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The Costs of School Failure

A Feasibility Study

Analytical Report for the European Commission

prepared by the

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Contents

1. Introduction

In recent years, "education" has been the keyword for economic and social development. A recent European Council concluded that "*education and training are critical factors to develop the EU's long-term potential for competitiveness as well as for social cohesion"* (European Commission 2006a, p. 6). At the same time, there is a shared concern that educational systems in most Member States are failing to deliver what it takes for achieving the Lisbon objectives.

The purpose of this paper is to take stock on what school failure means and explore the way the cost of such failure could be estimated. Knowing the cost of school failure may sensitize policy makers to take corrective action.

The strong European stance on education is largely anchored on the results of cost-benefit analysis: *"…investments in education and training produce high returns which substantially outweigh the costs…. [Such investments]… should be targeted on areas where economic returns and social outcomes are high*" (European Commission 2006a, p.7). Such statements are endorsed by economics Nobel Laureate James Heckman (2006).

In designing public policy on education one should take into account the social costs and benefits of the particular investment in education, and this will be the emphasis in this report. However, the private costs and benefits cannot be ignored as it is these that are associated with an individual's decision to invest or not in education. If a secondary school student decides to quit school before graduation, he or she perceives that the costs of staying in school outweigh the benefits, as such benefits and costs are realized by the individual. On whether such privately optimal decision is also desirable from the social point of view is a completely different matter.

Cost-benefit analysis applied to education has in general the same strengths and weaknesses as applied in other sectors. A rate of return estimate is a convenient summary of the profitability of a particular investment, readily comparable across alternative investments or the cost of borrowing funds. On the other hand, a single number may hide a myriad of considerations that may tip the decision scale towards one type of investment relative to another.

In the case of a firm a conventional profitability estimate may do, as the objective of the firm is efficiency or profits. In arriving at such estimate, only private costs and private benefits associated with the investment are taken into account. These are much easier to measure relative to the social costs and benefits used in estimating the profitability of educational investments. Education generates benefits that are not always measurable in the market, some of them spilling over to others beyond the individual who invests in education.

In addition, cost-benefit analysis tacitly assumes that one euro of costs or benefits has the same value whether it accrues to the rich or to the poor. To the extent that equity considerations are in order, the results of cost-benefit analysis are not a sufficient indicator of changes in social welfare associated with educational investments.

As it should become obvious from the review that follows, beyond economics, several other disciplines come to play ranging from sociology to medicine to political science.

A caveat is in order at the outset. This report is based on a desk review of the literature. The sources were the Econlit data base, European Commission and OECD reports, the new "wider effects of learning" literature, and private communication with key analysts of similar studies and education groups in the United States. One limitation of the

review is that it is largely based on the Anglosaxon literature. This means that although the most robust analyses, regardless of country of origin, must have appeared in the peer-reviewed English-language international journals, some relevant studies of more local nature might have been missed.

2. Defining school failure

"School failure" is a very broad concept that may mean different things to different people. It may mean that a school system is failing to provide services conducing to learning, or that a student is failing to advance to the next grade and eventually becomes a drop out. Or it may mean that some students leave school without having acquired competencies and skills that are demanded in the labor market**.** The reasons for failure could be traced to the school system as a whole, and/or to the individual student and his/her family.

That Europe may have a serious school failure problem is exemplified in the titles and frequency of headlines in the press, e.g.:

- *"Europe is **failing** its students"* (The Economist, 25 March 2006).
- *"Antiquated education systems are **failing** a new generation"* (Newsweek, 12 June 2006).
- *"Germany's school system **fails** ….."* (*The Economist*, 11 February 2006).
- *"Policy to blame for **failure** of schools…."* (The Independent, 21 October 2006).

At the 2000 European Council in Lisbon, the Union defined the dimension of the school failure problem as**: "**The number of 18 to 24 year olds with only lower-secondary level education who are not in further education and training". An EU benchmark was set, that the proportion of early school leavers should be not be more than 10% by 2010 (European Commission, 2006b). Beyond the ease of measurement and the round number, it is not clear how this benchmark was decided. Perhaps it means that those who do not complete upper secondary education fail to acquire basic skills necessary in life. As shown in Table 1, by 2006 only six of the twenty-seven Member States had met this benchmark. The average early school leaving statistic in the remaining twenty-one countries is 18%. This is nearly double the benchmark to be reached by 2010 – a real challenge.

In the academic literature, school failure takes many different names and forms for measurement purposes (Table 2). Thus in the United States the dominant keyword is "adequacy", referring to insufficient public funding of schools according to a variety of benchmarks. This is an input-oriented notion based on the assumption that increasing spending per student would result in better schools. The *motto* of the Alliance for Excellent Education (2006) in the United States is "Every child a graduate". Excellence and adequacy are used interchangeably. Rouse (2005) characterizes an individual as having inadequate education if he or she has not graduated from high school. Often the indicator is driven by empirical necessity or data availability. So in the UK the level of academic or vocational qualifications has been used, rather than high school graduation.

In Spain, school failure ('fracaso escolar') applies to those pupils who fail to obtain the leaving certificate at the end of compulsory education at age 16. Many of them however do obtain that certificate later on, so maybe at age 18 they are not considered anymore "school failures", despite having achieved only what is considered basic education and falling into the EU definition of early school leavers.

Table 1. Early school leavers in 2006 by 2010 benchmark state (%)

Countries having met the benchmark		Countries to meet the benchmark	
Country	Early leavers *	Country	Early leavers *
Austria	9.6	Malta	41.6
Slovak Republic	6.4	Portugal	39.2
Poland	5.6	Spain	29.9
Czech Republic	5.5	Italy	20.8
Slovenia	5.2	Latvia	19.0
Croatia	4.8	Romania	19.0
		Bulgaria	18.0
		Cyprus	16.0
		Greece	15.9
		Germany	13.8
		Luxembourg	13.3
		Estonia	13.2
		France	13.1
		United Kingdom	13.0
		Netherlands	12.9
		Belgium	12.6
		Hungary	12.4
		Ireland	12.3
		Sweden	12.0
		Denmark	10.9
		Finland	10.8
		Lithuania	10.3

Source: Eurostat (2007).

* Percentage of the population aged 18-24 with at most lower secondary education and not in further education or training.

Table 2. A taxonomy of school failure definitions

Domain	Keyword	Indicator nature
School systemic	Inadequate education	Input - School finance
Individual student	Repetition, dropouts	Output – Quantitative
	Low achievement	Output – Qualitative

Grade repetition or retention, also known as flunking, may be another indicator of school failure. Grade retention has been found to affect the probability of dropping out of school (Eide and Showalter 2001). On the other hand, grade retention may improve the student's cognitive learning. This trade-off indicates the difficulty of relying on only one measure (quantitative or qualitative) of school failure.

The European Commission's keyword of "early school leavers" or dropouts is an output-oriented indicator of failure measured in terms of headcount. Still another indicator in this respect is the level of cognitive achievement mastered by the student - if below a

given benchmark, it means failure. This output-oriented indicator has the advantage of taking into account the quality of schooling. It should be noted that popular indicators, such as the number of early school leavers, are perhaps a necessary but not a sufficient condition in documenting school failure. In other words, the weakness of the dropout indicator is that a student may graduate from secondary school with very low cognitive skills.

A recent EU-commissioned study (GHK 2005) identifies several weaknesses of the Eurostat early school leavers indicator such as technical measurement issues, accuracy, representativeness, comparability and ability to address the problem of early school leavers from a policy perspective. Possible new indicators and data collection include truancy, those expelled or suspended, those failing to obtain minimum qualifications, or school leavers failing to enter further training or the labor market within a period of time. In defining school failure, it is not always possible to separate what is due to student, family or school-related factors.

Given the wide diversity of school failure indicators found in the literature, no particular *a priori* indicator was adopted in conducting this literature review. But also given the already adopted EU definition, particular attention was paid to this indicator as a start.

3. The costs of school failure

No matter how exactly school failure is defined, it is associated with a series of various types of costs. As shown in Table 3, some of these costs are private, i.e. realised by the individual and mostly directly observed in the market. Other costs are social, impacting society as a whole and not directly observable. Some costs take the form of foregone benefits. Of course there is considerable overlap across cost categories, e.g. unemployment is both a private and a social issue. Costs could also be considered from the more narrow point of fiscal implications for the government.

More or better education has an impact on each element of school failure. More education may mean graduating from secondary school rather than leaving school early. Better education may mean mastering a higher level of cognitive achievement rather than scoring below a given norm. It may mean higher quality children in terms of offspring health and education (Becker and Tomes 1976). Also, more educated people may have a lower discount rate, i.e. valuing less present relative to future income and thus be willing to invest in human or other capital.

