Supplemental Report on Economic Returns to Investments in Education for Connecticut

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We have reviewed the report prepared by Clive Belfield and Henry Levin, ECONOMIC RETURNS TO INVESTMENT IN EDUCATION FOR CONNECTICUT, in the light of recent data in state reports on educational results[1] and conclude that the patterns that we have found are so robust that they will not be modified materially by the recent reports. The most recent reports of graduation rates provided by the State among different socioeconomic and racial groups are a grave cause for concern, and the cost to Connecticut taxpayers from these failures remain substantial.

References:

- Connecticut State 2010, 2011, 2012 Cohort Graduation Data and Cohort Graduation Rate Documentation, retrieved from http://www.sde.ct.gov/sde/cwp/view.asp?a=2758&q=334898

[1] 2010, 2011, 2012 Cohort Graduation Data for the State as well as the Cohort Graduation Rate Documentation.

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Summary

This report calculates the economic burden resulting from low educational attainment in Connecticut and reports on the costs and impacts of potential education reforms.

Although median income across the state is the 3rd in the nation, Connecticut ranks 11th in terms of educational attainment and has a substantial achievement gap for minority students. Approximately one-fifth of each cohort of public school students in Connecticut will not meet the high school graduation standards. Another sizeable proportion will enter higher education unprepared for college course work; many will fail to complete their college program.

We use Connecticut-specific data and the best available research evidence to calculate the economic burden arising from inadequate attainment for a single cohort of Connecticut public school students. Our criterion for inadequate education is that the individual did not graduate from high school; but many high school graduates are not at all prepared for college, so these persons might also be considered as having sub-optimal attainment. Since evidence for the latter group leads to statistical analysis that is less precise, we restrict ourselves to those who do not complete high school. The economic burden is expressed in present values at age 18, i.e. the amounts are equivalent to a lump-sum deposit at that age. All figures are in 2011 dollars, weighted for Connecticut prices.

- We calculate the **lifetime earnings by education level** per individual. These are: $480,000 if a high school dropout; $733,000 if a high school graduate; $862,000 if attended college for some period; and $1,434,000 if a college graduate.
  Relative to dropouts, the lifetime earnings gains are $253,000 for each high school graduate and $954,000 for each college graduate.
- We calculate the **lifetime <u>state</u> tax contributions** by education level per individual. These contributions are tax payments net of state expenditures on government health, the criminal justice system, welfare programs and higher education. Although all persons pay state taxes, these receipts must be offset against the state's public expenditures.

Critically, more educated persons pay more tax and incur lower public expenditures. From the perspective of the state, some groups pay less in taxes than they impose in state expenditures. Accounting for all these items, the net state tax contributions are: -$75,000 per high school dropout; -$12,000 per high school graduate; +$11,000 per person with some college; and +$48,000 per college graduate. However, the critical figures are the differences across education levels, not the absolute amounts.

Relative to dropouts, each high school graduate pays in $63,000 more over their lifetime to the state government; and a college graduate pays in $124,000 more.

- We calculate the **lifetime federal tax contributions** – net of federal expenditures on government health, the criminal justice system, and welfare programs – by education level. These are: -$34,000 per high school dropout; +$61,000 per high school graduate; +$120,000 per person with some college; and +$231,000 per college graduate.

  Relative to dropouts, each high school graduate pays in $95,000 more over their lifetime to the state government; and a college graduate pays in $265,000 more.
- We calculate the **social burden of low attainment** for Connecticut which refers to the costs to Connecticut citizens beyond the lost tax revenues and cost of services associated with low educational attainment. This includes the lost productivity, as well as the burden on victims of crime and the deleterious effects on economic growth from having an inadequately skilled workforce.
- The social burden borne by the overall Connecticut population is extremely large: relative to a high school dropout, each high school graduate represents a present value social gain of $501,000; each college enrollee represents a social gain of $764,000; and each college graduate represents a social gain of $1.57 million.
- We also estimate the costs of college remediation, which is associated with inadequate high school education. Sample data (for 30% of Connecticut's community college population) show that 40% need remediation in math and 33% need remediation in reading. Across a single cohort, the costs of providing remedial courses exceed $18 million. This does not include the costs of counseling or the opportunity costs of students' time.

These economic burdens associated with low attainment should be compared with the costs of education reforms.

- There are a number of education reforms that have been demonstrated to raise the high school graduation rate. These include: expanded pre-school programs and Head Start; increasing teacher salaries; reducing class size; and some high school reforms.
- There are also some reforms that have shown promise either in raising the high school graduation rate directly or affecting outcomes that predict graduation statistically, including: ALAS, Career Academies, Check & Connect, Twelve Together, Talent Search, and Talent Development, Success for All, I HAVE A DREAM, and summer school.
- Within the state of Connecticut, reforms for the Priority School Districts include: creation or expansion of innovative programs related to dropout prevention; early reading intervention programs; greater use of technology in the classroom and outside it; and initiatives to strengthen parent involvement.
- The Connecticut Department of Education Secondary School Reform plan also includes reforms that may raise attainment, including: Student Success plans; support programs for at-risk students; hiring additional guidance counselors; extra professional development; and improved internet connectivity in middle schools. As well, Career Pathways and Summer Reading programs are being promoted by the Department.
- These reforms all vary in cost and in their effectiveness at raising the graduation rate. However, based on the best available evidence, the most expensive reforms would cost $22,000 per each additional high school graduate in present value at age 18; most of the reforms cost between $4,000 and $8,000 per student; and many of those proposed by the Department of Education are estimated to cost less than $500 to be delivered to any individual student. These amounts are therefore significantly below the fiscal and social burden from low attainment in Connecticut.

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1. Introduction

There is a vast body of research evidence on the economic and social advantages of education (Lochner, 2011; Heckman, 2008). These benefits accrue to the private individual, to taxpayers, and to society as a whole. Importantly, education is especially powerful for disadvantaged groups who live in neighborhoods of concentrated poverty where economic opportunities are scarce. Programs that raise high school graduation rates and college progression rates are therefore public investments yielding a stream of benefits across decades. At issue is the economic magnitude of these benefits – what is being lost every time a student fails to graduate from high school or does not complete a college program? And, what policies and programs might be put in place – and at what cost – to improve educational opportunities?

This paper calculates answers to both these questions for the state of Connecticut. Although Connecticut's education system does not perform poorly relative to other states, almost one-in-five of each age cohort fails to complete high school; for Hispanics and blacks, the proportion is one-in-three. Also, many of those who do graduate from high school subsequent fail to complete college: only half of those who enroll at a two-year college progress to the sophomore year; and less than half of those who enroll in a four-year college graduate on time.[1] Addressing this low level of attainment is critical for future economic growth in Connecticut and has become even more urgent with the current economic recession.

This investigation into the benefits of education for Connecticut is structured as follows. We begin by describing current levels of attainment and spending for current cohorts of school children in Connecticut. This illustrates the extent of disparities by locality, need, and race. In Sections 3 and 4 we calculate the fiscal and social burdens associated with low educational attainment across the state. These calculations are based on our review of the best available research evidence and modeled using Connecticut-specific data. These estimates of the burdens provide an answer to the question 'What is being lost by inadequate education?' In Section 5, we itemize a set of proven and promising educational interventions and reforms that may raise education levels in Connecticut; we then report their costs based on the ingredients method. Finally, we compare the economic burdens against the costs of interventions; this allows us to express these interventions in the terms of a 'return on investment' framework for the Connecticut taxpayer and resident.

[1] Data from the Connecticut Department of Education and CEDAR database.

The analysis takes the perspective of the single age cohort of 12th graders in Connecticut public schools who should be graduating in 2011. Each age cohort can be divided into four groups: those who will be high school dropouts, high school graduates, have some college or an Associate's degree, and those who will complete at least a Bachelor's degree. The lifetime economic consequences of being in each group are tracked and expressed in present values at 12th grade using a 3.5% discount rate.[2] All prices are adjusted to account for cost-of-living in Connecticut and all figures are reported in 2011 dollars.[3]

2. The Education System in Connecticut

2.1 Educational Attainment

We first describe educational attainment in Connecticut and group all persons into one of four groups (dropout, high school graduate, some college, or BA plus). This description is needed to see the extent to which attainment levels are sub-optimal. We propose two ways to define this. Inadequate education is defined as the failure of an individual to graduate from high school. We believe this is an appropriate criterion because of the very strong link between graduation and future life experiences, because it is very hard to be economically independent if one is a high school dropout, and because subsequent education and training opportunities such as college are closed off for high school dropouts. It is increasingly recognized that many persons who graduate from high school are not 'college-ready'; if they enroll in college, these persons are placed in sequences of remedial courses which essentially cover material that should have been covered in high school. Thus, many high school graduates have acquired an education that is below what might be expected and below what is needed for future economic success. However, we do not include this category in the following analysis only because statistical measures and consequences are not available. Thus, the numbers of persons whom we estimate with inadequate education is highly conservative.

In this analysis, we focus primarily on inadequate educational attainment. Therefore, a key concern is to identify those at the bottom of the education distribution. There are many different ways used to measure the dropout rate and some differences across the estimates. State

[2] Present valuation means that the amounts are adjusted for the fact that money amounts that accrue later are valued less than those that accrue earlier. Different discount rates are applied as part of the sensitivity testing. The justification for a 3.5% discount rate is given in Moore et al. (2004).
[3] We use the Connecticut Department of Labor price index at www1.ctdol.state.ct.us/lmi/cpi.asp.

level data indicate that fewer than 10% of students dropout during the four years of high school; yet national data (from the Current Population Survey data and the Common Core of Data) put the number of Connecticut adults who do not have a high school diploma at 20% or more, as do other studies using alternative formulas (Mishel and Roy, 2006); and calculations using event and status dropout rates tend to yield different estimates (see Chapman et al., 2010, Table A-1). Therefore, our description of attainment in Connecticut is a pooled estimate from the Connecticut State Department of Education (CEDAR database) and from federal statistics for Connecticut given in Stillwell (2010) and Swanson (2004).[4]

Table 1 shows the attainment profiles of a single age cohort in Connecticut. At 9th grade, there are 46,770 persons: almost one-in-five of these persons will be a high school dropout; one-quarter will have a high school diploma (including GED); one-third will have either an Associate's degree or some college; and one-quarter will obtain a BA degree or above. Each cohort in Connecticut includes 8,350 high school dropouts and another 11,476 who have not attempted college.[5]

The right hand columns of Table 1 show the significant differences by race: for blacks and Hispanics, the proportion that fails to complete high school is more than double that of whites; correspondingly, the proportion who obtains a BA degree is less than half. The bottom two panels of Table 1 show the stark differences between males and females: almost twice as many males are dropouts; and females complete college at rates that are more than 25% above those of males.

2.2 Education Funding

The total public expenditure on education by the state of Connecticut is $7.327 billion annually (2008 most recent data including adult education). Spread across the 540,000 K-12 students, this amounts to approximately $12,900 per student. At issue is the extent to which this amount of spending – and how it is distributed – is optimal.

[4] We present all estimates per dropout, so getting a precise figure for the number of dropouts is not crucial.
[5] Some of these dropouts may obtain a high school diploma at a later date. However, many of these diplomas are GEDs, which do not have the same labor market equivalence as formal graduation from high school graduation.

This issue is beyond the scope of this report.[6] But our analysis may be salient. First, 'optimal' spending may be interpreted in regard to: is spending appropriately weighted according to student need?[7] But it may also be interpreted in relation to its value to society and to Connecticut taxpayers: if low spending leads to high taxes to pay for the criminal justice system, this is unlikely to be optimal. From our analysis, we can compare the amounts currently spent to their subsequent economic consequences. Second, our analysis traces the economic consequences of education in Connecticut for each level of government. We can then compare this to the burden of funding for education in Connecticut to see which levels of government gain the most. As we show below, most of the fiscal gains from education accrue to the federal government, with some non-trivial gains to the state Treasury; in contrast, it is hard to identify any gains for local governments. Yet, based on 2007-08 data for Connecticut, the burden of funding is exactly reversed: local governments pay for 66% of total expenditures on K-12 education, the state contributes 30%, and the federal government contributes 3% (with 2% from fees). Local government expenditure, net of state transfers, is about $8.5 billion, of which about$5 billion is for education.[8]

2.3 Education and the Connecticut Economy

Economic analyses within the state emphasize the need to address inadequate educational attainment. As noted in a recent Connecticut Department of Labor report, it is widely recognized that economic growth over the long-term depends on workers' productivity, which is a function of skill levels of the labor force (CT DOL, 2010). Changes in the labor market have "resulted in an occupational structure that increasingly requires higher levels of education" because the "old manufacturing economy with high paying, minimal training jobs has gone" (CT DOL, 2003, p.3). More specifically, there is a need for workers' to have strong technical skills. Workforce demand for math and science skills is predicted to grow over the period to 2020, far outstripping local labor supply; in turn this is likely to lead to greater outsourcing and hiring of immigrant

[6] Details on the Education Cost Sharing formula are given on the Connecticut State Department website. Data on how the ECS allocations are made and how they have changed over time are given at ccjef.org/documents/new-pdfs/CCJEF_ECS_Budget_Change_for_All_Towns_2008_09.pdf, retrieved January 31 2011.
[7] Augenblick et al. (2005) calculate the cost of an adequate education for Connecticut. Although Duncombe and Yinger (2005) report that education funding in Connecticut is weighted toward high-poverty over low-poverty districts, they also conclude that "no state has an effective poverty weight as high as the estimated weight in the scholarly literature".
[8] Municipality expenditures at given at www.ct.gov/opm/cwp/view.asp?A=2984&Q=383170 (page A-7), retrieved January 15 2011.

workers on 'specialty occupation' H1-B visas. Demographic changes in the state – as older workers retire and fewer younger workers with requisite skills are available – raise the stakes further. One proposed solution – as recognized by the Connecticut Department of Labor – is to "save the lost generation of labor force in urban school districts" (CT DOL, 2006, p.10).

