Preliminary. Comments Welcome

The Labor Market Consequences of an Inadequate Education

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I. Introduction

Because of the strong relationship between years of completed education and annual earnings, education is the traditional route to upward mobility in the United States. The relationship is shown in Figure 1.[1] While there is not much increase in earnings for each year of completed schooling before the 11th grade, there is a steep earnings gain with each year beginning with high school completion.[2] This relationship has increased dramatically over the past 40 years. In 1964 a high school dropout earned 64 cents for every dollar earned by an individual with at least a high school degree. In 2004 the high school dropout earned only 37 cents for each dollar earned by an individual with more education. High school graduation has been a necessary (but not sufficient) pre-requisite for making it in America.

The labor market consequences for not graduating from high school are both private (in that they primarily impact the individual in question) and public (in that they impact the whole of society). In this paper I document the fact that if an individual does not complete high school his income is lower which also means he is less able to contribute to society – in this case as reflected in tax revenues.[3] In this way, I characterize an individual as having "inadequate education"if he or

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[1] Data from the 2003 and 2004 March *Current Population Survey*. Includes individuals aged 25-65. I thank Lisa Barrow for calculating the earnings ratio in 1964.

[2] For simplicity, at times I use the term "high school dropouts" to refer to all those who have not completed a high school education. In fact, one-third of those who do not complete high school dropout before the 9th grade. Further, I use the terms "high school graduation," "high school completion," and the possession of a "high school diploma" interchangeably for ease of exposition. In reality there can be differences between the terms. For example, one may complete 12 years of schooling without actually graduating. Most of the evidence suggests that, on average, the General Educational Development (GED) credential – a high school equivalency degree – is not in fact, equivalent to a high school diploma (see e.g., Cameron and Heckman (1993) and Murnane, Willett, and Tyler (2000)). However, Tyler, Murnane, and Willett (2003) also find that it is associated with better labor market outcomes for low-skilled men and women.

[3] Waldfogel, Garfinkel, and Kelly (in this volume) discuss the social assistance implications of inadequate education.

she does not (has not) graduated from high school. Admittedly this is a narrow concept of the adequacy of education as many individuals who graduate from high school nevertheless have very low skills. For example, according to the National Assessment of Education Progress (NAEP) 26% of 12th graders in 2002 scored below the basic level in reading suggesting they could not determine the basic meaning of a text. However, while school quality is important, it is also extremely difficult to assess and quantify. I discuss issues related to school quality in Section III. E., below.

In the next section I review the "canonical" economic model of educational attainment which (in theory) provides insight into why some individuals complete less schooling than others as well as the empirical challenges to estimating the economic value of schooling. In Section III I review the literature attempting to estimate the causal effect of schooling on income and conclude that the basic "cross-sectional" relationship (i.e., the mean difference in income between those with and without high school degrees) is a fairly good approximation to the causal relationship. In Section IV I discuss the data and methodology and in Section V I present new estimates of the income and tax payment differences between those with high school degrees and those without to estimate the earnings and tax revenue losses associated with incomplete education. Because those who do not complete high school are less likely to be employed and have significantly lower annual earnings than those with at least a high school degree, they also contribute significantly less to tax revenues. I calculate that, under plausible assumptions about income growth and the discount rate, the discounted present value of the lifetime difference in income between an individual who graduates from high school (but completes no further schooling) and one who does not is likely about $260,000 and the lifetime difference in income tax payments is about $60,000.[4] Aggregated over

[4] I present the *discounted* lifetime difference in earnings and income taxes in order to account for the fact that a dollar earned 50 years from now is worth less than a dollar earned today. That is,

one cohort of 18 year olds who do not ever complete high school, the combined income and tax revenue losses is likely over $200 billion, or 1.7% of GDP. Section VI concludes.

II. Why Does Schooling Improve Labor Market Outcomes?

The Basic Model of Educational Investment

According to the canonical economic model of schooling attainment, an individual will choose to graduate from high school if she perceives the lifetime benefits of doing so outweigh the lifetime costs of dropping out (Becker 1967). In the basic formulation of the model, this individual has perfect information about future benefits and costs as well as access to adequate financial credit, if necessary. In fact, this individual will continue in school until the (marginal) benefit from the last year of schooling is equal to the (marginal) cost of that schooling.

When assessing "costs" and "benefits" economists typically distinguish between *private* costs and benefits and *social* costs and benefits. Private costs and benefits are those borne (or that accrue) uniquely to the individual; social costs and benefits are those that are borne (or that accrue) to others. A classic example of a social cost is crime. Further, if additional education raises an individual's income level, then the potential tax revenues for the government are also increased (especially in a society, such as the United States, that has a progressive income tax system). These tax revenues also form part of the social benefit to increased education. Note, however, from the individual's perspective, these same tax revenues also lower the private benefit, because of the required income taxes to raise them.[5]

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by factoring in the *discount rate* I can place a value on income earned and taxes paid in the future.

[5] Further, because individuals with higher income consume more, they pay more in sales taxes; and because they are more likely to own property, they pay more in property taxes. I discuss

Left to her own devices, an individual deciding whether or not to pursue more education (or graduate from high school in our example) will only care about her private benefits and costs and not worry about whether there are also social benefits or costs. In the canonical model, if there are no social benefits or costs, an individual who chooses not to complete high school is assumed to have made the "optimal" decision for her such that neither she nor society would be made better off by compelling her to complete a high school degree.

However, there are many reasons why the decision to drop out of high school may not, in fact, be individually or socially "optimal." First, the canonical model only holds under several important assumptions. For example, as noted above, it assumes that individuals have perfect information about the costs and benefits of completing high school (i.e., they understand what their life would be like without a high school degree as well as with a degree). If individuals drop out of school not fully understanding the ramifications of their decision, then it may not be optimal for either them or society (again, assuming no social benefits). Further, this model assumes there are perfect credit markets. In some families the income that a dropout might earn comprises a non-trival proportion of the family income. If, instead, the family could borrow money to allow the child to graduate from high school, then the increase in earnings would allow the family to re-pay the loan (and then some) assuming that interest rates are lower than the return to schooling. But this requires access to credit markets with competitive interest rates. If credit markets do not function so smoothly then, again, an individual's decision to drop out of high school may not be optimal.[6]

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the likely magnitude of the loss in property taxes in Section V. B, below.

[6] Whether borrowing constraints explain differences in educational attainment, especially college attendance, by family background is an unresolved issue (see, e.g. Heckman and Lochner (2000) and Ellwood and Kane (2000)). However, there is growing evidence from outside of education that individuals, particularly teenagers, are credit constrained (see, e.g., Warner and

Importantly, in the presence of (net) positive social benefits that exceed the (net) private benefits, it would be better if the individual completed more schooling, from society's point of view. In this case, society will have an incentive to encourage the individual to attain more schooling through, for example, compulsory schooling laws.

Empirically, it is of interest to understand the magnitude of the benefit to completing high school in terms of wages and income. To fully understand why some individuals do not complete high school, however, one must also have a firm understanding of the perceived costs. Further, while there is a large literature estimating the private benefit to completing high school, there is a much smaller literature attempting to understand the social benefits.[7]

Estimating the Economic Value of Schooling

In the economics literature it is conventional to define the average percentage difference in mean earnings for each additional year of schooling as the "return to schooling." As Mincer (1974) shows, if foregone earnings are the only cost of school attendance this is the private marginal benefit (or "return") to the investment in a year of schooling.[8] Current estimates based on the *Current Population Survey* (CPS) suggest that for each year of completed schooling an individual's earnings increase by about 11%.[9] While the relationship between income and schooling has been well

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Pleeter (2001) and Gross and Souleles (2000)).