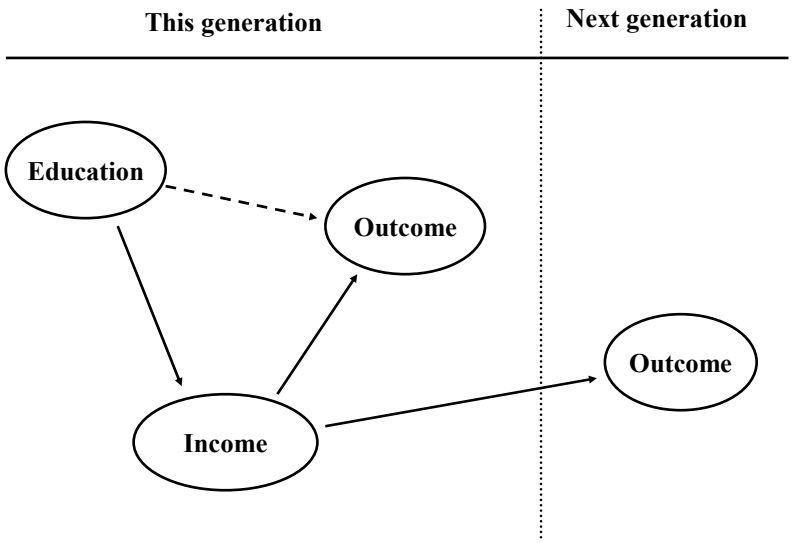
Table 3. Categorizing the elements of school failure

Cost category	Cost element
Private	Higher unemployment incidence Higher unemployment duration Lower initial and lifetime earnings Lower own health status Higher own discount rate Less risk aversion Less lifelong learning participation Lower quality children Lower lifetime satisfaction
Social	Increased criminality Lower positive spill over effects on co-workers Lower rate of economic growth Lower intergenerational effects on children and parents Lower public health status Higher unemployment Lower social cohesion
Fiscal	Lower tax revenues Higher unemployment and welfare payments Higher public health expenditures Higher police expenditure Higher criminal justice expenditure

Note: "Higher" or "lower" in this table is defined relative to a control group situation of non-school failure, however the latter is defined.

Figure 1 shows the major paths through which more or better education can lead to improved outcomes, e.g., employment, higher earnings, better health, less crime or higher social cohesion. The links between education and outcomes can be direct (broken arrow in Figure 1) or indirect (Feinstein 2002a, Feinstein 2002b, Muennig 2005). A direct effect of education is when education changes behaviour conducive to a particular outcome. An example of the direct effect of education on a health outcome is better awareness among the more educated of the harmful effects of smoking. An indirect effect is when education impacts and intermediate variable that in turn affects the outcome. For example, to the extent that education increases workers income, the more educated are able to buy high quality health services, leading to less burden of disease.

Figure 1. Direct and indirect paths of the effect of education on outcomes



These effects echo the distinction between the "worker efficiency" and "allocative efficiency" of education (Welch 1970). Education can make a worker more productive by raising his or her marginal product. Or education may instigate a change in the combination of other inputs used in production, leading to higher efficiency. The latter effect has been most eloquently encapsulated in Schultz's (1975) concept of the "ability to deal with disequilibria", i.e. the more educated being able to quickly adjust and act appropriately when faced with unforeseen situations. Some of the effects of education can carry across generations, e.g. when more educated parents can afford to buy quality health and education services for their children, or backwards, when more educated children can take care of their aging parents. Of course these distinctions are not watertight and there is a lot of overlap between categories, let alone isolating the effect of a particular education intervention on a non-market outcome, such as crime.

Of particular importance is the effect of earlier education on obtaining later education or participating in some form of lifelong learning. This is known in the literature as the "option value of education" (Weisbrod 1962), or more recently as the "life cycle of human capital formation" (Cunha et al. 2006). By dropping out of school at an early age, lifelong learning chances are diminished.

Labor market

The dominant mechanism by which education affects labour market outcomes is human capital formation. The path between education, employment and incomes has been the subject of most extensive research in the literature relative to the others. Today, there is a consensus in the literature that the higher earnings of the more educated have a social

productivity counterpart, rather than being due to screening or other causes (Psacharopoulos and Layard 1974, Psacharopoulos 1979, Card 1999). It is an undisputed fact that, on average, the more education one has the higher his or her employability and earnings in the labour market. Documenting such link is important because of the additional indirect effects of education through income.

In terms of incidence, the unemployment rate among secondary school graduates in EU-27 is lower by more than 5 percentage points relative to those with lower secondary education (Table 4). And once in employment, those who have completed upper secondary education enjoy on average up to one third higher earnings relative to those who have left school early (Table 5).

Table 4. Unemployment rate by level of education 2006, EU-27 average (%)

Educational level	Lower secondary	Upper secondary
Unemployment rate	13.2	7.9

Source: Based on Eurostat (2007).
Note: Refers to those aged 25-35.

Table 5. Average annual earnings by level of education, 2002 (in €)

Area	Educational level		Earnings advantage of secondary school graduation (%)
	Lower secondary	Upper secondary	
EU-15	23,645	31,316	32.4
EU-25	21,406	26,519	23.9

Source: Eurostat(2007).

In terms of analytical studies, the link between education and labor market outcomes is the most documented in the literature so it is only briefly reported here (see de la Fuente and Ciccone 2003, Psacharopoulos and Patrinos 2004, Wößmann and Schütz 2006). In the early economics of education literature it was debated whether the indisputable increase in earnings with more education had a productivity counterpart. A series of research based on identical twins (to control for genetic ability) or exogenous variation in schooling (such as minimum schooling laws) and use of instrumental variable techniques resulted to a statement by Nobel Laureate James Heckman, that "there is firmly established consensus that … the rate of return to a year of schooling….exceeds 10% and may be as high as…20%" (Carneiro and Heckman 2003, p.148-149).

Oreopoulos (2003) using instrumental variable techniques based on changes in compulsory schooling laws in the United States, Canada and the UK found that one extra year of secondary schooling reduces unemployment and increases earnings (Table 6). In terms of net present values, he reports that one additional year of high school raises lifetime earnings 9 to 11 percent.

Table 6. Marginal labor market effects of one extra year of schooling (%)

Effect on	USA	Canada	UK
Unemployment	-40.6	-21.0	-18.2
Earnings (males)	15.7	13.8	7.3

Source: Based on Oreopoulos (2003), Tables 3, col 3 and Table 4, col. 4.

According to a recent study by the Prince's Trust (2007) in the UK, the productivity loss to the economy as a result of youth unemployment is estimated at £10 million per day**.** There is also a £20 million per week cost to the exchequer in terms of Job-Seeker's Allowance. The personal cost of not being in education, training or employment goes beyond foregone earnings in the longer term: youth unemployment has been estimated as imposing a wage scar on individuals of between 8 and 15 per cent. According to the same study, the UK has between 10 and 25 per cent lower output per hour than France, Germany and the US and much of this can attributed to a poorer level of skills and a shortfall of capital investment.

Health

The two mechanisms by which education affects health outcomes is by changing behavior and through higher incomes. Health-related behaviors include diet, smoking, alcohol consumption, medical compliance, obtaining medical treatment, taking regular exercise, safe sex and use of seat belts. A higher level of income because of increased education allows the more educated to consume healthier food and buy better health care.

A higher level of education means increased cognition in avoiding unhealthy situations, such as smoking. Several studies show that more years of schooling are associated with both reduced smoking initiation and better health (Sander 1995a, 1995b, Grossman and Kaestner 1997, Kendler et al. 1999). More education increases the chances that the worker will have employment-related health insurance. Once sick, the better educated might be able to better follow medical advice and conform to taking medicines.

Eurostat data show large differences in the health status by level of education in some European countries (Table 7).

Table 7. People with long standing disease by level of education (%)

Country	Lower secondary	Upper secondary
Belgium	27.0	19.5
Denmark	53.6	44.8
Lithuania	29.4	12.3
Norway	49.6	37.2

Source: Eurostat (2007).

In the UK men and women with A Level or above qualifications were between 30 to 60% more likely to take regular vigorous exercise, half as likely to smoke and 20% less likely to be overweight (Marmot et al. 1991). Completing secondary schooling may make a difference between entering an accident-prone manual occupation rather than a safer office job. In the UK the mortality rate of unskilled adult males is nearly three times higher than the mortality rate of professional workers (Feinstein 2002b, p. 6). In the Netherlands, there are dramatic differences in the incidence of health status between lower and upper secondary school leavers (Table 8).

Table 8. Health status by level of education, Netherlands (%)

Health status	Lower secondary	Upper secondary
Cancer growth	2.0	0.5
Serious heart condition	2.1	1.0
Serious kidney, liver problems	2.4	0.7
Poor health (men)	1.1	0.5
Poor health (women)	1.3	0.7

Source: Groort (2007).

In the United States the mortality rate of high school dropouts is more than twice as large as those with some college education (Cutler and Lleras-Muney 2006). Also in the United States, those with less than high school education are almost twice as likely to suffer from the physiological costs of long term stress as those with higher levels of education (Kubzansky and Sparrow 1999). The mechanism seems to be better control over their working hours and less anxiety possibly leading to depression. Documenting an intergenerational effect of education, in the United States the death rate for infants with mothers who had attended high school as compared to the death rate of infants with mothers who had not attended high school was on average 1.7 percentage points lower for whites and 1.3 points lower for blacks (Corman and Grossman 1985). Also in the United States, those over 60 years old who graduated from high school have a level of functioning that is roughly one third higher than those who did not (Ross and Mirowsky 1999). The implication is that education is strongly and substantially associated with physical functioning in later life.

Feinstein (2002b) reports an attempt to move beyond raw health-education associations and document the causal effects of education on two health conditions in the UK: depression and obesity. Longitudinal data on two British cohorts contained enough information to control for a host of factors that affect health beyond education, such as childhood family background, reading and math test scores at 7 and 11, as well as childhood medical, intellectual and emotional conditions. The control for such variables was done by regression analysis and matching individuals in the cohorts with similar initial characteristics.

