than the private returns. This means that a strong case for public investment as a means of development rests on other unmeasured externalities or on other sources of market failure that would prevent efficient private investment decisions.

I close with an examination of the effects of schooling specifically and skills more generally on labor market outcomes other than earnings, or outcomes that are a consequence of greater earning power. I show that educated workers have stronger labor force attachments as measured by annual weeks and hours worked and that they have substantially lower unemployment and non-employment rates. Educated workers are also more insulated from economic downturns, the effects of which fall disproportionately on the least skilled.



Education Policy & the Social Value of Education

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Economists (and others) have generally had little success in estimating the social effects of different investments, and, unfortunately, education is no exception.

Becker, *Human Capital* (1975)

The Private Returns to Schooling

- The private monetary (earnings) return to education is one of the most widely studied empirical magnitudes in economics
 - Original work of Mincer followed by many others
 - Consensus: returns are substantial
 - 8-15% per year of schooling
 - Little evidence of selection bias (smart people get education)
 - 4 years of college raises earnings by about 65%, or a return of over 13%/year
 - Returns have risen with rising price of skills since 1980

Why Education Policy?

- None of this calls for public policies to deal with education, yet all developed countries have them
 - Quality & curriculum standards
 - Subsidies & public provision
 - Minimum years
- To an economist, positive case for public policy requires a wedge between the private and social returns to education—an externality

Externalities

- When the amount or quality of one person's education external benefits (costs) on others, there is a positive economic case for encouraging (discouraging) education
- Private return to schooling may understate the full *social* benefit of education
 - Left to their own devices, individuals make socially inefficient educational choices

A Taxonomy

- Private = Social
 - Education benefits only the individual
 - No compelling case for public participation
- Private < Social
 - Individual's education benefits others
 - Public expenditure and regulation may enhance efficiency
- Private > Social
 - Education merely redistributes from poor to rich
 - “Too much” education
 - No one really believes this any more

Elements of Private Returns

(Internalized by Individuals)

- Increased individual market productivity & earnings
- Improved non-market productivity
 - Home productivity
 - Consumption & other decisions
 - Production of children's human capital—dynastic concerns
- Improved health & longevity
- Education as consumption
 - Enables consumption of HK goods (ideas)
 - Matching & assortive mating

Elements of Social Returns

Private < Social

- Social network externalities in production
 - Education raises the *level* of economic activity by more than its private return
- Education & economic growth
 - The *level* of education raises economic growth because educated people produce ideas
 - Returns not internalized
- External benefits through social programs—less need for redistribution
 - Health
 - Other income transfers
 - Equity as a public good

Private < Social (Continued)

- Crime
- Network externalities in consumption
- Voting
- Other “2nd best” considerations
 - Redistribution creates distorted incentives to invest
 - Progressive taxes do the same
 - Artificial compression of skill differentials

Elements of Social Returns

Private > Social

- “Signaling” value of education
 - Education as a screening device
 - Private value as a signal, even if no impact on productivity
 - No social gain
 - My MBA students believe some version of this
 - Once a prominent argument, much less so today—no substantive evidence

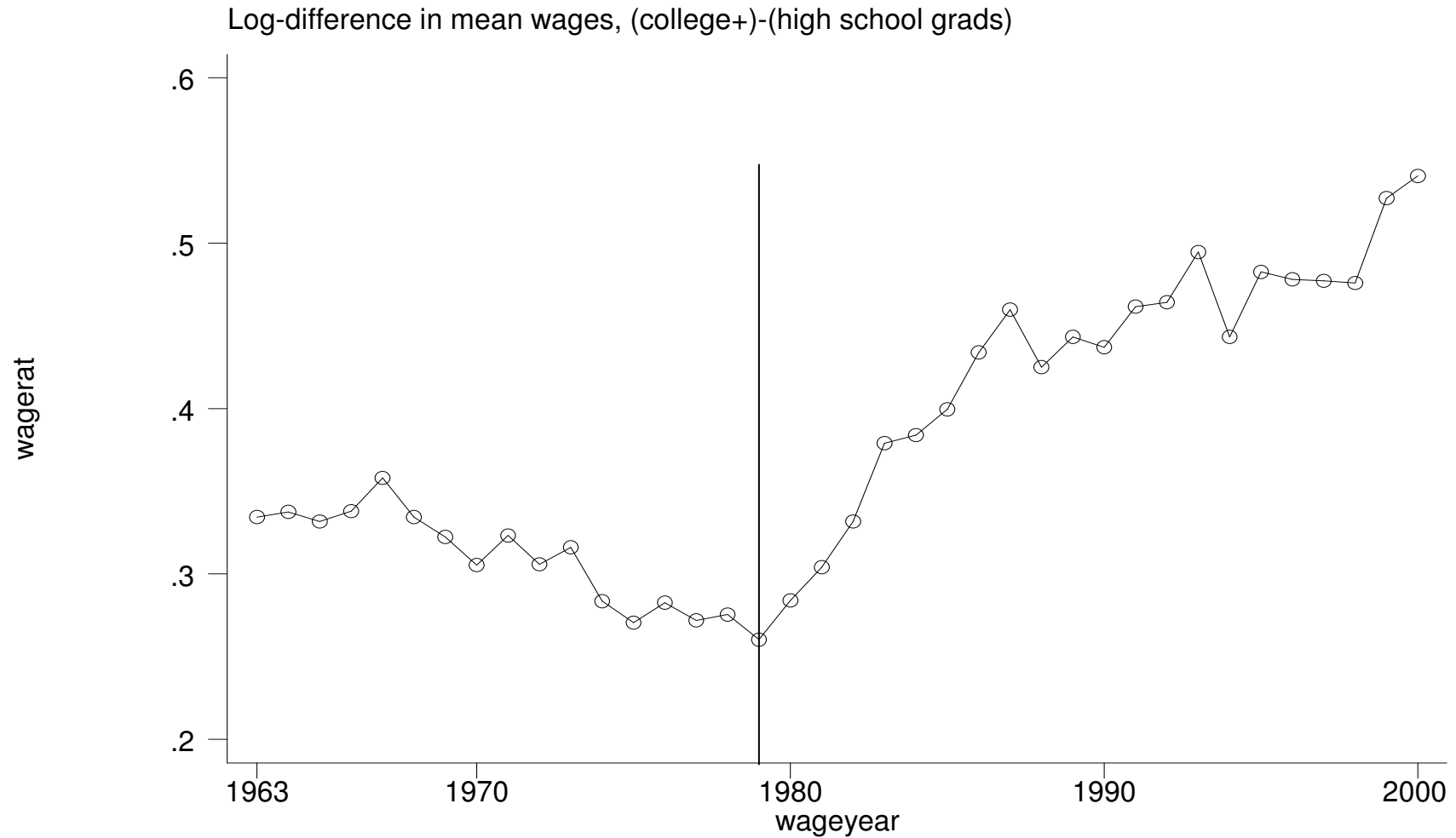
Measuring Private *Income* Returns: A Primer