[7] Using variation in compulsory school laws Acemoglu and Angrist (2000) estimate surprisingly small social benefits to secondary school education in terms of wages.

[8] For higher education, a more detailed calculation of the "return" would incorporate the other costs of schooling, including tuition, as discussed above.

[9] Based on a regression of the natural logarithm of hourly wages on years of completed education, a quadratic in potential experience, controls for sex, race/ethnicity, marital status, and 9

documented, the reason for its existence is more controversial. Specifically, some argue that education provides skills, or human capital, that raise an individual's productivity (e.g., Becker 1967). If so, then because productivity is reflected in income, education is a key determinant of upward social mobility. It follows that much of the gap between the rich and the poor arises from a lack of skills among the poor such that education and training should form the cornerstone of policies aimed at reducing income inequality.

Others (e.g., Spence 1973) argue the documented relationship may not be not causal, that education may not *generate* higher incomes. It is possible education and income are positively correlated because individuals with higher "ability" complete more schooling, and would likely earn higher wages and salaries even if they had not received the additional schooling. In this case, the schooling-income connection may be a mirage – it is just a symptom of the fact that higher ability people command a premium for their (innate) skills in the labor market. The result is that empirical estimates of the return to schooling are too large ("upward biased," in statistical terms) due to "family background" or "ability" bias. In this view increasing support for educational programs for the disadvantaged will have little or no effect on their labor market outcomes.

While much of this literature refers to the overall "return to schooling," the same mechanics are at work as one considers the effect of completing high school on income: Do high school graduates earn more than dropouts because the education they received in high school is valuable in the labor market? Or are the individuals who complete high school different from high school dropouts and it is this difference (and not the schooling) that explains the higher income?

In an effort to disentangle these two competing hypotheses, researchers have developed

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regions using the 2004 March *Current Population Survey*. The regression was weighted using the earnings weight.

several methods to isolate the causal impact of education on income. Ideally one might conduct an experiment to determine definitively whether high school graduation (or schooling more generally) causes higher incomes. In such an experiment, one group of students would be randomly assigned to complete high school without regard to their ability or general background; another group of students would be randomly assigned to drop out of high school. Years later we would compare the labor market outcomes of these students. On average the only difference between the two groups of individuals would be whether they had graduated from high school. Contrasts of the earnings of the two groups would, with a large enough sample, provide a credible estimate of the causal effect of high school completion on earnings.

The experiment just described has not been performed to study the effect of high school *per se* on incomes, and will not likely ever be performed. As a result, researchers have looked elsewhere for convincing non-experimental evidence. Three broad approaches have been taken to estimate the causal effect of education on labor market outcomes. The first compares the wages of workers who have similar genetic and family backgrounds, but who differ in educational levels. A systematic correlation between the educational differences and income differences of such workers is evidence of the link between income and schooling that cannot be a result of common family backgrounds. The second approach (so called "natural experiments") looks for a determinant of high school graduation (such as compulsory schooling laws) that is not also a determinant of incomes. By studying the relationship between this determinant and education and the relationship between this determinant and income, one can "back out" the causal relationship between education and income. The third approach uses randomized evaluations of programs designed to increase educational attainment to generate an experimental estimate of the effect of education on income. I summarize the literature using each of these approaches, below.

III. Empirical Estimates of the Return to Schooling

A. Intra-Family Comparisons

Many researchers have used sibling or twin pairs to construct estimates of the return to schooling. Because sibling and twin pairs share genetic material and were raised in similar household environments, their "ability" (and other unobservable characteristics of individuals) is much more similar than across random members of the population. As a result, when one relates differences in schooling between siblings to labor market outcomes, one implicitly accounts for these unobserved factors. Unfortunately, the measurement error in reported schooling poses an econometric challenge for these models. The reason is that classical measurement error[10] is exacerbated in within-sibling (or within-twin) estimators, because sibling education levels are so highly correlated (Griliches 1977). As a result, much of the more recent literature using this approach has focused on addressing the measurement error, as well as ability, bias.

Although the magnitude of the estimated return to schooling varies because of widely different time periods covered, studies using siblings and twins indicate a significant relationship between schooling level and earnings. When adjustments for measurement error are possible, the resulting estimates typically differ insignificantly from the simpler cross-sectional (ordinary least squares) estimates of the return to schooling.[11]

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[10] Classical measurement error is measurement error that is uncorrelated with the error term in the outcome equation and with the true level of schooling.

[11] See, for example, Ashenfelter and Zimmerman (1997) and Altonji and Dunn (1995) for studies using siblings. See Ashenfelter and Krueger (1994), Behrman, Rosenzweig, and Taubman (1994), and Rouse (1998) for studies using twins. Further, there is evidence from sibling studies that the return to schooling does not vary by the family background (Ashenfelter and Rouse 1998) nor the race (Barrow and Rouse 2005) of the individual.

B. "Natural Experiments" (Instrumental Variables)

Researchers have also attempted to find so called "natural experiments" that would provide the kind of information that an ideal experiment would provide. To do this they have attempted to locate exogenous events that might be expected to alter the schooling decisions of some people, but which would not be expected to independently alter their income. The basic idea used in the application of this method is straightforward. Suppose that we knew of an event that would increase a group's likelihood of graduating from high school. Suppose further we were certain that this event would not have any direct effect on the group's earnings. We would then estimate the effect of high school graduation on earnings in two steps: In the first step we would estimate the effect of the event on the probability of high school graduation of the group. In the next step we would measure the effect of the same event on the earnings of the group. If we find that the earnings of the group has increased, then we can be sure that education was the cause of the earnings increase since we were certain the event had no *direct* effect on earnings. The ratio of the income increase caused by the event to the increase in high school graduation caused by the event is a straightforward estimate of the causal effect of high school graduation on earnings. This instrumental variables (IV) estimator uses the "exogenous" event as the instrumental variable. Many studies using IV (e.g., Angrist and Krueger (1991), Kane and Rouse (1993), Kling (2001) and Card (1993)) find that the instrumental variables estimate of the return to schooling is at least as large as that implied by conventional procedures.[12]

More recently Oreopoulos (2003) has estimated the cost to dropping out of high school using

[12] Angrist and Krueger (1991) use an individual's quarter of birth as the instrumental variable; Kane and Rouse (1993), Card (1993), and Kling (2001) use proximity to a two- and/or four-year college as instrumental variables.

compulsory schooling laws in three countries as the exogenous event that affects schooling. He finds remarkably consistent evidence across the three countries: staying in school for one more year increases lifetime income by more than 3 times the peak income earned among those that drop out before the end of high school.