Table 2 illustrates these economic imperatives for the Connecticut adult population. Using data from the Current Population Survey, pooled across years to obtain a sufficient sample of Connecticut adults, it shows current labor market status by education levels for all working age persons. The top panel for each gender shows labor force activity. Differences in labor market participation are stark: for males, one-third of dropouts are not in the labor market, compared to one-in-twelve college graduates; for females, the respective proportions are one-half versus one-quarter. Similarly large gaps are evident for unemployment rates. These differences are only partially offset by dropouts still being in school (despite being over 18).

The second panel of Table 2 shows earnings and tax and FICA (Social Security) payments, averaged across all adults (even non-workers). The gaps here are very large, especially for males where college graduates earn almost seven times the amount dropouts do. But there are differences even at lower levels: both male and female high school graduates earn more than double that of high school dropouts.

The third panel of Table 2 reinforces the differences in labor market status. Not only are earnings higher, but more educated persons are more likely to be in a pension plan and have private health insurance. Finally, educational attainment is also strongly associated with welfare reliance in Connecticut. Here the relationships are stronger for females. Annually, female dropouts receive on average $3,310 in subventions ($230 in welfare, $730 in Social Security (before age 65), $1,370 in Medicare health, and $980 in food stamps). The corresponding figure for female high school graduates is $1,510 ($70, $180, $1,000, and $260 respectively across the domains). College graduates receive very low amounts of government subventions, at less than $220 in total.

2.4 Modeling the Consequences of Inadequate Education

The above data provides a framework for modeling the economic consequences of inadequate education. We use a lifetime approach and predict the full economic values associated with being either a high school dropout, high school graduate, person with some college, and BA graduate or above. These values are calculated for: earnings (including fringe benefits); tax

payments; criminal justice system burdens; government health burdens; and government welfare burdens. All levels of government are included to derive the full fiscal consequences across each education level. In addition, we model the lifetime social burdens or penalties to individuals and to Connecticut for inadequate education. These include not only the private earnings benefits, but also the burdens to the victims of crime and the effects on economic growth associated with a given state education level.

With these values it is then possible to calculate the economic burden – per individual and per cohort – associated with inadequate education, i.e. the amount the state loses when its citizens are not educated up to a certain level. One conventional measure of inadequate education is failure to graduate from high school. This is calculated as the difference in the economic burden between a dropout and a high school graduate, accounting for the possibility that a high school graduate can progress on to college. However, as noted above, graduation from high school is itself far from a guarantee of economic independence and, even for those students who do enroll in college, successful completion is far from guaranteed. Many students who graduate from high school are far from being 'college ready' and require additional expenditures at the college level on remedial classes (Bailey et al., 2010). The national overall graduation rate for all college students within six years is 56%, with almost one-third dropping out within the first year. Thus, it is appropriate to present a range of scenarios that would improve the economic future for current cohorts of Connecticut residents.

This modeling framework is developed for national data by Belfield and Levin (2007) and applied for California by Belfield and Levin (2008) and Brady et al. (2005). This literature follows methodological and empirical work that extends back to Levin (1972) and Haveman and Wolfe (1984) and is reviewed in detail by Lochner (2011) and by Baum and Payea (2006). More directly, two papers have looked in a similar way at the economic consequences for Connecticut: Sum et al. (2009a) examine employment and earnings by education level; and Sum et al. (2009b) examine a range of other outcomes, including health, criminal involvement, and welfare. Our estimates vary somewhat as these two analyses do not provide present value estimates for an individual cohort, do not consider the government (fiscal) consequences across education levels, and do not monetize the health, crime, and welfare consequences of inadequate education. However, these independent analyses provide useful corroboration of both the method and our results.

3. Economic Benefits across Education Levels

3.1 Earnings by Education Level

3.1.1 Research Evidence on the Earnings Benefits from Education

A large body of research has identified how additional years of schooling translate into higher earnings (Card, 1999). Although most of this research is based on correlations, there is also an extensive methodological literature on whether such estimates gains are biased upward or downward (see Belfield and Bailey, 2011). In their reviews, both Card (1999) and Rouse (2007) conclude that these biases do not in general distort the results obtained from simple earnings functions (in part because the upward and downward biases offset each other) and that adjusting for prior ability does not greatly influence the relationship. In their analysis for each state, Goetz and Rupasingha (2003) list Connecticut as being in the top quartile of states in terms of the rate of return to education. Thus, it is possible to be confident that earnings advantages from increased levels of education are genuine.

As well as private gains from education, research has also identified economic spillovers to the entire society (i.e. beyond the educated individuals) from having a more educated workforce. As the density of graduates in the population increases, so do average earnings.[9] Reviewing the literature, McMahon (2006) estimates these spillovers to be worth 37-61% of the total income returns to education; the most cited relationship, which has proved robust, is 50%, by Haveman and Wolfe (1984). So, if the net private earnings advantage is $1,000; the externality is conservatively $370.

As this is the largest source of benefit from education, we apply two methods to calculate the lifetime earnings gains. We then take the average of these methods as our best estimate of the private advantage associated with more attainment. To derive the social gains from these private advantages, we apply a factor of 0.37 to account for the positive spillovers of a more productive workforce.

3.1.2 Gross Earnings by Education: Method 1

[9] Goetz and Rupasingha (2003) find that the returns to education are higher in states with more educated persons. Abel et al. (2010) find that human capital externalities are greater in states with higher densities. However, the evidence is not conclusive. Iranzo and Peri (2009) use IPUMS data from 1960-2000 and find that only increments in college education generate positive social externalities and increases in Total Factor Productivity; increments in high school graduation have insignificant effects on state-level Total Factor Productivity and so Gross State Product.

Gross earnings are derived directly from the Connecticut resident subsample of the Current Population Survey over the five years 2006-2010. Cross-sectional information and sample sizes are reported in Table 2. Gross earnings, i.e. including tax payments employer contributions, are analyzed here: the goal is to calculate the social differences in output by education level, not the net income return to the individual.[10] The full productivity of a worker – their social value – is the amount of resource that the employer has to expend on that worker.

To obtain lifetime earnings profiles, the sample is divided into eight age bands (18-24, 225-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, and 60-64).[11] For each age band, average gross earnings are derived and these are then used to create a smoothed, annualized lifetime earnings profile for each education level. However, given the relatively small sample size, there are limits on how far this sample can be divided (beyond age band and education level). Thus, this sample is pooled by gender and race. Three models (a, b and c) are calculated to provide sensitivity analysis, with model [a] constructed as the 'best estimate' of lifetime earnings from these data. The details of each model are given in the Table Notes. The lifetime present value earnings are given in Appendix Table 1.

3.1.3 Gross Earnings by Education: Method 2

A second method of calculating earnings is also performed. This method follows the same protocol as the first method with respect to age bands and the creation of lifetime earnings profiles. However, the earnings estimates are only incomes, so we adjust for benefits incidences based on Table 2 above. Also, the entire CPS data from 2006-2010 is used. Given the much larger sample size, it is possible to estimate earnings by race and gender separately. It is also possible to adjust for work-life expectancies, using life tables reported in Skoog and Ciecka (2010). Lifetime profiles are calculated for white, black and Hispanic males and separately for males and females. These six profiles are then weighted according to educational attainment in Connecticut (see Table 1 above). These lifetime present values of earnings are given in Appendix Table 2.

3.1.4 Best Estimate of Earnings by Education

The 'best estimates' of the labor market productivity differences by education level are reported in Table 3. These estimates are the average across those from methods 1 and 2 above.

[10] It is easily established that the private gain to the individual person is substantial.

[11] These earnings differences in earnings show up even at early ages. Sum et al. (2009a) estimate that for the 16-24 year old group high school graduates earn 87% more than dropouts (including all persons, not just workers).

Comfortingly, the two methods yield reasonably similar estimates though they are calculated in very different ways based on distinct interpretations of adult productivity.

A current student in the Connecticut public school is predicted to have the following present values of lifetime earnings at age 18: $480,000 if a high school dropout; $733,000 if a high school graduate; $862,000 if they attend college for some period; and $1,434,000 if they graduate with a 4-year degree. Relative to dropouts, there are substantial lifetime earnings gains of at least one quarter of a million dollars for a high school graduate and almost one million dollars for a college graduate.

To account for social benefit externalities, these lifetime amounts are weighted by 1.37. The full social labor market differences by education level are given in the final row of Table 3.

3.2 Tax Payments by Education Level

3.2.1 The Connecticut Tax System

Differences in earnings by education level translate into differences in tax payments. However, these tax payments are made to various levels of government. The majority of taxes are paid to the federal government as income taxes and for Social Security. As such, the main fiscal benefit of higher incomes accrues nationally, not locally. Strictly, one might therefore regard differences in federal tax payments as irrelevant from the perspective of the Connecticut state Treasury. However, this interpretation may be too narrow, as Connecticut taxpayers receive resources from the federal government based on these contributions. Based on analysis by the Tax Foundation (2007) of the Census Bureau's 2005 data on Consolidated Federal Funds, Connecticut has historically been one of the heaviest subsidizers of the federal government: for every $1 paid in federal taxes the state receives only $0.64 in federal spending.[12] Therefore, any federal savings may be valued by Connecticut citizens, but instead discounted by 0.64.

Differences in Connecticut state taxes may be calculated directly. The state sales tax is 6%; and the state income tax is 3% up to $10,000, then 5% up to incomes of $500,000; and 6% beyond this level. The state also levies selective sales taxes, corporate tax and other taxes.[13] In total, approximately 11% of per capita income is paid in state and local taxes. But the link

[12] This is the third heaviest subsidy rate across all states (data retrieved January 14, 2011, from www.taxfoundation.org/taxdata/show/445.html).

[13] Based on data from taxadmin.org, tax revenues for the state government of Connecticut are: 49% from income taxes; 25% from sales tax; 17% from selective excise taxes; 3% from corporate tax; and 6% from other taxes. Therefore, state sales, excise and corporate tax revenues are approximately equal to the value of state income tax revenues. Data retrieved January 15, 2011, from www.taxadmin.org/fta/rate/tax_stru.html.

between property tax payments – and so municipality revenues – and education has not been found to be strong (Rouse, 2007).

As with earnings, tax payments represent the most significant element of the fiscal burden associated with inadequate education. Therefore, we apply two methods to calculate these burdens. Our best estimate is then the average across these two methods.

3.2.2 Tax Payments by Education Level: Method 1

Tax payments are derived directly from the Connecticut resident subsample of the Current Population Survey, March 2006-2010. These payments are federal and state tax payments after credits have been deducted. As per the earnings estimates, the lifetime tax payments are calculated using smoothed, annual averages from the eight age bands (see above). Three lifetime models are generated, with variations in productivity growth, the discount rate, and the taxable value of health and pension benefits. These amounts – expressed as present values at age 20 – are given in Appendix Table 3.

3.2.3 Tax Payments by Education Level: Method 2

Tax payments are also calculated using an alternate method as applied to our second method for calculating earnings (see above). That is, earnings from Section 3.1.3 above are entered into the National Bureau of Economic Research tax calculator, TAXSIM9.[14] For each income level, the federal income tax payments for a household in Connecticut are calculated and summed into a present value. Sales, excise and corporate taxes are calculated separately.[15] All these taxes are summed to get a more complete estimate of the additional taxes paid as incomes rise. These tax payment amounts are reported in Appendix Tables 4 and 5.

3.2.4 Best Estimate of Tax Payments by Education

The set of estimates from both above methods are averaged to yield our 'best' estimate of the tax payments by educational attainment. The calculations are shown in Table 4.

[14] TAXSIM calculations do not accurately include expense exemptions, mortgage interest tax relief, or the employer component of tax contributions. Also, individuals are assumed to file their taxes singly rather than as a household. In an earlier simulation, Rouse (2007) found that single filing produces more conservative results. Tax payments adjust for differences in labor market participation because non-workers do not pay tax. Federal tax liabilities include Social Security payments.

[15] These additional taxes are calculated as a function of state income tax payments, based on the proportions of revenues that each tax generates (see note above). This implies that persons contribute to sales and excise taxes to the same extent as they pay state income tax. Conservatively, only 75% of non-income taxes are assumed to be paid by in-state residents.

Clearly, as with incomes, those with more education pay higher amounts of tax. The average high school dropout will pay $71,000 in federal taxes and $33,000 in state taxes (expressed as present values). By comparison, high school graduates pay $113,000 in federal taxes and $51,000 in state taxes. Tax payments are higher for those who attend college and significantly higher for those who complete college (over one-quarter million in federal tax alone).