- To calibrate social returns, we need a benchmark estimate of typical private returns
- Generations of labor economists following Jacob Mincer: Micro (individual) data on wages, schooling, experience
- Assume:
 - only cost is foregone earnings
 - % increase constant over lifetime
- Then private rate of return is percentage increase in earnings due to an additional year of schooling

Measuring Private Returns (cont)

- $\ln W_i = X_i\beta + S_i\rho + \varepsilon_i$
 - S_i is years of schooling for person i
 - ρ is private monetary rate of return
- Versions estimated world-wide for 50 years
 - Remarkable consistency
 - Returns 5-15, rising after 1980, remain at the high end, especially in US
 - Comparable to returns on other risky assets
 - Sources of bias empirically unimportant

Difference in Log Average Wages: College and High School Graduates, 1963-2000



Changes in the Price of Skill

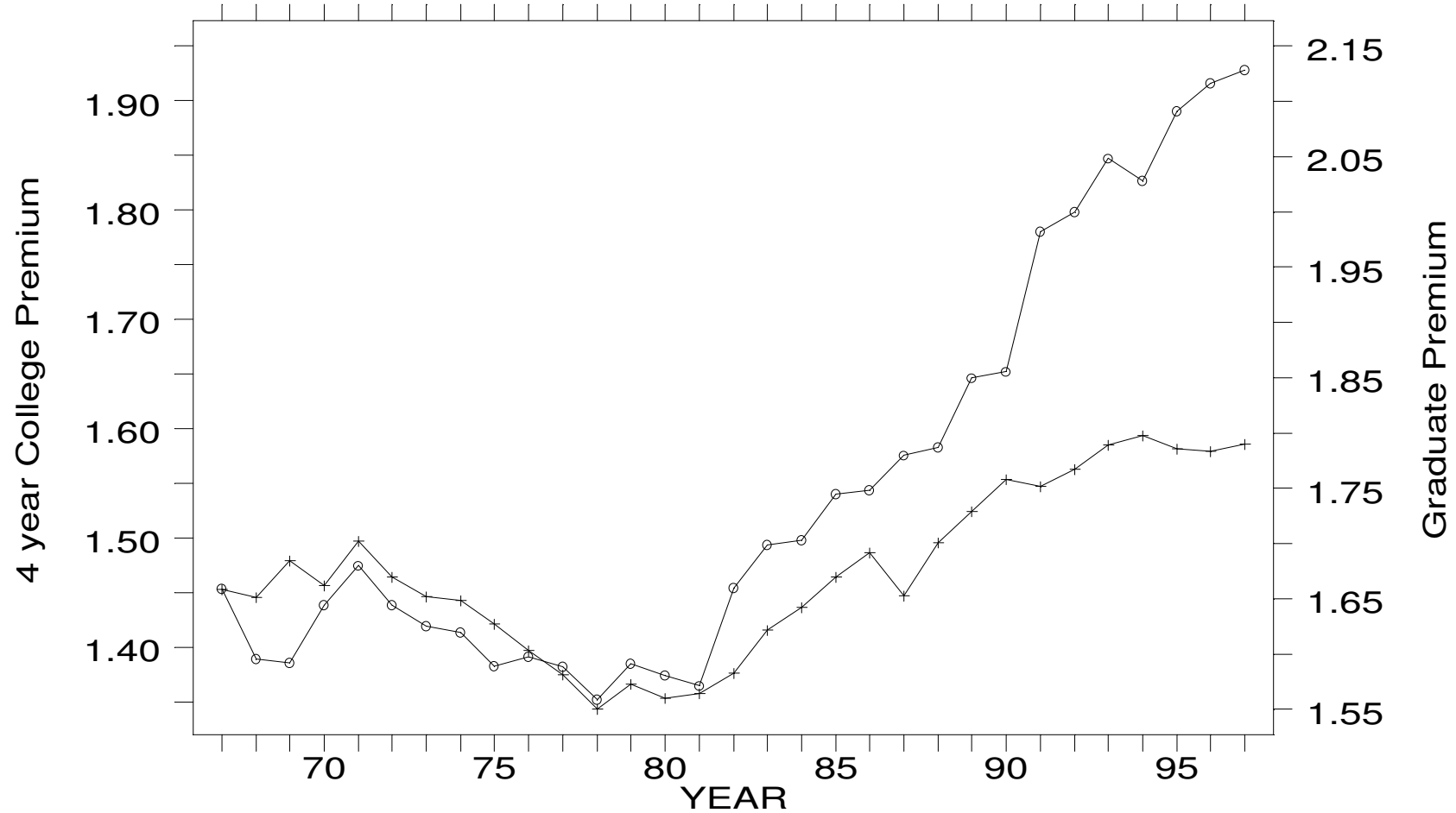


Figure 2. College & Graduate Wage Premiums 1967-1997

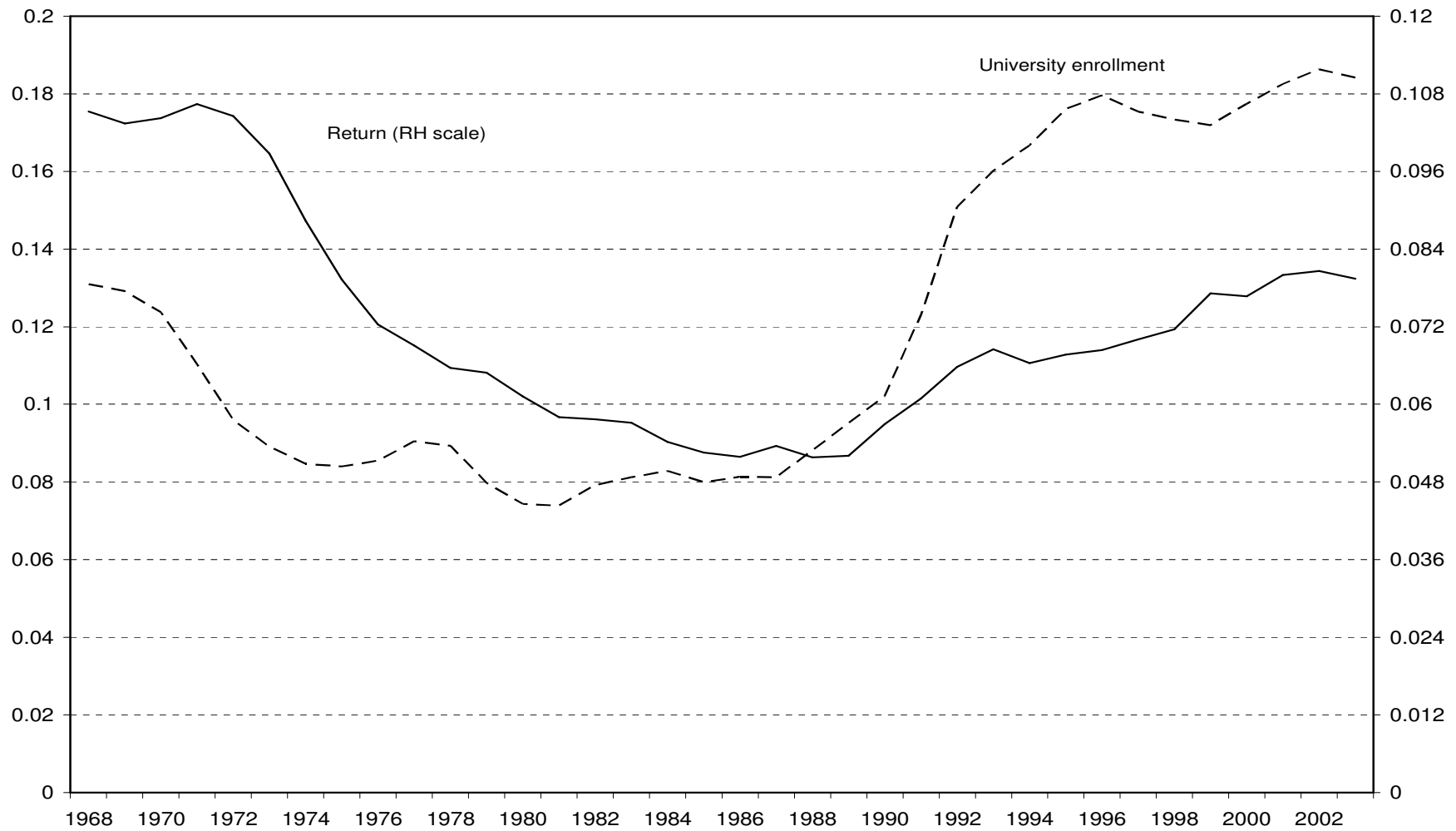
Rising Returns: Implications for Social Policy

- Rising returns → increased scarcity of skills
- Social policies that combat inequality may exacerbate the problem
 - Artificial compression of wage distribution
 - Tax policies
 - Income redistribution in all forms
- Paradox: Public expenditure as “2nd Best” solution to encourage investment
 - Sweden & Australia are extreme examples: pay students to remain in college

