

Inequality, Too Much of a Good Thing

by

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## Inequality, Too Much of a Good Thing

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As the title of this essay suggests, I believe there are both positive and negative effects of inequality. On the positive side, differential rewards provide incentives for individuals to work hard, invest and innovate. On the negative side, differences in rewards that are unrelated to productivity – due to racial discrimination, for example – are corrosive to civil society and cause resources to be misallocated. Even if discrimination did not exist, however, income inequality would be problematic in a democratic society if those who are privileged use their economic muscle to curry favor in the political arena and thereby secure monopoly rents or other advantages. Moreover, for several reasons discussed in the next section, poverty and income inequality create negative externalities. Consequently, it can be in the interest of the wealthy as well as the poor to raise the incomes of the poor, especially by using education and training as a means for redistribution.

The term inequality is often used rather loosely, and can be a lightning rod.<sup>2</sup> Some have argued that only extreme poverty is a concern. Others have argued that the gap in income or wealth between the well off and the poor is a concern. Yet others have argued that the rapid growth in income disparity between the richest of the rich and everyone else is an issue. I will argue that, for various reasons elaborated below, all of these forms of inequality are of concern to contemporary American society, and that America has reached a point where, on the margin, efficiently redistributing income from rich to poor is in the nation's interest.

A theme of my contribution to this debate is that societies must strike a *balance* between the beneficial incentive effects of inequality and the harmful welfare-decreasing effects of inequality. The optimal balance will differ across societies and time, but too much inequality can be harmful in any society, just like too much equality can suppress innovation and drive. Evidence presented below suggests that expanding education and training programs for less skilled workers could be an effective component of a strategy to restore a better balance.

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<sup>2</sup> Indeed, I am on record in the *Wall Street Journal* (January 24, 1995) as preferring the term “dispersion” over “inequality”. But, in the spirit of this debate, I will use the term inequality. See Atkinson (1983) for a thoughtful discussion of alternative meanings of inequality.

## 1. Trends in Inequality

To put income disparities in the United States in perspective, Figure 1 reports the average hourly wage at the 10<sup>th</sup> percentile, 30<sup>th</sup> percentile, 50<sup>th</sup> percentile, 70<sup>th</sup> percentile and 90<sup>th</sup> percentile of the wage distribution. Wages have been converted to constant 2000 dollars using the new “research series” Consumer Price Index (CPI-RS). Real wages for workers at the 10<sup>th</sup> percentile of the distribution grew by 8.6 percent from 1973 to 1979, declined by 14 percent from 1979 to 1989, held steady from 1989 to 1995, and grew an impressive 14 percent when the economy heated up and the minimum wage increased in the second half of the 1990s. When the dust settled, the worker at the 10<sup>th</sup> percentile of the wage distribution in 2001 earned 4 cents *less* per hour than a similarly situated worker in 1979.

Workers in the middle of the wage distribution did not experience much wage growth either in the 1980s, but at least avoided the sharp decline in earnings endured by the lowest wage earners in that period. From 1979 to 2001, the median worker’s wage increased by 7 percent, with all of the increase coming after the mid 1990s.

By contrast, workers at the top of the distribution experienced continuous wage growth since the early 1970s. The wage at the 90<sup>th</sup> percentile of the distribution was 23 percent higher in 2001 than it was in 1979.

Measured education and experience account for around a third of wage variability across members of the workforce. Figure 2 shows average male earnings by education level. Those with a college degree or higher fared well in the 1980s, while those with a high school degree or less fared badly. Indeed, workers with a high school degree or less saw a near continuous decline in their earning power since the early 1970s. The average male high school dropout earned \$13.61 per hour in 1973 and \$9.78 in 1999 – a drop of 28 percent. The pay of the average high school graduate fell from \$16.14 in 1973 to \$13.61 in 1999 – a drop of 17 percent. By contrast, workers with an advanced degree earned 20 percent more in 1999 than in 1973.

Wages for women display a similar pattern, though the declines for poorly educated workers are not as steep, probably because increases in work experience partially offset the erosion of their earnings power. Figure 3 shows the ratio of average hourly earnings of workers with a college degree to that of workers with a high school degree, and the ratio of wages of high school graduates to those with less than a high school education. As is well documented, the earnings-education gradient fell in the 1970s, and rose sharply in the 1980s. What is less well known is that the relative earnings advantage for more highly educated workers continued to rise in the 1990s, even as the bottom decile regained much ground. This finding, coupled with evidence summarized in Section 3, suggests that the payoff to increasing the skills of the workforce is at an historically high level.

Wages, of course, miss large disparities in non-labor income, and an individual's well being depends in large part on his or her family's economic situation.<sup>3</sup> Figure 4 shows real annualized family income growth by quintile for the first half and second half of the post-war period. In the first half of the post-World War II period, real family income growth was more evenly distributed and quicker. In the second half of the period, real income growth slowed for all but the high quintile of families. In terms of family living standards, the nation has been growing apart since the 1970s.

The top 20 percent of families amassed 62 percent of total income growth between 1973 and 2000 – with more than half going to the top 5 percent – while the bottom 20 percent accrued only 2 percent of total income growth; the second lowest quintile accrued only 5 percent. The pie grew larger, but hardly any of the increase went to those at the bottom.

What is more, these household survey data probably grossly understate the share of income accruing to the wealthiest households. Piketty and Saez (2001) use income tax data to measure the share of income going to the top fractiles from 1913 to 1998. Their analysis replicates, updates and extends the well-known work of Kuznets (1955). From 1973 to 1998, their data imply that the growth in income of the top 5 percent of tax filers exceeded the overall growth in income (holding the number of tax units constant) by 33 percent – that is, although overall average income grew, the average fell for everyone below the top 5 percent. Fully 94 percent of the growth in average income went to the top one percent. These figures suggest there is substantial underreporting in the incomes of the top families in the household survey data cited earlier.

Figure 5 reproduces Piketty and Saez's graph of the fraction of income reported by the top 1 percent of tax units over the 20<sup>th</sup> century. Contrary to Kuznets's hypothesis that income inequality would follow an inverted-U-shaped pattern over the course of development, the figure reveals a U-shape pattern. Their results turn the Kuznets curve on its head.

As many other authors have observed, they find that inequality fell sharply in the early 1940s, when wage and price controls were imposed during World War II.<sup>4</sup> But how does one account for the fact that high wage earners did not begin to recover until some 30 years after the controls were removed? Piketty and Saez argue that “this pattern of evolution of inequality is indirect evidence that non-market mechanisms such as social norms regarding inequality play an important role in the setting of the level of the high salaries.” Revelations about executive compensation at companies like Enron, WorldCom and Adelphia – as well as academic studies of executive compensation such as Bertrand and Mullainathan (2001) -- would not contradict that conclusion.

Evidence on the extreme low end of the distribution also suffers from reporting problems, but points to little progress or a deteriorating situation over the last 30 years, especially

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<sup>3</sup> Hamermesh (1999) and Pierce (2001) find that accounting for non-monetary fringe benefits and working conditions, such as health insurance, exacerbate the real declines in wages experienced by workers at the bottom.

<sup>4</sup> See, e.g., Thurow (1975), Williamson and Lindert (1980) and Goldin and Margo (1992).

for children. Despite declining for six consecutive years, the poverty rate, for example, was no lower in 2000 than in the early 1970s. Throughout the 1990s, the poverty rate averaged 20 percent for all children; it averaged 42 percent for Black children in the 1990s. It is true that the poverty rate for Black children exceeded 50 percent in the mid 1960s – so progress has been made – but hardly anyone would argue that there is not room for much more progress. It is certainly possible that many low-income families have unreported income which would make their situation look less dire. On the other hand, Ehrenreich (2001) provides much anecdotal evidence of hidden costs borne by the poor. Examples include low-wage workers who live in their cars or rundown hotels because they could not afford the deposit for an apartment, which would be cheaper by the month, and who have higher costs of food because they lack a kitchen in which to prepare or store their own meals.

Using the United States' poverty line as the standard in all countries (in Purchasing Power Parity dollars), Smeeding, Rainwater and Burtless (2001) find that 15.7 percent of the population was in poverty in the United States in 1994 and 1995, compared with only 9.9 percent in France, 7.4 percent in Canada, 7.3 percent in Germany, 6.3 percent in Sweden and 4.3 percent in Norway. All of these countries had GDP per capita ranging from 68 to 82 percent as large as the United States. Going even further than I would in criticizing inequality, they conclude, "The supposed efficiency advantages of high inequality have not accrued to low-income residents of the United States, at least so far."

Jan Pen (1971) famously described the income distribution as a parade, in which each person in the economy passed by in the span of an hour ranked by height, with the heights of the marchers corresponding to their incomes. The average income in the economy was set equal to the average height of the marchers. Those at the end of the line would be so tall that "their heads disappear into the clouds," Pen explained. The heads of those at the end of the procession today would be reaching even further up in the stratosphere than when Pen applied his analogy.

Figure 6, reproduced from Wolff (2002), shows the even greater imbalances in wealth than income. The top 1 percent of wealth holders own 34 percent of the nation's wealth in the United States, but only 20 percent in Sweden and the U.K. Moreover, the United States had a more equal wealth distribution than Sweden and the U.K. until the 1940s.

Intergenerational correlations in income also reveal that the United States has less mobility in income across generations than most other countries. Solon (2002), for example, reviews evidence indicating that the correlation between fathers' and sons' earnings is 0.40 or higher in the United States, .23 in Canada, 0.34 in Germany, and 0.28 in Sweden. Only South Africa – still scarred by apartheid – and the United Kingdom have close to as much immobility across generations as the United States.

Probably because of greater inequality in both income and school quality, the United States has wider inequality in cognitive performance than other high-income countries. According to the International Adult Literacy Survey, the United States ranked 19<sup>th</sup> among 21 high-income countries when all countries were compared at the 10<sup>th</sup> percentile

of the distribution on the prose literacy scale. The United States ranked 8<sup>th</sup> at the median and 3<sup>rd</sup> at the 85<sup>th</sup> and 90<sup>th</sup> percentile.<sup>5</sup>

These statistics paint a picture in which the United States has become a more polarized and static society; one in which children have become comparatively more disadvantaged. For the main, these facts are not in dispute. As James Heckman is quoted as saying, “Never has the accident of birth mattered more. If I am born to educated, supportive parents, my chances of doing well are totally different than if I were born to a single parent or abusive parents.”<sup>6</sup> The question is whether society collectively feels something should be done about such inequality, and whether education and training should be part of the solution. These are the questions addressed in the next sections.

## 2. Why Care About Rising Inequality?

Philosophers have argued about income inequality and social justice for centuries. I will sidestep most of that debate. Below is a thumbnail sketch of arguments why I think it is in our interest for public policy to try to restore a more balanced distribution of income in the United States. Because such a conclusion fundamentally rests on one’s values as well as an empirical view of the world, I will touch lightly on these arguments.<sup>7</sup> Suffice it to say that I hope there are enough arguments here to persuade the reader that it is worth considering using education and training as part of an overall strategy to reduce income inequality in America.

- *Philosophy.* As Atkinson (1983) observes, “different principles of justice lead to quite different views about inequality.” Principles of justice provide guidelines for society’s welfare function, and with a welfare function economists could judge the distribution of inequality against the optimal level. The rub, of course, is that the welfare function is not observable and depends on philosophical arguments that are not testable. In addition, one has the “Arrow Impossibility Theorem” to contend with. Consequently, appealing to philosophical arguments can never be universally dispositive.

Principles of social justice could be divided into those that focus on fair exchange starting from a just distribution of endowments, and those that focus on the equality of outcomes.<sup>8</sup> Rawls invites readers to arrive at a theory of justice by selecting the principles they would desire if they were choosing such principles in an original position behind a veil of

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<sup>5</sup> See “The Twin Challenges of Mediocrity and Inequality: Literacy in the U.S. from an International Perspective,” February 2002, The Educational Testing Service, Policy Information Report.

<sup>6</sup> Quoted in Alexander Stille, “Grounded by an Income Gap,” *New York Times*, December 15, 2001, p. A17.

<sup>7</sup> Jencks (2002), which I was unaware of when the first draft of this paper was written, reviews empirical evidence the effects of inequality. He concludes: “My bottom line is that the social consequences of economic inequality are sometimes negative, sometimes neutral, but seldom positive. The case for inequality seems to rest entirely on the claim that it promotes efficiency, and the evidence for that claim is thin.”

<sup>8</sup> Sen (1973) draws a useful distinction between assessing the actual income distribution relative to the distribution according to needs, or some concept of desert.

ignorance, unaware of their standing in society or initial endowment of talents. He argues that in this case the social justice that would be desired would involve two principles: one protecting liberties and the other providing for an egalitarian distribution of opportunities and material goods. This leads him to a maximin welfare function where the well being of the worst off in society should be as high as possible.<sup>9</sup>

Interestingly, Adam Smith arrived at a somewhat similar conclusion nearly 200 years earlier, positing, “No society can surely be flourishing and happy, of which the far greater part of the members are poor and miserable. It is but equity, besides, that they who feed, clothe and lodge the whole body of the people, should have such a share of the produce of their own labour as to be themselves tolerably well fed, clothed and lodged.”

Nozick (1974) questions whether a theory of justice can be based on the distribution of outcomes. Using the analogy of fans who were willing to pay a fee to watch Wilt Chamberlain, Nozick argues that “no end-state principle or distributional patterned principle of justice can be continuously realized without continuous interference with people’s lives.” Who could complain about Wilt Chamberlain’s exorbitant salary if it results from rational choices?<sup>10</sup> Nozick also raises the issue of adverse incentive effects of Rawls’s theory of justice on the acquisition of talent.

- *Religion.* I would argue that religious beliefs provide as strong (or weak) a justification for views toward society’s implicit welfare function as do philosophical reflections behind a veil of ignorance. Indeed, I would go further and say that religious tenets reflect the demand for equality among the public. If people did not adhere to the basic tenets of their religion, they would not practice or would eventually change faiths. Thus, long-standing religious views toward inequality provide something of a revealed preference argument. And on inequality, the major religions are united in favoring redistribution toward the poor.

Robert Nelson (1991), for example, observes, “Roman Catholicism has traditionally instilled a strong concern for the poor; in the Middle Ages the church itself provided much of the care for the indigent. The welfare state today similarly accomplishes substantial internal redistribution with the approval of many of the wealthier contributing members of the community.”

The Jewish *Siddur* advises followers to, “Be just to the poor and the orphan; Deal righteously with the afflicted and the destitute” and comments, “Happy are they who are thoughtful of the needy; In time of trouble may the Lord Keep them from harm.”

And the Koran criticizes the egoism of the rich inhabitants of Mecca and urges believers in Islam to support poor people, orphans, and captives. Islam requires five major

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<sup>9</sup> Others have reached an expected utility maximization welfare function as a result of the same reflection.

<sup>10</sup> A problem with this view arises if Wilt is highly paid in large part because basketball team owners lobby for public subsidies to build lavish stadiums, which raises Wilt’s marginal product. But this was less common in 1974 than today.

obligations of its followers, including *zakat*, an obligatory contribution to the needy (which today is implemented in the form of a tax).

