The Economic Gains to Colorado of Amendment 66

Jack Strauss

September 2013

Colorado is considering raising personal income taxes to fund a \$950 million initiative. Are the increased benefits from educational attainment worth the revenue costs? This study surveys indepth the economic literature on the impact of increased educational expenditure on future income, entrepreneurship, health care, housing, crime and business location. It discusses the economic links between educational spending and educational outcomes, and estimates the pecuniary and non-pecuniary impact of the initiative on the state.

JEL: H52, 120

Jack Strauss is the Miller Chair of Applied Economics at the Reiman School of Finance, University of Denver; Jack.Strauss@DU.edu

Executive Summary: The Economic Gains to Colorado of Amendment 66

Most studies that evaluate the impact of taxes on the economy are limited to analyzing the drag of the tax compared to the benefits of increased government expenditures. In the case of education taxes, this type analysis fails to incorporate the full picture of the economic gains of a quality education system such as the one Amendment 66 would help to produce. This study is thus meant to supplement the more limited economic studies by calculating the economic gains, both monetary and nonmonetary, of Amendment 66. To do this, this study measures the impacts that Amendment 66 will have on crime, healthcare, unemployment and welfare, future earnings and tax payments, property value, student achievement, dropout rates, business relocation, and entrepreneurship.

As reviewed in this study, there is extensive literature on the economics of education that documents the tremendous gains to a state economy as a result of targeted education investments such as those provided by Amendment 66¹. The report that follows this summary carefully reviews the literature and impacts of \$950 Million infusion of revenues into our schools as directed by SB 213. The report concludes that, if passed, Amendment 66 will result in as many as 11,850 more high school graduates than the current system, and will generate the following economic gains to the state:

- Reduction in crime. Over 300 fewer victims of violent crime. A decline of almost 3,000 incidents of property crime. Over 6,000 fewer drug related offenses. Amendment 66 has the potential to reduce criminal justice expenditures by \$329 million.
- Healthcare savings. Education results in less smoking, drinking, and obesity, as well as improved lifestyle choices. Amendment 66 has the potential to result in a \$500 million savings in healthcare costs.

¹ Amendment 66 includes \$366 million for a Teacher and Leadership fund, \$317 million focused on at-risk children, \$102 million for expanding full-day kindergarten, \$80 million for special education, \$40 million for bolstering preschool programs, and other important programs. Colorado has an overall graduation rate of 74%, but graduation rates are only 53% for children with limited English and 62% for economically disadvantaged children. Amendment 66 targets programs that improve educational attainment and lower Colorado's high school dropout rates through focused spending on high-risk children. Amendment 66 further funds programs to increase teacher effectiveness, including programs for the monitoring and possible dismissal of ineffective teachers. Rewarding good teachers and dismissing poor teachers is critical for improving class performance.

- Lower unemployment and welfare costs. Amendment 66 has the potential to result in a 4% increase in graduation rates with a resulting savings of \$37 million in welfare payments by the state.
- Increased property values. The report estimates that Amendment 66 will lead to an average housing price increase of \$7,280, which could contribute an additional \$675 million in spending on Colorado's goods and services. The housing price increase could further lead to \$86.8 million in additional property tax revenue for the state.
- Higher quality teachers and higher educational attainment. Funding the implementation of teaching monitoring and the dismissal of 1.5% of poor teachers has the potential to cause gains of \$180 million due to increases in educational attainment. Removing poor teachers and replacing them with better and/or average teachers leads to substantial gains in student performance, particularly in science and math.
- Reduced dropout rate. Educational gains from reducing the number of high school dropouts has the potential to increase Colorado's GDP by \$2770 million, which in turn generates \$184 million and \$102 million in additional income and sales tax revenues.²
- Increased entrepreneurship. Amendment 66 will lead to a significant increase in entrepreneurship due to funding of teacher effectiveness programs, charter schools and gifted and talented programs (particularly in Science Technology Engineering and Math (STEM) fields).
- Increased business retention and attraction. This paper presents strong evidence that higher student achievement affects business decisions more than taxes, as firms primarily compete on the quality of their ideas (which is directly related to their human capital).

The total economic benefits should Amendment 66 pass will be over \$3.3 billion. As stated above, this is achieved through increased production, a savings of \$866 million from lower health care, crime and welfare expenditures, and an increase in sales, income and property revenue of \$373 million. In total, the benefits are expected to exceed the \$950 million cost by \$3624 million, and imply a benefit/cost ratio equal to 4.8.

²These estimates of education investment are consistent with Psacharopoulos and Patrinos, (2004) who estimate that \$950 million education spending will yield \$3919 million in higher income to the state; Federal Reserve Economist Rolnick and Grunewald (2003, 2010) show a return exceeding \$45 24 million. Bretton (2013) and Kruger (2003) estimate that a \$950 million in educational investment in Colorado leads respectively to \$4500 billion and \$3200-\$4100 million rise in Colorado's GDP. These works summarized in our report further indicate the educational benefits of Amendment 66 outweigh the costs by a factor of 4-5 times.

Using the alternative economic analysis methodology of Belfield, Levin, and Rosen (2012), with the revisions of Amendment 66, Colorado's income gains from increased educational attainment (as well as benefits from increased tax revenues and reductions in public costs such as crime, public health and welfare costs), are \$258,240 per youth (lifetime in present value), while the cost to Colorado is \$56,925 per student. This implies that under this model the total benefit to Colorado of passing Amendment 66 is \$6718 million, which exceeds our estimate of \$4578 million. Using the approach advocated by Barnet and Masse (2007), we estimate a \$950 million education investment yields income gains to Colorado over \$5 billion, relatively close to our \$4.5 billion estimate. These alternative estimates suggest that our methodology as set forth above is conservative, and that Amendment 66 will yield at least \$4 billion in economic gains to the state.

The Economic Gains to Colorado of Amendment 66

Since 2000, Colorado's employment growth has increased nearly three times faster than the national average, and since 2010, job creation in Colorado has recovered 30% more rapidly than the average state. Colorado's population is growing: the state has added 17% population during the period of 2000-2010, while the U.S. population grew less than 10%. At the same time, spending on schools has not kept up with the skyrocketing enrollment; education spending in Colorado has lagged the national average more than 30%, and over the past decade, Colorado's teacher salaries (adjusted for inflation) have declined 5.5%, nearly twice the U.S. average. Since the recession's end, salary increases in Colorado's teachers have been half that of most states. Consequently, the NEA (2012) reports that Colorado teachers are paid \$6,000 less than the U.S. average, and staff pay is 10% less than other states. The Wall Street Journal (Sauter, 2013) finds Colorado's teachers and staff pay benefits rank third from the bottom of all states.

As we assess the value of increased funding on the public education system in Colorado, it is important to point out that education has complex pecuniary and nonpecuniary returns in the community that are difficult to capture using standard economic modeling or economic impact studies, for a variety of reasons. For example, economic models are designed to simplify reality and focus on the importance of only a few factors, and impact studies are designed to weigh the benefits of government spending compared to the costs of increased taxes to pay for these expenditures. Neither approach directly accounts for the fact that "schooling generates many experiences and affects multiple dimensions of skill that in turn affect central aspects of individuals lives in and outside the labor market" (Card, 1999). Moreover, in a comprehensive work, Lochner (2011) reports that "a growing body of work suggests that education offers a wide-range of benefits that extend beyond increases in labor market productivity. Improvements in education can lower crime, improve health, and increase voting and democratic participation."³ Hence, by their nature, the positive externalities of education will be difficult to capture in standard economic modeling and

³ Recent work by Oreopoulos and Salvenes (2011) entitled "Priceless: The Nonpecuniary Benefits of Schooling" also detail the relevance of education in improving the lives of its citizens including increased job satisfaction, improved health, parenting (Kalil, Ryan and Corey, 2010) and better marriage prospects (see also Becker, 1973; LaFortune 2013; Chiappori, Iyigun and Weiss, 2009).

impact studies; therefore, most models and studies will substantially underestimate the importance of education on Colorado's economy.

This report details six advantages of Amendment 66 that demonstrate the economic rationality of the personal income tax increase, looking at both monetary and nonmonetary benefits. The economic benefits of Amendment 66 include: increased productivity and pay, improved prospects for business relocation, augmented entrepreneurship, higher property values, lower crime, and increased health, and reduced poverty and inequality. This report additionally documents the impact of educational investment in early childhood education and the advantages of smaller class size. Overall, this report demonstrates that Amendment 66 will generate significant economic activity in Colorado.

In recent decades, a plethora of papers have emerged that demonstrate that education is key to economic growth, and that a well-educated labor force is key to a state's success (Berger and Fisher 2013). States, including Colorado, that fail to invest in their children's future will generate fewer jobs, will experience higher unemployment, and will have slower wage increases. According to Card, "hundreds of studies in many different countries and time periods have confirmed that better-educated individuals earn higher wages, experience less unemployment, and work in more prestigious occupations than their less-educated counterparts" (1999). A focus on luring employers from other states with lower taxes will not make the workforce more productive. Even worse, Berger and Fisher (2013) show that a short term focus on limiting taxes "drains resources from the most important, proven, path to increasing productivity: investments in education."