C. Evidence from Job Corps

Experimental evaluations of job training programs provide yet another piece of evidence on the economic value of education. The most recent is an experimental evaluation of the Job Corps Program conducted by Mathematica Policy Research (Burghardt., et al., 2001). Job Corps is a residential education and job training program aimed at disadvantaged youth without a high school diploma. A principal goal of the program is to encourage youth to complete their high school education or earn a GED. In the Mathematica evaluation, youth randomly assigned to Job Corps completed about 1 more year of schooling than those randomly assigned to the control group. Further, after 4 years those assigned to Job Corps had earnings gains that were about 12% higher than those assigned to the control group, generating an estimated return to one year of schooling of about 12%.[13]

D. Implications for Estimating the Earnings Loss from Dropping Out of High School

The results of all these studies – those using family relationships, those using IV, and that from the Job Corps evaluation – are surprisingly consistent: they indicate that the return to

[13] See Kane and Rouse (1999) for an estimate of the return to schooling using the experimental evidence from the Job Training Partnership Act (JTPA) (which was replaced by the Workforce Investment Act in 1998). The estimated returns to schooling using the JTPA evaluation are also quite similar to others in the literature.

schooling is not dominated by an omitted correlation between ability and schooling. As a result, this review of the literature has led many to believe that the overall cross-sectional estimate of the economic value of education is likely quite close to that one would generate from the ideal experiment. In fact Nobel Laureate James Heckman, with Pedro Carneiro, writes, "By now there is a firmly established consensus that the mean rate of return to a year of schooling, as of the 1990s, exceeds 10 percent and may be as high as 17 to 20 percent." (Carneiro and Heckman 2003, pp. 148-149). As such, I rely on the larger survey data to estimate the difference in earnings between individuals with and without a high school degree to get some idea of the earnings and tax revenue losses associated with not completing high school.

E. A Note about School Quality and Income

Before turning to these estimates, it is important to address the fact that whether an individual has a high school degree or not is a rather limited measure of whether that individual has had an "adequate education." Notably the quality of the individual's education is not explicitly part of this definition. The primary reason I do not calculate the social cost of a low *quality* education is that measures of school quality are quite imprecise and often difficult to measure. For example, while there is good evidence that smaller classes result in higher student achievement (e.g., Achilles and Finn 1990, Krueger 1999), most data sets simply report the number of pupils per teacher. In a one-room school house this is a good proxy for class size, however in larger schools with more heterogenous class sizes, it is not (e.g., Boozer and Rouse 2001). In addition, while there have been many studies that assess the impact of school quality on immediate student outcomes such as test scores, far fewer assess its impact on labor market wages because of the long lag between the two measurements. That said, one study by Card and Krueger (1992) relating the quality of schooling

received by individuals born between 1920 and 1949 and their earnings in 1979 found that a reduction in the pupil-teacher ratio of 10 students increased average earnings by 4.2 percent.

Further, part of the increase in earnings from improved school quality derives from an increase in educational attainment (including an increased likelihood of graduating from high school). For example, Card and Krueger (1992) also found that the 10 student reduction in pupil-teacher ratio increased educational attainment by 0.6 years. (See, also, Card and Krueger 1996.) Further, evidence from the Tennessee class size reduction experiment ("Project STAR") suggests that students (randomly) placed in smaller classes in grades K-3 performed better on standardized tests in the 8th grade and they were more likely to take a college entrance exam (such as the ACT or SAT) – a signal that such students may have been more likely to attend college as well (Krueger and Whitmore 2001).[14] Because of the likely effect of school quality on an individual's level of schooling, by focusing on educational attainment, I partially address issues of school quality as well.

IV. Data and Methodology

A. Data

To calculate the earnings and income tax revenue losses from not completing high school I use the *Current Population Survey* (CPS), a monthly labor market survey of approximately 50,000 households across the United States. The survey provides some of the most current information on income and wages for a national sample of households and individuals. I use the March CPS that includes detailed information on labor market earnings and other income for the previous calendar

[14] Others believe the evidence on a positive impact of school quality on subsequent educational attainment and earnings is not very strong. See, for example, the volume edited by Burtless (1996) for differing viewpoints.

year. One disadvantage of the March CPS is that it does not separately identify individuals who graduated from high school from those who received a General Educational Development (GED) credential. Another is that it only includes the civilian non-institutionalized population. As such it misses the potential effects of high school graduation that are realized through the military and the income gains or losses that accrue to the institutionalized population, such as those in jails and prisons. This limitation should be kept in mind when interpreting the results.[15]

However, these disadvantages are balanced by the many advantages of the March CPS. First it has individual reports of many kinds of income (such as that derived from wages and interest), in addition to social insurance (such as unemployment insurance) and transfer payments. Second, it has a measure of annual earnings. Annual earnings are comprised of an individual's hourly wage, the number of hours worked per week, and the number of weeks worked per year. It, therefore, implicitly accounts for both the compensation an individual receives for his time (which labor economists typically believe reflects the individual's productivity or usefulness to the employer) and how much the individual worked. If completing high school makes an individual more "productive" because of the skills he has acquired this will be reflected in annual earnings. If completing high school provides individuals with access to more stable employment such that they are employed for more hours per week and more weeks per year, this will also be reflected in annual earnings.

I combine data from 2003 and 2004 to ensure a sufficient sample size. Further, I categorize

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[15] I do not attempt to adjust the estimates in this paper for the institutionalized population because I would need to make assumptions about the likely earnings such individuals would earn were they not incarcerated (or otherwise institutionalized) as well as estimate the fraction that would nevertheless be incarcerated even if they had completed a high school degree. Further, I did not make adjustments for the military as most of these individuals have a high school diploma. If their earnings are similar to those in the civilian labor market their omission will likely have a negligible effect on the results.

individuals as having one of three levels of education: no high school degree, a high school diploma (including a GED), and at least a high school diploma (just over 60% of these individuals have completed at least some post-secondary education). The sample includes over 300,000 individuals aged 18 to 67. All figures are weighted using the sampling weights provided by the Bureau of Labor Statistics. And, all monetary figures are inflated to 2004 dollars using the Chained Consumer Price Index for Urban Consumers (the CPI-U).

B. Calculating Income Tax Revenues

I estimate the income tax revenue gains associated with high school graduation using a computer program administered by the National Bureau of Economic Research called the TAXSIM model.[16] TAXSIM is a set of programs and data sets that allow one to simulate an individual's U.S. federal and state income taxes (Feenberg and Coutts 1993). I used the tax calculator, a program that recreates each year's federal and state tax law and the March CPS to obtain a sample of individuals and their income sources. Because the income on the March CPS represents the previous calendar year, I simulate tax contributions using the tax laws for 2002 and 2003 (as such I calculate tax revenues based on the tax law in effect at the time the income was earned).

While the March CPS was designed to carefully account for an individual's sources of income, it does not collect data on expenses. Thus, in the tax simulations do not adequately account for expenses such as rent, property taxes, child care, and mortgage interests which can be deducted from tax liabilities. Further, while capital gains and losses are reported in the March CPS in 2003, they were not reported in 2004. That said, the simulated tax revenues come quite close to the actual

[16] I used TAXSIM version 6, documentation and programs for which can be accessed at http://www.nber.org/~taxsim/taxsim-cal6.

revenues reported by the Internal Revenue Service (IRS). For the both the 2003 and 2004 CPS (tax years 2002 and 2003) the simulated federal tax revenues are only 1% lower than those reported by the IRS.[17]

A final note about methodology. In the U.S. tax filing is by the family (unless one is single or a married couple filing separately). As such, in theory, I could have grouped individuals in the CPS into "families" – which are subunits of households. The problem is that once one has calculated the total taxes paid by a family, it is impossible to then back out the liability due to each individual (particularly since some aspects of the tax code are specific to the family unit). As a result, to calculate the difference in taxes paid between high school graduates and high school dropouts, I assume that all individuals do not live in families and are "single." (Thus I assume that individuals are not married and have no children.) In this way, I calculate the tax revenues to society based on the *individual's* income alone. The degree to which this over or understates the tax revenue benefits to high school graduation will depend on the extent to which families receive benefits (such as food stamps) which depend on the size of the family, take deductions (or credits) that rely on the family structure (e.g., the child care credit), and on the size of the "marriage penalty" since individuals with high school degrees are also more likely marry (McLanahan 2004). The simulations based on individuals generates a total federal income tax that is slightly higher than that produced using families and is 1% greater than that reported by the IRS.