- *Enlightened Self Interest*. Another line of argument for achieving and maintaining a minimum level of equality rests on self-interest. If wide disparities in income or education create negative externalities for a majority of people, then it clearly is in members of society's self interest to reduce inequality. Individuals acting on their individual preferences (e.g., paying to see Shaquille O'Neal play) will not internalize these externalities. What might such externalities be? An incomplete list would involve the following.

(1) More educated voters make the democratic process work better. First, people with more education are more likely to be informed and more likely to participate in democracy. Second, more informed citizens are likely (though not guaranteed) to make better decisions. For the latter reason, even a devout defender of free markets like Milton Friedman (1982) supported a minimum compulsory level of education.

(2) Available evidence suggests a link between crime and inequality (e.g., Ehrlich, 1973, Freeman, 1983 and 1995, and Imrohorglu, Merlo and Rupert, 2001). Other things being equal, the incentive for those with limited market opportunities to commit property crimes rises as inequality increases. From the criminal's perspective, the potential gain from crime is higher if inequality is higher, and the opportunity cost is lower. Society can devote more resources to crime prevention and incarceration, or to reducing inequality.

(3) Another type of externality arises precisely because society is not willing to allow citizens to be totally destitute, to fall below some minimum level of basic consumption when it comes to food or healthcare (see, e.g., Pauly, 1971). By providing those likely to have low incomes with skills, and therefore raising their future earnings, society can reduce the cost of providing transfer payments later on. Bruce and Waldman (1991) show that in the case of the "Samaritan's dilemma," it may be in society's best interest to make transfers in kind – e.g., through education – rather than in cash to avoid a moral hazard problem on the part of the recipient.

(4) Nelson and Phelps (1966) and Romer (1990) model the level of education as generating positive externalities for economic growth, although empirical support for this model is mixed (see Krueger and Lindahl, 2001).

- *Low Wages, Imperfect Monitoring and Public Safety*. In an advanced economy, people are connected via markets in a myriad of ways. Monitoring performance is imperfect. If an employee performs poorly because he or she feels poorly compensated, others may suffer. The tragic events of September 11<sup>th</sup>, for example, highlighted the importance of paying baggage screeners better wages.

- More generally, market failures could lead the distribution of income to be suboptimal. Credit constraints, for example, might prevent children from poor families from investing



adequately in education.<sup>11</sup> Monopsony power on the part employers might enable firms to pay workers less than the value of their marginal products. Statistical discrimination may lead to lower than optimal investment in education for discriminated-against groups (e.g., Lundberg and Startz, 1983).

- *Efficient Policy Changes.* Another type of externality could arise in the political arena if income inequality is viewed as excessive. As an example, take treaties to reduce international trade barriers. Such a policy undoubtedly would increase national income. However, there are winners and losers from such a policy. If some segments of society feel that they have not benefited from developments in the economy, then they are unlikely to support efforts to reduce trade barriers. I am not talking about just the losers, who are usually few in number and concentrated in a handful of industries. Instead, views toward free trade seem to be class related. For example, Blendon, et al. (1997) find that 72 percent of those with less than a college education say one reason the economy is not doing better is because, “Companies are sending jobs overseas,” while only 53 percent of college graduates agree with the same statement and just 6 percent of American Economic Association members. Less educated people are also less likely to respond that trade agreements are good for the economy. I suspect that one reason Presidents Bush and Clinton had difficulty securing fast track authority is because large segments of the public perceive that they would lose from free trade, an inference that they draw because they have seen their real incomes stagnate or decline over the last 20 years while trade expanded. Although I suspect trade has had little to do with rising wage inequality, it is understandable why so many people would draw such an inference.

Unless the public perceives that they benefit from more efficient policies, there is little reason to suspect they will support such policies – and with 94 percent of income growth accruing to the top 1 percent since 1973, it is understandable why the public might be a little skeptical that they gained from past changes such as expanded trade.

- *Money Buys Influence.* Economists at least since Adam Smith have fretted that wealthy merchants and manufacturers would be led by self interest to seek government regulation and privilege to protect their monopoly position, thereby preventing the invisible hand from working its magic. One need look no further than the formation of the Bush administration’s energy bill to see the relevance of this concern. Money buys access and influence in politics. It also buys influence through think tanks. A negative consequence of the skewed distribution of income is that some individuals have much more political influence than others.

Benabou (2000) develops a formal model in which the progressivity of educational funding and taxation is endogenous. He shows that the political influence of the wealthy interacts with income inequality to block efficient progressive policies, or impose inefficient regressive ones. When inequality is high, the wealthy are more likely to block

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<sup>11</sup> Benabou (2002) analyzes a model in which credit constraints prevent optimal investment. Not surprisingly, subsidized education improves efficiency and enhances growth in these models. His calibrated simulations suggest that the beneficial effects of relaxing credit constraints exceed the corresponding tax-induced distortions. Evidence on credit constraints is discussed below.

*efficiency enhancing* programs that would improve educational opportunities for the less well off.

- *Growth and Inequality.* Persson and Tabellini (1994) develop a model of economic growth in which inequality negatively influences growth through the political process. In their model, inequality leads to policies that do not protect property rights and therefore do not allow full private appropriation of the returns from investment. A growing body of cross-country and cross-state studies have estimated the relationship between initial inequality and subsequent GDP growth.<sup>12</sup> Although attributing causality is difficult in these studies, the correlation between inequality and growth is negative, conditional on variables like initial GDP per capita and average education. Two-stage least squares estimates that instrument for inequality with variables such as initial literacy and infant mortality also show an inverse relationship between GDP growth and inequality.

- *Health and Inequality.* One common argument I will *not* make concerns health and inequality. Wilkenson (1996), for example, argues that average health is negatively affected by the societal level of income inequality. The evidence in support of this view, however, is far from compelling (see, e.g., Smith, 1999 and Deaton, 2001), although Eibner and Evans (2002) provide evidence that relative deprivation affects health, and a large body of evidence finds that a person's own income level is related to his or her health.

- *Winner Take All Inefficiency in Superstar Markets.* Frank and Cook (1996) argue that technological changes have facilitated a shift to superstar markets in many top-paying professions. The reward for finishing first is much greater than the reward received by the "also rans." They lament that this shift is inefficient and inequitable, causing too many students to pursue careers in law, finance, and consulting at the expense of more socially beneficial fields such as engineering, manufacturing, civil service, and teaching. The winner-take-all society may create the same type of misallocation of talent that Murphy, Shleifer, and Vishny (1991) attribute to rent seeking. To some extent, inequality probably leads to legions of tax lawyers and lobbyist who look for ways to help wealthy clients avoid taxation. Cook and Frank believe that superstar markets have led to inefficient investment and wasteful competition. While I think we are at little risk of becoming a nation of Tonya Hardings, there may be something to the argument that superstar salaries provide perverse incentives and unnecessary competition in some sectors, and divert some workers from pursuing more socially rewarding careers.

- Last but not least, I would surmise that a majority of the public demands a certain amount of equality, and is particularly supportive of using education and training to achieve more equality of outcomes.

A survey of 1,001 adults by Lake, Snell, Perry & Associates in July 2000 asked, "I am going to read some different ways the government can help poor Americans find and keep good jobs. For each, please tell me if you strongly support, somewhat support,

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<sup>12</sup> Early papers are Persson and Tabellini (1994) and Alesina and Rodrik (1994). See Benabou (1996) for a survey of the empirical and theoretical literatures.

somewhat oppose, or strongly oppose this idea.” Fully 90 percent supported “Helping to pay for education and job training for people leaving welfare.”

A Gallup Poll sponsored by General Motors asked a free form question in May 1998, “Just your opinion, in what ways do you think the government should help the poor?” By far, the top two responses were better/more affordable education (38 percent) and provide job training/skills training (29 percent). The next highest response was more jobs/job opportunities, at 16 percent. Only 5 percent said lower taxes.

Even when given an explicit choice of lower taxes, the public prefers education and training. A CBS News Poll in September 1999, for example, asked 1,376 respondents, “Which comes closer to your view? Government should provide tools to help families better their lives, such as education and job training programs. The best thing that government can do for families is to cut taxes and allow individual families to decide for themselves how to allocate their money.” Fifty-five percent of respondents said “government should help families,” and 42 percent said “government should cut taxes.”

### *Wrapping Up*

In supporting minimum schooling, Milton Friedman argued, “A stable and democratic society is impossible without a minimum degree of literacy and knowledge on the part of most citizens and without widespread acceptance of some common set of values.” I would argue that inequality could grow so extreme that it eventually jeopardizes any type of “widespread acceptance” of a democratic capitalist society that might be established. This leads me to agree with Victor Fuchs, “For me the key word is *balance*, both in the goals that we set and in the institutions that we nourish in order to pursue these goals. I value freedom *and* justice *and* efficiency, and economics tells me that I may have to give up a little of one goal to insure the partial achievement of others.”

### **3. Targeted Education and Training – Part of the Solution**

In a perfect world, children from all families would invest in educational resources up to the point that their marginal return equals their discount rate, and all families would have equal access to credit. The evidence suggests that education decisions are not made in a perfect world, however. Children from poor families *behave* as if they have higher discount rates. The most plausible explanations for this phenomenon are that poor families are credit constrained (i.e., cannot borrow at the same rate as everyone else), or that they discount future benefits of human capital investments at a greater than market rate because they are impatient, have a greater disutility of schooling, or fail to appreciate the benefits of education. Credit constraints have received the most attention in the literature because students cannot easily use the return on their future human capital as collateral. This may be a reason for discount rates to vary. Poor families face different borrowing costs than rich ones.

The following five observations are consistent with the view that low-income families face credit constraints when it comes to education. First, Kane and Ellwood (2000) find that when the return to college education increased in the 1980s, four-year college enrollment increased for children from all quartiles of the income distribution, except the bottom one. Second, Behrman and Taubman (1990) find that the timing of parental income matters for children's educational attainment. Using data from the PSID, they find that father's income earned when children are teenagers has a stronger effect on children's educational attainment than income earned later on. Third, Shea (2000) looks at the effect on children's human capital of differences in parental income emanating from noncompetitive factors, such as employment in a high-paying union job or industry. Wage differences for these reasons arguably are independent of parents' ability. He finds that family income matters for children's human capital investment in a sample of low-income families, but not for the broader population. He concludes that these findings are "consistent with models in which credit market imperfections constrain low income households to make suboptimal investments in their children." Fourth, Björklund and Jantti (1997) find stronger family income effects on children's outcomes in the United States than in Sweden, which provides much more generous educational subsidies. Fifth, the reaction of college enrollment to changes in tuition, especially at the two-year-college level, are substantially larger than the reaction of college enrollment to equivalent, present-value changes in the payoff to education (see Kane, 1999).<sup>13</sup>

Although it is possible to construct complicated explanations of the facts that are consistent with equal access to credit – and I suspect part of the association between education and parental income reflects intergenerational transmission of ability and motivation for schooling, as Cameron and Heckman (2001) argue – Occam's razor and common sense suggest that families have different access to credit. For example, some families borrow for college costs by accumulating debt on their credit cards at exorbitant rates, while others tap into their family finances or take out home equity loans that are given tax-preferred treatment.

One does not have to resort to theoretical assumptions or indirect tests of credit constraints, however, to support the view that redistribution via targeted education and training is desirable. *It is clear that returns to education and training are at least as big at the bottom of the income distribution as at the top.* I will present evidence below indicating that the *social return* from investment in education and training for poor children – from infancy through early adulthood – is at least as great as the return from investments in education and training in the general public.

A theme that emerges from my survey of the evidence is that the real rate of return from investment in various education and training programs for the disadvantaged is around 6 to 11 percent. This range applies to a diverse set of programs, ranging from pre-school to Job Corps to conventional K-12 public schools. To put this figure in perspective, note

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<sup>13</sup> It is true that tuition subsidies and government loans are available to many individuals, but such assistance is small compared to the opportunity cost of attending college and probably insufficient to overcome credit constraints. Moreover, such subsidies do not help with credit constraints at the pre-college level.

that the historical real rate of return on the stock market has been calculated at 6.3 percent.<sup>14</sup> So investment in human capital for the disadvantaged seems to yield at least as great a return as investment in the equity market. Also, because there is not currently universal access to most of the educational and training programs considered here, and many willing participants are thus turned away, I would argue that the returns estimated from various evaluations reviewed below would approximately apply if the programs were greatly expanded to accommodate more participants.

The remainder of this section reviews the most compelling evidence available on the payoff from a variety of education and training programs targeted for the disadvantaged, organized in order of the age of the participants. I have tried to focus on evidence from randomized experiments or natural experiments, so that one could be reasonably confident that differences between the participants and nonparticipants are, on average, due to the programs under study, rather than to preexisting, uncontrolled differences between the participants and nonparticipants.<sup>15</sup>

### *3.1 Preschool*

The effects of early education programs on children's life outcomes have been extensively studied by economists and other social scientists. Barnett (1992) and Currie (2001) contain thorough surveys of the literature.

The federally funded Perry Preschool program in Ypsilanti, MI has provided the most influential results in the literature, although I suspect the strength of the results are exaggerated by many proponents. The goal of Perry was to improve the educational outcomes of children in a low-income, Black community, defined by the Perry School area. The "treatment" consisted of attending a half-day preschool program for five days a week plus a 90-minute home visit once a week, both for eight months a year. The student/teacher ratio was 6:1, and all the teachers had master's degrees in child development. The eligible population of students was limited to 3 or 4 year olds whose IQ was one standard deviation or more below the mean and showed no signs of mental retardation or physical handicap. Perry was evaluated with a randomized design: 58 students were assigned to a treatment group that entered Perry Preschool and 65 were assigned to a control group that was denied entry.<sup>16</sup> Five waves of subjects are included

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<sup>14</sup> See Gary Burtless, "Risk and Returns of Stock Market Investments Held in Individual Retirement Accounts," Testimony, Task Force on Social Security Reform, House Budget Committee, May 11, 1999. Burtless based this calculation on the average real rate of return over every 15-year period ending in 1885 through 1998. The return was calculated by assuming that \$1,000 was invested in the composite stock index defined by Standard and Poor's, with quarterly dividends reinvested in the composite index. From a survey of 95 chief financial officers at Fortune 500 companies, Summers (1987) estimates that the median firm applies a very high discount rate -- 15 percent -- to depreciation allowances, and most firms do not discount different cash flow components at different rates. The high discount rate that CFO's say that they use may, however, reflect inflated expectations of future cash flows.

<sup>15</sup> See Heckman and Smith (1995) for an accessible discussion of limitations of social experiments.

<sup>16</sup> There were two exceptions to randomization. First, siblings of children already participating in the study were assigned to the same group as their older sibling. Second, and more important, Barnett notes that "a few working mothers could not participate in the afternoon home visits and their children were shifted to

in the evaluation, entering Perry from 1962 to 1965. In addition to its randomized design, a great advantage of the Perry analysis is that the sample has been followed for a long time, and attrition was low.<sup>17</sup>

Table 1, reproduced from Barnett (1992), summarizes the main findings from evaluations of Perry Preschool. Although the program had only transitory effects on participants IQ scores, it had lasting effects on achievement test scores (at least through age 19), educational attainment, employment, and social outcomes like arrests and teen pregnancies. For example, 67 percent of members of the treatment group graduated from high school, while only 49 percent of the control group had. Thirty-one percent of the treatment group had been arrested, compared to 52 percent of the controls.

