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Financing Lifelong Learning

Hessel Oosterbeek
Harry Anthony Patrinos

The World Bank
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Abstract

This paper describes and analyzes different financial schemes to promote lifelong learning. Considered are financial instruments to stimulate successful early learning, financial aid schemes and subsidization mechanisms. Theoretical analyses about funding of early learning have mainly focused on vouchers. Yet, the available empirical evidence is more ambiguous about the effects of vouchers than about the effects of conditional cash transfers and financial incentives for pupils and teachers. Positive effects of financial incentives to pupils are not restricted to high ability pupils, as low ability students also seem to benefit. The evidence regarding the effects of subsidy forms is limited. The most prominent knowledge gaps regarding the effects of various financing schemes related to lifelong learning are the effects of vouchers in compulsory education; financial aid schemes for students; and entitlements and individual learning accounts.

This paper—a product of the Human Development Network, Education Team—is part of a larger effort in the department to document the benefits of investment in education. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at hpatrinos@worldbank.org.

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FINANCING LIFELONG LEARNING[1]

Hessel Oosterbeek

Harry Anthony Patrinos

[1] This draft: February 2008. Oosterbeek is affiliated with the Universiteit van Amsterdam School of Economics and the Tinbergen Institute. Patrinos is affiliated with the World Bank. The views expressed here are those of the authors and should not be attributed to the authors' organizations.

1. Introduction

This paper describes and analyzes different financial schemes to promote lifelong learning (it updates the mostly theoretical review presented in World Bank 2003). The motivation to do this is twofold. First, there is a belief that current expenditures are directed to learners and providers in an inefficient way. By giving better incentives more can potentially be achieved with the same amount of resources. Second, there is the notion that spending on education needs to be increased to meet the requirements of the knowledge economy, and that this should be achieved by increasing private expenditures on education, both directly and by creating new sources of finance.

Considered in this review are financial instruments to stimulate successful early learning, financial aid schemes and subsidization mechanisms. We apply the standard normative framework of welfare economics and discuss relevant empirical findings. Theoretical analyses about funding of early learning have mainly focused on vouchers. Yet, the available empirical evidence is more ambiguous about the effects of vouchers than about the effects of conditional cash transfers and financial incentives for pupils and teachers. Unexpectedly, positive effects of financial incentives to pupils are not restricted to high ability pupils, as low ability students also seem to benefit.

The education finance literature has traditionally paid much attention to financial aid schemes for (higher education) students. A standard economic analysis of capital market failures provides reasons for government intervention. Despite the almost universal enthusiasm about income contingent loans among economists, practical experience with such schemes is very

limited. Only a few countries have actually implemented such schemes, the best-documented example being Australia. The claim that the introduction of income contingent loan schemes in Australia did not harm the accessibility of higher education for students from low-income families may be unwarranted.

Another noticeable thing is that two recent studies have found indications of debt aversion among students at elite universities in the United States. If students at elite universities in the United States are already debt averse, it is very likely that students from poorer social backgrounds are also debt averse. The presence of debt aversion restricts the potential for income contingent loans.

To stimulate lifelong learning activities of adult workers, it is often believed that simply making such activities available below marginal costs provides insufficient incentives. Instruments such as vouchers, entitlements and individual learning accounts give potential learners a very explicit confirmation of their increased purchasing power. This should strengthen people's awareness of the availability and importance of learning activities. The available evidence regarding the effects of these subsidy forms is rather limited. Evidence from United States veterans indicates that the voucher type education subsidies that they received through the GI Bill, increased their educational attainment, but also widens the education gap between various groups. This evidence obviously pertains to a rather particular group, and the estimation results should be interpreted as the joint effects of military service and the GI Bill.

The importance of investments in education is widely documented. Education is

important for individuals' labor market position as reflected in their earnings and employment chances. For individuals education also has important other returns, for instance, in terms of their health (see Grossman 2006 for a review). But investments in education are also regarded as an engine for countries' prosperity.

Our analysis of financial schemes fits into the normative economics framework in which efficiency and equity serve as guidelines. In the next section we outline this analytical framework. While this framework serves as reference point, we do not judge financial arrangements purely in the terms of this framework. In addition, we also pay attention to empirical studies that inform us about the effectiveness of various financial arrangements. In reviews of financial arrangements in the field of education, the empirical analysis confines itself often to a description of alleged success stories. We will move away from that custom and instead focus on empirical results coming from studies that use credible strategies to identify the causal impacts of certain policies. By emphasizing this, we will also show that much is still unknown. In section 2 we will also elaborate a bit on the criteria that can be used to judge the credibility of empirical findings.

After the sketch of the analytical framework in section 2, section 3 applies this framework to various financial arrangements. That section starts with a description of financial instrument that can stimulate successful early learning (basic and secondary education). Successful early learning can be important for later learning in the presence of dynamic spillovers ("learning begets learning"). It then follows with an analysis of cost-sharing schemes, including various loans schemes, human capital contracts and financial incentives for students.

The final part of section 3 brings together insights regarding subsidization mechanisms such as scholarships and grants, vouchers and tax deductions. In section 4 we summarize and conclude.