Wage Compression & College Attendance in Sweden

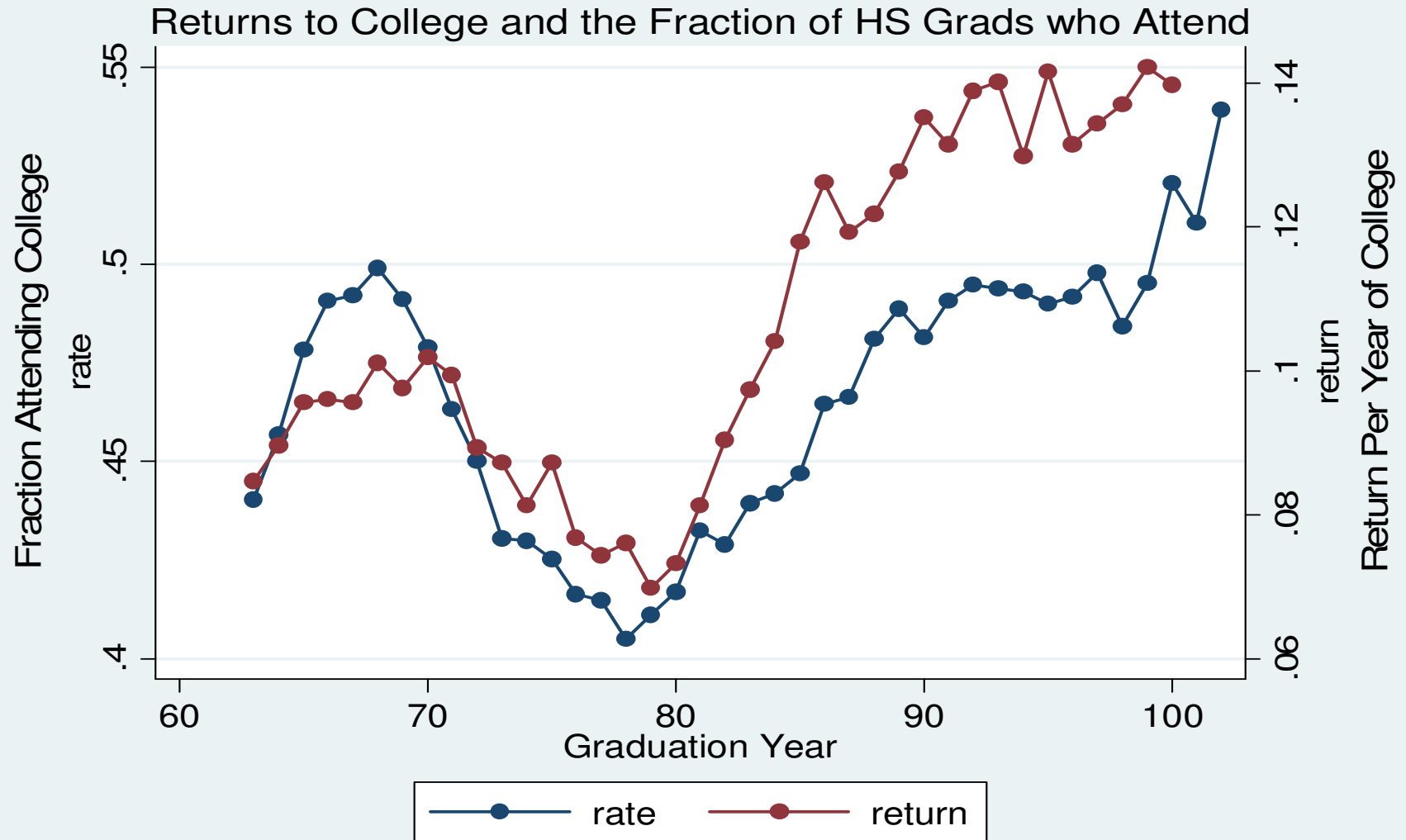
- From 1970 to 1989, returns to college fell from 10 percent per year to about 5 percent
- The fraction of college-age youth attending college fell from 13 percent to 8 percent
- From 1990, the returns increased to 8 percent, and enrollment rebounded

Sweden: Wage Compression, Returns & College Enrollment 1968-2003



United States

Returns & College Attendance 1963-2002



Educational Externalities

- Private returns as a benchmark
 - E.g. if private (Mincerian) return to a year of schooling is (say) 10%, does the social return exceed 10%--that is, does society benefit more (or less) than the individual?
- What are the sources of social returns?
- How could we measure them?
- Focus here: productivity and income

Sources of Externalities

- Higher level of productivity
 - E.g. Lucas (1988)—productive ideas from social interactions (outside of firms)
 - Productivity of cities
 - *Growth* of education leads to growth in output
 - Growth effect exceeds private return—more educated societies are richer
- Higher growth of productivity
 - Education as producer of ideas
 - *Level* of education leads to growth of output—more educated societies grow faster

Growth Accounting and Social Returns

- Economists have collected data on measures of national income and productivity over long periods (50+ years) and for many countries
- Similar data on educational attainment of the population and of demographic groups
- What is the connection of rising educational levels on per-capita income, productivity and economic growth
- Empirical Question: Is the impact of schooling on national average productivity larger than it's impact on individual productivity?

Schooling and Growth

- Data on over 100 countries, 30 years
- Change in education related to change in productivity
- “Social” rate of return about 10 percent
 - Somewhat higher than private returns for the period studied
- So some evidence consistent with social > private
- But many confounding factors correlated with rising education and income

Alternative Approach: States and Cities

- Will I earn more by living in an area where others are more educated?
- That is, does the education of others raise my productivity?
- “Tested” by asking if both an individual’s education and the average schooling in the area raise wages.
- Estimates of this “social” effect are all over the map
- Experiment is confounded by the tendency of more able people to locate in similar areas
- Looks like a “social return” even if there is none

Education and Growth of States

- Relative growth of U.S. states—pattern of convergence
- Two issues
 - Has growth in education contributed to economic growth of states? (Yes)
 - Has growth of education produced “spillovers” that raised total productivity by more than the private returns to schooling? (Maybe)