V. Income and Tax Revenue Losses Resulting from Inadequate Education

[17] The IRS data to which I compared the simulations were from the *Internal Revenue Service Data Book, 2004*, Publication 55B, Washington, DC, Issued March 2005 (Table 7), downloaded from http://www.irs.gov/taxstats/article/0,,id=102174,00.html.

A. Income Losses

An important social loss associated with individuals not receiving an adequate education is that they may not have acquired their "optimal" level of job market skills. As such, they will not have the requisite skills to be employed to their fullest potential which will be reflected in their ability to find jobs as well as the level of the compensation once employed. The statistics in Table 1 support this interpretation. The figures represent the average outcomes for individuals who have not completed high school, those whose highest level of education is a high school diploma, as well as those who have at least a high school diploma. The analysis suggests that only slightly more than one-half of high school dropouts are employed compared to 69% of those whose highest level of education is a high school diploma, and nearly three-quarters of those with at least a high school diploma. Similarly, high school dropouts are more likely to be unemployed, "discouraged workers," or out of the labor force.[18] Further, high school dropouts work more than 2 fewer months per year than those whose highest level of education is a high school degree and nearly 3 fewer months per year than those with at least a high school diploma.

Given that high school dropouts are more likely to be unemployed, it is natural to ask whether they are more likely to receive unemployment insurance. In fact, only 4.5% of high school dropouts ever claimed unemployment insurance (UI) during the previous year compared to 5.3% of those whose highest degree is a high school diploma and 4.4% of those with at least a high school education. While eligibility requirements differ across states, workers typically must have earnings that exceed a minimum threshold in several prior calendar quarters, they must not have been fired

[18] In order to be considered "unemployed" by the CPS, an individual must not have a job *and* be actively seeking employment. "Discouraged workers" would like a job but have given up looking for work, and those out of the labor force report not wanting a job at this time.

for cause, and they must be actively seeking work. Given their lower earnings and greater likelihood of not having a job, high school dropouts are less likely to be eligible for UI. Further the amount of UI received is lower among high school dropouts because the level of UI an individual receives is based on the individual's earnings and since high school dropouts have lower earnings (as discussed below), they receive lower payments once on UI.[19]

Not only do high school dropouts work less than those with higher levels of education, once working the quality of their jobs benefits is lower as well. For example, high school dropouts are about one-half as likely to have a pension plan or health insurance through their job as those whose highest level of education is a high school diploma. And, importantly, their earnings are lower. The average high school dropout earns about $12,000 per year, nearly one-half that earned by those whose highest level of education is a high school diploma and one-third that earned by those with at least a high school education. These lower earnings are a function of dropouts earning lower wages, and working fewer hours and weeks per year.

B. Tax Revenue Losses

The lower annual earnings also mean that high school dropouts are less able to contribute to government revenues. Table 3 shows average income taxes paid by the educational attainment of the individual. On average high school dropouts pay approximately $1300 per year in federal income taxes, $300 per year in state income taxes, and $1800 per year in Social Security taxes for a total of about $3400. This is one-half the contributions made by those who have (only) completed

[19] Because I use a tax simulator to calculate potential tax revenues, differences in unemployment compensation received (which are taxed) are implicitly factored into the tax analysis, below.

a high school degree, and nearly one-third the contributions of those with at least a high school degree.

The total income and tax revenue losses from the social view are not only the losses that would occur to one person, but the losses that accumulate over all high school dropouts. And, over many individuals, these differences add up. While one might believe that it is straightforward to calculate the number of high school dropouts accurately, in fact it is quite difficult. As noted above, the CPS does not include either the military nor those in institutional settings which disproportionately include high school dropouts.[20] Despite these disadvantages, I use the CPS to estimate the number of dropouts for purposes of this rough calculation. According to the CPS there were approximately 23,000,000 individuals aged 20-67 who had not completed high school in 2004.[21] This means that high school dropouts contribute over $50 billion fewer federal and state income tax payments annually than do those who obtain their high school diploma (but attain no further schooling); the difference rises to $80 billion when one also factors in Social Security contributions.

Before calculating lifetime differences in earnings and income tax revenues by educational attainment, it is worth considering the likely magnitude of the losses in other taxes. I focus on property taxes which are the major source of revenue for elementary and secondary education in the

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[20] Another potential source of information on dropouts is the *Common Core of Data*, administrative data gathered from school districts themselves. Unfortunately school districts do not track students who leave the district well. While some students leave school because they have decided to drop out, others simply move to another district and may well complete high school there.

[21] I use individuals 20-67 years old since in March of the year 18 year olds have not yet completed the school year so many of the seeming "drop-outs" are simply students who are in the 12th grade but have not yet graduated. And, there is a significant decrease in the number of high school dropouts between ages 19 and 20, as individuals belatedly obtain a diploma.

U.S. in most areas and for which information is available in the Decennial Census of the United States. Based on the 5% Sample of the 2000 Census, I calculate that households headed by an individual aged 18-67 who is a high school dropout contributed about $280 less in property taxes in 1999 (in 2004 dollars) than households headed by individuals who had completed a high school degree (but no further schooling), and about $800 less than those with at least a high school degree.[22] Given there were approximately 13 million household heads aged 20-67 who were high school dropouts in the 2000 Census, this implies that high school dropouts contributed approximately $3.6 billion less in property taxes in 1999 than households headed by those whose highest degree was a high school diploma, approximately 7% of the losses due to federal and state income taxes.

I emphasize that one must exercise much caution when interpreting these estimates regarding property taxes. First, while there is a literature establishing the causal relationship between education and earnings, I know of no research on the causal relationship between an individual's education and property tax payments. As such, these estimates may overstate the property tax revenue losses. Second, property taxes are based on the value of the housing unit and therefore one can only determine payments made (jointly) by members of the housing unit and not the payments made by a specific individual.[23] Finally, while renters do not *directly* pay property taxes, they do so *indirectly* through the rent and these calculations do not include such contributions.[24]

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[22] I extracted the data using the extracting program available on www.ipums.org (Ruggles, Sobek, et. al., 2004).

[23] In theory one could model each of the components that go into an individual living with others and then "back out" the individual contribution. This estimate would, needless-to-say, be quite imprecise.

[24] For example, in the 2000 Census 51.3% of household heads that are high school dropouts report owning their home compared to 64.7% of household heads that have a high school degree (and no further schooling) and 66.7% of household heads with at least a high school degree.

Nevertheless, property tax revenues likely form a non-trivial component of the social losses arising from inadequate education.