These differences in federal tax payments over a high school dropout amount to $42,000 for a high school graduate, $80,000 for an individual with some college, and $190,000 for a college graduate. The differences in state tax payments are also significant, at $18,000, $33,000 and $73,000 respectively.

3.3 Health Payments by Education Level

3.3.1 The Relationship between Health and Education

The most current and sophisticated research has demonstrated that the connections between education and health behaviors and health status are strong (Cutler and Lleras-Muney, 2009; for a recent review of the progression of the research and the trends in disparities, see Adler and Stewart (2010)). More educated persons follow healthier diets, undertake fewer risky behaviors, and appear to internalize health-related and medical information more efficiently. They are also likely to have jobs with private health insurance. Strong education-health gradients are also found for obesity, work limitations, and low physical activity. Using the National Health Interview Surveys (NHIS) from 2000-2006, Kimbro et al. (2008) report significant education–health gradients, i.e. the increase in health associated with higher levels of education. For example, for black males with a college education, smoking prevalence is less than half that of black males with only a high school diploma (for a full description of health burdens by race, see LaVeist et al. 2009). As found for earlier decades (Pappas et al., 1993), health disparities by education level are growing not shrinking (Adler and Stewart, 2010, p.6). Indeed, Freudenberg and Ruglis (2007) argue for thinking about failure to complete high school as a public health issue in itself.

Data for Connecticut from the Healthy People database shows that these relationships hold equally strongly within the state. Appendix Tables 6 and 7 shows the relationship between health and education for adults in Connecticut. Health screening is much more frequent for more educated persons (pap tests, colon cancer, and mammograms); diabetes rates are more than

halved for persons who at least complete high school; obesity rates are lower by more than one-third for high school graduates over dropouts; and cigarette smoking is also strongly correlated with education.[16] Correspondingly, self-reported health varies positively with education levels: whereas 76% of college graduates report excellent or very good health, only 36% of dropouts do. Each year, high school dropouts lose 2.5 days more of work than college graduates due to ill health and lose 5.7 days more in bed rest on average.

These differences in health status, coupled with differences in incomes, translate into different amounts of government health expenditures, consonant with a given health status. Connecticut spends 12% of Gross State Product on health care (Kaiser Health Facts, 2009). Annual Medicaid spending per enrollee in Connecticut averages $19,900 (Martin et al., 2007; CMS, 2007).[17] Hence, the Connecticut taxpayer is likely to save on government health programs if its citizens are educated to a greater level. In addition, there is a social benefit in that good health is itself valuable. This benefit may be calculated using Quality-Adjusted Life Year valuations.

3.3.2 Health-related Fiscal Burdens

To calculate the fiscal burdens across education levels, we apply two methods and take the average across these methods.

First, as reported in Sum et al. (2009b), 28% of high school dropouts aged under 65 in Connecticut are enrolled in Medicaid or Medicare; the respective figures for high school graduates and college graduates are 14% and 4% respectively (see Appendix Table 8). Applying these proportions to average expenditure per enrollee on Medicaid in Connecticut, we derive lifetime present values for total spending. This total is then apportioned across federal and state government according to analysis by Muennig (2007). These total lifetime amounts by education level are given in Appendix Table 9.

In a separate analysis, we adapt estimates from Muennig (2007) of lifetime federal and state costs associated with Medicaid and Medicare for those under 65. Muennig's estimates are re-calculated to account for health spending in Connecticut and apportioned across each education level. We also include an estimate of state spending on health distinct from Medicaid spending.

[16] Similar health disparities are given in Sum et al. (2009b, Chart 12).

[17] This includes personal health care, hospital care, physician and clinical services, other professional services, dental services, home health care, drugs, nursing care, and other personal care.

Table 5 shows the significant differences in federal and state health expenditures across education levels. Whereas lifetime expenditures by the federal government on health care for high school dropouts is estimated at $67,000, the respective figure for high school graduates is $32,000; for college graduates, it is $6,000 on average. Therefore, the average high school dropout imposes an additional burden of $35,000 over that of a high school graduate; the size of this burden increases with the gap in education levels.

Table 5 shows a similarly large effect for state expenditures. Dropouts will impose a lifetime burden worth $69,000, which is more than double that of high school graduates and ten times that imposed by college graduates.[18]

3.3.3 Health-related Social Burdens

Notably, these health-related savings do not include any economic value that private individuals might place on improved health (or any savings they might make in their own health-related spending). These valuations can be calibrated using two new studies of the value of health. Muennig et al. (2010) calculate the quality-adjusted life years (QALYs) of persons aged 18, using Medical Expenditure Panel Survey (MEPS) and NHIS data over the period 1997-2002.[19] For high school dropouts, these QALYs amount to 37.8 (standard error, 0.7) and for high school graduates they are 40.2 (standard error, 0.6). Thus, a high school graduate reaps an additional 2.4 years of life in full health. Assuming that each QALY is worth $100,000, the undiscounted gain from being a high school graduate is $240,000.[20] An alternative metric has recently been derived by Schoeni et al. (2011). They report annual differences in health-related quality of life across persons with different education levels. Relative to a high school dropout, a high school graduate experiences 0.03 extra QALYs each year and a person with a BA experiences 0.062 QALYs. Given the value of a QALY, these amount to $3,000 and $6,200 annually over a high school dropout. Over 50 years, these amounts are worth $150,000 and $310,000 respectively.

3.4 Crime by Education Level

3.4.1 The Relationship between Crime and Education

[18] Most likely, these estimates are be conservative. First, they do not fully count all government health subsidies because of incomplete data (especially on related state government programs, see Appendix Table 10). Second, they assume no family spillovers in health or health-related expenditures. Yet there is evidence that all members of families with low education are more likely to draw on government programs.

[19] A QALY is a scale to measure health status, with perfect health given a score of 1 and specific conditions translating into QALY values of less than one.

[20] It is debatable whether QALYs should be discounted, given that they cannot be transferred intertemporally.

Education levels are strongly correlated with criminal activity. The link is both direct – education causes lower criminal activity – and indirect – higher incomes reduce criminal activity.[21]

This relationship is starkly illustrated in the Connecticut prison system. Connecticut's incarcerated population is 17,750 persons. Less than 5% of these persons are female and 42% are black and 26% are Hispanic. Notably, more than two-thirds of incarcerated persons do not have a high school diploma (CT Department of Corrections website). Based on data from the American Community Survey, Sum et al. (2009b) calculate incarceration rates by education level: more than one-in-ten young adult male high school dropouts is incarcerated; the rate for graduates is 3.7% and for college graduates it is 0.1% (see Appendix Table 9). Moreover, research by Merlo and Wolpin (2009) establishes that the education–crime link is stronger for more disadvantaged and minority students. Where crime is lower, the pressure for spending on policing, the criminal justice system, and incarceration is lessened. Annually, the state's total corrections budget is $710 million (see Appendix Table 10); and each inmate costs $33,700 annually. Additionally, Connecticut state and local police protections expenditures are $1,039 million and criminal justice system expenditures are $674 million. Adding in federal government expenditures raises these amounts by at least another 20%.[22]

There are also savings to society beyond fiscal costs from reductions in crime. The fiscal consequences are a function of the spending by the criminal justice system, but victims of crime bear a bigger loss in terms of reduced quality of life and monetary losses (e.g. time off work) and all persons pay to prevent being the victim of crime. However, these social costs of crime are much harder than fiscal costs to estimate with precision. Notably, these cost savings are almost certainly underestimates of the true benefits of crime reduction. They do not include the psychic costs to criminals – and their families – from incarceration. Indeed, more recent calculations of the burden of crime yield much higher estimates than earlier studies.[23]

3.4.2 The Fiscal Burden of Crime by Education Level

[21] On the general education tocrime link, see Lochner and Moretti (2004) and Farrington and Welsh (2007) and the review in Belfield and Levin (2009).

[22] Federal expenditures on crime and incarceration are from the Bureau of Justice Expenditure and Employment Extracts, 2006 (December 2008, NCJ224394).

[23] Also, there are tax losses from crime. Victims of crime are often unable to work for some periods; and the criminals themselves are not participating in the formal labor market (Holzer et al. 2004).

A number of studies have calculated the lifetime economic consequences of being either an offender or a chronic offender as a function of education levels.[24]

Recently, Belfield and Levin (2008, 2009) calculated the costs for the state of California, separating out the costs to the taxpayer from policing, operation of the criminal justice system, and incarceration and grouping persons as either non-offenders, offenders, or chronic offenders. We adjust their estimates for Connecticut-specific incarceration costs and inflation. Conservatively, we calculate that the lifetime present values of government expenditures are: $99,000 per male offender, $597,000 per chronic male offender, $18,000 per female offender, and $110,000 per chronic female offender.

The probabilities of being a chronic offender are derived from Appendix Table 9 from Sum et al. (2009b) and the probabilities of being a general offender as the difference between these chronic offenders and the number of arrests (assuming offense multiples as per Farrington and Welsh, 2007). Given these probabilities, we weight the government expenditures accordingly. State and local governments are responsible for approximately two-thirds of the expenditures, with the federal government funding the remaining one-third.

Table 6 shows the present value expenditures on crime-related activity in Connecticut. (To be consistent with the other calculations, these expenditures are pooled by gender; but this means they mask the very large expenditure disparities between males and females). Federal and state expenditures on the criminal justice system amount to $21,000 and $43,000 per high school dropout. The amounts per graduate are much lower, at $14,000 and $28,000 respectively. Across the college-educated population, the costs are very low. Expressed as differences over a high school dropout, the federal government saves $8,000 per high school graduate, $15,000 per person with some college, and $19,000 per college graduate. Correspondingly, the state saves approximately double these amounts per person.

These are conservative estimates in two respects. First, only criminal activity up to age 32 is modeled: although this covers the peak years of criminal offending, it does not fully cover all incarceration and parole costs. The cut-off at age 32 is used because of data limitations. Second, juvenile crimes are not included because these occur before high school graduation (and they are often prosecuted differently from adult crimes). As shown in Appendix Table 11, juvenile crime is a substantial fraction of total crime.

[24] DeLisi & Gatling (2003) ; Fass & Pi (2002); DeLisi et al. (2010); and Cohen & Piquero (2009).

3.4.3 The Social Burden of Crime by Education Level

The social burden of crime includes the fiscal expenditures, but it also should include society's valuation of the psychic costs of crime, as well as costs to the victims and their families, and costs of crime prevention across the community. These burdens are much harder to estimate with precision: Ludwig (2006) estimates these social costs are 4.5 times larger than the fiscal costs; data reported by Miller et al. (1996) yields a factor that is closer to 2.5. Following convention, the more conservative ratio is applied here. The social burdens – as reported in the final rows of Table 6 – are 2.5 times the fiscal burdens.

3.5 Welfare Payments by Education Level

3.5.1 The Relationship between Welfare Reliance and Education

Higher levels of education are associated with lower reliance on welfare systems (Waldfogel et al., 2007; Grogger, 2004), not least because many welfare programs are means-tested.

In Connecticut, there are 35,750 recipients of Temporary Assistance for Needy Families (TANF) annually, at a cost of over $240 million in federal expenditures and $147 million in State Maintenance of Effort expenditures.[25] This approximates to $10,800 per recipient annually (including administration costs). Almost 230,000 persons in Connecticut (7% of the population) receive food stamps (2009 data, USDA). In addition, the state also provides housing assistance and state welfare supports. Each of these programs has an education gradient. For food stamps, for example, 24% of high school dropouts use them; the rates for high school graduates, those with some college, and college graduates are 9%, 5%, and 1% respectively (Appendix Table 12). Hence, where programs raise educational attainment and income, pressures on welfare programs will be alleviated.

3.5.2 The Relationship between Welfare Reliance and Education

To calculate differences in welfare reliance by education, we apply the same method as for crime and health: we relate changes in probability of welfare to changes in educational status. Three federal programs are included – TANF, housing assistance, and food stamps – and state welfare programs, which are assumed to be 25% of the value of these federal programs (Ratcliffe et al., 2007; Belfield and Levin, 2009). For each of the three federal programs, persons with low education are more heavily represented based on previously reported Table 2; and the

[25] U.S. Department of Health and Human Services, Administration for Children and Families, Retrieved January 22, 2011 from www.acf.hhs.gov/programs/ofa. Enrollment data from 2007. Financial data from 2009.

proportions are assumed to be the same for state welfare. Cost estimates for each welfare program are derived from DHHS (2004), Barrett and Poikolainen (2005), and CRS (2004) respectively.

Table 7 shows the differences in lifetime welfare payments by education level. Dropouts obtain on average $18,000 in federal payments and $6,000 in state payments. Other education levels account for significantly less, with college graduates having almost zero reliance on welfare.

Again, these are likely to be conservative estimates of the effect on welfare programs. The models assume that welfare payments are time-limited to the ages up to 28; beyond that point, no difference in welfare reliance is measured. Finally, no value is placed on the subjective well-being of persons who are dependent on welfare.