Education leads to higher pay and productivity

Federal Reserve economists Bauer, Schweitzer and Shane (2006) demonstrate that the overwhelming determinant of a state's long-run economic growth is an increase in education funding, and conclude that "knowledge variables play the main role in accounting for relative levels of per capita income across states." The impact of education in terms of magnitude and statistical significance dominate other explanatory variables... personal incomes across states tax rate is insignificant." High educational spending (MA, CT, NJ), not low taxes, contribute to a state's high productivity and wages (see Figures VI). These states also have education spending above the national average.

Michael Porter and Jan Rivlin (2012) show that America's competitiveness depends on its productivity, which in turn depends on its system of education. Additional work by Glaeser and Saiz (2004) confirms that educated cities have grown more quickly than comparable cities with less human capital over the past century, and are better able to handle adverse business cycle shocks; human capital predicts city growth because education enables people to adapt well to change (as in Shultz, 1964; Welch, 1970; Glaeser and Saiz (2004), Rangazas (2005), Benhabib and Speigel (1994). Further scholarly work by Barro (1997) emphasizes the central value of education in influencing technology innovation and adoption, and further shows that education is an increasingly important ingredient in agglomeration economies and makes making cities grow economically. Jacobs (1968) and Glaeser and Saiz (2004) present evidence that education leads to increased information flow, specialization, and comparative advantage in particular skills or ideas such as technology hubs. These authors highlight that technology and education are complementary, and that increases in education spending boosts technical progress. Overall, these works demonstrate that businesses succeed or perish due to their ideas; intrinsic to idea creation is a strong education background.

Figure I shows that the average college graduate earns twice as much as a high school graduate over his or her lifetime (White House, 2010; Wobbekind, 2009). Figure II illustrates that lack of schooling is strongly related to unemployment, and Wobbekind (2009) posits that in a globally competitive world that is rapidly changing, education is more critical than ever, and concludes that we should be doing whatever we can to improve the quality and quantity of education. Figure III highlights that the U.S. leadership in education has declined, and that the increase in remedial courses is also a strong warning sign that high schools are not preparing students adequately for the challenges ahead (Wobbekind, 2009). Figure I: More Education leads to Higher Worker Pay



Figure II: More Education Leads to Lower Unemployment





Figure III: US Education Falling Behind

Berger and Fisher (2013) show the following:

- Overwhelmingly, high-wage states are states with a well-educated workforce. There is a clear and strong correlation between the educational attainment of a state's workforce and median wages in the state.
- States can build a strong foundation for economic success and shared prosperity by
 investing in education. Providing expanded access to high quality education will not only
 expand economic opportunity for residents, but also likely do more to strengthen the
 overall state economy than anything else a state government can do.
- States can increase the strength of their economies and their ability to grow and attract high-wage employers by investing in education and increasing the number of well-educated workers.
- Investing in education is also good for state budgets in the long run, since workers with higher incomes contribute more through taxes over the course of their lifetimes."

Berger and Fisher illustrate that increasing education increases productivity, which in turn raises wages; further, wages are higher in well-educated states. Hence, there is a strong statistical relationship between education, productivity and wages; e.g., low education states such as Oklahoma and Louisiana have low wages and productivity. If Colorado wishes to maintain its income and wage advantage over most states, it must invest in education to boost productivity and wages. Maintaining low taxes will lead only to mediocre educational performance and poor future student attainment (Berger and Fisher, 2013). Figure IV: Relationship between state productivity growth and increase in college attainment from 1979-2012

Productivity has grown faster in states with greater growth in education.



Figure V: Relationship between change in state median worker compensation and productivity from 1979 to 2012



Worker compensation has increased more in states with greater increases in productivity

Figure VI: Relationship between state median hourly wage and share of state's workforce with a bachelor's degree or more education, 2012



Median wages are substantially higher in states with better-educated workers

Figures IV-VI illustrate that education increases productivity, which in turn raises wages. Further, Sockice (1993) as well as Green and Ridell (2003) determine that education is strongly and positively related to critical thinking and social skills. Recent work by Bretton (2013) "shows education has positive direct and indirect effects of national output. Educated workers raise national income directly because schooling raises their marginal productivity." Investment in schooling has a considerable positive return of 8-10%, and greatly exceeds the both the standard discount rate of 2-3% and therefore the cost of a tax increase. Glaeser, La Porta, Lopes-de-Silanes and Shleifer (2004) present overwhelming statistics demonstrating that education is the fundamental cause of higher income. Additionally, Bretton (2013) confirms that education has large external effects on national income. Substantive work using twins data by Ashenfelter and Krueger (1994), Miller et al. (1995), Ashenfelter and Rouse (1998), Rouse (1999) and Berhrman and Rosenzweig, (1999) further examines the nature versus nuture debate and show that twins in better schools achieve higher test scores and later more employment success.

Bretton comments that in the aftermath of the financial crisis of 2008, governments are legitimately asking whether they can afford public investment in schooling. Empirical

evidence is clear. Investment in education, or human capital, is an important element in the economic growth process, and educated workers are more productive and earn higher salaries. Psacharopoulos and Patrinos, (2004), for instance, show that the return on education is 8%; this implies that \$950 million expenditure will yield a benefit of 8 times this amount after 30 years. If one assumes a discount rate of 2.5%, this implies a yield of \$5225 million in income. Assuming that 75% of the students stay in Colorado, the benefit to of higher salaries is \$3919 million. Overall, Card (1999) posits "Hundreds of studies in many different countries and time periods have confirmed that better-educated individuals earn higher wages, experience less unemployment, and work in more prestigious occupations than their less-educated counterparts."

Investments in education encourage businesses to locate in high skilled areas

Economists have investigated factors that influence organizational and individual decisions to (re)locate ever since the seminal work of Alfred Marshall (1890). Business location theory posits that a number of factors influence the decision of a business to locate in a particular region, state or locality. Berger and Fisher (2013) find that "While cutting costs to business has become the principal focus of economic development policy in many states, more and more states are cutting programs across the spectrum to lower state taxes. In many cases these ideas are promoted as a way to attract employers from other states—to steal jobs by offering incentives to business leaders. But the preponderance of evidence has shown that in the long run these strategies are inefficient and ineffective (see also, Fisher, 2013; Mazerov, 2013; Lynch 2004)." They show that "low taxes to capture private investment from other states is a race-to-the-bottom state economic development strategy that undermines the ability to invest in education."

Fox and Murray (1990) reveal that the positive effects of increased expenditure on schooling outweigh the negative effects of taxes on firms and businesses. Plaut and Pluta (1983) present evidence that "previous studies have consistently found that state and local taxation is not a significant variable in industry location." These works include Advisory Commission on Intergovernmental Relations (1967,1981), Dean and Carroll (1977) and Williams (1967). Further, and Plaut and Pluta (1983). These studies find that businesses consistently rank educational expenditures as a desirable governmental expenditure, and that while taxes are a component affecting firm location, they are not first, second or third on the list, and that low tax burdens typically imply low levels of public services. The preponderance of evidence has shown that in the long run, low tax strategies are inefficient and ineffective (Fisher 2013; Mazerov 2013; and Lynch 2004).

More recent work in other countries by Araurzo and Viladecans (2009), Alanon et al. (2007), Autant-Bernard (2006), Cieslik (2005) and Holl (2004) all stress the benefits of education, including knowledge spillovers and skilled workforce as a critical factor in influencing a firm's decision to locate. In a comprehensive review of more than 4 dozen studies, Arauzo-Carod, Liviano-Solis, and Manjon-Antolin (2010) posit "most studies tend to conclude that geographical areas that have a higher-mean level of education in the working population are more attractive;" see also Couglin et al. (1991); Woodward, (1992), Simth and Florida (1994); and Coughlin and Segev (2000) for the critical importance of education as a significant factor in firm's location decision. Arauzo-Carod, Liviano-Solis, and Manjon-Antolin (2010) confirm that "according to earlier studies on industrial location, the effect of taxation is ambiguous see e.g., Lugar and Shetty (1985) and Buss (2001) for an overview."

Gabe and Bell (2004) present evidence that "there is a trade-off between taxes and the provision of public goods and services in that high-tax location remain attractive as long as they spend large sums of money on the provision of public goods and services." They show that low tax locations are not attractive to firms, due to the poor provision of public goods and services. Gebremariam, Gebremedhin and Shaeffer (2011) estimate the positive spillovers of public spending and their work reveals the positive effects of education on business location. Kampelmann and Rycx (2012) highlight the relevance of higher education's relationship to firm business productivity, and document that under- education (dropouts) is detrimental to firms. Chi (2008), Liu (2007) and Lopez-Bazo and Moreno (2008) all establish that increases in educational attainment lead to higher productivity, which is critical to a firm's success. Psacharopoulos and Patrinos (2004) estimate that education attainment increases have an average rate of return of 10%, far higher than the real return of capital of 2-3%.