C. Lifetime Earnings and Income Tax Revenue Losses

One can calculate the lifetime earnings penalty for not completing a high school degree using information on income and taxes paid across the population. Figure 2 – which plots average annual earnings by age and education – forms the basis for the calculation. The figure shows that earnings increase as individuals age (and are in the labor force longer) before reaching a peak in the early to mid-forties. Earnings growth increases with an individual's educational attainment which exacerbates earnings losses associated with dropping out of high school observed among younger workers.

To use these data to calculate the lifetime earnings losses associated with inadequate education for an 18-year old today, I assume that the age-earnings profiles observed here will continue for the individual's working life (i.e., for the next 50 years or so). Next I must make assumptions about how earnings will grow over the next 50 years and about the discount rate – the amount by which one must discount earnings in the future in order to place a value on such earnings today. In forecasting earnings growth, it is common to consider increases between 1-2% which mirror prior real earnings and productivity growth and track assumptions about future productivity growth used by government forecasts. As for the discount rate, Moore, Boardman, et al (2004) recommend 3.5%. A higher discount rate would reflect more uncertainty.

Table 3 shows the lifetime *difference* in the discounted present value of earnings between those whose highest level of educational attainment is a high school diploma and high school dropouts (in columns (1) -(3)) and between those with at least a high school diploma and high school

dropouts (in columns (4)-(6)) under a range of assumptions about future productivity growth and the discount rate.[25] The table also shows these differences in income taxes paid. Because Social Security is designed as a self-funding program in which benefits are paid for by contributions (such that one should not consider tax contributions as a net gain to society without also considering anticipated future benefits), the tables also shows differences in taxes paid with and without Social Security contributions.

The lifetime earnings between dropouts and those with a high school diploma as the highest level of education ranges from $121,000 (the third row of column (1) – assuming 0% annual earnings growth and a 6% discount rate) to $294,000 (the first row of column (3) – assuming 2% annual earnings growth and a 3.5% discount rate). Given the Social Security Trustee's intermediate forecast regarding productivity growth over the next 75 years is 1.6%, the estimates assuming a discount rate of 3.5% and productivity growth of 1.5% are sensible. In this case, the lifetime earnings losses associated with dropping out of high school are approximately $260,000 overall. This figure underestimates the potential earnings loss as it does not account for the fact that were some of the current high school dropouts to complete high school they would attend college. An upper-bound estimate of the earnings loss is given by the figures in columns (4)-(6) which include all individuals with at least a high school degree. The figures assume that were current dropouts to attain their high school degree, they would attend college at the same rate and complete the same distribution of years of schooling as current high school graduates. In this case, the estimated average lifetime earnings loss for an individual would be about $550,000.

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[25] Again, I present the lifetime earnings differences in discounted present value terms (rather than using nominal dollars) in order to account for the fact that a dollar earned today is worth more than a dollar earned in 50 years.

I conduct a similar exercise for the estimated income tax revenues as shown in the bottom two panels of Table 3. Assuming a discount rate of 3.5% and a rate of growth of 1.5% a high school dropout will contribute, on average, nearly $60,000 *less* in federal and state income taxes over her lifetime than an individual whose highest level of education is a high school diploma and about $153,000 less than an individual with at least a high school diploma. Including Social Security contributions, a high school dropout will contribute nearly $98,000 less in taxes than a high school graduate and about $225,000 less than an individual with at least a high school degree.

C. Aggregating Income and Tax Revenue Costs

Again, these figures add up over a cohort of individuals. According to the March 2004 CPS, there were approximately 600,000 noninstitutionalized individuals aged 20 who did not have a high school degree.[26] Thus, if I assume that there are currently approximately 600,000 18 year olds who will choose to dropout of school and never complete a high school degree, then the lifetime earnings loss for these dropouts compared to them having earned a high school diploma is about $158 billion resulting in an aggregate (lifetime) loss of about $36 billion in tax revenues (not including Social Security contributions) and $58 billion in total income tax revenues (or 4-6% of 2003 IRS income tax revenues). An upper-bound estimate which compares the income and tax revenue losses of high school dropouts to all individuals with at least a high school diploma is about $330 billion in income and $92 billion in federal and state income taxes or $135 billion in total income taxes when Social Security contributions are included.

While these estimates they imply large income and tax revenue losses due to the fact that a

[26] Again, I use 20 year olds since many 18 and 19 year olds will complete their high school education before turning 20.

significant portion of the population has not completed high school, they overstate potential gains to education and training programs designed to increase educational attainment. The reason is that nearly one-half of the 20 year olds in the 2004 CPS that had not completed high school dropped out before the 11th grade; these same individuals completed, on average, about 10 years of schooling. Thus, it would require an unbelievably effective intervention to increase the high school graduation rate to 100%. To put the income and tax revenue gains onto a metric that is on the same order of magnitude of a more realistic intervention, I also calculated the earnings and tax revenue gains that would result if all 20-year old dropouts increased their educational attainment by one year. The results are presented in Table 4.[27]

The estimated aggregate lifetime earnings gains to increasing educational attainment among one cohort of high school dropouts by one year range from nearly $34 billion (assuming no earnings growth and a discount rate of 6%) to over $81 billion (assuming 2% annual earnings growth and a discount rate of 3.5%). The range of non-Social Security tax revenue gains is from $7 billion to $19 billion (or $12-$30 billion including Social Security). As discussed above, reasonable estimates to work with assume a discount rate of 3.5% and an annual rate of earnings growth of 1.5% suggesting aggregate lifetime earnings gains of $72 billion and lifetime tax federal and state income tax revenues of $16 billion (or $27 billion including Social Security). Increasing the schooling of those without a high school degree by one year would generate an increase of $88 billion in lifetime income and income tax revenues (or nearly $100 billion including Social Security contributions).

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[27] These gains assume that no other changes would take place in the economy when this cohort of individuals increased their educational attainment. In particular, the wages of individuals with high school degrees could, in theory, fall due to the increased supply of such individuals. However, the effect of wages of increasing the number of 18 year old high school graduates would likely be minimal since they represent a very small fraction of the total labor force.

VI. Summary and Policy Consequences

The empirical literature suggests that education has a causal effect on earnings. If an individual is somehow able to complete another year of schooling, his or her income will rise by approximately 10%. This annual return aggregates to a relatively large benefit to high school completion for individuals and society. I estimate that those who do not complete high school are less likely to be employed, work fewer weeks per year, and make about one-half the earnings of individuals with a high school diploma, but no further schooling. Further, these individuals contribute only 40% of the federal and state income tax revenues of those with a high school diploma. Aggregated over all high school dropouts age 20-67, the annual losses in federal and state income taxes likely exceed $50 billion – enough to cover the annual discretionary expenditures of the U.S. Department of Education. Further, these estimates do not include the losses in terms of other tax revenues. As one example, households headed by high school dropouts aged 20-67 contributed approximately $3.3 billion less in property taxes in 1999 (in 2004 dollars) compared to households headed by a high school graduate (with no further schooling).

Over a lifetime, an 18 year old who does not complete high school earns approximately $260,000 less than an individual with a high school diploma and contributes about $60,000 less in lifetime federal and state income taxes. The combined income and tax losses aggregated over one cohort of 18 year olds who do not complete high school is about $192 billion, or 1.6% of GDP. Further, if we were able to increase the educational attainment of that same cohort of high school dropouts by one year, we would recoup nearly one-half of those losses.