Figure 1-a: Level and Growth of Wages

Log Weekly Wages, 1940-2000

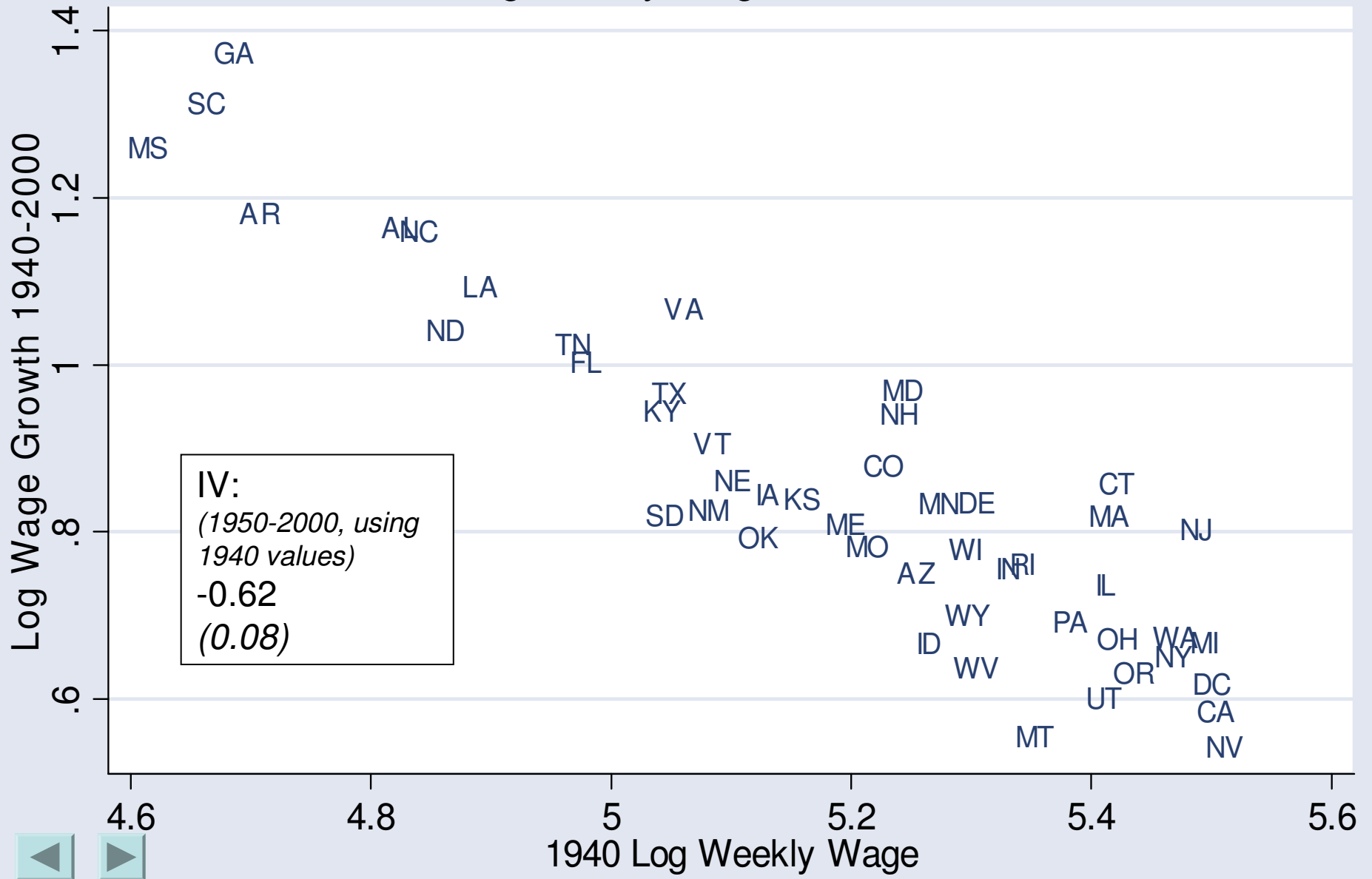