Controlling for the above background factors, it was found that women gaining level 1 qualification (roughly equivalent to lower secondary education in the British system) reduces the probability of depression between 6 and 10 percentage points relative to no qualifications. The corresponding reduction in the probability of obesity was estimated to be between 5 to 7 percentage points. The value of the benefits of one half of the different groups in the population gaining level 1 qualification (relative to none) are given in Table 9. A conservative estimate of the public cost of these two conditions is about £6 billion per year.

Table 9. The monetary benefits of one half of the reference group gaining academic level 1 qualifications

Health condition	Reference group (no qualifications)	Value of benefit (million £ per year)
Depression	Women	28.1 -169.6
Mental health	Women	299.4 – 1,809.1
Obesity	Men	8.1 – 122.1

Source: Feinstein (2002b), p. 32.

In the United States, Culter and Muney (2006) using broad controls for background characteristics find substantial effects of education on several health indicators (Table 10).

Table 10. Marginal effect of one year of education on health-related conditions

Health variable	Education effect (%)
5-year mortality	-4.2
In poor or fair health	-12.2
Depression scale (0=lowest, 16=highest)	-10.5
Obese (BMI > or = 30)	-5.7
Current smoker	-9.3
Days had 5+ drinks past year	-15.8
Ever had cholesteral screening	7.4
Always wears seat belt	4.3
Has smoke detector	2.6

Source: Based on Culter and Muney (2006), Tables 1 and 2.
Note: Numbers are education coefficients of a health production function as percentage of the dependent variable mean**.**

Cutler and Lleras-Muney (2006) report that in the United States **t**he differences between the more and the less educated are significant: in 1999, the age adjusted mortality rate of high school dropouts ages 25 to 64 was more than twice as large as the mortality rate of those with some college. Using extensive controls, such as age, race, gender, they found that an additional four years of education lowers five year mortality by 1.8 percentage points (relative to a base of 11 percent); it also reduces the risk of heart disease by 2.2 percentage points (relative to a base of 31 percent), and the risk of diabetes by 1.3 percentage points (relative to a base of 7 percent). Four more years of schooling lowers the probability of reporting in fair or poor health by 6 percentage points (the mean is 12 percent), and reduce lost days of work to sickness by 2.3 each year (relative to 5.2 on average).

Those with 4 more years of schooling are less likely to smoke (11 percentage points relative to a mean of 23 percent), to drink a lot (7 fewer days of 5 or more drinks in a year, among those who drink, of a base of 11), to be overweight or obese (5 percentage points lower obesity, compared to an average of 23 percent), or to use illegal drugs (0.6 percentage points less likely to use other illegal drugs, relative to an average of 5 percent).

Similarly, the better educated are more likely to exercise and to obtain preventive care such as flu shots (7 percentage points relative to an average of 31 percent), vaccines, mammograms (10 percentage points relative to an average of 54 percent), pap smears (10 percentage points relative to an average of 60 percent) and colonoscopies (2.4 percentage points relative to an average of 9 percent). Among those with chronic conditions such as diabetes and hypertension, the more educated are more likely to have their condition under control. Furthermore, they are more likely to use seat belts (12 percentage points more likely to always use a seat belt, compared to the average of 68 percent) and to have a house with a smoke detector (10.8 percentage points relative to an average of 79 percent) and that has been tested for radon (2.6 percentage points relative to a base of 4 percent).

Oreopoulos (2003) using natural experiment controls finds that in the United States among all individuals aged 25-74, an additional year of compulsory schooling lowers the likelihood of reporting a disability by 1.7 percentage points (relative to a sample mean of 9.2), and the likelihood reporting a disability that limits daily activity by 2.5 percentage points. In the UK, a one-year increase in schooling lowers the probability of reporting

being in poor health by 3.2 percentage points and raises the chances of reporting being in good health by 6 percentage points (Table 11).

Table 11. Marginal effects of a one year increase in schooling (%)

Effect on	USA	UK
Disability limiting personal care	-31.5	
Disability limiting mobility	-24.2	
In poor health		-12.7
In good health		4.4

Source: Based on Oreopoulos (2003), Tables 3, col 3 and Table 4, col. 4.

Feinstein et al. (2006) report that those with more years of schooling tend to have better health and health behaviors, and that these effects are causal to a substantive extent (Table12).

Table 12. Effects of one additional year of schooling

Country	Effect
USA	Reduced probability of dying in the next 10 years by 3.6 percentage points. Reduced probability of having a work-limiting condition by 2.6 percentage points, from a mean value of 12.5%. For adults over 51, increased probability of finding it easy to climb stairs by 4 percentage points from a mean value of 79. Increased amount of exercise per 2 weeks by 34 minutes, weekly strenuous exercise from 2.9 to 3.0 days per week, and walking from 3.2 to 3.4 days per week.
Sweden	Reduced standardized index of bad health by 18.5%. Increased likelihood of having Body Mass Index in the healthy range by 12 percentage points, from 60% to nearly 72%.

Source: Based on Feinstein et al. (2006), Table 4.4.1.

In the Netherlands, Hartog and Oosterbeek (1998) controlled for a host of factors that may affect the health status and happiness of an individual. People with upper secondary education seem to be twice as happy relative to those with a lower level of education (Table 13).

Table 13. Predicted probabilities of health and happiness by level of education, Netherlands (%)

Educational level	Intermediate secondary	Higher secondary
Very good health	24.4	36.7
Highest happiness	4.0	7.4

Source: Based on Hartog and Oosterbeek (1998), Tables 3 and 7.

In a macro-level analysis using several health indicators Weil (2005) found that variation in health explained 23% of the share of cross-country variance in log-income per worker, roughly the same explained by education. According to Weil estimates, eliminating health variations among countries would reduce world income variance by 37%.

Spasojevic (2003) used a person's current income in the first-stage equation of her instrumental variables estimates of educational effects on an index of bad health to account for a contemporaneous income effect on education. She found that a one-year increase in schooling nearly equals a $17,700 income increase in terms of health.

Currie and Moretti (2003) also used instrumental variables to estimate the impact of schooling on health outcomes. They found that 12% of the decrease in the probability of low birth weight and 20% of the decrease in the probability of pre-term birth can be attributed to increased maternal education. The costs of low birth weight and prematurity are large. For example, it is estimated that between birth and age 15, low birth weight children incur an additional $5.5 to 6 billion more in health, education, and other costs than children of normal birth weight.

In a meta-analysis of 18 studies estimating the effect of education on health, Groot and van den Brink (2004) found that one year of education increases the quality-adjusted life years (QALY) of a person by 0.023. QALY's combine quality and quantity (mortality and morbidity) in one unified measure of quality-of-life-corrected life years. From the value of a statistical life literature, this translates to €90,000 per QALY (Laupacis et al. 1992). With a remaining life expectancy at age 18 of 58 years for men and 63 years for women, the discounted present value of a QALY is approximately €1.7 million. When comparing this benefit to the marginal cost of one year of education, the authors report that the benefits exceed the costs by a factor or six to seven times.

In a more recent analysis Groot and van den Brink (2007) used data from a large survey for the Netherlands to estimate the education effects on health (Table 14). Calculated at the average value of GDP per capita, the implied health returns to education are 1.3–5.8%. Or, taking into account the returns to health, the rate of return to investment in education, as conventionally calculated in the economics of education, should be increased by up to 60 percent.

Table 14. Value of health gain due to one extra year of education

Dimension	Men	Women
Absolute value (€)	600 - 1380	300 - 600
Percent of GDP per capita	2.5 - 5.0	1.2 - 2.8

Source: Groot and van den Brink (2007), Table 7.

Dynarski (2003) finds that offering $1,000 of grant aid results in an increase in education of 0.16 years, which translates into 0.03-0.10 years of additional life (depending on discounting). This translates roughly to $2,250-$7,200 in present value. Indicative of the value of reducing mortality, Murphy and Topel (2006) report that in the United States potential gains from a reduction of cancer mortality by 1% would be worth $500 billion.

Crime

One mechanism by which education affects crime is that schooling increases the returns to legitimate work, raising the opportunity cost of illicit behavior. By raising wages, schooling makes prison time more costly. Schooling may increase risk aversion and patience (Becker and Mulligan 1997). The higher income effect of education makes the more educated less prone to engage in criminal activities, either because of a time conflict while being in school, or because they may not need the immediate cash reward of illegal actions. If education reduces discount rates (increases patience) it reduces the propensity to commit crime since potential punishments extend into the future and the threat of future punishments will bear more heavily in any decision on whether or not to engage in crime (Lochner and Moretti 2004). There is ample evidence that the more educated are less prone to be engaged in crime, as shown in the case of the United States (Table 15).

Table 15. Average incarceration rates by level of education, USA

Population group	Incarceration rate (%)	
	High school dropout	High school graduate
White males	0.83	0.34
Black males	3.64	2.18

Source: Based on Lochner and Moretti (2004), p. 160.

Machin and Meghir (2000) report that in the UK a 10 percent rise in the average wages of those on low pay reduces the property crime rate by between 0.7 and 1.0 percentage points. The estimated benefits would be worth between £1.3 and £1.8 billion in an average year.

Feinstein (2002a) suggests that the benefit in terms of reduced crime through the effect on wages of a 1 point increase in the proportion of the working age area population with O Level or equivalent qualifications lies between £10 million and £320 million. (O and A level qualifications relate to a lower and higher exit points, respectively, in the British secondary school system). The benefit of one extra percentage point of those in the area population with O Levels reaching A Level or equivalent qualifications and those with O Levels or equivalent who progressed were replaced by those who had previously had no qualifications, lies between £80 million and £500 million. Assuming linearity, a 5 point increase in qualifications would have effects of between £400 million and £2,500 million. If the effects of wages on property crime were applied to other forms of crime, in particular violent crime, the benefits would increase by a factor of 2.7. For example, if the proportion of the working age population with no qualifications were reduced by 1 percentage point and those people achieved A Level or equivalent qualifications, the saving in reduced crime would then be £665 million per year.