Barnett (1992) provides a cost-benefit analysis of Perry Preschool. He estimates that the real social internal rate of return was 8 percent: that is, the present value of the social costs of the program would equal the present value of the social benefits if the discount rate were as high as 8 percent. His estimate uses the results in Table 1, and forecasts benefits after age 19. Barnett (1996) extends this cost-benefit analysis using data on outcomes through age 27, and forecasting benefits thereafter. The estimated benefit due to a reduction in crime and associated costs is much larger in the subsequent analysis, owing primarily to different assumptions about the cost of crime and the number of crimes committed per arrest. He estimates that the social benefits exceed the costs of Perry even if an interest rate of 11 percent is used to discount benefits and costs. At a 5 percent interest rate, social benefits are 5.5 times as great as the costs, although the private benefits to participants are slightly less than the costs. A remarkable two-thirds of the social benefit is due to a reduction in crime and associated costs, but discounted social net benefits are still positive if savings from crime are set to zero.

While the findings from the Perry program suggest a very high rate of return that has persuaded some that preschool is the most (or only?) effective educational intervention for the disadvantaged, the limitations of the cost-benefit analysis are important to bear in mind. Most importantly, many benefits were estimated over future years, and subject to substantial uncertainty.<sup>18</sup>

The Perry program was more time intensive and more expensive than most preschool programs for poor children. Moreover, evaluations of the program are based on a small, geographically limited sample, and the data have not been made publicly available to outside researchers. And there is the possibility that the very fact that Perry was found to be so successful contributed to it having been studied for so long. That is, one needs to be concerned about selection bias -- had the initial results found Perry to be a bust, the program probably would have slipped into obscurity.

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the control group.” This might explain why 33 percent of control group mothers were working at baseline, while only 13 percent of treatment group mothers were working at the same time. This was the only reported baseline characteristic that had a statistically significant difference between the control and treatment groups.

<sup>17</sup> Note, however, that 5 students who were assigned to the treatment group did not complete Perry Preschool because they died or moved away. They appear to have been dropped from the sample.

<sup>18</sup> See Karoly, Greenwood and Everingham, et. al (1998; Figure 3.5) for estimated confidence intervals.

So it is reassuring to note that the weight of the rest of the evidence on preschool programs points in the same direction as Perry, if not always as strongly.<sup>19</sup> Consider the Carolina Abecedarian program.<sup>20</sup> Like Perry, Abecedarian used a random assignment design. The Abecedarian program was even more intensive than Perry, however. At birth, 57 infants were randomly selected to receive center-based child care services emphasizing language development for 8 hours a day, 5 days a week, 50 weeks a year for 5 years. Another 54 infants were randomly assigned to a control group. The teacher/student ratio in the preschool ranged from 1:3 to 1:6, depending on children's age. This phase of the program lasted from age 0 to age 5. The cost per year was \$11,000 in 1999 dollars. The eligible pool of participants was restricted to healthy infants free of conditions associated with mental retardation who were born to low-income families and were likely to remain in the area for several years. Four cohorts of infants born between 1972 and 1977 were included in the study. Only a quarter of the infants lived with both parents at birth, and average maternal education was 10 years and average maternal age at birth was 20. Ninety-eight percent of participants were Black.

The children were studied from infancy until age 21. The follow-up survey at age 15 found that students in the preschool group performed significantly higher on math and reading tests, and had lower grade retention and lower placement in special education classes than control students. The latest follow-up was conducted from 1993 to 1999. 104 of the original 111 subjects participated in the age 21 follow-up. In terms of outcomes, the results were similar to those in Perry: 40 percent of the preschool group were attending school at age 21, compared to 20 percent of the controls, and 35 percent of the preschool group had ever attended a four-year college, compared to 14 percent of the controls. The age at first birth for those with a child was also significantly higher for the preschool group. Unfortunately, a benefit-cost analysis of Abecedarian has not been performed.

Head Start is the government's largest preschool program. Head Start has not been evaluated with random assignment, but Mathematica is in the midst of conducting a random-assignment evaluation of Early Head Start, a program begun in 1995 that extends the Head Start concept to low-income pregnant women and families with infants and toddlers. Early Head Start targets children from age 0 to 3 and their families. Mathematica's interim findings, based on 3,000 families in 17 communities are promising.<sup>21</sup> Participating children performed significantly better on cognitive, language, and social-emotional development assessments than their peers who did not participate. Effect sizes on the Bayley Mental Development Index and MacArthur Communicative Development Index were approximately 0.10-0.15 standard deviations for two-year olds. The program, as intended, also had impacts on aspects of the home environment, including parenting behavior, parents' knowledge of infant-toddler development, and parents' school attendance and job training.

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<sup>19</sup> See Karoly, Greenwood and Everingham, et. al (1998) for an overview of preschool programs.

<sup>20</sup> The information on Abecedarian in this section is drawn from <http://www.fpg.unc.edu/~abc/index.htm>.

<sup>21</sup> The material on Early Head Start is drawn from Love, et al. (2001).

Currie (2001) performs a cost-benefit analysis of Head Start, using estimates of the short- and medium-term benefits and costs of the program. She concludes: “Head Start would pay for itself if it yielded long-term benefits that were even a quarter as large as those of Perry Preschool.”

The evaluations of preschool programs that have been conducted in the past are restricted to specialized, poor populations. There may be heterogeneous effects of the programs. However, there is probably little risk from extrapolating from the effects discussed here to a wider population because just under half of eligible children currently participate in Head Start. Doubling Head Start’s budget to provide universal access to the program is unlikely to materially alter the mix of children who participate.

### *3.2 Elementary and Secondary School*

#### *3.2.1 Summer Time Fadeout*

Studies of over-the-year and over-the-summer learning suggest that public elementary schools serve low-income students better than is commonly appreciated. Table 2 summarizes the findings of Entwisle, Alexander and Olson (1997). The three sociologists have been studying a random sample of 800 students since they entered first grade in one of 20 Baltimore public schools in 1982. At the beginning and end of each school year, students took the California Achievement Test. The researchers examined gains and losses in test scores over the school year and summer break. Students were classified into groups based on their parents’ socioeconomic status, which depended on their education, occupation, and income.

Remarkably, children from high and low socioeconomic-status families made equivalent gains on math and reading exams during the school year. But the achievement level of children from low-income families either fell or stagnated during the summer, while children from higher income families continued to improve.

Children from well off and poor families enter school with a gap in achievement. But the entire rise in the gap subsequently arises from periods when school is out of session. This pattern, which also holds in studies of other data sets (see Cooper, et al., 1996 for a literature review), suggests public schools are doing more to help poor children overcome the obstacles they face in their homes and neighborhoods than is commonly appreciated.

These findings come as no surprise to teachers, who regularly review material in the beginning of the school year that students learned in the previous year. Students from poor families receive less academic enrichment over the summer than do students from more advantaged families. Indeed, a Gallup poll taken in July 2000 even found that children in low-income families are much less likely to read *Harry Potter* over the summer months than are their counterparts in middle- and upper-income families.<sup>22</sup> The problem is that children from low-income families are unlikely to read *Harry Potter* or

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<sup>22</sup> Author’s calculation from data provided by Gallup.



much else during the summer, which causes their skills to atrophy when school is out of session.

I suspect that students from poor families are particularly poorly served by America's comparatively short 180-day school year; they receive little academic enrichment when school is not in session. As a solution to this problem, I have previously proposed giving low-income parents a scholarship, or voucher, to send their children to some type of a summer learning program.

Only 9 percent of students in the U.S. attend summer school. Unlike other voucher programs, summer school vouchers would supplement, rather than substitute for, the public school system.

The 180-day U.S. school year is short by international standards. Japan's school year, for example, runs about 240 days a year. By the end of high school, children in Japan have had the equivalent of four more years of schooling than American children. Although it would be desirable to use the 180-day school year more constructively, one thing is clear: more time on task helps students learn. Almost everyone agrees that obtaining more years of schooling would raise most individuals' earnings and productivity. It seems plausible to me that adding 30 days of schooling each year will raise students' earnings by about the equivalent return to two years of schooling for a high school graduate ( $30 \times 12 / 180 = 2$ ).

Though not all summer school programs have been found to be successful, a meta analysis of 93 evaluations of separate summer school programs by Cooper, et al. (2000) concludes that the average effect of summer school on student achievement is positive, either when performance is compared to participants' pre-summer scores or to a randomly selected control group of non-participants.

### *3.2.2 School Resources Matter, and Matter Most at the Bottom*

Hanushek (1997) argues that, "The close to 400 studies of student achievement demonstrate that there is not a strong or consistent relationship between student performance and school resources, at least after variations in family inputs are taken into account." This inference has led some to doubt whether investing more in education is a useful strategy for helping low-income children. Elsewhere I have criticized the evidence on which this view is based. Here I highlight some of my critique.<sup>23</sup>

Hanushek's latest tabulation of the literature is based on 59 articles on class size and 41 on expenditures per student, 22 of which were included in both. Hanushek extracted information on the sign and significance of 277 estimates of the effect of class size drawn from 59 studies. (Each estimate is called a study in Hanushek, 1997.) The number of estimates extracted from the studies varied widely: as many as 24 estimates were extracted from each of two papers, and only one from 17 studies apiece.

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<sup>23</sup> This debate is played out in Krueger (2002) and Hanushek (2002).

Figure 7 shows the fraction of estimates that are positive, negative or of unknown sign, by the number of estimates Hanushek extracted from each study. For the vast majority of studies, from which Hanushek took only a small number of estimates, there is a clear and consistent association between smaller class sizes and student achievement. For the 17 studies from which Hanushek took only one estimate, for example, over 70% of the estimates indicate that students tend to perform better in smaller classes, and only 23% indicate a negative effect. By contrast, for the nine studies from which he took a total of 123 estimates the opposite pattern holds: small classes are associated with lower performance. These nine studies are closely scrutinized in Krueger (2002); many are found to have statistical problems that cast doubt on their findings vis-à-vis class size. For example, one-third of the studies control for both expenditures per student and class size in the same regression, rendering the results difficult to interpret.

By using estimates as the unit of observation, Hanushek implicitly weights studies by the number of estimates he extracted from them. It is difficult to argue that the studies that receive the most weight in Hanushek's approach deserve more weight than the average study. For example, Summers and Wolfe's (1977) *American Economic Review* article received a weight of 1, while Link and Mulligan's (1986) *Economics of Education Review* article received a weight of 24.

When all studies are given equal weight, however, the literature exhibits systematic evidence of a relationship between class size and achievement, and between expenditures and achievement. Using Hanushek's coding of the studies the number of studies that find positive effects of expenditures per student outnumber those that find negative effects by almost four to one. The number of studies that find a positive effect of smaller classes exceeds the number that find a negative effect by 57 percent. Differences of these magnitudes are unlikely to have occurred by chance.

One could also question the logic of the coding of many estimates. For example, if a study provided two estimates, one for a sample of Black students and one for a sample of White students, Hanushek would take two estimates. But if the same study interacted a dummy variable indicating whether the student was Black with school resources, and included a school resources "main effect" in the regression to allow for a differential impact of resources by race, Hanushek would only take one estimate -- the main effect, which pertains just to White students. This is quite unfortunate because Hanushek's surveys often have been used to draw inferences for poor and minority students.

A consensus is emerging that smaller classes raise student achievement, on average, and particularly for children from low-income families and for minorities. This conclusion emerges from meta-analyses (e.g., Hedges, Laine and Greenwald, 1994) and from the only experimental evaluation of class size, the Tennessee STAR experiment.

The Tennessee STAR experiment has been described by Mosteller (1995) as "one of the most important educational investigations ever carried out and [it] illustrates the kind and magnitude of research needed in the field of education to strengthen schools." Project

STAR was an experiment involving the wave of students who entered kindergarten in participating schools in 1986. Students who moved into this wave at participating schools were added to the experiment. All together, a total of 11,600 students in kindergarten through 3<sup>rd</sup> grade were randomly assigned to a small class (target of 13-17 students), regular-size class (target of 22-25 students), or regular-size class with a full-time teacher's aide, within 79 Tennessee public schools.<sup>24</sup> The initial design called for students to remain in the same class type from grades K-3, although students were randomly re-assigned between regular and regular/aide classes in first grade. Students who left the school or repeated a grade were dropped from the sample being tracked during the experiment, although data on their subsequent performance in many cases was added back to the sample after 3<sup>rd</sup> grade, as other data sources were used. In 4<sup>th</sup> grade, all students were returned to regular classes.

Data are available for about 6,200 students per year in grades K-3, and about 7,700 students per year in grade 4-8, after the experiment ended. The average student in the experiment who was assigned to a small class in the experiment spent 2.3 years in a small class. An important feature of the experiment is that teachers were also randomly assigned to class types. Krueger (1999) evaluates some of the problems in the implementation and design of the STAR experiment, including high rates of attrition and possible nonrandom transitions between grade levels, and concludes that they did not materially alter the main results of the experiment.

It is important to emphasize that the small class effects are measured by comparing students from different class assignments in the same schools. Because students were randomly assigned to a class type within schools, student characteristics – both measurable, such as free-lunch status, and unmeasurable, such as parental involvement in students' education – should be the same across class types, on average. For observed characteristics, the treatment and control group did not exhibit significant differences (see Krueger, 1999).

Table 3 summarizes key findings from Project STAR. Results are presented separately for all students, Black students and students who participated on free lunch. The reported coefficients are the differences between those who were assigned to a small class and those who were assigned to a regular-size class (with or without an aide).<sup>25</sup> Because about 10 percent of the students did not attend the size class they were assigned to, the reported coefficients understate the impact of attending a small class. Nevertheless, assignment to a small class appears to have raised test scores by about 0.2 standard deviations while students were in small classes in grades K-3, and by about 0.10 standard deviations from grade 4-8. Moreover, attending a small class appears to have raised the likelihood that students would take a college entrance exam, either the SAT or ACT exam. As is commonly found in the class-size literature, the effect sizes are substantially

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<sup>24</sup> See Word, Johnston, Bain, et. al (1990), Nye, Zaharias, Fulton, et al. (1994) or Krueger (1999) for more detail on the experiment.

<sup>25</sup> In most cases, the differential between the regular-size classes with or without an aide was small and statistically insignificant. Having an aide raised the likelihood that Black students took one of the college entrance exams, however.

larger for Black students and those on free lunch. Krueger and Whitmore (2001) also find that those who were randomly assigned to small classes were less likely to have been arrested and to have become teenage parents.

In Krueger (2002) I conducted a cost-benefit analysis of reducing class size by 7 students, using the effect size for test scores found for the full sample in the STAR experiment. The only benefit considered is future earnings, which are predicted from differences in test scores and the assumption that real wages will grow by 1 percent a year in the future. I conclude that the internal real rate of return is 6 percent for all students combined.<sup>26</sup> The analogous calculation yields an internal rate of return for Black students of 8 percent.<sup>27</sup>

### *3.2.3 Evidence on the Returns to Schooling*

A large literature surveyed in Card (1999) and elsewhere estimates the payoff in terms of higher earnings from additional years of schooling, using variability in schooling resulting from factors such as compulsory schooling or geographic proximity to a college. These findings are also consistent with the interpretation that credit constraints induce some students to leave school earlier than others.