In a large study of Colorado businesses that had relocated, expanded or newly launched, Love and Crompton (1999) show that quality of life factors in Colorado are statistically relevant for firms choosing to locate in the region. Further, the quality of primary/secondary education ranked higher (in terms of important or very important) than personal income taxes.

The fact that increased spending on education per student has positive effects on the local or state economy in terms of jobs and/or income has also been established by Tannenwald and Kendrick (1995), Dalenberg and Partridge (1995), Garcia-Mila and McGuire (1992), Testa (1989), Helms (1985) and Waslenko and McGuire (1985). Krueger and Ludwig (2013) present evidence that economic growth would be higher if taxes are raised to pay for education, as the investment in education has not reached diminishing returns in the U.S.; thus, increases in Colorado's taxes to support education will benefit the state overall, and the reforms provided in Colorado's education bill funded by Amendment 66 will lead to more businesses moving to Colorado.

Why Education Spending Helps – The Importance of Preschool

How can we improve education quality? The academic literature below shows a clear link between increased spending on early education including pre-school, all day kindergarten programs, and more attention paid to children in early grades. Diefendorf and Goode (2005) find that an extensive body of research indicates that high quality early intervention for at-risk infants, toddlers and young children and their families is a sound economic investment: "Studies have found a number of long-term cost savings in terms of decreased grade repetition, reduced special education spending, enhanced productivity, lower welfare costs, increased tax revenues, and lower juvenile justice costs". Additionally, Barnett (2011) finds that a broad range of early educational interventions are found to produce meaningful, lasting effects on cognitive, social, and schooling outcomes. Federal Reserve economists Rolnick and Grunewald (2003, 2010) mention that early childhood programs should be at the top of state and local government's agendas due to very high public returns: they cite a cost/benefit of 8 to 1. They find that an educational investment of \$12,356 yields gains of \$108,000 (in 2003 dollars). Using these calculations, in 2013 the gains to Colorado of \$650 million spending in these types of programs are more than \$4 billion.

Belfield, Nores, Barnett, & Schweinhart (2006); Deming (2009) and Krueger & Whitmore (2001) present considerable statistical analysis that childhood educational interventions including preschool can produce long-term benefits. In a comprehensive review of 36 studies,

Barnett (1995) finds positive long-term effects of early childhood programs on cognitive and school outcomes. Results indicate that early childhood programs can produce large short-term benefits for children on intelligence quotient (IQ) and sizable long-term effects on school achievement. Moreover, Garces, Thomas and Currie (2002) indicate that participation in preschool programs for white children is associated with a significantly increased probability of completing high school and attending college, and evidence of elevated earnings in one's early twenties. African Americans who participated in Head Start are significantly less likely to have been charged or convicted of a crime. The evidence also suggests that there are positive spillovers from older children who attended Head Start to their younger siblings. They conclude: "Head Start participants gain social and economic benefits that persist into adulthood." Overall, though these gains are not typically modeled or accounted for in an impact/cost benefit analysis study, Nores and Barnett (2013) find that preschool by itself can close half the achievement gap, and recently summarize the benefits from preschool investments (these gains are not typically modeled or accounted for in an impact/cost benefit analysis study as follows:

- Higher Achievement test scores
- Increased High school graduation
- Less Special education and grade repetition
- More educational success and higher wages
- Lower Behavior problems, delinquency, and crime
- Decline in welfare dependency
- Lower Smoking, drug use, depression
- Lower Social services costs
- Lower Crime costs
- Lower Health care costs (teen pregnancy and smoking)

Additionally, studies show that early educational intervention partially offsets the negative impacts of poverty and inadequate learning environments on child development and school success (Barnett, 2011). Magnuson, Meyers, Ruhm and Waldfogel (2004) document that preschool programs reduce inequality and increase poor at-risk children's success later in school. Nobel Prize Winner James Heckman and Cunha (200) show "economic returns to initial investments at early ages are high," and that early investment in disadvantaged children must be followed by later investment." Heckman and Cunha find that specialized programs toward economically disadvantaged children must continue throughout all grades. Thus, Ludwig and Phillips (2007), after reviewing new accumulating evidence on preschool programs, including Head Start's long-term effects on early cohorts, demonstrate that early pessimists were incorrect and that the benefits of investment in early education clearly outweigh its costs.

 Table VI: Economic Returns to Pre-K for Disadvantaged Children (In 2006 dollars, 3% discount rate)

Perry Pre-K \$17,599 \$284,086 16
Abecedarian \$70,697 \$176,284 2.5
Chicago \$8,224 \$83,511 10

Source: Barnett, W. S., & Masse, L. N. (2007). Early childhood program design and economic returns: Comparative benefit-cost analysis of the Abecedarian program and policy implications, *Economics of Education Review*, *26*, 113-125; Belfield, C., Nores, M., Barnett, W.S., & Schweinhart, L.J. (2006). The High/Scope Perry Preschool Program. *Journal of Human Resources*, *41*(1), 162-190; Temple, J. A., & Reynolds, A. J. (2007). Benefits and costs of investments in preschool education: Evidence from the Child-Parent Centers and related programs. *Economics of Education Review*, *26*(1), 126-144.

Figure VII: Early Childhood Gains to lower class size



The evidence clearly illustrates below that early education benefits are considerable and exceed their costs by several times; students involved in an early education program experience increases in high school graduation, need fewer special education classes, repeat grades less often and are arrested at a lower rate. Colorado needs to offer our students the same advantages.

Why Education Spending Helps – Smaller Classes

Approximately 85% of Amendment 66 will be targeted toward teachers and staff, including the hiring of 10-15,000 teachers and staff. Altonji and Dunn (1996) show that higher spending per pupil, along with higher teacher salaries, raises school quality and educational outcomes. Boozer and Rouse (2001) offer strong evidence that larger classes have a significant and negative effect on test scores. Word et al. (1994), Mosteller (1995), Krueger (1999), Krueger and Whitmore (2001) and Eide and Showalter (2010) all demonstrate that the STAR initiative (a program that reduced class size in Tennessee) had significant positive effects on tests scores and on the likelihood of taking a college-entrance exam.

Mitchell & Mitchell (1999), Molnar, Smith, & Zahorik, (1999) and Ehrenberg, Brewer, Gamoran, & Willms (2001) prove that smaller class sizes in lower grades boosts student reading and math scores. Fidler, (2001) and Nye, Hedges, & Konstantopoulos (2001) present statistical results demonstrating that the achievement of students in small classes outpaces that of students in larger classes by a widening margin for each additional year spent in small classes. Nye, Hedges, & Konstantopoulos (2004) further find that the benefits of smaller class size in primary school last more than five years. Rice (1999) determines that teachers with small classes give more individual attention to students. High school math teachers with small classes were found to engage with individual students and small groups more frequently than teachers with larger classes, possibly because they spend less time on classroom management than teachers in larger classes. Krueger (2003) estimates that hiring more teachers and reducing class size by 31% has a (discounted present) value of \$38,000. If Colorado hired 11,000-15,000 teachers and reduces class size by 15-20%, the increase in income to the state is \$3200-\$4,100 million (assuming that 75% of the children stay for most of their working lives). Work by Levin, Belfield, Muenning and Rouse (2007) demonstrates that 4 years of smaller classes in early grades would lead to an additional 11 students graduating for every 100 students. Given that Colorado has more than 320,000 in early grades, a decrease in class size of 22% would lead to an extra 24,200 high school graduates, or 6050 per year.

Why Education Spending Helps – Teacher Effectiveness

A critical piece to education reform is increasing teacher effectiveness. In 2010, Colorado passed a Senate Bill, 191, Teacher and Principal Accountability Act, that would allow poor teachers to be fired, but there was not money to implement the plan. A large chunk of the funding provided by Amendment 66, \$366 million, goes to Teacher and Leadership Investment – giving incentives for good teachers to stay, and implementing monitoring programs that would make it possible to fire poor teachers. Work by Belfield and Heywood (2008) shows that performance-related pay substantially increases job satisfaction, and this leads to significantly higher high school graduation rates (Levin, Belfield, Muennig and Rouse, 2007). Woessmann (2011) further presents significant evidence that performancerelated pay will boost student performance by one-quarter standard deviation. Leigh (2012) demonstrates the importance of teacher pay in boosting teacher aptitude and attracting better teachers. Chetty, Friedman and Rockoff (2011) further provide substantial statistical evidence of the importance of replacing "teachers in bottom 5% with one of average quality would generate cumulative earnings gains of \$52,000 per student or more than \$1.4 million for the average classroom"; discounting at a 5% interest rate to age 12 yields a present value gain of more than \$250,000 per classroom." If Colorado were to replace 1.5% of its poor teachers, there would be gains of \$180,000 million dollars. Performance pay increases of 6% by Levin, Belfield, Muennig and Rouse (2007) show this would lead in Colorado to increases of 5200 high school graduates.⁴

Lastly, Belfield, Levin, and Rosen (2012) estimated the cost of lost economic opportunities (as well as fiscal costs from foregone tax revenues), and additional public costs (such as crime and higher public health and welfare costs) of so-called "opportunity youth" at \$258,240 per youth, over a lifetime in present value, and the cost to society at \$755,900. Assuming that 75% of the 11850 graduates stay in Colorado work in for most of their adult lives, the gain to Colorado is \$6 billion.