Lochner and Moretti (2004) have investigated the effect of high school graduation on various types of crime in the United States using robust econometric techniques regarding selectivity bias. The probability of a black dropout to be in prison is more than 4 times higher than that for white dropouts. They found that one additional year of schooling reduces the probability of imprisonment by 0.1 percentage point for whites and up to 0.5 percentage points for blacks. About one quarter of the difference of the imprisonment rate between blacks and whites could be eliminated if blacks and whites had the same level of education. They also estimated that a 10 percentage point increase in graduation rates would reduce murder and assault arrest rates by 20%, car theft by 13% and arson by 8%. They also confirmed that an important explanation for the effect of education on crime is the higher wage rates associated with finishing high school. Table 16 presents their estimates of a

reduction in the number of crimes, the benefits associated with increasing the high school completion rate by 1 percent.

Table 16. Social benefits of crime reduction by increasing high school completion rate by one percent

Crime	Change in crime	Cost per crime ($)	Social benefit (in million $)
Murder	-373	3,024,359	1,129
Assault	-37,135	9,917	368
Arson	-469	30,042	18
Car theft	-14,238	1,245	18

Source: Lochner and Moretti (2004), Table 13.

The authors considered the general equilibrium possibility that raising the graduation rate wages of graduates would be reduced, thus lowering the benefits. They estimated the positive externality in crime reduction generated by one extra high school graduate to lie between 14% and 26% of the private rate of return to high school graduation. This externality is even greater for blacks. Taking into account the social benefits for increasing by 1% the high school graduation rate, it might be more cost-effective to combat crime by means of education rather than training police.

Prince's Trust (2007) estimates that the cost of youth crime in Great Britain was in excess of £1 billion in 2004. UK evidence on the effects of the Educational Maintenance Allowance and the Reducing Burglary Initiative suggest that programs like these can lead to savings of about £3,595-£4,902 per 1,000 pupils because of reduced levels of crime.

Social welfare

Oreopoulos (2003) reports that, after controls based on minimum schooling legislation, one extra year of schooling has a significant effect in reducing dependence on social welfare payments in Canada and the Untied States (Table 17). It has also an effect on reducing the number of those below the poverty line.

Table 17. Marginal labour market effects of one extra year of schooling (%)

Effect on	USA	Canada	UK
On welfare, income support	-29.9		-47.0
Below poverty line	-38.6	-8.3	

Source: Based on Oreopoulos (2003), Tables 3, col 3 and Table 4, col. 4.

Civic and social cohesion

The civic dimension of education benefits can take the form of social engagement, activity aimed at influencing public policy, the desire to influence public policy, voting in public elections, trust in other people or public institutions and political parties, tolerance to extend civil liberties to unpopular groups and knowledge of democratic institutions and processes (Wolfe and Haveman 2000, Oliva and Rivera Batiz 2002, McMahon 2004, Dee 2004, Milligan et al. 2004, OECD 2006). The civic terrain is not as well researched as that of labor markets and health.

Pushing the effects of education to the "wider effects of learning", Green et al. (2004) report a set of simple correlations between a measure of education (literacy score) and several indicators of social cohesion (Table 18). The correlations are based on a cross-section of 13 OECD countries that participated in the International Adult Literacy Survey. Out of the eight indicators, only general trust is statistically significantly associated with the literacy score.

Table 18. Zero-order correlation between literacy and social cohesion indicators

Indicator	Correlation coefficient
General trust	0.354*
Civic participation	-0.120
Trust in democracy	0.244
Cheating on taxes	-0.376
Cheating on public transport	-0.487
Violent crime	-0.055
Tolerance	0.491
Risk of assault	-0.505

Source: Green, Preston and Malmberg (2004), Table 3.
Note: * Significant at the 5% level of probability.

Dee (2004) used variation in the adoption of child-labor laws across American states as an instrument for educational attainment. His 2-stage least square estimates suggest that one additional year of schooling increases voter participation by 6.8 percentage points and the frequency of newspaper readership. Schooling significantly increased support for free speech by anti-religionists, communists and homosexuals by 8.0 to 12.5 percentage points. An extra 2.5 years of secondary schooling would also increase voter turnout by roughly 17 percentage points.

Milligan, Moretti, and Oreopoulos (2004) used both compulsory education and child labor laws as instruments for educational attainment in the USA and the UK to estimate the impact of education on voter turnout. They found a strong and robust relationship between education and voting for the US, but not for the UK. The results suggest that the observed drop in voter turnout in the US from 1964 to 2000 would have been 10.4 to 12.3 percentage points greater if high school attainment had stayed at 1964 rates, holding all else constant.

Macro externalities

When aggregated to the economy as a whole, the above micro effects of education are reflected in the country's rate of economic growth (Bassanini and Scarpetta 2001, de la Fuente and Ciccone 2003, Coulombe et al. 2004). In OECD countries, each year of schooling is statistically significantly associated with a 0.3 higher rate of economic growth. Not only is the quantity of education important in this respect, but education quality as well. Using PISA test scores as a measure of education quality, Hanushek and Wößmann (2007) found that in OECD countries a one standard deviation increase in test scores is associated with a two percentage points higher rate of economic growth of GDP per capita.

Beyond the individual external effects of education identified above, there are complementary and overlapping macro externalities. This is when a higher level of education in general acts as an efficiency booster of other factors of production (Lucas 1988). More educated workers act as informal teachers on less educated co-workers. More educated parents raise higher quality children in terms of offspring health and education. Less unemployment associated with more education means better social cohesion.

Evidence on such aggregate human capital externalities is mixed. The difficulties in identifying externalities are explained in Ciccone and Peri (2006), and the divide between the micro and macro literature on the effects of education on economic growth in Sianesi and van Reenen (2003) and Pritchett (2006). A major difficulty in identifying education externalities is that the output, as typically measured in national accounts, includes only market-observed effects of education.

From associations to causation

Moving from the incidence and associations presented, one needs a theory for understanding the mechanism by which an education effect takes place, and testing that theory. Only then one can be confident that the associations are not spurious and use education as an instrument for economic and social development. One must also know the relative cost of achieving a beneficial outcome by means of an education vs. another type of intervention.

Differences in unobservable characteristics create a major problem in isolating the effect of education. Schooling decisions and outcomes are likely to be correlated with a host of factors influencing both educational attainment and outcomes, such as ability and socioeconomic background. Econometric techniques, such as instrumental variables, matching, and difference- in-differences approach, have been used extensively to deal with the bias resulting from unobservable factors. Instrumental variable results indicate that the effect of education is larger than the estimated effect by ordinary least squares. This may be explained by the fact that the instruments are based on policy interventions, such as school reforms to increase participation or changes in compulsory school leaving age laws, that affect the educational choices of those with lower levels of education (Card 1999; Angrist, Imbens and Rubin, 1996).

In order to design interventions for correcting school failure, one must understand the reasons for such failure. E.g., Robinson (1999) found that in Australia students in the top quartile of school achievement were 7 to 8 times more likely to complete school than those in the lowest quartile. Ball and Lamb (2001) found that students in the lowest quartile of achievement in the literacy and numeracy test in Year 9 are almost four times more likely to leave school early than those in the highest quartile of achievement. Teese and Walstab (2002) reports that 38 per cent of the earliest leavers say they are not doing well enough to continue at school. MCEETYA (2000) reports that 78 per cent of students from high

socioeconomic households complete Year 12, compared with only 61 per cent of students from low socioeconomic households. Teese and Walstab (2002) also found a strong relationship between school completions and socioeconomic class. Marks and Fleming (1999) report that early school leavers are more likely to have parents in low skilled jobs or with little formal education. Students with parents in manual employment are almost twice as likely to leave school early as students with parents from a professional background. Geography also affects school-leaving rates. Students in regional or rural areas display a higher incidence of early school leaving (Teese and Walstab 2002).

4. Cost-benefit studies

A thorough literature review identified only three studies attempting a full-blown cost-benefit analysis of reducing school failure. Two of the studies refer to the United States and one to Australia.

The Teachers' College study

The most comprehensive study attempting a cost-benefit analysis in this respect comes from an ongoing project at Teachers' College, Columbia University titled "An excellent education for all of America's children " (Levin 2005, Levin et al. 2006, 2007a, 2007b, http://www.cbcse.org). Indicative of the interchangeability of terms associated with school failure, the project started as "The social costs of inadequate education," and education excellence was narrowed down and defined as high school graduation for estimation purposes. This study is reported in some detail as it might serve as a model for undertaking similar work in Europe.

Failing to complete high school is a big issue in the United States. At least three out of ten students do not graduate on time in the public school system. Graduation rates for black males are as low as 43 percent. In 2005, nearly one quarter of male 20-year old in the US male population were high school dropouts. This statistic is nearly 60 percent for Hispanics (Levin et al. 2007a, p. 3).

The study's methodology involved three steps: First, estimates were made of the various private and social costs associated with high school dropouts. These estimates give the potential benefit of reducing the high school dropout rate. In a second step, various interventions expected to increase high school completion were costed. Finally, the costs and benefits were combined into a cost-benefit model. Steps one and two relied heavily on existing studies having estimated partial effects of education on social outcomes, as those reported above.