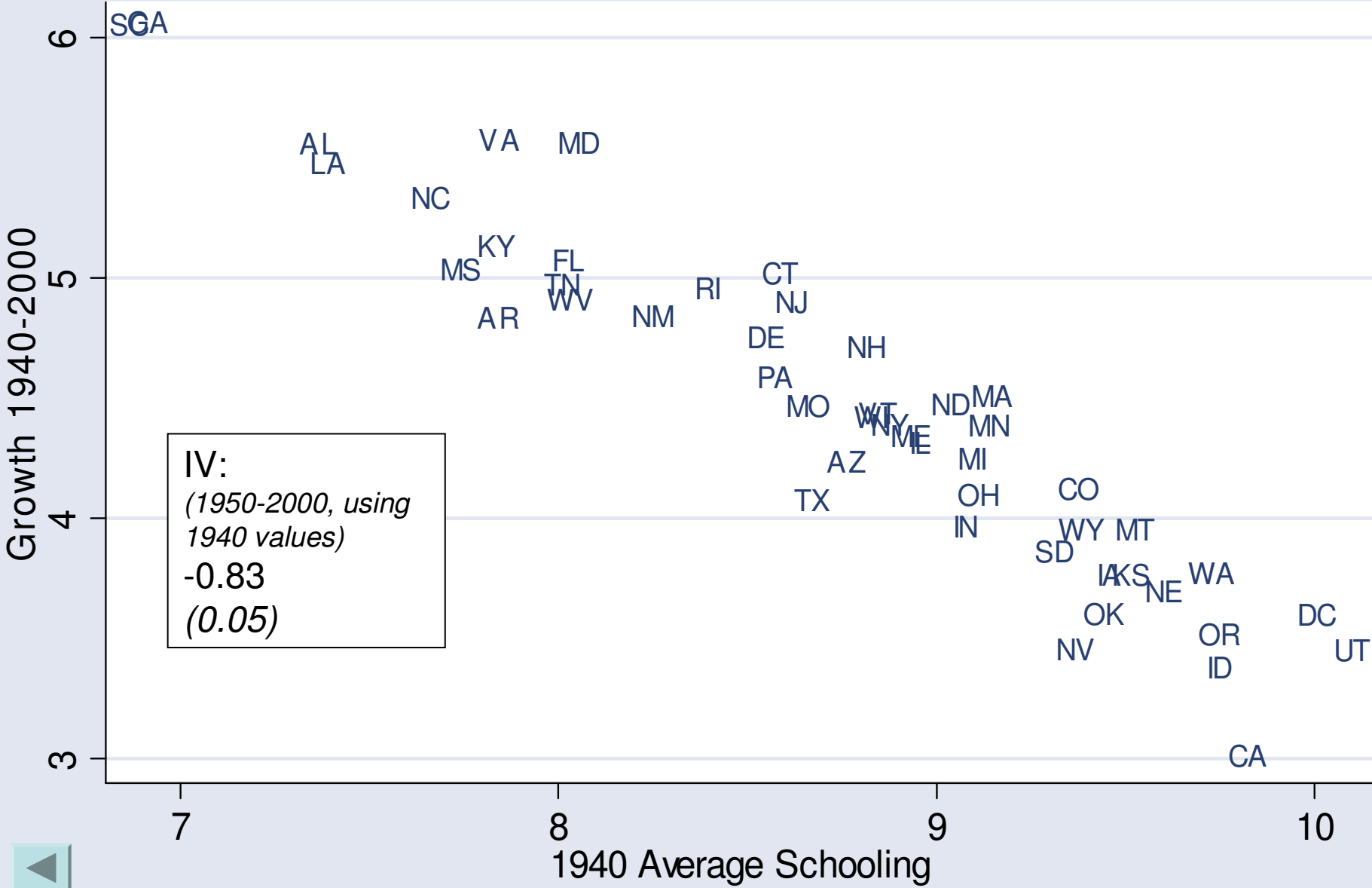
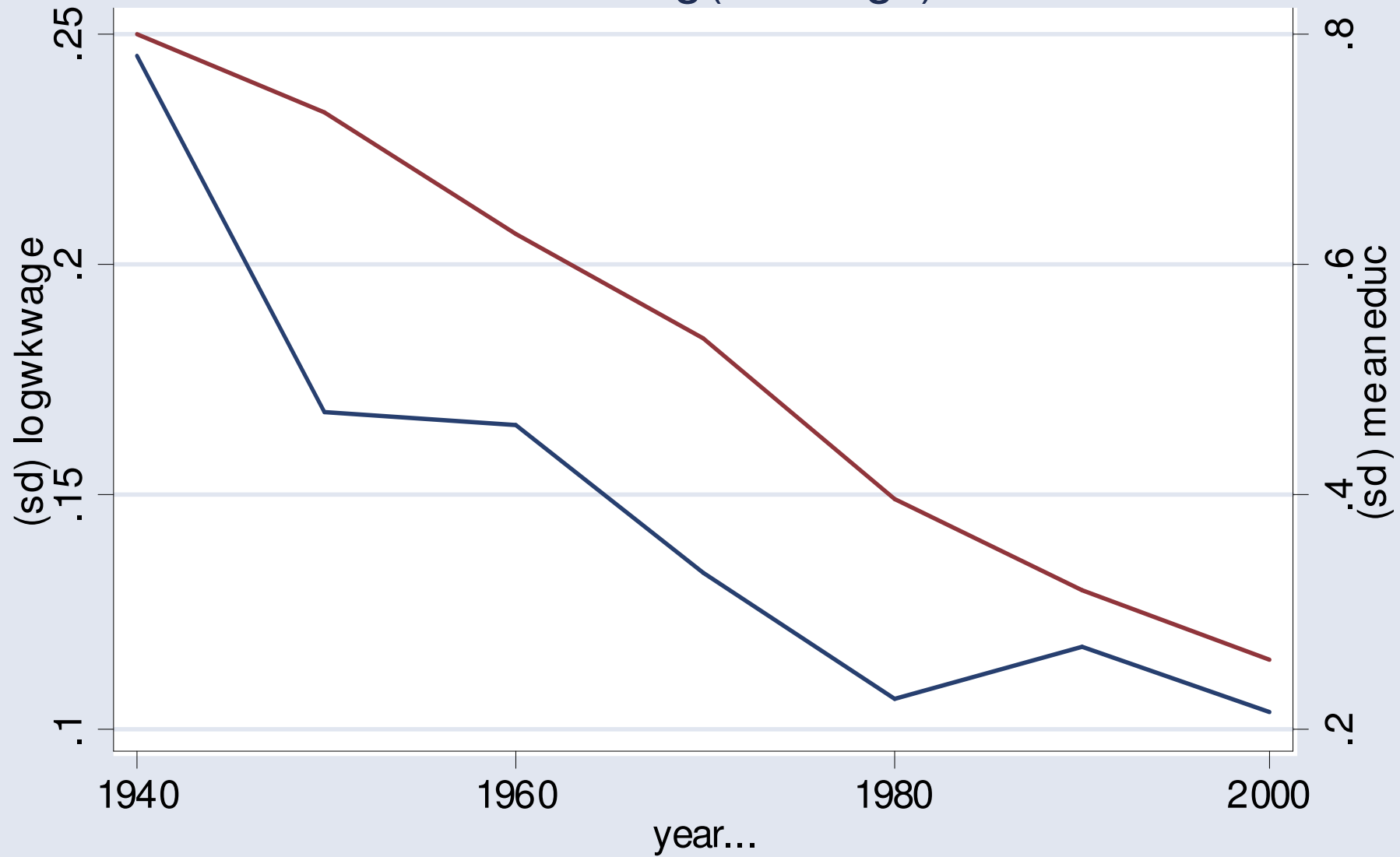