⁴Hanushek (2011) documents that raising teacher effectiveness by one standard deviation leads to "marginal gains of over \$400,000 in present value of student future earnings with a class size of 20 and proportionally higher with larger class sizes." He notes that replacing the bottom 5-8% of poor teachers with average teachers could move the U.S. near the top of international math and size 'with a present value of 100 trillion." Using Hanushek's numbers, even replacing .1% of teachers would justify Amendment 66.

Education promotes higher housing prices

Public school quality is one of the most important determinants of housing prices (Haurin and Brasington, 1996; and Goodman and Thibodeau, 1998; Black, (1999) and Brasington, 1999). Chiodo, Hernandex-Murillo and Owyang (2010) offer significant evidence that differences in school quality generate substantial housing price differences; a one standard deviation increase is associated with a 11- 15% increase in home prices. Using Krueger's (2003) estimate that \$800 leads to .15 standard deviation increase, the roughly \$1,100 spending per student will lead to 2.3-3.1% increase in housing prices.

Higher housing prices, according to Carroll, Otsuka and Slacalek (2011), in turn cause increased spending in the area, which generates jobs and income for Colorado residents. These authors estimate a 9% increase in spending for every dollar housing prices increase; e.g., assuming a more conservative 7%, this implies an extra \$500 spent by Colorado residents of which \$375 is on local Colorado goods and services. Given the 1.5 million homes in Colorado, this implies \$559 million in additional spending. Campbell and Cocco (2006), Muellbauer (2007) and Slacalek (2009) additionally document the strong positive relationship between housing prices and local and national economic spending. Thus, better schools will lead to increased demand for housing in Colorado, which in turn generates positive economic activity. The simple explanation is that parents with school-age children are willing to pay a premium for housing that gives their children access to superior schools (Black, 1999). Thus, increases in educational spending will make Colorado a more desirable place and boost home prices substantially. Using Carroll, Otsuka and Slacalek's (2011) conservative estimates, spending increases by more than \$550 million on local Colorado products, thereby boosting jobs and income.

Education discourages crime

Harlow (2003) reports that 2/3 of all prison inmates in the U.S. are high school dropouts and results are robust after controlling for family background (Lochner, 2004). Lochner and Morretti (2004) shows that "Schooling significantly reduces the probability of incarceration and arrest" due to changes in criminal behavior and imply that the social return exceeds the private return, and further, due to large social costs of crime, "even small reductions in crime associated with education maybe economically important." A 2% increase in high school

completion rates then saves Colorado more than \$55 million in reduced costs incurred by victims and society as a whole. Such positive externalities from increased education amount to \$1400-2500 per additional high graduate. Lochner and Morretti (2004) find that "It is difficult to imagine a better reason to develop policies that prevent high school drop out."

In a comprehensive work, Currie (2001) documents that preschool programs reduce crime, while Merlo and Wolpin (2009) also establish that sizeable improvements in education "substantially reduce crime in late adolescence and early adulthood"; e.g., the probability of committing a crime falls by 13% by age 19; total crime and arrest rates fell by 42% and 23%, respectively. Cullen, Jacob and Levit (2006) and Deming (2011) offer compelling statistical evidence that by winning a high school lottery in Chicago raises peer graduation by 6%, and these students experienced 60% fewer arrests. Buonanno and Leonida (2006) and Machin, Marie and Vujic (2012) find that increases in education in Italy and UK additionally lead to considerable reductions in crime.

Lochner (2004, 2011) as well as Fella and Galllipoli (2009) developed a model that clearly shows that increases in education raise wages, increases future legitimate work opportunities, and then also discourages participation in crime. Becker and Mulligan (1997) also document that education teaches individuals to be more patient, which discourages crime, since forward-looking individuals place greater weight on possible punishments associated with criminal activities. The impact of education on crime is shown by Table I.

	Total Cost	Est. Change	Est. Change	Social
	per crime	in Arrests	in Crimes	Benefit
Violent Crimes				
Murder	4,506,253	-373	-373	\$1,683,083,243
Rape	132,938	347	1,559	-\$207,270,899
Robbery	13,984	134	918	-\$12,839,495
Assault	14,776	-7,798	-37,135	\$548,690,721
Property Crimes				
Burglary	1,471	-653	-9,467	\$13,920,409
Larceny/Theft	295	-1,983	-35,105	\$10,347,853
Motor Vehicle Theft	1,855	-1,355	-14,238	\$26,414,558
Arson	58,171	-69	-469	\$27,302,131
Total		-11 750	-94 310	\$2.080.648.510

Table I: Social Benefits of Increasing High School Completion by 1%

Notes: These costs reflect incarceration and victim costs. Victim costs are taken from Miller, et al. (1996). Incarceration costs per crime equal the incarceration cost per inmate multiplied by the incarceration rate for that crime (approximately \$25,000). Incarceration rates by offense type are calculated as the total number of individuals in jail or prison (from U.S. Department of Justice, 1994) divided by the total number of offenses that year (where the number of offenses are adjusted for non-reporting to the police). Incarceration costs per inmate are taken from U.S. Department of Justice (1999). All dollar figures are translated into 2008 dollars using the CPI-U. Source: Lochner and Moretti (2004).

Overall, Lochner's (2011) comprehensive work demonstrates that:

- education raises wage rates which raises the opportunity costs of crime
- education may directly affect the financial or 'psychic' reward from crime
- education may alter preferences for risk-taking or patience
- schooling may affect the social networks or peers of individuals.

Table II: Annual Criminal Activity by Dropouts Aged 20

	Par	1 000	Impact from
	high school dropouts		high school
	Arrests	Crimes	graduation
Murder	0.48	0.82	-19.6%
Rape	0.69	2.43	-19.6%
Violent crime	14.02	32.24	-19.6%
Property crime	42.95	279.17	-10.4%
Drugs offenses	60.04	600.43	-11.5%

SOURCES: UCR (2004) adjusted for undersurvey; Wolf and Harlow (2003); Lochner and Moretti (2004). **NOTES:** Violent crime includes robbery and aggravated assault. Property crime includes burglary, larceny-theft, arson, and motor vehicle theft. The share of total arrests by high school dropouts is based on incarceration rates. Thus, Colorado can save millions of dollars of taxpayer money, save lives, and prevent "wasted lives" (Belfield, Nores, Levin, and Rosen, 2012) by increasing spending on education. Also, these benefits further are generally not captured in impact analysis, and hence most economic modeling underestimates the social benefit of increases in education.

Education promotes health and reduces poverty

Increases in education attainment are also important in improving children's health, cognitive abilities, and academic achievement (see, Wolfe and Zuvekas (1995); Haveman and Wolfe, (1995); and Smith, Brooks-Gunn, and Klebanov (1997)). Grossman and Kaestner (1997) as well as Grossman (2000, 2006) prove that education is even more strongly related to health than income or occupation; for example, white males with at least some college education could expect to live 6.2 years more than less educated counterparts (Meara et al. 2008).

Johnson (2010) reveals that accessibility to quality schools and educational resources are key engines for upward mobility and can break the cycle of poverty. Johnson (2009) establishes strong correlations between health and education, which tend to perpetuate inequality. The accessibility of quality schools and educational resources for children are key engines of upward mobility in the United States, holding the potential to break the cycle of poverty from one generation to the next. Inequalities in economic status tend to be correlated across generations in part because of intergenerational correlations in health and education (Johnson 2009). Wagstff (1993) and Grossman (2005) present significant evidence that increased schooling improves health and reduces the number of doctor visits. Johnson (2010) as well as Cutler and Lleras-Muney (2010) demonstrate that increased education improves health; e.g., a 10% increase in student spending during adolescence is associated with a 3 point increase in the adult health utility index which is roughly 8 years longer. Head start participation also significantly increased health outcomes (lower diabetes, smoking and obesity).

Lleras-Muney (2005) determines that each additional year of education reduces ten-year mortality by 6%, and Lleras-Muney and Jensen (2013) shows that additional schooling causes results in lower rates of smoking and teenage drinking. Cutler and Lleras-Muney (2010) find that a high school dropout of the same age could expect to live 8 fewer years fewer than a college graduate, and "this is enormous difference in life expectancy by education is true for every demographic group, is persistent – if not increasing – over time (Kitagawa and Hauser,

1973; Elo and Preston, 1996; Meara, Richards, and Cutler, 2008), and is present in other countries (Marmot, Shipley, and Rose, 1984 (the U.K.); Mustard, et al. 1997 (Canada); Kunst and Mackenbach, 1994 (northern European countries)."