Step 1 – Assessing the gross benefits

(a) Labor market outcomes. Census data were used to estimate the employment probability of high school dropouts and completers, as well as the earnings of the two groups while employed. Annual earnings were aggregated over a person's working life assuming a 1.5% productivity growth rate and a 3.5% discount rate. It was found that in terms of present values at age 20, a high school graduate is expected to earn approximately $900,000 vs. $600,000 of a high school dropout (Table 19).

Table 19. Labor market outcomes by high school completion state, USA

Category/ subgroup	Dropout	Graduate
Employment probability (%)		
White males	71	79
Black males	49	66
White females	46	65
Black females	46	63
Mean annual earnings ($)		
White males	22,800	33,900
Black males	13,500	21,800
White females	7,800	16,500
Black females	10,000	14,200
Lifetime earnings	600,000	900,000

Source: Based on Levin et al. (2007a), Table 4 and Chart 1, whites.

(b) Tax revenue. Given the above earnings, a tax simulation model (TAXSIM) was used to estimate federal and state income taxes paid by the two groups. It was estimated that one extra high school graduate is expected to pay $139,100 more in taxes over his or her lifetime relative to a dropout.

(c) Health. It was found that because of their higher income and better health status, high school graduates depend less on the public health system (Medicare and Medicaid). This translates that, for example, a white female high school dropout would receive $60,800 in public health benefits over her lifetime, vs. $23,200 for a high school graduate. For one extra high school graduate, lifetime public health expenditures are reduced by $40,500 on average (Levin et al. 2007a, pp. 11, 12).

(d) Crime. Although dropouts constitute less than 20% of the US population, they make over 50% of prison inmates. Table 20 shows the expected impact of high school graduation in reducing various types of crime. Using Bureau of Justice Statistics data it was estimated that one extra high school graduate saves over a lifetime $26,600 in terms of policing, arresting, sentencing and incarceration costs.

Table 20. Crimes and expected reduction of crime from high school graduation

Crime type	Number of crimes per 1,000 high school dropouts	Expected reduction in crime from high school graduation (%)
Murder	0.82	19.6
Rape	2.43	19.6
Violent crime	32.24	19.6
Property crime	179.17	10.4
Drug offenses	600.43	11.5

Source: Based on Levin et al. (2007a), p. 13.

(e) Welfare expenditures. Each year the US federal and state government spend about $200 billion on need-based public assistance programs in the form of cash, food, housing, training and energy aid. As income rises, such aid is diminished. High school dropouts are disproportionaly represented among welfare recipients. Dropouts are only about 20% of the population, but they are about 45% of all welfare recipients. Therefore, reducing the number of dropouts would reduce the scale of welfare payments because it would reduce the rate of welfare receipt. In a first step, a model was used to estimate the impact of education in

reducing welfare receipts for various welfare programs. In a second step, the savings in welfare expenditures was estimated over the lifetime of an extra high school graduate. Table 21 shows the expected welfare expenditure savings for four programs.

Table 21. High school graduation impact on welfare receipts, relative to dropout

Program	High school graduation impact (%)	Present value of lifetime cost-saving ($)
Temporary assistance to needy families	-39.5	1,259
Housing assistance	-0.7	819
Food stamps	-18.6	503
Female welfare spells	-68.3	387

Source: Levin et al. (2006), p.53-54.

Aggregate benefits per high school graduate. When aggregated, the present value of higher income, better health, lower criminality and lower welfare receipts amounted to $209,100 per average school graduate at age 20. This value is higher for black males ($268,500). The value is gross in the sense that it has to be compared to the cost of increasing high school graduation.

Step 2 - Interventions to increase high school graduation

Five programs have been identified that demonstrably increase high school graduation. The effect of each program on high school graduation and the cost of the program for generating one extra high school graduate are given in Table 22.

Table 22. Interventions that increase high school graduation

Intervention	Extra high school graduates (per 100 students in intervention)	Cost per new graduate ($)
Perry preschool 1.8 years of a center-based program for 2.5 hours per weekday, child-teacher ratio of 5:1; home visits; and group meetings of parents.	19	90,700
First Things First Comprehensive school reform of: small learning communities with dedicated teachers; family advocates; instructional improvement efforts.	16	59,100
Class size reduction 4 years of schooling (grades K–3) with class size reduced from 25 to 15.	11	143,600
Chicago child-parent Center-based pre-school program: parental center program involvement, outreach and health/nutrition services.	11	67,700
Teacher salary increase 10% increase in teacher salaries for all years K–12.	5	82,000

Source: Levin et al. (2006), Table 2.4.

Step 3 - Cost-benefit analysis

Table 23 shows the results of applying cost-benefit analysis to the five interventions. The cost-benefit ratio of the various interventions range from 1.5 to 3.5, i.e. the benefits far exceed the costs of the intervention in all cases. The net present values of each intervention are also substantial, ranging from $65,500 to $150,100 per high school graduate.

Table 23. Cost-benefit analysis of selected interventions to raise high school graduation

Intervention	First Things First	Chicago Parent-Child	Teacher salary increase	Perry Preschool	Class size reduction
Benefits ($)	209,100	209,100	209,100	209,100	209,100
Cost ($)	59,100	67,700	82,000	90,700	143,600
Net present value ($)	150,100	141,400	127,100	118,400	65,500
Benefit-cost ratio	3.54	3.09	2.55	2.31	1.46

Source: Based on Levin et al. (2007a), p. 18.

The net present values reported in Table 23 refer to one extra high school graduate. In the United States, each cohort of 20-year olds generates over 700,000 dropouts. The fiscal consequences is $148 billion in lost tax revenues and additional public expenditure

over a lifetime. If this number were reduced by half through successful implementation of the median intervention (teacher salary increase) the net present value of the economic benefits would be $45 billion per year.

The case of minorities

In a related sub-analysis of minorities, Levin et al. (2007b) calculated the public savings (financial benefits) from greater public investments in the education of African American males. Over one-fifth of each age cohort of black males in the U.S. does not graduate from high school. Based on the five interventions reported above, they calculated the lifetime public benefits in terms of increased tax revenues and lower spending on health and crime. In terms of present values for a black male aged 20, these public benefits amount to $256,700 per new graduate, while the median intervention would cost only $90,700. Taking into account the increased tax revenues, health cost savings and crime cost savings, and comparing these benefits to the cost of the five interventions, they came up with the benefit-cost ratios reported in Table 24. If the high school graduation rate of black males were equalized to that of white males, the net public benefit would range from $3.3 to $4.7 billion for a single cohort of 20 year olds.

Table 24. Costs and benefits of education for interventions for blacks

Intervention	First Things First	Chicago Parent-Child	Perry Preschool	Class size reduction	Teacher salary increase
Net present value	$197,599	$188,951	$165,971	$159,292	$136,427
Benefit-cost ratio	4.35	3.79	2.83	2.64	2.13
Total economic effect of equal graduation rates for black and white males	$4.74 bn	$4.53 bn	$ 3.98 bn	$3.82 bn	$ 3.27 bn

Source: Levin et al. (2007a), Table 4.

By way of summary, below are some highlights from of the Teachers College study:

- The present rate of high school dropouts in the United States entails a loss of $260,000 less lifetime earnings of a high school dropout vs.a high school graduate, $60,000 less in taxes paid and $58 billion in total annual health bills.

- The country loses $192 billion (1.6% of GDP) in income and tax revenue with each cohort of 18-year-olds who never complete high school.

- Increasing the average years of schooling for dropouts by one year would mean 30% less murder and assaults, 20% less car thefts, 13% less arsons and 13% less burglaries. Increasing the high school completion rate by 1% for all men would translate to $1.4 billion per year in reduced costs from crime.

- The benefit-cost ratio of preschool programs in terms of reduced costs of crime, drug use and teen parenting is 7:1 (Levin 2005).

The Rand Corporation study

This is a cost-benefit analysis of closing the education gap between minorities and the rest of the population in California, and extended to the rest of the country as a whole (Vernez et al. 1999). Because of immigration, one half of the school population in the state of California is Hispanic. The study projects that Hispanics and blacks will soon constitute 75% of the state's high school dropouts. The study addressed the following questions:

- What would happen if the educational attainment (e.g., defined in terms of high school completion) of blacks and Hispanics were increased towards that of non-Hispanic whites?

- How much would such education cost?

- What savings to government would the additional education generate, both by decreasing the demand for social programs and by increasing tax revenues?

The study involved three steps:

- Estimating the relationship between educational attainment and public spending and revenues.

- Developing a dynamic model of flows of the student population and projecting the number of high school dropouts.

- Using the above model to simulate the cost of various interventions to close the education gap between non-Hispanic whites, and blacks and Hispanics.

The welfare benefits received by a particular person were expressed as a function of his or her education and a host of socioeconomic factors such as ethnicity, age, gender, nativity and parental characteristics. Because only a small share of the population receives benefits from a specific public social program the model was estimated in two steps. In the first step, the probability of receiving a public benefit in a given year was estimated as a probit function of education and the individual's characteristics. In the second step, the annual benefit received from each program was estimated again as a function of the individual's characteristics. Public program utilization differs sharply between high school dropouts and graduates (Table 25).