For example, Angrist and Krueger (1991) estimate the effect of compulsory schooling on earnings by exploiting the fact that it was common for schools to require students to turn age 6 by January of the upcoming school year to start school, or wait another year before starting school. Because most states require students to attend school until they reach their 16<sup>th</sup> or 17<sup>th</sup> birthday, this combination of rules sets up a natural experiment in which the day of the year students are born determines their age upon entering school, and the compulsory schooling law enables students born early in the year to drop out of school at a lower grade level. Assuming that date of birth is uncorrelated with other attributes of individuals -- an assumption that is not too difficult to accept unless one believes in astrology -- then date of birth could be used to generate exogenous variability in educational attainment.

Instrumental Variables (IV) estimates identified by differences in date of birth suggest that an additional year of education obtained because of compulsory schooling leads to about 6 to 8 percent higher earnings in 1970 and 1980. These estimates are slightly higher than the estimates one obtains from estimating a Mincerian earnings function in these years. Presumably, the return to compulsory schooling would be substantially higher in 2002 because of the large increase in the payoff to schooling since 1980.

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<sup>26</sup> On the other hand, using parameter estimates from Card and Krueger (1996a), Peltzman (1997) presents back-of-the-envelope calculations that he argues imply that “reducing class size would be a bad investment”. However, Peltzman’s calculations assume that real wages will not grow at all over the next 50 years; see Card and Krueger (1997).

<sup>27</sup> This calculation assumes that annual earnings of Black workers will be 80 percent as high as overall average earnings.

Other studies point in the same direction. Honoré and Hu (2001) provide IV versions of quantile estimates using the Angrist and Krueger identification strategy and a sample of 302,596 White men. They find that the return to years of compulsory schooling is higher for the *lower* quantiles, and conclude: “This suggests that the impact of education is larger at the lower end of the income distribution.” Harmon and Walker (1995) more directly examine the effect of compulsory schooling by studying the effect of changes in the compulsory schooling age in the United Kingdom. They find that the payoff to compulsory schooling is considerably higher than the Mincerian estimate. Card (1995) exploits variations in schooling attainment owing to families' proximity to a college in the U.S., and finds that the return to education is higher using this source than all sources of variability. And Rouse and Kane (1999) find that the return to attending a community college per year of schooling is at least as great as the return to attending a year at a four-year college.

Ashenfelter, Harmon and Oosterbeek (1999) compiled estimates from 27 studies representing 9 different countries. They find that the conventional Mincerian return to schooling is .066, on average, whereas the average IV estimate using variability in schooling from a natural experiment like those just described is .093.

This literature suggests that those who are most likely to drop out of school early – and only induced to complete more schooling because they are compelled to or because they live near a college – received the greatest return from education, on the margin. Such a finding is consistent with credit constraints or impatience causing low-achieving students to invest less in their education. Regardless of the reason, if the cost of school attendance is primarily one's foregone earnings, then this literature suggests that the private return to completing additional schooling is around 6-9 percent for the disadvantaged.

The social return is likely to be even higher because studies have found that incarceration rates decline with educational attainment. For example, Lochner (1999) finds, “High school graduation reduces the probability that a young man earns an income from crime by .09 on average – about a 30% reduction from the average probability of non-graduates,” holding constant the effect of AFQT score, parental education, race, and many other variables.

### *3.3 Second Chance Education and Training*

By second chance education and training I mean programs intended for youth who drop out of school before completing high school or who fall into trouble in their early 20s. It is this population that causes the greatest social costs for society. If one thinks about it, it is also this population that receives the least support from society. If they drop out of school early they do not receive publicly subsidized high school education. If they fail to attend college, they do not receive government and private tuition subsidies. Both efficiency and fairness suggest that effective training should be available for second chance opportunities.

The provision of federally subsidized job training has been greatly curtailed in the last two decades. Because of budget cuts, the total number of participants in federal job training (JTPA, CETA and Job Corps combined) fell from around 1.3 million a year in 1979 to around 450,000 in 1998.<sup>28</sup> The Bush administration proposes further cuts of about \$0.5 billion next fiscal year.

### 3.3.1 *The Job Corps Program*

The Job Corps is the most intensive and expensive of the government programs for disadvantaged youth. The \$1.4 billion cost last year amounts to about \$20,000 for each participant. Although critics mistakenly argue that the Job Corps is as expensive as a year at Harvard - ignoring the public subsidy and endowment spending that raise Harvard's true costs for each student well above \$50,000 a year - the costs are high compared to most second chance programs.

Because the intervention is so intensive, and because there are few substitutes for Job Corps, the program provides a better ground to test the effect of federal training on adolescents than do less intensive programs, such as those provided under the Job Training Partnership Act (JTPA).

The Job Corps program annually serves more than 60,000 disadvantaged high school dropouts from age 16 to 24. A third of the male participants had been arrested at least once before joining the program; two-thirds of all participants had never held a full-time job. The average participant reads at the eighth-grade level. The Job Corps program is expensive because 90 percent of participants are sent from their neighborhoods to one of 116 residential campuses in 46 states. They stay there for about eight months of academic education, vocational training, counseling, health education, and job placement assistance.

Burghardt, et al. (2001) summarize final results of Mathematica's four-year "National Job Corps Study" study. The researchers followed 9,409 eligible applicants to the Job Corps between November 1994 and December 1995 who were randomly selected for the program, and another 5,977 eligible applicants in the same time period who were randomly assigned to a control group that was excluded from the Job Corps services for three years. In addition to the baseline survey, applicants were surveyed 12, 30 and 48 months after they applied; 80 percent responded in the last survey.<sup>29</sup> This is a much larger sample than the ones previously used in randomized evaluations of youth training programs.

The final report compares the self-reported employment, earnings and criminal activity of the participant and control groups in the 48 months after students applied to the program. By the last survey, participants had typically lived on their own or with their family, away from the Job Corps for about three years. The findings complement – and in many

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<sup>28</sup> House Ways and Means Committee, *Green Book 2000*. These figures probably understate the decline because the 1979 figure is for new enrollees and the 1998 figure is for total participants.

<sup>29</sup> The response rate was 81.5 percent for the program group and 77.8 percent for the control group.

ways mirror – Mallar, et al.’s (1982) previous non-randomized evaluation of the Job Corps.

Table 4 summarizes the key findings from the final Job Corps summary report. Column (1) reports means for youth assigned to the program group, and column (2) reports means for those assigned to the control group. Because subjects were randomly assigned when they were determined eligible for Job Corps, but before they enrolled, only 73 percent of those assigned to the program group actually enrolled in Job Corps. Consequently, the difference between the program group and the control group shown in column (3) *understates* the impact of participation in the program on the participants’ outcomes. The effect of participation reported in column (4) was derived by inflating the program-control group difference by the difference in the participation rates between the program group and control group.

Job Corps appears to have had a substantial impact on the participants’ outcomes. Welfare payments were reduced by 16 percent in the first 48 months after students applied to Job Corps. Arrests were down by 16 percent, and the fraction of youth who served time in jail was also down by 17 percent.

Figure 8 reports average weekly earnings each quarter after random assignment by assignment status. Mathematica estimates that participation in the Job Corps raised participants average weekly earnings in the fourth year after random assignment by 12 percent ( $p < .01$ ).<sup>30</sup> About one third of the earnings gain came from a higher hourly wage rate, and about two thirds from more hours of work per week. If the sample is broken down by age, statistically significant earnings gains are also found for 16-17 year-old youths. For this group, the average weekly earnings gain for participants was 9.8 percent in the fourth year after random assignment, suggesting that job training interventions can be successful for this young age group.<sup>31</sup>

The large earnings gains for the Job Corps participants are all the more impressive in light of the fact that the job market was extremely strong in the late 1990s. One would have expected a tight labor market to provide relatively more help for those with lower skills, which would have benefited the control group.

Notice that Figure 8 shows that earnings were lower for the program group than for the control group in the first year and a half after random assignment. Average earnings do not become statistically significantly greater for the program group compared to the control group until more than two years *after* random assignment. The reason for the initially lower but steeper earnings profile for the program group is that Job Corps participants spent much of their time in the program acquiring skills instead of in the labor market. Consequently, the program group has spent less time searching for a job

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<sup>30</sup> These figures are different from those in Table 4 because they pertain to the entire 12 month period beginning three years after random assignment. Table 4 reports earnings and employment data for the latest quarter available, 16 quarters after random assignment. Earnings were 13 percent higher as a result of participation in the Job Corps in this quarter.

<sup>31</sup> For Black 16-17 year olds, the earnings gain was 6.7 percent, but not statistically significant.

and less time acquiring work experience. Age-earnings profiles are particularly steep for young workers. As emphasized below, this finding suggests that one should be cautious about drawing inferences from other youth training programs that have a short follow-up period.

About 10 percent of Job Corps participants attend a nonresidential program. On intake into the experiment, evaluators made an assessment as to whether the applicants would likely attend a residential or nonresidential program. Mathematica found that except for men and women with children, students slotted for a *nonresidential* Job Corps program had a statistically insignificant improvement relative to comparable control group members. This result suggests that sending youth without children to residential campuses, where they can study away from the distractions of gangs, drugs and poverty that plague their normal neighborhoods, is a critical component of the success of the Job Corps program.<sup>32</sup> This feature, however, should be fairly straightforward to replicate if the program is expanded to include more participants.

Heckman (1996 and elsewhere) relies heavily on the Perry Preschool evaluation to make the provocative argument that “skill begets skill.” On the basis of presumed high returns from pre-school programs and low returns from second-chance programs targeted toward young adults, Heckman (1996; p. 340) argues, “The available evidence clearly suggests that adults past a certain age, and below a certain skill level make poor investments.” The results of the Job Corps evaluation necessitate a reassessment of that view.<sup>33</sup> *Mathematica estimates that the social internal rate of return of the Job Corps program is 10.5 percent – in the same ballpark as the most successful preschool programs.*

Moreover, I would argue that there are grounds to be more confident in the estimated rate of return from the Job Corps evaluation than Perry Preschool. The Job Corps sample was 125 times larger than the Perry sample, and the Job Corps sample was drawn from a national set of communities, rather than just one grammar school catchment area in one city.

The number of Job Corps slots has been stable for decades, while the number of disadvantaged youth has exploded. If Job Corps is expanded, it is quite likely that the additional youth who are served by the program will benefit in similar ways to those who participated in the National Job Corps Study.

### 3.3.2 *Why JTPA Does Not Make the Case Against Youth Job Training*

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<sup>32</sup> For participants with children, however, the nonresidential program appears to be effective.

<sup>33</sup> Others challenge the scientific basis for the importance of early learning. See, for example, Bruer’s (1999) review of the neurological evidence. Apparently, the frontal cortex, a part of the brain critical to higher cognitive functions, is the part of the brain that takes longest to develop, and continues to develop well into adolescence. Furthermore, functional MRI studies demonstrate that adults can learn, and cortical reorganization can take place, after a stroke impairs reading ability (see Small, Flores, & Noll, 1998).



A common view is that job training for out-of-school youth is ineffective. I used to be sympathetic to this view. However, the accumulation of results from the Job Corps program has led me to change my mind.

The most compelling evidence on the effectiveness of youth job training prior to the National Job Corps study was probably from the “National Job Training Partnership Act Study.” Bloom, et al. (1997) provide an analysis of the key findings from the JTPA Study, a randomized evaluation of JTPA funded by the U.S. Labor Department. They conclude that, “It appears that employment and training programs for adults can be cost-effective from a societal perspective.” The youth results, however, are generally considered much less encouraging. For example, the authors write, “For out of school youths, we are at a more primitive stage in our understanding of how to increase labor market success; we have not found *any* way to do so.” This conclusion appears to be widely accepted. Heckman, LaLonde and Smith (1999), for example, also conclude: “the cost-benefit analyses indicate that JTPA services generated a substantial net social benefit when targeted toward adults, but none when targeted toward youths.”

Insofar as this debate is concerned, the adult results are encouraging.<sup>34</sup> Indeed, the findings of the National JTPA Study led the Labor Department to shift substantial JTPA funds away from youth training and toward adult training.

But for the following five reasons I think Bloom, et al. are much too pessimistic on the efficacy of training programs for out-of-school youth.

First, as discussed above, Job Corps is probably highly cost effective for a population that is similar to that served by JTPA.

Second, Heckman, Hohmann and Smith (2000) document that there was substantial substitution between JTPA and other training for those youth who were randomly denied access to the program in the National JTPA study. Many of those in the control sample managed to obtain training that was probably not too different from JTPA. Heckman, Hohmann and Smith (2000) report that 56 percent of male youth in the National JTPA Study’s treatment group received classroom training services, compared with 35 percent of those in the control group: the difference was only 21 percentage points, so the treatment-control difference should arguably be inflated by a factor of 5 to gauge the impact of training. Third, JTPA is not very intensive to begin with; the program typically lasted 3-5 months and cost only about one-fifth as much as the Job Corps per participant. *Consequently, the treatment effect might have been small because the treatment was small.* In the National Job Corps experiment, the participants received 1,000 more hours of training than the control group, approximately equivalent to a year of high school. For JTPA, the treatment was much more modest, so it is not very surprising that a return to the training is much harder to detect. But this does not mean that the training was not worth the investment. Indeed, Heckman, Hohmann and Smith find that, after taking account of the effect of substitution on their estimates, “Under different assumptions

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<sup>34</sup> Abadie, Angrist and Imbens (2002) find that the proportionate effect of JTPA participation on earnings was largest in the middle quantiles for adult men, and largest in the lower quantiles for adult women.

about the persistence of benefits (33 months, 5 and 10 years), the estimated rates of return are quite large, ranging from 21 percent to 263 percent annually.”<sup>35</sup>

Fourth, participants in the Job Corps without children who were sent to residential campuses seemed to benefit more than those who received nonresidential training. JTPA is a nonresidential program.

Fifth, the JTPA follow-up period in Heckman and Smith (1998) and Bloom, et al. (1997) is short, only 6 quarters after random assignment.<sup>36</sup> Recall that Figure 8 indicated that the earnings gain from Job Corps did not turn positive until two years after random assignment. If the JTPA program lasted for 5 months (and started immediately after random assignment), then the control group would have had about half a year head start in terms of labor market experience and job search effort compared to the treatment group. Given how steep the age-earnings profile is at the beginning of the working career, one probably would not expect the earnings of the treatment group to overtake that of the controls until at least 1.5 years after random assignment, even if the program was highly cost effective. If this is the case, the short follow up window in the National JTPA Study would have caused researchers to miss any gain in earnings due to the program.

This is not just idle speculation. The General Accounting Office (GAO, 1996) linked Social Security earnings records to observations in the National JTPA Study for three years before random assignment and five years after. The GAO reported the difference in average earnings between the treatment and control groups separately for male youth and female youth, as well as for adults. Separating the sample by gender reduces the precision of the estimates, and the GAO found insignificant effects for male youths and female youths each year. But if the goal of the exercise is to estimate the average payoff from training for all young workers, there is no need to disaggregate the estimates by sex. Therefore, to increase the precision of the estimates, I calculated the unweighted average treatment-control differences for men and women.<sup>37</sup> (Youths are defined as those aged 16 to 21 who were not attending school when they applied for the program.) Figure 9 shows the resulting average “intent-to-treat” effect for the youth.