Glied and Lleras-Muney (2008) further find that increases in compulsory schooling led to significant declines in death rates caused by disease. Oreopoulos (2006) shows that an additional year of school reduces disability limiting personal care or mobility by about 30%. Currie and Moretti (2003) estimate that every year of college reduces the likelihood of a low birth weight baby by 20% and a pre-term birth by 15%. Additionally, education also reduces smoking during pregnancy by 33%. Milligan, Moretti and Oreopoulos (2004) further present considerable statistical results that increased education leads to large social returns including lower rates of smoking and drunk driving. Therefore, increasing expenditures on education in Colorado will lead to considerable health gains for its residents; these benefits, which are largely nonpecuniary, are not taken into account by standard economic modeling and impact analysis.

				Schooling			Estimat	ted Effect		
Study	Data	Sample	Instrument	Measure	Health Outcome	No Instruments		IV Methods		
	Supray of Income				Self-Reported Heath Fair or Poor	OLS/Probit (Marg. Eff.) -0.036 (0.001)		<u>IV/2SCML (Marg. Eff.)</u> -0.082 (0.034)		
Mazumder (2008)	er and Program Participation Native Whites Born Compulsory Education	Number of Nights in Hospital Last Year	-0.073 (0.0186)		-1.083 (0.767)					
(1984, 1986-88, 1990-93, 1996)	(1984, 1986-88, 1990-93, 1996)		Schooling Laws		Trouble with Stairs	-0.025 (0.001)		-0.007 (0.032)		
				Health Limitation	-0.025 (0.0013)		-0.074 (0.035)			
Dreopoulos (2006)	U.S. Censuses (1950-2000)	Natives Born 1901- 56, Ages 25-84 at	State-Level Compulsory	avel sory Average Years of Education	Disability that Limits Personal Care	<u>OLS</u> -0.014 (0.0003)		<u>2SLS</u> -0.025 (0.006)		
		Time of Survey	Schooling Laws		Disability that Limits Mobility	-0.020 (0.0004)		-0.043 (0.007)		
Kenkel, Lillard & Mathios	National Longitudinal Survey of Youth, 1979	Born 1957-64 Observed in 1998 (Oversamples Minorities & Poor	High School & GED Requirements &	High School Graduate Indicator (GED results not	Currently Smoke	<u>Ol</u> <u>Women</u> -0.194 (0.030)	<u>Men</u> -0.226 (0.029)	<u>Women</u> -0.102 (0.124)	<u>Men</u> -0.229 (0.088)	
(2006) Cohort White	Whites) Policies	Policies reported here)	Obese	0.005 (0.029)	0.013 (0.026)	-0.021 (0.139)	-0.008 (0.082)			
	National Health			Number of Years	Currently Smoke	<u>OLS</u> -0.040		Risk of Induction -0.038	Risk of Induction x Risk of <u>Being Kille</u> -0.040	
de Walque (2007) Smoking Supplements (Various years 1983-1995)	Natives born 1937- 56, aged 25+ at the time of the survey	Risk of Induction in Vietnam War	of Education Above High School	Stopped Smoking	(0.004) 0.041 (0.002)		(0.020) 0.051 (0.031)	(0.019) 0.066 (0.029)		
	1983-1995)			Indicator for	Currently Smoke	-0.173 (0.015)		-1.169 (0.642)	-0.181 (0.087)	
		or More	Stopped Smoking	0.178 (0.010)		2.190 (1.395)	0.297 (0.133)			
Grimard & Parent	Current Population Survey Tobacco Supplements	White native-born citizens at least age	Vietnam Draft Cohort Indicator	Years of Education	Currently Smoke Every Day	<u>OLS</u> -0.055 (0.002) -0.043 (0.002)		<u>23</u> -0 (0.	<u>SLS</u> . 136 .024)	
(2007)	(1995, 1996, 1998, 1999)	25, born 1935-74	(Born 1945-50)		Ever smoked			-0.111 (0.029)		

Table III: U.S. Studies of the Effects of Schooling on Health

Table IV: Channels through which Education Improves Health

		Benefits Private
Channel	Private Costs	or Public?
1. Reduce Stress	None	Private
2. Better Decisionmaking Ability/Use of Inputs	None	Private
3. Better at Gathering/Interpreting Information	None	Private
4. Health Insurance	Financial	Private
5. Healthier lifestyle		
a. Safety Precautions (e.g. seatbelts, smoke alarms)	Utility, Financial	Private
b. Diet	Utility, Financial	Private
c. Exercise	Utility, Financial	Private
d. Non-Smoking, Alcohol Moderation, Avoiding Drugs	Utility, Saves Money	Private
6. Healthier/Safer Employment	Lower Wages	Private
7. Healthier Neighborhoods	Housing Prices	Private
8. Healthier Peers and Friends	None	Public

Source: Lochner 2011

Study	Country	Outcome Details	Sample Average		Estimated Effect	Effect as % of Average
A. Mortality						
Mazumder (2008)	under (2008) U.S. 10-Year Mortality Rates		0.213		0.006	2.8%
Lleras-Muney (2005, 2006)	s-Muney U.S. 10-Year Mortality Rates 5, 2006)		0.106		-0.063*	-59.4%
Clark & Royer (2010) ^a	U.K.	Prob. of Dying b/w Ages 45 & 69	Women: Men:	0.146 0.221	0.004 0.012	2.7% 5.4%
Albouy & Lequien (2009) ^b	France	37-Year Mortality Rate	Ages 15-42: Ages 45-82:	0.07 0.40	-0.013 -0.063	-18.6% -15.8%
Salf-Reported Health						
Mazumder (2008)	U.S.	Self-Report Fair or Poor	0.357		-0.082*	-23.0%
Clark & Royer (2010)	U.K.	Self-Report Fair or Bad Long Illness	0.25 0.46		-0.005 0.023	-2.0% 5.0%
Oreopoulos		Self-Report Poor Health	0.150		0.007	4.7%
(2006, 2008)	U.K.	Self-Report Good Health	0.564		-0.01	-1.8%
		Self-Report Good Health	0.661		0.064*	9.7%
Silles (2009)	U.K.	No Long-Term Illness	0.685		0.075*	10.9%
Kemptner, Jurges &			Women:	0.15	0.013	8.7%
Reinhold (2010)	Germany	Long-Term Illness	Men:	0.20	-0.039*	-19.5%
C. Disability, Limited Mo	bility, Activity	1				
Mazumder (2008)	U.S.	Health Limitation	0.423		-0.074*	-17.5%
Organaulas (2006)	11.0	Disability Limiting Personal Care	0.092		-0.025*	-27.2%
Oreopoulos (2006)	reopoulos (2006) U.S. Disability Lim		Mobility 0.128			-33.6%
Clark & Pover (2010)	11.14	Reduced Activity	0.16		0.014	8.8%
Clark & Royer (2010)	0.K.	Physically Active	0.44		-0.001	-0.2%
). Smoking						
Clark & Royer (2010)	U.K.	Currently Smoke	0.27		-0.035*	-13.0%
Kankal at al. (2006)	11.9	Currently Smoke	Women:	0.26	-0.229*	-88.1%
Kenkel, et al. (2006)	0.5.	Currently Shicke	Men: 0.27		-0.102	-37.8%
de Walque (2007) ^d	U.S.	Currently Smoke	0.40		-0.040*	-10.0%
Grimard & Parent		Currently Smoke Every Day	0.31		-0.136*	-43.9%
(2007)	U.S.	Ever Smoked	0.58		-0.111*	-19.1%
		0	Women:	0.24	0.001	0.4%
Kemptner, Jurges &	Germany	Currently Smoke	Men:	0.36	0.005	1.4%
Reinhold (2010)	Germany	Ever Smoked	Women:	0.39	0.014	3.6%
			Men:	0.63	-0.012	-1.9%
. Obesity						
Clark & Royer (2010)	U.K.	Obese	0.21		0.028	13.3%
		Overweight	Women:	0.44	-0.016	-3.6%
Kemptner, Jurges &	Germany	o to thought	Men:	0.66	-0.034*	-5.2%
Reinhold (2010) Germany		Obese	Women:	0.13	0.007	5.4%
			Men:	0.16	-0.028	-17.5%
Brunello, Fabbri & Fort	10 European	Overweight (Women)	0.387		-0.044*	-11.4%
(2009)	Countries	Obese (Women)	0.114		-0.012	-10.5%
Kenkel et al (2006)	US	Obese	Women:	0.27	-0.021	-7.8%
(2000)	0.0.	00000	Men:	0.25	-0.008	-3.2%

Table V: Effects of Years of Education on Health and Mortality by Outcome

Notes: "Clark and Royer (2010) do not report IV estimates for the effect of education on mortality, values reported in table reflect RD estimated effect of 1947 reform on death rates between ages 45 and 56 divided by the effect of the reform on average years of completed schooling, "Mortality estimates for Ablovy & Lequider (2009) are calculated from survival rates indirect areas inferred from from Figures 1 and 2. "Kenkel, et al. (2006) estimates are for high school graduation rather than years of schooling." Average smoking rates for de Walque (2007) inferred from Figure 1 for those with a high school graduation rather than years of schooling. "Average anothing rates for de Walque (2007) inferred from Figure 1 for those with a high school graduation rather than years of schooling."