Table 25. Social program utilization by state of high school graduation (%)

Program	High school dropout	High school graduate
Welfare assistance	7.5	3.8
Food stamps	16.4	7.4
Unemployment insurance	6.5	7.3
School meals	21.2	14.2
Energy assistance	11.7	4.8
Social security	42.3	20.8
Medicare	38.8	17.6
Medicaid	18.5	7.0
In prison	0.7	0.4

Source: Vernez et al. (1999) pp. 106-107.

The incidence of program use among recipients was costed, e.g. inpatient Medicare costs were about $10,000 per person, and keeping a person in prison $25,000 per year. Aggregating the costs of various programs and applying the probability of a sub-group using such program, it was estimated that, in the case of native black males at age 30, the savings reported in Table 26 would be realized. Tables 27 and 28 report the aggregate costs and benefits applying to the case of closing the high school gap between the whites and minorities.

Table 26. Effect of high school graduation vs. dropping out, black males

Item	Value per extra high school graduate ($ per year)
Welfare program savings	7,064
Increased tax revenue	1,039
Increased disposable income	2,257

Vernez et al. (1999), p. 143.

Table 27. Estimated costs and benefits of closing the high school gap between non-Hispanic whites and minorities ($ billions)

Location	Costs	Benefits			
		Savings in public expenditures	Income tax revenues	Subtotal public benefits	Private benefits
California	1.8	1.9	2.2	4.2	3.9
Rest of the USA	3.7	6.6	5.3	11.9	9.1

Source: Vernez et al. (1999), p. 190.

Table 28. Benefit-cost ratios of closing the high school gap for Blacks and Hispanics

Location	Public	Societal
California	2.4	4.6
Rest of the USA	3.3	5.7

Source: Vernez et al. (1999), Table 5.2.

Note: The "public" ratio includes the savings in public expenditures and the increase in tax revenues. The "societal" ratio includes these two public benefits plus the increase in private disposable income.

The Australian study

Each year in Australia one in three teenagers leaves school without completing Year-12 education. Early school leaving is associated with poor school achievement and strong dislike of school. Early school leavers are less likely to participate in the labor force and more likely to be unemployed than Year-12 leavers. Three studies were conducted to address the above problem, each one building on the results of the previous one.

Applied Economics (2002) analyzed the costs and benefits of providing Year-12 equivalent education to 50 per cent of the early school leavers in a five-year cohort. The 50 percent take-up figure was adopted because it was considered to be the upper level of Year-12 equivalent education that might be achieved in the near future.

The costs include public expenditure on education and training courses in schools or apprenticeships for 40 per cent of the students, the private costs of education (books, travel etc.), and incomes foregone during study. It should be noted that the study differs from the one for the United States, in the sense that the intervention to address the dropout problem includes training and labor market assistance.

The estimated benefits include the increased net earnings of students (after allowing for foregone earnings), increased profits of employers and benefits to society as a whole. The latter were assumed to equal 20 percent of the earnings gains due to education. It should be noted that this is a guess estimate, rather than based on specific case studies to assess the wider benefits of education in Australia. The estimates allowed for some displacement of output of the existing workforce while the students are in school or in training. This was assumed to equal 10 per cent of the increased earnings of students completing Year-12 education.

The intervention was assumed to last several years during which the costs are incurred. The horizon of the expected benefits was year 2050 (Table 29). Accounting for all such benefits and costs, the estimated net present value of the proposed programs is $8.2 billion using a 5 per cent discount rate. The benefit-cost ratio was estimated to be 3.3.

Table 29. Costs and benefits of providing further education to a five year cohort (in $million)

Item	2004	2005	2006	2007	2008	2009	2010	Present value in 2011 of benefits 2011 to 2050
Government costs	304	492	573	577	579	271	72	
Private student costs	40	66	76	76	76	36	9	
Total Cost	344	558	649	653	655	307	81	
Net earnings of students	-181	-367	-362	-274	-156	150	513	13,578
Benefits to employers	0	0	0	0	0	22	77	2,037
Social benefits	0	0	0	0	0	30	102	2,715
Less displaced output	0	0	0	0	0	-15	-51	-1,358
Total Benefit	-181	-367	-362	-274	-156	187	641	16,972
Net benefit	-525	-925	-1011	-927	-811	-120	560	16,972
Net present value @ 5%	8,183							

Source: Adapted from Applied Economics (2002), Table S.1.

Government bears a large part of the program costs initially. However, the study estimates that if government recoups by way of taxes 25 per cent of the increased earnings of students and businesses, the present value of its receipts will approximately equal the present value of its outlays. In addition, the program would increase employment by an estimated 18,000 people, including increased workforce participation, and save about $80 million in annual unemployment benefits.

The study has not formally evaluated the full social benefits and costs of labor market programs. But based on existing research (by Piggott and Chapman 1995) regarding the effectiveness of such programs and the likely displacement effects, the authors conclude that the financial return to the government is likely to be positive, with the present value of savings on future government expenditures exceeding the present value of program outlays.
`

Allen Consulting Group (2003) extended the above study by using a macroeconomic model to examine the impact of increasing the proportion of one cohort of young people in Australia who achieve a Year-12 or equivalent education from 80 to 90 per cent. This increase represents 50 per cent of early school leavers. The model estimates the impact of the implementation of the program on key macroeconomic indicators such as the GDP and the terms of trade. The net impact of the program on economic welfare over the forecast period was also examined. The modeling involved estimating the impact of the proposed policy by applying a 'policy shock' to a business–as–usual forecast.

The key results of the modeling was that the program requires an investment in the short term—less labor input to the economy and increased taxes to finance extra provision of education services. As a result, during the implementation of the program GDP and private consumption fall relative to business–as–usual levels. In the longer run however, the benefits of the program outweigh its costs. Over time, labor inputs increase and taxes fall as a result of the additional economic activity generated by the program. In 2020, GDP is 0.28 per cent (or around $1.8 billion) greater than would otherwise have been the case. In terms of welfare, modeling results show that the policy would generate a rate of return of around 9.6 per cent over the period 2004 to 2050.

Access Economics (2005) extended further the analysis to a dynamic cohort model for population, the economy and the federal budget, treating the stock of education as an endogenous variable in the production function. The analysis assumed a balanced Government budget. In estimating the economy-wide effects of increased retention in education and training the authors borrowed existing research "by the OECD and others". The model assumed a productivity gain of 4% per person per year of education on average. Labour force participation rates increase by 6% over the long term for workers aged 25 and above, but fall 2% for 15-25 year olds. The GDP impact of the program was estimated to be 1.1% in 2040.

b) Critical Assessment

The review of the studies presented above gives a flavour of the complexity of the research question. The costs of school failure extend beyond the individual student who drops out to society at large. Private costs, such as lower lifetime earnings, have been adequately documented, and so have lost taxes and social welfare payments. Social costs, such as forgoing the benefits of the wider effects of learning, have only recently started to be the subject of rigorous research. Even so, such benefits span the range of several disciplines for the issues to be addressed in a comprehensive manner. Beyond economics, one needs expertise in sociology, psychology, medicine, criminology and political science. And once education effects not observable in the market have been documented, it is difficult to translate them into monetary values for the purpose of cost-benefit analysis.

The above review of the literature has shown that there is more evidence on partial effects than comprehensive cost-benefit analyses. The few studies that have attempted a full-blown cost-benefit analysis had to rely on too many assumptions in order to arrive at an overall benefit-cost ratio of programs to reduce school failure, e.g., that the external benefits amount to a given percentage of observed private benefits, or that the beneficial effects of high school completion would linearly apply to those who now drop out.

Surprisingly, the equity dimension of school failure has not been fully addressed in this literature. This is lamentable, because it is those who come from lower a socioeconomic background who are more likely to fail in school. Reducing the number of early school leavers is likely to also have an equity effect, because it will be mainly those from less privileged origins who will not complete secondary school (as documented in Sweden by Meghir and Palme 2005, and in Greece by Paleocrassas et al. 1997).

European countries are virtually absent among the studies reviewed. Exceptions are a handful of studies on partial effects using data from the United Kingdom the Netherlands and Sweden. The literature is dominated by the United States, and to some extent Australia and Canada.

The dominant definition of school failure for empirical purposes is the quantitative indicator of secondary school dropouts. No comprehensive study exists on the social costs and benefits based on the qualitative indicator of low cognitive achievement.

Much of the evidence on partial effects refers to that of one year of schooling on average, i.e. not specifically to secondary school graduation.

Most studies have been based on linearities, abstracting from elasticities, substitutions or general equilibrium effects. For example, only a couple of studies considered the possibility of lower high school graduate earnings because of the increased supply of graduates, or accounted for forgone output because of keeping students in school.

Even rarer is assessing the economy-wide effects of reducing school failure using a macroeconomic model.

The studies did not consider the possibility of increasing costs of remedial action for keeping in school older students, or students who are less willing to learn, or and/are less able. Also, the possibility that crime can take place during school hours has not been taken into account.

Regarding how convincing are the studies, this is a function of the topic dealt with. The most convincing evidence refers to the private effect of education on income, and of course the related tax revenues and welfare receipts. The least convincing evidence is the one related to the civic effects of education. Understandably, whatever civic effects of education are found have not been monetized. In-between lie the partial effects of education on health improvement, and next on crime reduction.

The reasons and the extent of the divide between a privately optimal but socially sub-optimal decision to leaving school early have not been sufficiently addressed in the literature. Even whether an individual made a privately optimal decision in dropping out is debatable. One major assumption might be violated - that the individual has perfect information on the consequences of his/her decision regarding future private benefits. Another assumption is that there is access to the credit market for borrowing to cover the costs allowing the student to graduate. Both assumptions might be violated especially (but not exclusively) regarding students coming from a less privileged socioeconomic background.