These figures represent the gross loss in terms of earnings and income taxes. We would need to make considerable investments in educational and other programs to improvement educational

attainment. While I do not conduct such a cost-benefit analysis here, it is likely that the required investments would not equal the current losses (leading to net social gains). For example, one can compare the earnings and tax revenue losses to the cost of placing all of our cohort of 18-year old high school dropouts in Job Corps at a cost of $9 billion (at a cost of approximately $15,000 per student). If 20% of these individuals increased their educational attainment by one year as a result of the program, then the total benefit would be $20 billion. Again, I do not intend for this to be a proper cost-benefit analysis of Job Corps or of the net social gains to unspecified educational interventions, but merely to put potential social gains into context.

There are reasons why these estimates may over- or under-state the income and tax revenue losses associated with inadequate education. One reason is that I may not have assumed the proper discount rate and/or the future rate of income growth. Similarly, if the shape of the relationship between earnings and the age of the individual were to change, that would also change any estimated lifetime income and tax revenue estimates. Further, the tax simulations are a rough approximation to true tax revenues, particularly given that the CPS does not provide expenditure data and given that in order to conduct analyses about individuals I had to ignore features of the tax code that affect families, which likely inflates the tax revenue gains to high school completion. And, the CPS undercounts the number of high school dropouts, leading to underestimates of the losses.

In addition, the relationship I estimate between earnings and educational attainment using the CPS may overstate the expected benefits that would accrue as a result of policies that resulted in large numbers of dropouts completing high school. One reason is that the cross-sectional estimates may partially reflect the fact that those who have completed high school are more "able" or "motivated" than those who did not and therefore would have earned more even if they had not completed high school. While the academic literature suggests any such bias may be small, it may

still exist. Also, the marginal gains to an individual increasing her educational attainment may be much larger than if an entire cohort of individuals increases its educational attainment. Economic theory suggests that if the supply of high school graduates increases, in order to employ all of these newly skilled workers, employers will lower wages. Thus, wages of high school graduates may decrease in the face of a large-scale increase in the proportion of high school graduates in the labor force. While this is certainly a possibility, the demand for skilled workers continues to rise despite the increase in educational attainment that the U.S. labor market has observed over the past 50-60 years.

Finally, it is worth re-emphasizing that I have not considered the magnitude of the loss of state sales and local property taxes due to inadequate education. Given that over 90% of educational revenues come from state and local sources, the increased contributions to these taxes that would result from improved education are very important as one considers the costs and benefits of educational improvements or interventions.

The income and tax revenue losses associated with a lack of high school completion are already large. As globalization of the labor market increases, and U.S. workers – who are relatively skilled – compete with workers worldwide, so too, will the costs of incomplete or inadequate education increase. While it is difficult and expensive to improve educational attainment among those at-risk of not completing high school, as a society it will also become increasingly costly not to.

References

Acemoglu, Daron and Joshua Angrist. "How Large are Human-Capital Externalities? Evidence from Compulsory-Schooling Laws" *National Bureau of Economic Research Macroeconomics Annual 2000,* Ben S. Bernanke and Kenneth Rogoff, editors (Cambridge, MA: MIT Press, 2000): 9-59.

Altonji, Joseph and Dunn, Thomas. "The Effects of Family Characteristics on the Return to Education." *Review of Economics and Statistics*, November 1996, 78(4), pp. 692-704.

Angrist, Joshua D. and Alan B. Krueger. "Does Compulsory Schooling Affect Schooling and Earnings?" *Quarterly Journal of Economics*, vol. 106 (November 1991): 979-1014.

Ashenfelter, Orley and Cecilia Elena Rouse. "Income, Schooling, and Ability: Evidence from a New Sample of Identical Twins," *Quarterly Journal of Economics*, 113 no. 1 (February 1998): 253-284.

Ashenfelter, Orley and Cecilia Elena Rouse. "Schooling, Intelligence, and Income in America," in *Meritocracy and Inequality*, Kenneth Arrow, Steven Durlauf, and Samuel Bowles, editors, (Princeton, NJ: Princeton University Press, 2000): 89-117.

Ashenfelter, Orley and Alan Krueger. "Estimating the Returns to Schooling Using a New Sample of Twins." *American Economic Review* 84 (December 1994): 1157-1173.

Barrow, Lisa and Cecilia Elena Rouse. "Do Returns to Schooling Differ by Race and Ethnicity?" *American Economic Review* forthcoming (May 2005).

Becker, Gary S. *Human Capital: A Theoretical and Empirical Analysis, with Special Refernce to Education.* New York: Columbia University Press, 1967.

Boozer, Michael A. and Cecilia Elena Rouse. "Intraschool Variation in Class Size: Patterns and Implications" *Journal of Urban Economics*, 50, no. 1 (July 2001): 163-189.

Burghardt, John, Peter Z. Schochet, Sheena McConnell, Terry Johnson, R. Mark Gritz, Steven Glazerman, John Homrighausen, and Russell Jackson. "Does Job Corps Work? Summary of the National Job Corps Study" Mathematica Policy Research Summary Report, June 2001.

Burtless, Gary. *The Effect of School Resources on Student Achievement and Adult Success* (Washington, DC: Brookings Institution Press, 1996).

Cameron, Stephen V. and James J. Heckman. "The Nonequivalence of High School Equivalents" *Journal of Labor Economics*, 11, no. 1, Part 1: Essays in Honor of Jacob Mincer (January 1993): 1-47.

Card, David, "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems," *Econometrica* 69, no. 5 (September 2001): 1127-1160.

Card, David and Alan B. Krueger. "Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States," *Journal of Political Economy*, 100, no. 1 (February 1992): 1-40.

Card, David and Alan B. Krueger. "Labor Market Effects of School Quality: Theory and Evidence" in *Does Money Matter?: The Effect of School Resources on Student Achievement and Adult Success*, Gary Burtless, editor (Washington, DC: Brookings Institution Press, 1996): 97-140.

Carneiro, Pedro and James J. Heckman. "Human Capital Policy" in *Inequality in American: What Role for Human Capital Policies* (Benjamin M. Friedman, editor) (Cambridge, MA: MIT Press, 2003).

Carneiro, Pedro, James J. Heckman, and Edward Vytlacil. "Understanding What Instrumental Variables Estimate: Estimating Marginal and Average Returns to Education." University of Chicago working paper, 2003.

Ellwood, David T. and Thomas J. Kane. 2000. "Who Is Getting a College Education? Family Background and the Growing Gaps in Enrollment." In *Securing the Future: Investing in Children from Birth to College*. Sheldon Danziger and Jane Waldfogel, editors. The Russell Sage Foundation, New York.

Feenberg, Daniel and Elisabeth Coutts. "An Introduction to the TAXSIM Model," *Journal of Policy Analysis and Management*, 12, no. 1 (Winter 1993): 189-194.

Finn, Jeremy D., and Charles M. Achilles. "Answers and Questions About Class Size: A Statewide Experiment," *American Educational Research Journal*, 27 no. 3 (Fall, 1990): 557-577.

Griliches, Zvi. "Estimating the Returns to Schooling: Some Econometric Problems." *Econometrica* 45, no. 1 (January 1977): 1-22.

Gross, David B. and Nicholas Souleles. 2000. "Consumer Response to Changes in Credit Supply: Evidence from Credit Card Data," mimeo, University of Pennsylvania, (February).

Heckman, James J. and Lance Lochner. 2000. "Rethinking Education and Training Policy: Understanding the Sources of Skill Formation in a Modern Economy." In *Securing the Future: Investing in Children from Birth to College*. Sheldon Danziger and Jane Waldfogel, editors. The Russell Sage Foundation, New York.