Figure 1-b: Level and Growth of Schooling
 Average Years, 1940-2000



Standard Deviation of log(earnings) and Education



(sd) logkwage (sd) meaneduc

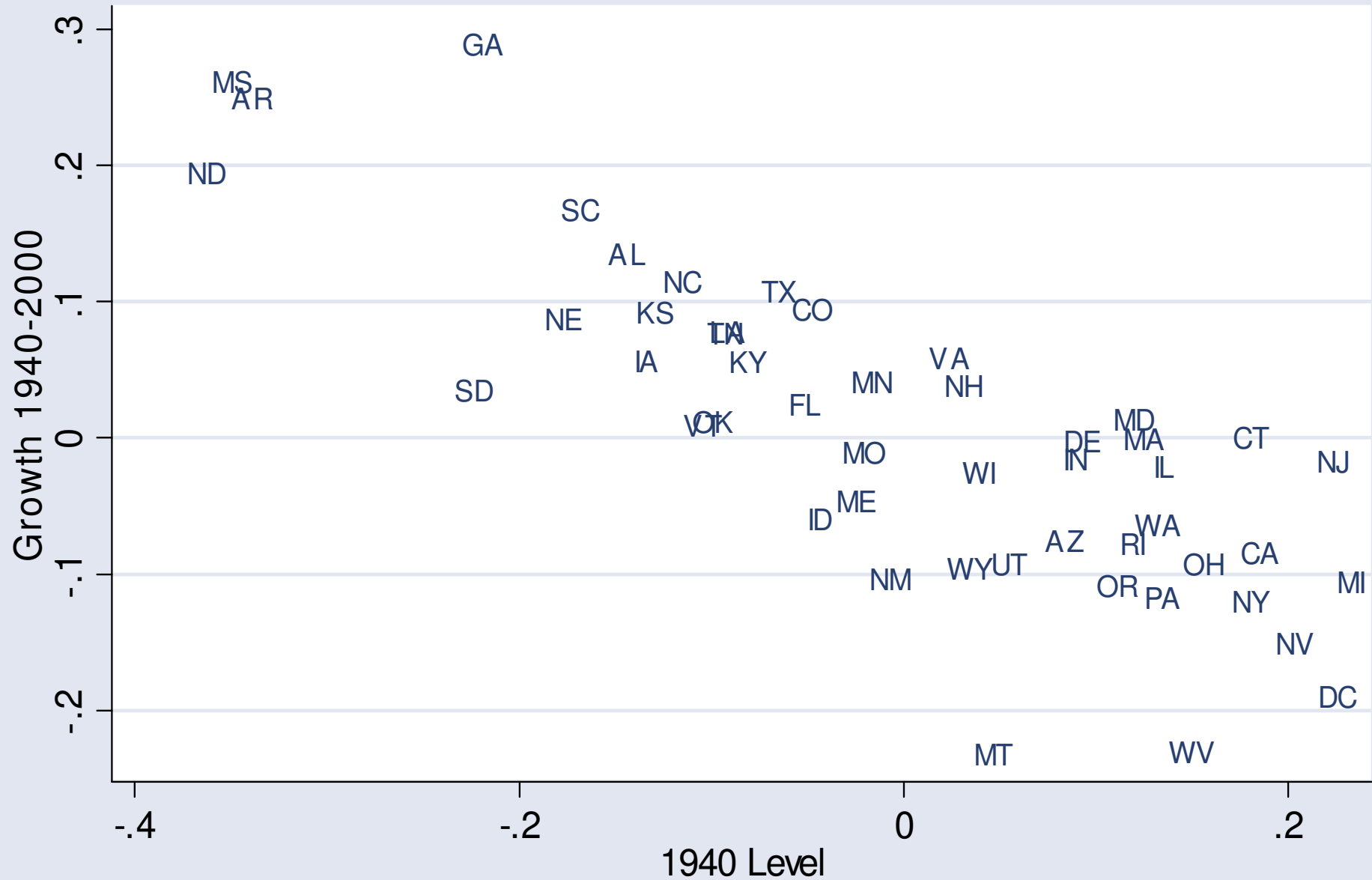


Figure 1-c: Growth in Wages and Schooling

Log Weekly Wages and Average Years of Schooling, 1940-2000



Figure 2-a: Level and Growth of TFP
Estimated State Specific Productivity, 1940-2000



Interpretation of the Evidence

- Data *suggest* that education “drives” growth, and that social return substantially exceeds the private return
- Yet growth in education may be correlated with other, unmeasured, factors that contribute to productivity
 - Unobserved talent
 - Changes in demand for skills
 - Quality of education

Deeper Look at the Data

- Isolate *Total Factor Productivity* as local effect on wages
- Control for environmental factors affecting “skills” of workers using state of birth
 - Controls for differences in skills or quality by birth state and cohort