Interestingly, by the fourth year after random assignment the average earnings of the male and female youths in the treatment group overtook that of the control group. And in the fifth year after random assignment the difference is statistically significant ( $t=2.1$ ). And the effect is substantial: in year 5 earnings are 11 percent higher for males in the treatment group than males in the control group, and 4 percent for females in the

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<sup>35</sup> In view of such high returns, the fact that control group received significantly less training than the treatment group suggests that credit constraints were binding.

<sup>36</sup> Orr, et al. (1994) and Heckman, Hohmann and Smith (2000) present results spanning 2.5 years after random assignment. Figure 9 suggests that this period might also be too short to capture any effects of JTPA training on youths’ earnings. Heckman, Hohmann and Smith’s figures suggest that earnings of the treatment group are rising relative to that of the controls (especially for females) between 18 and 32 months after random assignment, although the difference is not statistically significant at 32 months.

<sup>37</sup> The sample had approximately equal numbers of men and women, so weighting by sample size would cause little difference.

treatment group than females in the control group; for males and females pooled together the gain is 8 percent of earnings.<sup>38</sup> Given the low cost of JTPA training, the low take-up rate of JTPA, and the substantial of training by members of the control group, these earnings gains are noteworthy.

I should emphasize that I do not interpret the results in Figure 9 as suggesting that analyses of administrative earnings data yield markedly different results of the effectiveness of JTPA than do analyses of self-reported earnings data (e.g., Bloom, et al. (1997)). The administrative Social Security earnings data assembled by GAO show the *same* pattern of results as previous analyses of self-reported earnings in the first three years after random assignment (that is, in the period when they overlap), but the self-reported data are not available for a longer follow-up period. The GAO data suggest that treatment-control earnings differences for youth do not arise until the fifth year after random assignment to the program. In addition, as of this writing, analyses of administrative earnings records from the Unemployment Insurance system, such as Kornfeld and Bloom (1999), have not examined earnings data beyond 2.25 years after random assignment, so they are not inconsistent with the results in Figure 9 either. Indeed, the UI data are consistent with the finding of non-effects in the Social Security data in the period when they overlap.

Nevertheless, I am reluctant to interpret the results in Figure 9 as indicating that JTPA was a wild success for youth. I am not sure that it was. Longer term follow up with administrative UI records may overturn the results in Figure 9. I have a less ambitious conclusion, however. The results in Figure 9 and the four other considerations discussed here should give pause to those who believe that training programs for young adults are necessarily a failure based on the JTPA program.

### 3.4 College

Research suggests that the payoff in terms of subsequent earnings associated with attending a highly selective college is greater for students from poor families than for those from wealthy families. Figure 10 illustrates results found in Dale and Krueger (2002). College selectivity is based on the average SAT score of the freshman class. Data are from the College and Beyond Survey of individuals who were freshmen in 1976. Their earnings were surveyed as of 1995. Although the data came from only 30 moderate to highly selective colleges, results are similar if a nationally representative sample, the National Longitudinal Study of the High School Class of 1972, is used.

The average earnings for the 519 students who were accepted by both moderately selective (average SAT scores of 1,000 to 1,099) and highly selective schools (average scores greater than 1,275), varied little, no matter which type of college they attended.

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<sup>38</sup> The GAO emphasized that the effects were statistically insignificant for male and female youth when considered separately. But the effect for all youth (i.e., males and females combined) is of interest for policy evaluation, and more precisely estimated.

Students from lower-income families (defined approximately as the bottom quarter of families who send children to college), however, experienced an increase in earnings if they attended a highly selective college from their menu of choices. Their annual earnings were nearly \$6,000 (8 percent) higher if they chose to attend one of the elite schools over one of the moderately selective schools. Even in their late teens and early 20s, the payoff to quality schooling seems to be higher for those from lower income families.

#### 4. Theoretical Interpretations

Figure 11a provides a simple theoretical explanation of many of the findings in the literature. The concave function represents the structural log earnings function facing poor and non-poor children. The intercept is lower for the poor children because of the intergenerational transmission of ability. As in the Becker-Rosen-Ben Porath model, individuals choose their schooling level by finding the tangency between their supply of funds and the structural earnings function. However, the supply of funds curves are convex because families first use lower cost sources, and then higher cost ones. Children from poor families have less access to credit, and hence a more convex supply of funds schedules. (Alternatively, the convex supply of funds curves could be interpreted as reflecting a rising marginal distaste for school that varies with family income.) This constrained income maximization problem would lead children of poor families to have  $H_1$  invested in their education, and children of non-poor families to have  $H_2$  invested in theirs. Notice also that the marginal payoff to additional money invested in human capital is greater for children from poor families than it is for children from non-poor households.

This model ignores the possibility that credit-constrained children could temporarily leave school to work for a while to accumulate funds to pay for tuition and living costs and return to school later on. In a model without credit constraints, children would never leave school to work and then return to school again (unless the payoff to education unexpectedly changed). With credit constraints, human capital investment decisions are more complicated than in the optimal stopping rule of the Becker-Rosen-Ben Porath model. Nevertheless, I suspect the model captures an important aspect of behavior. Moreover, many public school districts prohibit students from attending school after they exceed a certain age.

Figure 11b extends the model to allow for social externalities from human capital accumulation.<sup>39</sup> The line labeled  $gg'$  represents the government's discount rate, reflecting among other things the Treasury's borrowing rate and dead weight loss from raising tax revenue, under the assumption that the government is not constrained in terms of how much it could raise for human capital investments at the prevailing rate. From

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<sup>39</sup> For a related model, see Pauly (1967). Pauly models education as a normal good that generates positive externalities, although the marginal value of the externalities declines with educational attainment. Without credit constraints, he shows that economic efficiency is enhanced if education is more highly subsidized for children from lower income families.

society's perspective, the optimal level of human capital investment in children from poor families is  $H'_1$ , which exceeds the prevailing level,  $H_1$ .

Notice also that improving the quality of schooling – for example, by increasing the length of the school year, reducing class sizes, or recruiting more effective teachers – would make the structural earnings functions steeper. This would lead to an increase in educational attainment and higher earnings. (See Card and Krueger, 1996b for a formal model.)

It should also be noted that even without credit constraints, risk aversion would cause children from low-income families to under invest in human capital and have a higher average return, assuming preferences exhibit decreasing absolute risk aversion. As with other investments, the return to investment in education is uncertain – and the variance in returns has probably increased along with the mean in the 1980s and 1990s. Unlike other investments, however, the risk inherent in investing in education is not easily diversifiable by individuals (e.g., because of moral hazard problems, inability to use human capital as collateral, etc.). The government, however, can diversify the risk by investing across many individuals. In this situation, the expected return from additional investment in education and training of low-income students would be higher than that from investments in high-income students because a premium would be required to induce low-income students to take on the additional risk.

## **5. Conclusion**

The evidence reviewed here suggests to me that allocating more resources to education and training of the disadvantaged could reduce inequality. Such programs could be paid for by rejecting proposals that would exacerbate income disparities, including the elimination of the estate tax or cuts in the capital income tax and top income tax rate. Moreover, as noted earlier, education and training are popular ways to transfer income, probably because of the good Samaritan's dilemma. Practical political economy constraints limiting the specific proposals for redistributing income that are in the feasible set should not be ignored by economists.

My priority list of education and training initiatives would include: fully funding Head Start and Early Head Start so every eligible child could participate; fully funding Job Corps so every eligible youth could participate; increasing the length of the school year by 30 to 40 days, especially in inner city areas, either by extending the school year or offering summer school vouchers; targeting reductions in class size to low-income areas; increasing the compulsory schooling age to 18; improving the quality of teachers, especially in low-income areas, by raising merit-related pay for teachers and pursuing other initiatives; expanding funding for adult training programs in the current structure of the Workforce Investment Act, and providing income maintenance allowances for up to two years (as is done in Trade Adjustment Assistance) while individuals are undergoing training. Notice that this is a comprehensive list, not focused on any particular age group. Given the evidence that the Job Corps generates large gains for participants and society,

there seems little reason to me to disregard older youth when it comes to government supported training. Old dogs can learn new tricks. Even if JTPA was ineffective for youth, a workable, replicable model exists: the Job Corps program. Furthermore, since the delay between when human capital investments are made and when participants enter the labor force is shorter for out-of-school teenagers than it is for pre-school children, there is much less discounting of future benefits for teenagers than for pre-schoolers.

But more important than the specifics of my wish list, I would recommend the general principle that wise investment in education and training pays off. The optimal set of programs is likely to vary across areas with different needs. But as a general rule, on the margin, the payoff from public human capital investments seems to be higher from investments in lower income areas than in higher income areas. Money invested wisely matters. This would lead me to recommend a policy of giving ample resources to local governments in low-income areas to invest in the initiatives that they think best meet their needs, and holding the local governments accountable for the results.

Heckman (1994) makes the provocative calculation that to restore educational earnings ratios to their 1979 level would require an investment of \$1.66 trillion. This calculation assumes a 10 percent return on educational investments, which strikes me as reasonable based on the evidence presented here.<sup>40</sup> Heckman (2000) writes, “Given the magnitude of the required investment to restore real earnings levels, and the stringency of current government budgets, it is necessary to use funds wisely.” I have three reactions to this argument. First, it is not clear why restoring the wage structure to its 1979 form should be a zero-sum goal for public policy. If programs to improve human capital, especially that of children in low-income families, have higher returns than other competing uses of government funds, then it seems to me a wise use of funds to expand the programs on the margin. Just because expanding the Job Corps would not revive the 1979 wage structure does not mean that expanding the program is an unwise use of government funds.<sup>41</sup>

Second, if skilled and unskilled workers are complementary inputs in production, as is likely, then reducing the number of unskilled workers and increasing the number of skilled workers would have an added effect of reducing inequality (see, e.g., Bishop, 1979).

Third, \$1.66 trillion for a major national initiative sounds like a lot less money in 2002 than it did in 1994. The estimated cost of the Bush tax cut from 2001 to 2011 is \$1.8 trillion, and *another* \$4.1 trillion from 2012 to 2021.<sup>42</sup> The illustrative target of \$1.66 trillion does not seem so far beyond reach if there is the collective will to reduce inequality.

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<sup>40</sup> The calculation seems to exclude the opportunity cost of individuals’ time from the cost of investment, which reduces the cost of the government’s investment cost.

<sup>41</sup> My point also seems in the spirit of Heckman’s (1995; p. 1103) critique that the *The Bell Curve* failed because “the authors do not perform the cost-benefit analyses needed to evaluate alternative social policies for raising labor market and social skills.”

<sup>42</sup> See Friedman, Kogan and Greestein (2001). These figures ignore the extra costs associated with higher interest payments.

Nonetheless, Heckman's exercise of putting the magnitude of the returns and costs of the investment in perspective is important. The benefits should not be oversold. How much additional equity is possible through a greater emphasis on government training and education? I have not cost out the components on my wish list above, but it is sure to be an order of magnitude below \$1.66 trillion. For the sake of argument, suppose it is \$100 billion a year. (The most expensive component would be expanding the school year by around one-sixth.) Over five years this would cumulate to a \$500 billion increase in investment in human capital for children of lower income families. A 10 percent return on this investment would lead to a \$50 billion a year increase in income, ignoring general equilibrium effects which would likely increase the amount.

Is this small potatoes? A good comparison is with the expansion of the Earned Income Tax Credit (EITC) in 1993, one of the most progressive changes in government policy in the last decade. The expansion of the EITC transferred an additional \$6-7 billion per year, so the proposal that I have in mind would have a substantially larger effect. Indeed, the entire EITC transferred \$31 billion in 2000, less than the return that could be garnered from a major step up in investment in education and training for the disadvantaged. And the net redistributive effect of the EITC is smaller than \$31 billion once incidence is taken into account because of wage adjustments in response to the subsidy.

I would agree, however, that \$50 billion a year is small compared with the magnitude of the problems caused by extreme inequality. But I would emphasize that I do not envision human capital as the sole component of a program to address the adverse consequences of income inequality. It is part of the solution, not the whole solution. In principle, the optimal government policy would utilize multiple instruments up to the point where the social benefit per additional dollar of cost of each instrument is equal across the instruments. To restore more balance to the income distribution, I would also recommend seriously considering the following: another increase in the EITC; another increase in the minimum wage, which is 22 percent below its real level from 1979; a reconsideration of immigration policy, which currently places little weight on the human capital of immigrants and labor force needs of the economy; and universal, national health insurance. These proposals strike me as more desirable than eliminating the estate tax and cutting the highest income tax bracket. I'll leave these topics for another Alvin Hansen Symposium on Public Policy.

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**Table 1: Summary of Perry Preschool Findings<sup>a</sup>**

<b>Outcome</b>	<b>Treatment Group</b>	<b>Control Group</b>	<b>p<sup>b</sup></b>
Intelligence Test Scores			
At study entry	79.6	78.5	---
After 1 year	95.5	83.3	.001
Age 6	91.3	86.3	.024
Age 7	91.7	87.1	.040
Age 8	88.1	86.9	---
Age 9	87.7	86.8	---
Age 10	85.0	84.6	---
Age 14	81.0	80.7	---
Achievement Test Scores			
Age 7	97.1	84.4	.216
Age 8	142.6	126.5	.079
Age 9	172.8	145.5	.042
Age 10	225.5	199.3	.040
Age 14	122.2	94.5	.003
Age 19	24.6	21.8	.059
School Success (to age 19)			
Years spent in special education	16%	28%	.004
Classified mentally retarded	15%	35%	<.05
Graduated from high school	67%	49%	<.05
Received post-secondary education	38%	21%	<.05
Economic Success (at age 19)			
Employed	50%	32%	<.05
Median earnings <sup>c</sup>	\$3,860	\$1,490	.061
Self-supporting	45%	25%	<.05
Receives welfare	18%	32%	<.05
Social Adjustment (to age 19)			
Arrested	31%	51%	.021
Average number of arrests	1.3	2.3	.001
Average number of teen pregnancies	.7	1.2	.076

- a. Sources: Barnett (1992), Table 8. Sample size is 123 or fewer, depending on outcome.
- b. Statistical analyses for IQ test scores, achievement test scores, and years in special education were analyses of covariance with gender, family background variables (including mother's employment), and initial IQ as covariates. Comparable probit analyses were performed for dichotomous variables. Differences in number of arrests and pregnancies per group were tested for significance by chi-square. The median test was applied to median earnings. A number of alternative models and statistical techniques (parametric and nonparametric) were used to analyze the data in order to examine the sensitivity to various assumptions. The results are reported in the appendices cited above and indicate that the findings are quite robust with respect to statistical approach.
- c. Expressed in 1988 dollars. The earnings difference appears to be primarily the result of differences in employment rather than wages.