Education encourages entrepreneurship

In a comprehensive review of three decades of the effects of education on entrepreneurship, Unger, Rauch, Frese and Rosenbusch (2010) document a significant positive relationship between education and self-employment. Colombo and Grilli (2005) establish the importance of education and its relationship to venture capital and high tech startups. Davidsson and Honi (2003) demonstrate that education is critical for new startups, and Robinson and Sexton (1994) indicates that general education has a strong positive influence on entrepreneurship in terms of becoming self-employed and successful. Sockice (1993); Heckman (2006); Glaeser, Ponzetto, and Schleifer (2005), and Green and Ridell (2003) all present strong statistical evidence that education is strongly and positively related to critical thinking and social skills; these skill sets are critical for entrepreneurial success. Shane and Venkatraman (2000) and Westhead, Ucbasaran and Wright (2005) show increases in education raise the likelihood of entrepreneurs in discovering and exploiting new business opportunities.

Education also explains why entrepreneurship rates differ across states; e.g., Gurley-Calvez, Hammon and Thompson (2010) establish that human capital is an important determinant of the individual decision to pursue entrepreneurship, and that increased education investment stimulates self-employment growth. The rise in entrepreneurship generated by gains in education will raise economic growth since entrepreneurs playing a crucial role in facilitating "knowledge spillovers" in the local economy (Audretsch and Keilbach, 2005; Camp, 2005; and Shrestha et al., 2007). Therefore, augmenting educational investment then will generate more start-ups, high tech startups, and economic growth in Colorado.

Conclusion

Overall, Colorado's effort to boost education achievement through early education initiatives such as preschool programs and hiring more teachers will lower class size, boost student educational achievement, and lead to improved schools. These educational programs add significant pecuniary and nonpecuniary benefits to Colorado's economy, and are not captured by standard economic impact modeling. Colorado gains when its children perform better in school, and investing in our schools today will improve Colorado's future.

References

Advisory Commission on Intergovernmental Relations, (1981). Regional Growth Interstate Competition. Wash. D.C.

Alañón, Á., Arauzo, J.M. and Myro, R., (2007). "Accessibility, agglomeration and location". In: J.M. Arauzo and M. Manjón (eds.), Entrepreneurship, Industrial Location and Economic Growth, Edward Elgar.

Altonij, Joseph and Thomas Dunn, (1996). "Using siblings to estimate the effect of school quality on wages," Review of Economics and Statistics, 78, 692-704

Arauzo-Carod, Josep-Maria, Daniel Liviano-Solis and Miguel Manjon-Antolin, (2010). "Empirical Studies in Industrial Location: An Assessment of their Methods and Results. 50,3, 685-711.

Arauzo, J.M. and Viladecans, E. (2008)."Industrial Location at the Intra-metropolitan Level: The Role of Agglomeration Economies", Regional Studies: 43 (4) 685-711.

Autant-Bernard, C., (2006). "Where Do Firms Choose to Locate their R&D? A Spatial Conditional Logit Analysis on French Data", European Planning Studies 14: 1187-1208.

David Audretsch & Max Keilbach, 2005. "Entrepreneurship capital and regional growth," The Annals of Regional Science, Springer, vol. 39(3), pages 457-469, 09.

Ashenfelter Orley and Cecilia Rouse, (1998). "Income, Schooling and Ability: Evidence from a New Sample of Identical Twin." Quarterly Journal of Economics, 113,1 253-284.

Barnett, Steve and Miagros Nores, (2013). "The Economics of Early Childhood Programs: Lasting Befits and Large Returns." NIEER.org.

Barnett, Steve and L.N. Masse, (2007). "Early childhood program design and economic returns: Comparative benefit-cost analysis of the Abecedarian program and policy implication," Economics of Education Review, 26, 113-125.

Barnett, Steve, (2011). "The Effectiveness of early educational intervention." Science. 333, 975-978.

Barro, Robert, (1997). Macroeconomics, Cambridge Mass.: MIT Press.

Barrow, Robert and Lee, Jong–Wha, (2001). "Schooling quality in a cross–section of countries." Economica, 68.272

Bauer, Paul, Mark Schweitzer and Scott Shane, (2006), "State Growth Empirics: The Long-Run Determinants of State Income Growth." FRB of Cleveland Working Paper, 06-06. Becker, Gary, (1973) "A Theory of Marriage, Part I." Journal of Political Economy, 81 (4) 813-46.

Becker, Gary and Casey Mulligan, (1997). "The endogenous determination of time preference." The Quarterly Journal of Economics, 112 (3) 729-58.

Belfield, Clive R. & Heywood, John S., (2008). "Performance pay for teachers: Determinants and consequences," Economics of Education Review, Elsevier, vol. 27(3), pages 243-252, June.

Belfield, Nores, Henry Levin, and Rosen, (2012). The Economic Value of Opportunity Youth.

http://www.civicenterprises.net/MediaLibrary/Docs/econ_value_opportunity_youth.pdf

Belfield, C., Nores, M., Barnett, W. S., & Schweinhart, L. (2006). "The High/Scope Perry Preschool Program: Cost- benefit analysis using data from the age 40." Journal of Human Resources, 16(1), 162-190.

Benhabib, Jess & Spiegel, Mark M., (1994). "The role of human capital in economic development evidence from aggregate cross-country data," Journal of Monetary Economics, Elsevier, 34(2), 143-173.

Berger, Noah and Peter Fisher, (2013). "A Well-educated Workforce is Key to State Prosperity." Economic Policy Institute. http://www.epi.org/publication/states-educationproductivity-growth-foundations/

Black, Sandra, (1999). "Do Better Schools matter? Parent al Valuation of Elementary education," Quarterly Journal of Economics, 114 (2): 577-599.

Breton, Theodore, (2013). "The role of education in economic growth: theory, history and current Returns." Educational Research. 55, No. 2, 121–138.

Bretton, Theodore R., (2013). "Were Mankiw, Romer, and Weil Right? A Reconciliation of the Micro and Macro Effects of Schooling on Income". Macroeconomic Dynamics 17 (5):

Brasington, David, (1999). "Which Measures of School Quality Does the Housing Market Value?," Journal of Real Estate Research, American Real Estate Society, vol. 18(3), pages 395-414.

Brookings Report, Johathan Rothwell, (2012). "Housing Costs, Zoning, and Access to High-Scoring Schools." http://www.brookings.edu/research/papers/2012/04/19-school-inequality-rothwell

Buonanno, Paula and Leone Leonida, (2009). "Education and Crime: Evidence from Italian Regions." Applied Economic Letters. 13, 709-13.

Buss, Terry F. (2001). "The Effect of State Tax Incentives on Economic Growth and Firm Location Decisions: An Overview of the Literature," Economic Development Quarterly, 15, 90–105.

Camp, S. Michael (2005). "The Innovation-Entrepreneurship NEXUS: A National Assessment of Entrepreneurship and Regional Economic Growth and Development." Research Report. U.S. Small Business Administration, Office of Advocacy. April 2005.

Campbell, John and Jaoo Cocco, (2007). "How do house prices affect consumption? Evidence from micro data." Journal of Monetary Economics, 54: 3, 591–621.

Card, David, (1999). "The Causal effect of education on earnings," in Ashenfelter & D. Card (ed.), Handbook of Labor Economics, 3-30.

Carroll, Christopher & Misuzu Otsuka & Jiri Slacalek, (2011). "How Large Are Housing and Financial Wealth Effects? A New Approach," Journal of Money, Credit and Banking, Blackwell Publishing, vol. 43(1), pages 55-79, 02.

Chetty, Raj, John Friedman and Jonah Rockoff, (2011). "The Long-term impact of teachers: teacher value-added and student outcomes in adulthood." NBER working paper, 17699.

Chi, Wei, (2008), "The Role of Human Capital in China's Economic Development: Review and New Evidence," China Economic Review, v19, 421-436

Cielik, A. (2005b): "Regional characteristics and the location of foreign firms within Poland", Applied Economics 37: 863-874.

Chiappori, P.A. B. Fortin and G. Lacroix, (2009). "Investments in Schooling and the marriage market." American Economic Review., 99(5), 1689-1713.

Chiodo, Abigail, Rubén Hernández-Murillo & Michael T. Owyang, (2005). "Nonlinear hedonics and the search for school district quality," Working Papers 2003-039, Federal Reserve Bank of St. Louis.

Columbo, Massimo and Luca Grilli, (2005). "Founders' human capital and the growth of new technology-based firms: A competence-based view." Research Policy, 34 795-816.

Coughlin, C.C.; Terza, J.V. and Arromdee, V., (1991): "State characteristics and the location of foreign direct investment within the United States", The Review of Economics and Statistics 73: 675-683.

Coughlin, C.C. and Segev, E., (2000). "Location determinants of new foreign-owned manufacturing plants", Journal of Regional Science 40: 323-351.

Culter, David and Adriana and Lleras-Muney, (2010). "Understanding Differences in Health Behaviors by Education. Journal of Health Economics, Volume 29, Issue 1, Pages 1-28. Cunha, Flavio and James Heckman, (2010). "Investing in our Young People." NBER 2010.