3.6 Costs of Incremental Education

There is one additional 'negative benefit' from additional education: students who stay in school or college longer accrue more public subsidies for their education (net of tuition payments). In this respect, high school and college dropouts are a saving to education budgets in the short run. However, this 'saving' is not substantial: many students who drop out will require additional educational programs later; and many students who attend college but are not adequately prepared must take remedial courses to cover material covered before in high school.

These educational costs are calculated based on the pathways of the students. Annual state and federal costs of school and college are calculated from: the *Digest of Education Statistics* from the National Center for Education Statistics; the Connecticut Department of Education CEDAR database; and the University of Connecticut system.

Table 8 shows the additional amounts of public expenditures on education beyond high school for each of the four groups. High school dropouts yield some savings in expenditures. Straightforwardly, the high school graduate group generates zero additional expenditure beyond high school. For those individuals with at least some college, there are assumed to be two years of federal and state subsidies, net of tuition fees. Expressed in present values, these subsidies are $1,600 (federal) and $21,400 (state). Similarly, there are subsidies to persons who obtain a BA or above (net of tuition and the private college attendees); these subsidies over four years amount to $20,500 and $45,600 by federal and state agencies respectively.

The differences over high school dropouts are also reported. These show the extent of the education savings from persons who do not rely on government education programs.

3.7 Costs of Remediation in College

Our operational definition of inadequate education is failure to graduate from high school. However, inadequate education may also encompass students who graduate from high school but are not college-ready. Many of these students will enroll in college only to find that they must take remedial classes in order to pursue a college degree. There is both a private cost to the student and a fiscal cost to the extent that these courses are subsidized by the state. Importantly, not only is there a cost in terms of fees and time away from the labor market for the student, but many of the students in remedial classes never progress to taking college credits. Bailey et al. (2010) estimate that up to two-thirds of students in remediation fail to complete the sequence of courses required to formally enter college. In effect, these students are simply repeating high school classes even as they are recognized as high school graduates.

As noted above, precise data are not available for the following reasons. First, it is challenging to identify the amount of remediation in Connecticut. Second, there is mixed evidence on the difference between college graduates who undertook remediation and those who did not; it is hard to tell whether remediation pays off. Moreover, if policies raise the high school graduation rate without improving the quality of college preparation that is likely to *increase* the amount of remediation required. We make an assumption that all remediation is costly and reflects the inadequate education of a proportion of high school graduates.

Given limitations on state data, we estimate the extent of remediation using several sources. Our primary source is data from the Achieving the Dream (ATD) study on remediation rates in Connecticut. The ATD study looks at remediation in community colleges in 14 states and has detailed data on remediation rates for three large community colleges in Connecticut (enrolling 29% of all community college students across the state). In the entering cohorts from 2001-2006 (but not 2005), 60% of students were declared as college-ready in Math; with 16% assigned one level below and 24% assigned two levels below. For Reading, the rates were 67% college-ready, 22% one-level below, and 11% two levels below.[26] These rates of community college remediation are somewhat lower than in other states but nevertheless still represent a

[26] Email communication, Sung-Woo Cho, Community College Research Center, Teachers College, March 30 2011.

significant cost to the student and the state.[27] In addition there is non-trivial remediation at the four-year level, although data for Connecticut is not available. Using the national average rate from NPSAS:04 data, however, the rate is 15% (using data from Florida yields a lower rate, at 10%).[28]

Mapping these rates onto our cohort of students, and adjusting for the failure rates for those assigned more than one-level below, we have 6,440 community college students who will take remedial courses, with an average of 2.26 courses per taker.[29] In addition, there are 1,080 students in the four-year system who will take a remedial course and we conservatively assume they take only one remedial course each. At the community college level, each 3-credit remedial course is estimated to cost $1,070 to the state and $80 to the federal government (net of fees). At the four-year level, each 3-credit remedial course is estimated to cost $1,140 to the state and $510 to the federal government (net of fees).[30]

The total present value expenditure on remedial education for our single cohort is therefore $16.8 million to the state and $1.7 million to the federal government. Across each of the college-bound population, we estimate the present value cost at $690. This should be added to the total burden of inadequate education across each cohort. However, because we cannot be sure that the remediation costs will fall as the number of graduates increases, this amount is not included in our overall total. Moreover, the reason the per-student amount is relatively small is because of our particular economic framework. That is, the remediation costs are expressed

[27] NPSAS:04 data show that nationally 43% of community college students take one remedial course (Horn and Nevill, 2006, Table 6.2). Rates cited in Bailey et al. (2010, 257) are even higher. For example, Florida data show that 78% of students in community colleges need remediation (FOPPAGA, 2007). Data for Ohio indicate that 11% of all undergraduate credits are in remedial courses at community colleges (Ohio Board of Regents, 2006).

[28] This average comes from the national NPSAS:04 data (Horn and Nevill, 2006, Table 6.2). Florida data indicate that 10% of students at four-year colleges need remediation (FOPPAGA, 2007).

[29] This figure is calculated as 40%+36% of all community college students plus 10% of all four-year students. For students assigned two levels below, only 50% will progress to take their second remedial course (Bailey et al., 2010).

[30] We assume that each remedial credit hour uses the same resources as the average credit hour for the institution. It may be that resources for remedial students are lower: this would be the case if: faculty assigned to teach these courses are paid less; or class sizes are larger than average; or course materials are less (e.g. no scientific equipment is needed). It might be that resources required are higher, in that remedial students receive a fixed amount of counseling that is spread over fewer credits. The ATD data shows that in fact developmental education courses have higher instructional expenditure per FTE than non-DE courses (but the difference is not statistically significant, see Bailey et al., 2010, Table 9). We also have to make assumptions about how much the student pays versus the state. Here again we might anticipate that developmental education students would pay more than college-credit students (they have a much lower probability of success in college and or because they are receiving more resources). But the ATD data show that DE students pay less in tuition than non-DE students, by as much as 25% less (Table 9). We assume that these relationships also hold for the four-year institutions.

across all students in a cohort, regardless of whether they go to college or not. A more appropriate way to understand the cost of remediation might be to ask: what proportion of the costs of the higher education system reflects inadequate preparation of students in the school system? National estimates – with some support from our data in Connecticut – suggest that at least 11% of community college budgets and perhaps 5% of four-year college budgets reflect inadequate preparation in high school. Finally, we should emphasize that all that has been measured is the expenditure on providing remedial courses. This falls far short of a full accounting of the costs of remediation, which should include additional screening and counseling, dilution of college-level course content, and the substantial burden on discouraged students.

4. Economic Burdens by Education Level

4.1 Fiscal Burdens

We calculate the full fiscal burden as the sum of the burdens calculated above. This burden in given in Table 9, split across federal and state/local government. Each individual pays taxes making a positive contribution to the treasury. However, each individual also imposes a fiscal burden, either because they commit crime, require government health services, are on welfare, or are being further subsidized to attend school or college. Thus, from the fiscal perspective, some individuals will pay more than they incur and vice versa. Critically, more educated persons pay more and incur less in expenditures.

At the state level, each high school dropout imposes a net fiscal burden of $75,000: each dropout reduces the states' fiscal revenue streams by this amount. Although each dropout contributes $33,000 in state taxes, he or she imposes a $69,000 health burden, a $43,000 crime burden, a $6,000 welfare burden, and a saving of $10,000 in education expenditures. The net effect is therefore negative, at $75,000. Similarly, high school graduates also receive more state/local subventions than they pay in: with an excess of $12,000 in public costs over their tax contributions($51,000 paid in taxes and $63,000 in expenditures). In contrast, persons with some college and with college graduation pay in $11,000 and $48,000 respectively to the state beyond their call on the public services affected by education.

Of key interest for this study are the net differences between dropouts and others. On net, each high school graduate pays in $63,000 more over their lifetime to the state government than a high school dropout; a person with some college pays in $86,000 more; and a college graduate pays in $124,000 more.

At the federal level, the amounts are significantly larger and so are the disparities. As with the state budgets, a high school dropout contributes less in taxes to the federal government than he or she imposes in expenditures: over their lifetime expressed in present values, this contribution is -$34,000. In contrast, from the federal perspective a high school graduate generates $61,000 in net federal revenues. College-educated persons contribute significantly more, at $120,000 from those with some college and $231,000 from college graduates. These last two groups pay in large amounts in federal taxes and impose relatively low burdens in the form of public expenditures.

As for the state-level analysis, the net differences between dropouts and others are the primary focus. Compared to a high school dropout, a graduate contributes $95,000 more in federal taxes; a person with some college contributes $154,000; and a college graduate contributes $265,000 more. These differences are much larger than the state differences because the federal income tax takes a much larger share of income.

From the perspective of a Connecticut taxpayer, at least $63,000 is being lost every time a student fails to graduate from high school. The true figure is likely to be much higher for two reasons (leaving aside any issues of sensitivity to the assumptions used, see below). One reason is because graduation from high school allows a student to progress to college and so generate even more taxpayer returns. If we assume that each dropout graduated from high school and progressed on to college at the average rate across the state of Connecticut (see Table 1), then the taxpayer gains would actually be $90,000. A second reason that this figure is an underestimate is because Connecticut taxpayers gain from federal government expenditures. As noted in Section 3 above, Connecticut only receives 64 cents back for every dollar in federal contributions. If 64% of a high school graduate's net federal tax contributions are counted, this is worth almost $61,000 to the state of Connecticut. Therefore, the economic value to the state as each dropout becomes a graduate would now be $123,000 (the rounded sum of the state gains of $63,000 and the weighted federal gains of $61,000).

As given in Table 1, there are 8,350 high school dropouts in the current cohort of students in Connecticut. If one-quarter of those students actually graduated from high school, the aggregate effect would be worth at least $131.5 million in present value terms for the Connecticut taxpayer (not counting any federal tax consequences). This amount is more than 1% of the total state budget each year, and it would be generated for each year that the dropout rate is reduced. If this new one-quarter of students graduated from high school and then progressed on to college at the average rate for the state, the aggregate gains would rise to $186 million or almost one billion dollars over a five year period..

Similarly large amounts would be generated if there were improvements in the higher education pipeline. If an individual who attained some college were to instead complete a four-year degree, the state taxpayer gains would be $61,000. As given in Table 1, there are 16,466 persons with some college. If one-quarter of these persons instead graduated from college, the aggregate effect would be worth $250 million in present value terms to state taxpayers in Connecticut (again not counting any federal tax consequences).

4.2 Social Burdens

The full burden of inadequate education in Connecticut is significantly greater than the burden on the taxpayer. Table 10 summarizes the social consequences of inadequate education.

The biggest loss to society occurs because of the relationship between education and increases in the productivity of the labor force as a whole, by which we mean both own earnings and labor force spillovers. The amounts are given in row 1 of Table 10. On top of this are the burdens to government agencies for health, crime, and welfare services and the social costs to victims of crime (rows 2 and 3). The net social resource effect is given in row 4 of Table 10. Each high school dropout generates $658,000 in lifetime productivity against which we deduct the additional government expenditures associated with their added public service burdens and the consequent social costs of crime; this yields a net social resource effect of $284,000. In contrast, the net social resource effect per high school graduate is $784,000, rising to $1.86 million per college graduate.

The net social burden across low educational attainment is given in the bottom rows of Table 10. Relative to a high school dropout, each high school graduate represents a social gain of $501,000; each college enrollee represents a social gain of $764,000; and each college graduate represents a social gain of $1.57 million.

Across the 8,350 high school dropouts in the current cohort of students in Connecticut, the social consequences amount to $4.18 billion as a result of these persons not graduating from high school. If one-quarter of those students actually graduated from high school, the aggregate effect would be worth at least $1.05 billion in present value terms for Connecticut citizens. This amount is approximately 0.6% of the Gross State Product annually. If these new graduates progressed on to college at the state average rate, the social gain would be $1.90 billion in present value terms.

4.3 Sensitivity Analysis

The above calculations rely on many relationships between education, behaviors, and cost consequences. Although these relationships are derived from the best available research evidence, their magnitudes cannot be precisely bounded. Hence, it is necessary to consider the extent to which they may be mis-measured and so yield an inaccurate calculation of the burden by education level.

First, we note that for each domain (earnings, taxes, crime, health and welfare) we have reported multiple estimates of the economic consequences. By applying the averages of these estimates, some sensitivity analysis has already been built into the modeling process.

Second, it is likely that the best estimate model understates the actual consequences. As noted above, the calculations for each domain were conservative. The most important ways in which the income assumptions are conservative are: the likely underestimate of the full earnings gain from education; and the valuation of non-work time (especially for females) at zero.[31] A final assumption that renders the best estimate results conservative is the use of discount rates that exceed 3.5% in the sensitivity analyses (see Table Notes). The 3.5% value is recommended by Moore et al. (2004); using higher values has the effect of reducing all the present values benefits of education.

Importantly, we have omitted some considerations such as the economic distortion arising from a positive marginal excess tax burden (METB), i.e. the distortion imposed by raising taxes to pay for health, crime, and welfare services. Allgood & Snow (1998) estimate 13-28 cents as the marginal welfare cost per dollar of a lump-sum grant, i.e. our estimates of fiscal

[31] Our adjustments for employment rate differences are almost certainly conservative; Sum et al. (2009a, p.10) calculate that "non-college enrolled high school graduates in 2009 were almost twice as likely to be employed as high school dropouts".

burdens may be underestimated by this proportion. However, METB values are very context specific – depending on the level of government at which taxes are collected and the price elasticity of demand of the taxed good – such that we do not include a specific value for the METB. Including the METB would increase the economic magnitudes such that the value of additional education would be even larger (every $1 saving in government health care, for example, is strictly worth $1 times the METB). Other important omissions include intra-family and intergenerational effects. For example, 72% of all births to high school dropouts in Connecticut are out of wedlock (Sum et al., 2009b, p.10), such that disadvantage is being transferred through generations.