**Table 2: School Year and Summer Gains on California Achievement Test in Reading and Math over Elementary School Years, by Family Socioeconomic Status Level**

<i>School Year</i> <b>Gains</b>	<u>Reading</u>		<u>Math</u>	
	<u>SES Level</u>		<u>SES Level</u>	
	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>
Year 1	56.7	60.8	49.0	45.0
Year 2	48.0	40.1	42.9	42.2
Year 3	31.2	33.7	36.0	35.6
Year 4	33.1	31.7	33.2	35.7
Year 5	24.3	24.6	24.7	27.8
Total Gain	193.3	190.9	185.8	186.3
<i>Summer Gains</i>				
Year 1	-3.7	15.0	-4.8	8.8
Year 2	-3.5	8.5	-5.2	3.3
Year 3	1.6	14.9	-1.9	1.3
Year 4	4.5	10.4	4.8	5.6
Year 5	1.9	-2.2	-0.9	5.9
Total Gain	0.8	46.6	-8.0	24.9

Source: Doris Entwisle, Kurt Alexander, and Linda Olson, “Children, Schools and Inequality”. Sample consists of Baltimore public school students who entered first grade in 1982. Test “scale scores” are calibrated to measure growth over a student’s 12-year school career.

**Table 3: Summary of Findings from Tennessee STAR Class-Size Reduction Intervention; Estimated Intent-To-Treat Effects**

	<u>All</u>	<u>Black</u>	<u>Free Lunch</u>
<b>Achievement Test Scores</b>			
K	0.200**	0.272**	0.229**
1	0.229**	0.378**	0.255**
2	0.209**	0.390**	0.272**
3	0.200**	0.369**	0.251**
4	0.092**	0.181**	0.102**
5	0.085**	0.207**	0.105**
6	0.098**	0.187**	0.133**
7	0.091**	0.170**	0.119**
8	0.089**	0.168**	0.133**
<b>Took ACT or SAT</b>	0.070*	0.204**	0.113*
<b>College Exam Score (ACT or SAT)</b>	0.109**	0.238**	0.203**

Notes: Table shows difference in average outcome between students initially assigned to a small class and those initially assigned to a regular or regular aide class, conditional on school attended. For grades K-3, the Stanford Achievement Test was used; for grades 4-8 the Comprehensive Test of Basic Skills was used. ACT and SAT scores are adjusted for participation differences using the two-step normal-selection correction described in Krueger and Whitmore (2001). In all cases, test scores are expressed relative to the standard deviation. The difference in the probability of taking the ACT or SAT is expressed as a proportion of the fraction of students in regular-size classes who took the ACT or SAT.

**Table 4: Estimated Impacts of Job Corps Program, 1996-99**

<u>Outcome</u>	<u>Program Group</u>	<u>Control Group</u>	<u>Estimated Impact per Eligible Applicant</u>	<u>Estimated Impact per Participant</u>
1. Average Amount of Public Assistance	\$3,696	\$4,156	-\$460*	-\$639*
2. Percent Arrested or Charged	28.8	32.6	-3.7*	-5.2*
3. Percent Served Time in Jail	15.8	17.9	-2.1*	-2.9*
4. Percent Received GED	42	27	15*	21*
5. Percent High School Diploma	5	8	-3*	-4*
6. Percent Vocational Certificate	38	15	23*	32*
7. Average Weekly Earnings	\$217.5	\$199.4	\$18.1*	\$25.2*
8. Percent Employed	71.1	68.7	2.4*	3.3*

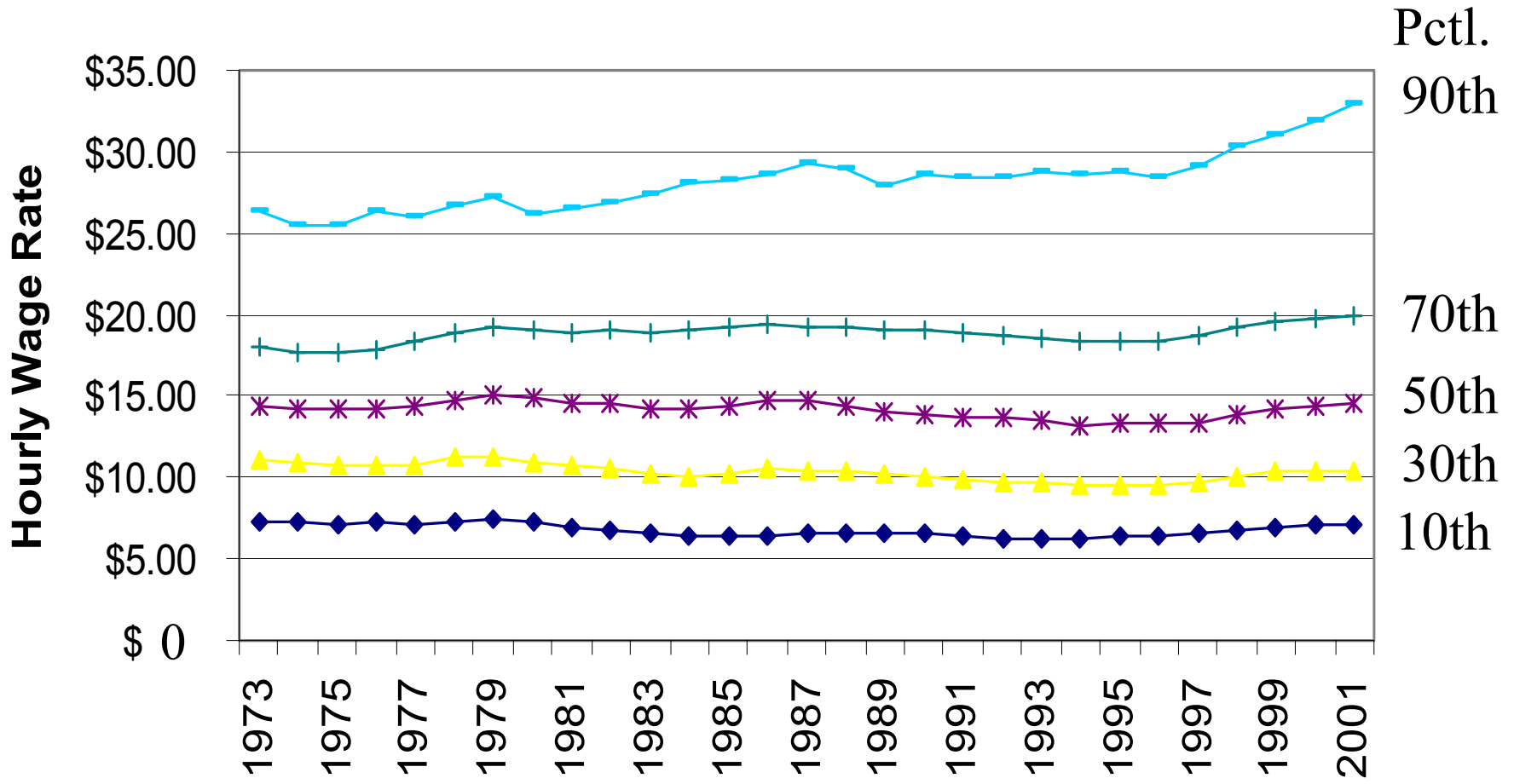
Rows 1-6 pertain to outcomes during the 48 months after random assignment.

Rows 7-8 pertain to the 16th quarter after random assignment, the latest quarter with available data.

\* Statistically significant at .05 level, two-tailed test.

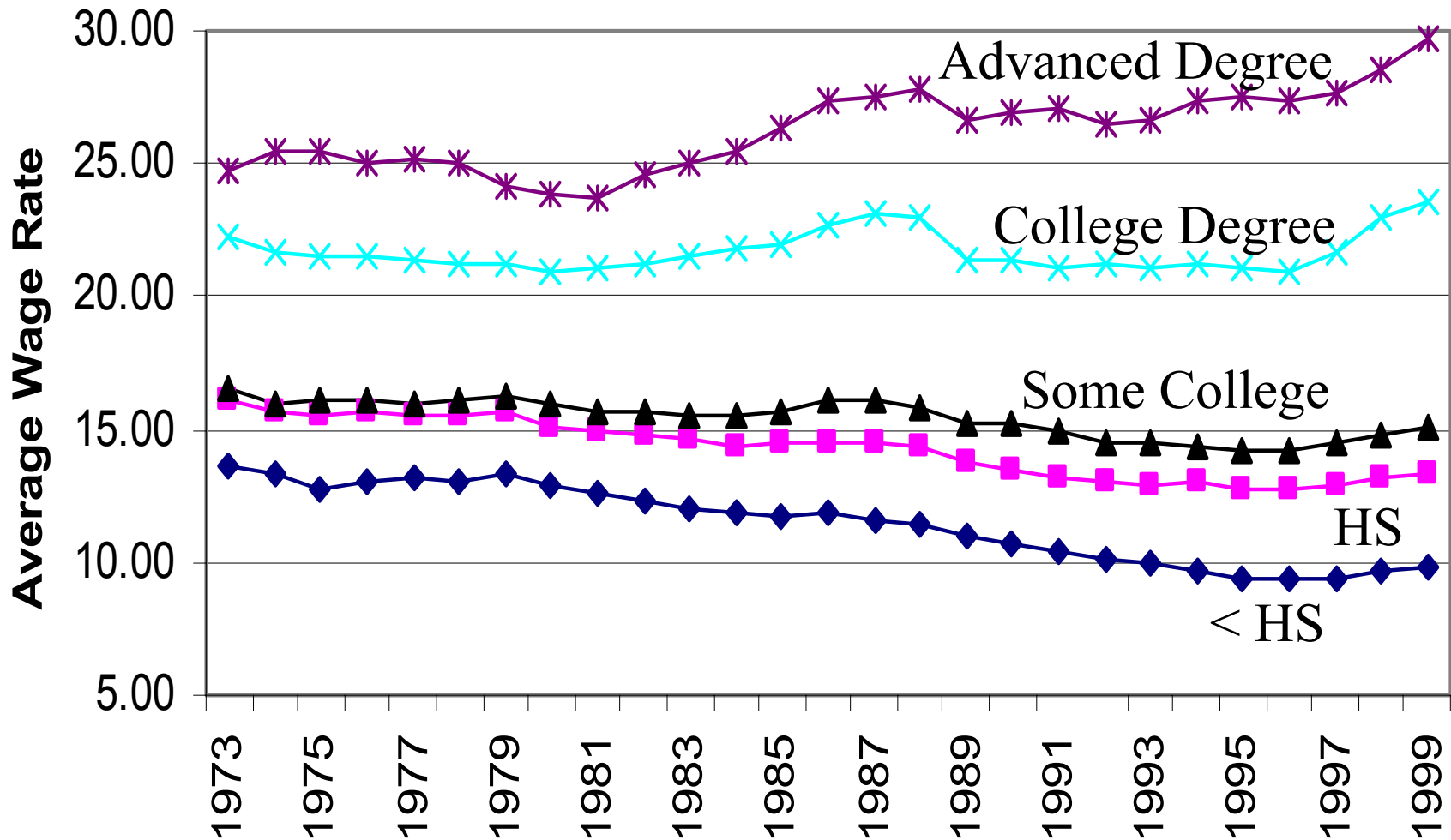
Source: Based on Mathematica's "National Job Corps Study", available from <http://wdr.doleta.gov/opr/>.

# Figure 1: Real Hourly Wage Rates, By Decile, 2000 Dollars



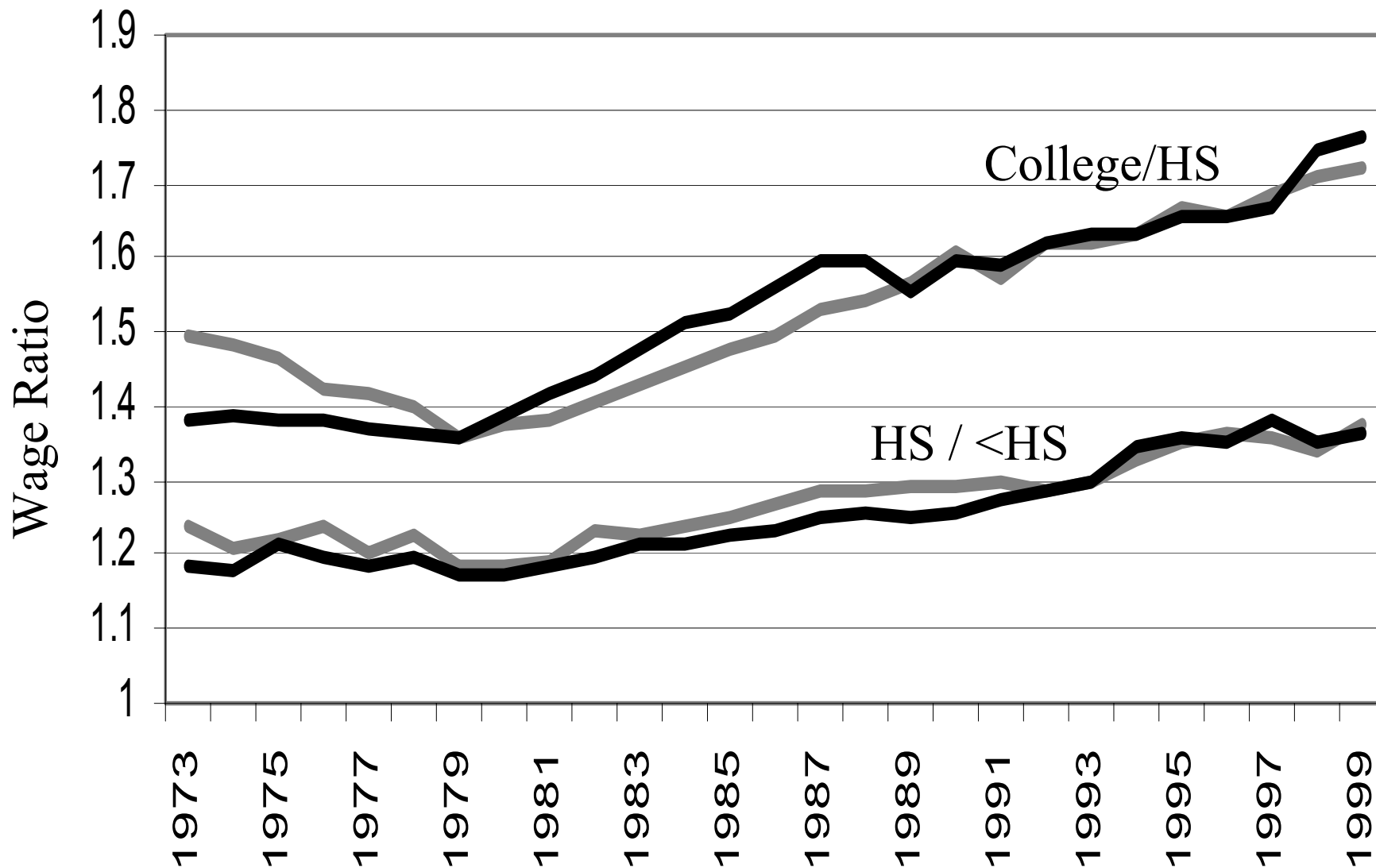
Source: Economic Policy Institute analysis of CPS data. The CPI-Research Series is used to deflate wages.