IRS Data Book, FY 2004, Publication 55b.

Kane, Thomas J. and Cecilia Elena Rouse. "The Community College: Educating Students at the Margin Between College and Work," *Journal of Economic Perspectives*, 13, no. 1 (Winter

1999): 63-84.

Kling, Jeffrey R. "Interpreting Instrumental Variables Estimates of the Returns to Schooling," *Journal of Business Economics and Statistics* 19, no. 3 (July 2001): 358-364.

Krueger, Alan B. "Experimental Estimates of Education Production Functions," *Quarterly Journal of Economics*, 114 no. 2 (May 1999): 497-531.

Krueger, Alan B. and Diane M. Whitmore. "The Effect of Attending a Small Class in the Early Grades on College-Test Taking and Middle School Test Results: Evidence from Project STAR," *The Economic Journal*, 111, no. 458 (January 2001): 1-28.

McLanahan, Sara. "Diverging Destinies: How Children Fare Under the Second Demographic Transition," *Demography* 41, no. 4 (November 2004): 607-627.

Mincer, Jacob. *Schooling, Experience, and Earnings* . New York: Columbia University Press, 1974.

Moore, Mark A., Anthony E. Boardman, Aidan R. Vining, David L. Weimer, and David H. Greenberg. "'Just Give Me a Number!' Practical Values for the Social Discount Rate." *Journal of Policy Analysis and Management*, 23, no. 4 (2004), pp. 789-812.

Murnane, Richard J., John B. Willett, and John H. Tyler. "Who Benefits from Obtaining a GED? Evidence from High School and Beyond" *The Review of Economics and Statistics* 82, no. 1 (February 2000): 23-37.

Oreopoulos, Philip. "Do Dropouts Drop Out Too Soon? International Evidence from Changes in School-Leaving Laws," National Bureau of Economic Research Working Paper Number 10155 (December 2003).

Rouse, Cecilia Elena. "Further Estimates of the Economic Return to Schooling from a New Sample of Twins," *Economics of Education Review*, 18, no. 2 (April 1999): 149-157.

Ruggles, Steven, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. *Integrated Public Use Microdata Series: Version 3.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004.

Spence, A. Michael. "Job Market Signaling." *Quarterly Journal of Economics* 87 (August 1973), pp. 355-374.

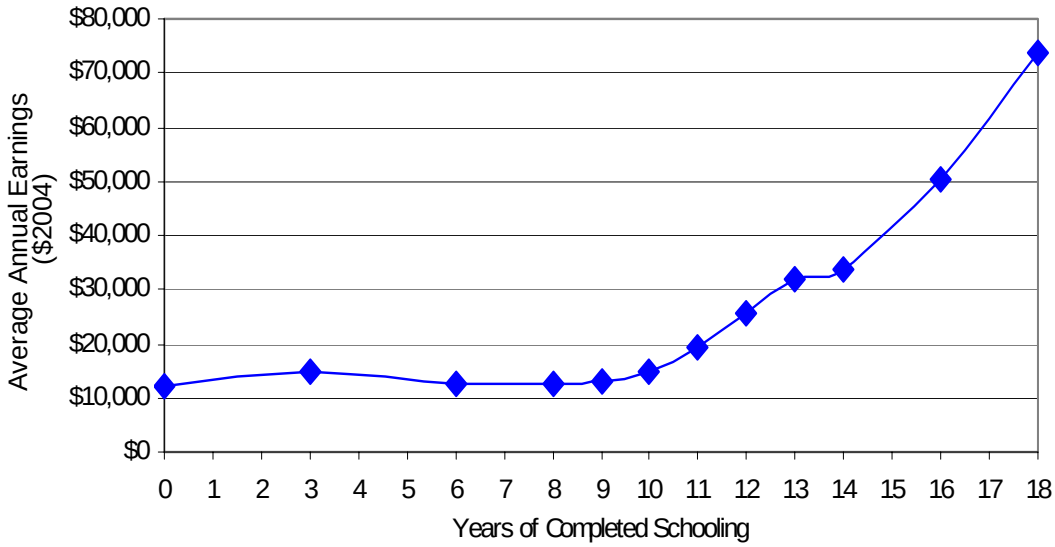
Taber, Christopher. "The Rising College Premium in the Eighties: Return to College or Return to Unobserved Ability?" *Review of Economic Studies* 68, no. 3 (July 2001), pp. 665-691.

Tyler, John H., Richard J. Murnane, and John B. Willett. "Who Benefits from a GED? Evidence for Females from High School and Beyond" *Economics of Education Review* 22, no. 3 (June

2003): 237-248.

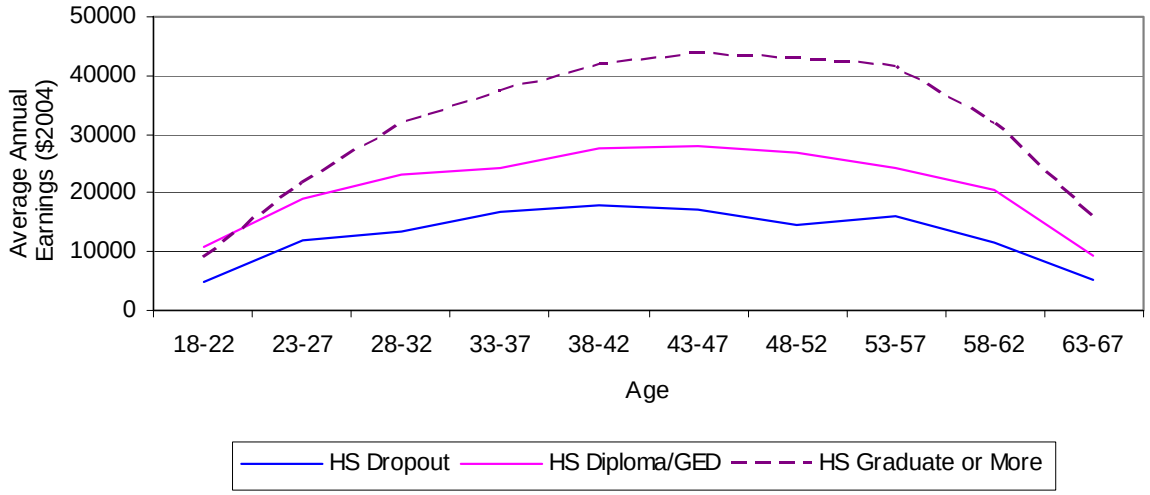
Warner, John T. and Saul Pleeter. 2001. "The Personal Discount Rate: Evidence from Military Downsizing Programs." *American Economic Review*, vol. 91, no. 1 (March): 33-53.