Currie, Janet and Enrico Moretti, (2003). "Mother's education and the intergenerational transmission of human capital: Evidence from college openings," The Quarterly Journal of Economics, 118(4), 1495-1532.

Cutler, David and Adriana Lleras-Muney, (2010). "Understanding differences in health behaviors by education." Journal of Health Economics 29 (1) 1-28.

Dalenberg, Douglas R. and Mark D. Partridge, (1995). "The Effects of Taxes, Expenditures, and Public Infrastructure on Metropolitan Area Employment." Journal of Regional Science, 35, 4 617–40.

Davidsson, Per and Benson Honig, (2003). "The role of social and human capital among nascent entrepreneurs." Journal of Business Venturing 18 (3) 301-331.

Dean, Robert and Thomas Carroll, (1977). "Plant Location under Uncertainty." Land Economics, 423-44.

Deming, David, (2011). "Better Schools, Less Crime." Quarterly Journal of Economics, 126 (4) 2063-2115.

Diefendorf, Martha and Susan Goode, (2005). "The Long Term Economic Benefits Of High Quality Early Childhood Intervention Programs." NECTAC Clearinghouse on Early Intervention and Early Childhood Special Education. Chapel Hill, NC: NECTAC.

Education Week, (9/2/2013). State Report Cards. http://www.edweek.org/ew/qc/2013/state_report_cards.html

Ehrenberg, Ronald, Dominic Brewer, Adam Gamoran, & Douglas Willms, (2001). "The class size controversy." Scientific American, v285 n5 p78-85.

Elo, Irma T., and Samuel H. Preston, (1996). "Educational differentials in mortality: United States, 1979-85", Social Science and Medicine, 42(1): 47-57.

Fella, Guiulio and Giovanni Gallipolli, (2009). "Education and Crime over the Life Cycle," Working Paper, http://www.webmeets.com/files/papers/ESWC/2010/168/fella_gallipoli_f.pdf

Fidler, P. (2001). "The impact of class size reduction on student achievement." Los Angeles, CA: Los Angeles Unified School District, Program Evaluation and Research Branch.

Fisher, Peter, (2013a). *Corporate Taxes and State Economic Growth*. The Iowa Policy Project. <u>http://www.iowafiscal.org/2011docs/110209-IFP-corptaxes.pdf</u>.

Fisher, Ronald (2013). "The Effects of State and Local Public Services on Economic Development." New England Economic Review 53-82.

Fox, William and Mathew Murray, (1990). "Local Public Policies and Interregional Business Development." Southern Economic Journal, 57:2, 413-427.

Garces, Eliana, Duncan Thomas and Janet Currie, (2000). "Longer Term Effects of Head Start. American Economic Review, American Economic Association, vol. 92(4), pages 999-1012, September.

Garcia-Mila, Teresa and Therese J. McGuire, (1992). "The Contribution of Publicly Provided Inputs to States' Economies." Regional Science and Urban Economics, vol. 22, pp. 229–41.

Gebremariam, Gebremeskel H., Tesfa G. Gebremedhin, and Peter V. Schaeffer, (2011). "Employment, Income, and Migration in Appalachia: A Spatial Simultaneous Equations Approach," Journal of Regional Science, 51(1): 102-120.

Glaeser, Edward and Albert Saiz, (2004). "The Rise of the Skilled City." Brookings-Wharton Papers on Urban Affairs, 47-94.

Glaeser, Edward, Rafael La Porta, Florencio Lopez-de Silanes and Andrew Schliefer, (2004). "Do Institutions cause growth? " Journal of Economic Growth, 9:271-303.

Glied, Sherry and Adriana Llreras-Muney, (2008). "Technological innovation and inequality in health." Demograph, 45, 3 741-761.

Goodman, Allen C. & Thibodeau, Thomas G., (1998). "Housing Market Segmentation," Journal of Housing Economics, Elsevier, vol. 7(2), pages 121-143, June.

Green, David A. & Craig Riddell, W., (2003). "Literacy and earnings: an investigation of the interaction of cognitive and unobserved skills in earnings generation," Labour Economics, 10(2), 165-184, April.

Greenwald, Rob, Larry Hedges and Richard Laine, (1996). "The Effect of School Resources on Student Achievement." Review of Educational Research, 66:3 361-396,

Grossman, Michael, (2000). "The human capital model." In Anthony J. Culyer and Joseph Newhouse, editors, Handbook of Health Economics, 1 (1), 346-408.

Grossman, Michael, (2006). "Education and nonmarket outcomes." In E. Hanushk and F. Welch, editors, Handbook of the Economics of Education 1 (10), 577-633.

Grossman, Michael and Robert Kaestner, (1997). "Effects of education on health." In Jere R. Behrman and Nevzer Stacey, editors. 4. 577-633.

Gruenewald, Rob and Arthur Rolnick, (2003). "Early Childhood Development: Economic Development with a High Public Return." Fedgazette, Federal Reserve of Minneapolis.

Gruenewald, Rob and Arthur Rolnick, (2010). "An Early Childhood Investment with a High Public Return." The Regional Economist. St. Louis Federal Reserve.

Gurley-Calvez, Tami, George Hammond and Eric Thompson, (2010) "Determinants of Growth in Entrepreneurship across U.S. Labor Market Areas: 1970:2005. SBA, Office of Advocacy. http://www.sba.gov/sites/default/files/rs363tot_0.pdf

Harlow, Caroline, (2003). "Education and Correctional Populations." U.S Dept. of Justice, Bureau of Justice Statistics.

Holl, A. (2004): "Start-ups and Relocations: Manufacturing Plant Location in Portugal", Papers in Regional Science 83: 649-668.

Hanuschek, Eric, (2011). "The economic value of higher teacher quality." Economics of Education Review." 30, 466-479.

Haurin, Donald and David Brasington, (1996). "School Quality and Real House Prices: Inter- and Intrametropolitan Effects," Journal of Housing Economics, vol. 5(4), pages 351-368, December.

Jacobs, J. (1969). The Economy of Cities, New York: Random House.

Johnson, Rucker, (2010). "The Health Returns to Education Policies from Preschool to High School and Beyond." American Economic Review: Papers and Proceedings, 100 288-295

Johnson, Rucker C., (2011). "Long-run Impacts of School Desegregation and School Quality on Adult Attainments." NBER working paper #16664.

Kalil, Ariel, Rebbeca Ryan and Michael Corey, (2009). "Diverging Destinies: Maternal Education and the Development Gradient in Time with Children." PIER Working Paer 09-002.

Kampelmann, Stephen and Francois Rycx, (2012). "The impact of educational mismatch on firm productivity: Evidence from linked panel data." Economics of Education Review. 31:6, 98-931,

Kitagawa, Evelynn M., and Philip M. Hauser, (1973). "Differential Mortality in the United States: A Study in Socioeconomic Epidemiology." Cambridge, MA: Harvard University Press.

Kunst, Anton E. and Johan P. Mackenbach, (1994). "The size of mortality differences associated with educational level in nine industrialized countries." American Journal of Public Health, 84:932-7

Krueger, Alan, (1999). "Experimental estimates of education production functions." Quarterly Journal of Economics, 114, 497-532.

Krueger, Alan, (2003). "Economic Considerations and Class Size." The Economic Journal, 113, 34-63.

Krueger, Alan & Diane Whitmore, (2001). "The Effect of Attending a Small Class in the Early Grades on College-test Taking and Middle School Test Results: Evidence from Project Star." Economic Journal, 111:468, 1-28.

Krueger, Dirk and Alexander Ludwig, (2013). "Optimal Progressive Labor Income and Education Subsidies when Education Decisions and Intergenerational Transfers are Endogenous." American Economic Review: Papers and Proceedings, 103 (3) 496-501.

LaFortune, Jeanne, (2013). "Making Yourself Attractive: Pre-marital investments and the Returns to Education in the Marriage Market." American Economic Journal: Applied Economics, American Economic Association, vol. 5(2), pages 151-78, April.

Levin, Henry, Clive Belfield, Peter Muenning and Cecilia Rouse, (2007) "The Costs and Benefits of an Excellent Education for All of America's Children." NY, N.Y.: Columbia Univ. Teachers College.

Leigh, Andrew, (2012). "Teacher pay and teacher aptitude." Economics of Education Review 31, 41-53.

Lleras-Muney, Adriana, (2005). "The relationship between education and adult mortality in the United States." Review of Economic Studies, 72 (1) 189-221.

Lleras-Muney, Adriana and Rob Jensen, (2013). "Does staying in School (and not working) prevent teen smoking and drinking." Forthcoming Journal of Health Economics.

Liu, Zhiqiang, (2007). "The External Returns to Education: Evidence from Chinese Cities," Journal of Urban Economics, v61, n3, 542-564.

Lochner, Lance, (2004). "Education, Work and Crime: A Human Capital Approach," International Economic Review, 45(3), 811-843.

Lochner, Lance and Enrico and Moretti, (2004). "The effect of education on crime: Evidence from prison inmates, arrests and self-reports." American Economic Review, 94(1): 155:189.

Lochner (2011). "Non-Production Benefits of Education: Crime, Health, and Good Citizenship", NBER 16722, January.