# Figure 2: Average Hourly Earnings by Education, Men (1999 Dollars)



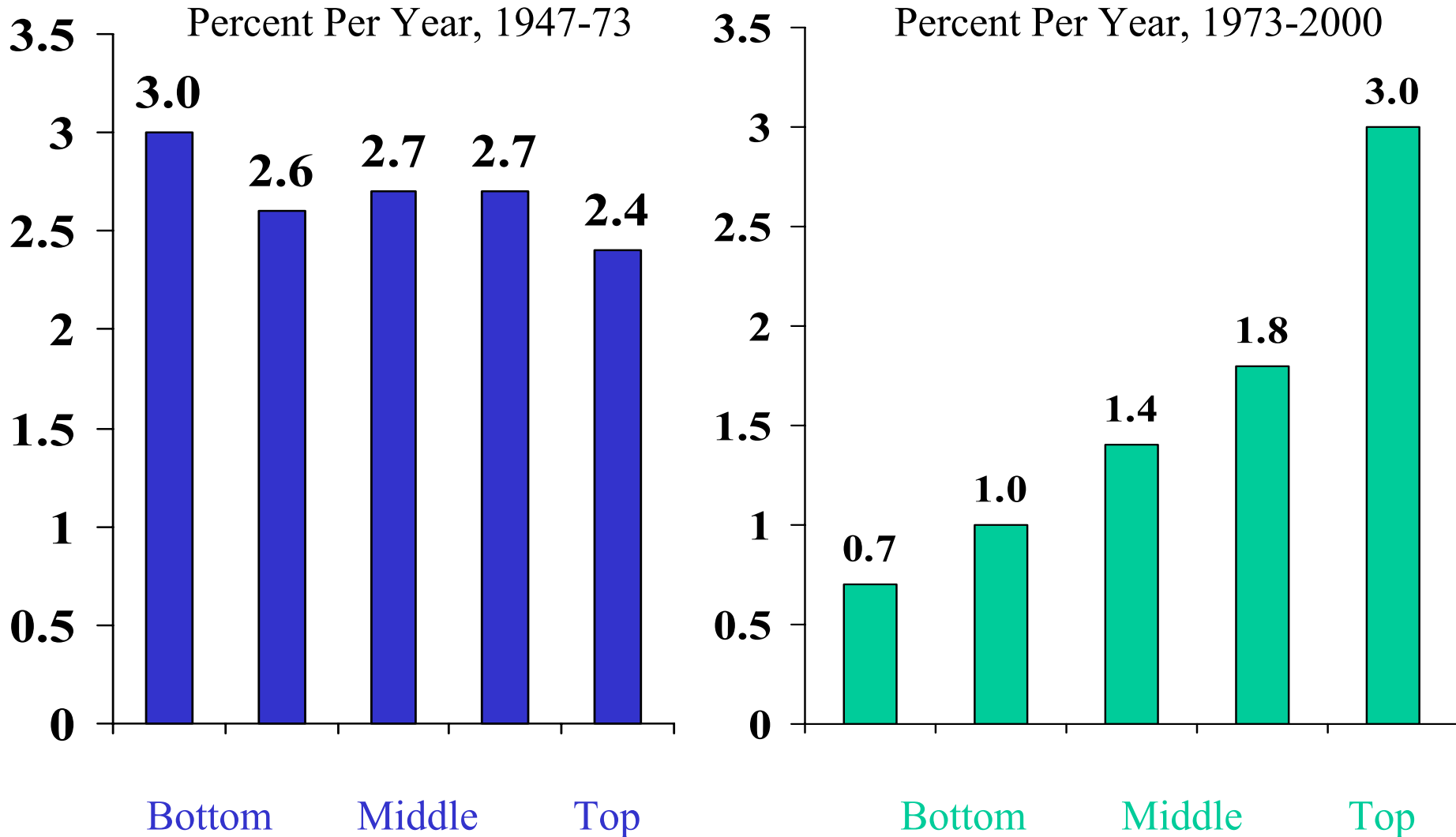
Source: Economic Policy Institute analysis of CPS data.

# Figure 3: College-High School Wage Ratio and High School-High School Dropout Wage Ratio, by Sex, 1973-99

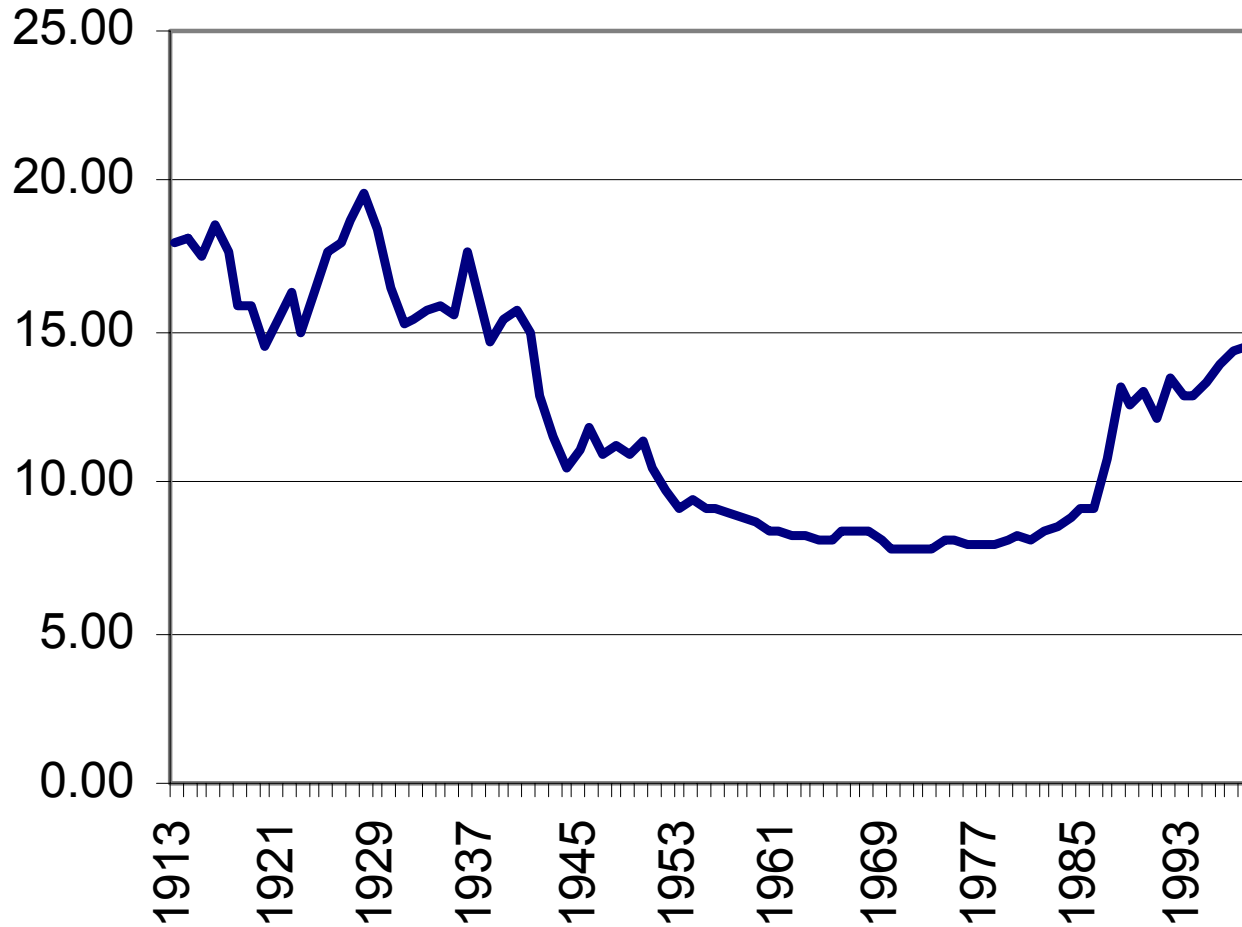


Source: Economic Policy Institute analysis of CPS data. Ratios for women are shown in gray, men in black.

# Figure 4: Real Family Annualized Income Growth by Quintile, Post-War Period



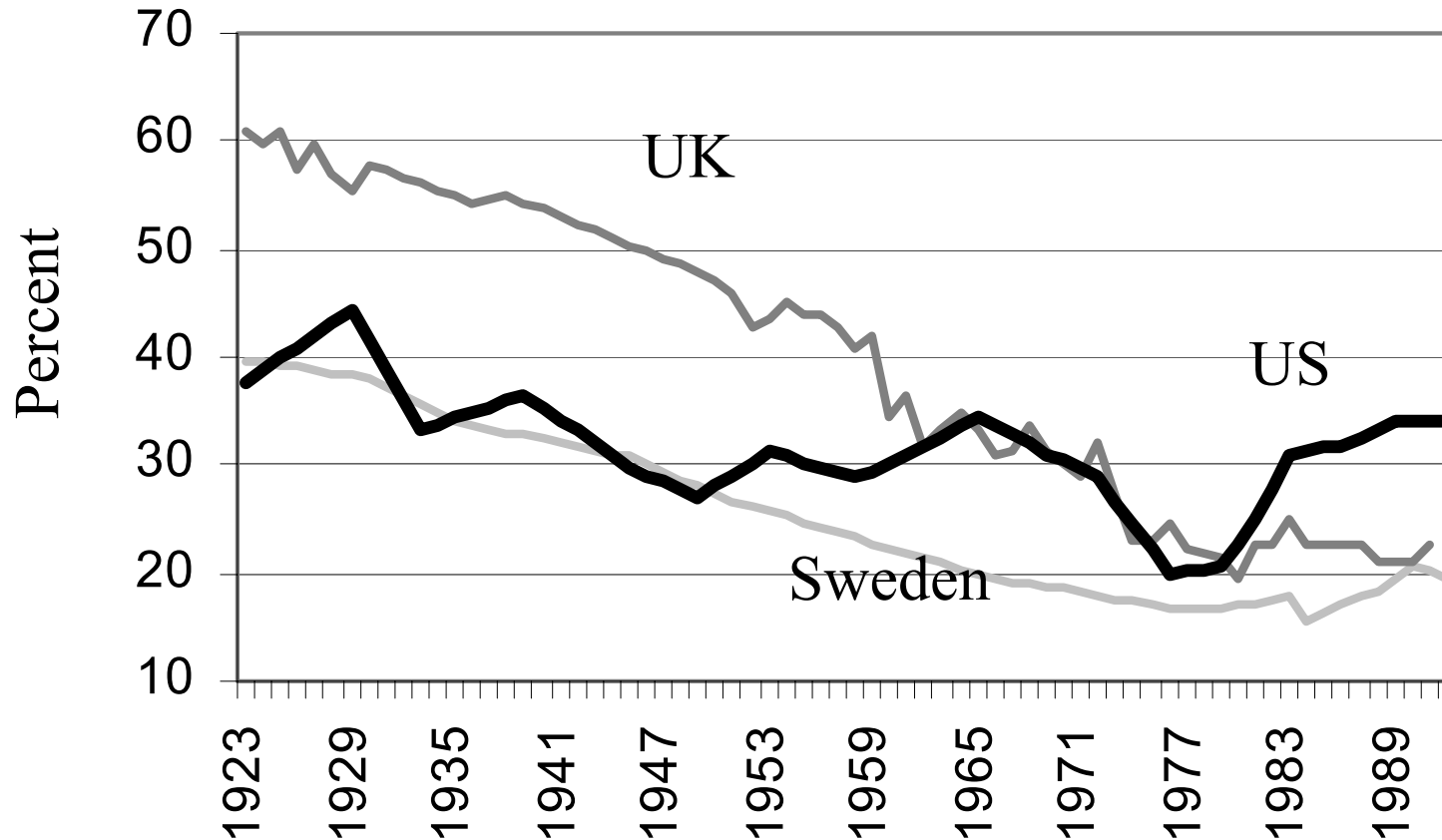
**Figure 5: Top 1 Percentile's Share of Income in the United States, 1913-98**



Source: Piketty and Saez (2001), Figure 3.

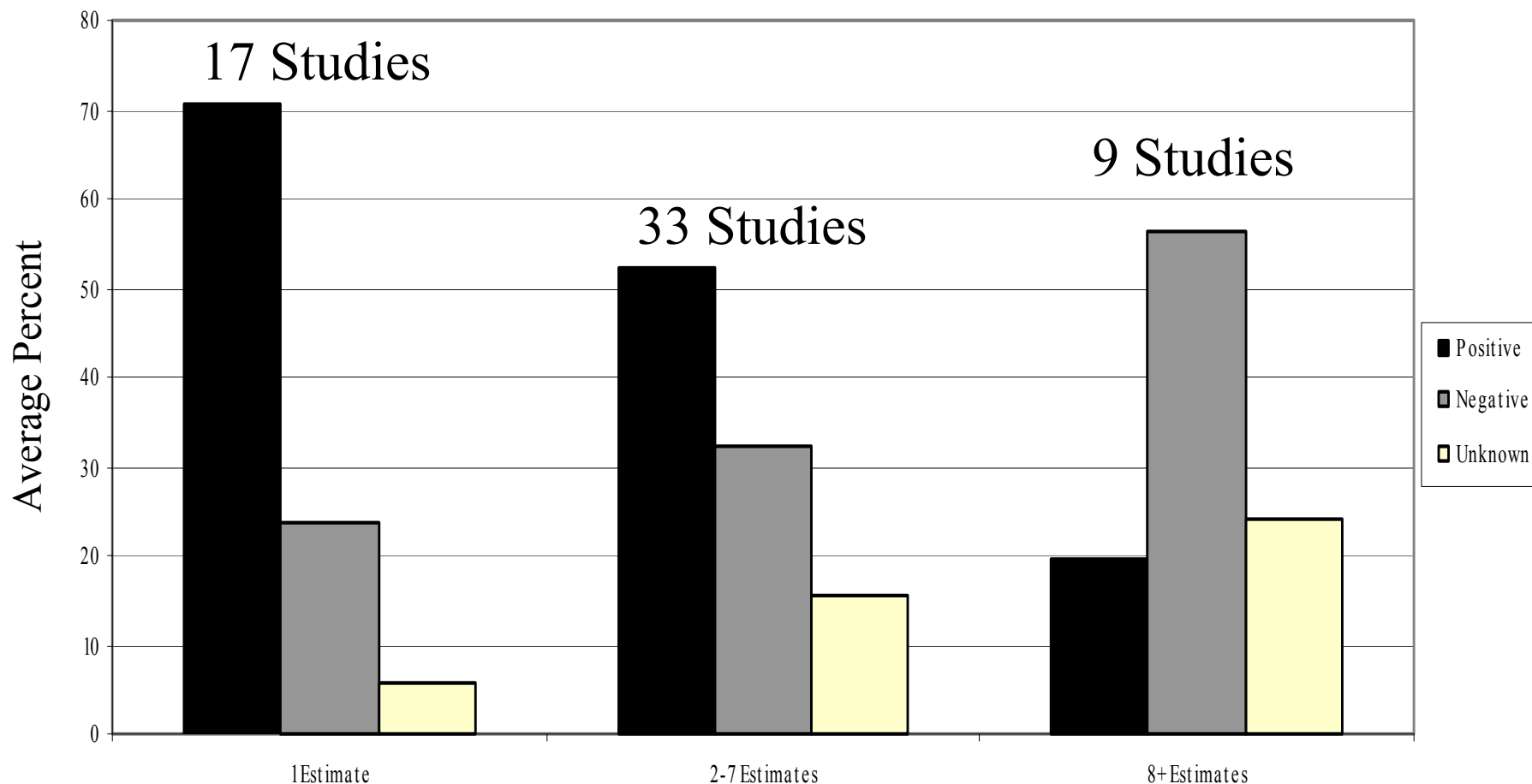


**Figure 6: Share of Marketable Net Worth Held by Top 1 Percent of Wealthholders: Sweden, United Kingdom, and United States, 1923-1992**