Figure 2-c: Growth in Skills and Schooling

Growth in Estimated Skills and Mean Years of Schooling, 1940-2000

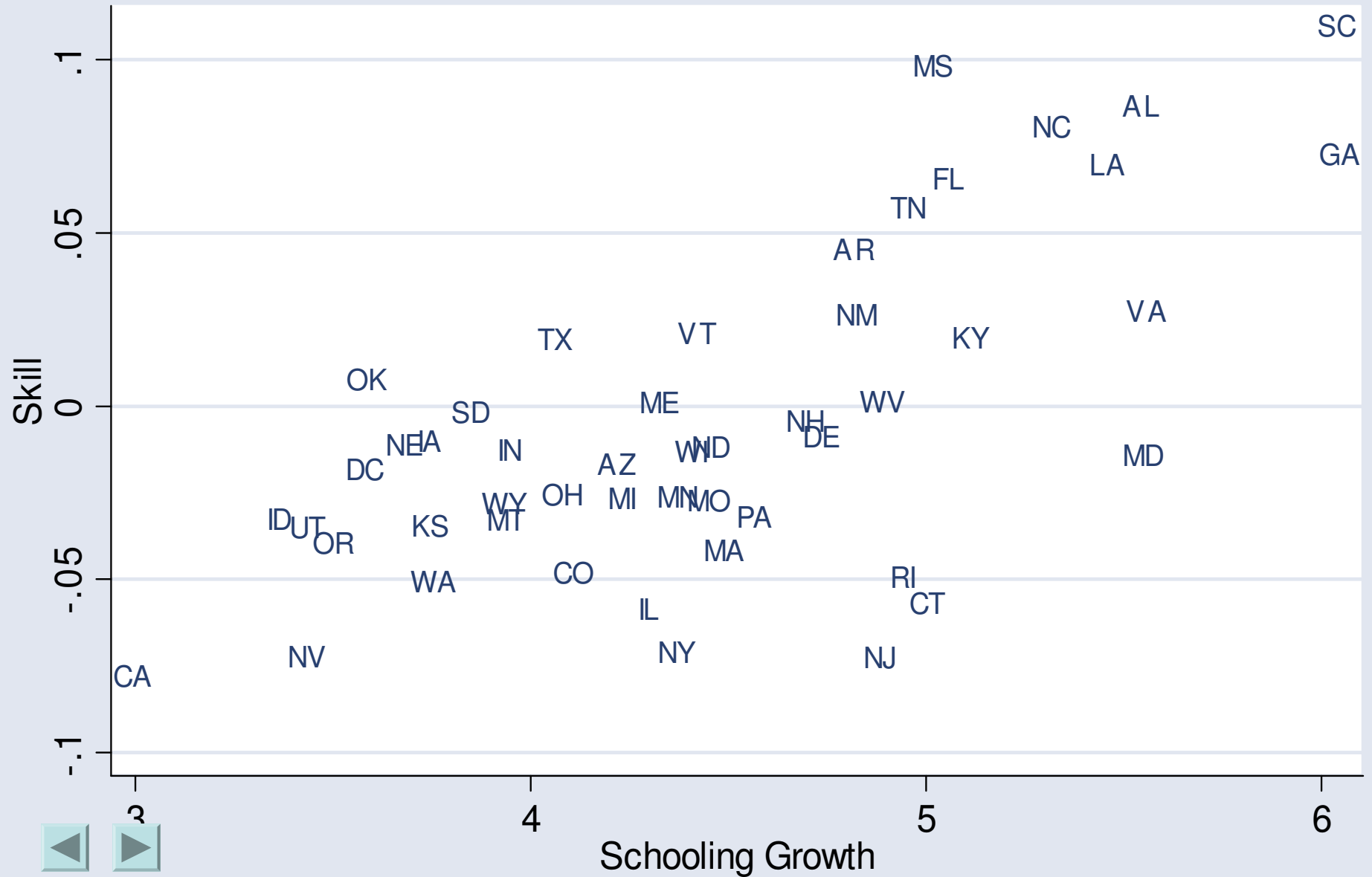
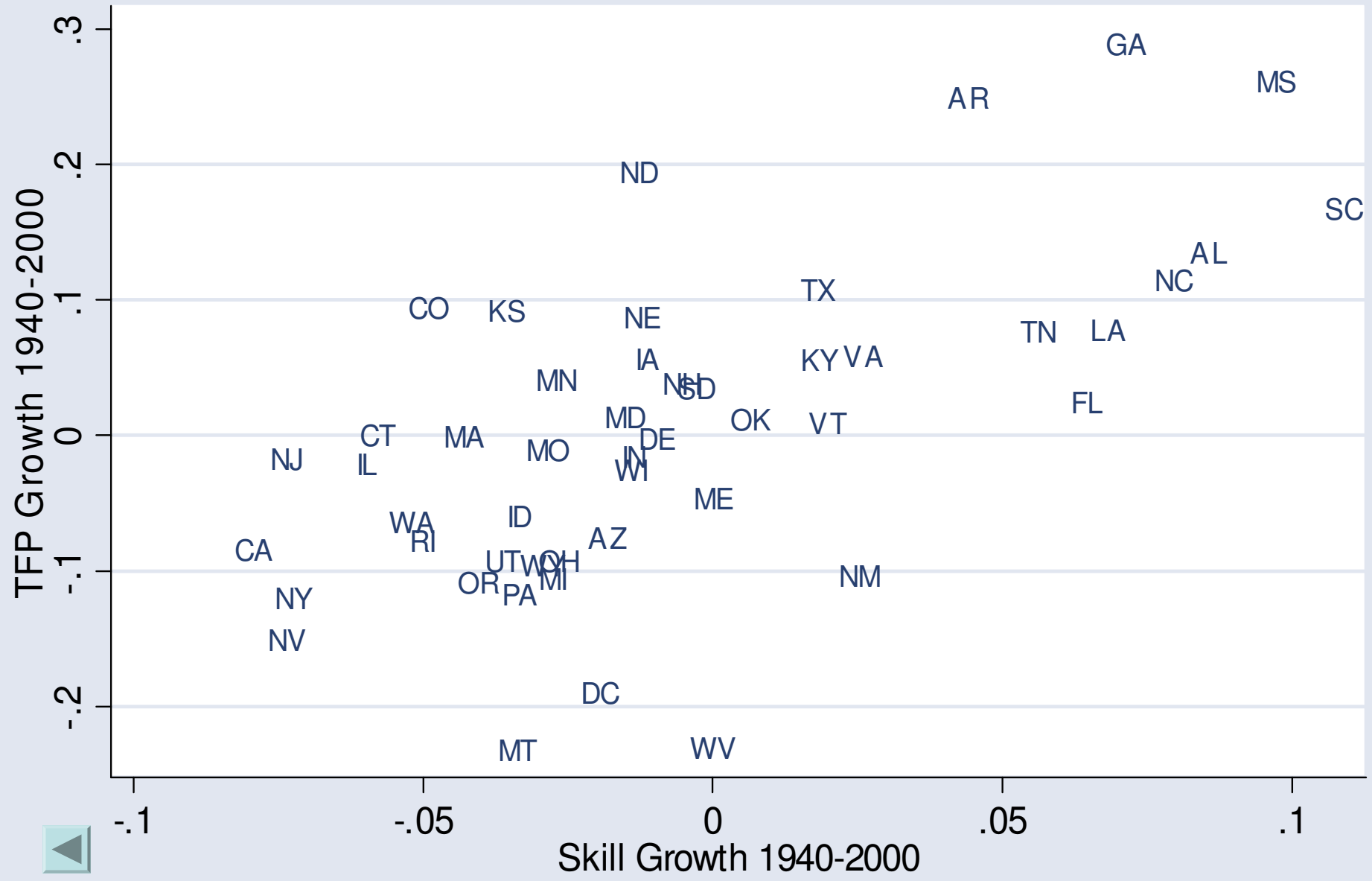


Figure 2-d: Growth in Skills and Local TFP

Growth in Estimated Skills and State Specific Productivity, 1940-2000



Basic Finding

- Effect of raising educational growth is in the range of .08 per year of average schooling
- Consistent with private returns, but not materially greater
- Evidence that social returns as measured by total factor productivity exceed private returns is weak

Social Returns to Schooling: Where Do We Stand?

- Evidence for “excess” social returns is, at best, mixed
 - Impact of education on TFP is greatly reduced when growth of other skills is accounted for
- But evidence does indicate that social returns in economic growth are at least as large as private ones
 - Important contributor to convergence in incomes and welfare