One important finding is that individuals are not fully aware of the health returns to education - compulsory schooling yielding large returns in terms of mortality reduction (Lleras-Muney 2005). Oreopoulos (2006) also finds evidence that individuals' education investments are sub-optimal given the rate of return. Whether this is due to lack of information or credit constraints is not known.

Out of the three full-blown cost-benefit analyses reviewed above, the Teachers' College study is the most convincing relative to the others in the sense that it built on country-specific (USA) research to quantify the various sub-effects on health and crime. The least convincing is the one referring to Australia as it used too many assumptions in arriving at the benefit-cost ratios. On the other hand, the US study did not take into account general equilibrium effects, such as the reduction of labor market benefits because of the expansion of the number of graduates.

5. Feasibility of a European study

Given the glaring absence of even a single full-blown cost-benefit analysis of school failure in Europe and the apparent magnitude of the problem, a study might be in order. Ideally such study should be conducted within each one of the Member States and the results possibly aggregated to the EU level. Below we explore how such study could be conducted.

Step 1 – Adopt one or more "school failure" indicators. Given the availability of data and work already done on the subject, the EU benchmark definition of early school leavers would be a natural starting point. As mentioned above, this is not necessarily the best indicator because it ignores education quality. A second measure is leaving school without obtaining a certificate or academic/vocational qualification. A third and better measure is the level of cognitive achievement of school leavers, whether they drop out early or not. For example, if the score in a literacy test is below a given benchmark, this would be classified as failure. No

single indicator should be imposed on all countries. Data availability and financial resources will dictate how far a country can go in documenting school failure in a rigorous way.

Step 2 – Estimate the gross cost of school failure on a series of outcomes, listed below in ascending order of empirical difficulty. The cost per student failing is relative to a control group of those who do not fail, according to the definition adopted.

- **Labor market losses.** Lower labour market participation, higher unemployment, lower annual earnings, lower lifetime earnings.

- **Equity**. Contribution of school failure to the number of those below the poverty line or to the size of a measure of income distribution.

- **Fiscal**. Losses in tax and social security revenue because of the lower labour market participation and earnings of school failures.

- **Social welfare**. Unemployment and other social assistance payments to those who have failed.

- **Health**. Private and public health costs associated with school failure.

- **Crime.** Social costs of policing, sentencing and imprisonment due to school failure.

- **Civic.** Less voter participation or social engagement. Qualitative, not monetized.

- **Lifelong learning.** Diminished chances that those who failed in school will participate in further education or training – an issue of major importance in the EU.

Step 3 - Identify the factors leading to school failure. Why some students drop out early in a particular country? Is it a matter of lack of information on the future benefits associated with graduation? Or is it due to family credit constraints and the need of the dropout's income? If an achievement indicator is chosen, why some students leave school with low cognitive skills? Is it due to their socioeconomic background, lack of school resources or else?

Step 4 – Identify which interventions are cost effective in reducing school failure, e.g., reducing class size, having central exams, programs to keep in school students at risk, such as direct financial assistance to the family (e.g., the Education Family Allowance in the UK).

Step 5 – Use a model to simulate and compare a business-as-usual situation to the one after the school failure reducing intervention(s).

Step 6 - Conduct a cost-benefit analysis to find the net present value, internal rate of return or benefit-cost ratio of policies to reduce school failure.

b) What methodology should be used?

Move beyond simple associations and incidence to establishing causal relationships. This can only be done by exploiting special samples of the population where more or less education is the result of an exogenous factor, rather than being determined by unmeasured variables. Examples of exogenous producing education variation are identical twins

separated early in life, minimum schooling laws, military drafting, child labour laws or month-of-birth determining school year entrance (as in Ashenfelter and Rouse 1998, Angrist and Krueger 1991, 1999).

Regarding the labor market earnings effect, the extended Mincerian earnings function can be used as the main analytical tool, adapted to the data in hand (Mincer 1974, Rouse 2005). The difference of the coefficients of the dummy variables of high school completion and high school dropout is a good indictor of the private earnings premium associated with high school graduation. Regarding the social premium, the fitting of the function could be restricted to those employed in the private sector of the economy for their earnings to proxy their productivity (as in Psacharopoulos 1983).

The equity effects of high school graduation can be assessed by means of a simulation model predicting the earnings distribution under a business-as-usual and a decreased-early-school- leaving scenario. The fitted Mincerian earnings functions can be used as the base for simulating the value of before-after inequality indices, e.g., the Gini or Theil (as in Psacharopoulos 1976, Marin and Psacharopoulos 1976). Consider separately the efficiency and the equity effects and do not be tempted to integrate them into a composite efficiency-cum-equity indicator of social welfare. Such blending requires value weights that are better left to politicians.

Foregone taxes due to early school leaving can be estimated in a similar manner, i.e. by inserting the coefficients of the fitted Mincerian functions into a tax simulation model (as in Levin et al. 2006a).

The social welfare payments can be assessed by means of a demographic projection model where a distinction is made between age groups with incomplete and completed secondary education (as in Levin et al. 2006a).

Identification of the reasons for dropping out of school could be the result of a probit or logit function explaining the 0-1 high school graduation state, where 1 refers to early school leaver and 0 to completion (as in Oreopoulos 2003). In this respect, it would also be helpful to draw on the non-economics literature. But money is certainly one of the reasons for dropping out, either because parents cannot afford to support their children, or that children themselves need the income.

One reason for dropping out is previous low achievement (Applied Economics 2002). This necessitates to study the determinants of achievement using an educational production function (as in Wößmann 2002, 2005) and costing alternative ways to improve achievement (as in Harbison and Hanushek 1992).

The health effects of high school completion or higher achievement could be assessed by a health production function where the dependent variable is the state of health of an individual and the control variables include dummies for high school graduation or not (as in Cutler and Lleras-Muney 2006). To the extent possible, the health status should be real, rather than self-assessed.

The crime effects could be isolated using a crime production function, as in Locher and Moretti (2004). Again the choice of dependent variable is crucial as it could refer to the probability of arrest, sentencing or imprisonment. Another difficulty regarding this dimension of the effects of education, is that much crime goes unreported.

Isolating the effects of civic participation can also be the result of a civic production function, although this subject has not been researched as much as the others in the literature (but see OECD 2006).

Identifying effective interventions to reduce early school leaving should rely on existing rigorous research findings in this respect (as done at the Teachers' College project). If no such findings are available, evaluation of various interventions should take place (as in Heckman and Vytlacil 2005).

Interventions do not have to be at the secondary level - the earlier the better. Preschool raises disadvantaged children's chances of staying in school and out of jail. According to Cunha and Heckman (2006), preschool exhibits the highest social rate of return among all education interventions. If vulnerable youngsters continued to be tutored and mentored through high school, such a commitment raised children's high-school graduation rates to 90 percent.

To take into account general equilibrium effects, a simulation model could be used along the lines of Vernez et al. (1999). The future educational attainment of the population could be projected under a business as usual and post-intervention scenarios. The cost side should take into account the increased capacity in schools to accommodate the extra stayers, improvements in the quality of schooling and increasing resources at the margin for making potential dropouts stay in school.

Such elasticity also applies to the cost per treated subject. Increasing the high school completion rate might be more than the average cost per student now in secondary school. This is because it might be increasingly difficult and costly to successfully incorporate in the system high failure groups in the student population. In addition, there will always be an asymptote beyond which the completion rate could not be reached for a myriad of nothing-to-do with the school factors, such as accidents or chronic illness.

Aggregation to the country as a whole is not simply a matter of blowing up the figures to the population. General equilibrium effects should be considered, e.g. the fact that once the high school graduation rate is increased, the relative earnings premium of completers may drop. This issue can be addressed only by incorporating behavioural elasticities into a macroeconomic model.

c) Data requirements

The preceding catalogue of sub-analyses that have to be conducted in order to identify the costs of school failure is daunting data-wise. One would need characteristics not routinely available in national surveys. For example, Eurostat does not report the health and crime status by level of education. Where the education variable is available, it is usually in terms of years of schooling rather than whether the student has left early or not. Not all European countries participate in PISA to have a measure of education quality, and even if they do participate, achievement refers to a small segment of the school system and age group.

At first sight, there already exists a plethora of statistics on the needed indicators. The richest collection might be found in the New Cronos, "Monitoring progress in the "Education and Training 2010" process" (under "Population and social conditions-->Education and training-->Education-->Thematic indicators). And there are many printed reports covering various sub-themes of the human capital statistics, e.g., Eurostat's "Key Data on Education in Europe", "Lifelong learning in Europe", "Spending on tertiary education in Europe", "Final report of the Task Force on Adult Education Survey". OECD's "Education as a Glance" contains many selected relevant indicators.

On closer scrutiny, however, the existing statistics have several limitations. Take for example the most critical variable on the link between education and growth, i.e. earnings by level and type of education. The income variable is spread out in many overlapping and time-discontinuous surveys. The European Community Household Panel (ECHP) seems to contain the most critical income variables, but it was discontinued in 2001. It was replaced by the Statistics on Income and Living Conditions (EU-SILC), but no databases or publications are yet available from this survey.

The general Labor Force Survey (LFS) and its special modules raise a wealth of information. However, one of the most critical indicators – the transition of young people from school to the labor market, is scheduled to take place in 2009, while the agreement on the variables it would contain is planned for 2007.