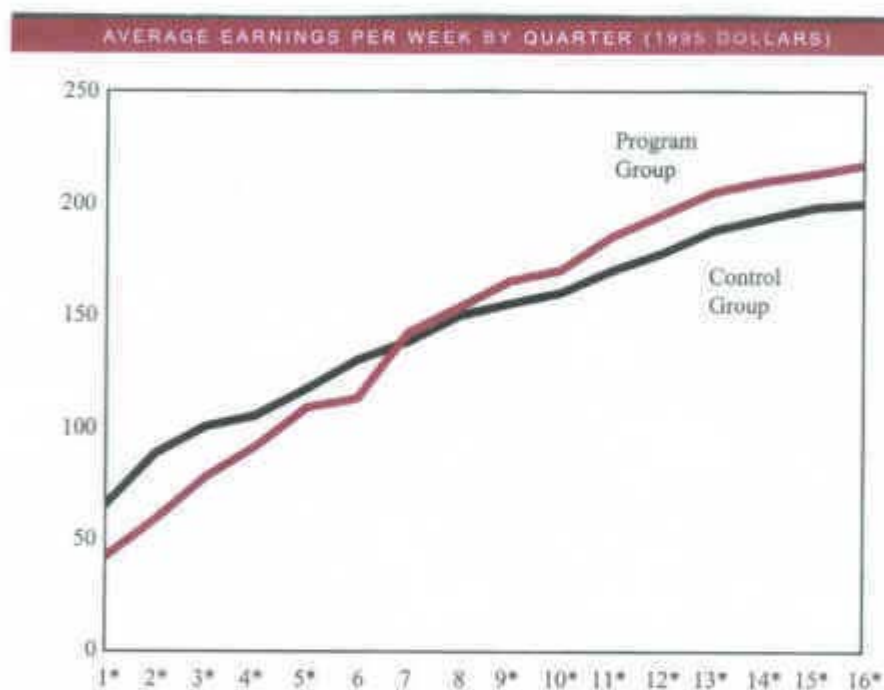
Source: Wolff (2002), Table 5-1.

**Figure 7: Percent of Estimates of the Effect of Smaller Classes that are Positive, Negative or Unknown Sign, by Number of Estimates Hanushek Extracted from each Study**



Notes: Based on data from Hanushek (1997). Arithmetic averages of percent positive, negative and unknown sign are taken over the studies in each category. See Krueger (2000) for details.

## Figure 8: Average Weekly Earnings, Program Group and Control Group, National Job Corps Study (1995 Dollars)

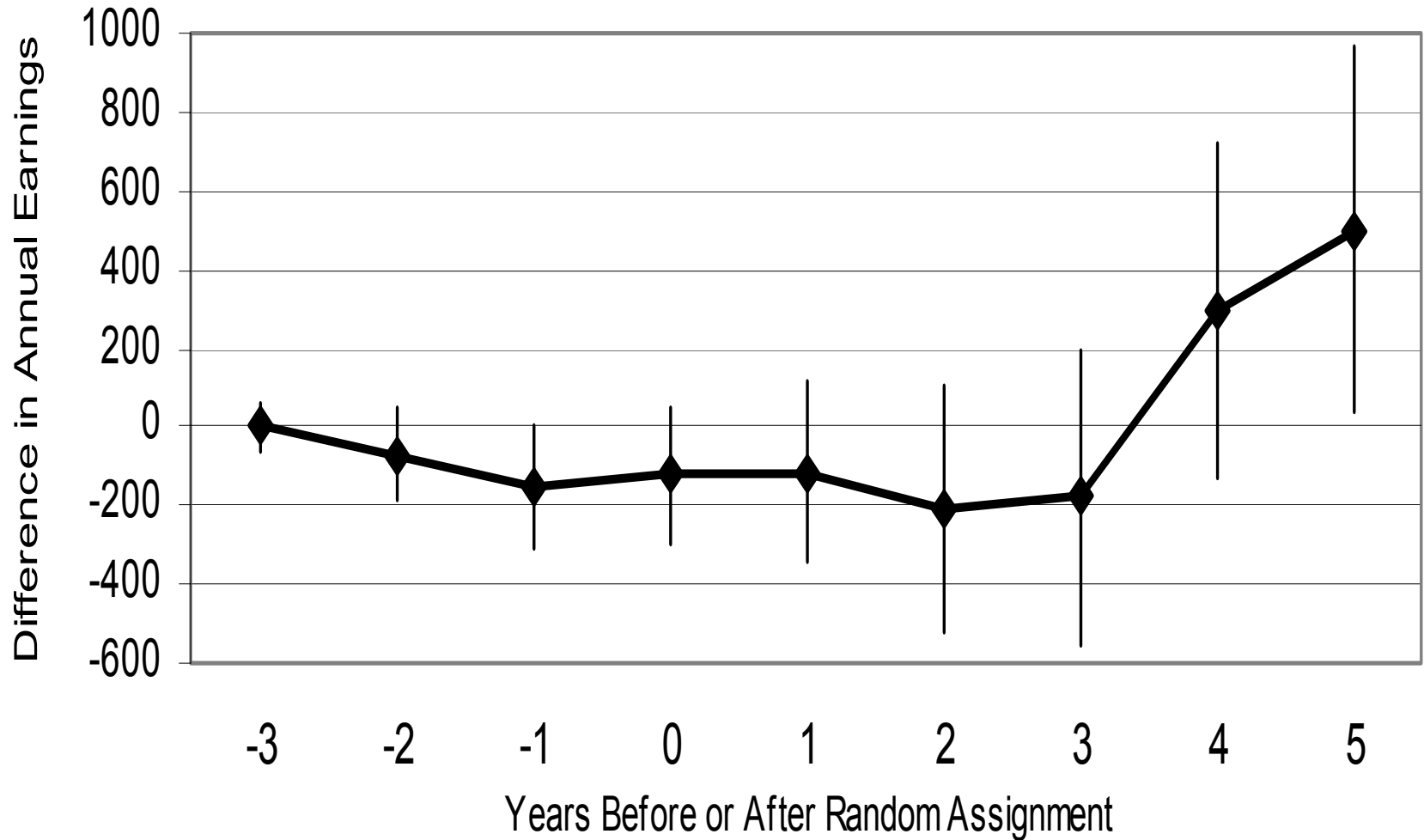


Quarters After Random Assignment

\*Difference Statistically Significant.

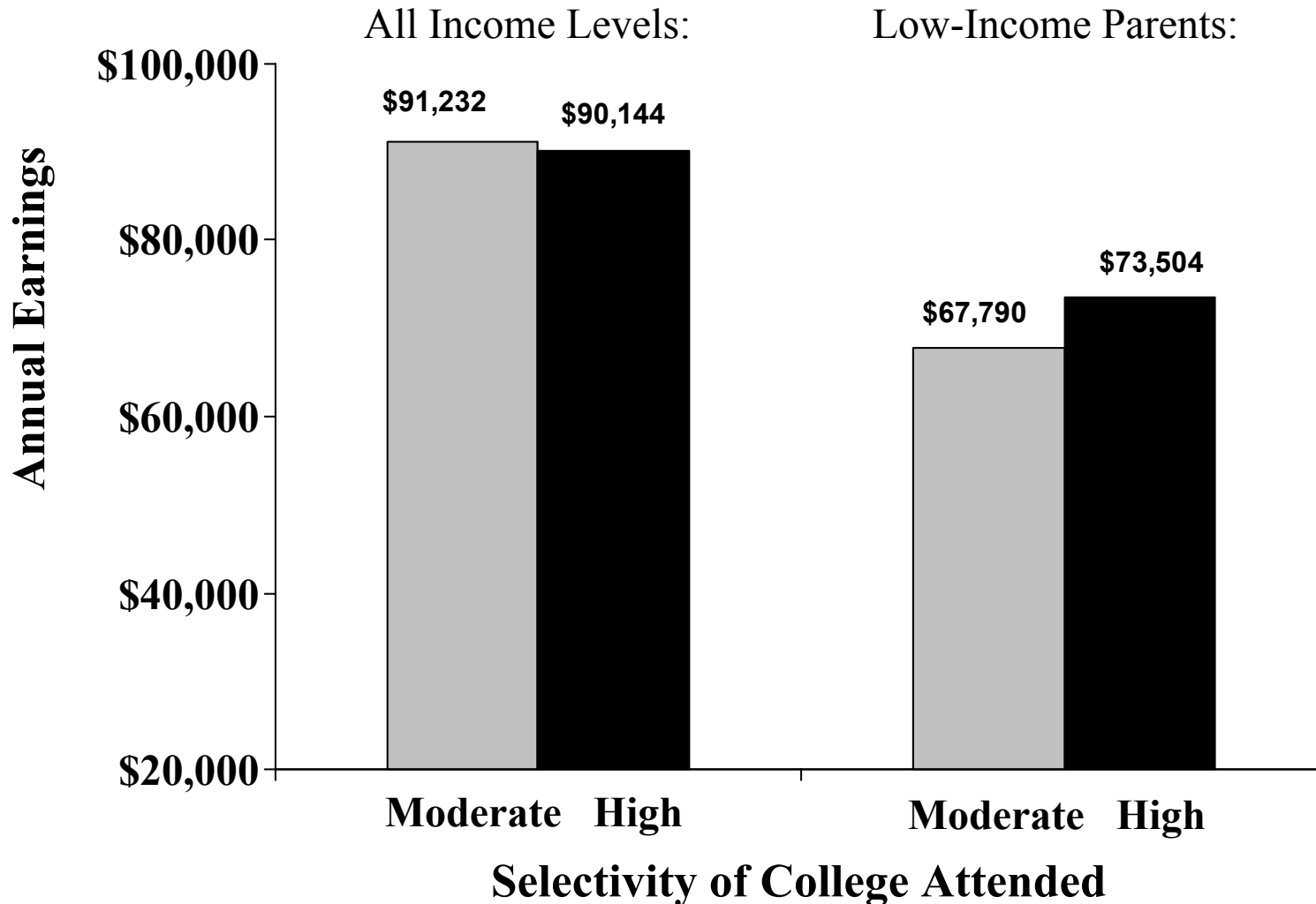
Source: John Burghardt, Peter Schochet, and Sheena McConnell, et al., "Does Job Corps Work?" Mathematica Policy Research, Inc., July 2001.

# Figure 9: Five-Year Follow Up of National JTPA Study Treatment-Control Difference in Mean Earnings, By Year Average for Male and Female Youths

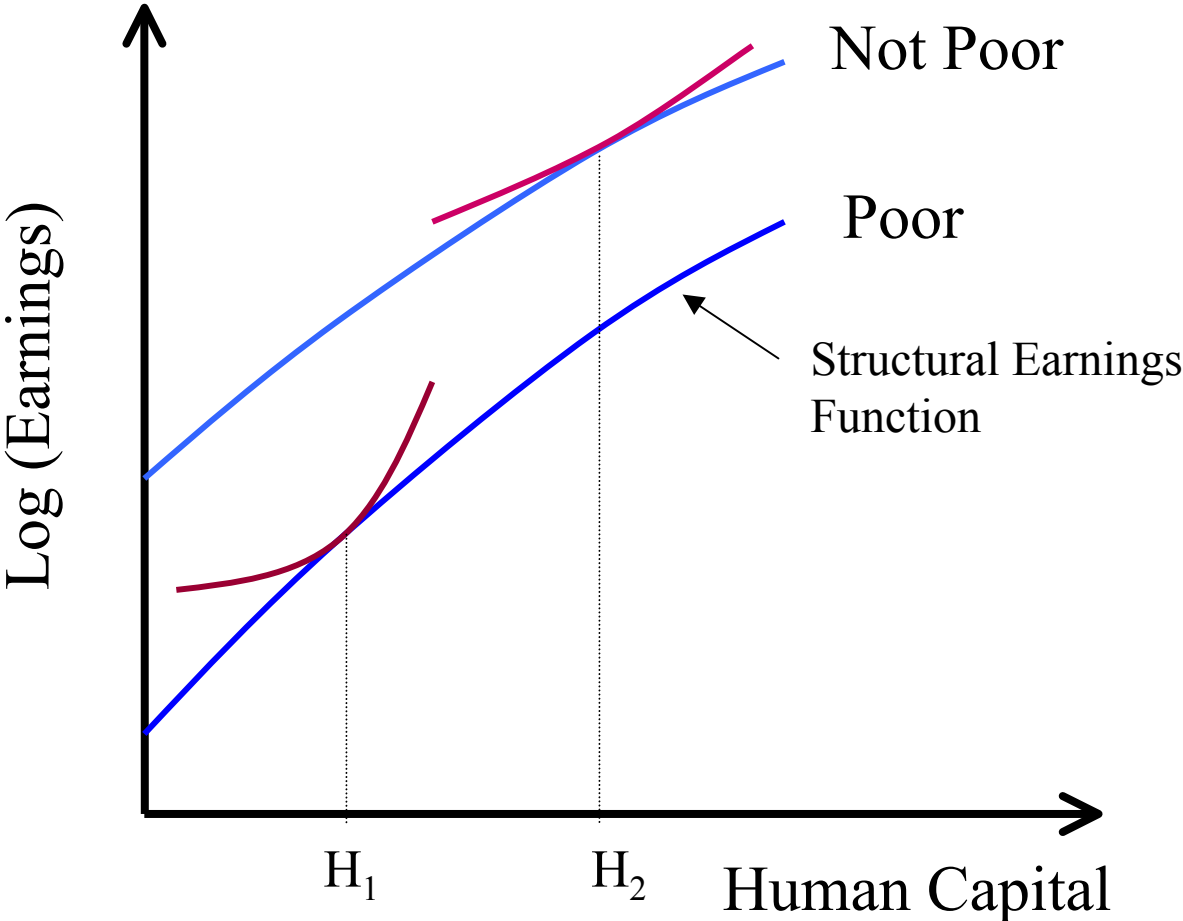


Source: Authors Calculations from GAO (1996). The diamond indicates the average control-treatment difference for men and women. The vertical lines indicate the width of a 95 percent confidence interval.

**Figure 10: Average Earnings in 1995, by Selectivity of College Attended for Students who Applied to and were Accepted by Both Highly and Moderately Selective Colleges**



**Figure 11a: Illustrative Human Capital Earnings Functions, with Credit Constraints**



**Figure 11b: Illustrative Human Capital Earnings Functions, with Credit Constraints and Social Externalities**