Lopez-Bazo, Enrique, y Moreno, Rosina, (2008), "Does Human Capital Stimulate Investment in Physical Capital? Evidence from a Cost System Framework," Economic Modeling v25, 1295-1305. Love, Lisa and John Compton (1999). "The Role of Quality of Life in Business (Re)Location Decision." Journal of Business Research. 44, 211-222.

Luger, Michael I. and Sudhir Shetty, (1985). "Determinants of Foreign Plant Start-ups in the U.S. States: Lessons for Policymakers in the Southeast," Vanderbilt Journal of Transnational Law, 18, 223–245.

Lutwig, Jens and Deborah A. Phillips, (2007), "The Benefits and Costs of Head Start," NBER 12973.

Lynch, Robert, (2004). "Rethinking Growth Strategies: How State and Local Taxes and Services Affect Economic Development." EPI. http://www.epi.org/publication/books_rethinking_growth/

Max, Sarah, (2004), "School, what is it good for?" CNN, August 30.

Machin, Stephen, Olivier Marie, and Suncica Vujic, (2011). "The Crime Reducing Effect of Education." Economic Journal, , 121, 552, 463-484.

Magnuson, Katherine, Marcia Meyers, Christopher Ruhm, & Jane Waldfogel. 2004. "Inequality in Preschool Education and School Readiness." American Educational Research Journal. 41(1): 115-157.

Manjón-Antolín, Miguel C., (2010). "Firm size and short-term dynamics in aggregate entry and exit," International Journal of Industrial Organization, 28(5), 464-476.

Marmot, Michael G, Martin J. Shipley, and Geoffrey Rose, (1984). "Inequalities in death--specific explanations of a general pattern?" Lancet. May 5;1(8384):1003–1006.

Mazerov, Michael, (2013). "Academic Research Lacks Consensus on the Impact of State Tax Cuts on Economic Growth: A Reply to the Tax Foundation." Center on Budget and Policy Priorities, June 17. http://www.cbpp.org/files/6-17-13sfp.pdf

Meara, Ellen R., Seth Richards and David M. Cutler, (2008). "The Gap Gets Bigger: Changes in Mortality And Life Expectancy, By Education, 1981–2000", Health Affairs, 27(2), 350-360.

Merlo, Antonio and Kenneth Wolpin, (2009). "The Transition from School to Jail: Youth Crime and High School Completion among Black Males," Penn Institute for Economic Research WP, 09-002.

Miller, Paul, Charles Mulvey and Nick Martin, (1995). "What Do Twin Studies Reveal about the Economic Returns to Education?" American Economic Review 85, 586-99.

Mitchell, D. E., & Mitchell, R. E., (1999). "The impact of California's Class Size Reduction initiative on student achievement: Detailed findings from eight school districts." Riverside, CA: University of California, California Educational Research Cooperative.

Molnar, A., Smith, P., & Zahorik, J., (1999). "Evaluation results of the Student Achievement Guarantee in Education (SAGE) Program, 1998-99." Madison, WI: Univ. of Wisconsin Madison, School of Education.

Mosteller, Frederick,(1995), "The Tennessee Study of Class size in the Early School Grades." Critical Issues for Children and Youths, 5,2 Summer/Fall 113-127.

Mustard, Cameron A., Shelley Derksen, Jean-Marie Berthelot, Leslie L. Roos, and Michael C. Wolfson,(1997). "Age Specific education and income gradient in morbidity and mortality in a Canadian province," Social Science and Medicine, 45(3): 383-397.

NEA, (2012), Rankings & Estimates, NEA Research.

Milligan, Kevin, Enrico Moretti and Philip Oreopoulos, (2004). "Does education improve citizenship? Evidence from the United States and the United Kingdom. Journal of Public Economics 88 (9-10), 1667-95.

Muellbauer, John, (2007). "Housing and Personal Wealth in a Global Context," Working Papers UNU-WIDER Research Paper, World Institute for Development Economic Research (UNU-WIDER).

Nye, B., Hedges, L.V., & Konstantopoulos, S., (2001). "Are the effects of small classes cumulative? Evidence from the Tennessee class size experiment." Journal of Educational Research, 94, 336-345.

Nye, B., Hedges, L.V., & Konstantopoulos, S., (2004). "Do minorities experience larger lasting benefits from small classes? Evidence from a five-year follow-up of the Tennessee class size experiment." Journal of Educational Research, 98, 94-100.

Oreopoulos, Philip and Kjell G. Salvanes, (2011). "Priceless: The Nonpecuniary Benefits of Schooling." Journal of Economics Perspectives, 25 (11), 159-184.

Plaut, Thomas R. and Joseph E. Pluta, (1983). "Business Climate, Taxes and Expenditures, and State Industrial Growth in the United States." Southern Economic Journal, 50 (July): pp. 99-119.

Porter, Michael and Jan Rivlin, (2012). "What business should do to restore competitiveness." <u>http://management.fortune.cnn.com/2012/10/15/porter-rivlin-economy-fix/</u>

Psacharopoulos, George and Harry A. Patrinos, (2004). "Returns to Investment in Education: A Further Update." Education Economics, Vol. 12, No. 2, pp. 111-134.

Rice, J. K., (1999). "The impact of class size on instructional strategies and the use of time in high school mathematics and science courses." Educational Evaluation and Policy Analysis, 21(2), 215–229.

Rangazas Peter C, (2005). "Human Capital and Growth: An Alternative Accounting," The B.E. Journal of Macroeconomics, De Gruyter, vol. 5(1), pages 1-43, September.

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

Schultz, T. W., (1964). *Transforming Traditional Agriculture*. New Haven: Yale University Press.

Shane, S and S. Venkatraman, (2000). "The promise of entrepreneurship as a field of research", Academy of Management Journal, 25, 217-226.

Shrestha, Sundar S., Stephan J. Goetz, and Anil Rupasingha. (2007). "Proprietorship Formations and U.S. Job Growth." The Review of Regional Studies. 37.2: 146-68.

Slacalek Jiri, (2009). "What Drives Personal Consumption? The Role of Housing and Financial Wealth," The B.E. Journal of Macroeconomics, De Gruyter, vol. 9(1), pages 1-37, October.

Smith, J. R., Brooks-Gunn, J., & Klebanov, P. K., (1997). "The consequences of living in poverty for young children's cognitive and verbal ability and early school achievement." In G. J. Duncan & J. Brooks-Gunn (Eds.), Consequences of growing up poor (pp. 132–189). New York: Russell Sage.

Smith, D.F. and Florida, R. (1994): "Agglomeration and Industrial Location: An Econometric Analysis of Japanese-Affiliated Manufacturing Establishments in Automotive-Related Industries", Journal of Urban Economics 36: 23-41.

Tannenwald, Robert and Christine Kendrick, (1995). "Taxes and Capital Spending: Some New Evidence." In Proceedings of the 87 Annual Conference. Columbus, OH: National Tax Association

Temple, J. A., & Reynolds, A. J., (2007). "Benefits and costs of investments in preschool education: Evidence from the Child-Parent Centers and related programs." Economics of Education Review, 26(1), 126-144. Also see NIEER, 2013.

Testa, William A. (1989). "Metro Area Growth from 1976 to 1985: Theory and Evidence." Working Paper. Federal Reserve Bank of Chicago, January.

Unger, Jens, Andreas Rauch, Michael Frese and Nina Rosenbusch, (2013). "Human capital and entrepreneurial success: A meta-analytical review." Journal of Business Venturing 26 (3) 341-340.

Wagstaff, Andrew, (1993). "The demand for health: an empirical reformulation of the Grossman model." Health Economics, 2, 189-198.

Wasylenko, Michael and Therese McGuire, (1985). "Jobs and Taxes: The Effect of Business Climate on States' Employment Growth Rates." National Tax Journal, 38, 4 (December), pp.497–512.

Wall Street Journal, (2013). "The States Spending the Most on Education. Mike Sauter May 31, 2013.

Welch, F. (1970). "Education in Production," Journal of Political Economy, 78, 1. 35-59.

Westhead, P., D. Ucbasaran and M. Wright, (2005). "Decisions, actions and performance: Do novice, serial and portfolio entrepreneurs differ?" Journal of Business Management, 43 393-417.

White House, (2010). "Economic Report of the President, 2010. U.S. Government Printing Press, Chapter 3.

Williams, Willia, (1967). "A Measure of the Impact of the State and Local Taxes on Industry Location." Journal of Regional Science, 40-59.

Wobbekind, Richard, (2012). "On the Importance of Education." Business Economics, 47 90-96.

Woessmann, Ludger. (2011). "Cross-country evidence on teacher performance pay," Economics of Education Review, Elsevier, vol. 30(3), pages 404-418, June.

Woodward, D. (1992): "Locational determinants of Japanese manufacturing start-ups in the United States", Southern Economic Journal 58: 690–708.

Word, E., Johnston, J., Bain, H., et al. (1990). "The state of Tennessee's Student Teacher Achievement Ratio (STAR) Project: technical report 1985-1990." Tennessee State Department of Education.