Finally, these predictions assume that the gains from additional education that currently exist will be maintained as Connecticut students graduate from school and college and enter the labor market. That is, our estimates assume that the labor market outcomes for a 50-year old dropout in 2040 are equivalent to those of a 50-year old dropout in 2010. In fact, the impact of education as a determinant of economic well-being has grown over recent decades; and future demographic and labor market changes are likely to accelerate this trend (Kirsch et al., 2007). Most of the evidence points to a long-term trend of growing adversity for dropouts. Moreover, the decline in employment for high school dropouts - even over the last decade - has been much faster in Connecticut than nationally (Sum et al., 2009a, Chart 2). Also, the cost consequences are likely to grow: both criminal justice system costs and health care costs consistently outpace inflation (Glied, 2003).[32]

Overall, the size of the economic burden from inadequate education is likely to be larger than our estimate. At issue is what would education reforms cost that might mitigate this burden.

[32] An additional concern might be 'leakage' of educated persons out of Connecticut. However, the majority of school-aged residents gain adult employment in their local labor market such that this analysis is not sensitive to leakages of highly educated persons to (for example) New York or Massachusetts. The extent of the leakage is small and whether it is positive or negative depends on how it is measured. Based on 2005 American Community Survey data, Connecticut is a net importer of persons aged 22-29 with at least an associate degree (www.nchems.org). That is, the state is not generating enough of its own skilled workers to meet the demand. But, using an alternative measure of young, single persons with college degrees, Connecticut is estimated as a net exporter (http://www.census.gov/prod/2003pubs/censr-12.pdf). Of course, if the state had a more productive labor force that would likely induce new investment by firms, leading to further job growth. Arguments showing how a more 'creative class' leads to economic growth are given in Florida (2002).

5. Education Reforms in Connecticut

Our economic analysis shows that there is a very large burden associated with low levels of education in Connecticut. Potentially, this suggests substantial economic pay-off to implementing effective educational reforms to either boost the high school graduation rate or expedite students' progression through college.

In this Section we report on education reforms that might bring about such change, and how much they would cost. Potentially, the list of reforms might be long, to include interventions from pre-school to college and might also encompass health-related or socio-emotional policies. Ultimately, the scope for reform is given by the pay-off: the state should be willing to spend up to the present value of benefits. However, to keep the review manageable, we focus on reforms that are under consideration in Connecticut and on reforms that would raise the high school graduation rate. For each reform, we provide a description with only a brief justification of its efficacy (with citations) in improving the high school graduation rate; we then report its expected costs so that they can be compared to the benefits.

These cost estimates are derived from our earlier work (Belfield and Levin, 2007). The costs are updated to 2011 prices and expressed in present values at age 18. Also, the cost estimates are adjusted for the relative cost of education in Connecticut. The cost index used is by Taylor et al. (2007): this index finds that the cost of education in Connecticut is significantly above the national average and that costs vary considerably by county. Education costs in Windham County are the closest to the national average of costs, but still exceed the national average by 10.4%; in Hartford they are 34.2% higher; and in Fairfield County they are 58.3% above the national average. Our estimates are based on implementation of the reform in the median county in Connecticut (New London). If the reforms were implemented in Windham County, the costs would be 17% lower; if they were implemented in Fairfield County they would be 18% higher.

5.1 Reforms with Demonstrated Evidence on High School Graduation

5.1.1 Raising Teacher Quality

More effective teaching over the K-12 years has been found to be cumulatively significant, such that investing in more high quality teachers in Connecticut may be worthwhile. The supply of higher quality applicants for teaching jobs would require higher baseline salaries. Teachers

would then be selected from this enhanced supply based on expected productivity and retained on their realized productivity. Using state-level panel data, Loeb and Page (2000) estimate the association between higher teacher salaries and high school graduation rates ten years later. Loeb and Page (2000, 406) find that a ten percent increase in teacher salaries across the K-12 years would increase the number of high school graduates by 5 percentage points.

In present values, paying teachers ten percent more through the K-12 years would cost Connecticut $10,850 per student. However, this reform would also benefit all the students who will graduate anyway, as well as those students on the margin of dropping out of high school.

5.1.2 Reducing Class Size

One popular policy for improving educational outcomes is to reduce class sizes. There is strong research evidence on this policy, at least for elementary grades; although in practice class-size reductions have proved less effective, in part because they have been more modest. Evidence from Tennessee's Student Teacher Achievement Ratio (STAR) Project shows strong advantages from being in smaller classes: students randomly assigned to smaller classes were more likely to graduate from high school than students assigned to larger classes (Finn et al., 2005). Students in smaller classes in elementary school reported graduation rates that were 11 percentage points higher than students assigned to regular classes. The impacts were even greater – at 18 percentage points – for minority and low-income children.

Our costs follow those of Project STAR in assuming a reduction in class size from 22 to 15, and that this policy is implemented for on average 2.3 years in elementary school. The present value 'unit cost', i.e. the cost per child affected by the change, is $16,960.

5.1.3 Publicly-funded Pre-School

Expanding pre-school provision is possibly the most compelling educational investment on economic grounds. Greater access to, and improved quality of, preschool has been found to be associated with lower rates of special education, higher achievement, and subsequently higher graduation rates. Results from the Chicago Child-Parent Centers show that this program increased the high school graduation rate by 11 percentage points (Temple and Reynolds, 2007). The unit cost of delivering this program to each student in Connecticut is estimated at $9,120 per year. Using results from the High Scope/Perry Pre-School program, the increase in the high school graduation rate is 19 percentage points (Nores et al., 2006). The cost for its delivery in

Connecticut is estimated at $19,070 per student. We note, however, that the total costs for both these programs will vary with the duration that a child is enrolled in pre-school.

5.1.4 Head Start

Expansions or improvements in the quality of Head Start programs might be a way to improve the high school graduation rate. Recent evidence has found academic gains from Head Start, of the order of 0.10 to 0.24 standard deviations for language and cognitive abilities, as well as increased rates of high school graduation (see Barnett and Belfield, 2006). Higher quality Head Start may also be effective: doubling the amount of resources for Head Start has been estimated to raise attainment by one year of education (Ludwig and Miller, 2007). Research evidence is not precise, but expanding Head Start to 100 additional children would yield between 4-12 additional high school graduates.

Annual spending on Head Start in Connecticut is currently $8,996 per participant (DHHS, 2007; NIEER, 2011). In present value terms comparable to the benefit estimates given above, one year of Head Start would cost $13,570 per student. However, most Head Start provision is federally- funded such that the cost to the Connecticut taxpayer is significantly lower.

5.1.5 Secondary School Interventions: First Things First

The strongest example of a successful reform at the high school level is the Institute for Research and Reform in Education's First Things First (FTF). This program emphasizes small learning communities (less than 350 students), long-term teacher student relationships, mentoring, and teacher advocacy for each student with a rigorous curriculum (Quint et al., 2005). In a research study using interrupted time–series data, FTF generated higher graduation rates by 16 percentage points as a result of the intervention.

Levin et al. (2007) estimated the costs of this program at $5,400 per child across three years of high school. Adjusting these costs for Connecticut prices, the present value unit cost of FTF is estimated at $7,250.

5.2 Reforms with Potential to Increase the Rate of High School Graduation

The *What Works Clearinghouse* catalogs secondary school programs that are intended to reduce the dropout rate and provides reviews of the evidence for each. Retrieved in January 2011, the WWC review of dropout prevention programs identifies 3 middle school reforms and 5 high

school reforms that have "evidence of positive or potentially positive effects for at least one improvement outcome".[33]

5.2.1 Middle School Interventions

Achievement for Latinos through Academic Success (ALAS) is a program that assigns counselors to monitor attendance, behavior, and achievement. Counselors work with children and their parents to ameliorate problems, offer remediation, and provide feedback on school progress. An evaluation using an experimental research design was performed by Gandara et al. (1998). For a sample of 81 students in California, ALAS did reduce the probability of dropping out in 10th grade: whereas 86% of the ALAS participants were still enrolled, only 69% of the control group were. By 12th grade, the respective graduation rates were 32% and 27%. However, these differences – based on the small sample – were not statistically significant. If these graduation rate differences are genuine, then if the ALAS program were delivered to 100 at-risk students, five new graduates would result.

Adjusting for Connecticut prices, the present value unit cost of the ALAS program over three years is approximately $3,800 per participant.

Twelve Together is a program offering peer support and mentoring in middle school and high school. Students participate in weekly after-school discussion groups. A randomized controlled trial of 219 8th graders in California found that the dropout rate for participants was five percentage points lower than the control group (Dynarski et al., 1998).

In present values the unit cost if this program were applied in Connecticut would be $4,800.

5.2.2 High School Interventions

Career Academies are school-within-school programs intended to promote employment readiness. Students are instructed with career-related materials and supported to gain work experience at local employers, with academies operating across the country. One randomized

[33] Other interventions might be included when sufficient evidence is available, including: KIPP academies, High School Puente, Boys and Girls Clubs of America, Sponsor a Scholar, AVID, the Institute for Student Achievement, Rutgers Future Scholars Program, and Project GRAD. These interventions were excluded either because there has been no rigorous evaluation, there are no effects on graduation, or because information on high school graduation is not available. The High School Redirection and JOBSTART programs are not included because they are no longer operating. There are also some remedial, out-of-school interventions that are included in the WWC review. These are also outside the scope of this analysis. Finally, Accelerated Middle School is not included because the cost estimates vary significantly across sites (with some sites reporting cost savings as well as benefits).

trial evaluation for 1,764 students found significant reductions in dropout rates for the sub-sample of at-risk students over the control group (21% and 32%), but no impact on those students who were low or moderate risk (Kemple and Snipes, 2000). Assuming Career Academies are targeted to at-risk youth, if the program is delivered to 100 at-risk students, 11 new graduates would result.

Applying cost estimates from the What Works Clearinghouse, the present value unit cost of the program over three years is approximately $4,350.

Check & Connect is a program to monitor and assess student performance and mentor students to improve both behaviors and academic outcomes. It is implemented in school districts in Minnesota and targeted to at-risk students. An experimental evaluation was performed for 94 high school students in Minneapolis (Sinclair et al., 2005). Again, the evidence is mixed: there is no clear evidence that the program raises the graduation rate, but at least by 12th grade the dropout rate of program participants was considerably below that of the control group, at 39% compared to 58%. Assuming Check & Connect is targeted to at-risk students and the dropout differences translate into graduation rates, then a program delivered to 100 students would generate 17 new graduates.

The present value unit cost of the program over four years in Connecticut would be approximately $6,080.

I Have a Dream is a program for inner-city low-income children from 6th to 12th grade. The program offers a mentor and facilitator for 6th graders; funding sponsors are actively engaged with the students and the school and provide financial support for those who enroll in college. An evaluation by Kahne and Bailey (1999) reported graduation rates 34 percentage points higher for those in the program.

However, the cost of the program would be approximately $22,360 per child enrolled, and this cost may be an understatement because it does not include in-kind resources in terms of time commitment of the sponsors and mentors.

Talent Development High Schools may also raise the graduation rate. Based on evidence from the What Works Clearinghouse, these high schools are predicted to reduce the dropout rate by 7%, i.e. by 1-2 percentage points.

The Connecticut CSOS estimates that the additional costs of operating these types of high schools, beyond the regular operating costs of a traditional high school, are $420 per year. This

includes the costs of curriculum materials and technical assistance. Expressed in present values at age 18, the total amount per student would therefore by $1,850. However, this estimate does not include the costs faced by school districts in shifting to block scheduling and general reorganization to implement the model.

5.2.3 Out of School Interventions

Talent Search is a program of academic support intended to raise the graduation rate and motivate low-income students to attend college. It serves about 380,000 students across over 400 sites. Evaluations by Constantine et al. (2006) found that high school completion rates were 9 percentage points higher for those who had participated in Talent Search. Importantly, this is a federally-funded program; state and local agencies also contribute to the program but the resource amounts are unknown. Adjusting for Connecticut prices, the unit cost of the program to the federal government per participant is approximately $1,140.

5.2.4 Whole-School Reform

Whole-school reforms may change the culture and organization of a school to enhance educational outcomes. However, there are few economic analyses of whole-school reforms, despite the substantial cost involved in implementing them (Levin 2002). One whole-school reform model which has been evaluated is **Success for All**, which focuses on promoting early school success among educationally at-risk students. Success for All includes materials, training, and professional development to implement a school-wide program for grades K-5. It serves approximately 1 million children in 2,000 schools. The evaluation by Borman and Hewes (2002) shows Success for All may be a good investment because it shows higher test scores at 8th grade, reduces special education placement, and reduces rates of grade retention. No high school graduation data are available, but the test score gains are comparable to those found from Project STAR to reduce class size. Hence, a yield of 11 new graduates per 100 students might be possible.