Information on participation in education and the public cost of education is raised by means of a Unesco/OECD/Eurostat questionnaire, and a supplementary Eurostat education questionnaire. But the answer to these questionnaires is voluntary, and the comprehensives of the questionnaires cause many missing entries in the final tables, as well as a three-year gap between the time reference of the statistic and its availability in the database.

Regarding out-of-school training, the Continuing Vocational Training Survey (CVTS) has been in fact discontinuous (available for reference years 1993, 1999, 2005), and misses workers in firms with less than 10 employees.

Information on student cognitive achievement is based on the International Association for the Evaluation o f Educational Achievement (IEA) and OECD's Program for International Student Assessment (PISA). Both share the limitation that they are irregular, highly dated by the time of data availability, and in addition PISA refers to a very small segment of the student population – the 15 years old.

Statistics on adult literacy are spread out between the OECD's discontinued International Adult Education Survey (IALS), the Adult Literacy and Life Skills Survey (ALL) conducted in 2003 - the database becoming available in 2006 - and the Program for International Assessment of Adult Competencies (PIAAC) scheduled to be launched in 2010, i.e. at the time when, according to the Lisbon agenda, Europe would have allegedly been a knowledge driven economy.

Information is also lacking on the institutional framework within which education takes place and yields results. For example, plotting student achievement against the degree of centralization of an educational system gives a negative relationship. The degree of centralization of an educational system has been dropped from the recent edition of OECD's Education as a Glance.

At present, there are too many "missing" entries in statistical tables, perhaps a result of the comprehensiveness of some of the questionnaires, or the fact that reporting might be voluntary. The most critical outcome indicator, the returns to investment in education, is reported only for ten countries in OECD's Education at a Glance. And the methodology on which these rates were computed is not very clear.

With respect to the higher tax revenues and lower costs of public services associated with more education, this will depend upon the quality of data available for each sector. First, one needs to be able to distinguish the basis for gains in each area by level of education and gender (and possibly immigrant status). Second, one needs to be able to link educational status in these categories to the tax base. Third, one needs data on use or incidence patterns by education for each of the social services and a breakdown of costs that

are associated with each to link to the specific health status and medical procedures or crimes and their disposition in the criminal justice system as examples. Thus, the first thing that needs to be done is to model the situation for each sector and to seek out data that might be used for estimation.

Samples should be representative of the population as a whole, rather than anecdotal referring to a small number of observations. Beyond the dependent variables (labor market status, unemployment, earnings, achievement, health status, crime status and civic participation) the data base should contain sufficient controls such as socioeconomic background. Data referring to natural experiments to control for the endogeneity of education would be a luxury.

Where individual data are not available, the analysis could exploit cross-country variation, as in Oreopoulos (2003). However, using country means as a unit of observation removes much of the data variation. In addition, because of omitted country-level variables, it is often difficult to identify education effects using cross-country data (Pritchett 2006).

Europe is not as fortunate as the United States regarding data availability to conduct the analyses outlined above. Whatever data are available have already been exploited and reported here. In most countries there is already enough information regarding the labour market effects of early school leaving. But as we move on the health, crime and civic effects, only the UK, Netherlands and Sweden appear in the picture.

Restating the research question [1]

Given the complexity of the subject, an alternative way to proceed is to break down the research question into three parts:

a) What can EU policy learn from the existing research ?
b) What can be the value added of new research covering the EU ?
c) What can be done with the available data sources, and how can they be enriched for this purpose ?

What can EU policy learn from this review ? The main lesson from this report is that the social benefits from education are much larger (and more diverse) than appears from private rate-of-return analysis. Beyond the purely economic gains, there are important social benefits in terms of health, crime reduction, democratic participation etc. Those effects confirm the different objectives assigned to the EU's lifelong learning agenda - human capital formation, personal fulfilment, social cohesion and active citizenship. This points to a very subtle and complex interplay between equity and efficiency, and between economic and social effects in the field of LLL. In any event, this review reinforces the case for more active education policies at the national and EU-level, also beyond the present Lisbon agenda.

What could be the value added of further cost-benefit research for the EU? In addition to providing empirical arguments the case for intensified and targeted LLL strategies at the EU-level, a school failure study may be justified for various reasons:

- The smaller income inequality in the EU relative to the United States may affect the cost-benefit balance of education in several ways: to begin with, the private returns to education may be lower – resulting in lower rates of return, unless

[1] This section draws from the comments of Ides Nicaise and Steven Groenez

public subsidies to education also reduce the private costs. Some health and crime effects are mediated by tax and social security measures. Hence, the overall cost-benefit balance may turn out different in the EU.

- Labour markets in the EU tend to be more rigid than in the US. This may result in different general equilibrium effects.

- Larger differences between private and social returns can be expected in the EU, due to the size of taxes and welfare expenditure in the EU.

- Apart from differences between the EU and the US, there is a great deal of variation between member states within the EU as regards the economic, social and institutional context. This raises a number of interesting issues. For example, does the narrower wage distribution in Nordic countries translate into weaker incentives to invest in human capital – and if not, why? How does the weakness of the welfare state in the new member states affect the cost-benefit balance ? How does this translate into different policy recommendations across member states ?

An EU-wide research may also reach beyond a simple replication of previous research. It may try and fill some gaps in the existing knowledge. There are at least four sets of issues that call for further investigation:

- What are the underlying causal relationships between education and the 'quality of life' (including health and social capital) ? Different types of causality may be at stake here: income effects; effects on generic skills that affect efficient behaviour; effects on health-specific knowledge, effects on social skills.

- The benefits of intergenerational spill-over effects appear to have been largely neglected thus far. And yet the effects of better educational achievement on the educational opportunities of one's offspring may be the most important benefit. It may result in more sustainable social cohesion across future generations. Can the benefits from such effects be quantified in terms of equity and/or economic gains ?

- Further theoretical and empirical research into the macro-economic externalities may contribute to a better insight into the nature of causal relationships. Moreover, as mentioned earlier, the general equilibrium effects may turn out very different between the EU and the US.

- A fourth area for further research relates to methodological improvements in the micro-analysis. The review points to the problem of non-linearities in cost calculations: the marginal cost of reducing school failure may differ from the average cost of education in the past. The issue of heterogeneity between dropouts and non-dropouts has also been tackled rather superficially in the literature. Following Heckman and Smith (1998), a more explicit distinction can be made between (a) average treatment effects, defined as the expected gains for a randomly selected individual, (b) average treatment effects on treated individuals (those who selected into the treatment in the past), and (c) the expected treatment effects on the non-treated (those who previously did not select into the treatment). The latter type of effects are particularly relevant in a study of current dropouts. They may turn out lower to the extent that current dropouts tend to be less efficient in producing human capital; but they may also be higher if dropping out is caused by social barriers such as discrimination. Heckman and Vytlacil (1999, 2001, 2005) suggest that it is hazardous to rely on average treatment effects and propose to estimate the full distribution of potential effects as an intermediate step.

This review has been critical on the availability of appropriate data sources in the EU. Although some gaps in the data are undeniable, it may be helpful (a) to examine more closely the opportunities offered by existing data, and (b) to make suggestions as to how current statistical sources can be improved.

Research based on the ECHP may take advantage from the Euromod simulation models to estimate fiscal returns and economies in welfare programmes. Some national panels (such as the Belgian panel) include explanatory variables relating to social background, which can be used for the purpose of estimating intergenerational spillovers. It is difficult to make recommendations regarding complementary data collection in the framework of EU-SILC (which is more up-to-date than the ECHP and covers all member states).

6. Conclusion

Is a study on the costs of school failure in Europe feasible along the lines presented above? The answer is yes, although it will take some time and substantial resources. Given the state of data availability in most Member States, the need to bring together multiple disciplines and the number of countries involved, it is unrealistic to expect that one would have fresh results soon.

An estimate of the cost to conduct the study (or the studies) depends heavily on assumptions. To start with, one should go beyond the Anglosaxon net of this literature review and identify local studies that purport to have assessed the effects on school failure or effective interventions to combat it. These studies would have to be carefully evaluated to identify the ones that are robust enough for their findings to be used in the European study. Identification of such studies can be done by contacting local experts to get their nominations of studies.

Based on private communication with those who conducted comprehensive cost-benefit studies in the United States, the estimate of one study per country is expected to range from €150,000 to €400,000 depending on the initial data conditions and the assumptions one is willing to make, rather than conducting sub-topic country-specific research.

Given this situation, a tempting approach might be to initially take at face value the results for the United States and Australia, and assume they would also, more or less, apply in Europe. The benefit-cost ratios of about 3:1 reported above allow for a wide margin of error in the wrong direction.

Another approach is to ask what would be lost or gained from an analysis of the net costs of school failure in the Europe, or to conduct a cost-benefit analysis of doing the study itself. The cost of data collection and analysis has to be compared to the gains from reducing the costs of school failure in a faster than business-as-usual situation. Given the sizes of the latter effects reported for the United States and Australia, even at the highest estimated study cost, it would make the study socially profitable.

Returning to the press, this is an extract from Time Magazine (February 12, 2007):

> *"$500 billion annual cost to the U.S. economy of children growing up poor, a result of eventual lower productivity and earnings and higher crime rates and health costs".*

Beyond just often reporting school failure in general (see section 1, above), there are no similar headlines quantifying the cost of failure in Europe. Perhaps conducting a case study as suggested here, even in a few countries, would instigate similar headlines in Europe and sensitize policy makers to correct school failure.

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