Figure 1. Average Annual Earnings by Years of Completed Schooling



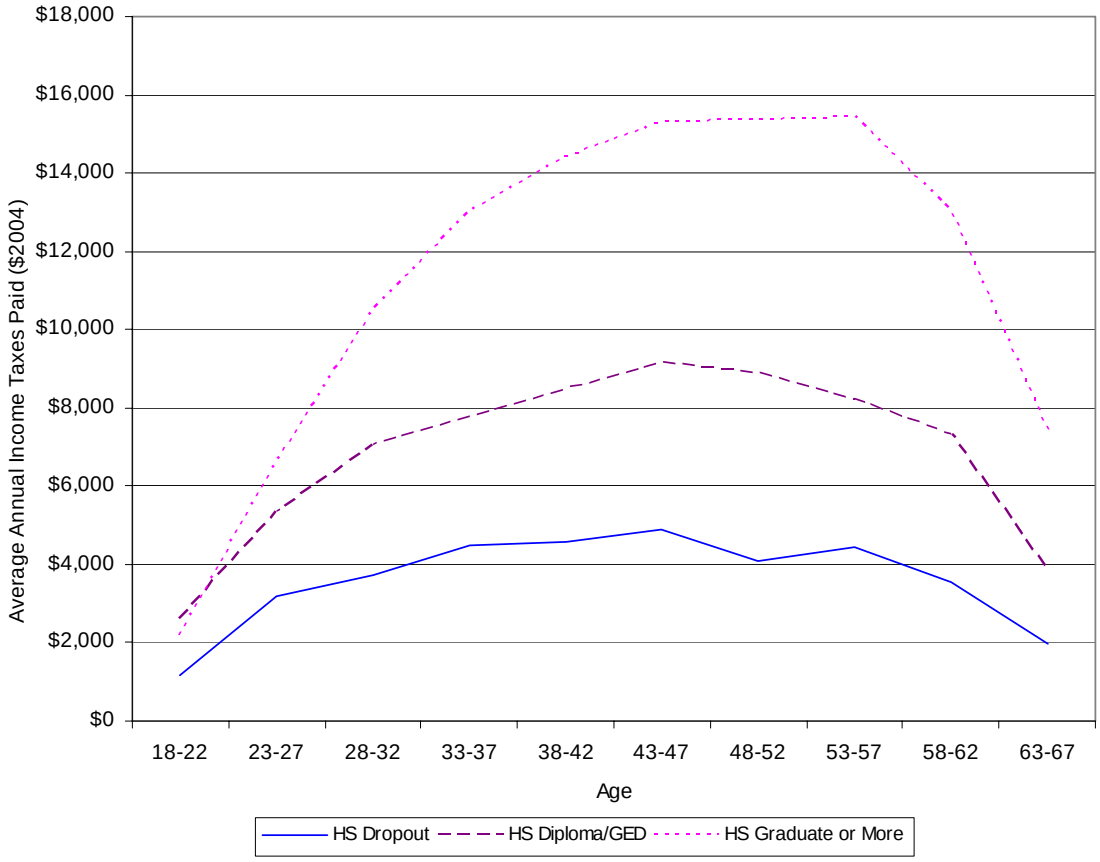
Source: Author's calculations using the March *Current Population Surveys* from 2003 and 2004.

Figure 2. Average Annual Earnings by Age and Educational Attainment



Source: Author's calculations using the March *Current Population Surveys* from 2003 and 2004.

Figure 3. Average Annual Income Taxes Paid by Age and Educational Attainment



Source: Author's calculations using the March *Current Population Surveys* from 2003 and 2004 and TAXSIM, version 6.

Table 1. Average Labor Market Outcomes by the Educational Attainment of the Individual

	High School Dropout	High School Diploma	High School Diploma or More
Employed	53.0% (0.3)	69.0% (0.2)	74.4% (0.1)
Unemployed	7.2% (0.1)	5.3% (0.1)	4.2% (0.04)
Discouraged Worker	0.5% (0.04)	0.3% (0.02)	0.2% (0.01)
Not in labor force – Other	39.2% (0.3)	25.4% (0.1)	21.3% (0.1)
Number of weeks worked last year	26.9 (0.1)	35.7 (0.1)	38.1 (0.04)
Received any unemployment insurance last year	4.5% (0.1)	5.3% (0.1)	4.4% (0.04)
Unemployment insurance received during year	$171 (6)	$225 (5)	$210 (3)
Employer provides pension plan*	28.6% (0.3)	49.7% (0.2)	58.0% (0.1)
Covered by employer/union-provided health insurance*	20.9% (0.2)	41.2% (0.2)	48.5% (0.1)
Annual earnings	$11,989 (261)	$22,337 (210)	$33,701 (202)

Note: Standard errors in parentheses. Sample includes individuals aged 18-67. All means are weighted. Data from the March *Current Population Survey*, 2003 and 2004.

* Among those with jobs.

Table 2. Average and Total Taxes Paid by Educational Attainment

	High School Dropout	High School Diploma	High School Diploma or More
Average Federal Income Taxes	$1,302	$3,085	$5,954
	(29)	(27)	(29)
Average State Income Taxes	$304	$734	$1,297
	(5)	(5)	(6)
Average Social Security Taxes (FICA)	$1,769	$3,221	$4,497
	(12)	(11)	(9)
Average Total Income Taxes	$3,374	$7,040	$11,747
	(43)	(41)	(41)

Note: Figures in 2004 dollars. Standard errors in parentheses. Sample includes individuals aged 18-67. All means are weighted. Tax revenues simulated using TAXSIM, version 6 using data from the March CPS files from 2001-2004 (see text).

Table 3
Increased Discounted Present Value of Lifetime Earnings and Taxes Paid from High School Graduation

	High School Graduate			High School Graduate or More Schooling		
	Annual Productivity (Earnings) Growth			Annual Productivity (Earnings) Growth		
Discount Rate	0%	1.5%	2%	0%	1.5%	2%
	(1)	(2)	(3)	(4)	(5)	(6)
	Earnings					
3.5%	$190,230	$262,519	$294,024	$386,392	$552,439	$606,492
4%	$172,559	$235,703	$263,084	$346,221	$490,568	$534,624
6%	$121,074	$159,045	$175,175	$230,588	$315,646	$334,398
	Non-Social Security Income Taxes Paid					
3.5%	$41,683	$59,210	$66,946	$104,209	$152,691	$168,544
4%	$37,456	$52,669	$59,349	$92,623	$134,528	$147,372
6%	$25,311	$34,242	$38,080	$59,709	$83,852	$89,175
	Total Income Taxes Paid					
3.5%	$69,527	$97,494	$109,771	$155,254	$224,969	$247,702
4%	$62,743	$87,083	$97,713	$138,511	$198,907	$217,359
6%	$43,135	$57,572	$63,746	$90,688	$125,808	$133,513

Notes: All values in 2004 dollars. See text.

Table 4
Increased Discounted Present Value of Lifetime Earnings and Income Taxes Paid
Were All Individuals With Less than a High School Diploma to Complete
One More Year of Schooling
(in thousands of dollars)

	Annual Productivity (Earnings) Growth		
Discount Rate	0%	1.5%	2%
	(1)	(2)	(3)
	Earnings (Thousands)		
3.5%	$52,757,175	$72,480,056	$81,069,711
4%	$47,932,717	$65,166,199	$72,634,256
6%	$33,868,550	$44,242,401	$48,647,072
	Non-Social Security Income Taxes Paid (Thousands)		
3.5%	$11,574,621	$16,428,259	$18,573,723
4%	$10,405,940	$14,615,576	$16,466,622
6%	$7,053,822	$9,517,922	$10,578,451
	Total Income Taxes Paid (Thousands)		
3.5%	$19,298,450	$26,991,520	$30,370,114
4%	$17,433,195	$24,127,291	$27,052,036
6%	$12,044,701	$16,011,724	$17,708,904

Notes: All values in 2004 dollars. See text.