Over four years of elementary school, which is the typical duration of Success for All, the cost per student is estimated at $19,910 per student.

5.3 Reforms in Connecticut

As well as reforms with general promise, we also consider programs that have received more attention in Connecticut.

Since 1983 the state has funded a Priority School District Program for districts with the greatest academic need. Resources for this program are allocated to reforms such as "(1) the creation or expansion of innovative programs related to dropout prevention; (2) early reading intervention programs which include summer and after-school programming; (3) the enhancement of the use of technology to support instruction or to improve parent-teacher communication; (4) initiatives to strengthen parent involvement in the education of children and parent" and others.[34]

These uses of Priority School District Program funds may pass an economic test. The innovative dropout prevention programs are likely to include variations on the programs analyzed above. Such programs should, for the most part, pass a cost-benefit test. However, because we do not have cost data, or information on exactly how the programs are implemented across the state of Connecticut, these reforms are not costed out. We do note, however, that the PSD funding for 2010-11 academic year is $40.6 million across 163,088 students in 15 districts; this amounts to less than $250 per individual student.

Early reading programs have been found to be effective by the What Works Clearinghouse (2011), although the costs of such programs vary significantly with implementation. Similarly, summer school has been found to be effective. Based on an experimental field trial in Baltimore, Borman and Dowling (2006) estimate that after two successive summer schools, the treatment group is approximately 0.5 standard deviations ahead of the control group in test scores. The costs of such summer school programs are estimated at $4,120 per student for Connecticut. After school programs may have some promise for some students. However, the recent high-quality evaluation of the 21st Century Community Learning Centers, a $1 billion federal program, found no effects on academic achievement or homework (James-Burdumy et al., 2004). Of course, changing the content and focus of these programs from what is presently offered could have different outcomes. Similarly, enhanced use of technology in education may take many forms and its effectiveness will depend heavily on what it is and how it is introduced. Nevertheless, a relatively simple intervention – boosting computer use at home – has been found to be effective in raising attainment by Fairlie (2005). Finally, parent involvement programs are varied, to include parent recruitment for school activities and

[34] CT State Department of Education website, retrieved January 25 2011, www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=321612.

support of parents' ability to instruct their children at home. These have been found to boost literacy (see the meta-analysis for grades K-3 by Senechal 2006), but they are not costed out here although it is likely that their unit costs are low.[35]

In addition, the state has promoted the Career Pathways model and Summer Reading challenges. The summer reading challenge is a program to encourage students to read more during the summer months. It is low cost in that no instructional resources are used. The Career Pathways model is likely to require resources similar to the Career Academy model given above.

In 2006, the Connecticut Department of Education compiled a report on the costs of a series of changes as part of the Secondary School Reform plan. These cost estimates are not linked to any specific estimates of changes in attainment, but they are illustrative of the reforms that the state is contemplating. Also, the cost estimates are often reported in aggregate because the reforms vary in how many students they are intended to cover (e.g. reform at the middle school level involves fewer students than reforms involving high schools).

Student Success Plans for all students in grades 6-12 are estimated to cost less than $100 per student annually for the state Department of Education, with approximately equivalent costs at the district level. Student Support Programs for At-Risk students are estimated to cost $600 per student annually for the state, with additional (unknown) costs to the districts. Capstone projects, which are already partially implemented across the state, are estimated to cost less than $200,000 in total for full implementation across the relevant student cohorts. Hiring additional guidance counselors for all high schools is estimated to cost $10.2 million and ten extra days of professional development for high school teachers is estimated to cost $9.1 million; together, these reforms amount to less than $200 per high school student enrolled in them. Finally, providing connectivity for middle schools to the Connecticut Education Network is estimated to cost $4.9 million, which is also less than $200 per middle school student. Only one reform proposal appears to have a substantial and uncertain cost: improvement of physical facilities.

5.4 Alternative Reforms

Finally, we consider a set of alternative reforms. These are systemic reforms that cannot easily be costed out and reforms that are beyond the purview of the education system.

[35] District and school staff must commit time for parent liaison and mentoring, as well as to create media for conveying information about school policies. But parents who participate in school decision-making and policies are not compensated for their time and may in fact be substituting for other staff.

Reducing the sizes of schools may be effective at raising achievement (Kuziemko, 2006). A policy to reduce school size is excluded because cost calculations are too imprecise and the specifics of what is done with smaller schools must be identified because it affects both their costs and effectiveness.

Charter schools and privatization reforms to create more options for parents and more competition between schools may also be effective in raising outcomes. However, there is little solid evidence that privatization will raise the rate of high school graduation. Perhaps more importantly, the costs of privatization reforms are not easily identified (Levin and Driver, 1997) and it is not clear how to increase the number of private schools within a district.

One reform that may be a good investment is increased accountability frameworks, concomitant with raising standards on exit-based exams. However, accountability frameworks – as found by Dee and Jacob (2006) – are beneficial for those pushed to study harder and adverse for those who drop out early. More likely, accountability frameworks generate gains in efficiency that do not show up in achievement measures.

Finally, tax relief (or higher incomes from greater opportunities in the labor market) might allow parents to invest more resource in the education of their children. Thus, one educational policy might be to raise either family incomes or the economic status of youth. However, the effect of short-run changes in family income on children's educational attainment is not especially strong. (The effect of socioeconomic status on educational outcomes is powerful, but status encompasses more than income).[36]

Overall, for these alternative reforms the effects on the rate of graduation are not clearly established and the costs are uncertain.

6. The Returns to Investments in Education for Connecticut

On this reading of the literature, there are some educational investments that clearly demonstrate an impact on the rate of high school graduation; others are promising but their effects remain to be sufficiently corroborated; and others are plausibly motivated but have yet to be evaluated in practice.[37]

[36] See Belfield and Levin (2009) and Carneiro and Heckman (2002).

[37] Of course, multiple interventions may be offered as part of a wider organizational reform. As Carneiro and Heckman (2002, 159) note, "Marginal improvements in school quality are likely to be ineffective in raising lifetime earnings and more fundamental changes are required if we hope to see a significant improvement in our educational

Table 11 lists the cost estimates for each reform, alongside information on the expected increase in the number of high school graduates per 100 students in receipt of the intervention. Each of these costs estimates may be compared to the present value benefits. However, we caution against a simplistic comparison from both the costs and benefit perspective. From the costs side, we report only the costs of program delivery per student, not the cost per new high school graduate. The latter depends critically on how well the program or reform is targeted, as well as on how effective it would be in Connecticut. Also, the costs are based on the assumption that the state fully funds these reforms, without any transfers from the federal government. From the benefits side, the gain per high school graduate is at least $63,000 from the perspective of the Connecticut fiscal authority. But a program delivered to a cohort of students will likely yield benefits to those who would have graduated anyway; such students might be more likely to progress to college and to complete a four-year degree. In addition, programs delivered before high school are likely to generate benefits in terms of lower remediation and special educational placement. None of these effects are incorporated in Table 11.

7. Conclusions

Connecticut's high school graduation rate ranks 11th in the nation, even as the state ranks 3rd in terms of median income. And, as for many states, demographic shifts are placing significant pressures on the school system at the same time as these shifts are constricting revenues. At issue is whether the state can afford to invest in educational investments for disadvantaged students.

Our analysis indicates that the economic value of extra educational attainment is strongly positive. The relationship between education and personal economic independence, as well as an array of other private advantages and social gains, is extremely strong. This relationship holds especially at lower levels of education, where individuals are at greater risk of low health status, of involvement in the criminal justice system, or reliance on welfare. However, the income effects of education are very powerful at higher levels of education too, with the pay-off to completing college being in excess of a half million dollars over the lifetime. Moreover, all of

system". Such fundamental change might include several of the above interventions although the costs of implementing multiple interventions simultaneously have not been calculated.

these relationships are becoming stronger over time such that the net effect of additional education is going to be even greater for current cohorts of Connecticut school children.

Although the private individual gains the most from additional years of education, the state of Connecticut gains a substantial amount also. The state's fiscal balance is stronger, as persons with more education pay more in taxes and draw less upon government services. The state's economy is stronger, as more productive workers generate positive spillovers in the labor market. Our estimates of these fiscal and social or economic gains easily exceed the costs of potential education reforms that might either raise the high school graduation rate or improve the college completion rate. By failing to consider investment in such reforms, therefore, Connecticut is making short run budget savings but creating long run economic burdens.

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Tables

Table 1

Educational Attainment in Connecticut (2007-08)

	Total		White and other		Black		Hispanic	
TOTAL:								
Terminal attainment:								
High school dropout	8,350	18%	3,816	12%	1,879	29%	2,655	34%
High school graduate	11,476	25%	8,569	26%	1,381	21%	1,526	20%
Some college or 2-year degree	16,106	34%	11,178	34%	2,341	36%	2,587	33%
4-year degree	10,838	23%	8,942	28%	900	14%	995	13%
Cohort size (at 9th grade)	46,770		32,505		6,501		7,764	
MALES:								
Terminal attainment (%):								
High school dropout	5,428	23%	2,480	15%	1,221	38%	1,726	45%
High school graduate	4,996	21%	4,151	26%	443	14%	401	10%
Some college or 2-year degree	8,053	35%	5,589	35%	1,171	36%	1,294	34%
4-year degree	4,769	21%	3,935	24%	396	12%	438	11%
Cohort size (at 9th grade)	23,245		16,155		3,231		3,859	
FEMALES:								
Terminal attainment (%):								
High school dropout	2,923	12%	1,336	8%	658	20%	929	24%
High school graduate	6,481	28%	4,418	27%	938	29%	1,125	29%
Some college or 2-year degree	8,053	34%	5,589	34%	1,171	36%	1,294	33%
4-year degree	6,069	26%	5,008	31%	504	15%	557	14%
Cohort size (at 9th grade)	23,525		16,350		3,270		3,905	

Sources: Tabulations pooled from the Connecticut State Department of Education, CEDAR database; *Data on the Condition of Education*, Connecticut State Department of Education, www.sde.ct.gov/sde/lib/sde/pdf/pressroom/ConditionofEd_08_09.pdf ; Swanson (2004); and Stillwell (2010). *Notes:* GED completion assumed equivalent to high school graduate.

Table 2

Labor Market Status: Connecticut Adults (18-65)

	High school dropouts		High school graduate (incl. GED)		Associate degree or some college		BA degree or above	
Males:								
Not in labor force	0.32		0.17		0.19		0.08	
Unemployed	0.11		0.07		0.05		0.03	
In school	0.18		0.03		0.16		0.01	
Annual earnings	$15,823	(24620)	$34,846	(37497)	$40,436	(47171)	$101,159	(108767)
State tax (net cr.)	$327	(1395)	$1,153	(3140)	$1,610	(3208)	$4,351	(8222)
Federal tax (net cr.)	$1,116	(4633)	$3,438	(7873)	$5,152	(10894)	$14,162	(23219)
FICA	$1,264	(1725)	$2,707	(2534)	$2,911	(2827)	$5,875	(4395)
Pension plan	0.18		0.43		0.48		0.64	
Private health ins.	0.46		0.72		0.8		0.91	
Employer contrib.	$1,166	(2598)	$2,990	(3683)	$3,210	(3824)	$5,057	(4186)
Welfare amounts	$13	(196)	$14	(372)	$1	(14)	$2	(81)
Social Security	$325	(1772)	$72	(824)	$31	(481)	$23	(610)
Medicare health	$1,165	(2988)	$681	(2346)	$455	(1934)	$372	(1754)
Food stamps	$502	(1697)	$133	(754)	$50	(421)	$11	(189)
N		*715*		*2009*		*1590*		*2449*
Females:								
Not in labor force	0.48		0.30		0.26		0.23	
Unemployed	0.07		0.06		0.04		0.03	
In school	0.12		0.05		0.16		0.01	
Annual earnings	$9,003	(13679)	$18,720	(24140)	$23,416	(28299)	$43,850	(53781)
State tax (net cr.)	$298	(1306)	$818	(2112)	$1,323	(3620)	$2,885	(5627)
Federal tax (net cr.)	$960	(4285)	$2,564	(7374)	$3,990	(10537)	$9,496	(18197)
FICA	$707	(1177)	$1,401	(1599)	$1,743	(1922)	$3,068	(2900)
Pension plan	0.17		0.35		0.41		0.53	
Private health ins.	0.41		0.69		0.79		0.91	
Employer contrib.	$832	(2037)	$1731	(2823)	$1,955	(3031)	$2,973	(3582)
Welfare amounts	$230	(1050)	$65	(611	$40	(438)	$3	(158)
Social Security	$726	(2251)	$178	(1192)	$76	(850)	$23	(414)
Medicare health	$1,369	(3200)	$1,000	(2794)	$479	(1998)	$370	(1751)
Food stamps	$983	(2188)	$256	(1078)	$118	(681)	$12	(160)
WIC recipient	0.07		0.03		0.03		0	
N	*732*		*1934*		*2069*		*2685*	

Source: Current Population Survey, March Supplements 2006-2010 combined. Standard errors in brackets.

Table 3

Earnings

Lifetime Present Value by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
Model [a]	$604,601	$934,078	$1,107,134	$1,844,131
Model [b]	$554,634	$889,042	$1,051,664	$1,798,555
Model [c]	$280,897	$375,791	$428,278	$658,199
Average [a]-[c]	$480,044	$732,970	$862,359	$1,433,628
Gain over a high school dropout	-	$252,926	$382,314	$953,584
Social gain	$657,661	$1,004,169	$1,181,431	$1,964,071
Gain over a high school dropout		$346,509	$523,771	$1,306,410

Notes: See Appendix Tables 1 and 2 for details of two methods used to calculate income differences.

Table 4

Federal and Connecticut State Tax Payments

Lifetime Present Value by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
Federal Tax:				
Model [a]	$93,826	$146,957	$195,541	$336,386
Model [b]	$81,778	$134,608	$183,458	$325,123
Model [c]	$38,032	$58,781	$74,040	$122,988
Average [a]-[c]	$71,212	$113,448	$151,013	$261,499
Gain over a high school dropout	-	$42,236	$79,801	$190,287
State Tax:				
Model [a]	$43,829	$66,336	$86,201	$137,892
Model [b]	$37,266	$58,955	$78,105	$127,356
Model [c]	$17,965	$26,946	$33,299	$51,497
Average [a]-[c]	$33,020	$50,745	$65,869	$105,582
Gain over a high school dropout		$17,725	$32,849	$72,561

Notes: See Appendix Tables 3, 4 and 5 for details of two methods used to calculate income differences.

Table 5

Federal and State Expenditures on Health Care

Lifetime Present Values by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
Federal expenditures	$66,874	$32,284	$19,360	$6,297
Difference over high school dropout	-	$(34,591)	$(47,515)	$(60,577)
State expenditures	$69,438	$33,015	$19,894	$6,197
Difference over high school dropout	-	$(36,423)	$(49,544)	$(63,241)

Notes: Present values with 3.5% discount rate. Estimates are the average of models derived from Sum et al. (2009b) and Muennig (2007).

Table 6

Federal and State Expenditures on Crime

Lifetime Present Values by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
Federal expenditures	$21,460	$13,928	$6,395	$2,534
Difference over high school dropout	-	$(7,532)	$(15,065)	$(18,926)
State expenditures	$42,920	$27,855	$12,791	$5,069
Difference over high school dropout	-	$(15,065)	$(30,130)	$(37,851)
Social cost of crime	$160,950	$104,457	$47,965	$19,008
Difference over high school dropout	-	$(56,493)	$(112,986)	$(141,943)

Sources: Figures adapted from Belfield and Levin (2008). Social costs from Miller (1996).

Table 7

Federal and State Expenditures on Welfare

Lifetime Present Values by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
Federal expenditures	$17,560	$6,287	$3,541	$723
Difference over high school dropout	-	$(11,273)	$(14,019)	$(16,838)
State expenditures	$5,853	$2,096	$1,180	$241
Difference over high school dropout	-	$(3,758)	$(4,673)	$(5,613)

Sources: DHHS (2004), Barrett and Poikolainen (2005), and CRS (2004) and Table 2.
Notes: Figures adjusted for Connecticut prices and state welfare rules.

Table 8

Federal and State Expenditures on Education Beyond High School

Lifetime Present Values by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
Federal expenditures	$(1,099)	$0	$1,609	$20,496
Difference over high school dropout		$1,099	$2,708	$21,595
State expenditures	$(9,983)	$0	$21,377	$45,620
Difference over high school dropout		$9,893	$31,270	$55,513

Sources: CEDAR database, *Digest of Educational Statistics* (2009); University of Connecticut budget.
Notes: Figures adjusted for Connecticut prices and state welfare rules. Adjustments for private college enrollment. Expenditures net of fees and other sources of revenue.

Table 9

Total Fiscal Expenditures

Lifetime Present Values by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
State/local government:				
Tax revenues	$33,020	$50,745	$65,869	$105,582
Health expenditures	$69,438	$33,015	$19,894	$6,197
Crime expenditures	$42,920	$27,855	$12,791	$5,069
Welfare expenditures	$5,853	$2,096	$1,180	$241
Education expenditures [a]	($9,983)	$0	$21,377	$45,620
Balance (T-H-C-W-E)	***($75,208)***	***($12,221)***	***$10,627***	***$48,455***
Federal government:				
Tax revenues	$71,212	$113,448	$151,013	$261,499
Health expenditures	$66,874	$32,284	$19,360	$6,297
Crime expenditures	$21,460	$13,928	$6,395	$2,534
Welfare expenditures	$17,560	$6,287	$3,541	$723
Education expenditures [a]	($1,099)	$0	$1,609	$20,496
Balance (T-H-C-W-E)	***($33,583)***	***$60,949***	***$120,108***	***$231,449***
Difference over high school dropout:				
State/local government	-	($62,987)	($85,835)	($123,663)
Federal government	-	($94,532)	($153,691)	($265,032)

Sources: Tables 3-8 above. *Notes:* 2011 dollars. Discount rate of 3.5%. [a] Expenditures beyond high school.

Table 10

Total Social Impacts

Lifetime Present Values by Education Level

	High school dropouts	High school graduate (incl. GED)	Associate degree or some college	BA degree or above
Productivity including economic spillovers [P]	$657,661	$1,004,169	$1,181,431	$1,964,071
Government expenditures on health, crime, welfare, and education [G]	$213,023	$115,465	$86,147	$87,177
Social costs of crime [V]	$160,950	$104,457	$47,965	$19,008
Net social resource effect [=P-G-V]	**$283,688**	**$784,247**	**$1,047,319**	**$1,857,886**
Difference over high school dropout	-	$500,559	$763,631	$1,574,198
Difference over high school dropout including value of better health	-	$650,559	$993,631	$1,804,198

Sources: Tables 3-8 above; value of better health from Schoeni et al. (2011). *Notes:* 2011 dollars. Discount rate of 3.5%.

Table 11

Cost Estimates for Education Reform

Present Values at Age 18

Reform	Cost per student	Anticipated number of new high school graduates per 100 students	Issues affecting return on investment
10% increase in teacher salaries (grades K-12)	$10,850	5	Benefits to all students, not just high school graduates
Expansion of Head Start	$13,750	4-12	Bulk of funding from federal government
First Things First	$7,250	16	Effectiveness depends on extent of targeting
Chicago Child-Parent Center Program	$9,120	11	Targeted to at-risk students
High Scope Perry Pre-School Program	$19,070	19	Targeted to at-risk students
Class size reduction (grades K-3)	$16,960	11	Depends on availability of teachers at current wages
ALAS	$3,800	5	Program designed for Latino students.
Twelve Together (grades 8-12)	$4,800	5	Peer support costs are not counted.
Career Academies	$4,350	11	Targeted to at-risk youth
Check & Connect	$6,080	17	Targeted to at-risk youth, graduation rate effects not statistically significant
I HAVE A DREAM (grades 6-12)	$22,360	10	Funding support from private agencies.
Talent Development High Schools (grades 9-12)	$1,850	1-2	District costs are unknown.
Talent Search	$1,140	9	Federally funded program; state/local contributions are unknown.
Success For All (grades K-3)	$19,910	11	Achievement gains only.
Summer school: 4 weeks (grades 9-10)	$4,120	n.a.	Achievement gains only across two summers.

Sources: Connecticut cost of education data (CEDAR). 2011 dollars to nearest $10. Discount rate of 3.5%. See Appendix for further information on these programs.

Appendix Tables

Appendix Table 1

Gross Earnings

Lifetime Present Values by Education Level

	High School Dropout	High School Graduate	Some College	BA or above
Gross earnings (includes employer contributions):				
Model [a]	$499,078	$918,600	$1,051,159	$2,004,792
Model [b]	$566,597	$1,049,656	$1,213,236	$2,319,450
Model [c]	$217,212	$367,203	$379,471	$697,071

Source: Current Population Survey, March Supplements 2006-2010 combined. Connecticut resident subsample only. Includes all persons, employed or not.
Notes: No adjustments are made for labor market participation, GED receipt, or incarceration rates. Labor market activity begins at age 18 (conditional on not being in college) and lasts until age 65. Model [a]: health and pension benefits incidence as per Connecticut subsample of CPS (see Table above); discount rate 3.5%; productivity growth 1.5%. Model [b]: health and pension benefits incidence/valuation as per model [a]; discount rate 5%; productivity growth 2%. Model [c]: no adjustment for health and pension benefits incidence and valuation; discount rate 7.5%; productivity growth 1%.

Appendix Table 2

Incomes by Race and Gender

Lifetime Present Values by Education Level

	High School Dropout	High School Graduate	Some College	BA or above
Hispanic female:				
Model [a]	$516,919	$743,073	$903,956	$1,227,145
Model [b]	$392,223	$571,281	$695,162	$941,204
Model [c]	$388,519	$558,956	$676,889	$909,328
Hispanic male:				
Model [a]	$850,802	$1,035,640	$1,216,197	$1,889,201
Model [b]	$654,983	$795,200	$932,505	$1,416,611
Model [c]	$643,551	$778,692	$909,666	$1,386,593
White female:				
Model [a]	$481,284	$783,343	$949,319	$1,339,257
Model [b]	$365,784	$601,907	$727,724	$1,024,103
Model [c]	$166,766	$284,953	$338,942	$462,889
White male:				
Model [a]	$895,568	$1,207,264	$1,466,131	$2,220,164
Model [b]	$682,923	$924,481	$1,121,830	$1,674,849
Model [c]	$314,523	$429,972	$515,204	$721,600
Black female:				
Model [a]	$471,676	$755,673	$922,793	$1,344,483
Model [b]	$361,810	$583,470	$707,609	$1,022,972
Model [c]	$171,502	$281,013	$330,030	$457,604
Black male:				
Model [a]	$660,498	$1,049,406	$1,205,246	$1,549,242
Model [b]	$504,526	$798,703	$910,015	$1,181,156
Model [c]	$237,427	$367,308	$402,724	$530,707

Source: Current Population Survey, March Supplements 2006-2010 combined. Includes all persons, employed or not.
Notes: No adjustments are made for labor market participation, GED receipt, or incarceration rates. Labor market activity begins at age 18 (conditional on not being in college) and follows Skoog and Ciecka (2010) lifetables. Model [a]: health and pension benefits incidence as per Connecticut subsample of CPS (see Table above); discount rate 3.5%; productivity growth 1.5%. Model [b]: health and pension benefits incidence/valuation as per model [a]; discount rate 5%; productivity growth 2%. Model [c]: no adjustment for health and pension benefits incidence and valuation; discount rate 7.5%; productivity growth 1%. Estimates adjusted for race and sex composition of current cohorts of students in Connecticut (see Table 1).

Appendix Table 3

Federal and State Tax Payments After Credits

Lifetime Present Values by Education Level

	High School Dropout	High School Graduate	Some College	BA or above
Federal Tax Payments:				
Model [a]	$32,824	$86,882	$137,491	$305,726
Model [b]	$38,229	$100,989	$161,352	$355,176
Model [c]	$11,896	$30,741	$43,874	$103,096
State Tax Payments:				
Model [a]	$10,245	$29,156	$45,607	$92,261
Model [b]	$11,868	$33,796	$53,429	$107,176
Model [c]	$3,847	$10,481	$14,496	$31,554

Source: Current Population Survey, March Supplements 2006-2010 combined. Connecticut resident subsample only. Includes all persons, employed or not.
Notes: Models as per those in Appendix Table 1.

Appendix Table 4

Federal Tax Payments by Race and Gender

Lifetime Present Values by Education Level

	High School Dropout	High School Graduate	Some College	BA or above
Hispanic female:				
Model [a]	$112,704	$162,012	$197,089	$267,554
Model [b]	$90,583	$131,935	$160,545	$217,368
Model [c]	$45,718	$69,064	$83,205	$109,653
Hispanic male:				
Model [a]	$185,500	$225,800	$265,167	$411,901
Model [b]	$151,266	$183,648	$215,359	$327,161
Model [c]	$79,188	$95,172	$109,625	$152,759
White female:				
Model [a]	$104,934	$170,792	$206,979	$291,997
Model [b]	$84,476	$139,008	$168,065	$236,513
Model [c]	$42,315	$72,304	$86,003	$117,453
White male:				
Model [a]	$195,260	$263,219	$319,660	$484,061
Model [b]	$157,718	$213,505	$259,082	$386,800
Model [c]	$79,807	$109,101	$130,727	$183,098
Black female:				
Model [a]	$102,839	$164,759	$201,196	$293,137
Model [b]	$83,559	$134,750	$163,420	$236,251
Model [c]	$43,517	$71,304	$83,742	$116,112
Black male:				
Model [a]	$144,008	$228,801	$262,779	$337,780
Model [b]	$116,518	$184,457	$210,165	$272,784
Model [c]	$60,244	$93,200	$102,187	$134,661

Source: Current Population Survey, March Supplements 2006-2010 combined.
Notes: Tax payments calculated using TAXSIM9, based on incomes given in Appendix Table 2 above.

Appendix Table 5

State Tax Payments by Race and Gender

Lifetime Present Values by Education Level

	High School Dropout	High School Graduate	Some College	BA or above
Hispanic female:				
Model [a]	$56,352	$81,006	$98,544	$133,777
Model [b]	$45,291	$65,968	$80,273	$108,684
Model [c]	$22,859	$34,532	$41,602	$54,826
Hispanic male:				
Model [a]	$92,750	$112,900	$132,583	$205,951
Model [b]	$75,633	$91,824	$107,679	$163,580
Model [c]	$39,594	$47,586	$54,813	$76,379
White female:				
Model [a]	$52,467	$85,396	$103,490	$145,999
Model [b]	$42,238	$69,504	$84,033	$118,256
Model [c]	$21,158	$36,152	$43,001	$58,727
White male:				
Model [a]	$97,630	$131,609	$159,830	$242,030
Model [b]	$78,859	$106,753	$129,541	$193,400
Model [c]	$39,903	$54,550	$65,364	$91,549
Black female:				
Model [a]	$51,420	$82,379	$100,598	$146,568
Model [b]	$41,779	$67,375	$81,710	$118,126
Model [c]	$21,758	$35,652	$41,871	$58,056
Black male:				
Model [a]	$72,004	$114,401	$131,390	$168,890
Model [b]	$58,259	$92,229	$105,082	$136,392
Model [c]	$30,122	$46,600	$51,093	$67,331

Source: Current Population Survey, March Supplements 2006-2010 combined.
Notes: Tax payments calculated using TAXSIM9, based on incomes given in Appendix Table 2 above.

Appendix Table 6

Relationship between Health and Education in Connecticut

	High School Dropout	High School Graduate	At Least Some College
Pap tests - Ever received (Aged 18+)	92	97	97
Colorectal cancer screening in last 2 years (Aged 50+)	24	27	32
Mammograms - Women receiving within past 2 years (Aged 40+)	73	78	85
Prevalence of diabetes (per 1,000 standard population)	120	61	56
Influenza/pneumococcal vaccine of high-risk non-institutionalized adults in past year (Aged 65+)	56	69	74
Prenatal care - Beginning in first trimester	69	82	92
Low birth weight infants (less than 2,500 grams)	10.2	9.2	7.2
Healthy weight in adults (Aged 20+)	24	34	43
Obesity in adults (Aged 20+)	36	22	15
No leisure-time physical activity (Aged 18+)	45	30	14
Regular physical activity- Vigorous (Aged 18+)	17	24	31
Cigarette smoking - Adults (Aged 18+)	35	26	8

Sources: Data retrieved from DATA2010, the Healthy People 2010 Database - January, 2010 Edition - 01/23/11 - 2:50:13PM. Data from National Vital Statistics System - Mortality, CDC, NCHS; Behavioral Risk Factor Surveillance System, CDC, NCCDPHP; National Vital Statistics System Mortality and Natality, CDC, NCHS.
Notes: Connecticut data only. Figures for most recent year (2006-2008), age-adjusted.

Appendix Table 7

Relationship between Health Status, Productivity and Education

	High School Dropout	High School Graduate	Some College	BA or above
Self-reported health status (%):				
Excellent or very good	36	51	60	76
Good	34	32	27	19
Fair or poor	30	18	13	5
Work days lost per employed person	5.6	5.6	5.4	3.2
Bed days lost per person	8.2	6.1	4.9	2.5

Source: Pleis et al. (2009), Tables 20 and 17.

Appendix Table 8

Relationship between Medicaid/Medicare and Education in Connecticut

	High School Dropout	High School Graduate	Some College	BA degree or above
Medicaid or Medicare enrollment for Health Insurance Coverage (ages 18-64)	28.2	14.9	8.7	3.5

Source: Sum et al. (2009b, Table 13) from the American Community Survey.

Appendix Table 9

Relationship between Incarceration and Education in Connecticut

	High School Dropout	High School Graduate	Some College	BA degree or above
Incarceration rate among 18-34 year olds:				
Male	11.1	3.7	1.1	0.1
Female	1.9	0.5	0.2	0.1

Source: Sum et al. (2009b) from the American Community Survey.

Appendix Table 10

State Expenditures in Connecticut Affected by Education Levels

Government Department	Expenditure (2009)
Department of Social Services	$5,041,515,367
Department of Education	$2,671,599,590
Department of Children and Families	$852,472,129
Department of Correction	$710,139,836
Department of Mental Health and Addiction Services	$582,994,915
Teachers Retirement Board	$564,062,345
Judicial Department	$482,961,251
University of Connecticut	$234,057,728
Department of Public Safety	$175,301,874
Regional Community-Technical Colleges	$158,737,423
University of Connecticut Health Center	$128,212,205
Connecticut State University	$126,935,234
Department of Public Health	$101,058,572
Department of Higher Education	$70,426,112
Department of Labor	$69,989,319
Division of Criminal Justice	$52,383,042
Public Defender Services Commission	$48,239,784
Attorney General	$30,870,400
Council to Administer the Children's Trust Fund	$14,554,786
Child Protection Commission	$11,876,797
Office of Workforce Competitiveness	$7,744,168
Police Officer Standards and Training Council	$2,830,550
Charter Oak State College	$2,712,793
Office of Health Care Access	$2,154,414
State Marshal Commission	$405,871
Office of the Victim Advocate	$363,283
Psychiatric Security Review Board	$344,474
Total	**$12,144,944,262**

Source: Connecticut Budget Statement, Schedule B-3, pages 19-31.

Appendix Table 11

Annual Arrests in Connecticut by Crime Type and Age

	Adult Arrests	Juvenile Arrests	Juvenile arrests as proportion of all arrests
Violent crime	**6,861**	**1,170**	0.15
Murder and non-negligent manslaughter	118	7	0.06
Forcible rape	247	29	0.11
Robbery	1,473	327	0.18
Aggravated assault	5,023	807	0.14
Property crime	**19,042**	**4,087**	0.18
Burglary	2,938	576	0.16
Larceny-theft	15,351	3,255	0.17
Motor vehicle theft	654	214	0.25
Arson	99	42	0.30
Other assaults	23,501	4,009	0.15

Source: FBI Uniform Crime Report, 2009 data. Retrieved January 22, 2011 from www2.fbi.gov/ucr/cius2009/data/table_69.html

Appendix Table 12

Relationship between Food Stamps and Education in Connecticut

	High School Dropout	High School Graduate	Some College	BA degree or above
Food stamp usage (%) (ages 18-64)	24.3	8.9	4.7	0.9

Source: Sum et al. (2009b) from the American Community Survey.

Appendix: Programs with Evidence and Promise for Raising Attainment

This appendix provides more information on reforms that might increase the high school graduation rate. See Table 11 for details of cost estimates.

Raising Teacher Quality

A credible estimate of how an increase in wages for teachers would raise graduation rates is from Loeb and Page (2000). Using state-level panel data, Loeb and Page (2000) estimate the association between higher teacher salaries and high school graduation rates ten years later. Their analysis improves on prior work by including controls for the *opportunity cost* (relative wages in other jobs) of teaching. Loeb and Page (2000, 406) also find that a ten percent increase in teacher salaries across the K-12 years would increase the number of high school graduates by 5 percentage points.

Reducing Class Size

One popular policy for improving educational outcomes is to reduce class sizes. Evidence from Tennessee's Student Teacher Achievement Ratio (STAR) Project shows strong advantages from being in smaller classes: students randomly assigned to smaller classes were more likely to graduate from high school than students assigned to larger classes (Finn et al., 2005). Students in smaller classes in elementary school reported graduation rates that were 11 percentage points higher than students assigned to regular classes. The impacts were even greater – at 18 percentage points – for minority and low-income children.

Publicly-funded Pre-School

Expanding pre-school provision is possibly the most compelling investment on economic grounds. The evidence is based on high-quality research methods with full cost–benefit analyses from both the private and public perspective; and it is almost completely consistent in identifying impacts. The three most frequently cited programs are the High Scope/Perry Pre-School program, the Chicago Child–Parent Centers, and the Abecedarian program (see the review by Barnett and Belfield, 2007). Separate evaluations have found that each intervention will yield significant economic returns over the lifetimes of participants, and that these easily exceed the costs.

On the Chicago Child–Parent Centers, see http://www.waisman.wisc.edu/cls/Program.htm.

On the Abecedarian program, see http://www.fpg.unc.edu/~abc/.

On the High Scope/Perry Pre-School program, see http://www.highscope.org/content.asp?contentid=219.

Head Start

Recent evidence has found academic gains from Head Start, of the order of 0.10 to 0.24 standard deviations for language and cognitive abilities (see Barnett and Belfield, 2007). In their cost–benefit analysis, Ludwig and Phillips (2007) calculate that the program pays for itself, even if the academic benefits are only 0.05 standard deviations. Over the long term, Garces et al. (2002) found increased rates of high school graduation and college attendance by 20 percentage points for White children, but not at all for African American children. Finally, Ludwig and Miller (2006) estimate that doubling the amount of resources for Head Start would raise attainment by one year of education.

Secondary School Interventions: First Things First

The strongest example of a successful reform at the high school level is the Institute for Research and Reform in Education's **First Things First** (FTF). This program emphasizes small learning communities (less than 350 students), long-term teacher student relationships, mentoring, and teacher advocacy for each student with a rigorous curriculum (Quint et al., 2005). In a research study using interrupted time–series data, FTF generated higher graduation rates by 16 percentage points as a result of the intervention.

See http://ies.ed.gov/ncee/wwc/reports/dropout/ftf/references.asp.

Secondary School Interventions: Possible Alternatives

A recent review by the 'What Works Clearinghouse' (WWC) identified a number of secondary school programs intended to reduce the dropout rate.

For full information, see http://ies.ed.gov/ncee/wwc/reports/Topicarea.aspx?tid=06

- **Achievement for Latinos through Academic Success** (ALAS) is a program that assigns counselors to monitor attendance, behavior, and achievement. The counselors work with the children and their parents to ameliorate problems, offer remediation, and provide feedback on school progress. An evaluation (of this program) using an experimental research design was performed by Gandara et al. (1998). For a sample of 81 students in California, ALAS did reduce the probability of dropping out in 10th grade: whereas 86% of the ALAS participants were still enrolled, only 69% of the control group were. By 12th grade, the respective graduation rates were 32% and 27%.
- **Career Academies** are school-within-school programs intended to promote employment readiness. Students are instructed with career-related materials and supported to gain work experience at local employers, with academies operating across the U.S. One randomized trial evaluation for 1,764 students was conducted by Kemple and Snipes (2000). It found significant reductions in dropout rates for the sub-sample of at-risk students over the control group (21% and 32%), but no impact on those students who were low or moderate risk.
- **Check & Connect** is a program to (a) monitor and assess student performance and (b) mentor students to improve behaviors and academic outcomes. It is implemented in school districts in Minnesota and targeted to at-risk students. An experimental evaluation was performed for 94 high school students in Minneapolis (Sinclair et al., 2005). Again, the evidence is mixed: there is no clear evidence that the program raises the graduation rate, but at least by 12th grade the dropout rate of program participants was considerably below that of the control group, at 39% compared to 58%.
- **Talent Search** is a program of academic support intended to raise the graduation rate and motivate low-income students to attend college. It serves about 380,000 students across over 400 sites. Evaluations by Constantine et al. (2006) found that high school completion rates were 9 percentage points higher for those who had participated in Talent Search.
- **Twelve Together** is a program offering peer support and mentoring in middle school and high school. Students participate in weekly after-school discussion groups. A randomized controlled trial of 219 8th graders in California found that the dropout rate for participants was five percentage points lower than the control group (Dynarski et al., 1998).
- **I Have a Dream** is a program for inner-city low-income children from 6th to 12th grade. The program offers a mentor and facilitator for a selected class of 6th graders and the funding sponsors who are actively engaged with the students and the school and provide financial support for students who enroll in college. An evaluation by Kahne and Bailey (1999) reported graduation rates 34 percentage points higher for those in the program.
- **Talent Development** is a high school program similar to FTF. It includes: small learning communities, accelerated curricula; supplemental tutoring; professional development; and parental involvement strategies. For an evaluation, see http://www.mdrc.org/project_29_17.html.

Other Reforms:

Success for All includes materials, training, and professional development to implement a school-wide program for grades K-5 to ensure every child will reach third grade on time. It serves approximately 1 million children in 2,000 schools. The evaluation by Borman and Hewes (2002) shows Success for All may be a good investment because it shows higher test scores at 8th grade, reduces special education placement, and reduces rates of grade retention. Specifically, the effect size gains in reading and math were 0.3 and 0.1 respectively. These gains are about equivalent to the gains from Project STAR to reduce class size.
See http://www.successforall.net.

After School Programs

A potentially promising policy is to offer more after school programs or summer school. Lauer et al. (2003) review the positive impacts of out-of-school educational strategies across the U.S., but only academic test score outcomes

are considered. However, a recent high-quality evaluation of the 21st Century Community Learning Centers, a $1 billion federal program, found no effects on academic achievement or homework (James-Burdumy et al., 2004).

Summer School

Based on an experimental field trial in Baltimore, Borman and Dowling (2006) show that summer school is effective: after two successive summer schools, the treatment group is approximately 0.5 standard deviations ahead of the control group in test scores. A meta-analysis by Cooper et al. (2000) gives an effect size gain of approximately 0.2 across the U.S.