2. Analytical Framework

According to standard economics, education (formal schooling and training) can be classified as a private good. A good is private rather than public when people can be excluded from consumption and when there is rivalry in consumption. Exclusiveness means that it is, at relatively low cost, possible to prohibit a person from using the good. In the case of education, this can be achieved by not allowing someone to enter the school building, the classroom, or the workplace. Rivalry means that the use of the good by one person reduces the opportunities for other persons to use the same good. Again, in the case of education, this condition is satisfied since the attention that a teacher or instructor gives to one student or trainee reduces the amount of time available to others.

Private goods can in principle be provided through the market. Without any form of cooperative action (for example, government intervention) a certain positive quantity of the good will be provided. This is not true for pure public goods. If it is impossible to exclude a person from the use of a good and if there is no rivalry in consumption, then provision without some form of cooperation or coordination will be impossible. No single individual will pay for all of the costs, except in the rare case that their private benefits exceed the full costs.

But while private provision of education is possible, in almost every country in the world there is some level of government intervention. Intervention takes the form of regulation and/or

of financing. The amount and form of government intervention in the schooling market differs considerably from country to country. Motives for intervening in the market for education relate to efficiency and equity. The form of intervention is, therefore, typically evaluated in terms of its effects on these criteria.

2.1 Efficiency

Efficiency requires that (social) marginal costs equals (social) marginal benefits. Two main factors are often mentioned as potential sources for inefficiencies in education markets: externalities and capital market failures. Here we analyze these factors in some depth. This is important because understanding the precise causes of inefficiencies is helpful in judging the possible effectiveness of suggested solutions. Externalities occur when the production or consumption of a good has effects on people other than the decision-makers. Externalities can be either positive or negative. Since decision-makers are assumed to take only their own private costs and benefits into account, there will be, from a social point of view, an under-provision of goods that generate positive externalities and an overprovision of goods that cause negative externalities. In the case of schooling, the common view is that it produces positive external effects. Various authors have attempted to quantify the external effects of schooling by estimating social returns and private returns separately (Moretti 2003; Krueger and Lindahl 2001; Acemoglu and Angrist 2000). The findings diverge considerably. Acemoglu and Angrist (2000) find that almost all of the returns to education are private, while Moretti's (2003) findings imply that the macro impact of education is close to four times the private rate of return (see also Lange and Topel 2006). In their recent review, Lange and Topel (2006: 460) conclude that "there is no evidence from this literature that social returns are smaller than private ones, yet

neither is there much to suggest that they are larger."

Aspects that qualify as positive externalities of schooling include: quality of children, health, social cohesion, technological development, income distribution, higher economic growth, less crime, more democracy, philanthropy and political participation (see, for example, Haveman and Wolfe 1984). The common view is that externalities of schooling tend to diminish with the level of schooling. That is, the externalities are higher for elementary schooling than for secondary schooling, and higher for secondary schooling than for post-secondary schooling. If that is the case, the externalities argument cannot explain why in many countries the public subsidy to higher education exceeds that to elementary education. In addition, there is a large body of empirical literature demonstrating that the private returns to education are high enough to pay for its costs (see Ashenfelter *et al*. 1999).

Another form of externality is exclusively connected to investment in firm-specific training. Firm-specific training is defined as training that is only useful in the current firm; it has no value in other firms. By contrast, general training is defined as training that enhances the worker's productivity not only in the current firm but also to the same extent in all other firms. Investments in specific training are predicted to be below their efficient level due to holdup. Since the return to specific investments depends on the two parties staying together, one party can always try to get some of the return to the other party's investment by threatening to end the relationship. The investing party will anticipate such opportunistic behavior and will invest below the optimum level. Holdup can only occur when the investment is non-contractible but verifiable. This is likely to be the case for training. In a recent contribution, Acemoglu and

Pischke (1999) have shown that training that is general in a technical sense can still be specific in an economic sense in situations with labor market frictions. This insight enhances the potential relevance of the holdup problem.

A final form of externality is relevant from the perspective of investments in early learning. Cunha *et al*. (2006) argue that learning is an activity that generates dynamic spillovers. Investments in learning at a young age make investments in learning at later ages cheaper and more efficient. In that sense: learning begets learning. Implicitly, this means that the costs of investment in lifelong learning are lower for people for whom investments in early learning have been larger. For this reason, our survey of funding schemes will not be restricted to direct funding of lifelong learning arrangements only, but will also be concerned with financing forms that effectively stimulate early learning (and by implication reduce the costs of any further learning investment).

Unless they come from wealthy families, students will typically not have the funds to finance their tuition fees and the cost of living while studying. They will, therefore, have to borrow. Because human capital is stored in persons and is not readily transferable, there is no collateral in case of default. Therefore, private banks will be unwilling to provide student loans without any compensation for the default risk.

More fundamentally, capital market failures can be attributed to adverse selection and moral hazard. Adverse selection refers to the mechanism that a default premium will prevent the lowest risk students from taking up a loan. As a result, the average risk for the remaining cases

will be higher and the default premium needs to increase. Moral hazard refers to the fact that after graduation people may be inclined to take no job or a low paying job in order to avoid/evade repayment of the loan.

On average, and by expectation, investments in schooling are beneficial, but earnings prospects are uncertain. Even students with an accurate idea of their own capabilities cannot be certain of their future earnings level. Risk-averse individuals attach heavier weights to bad outcomes than to good outcomes, and may, therefore, underinvest in education because of the risk involved.

A concept that only recently attracted the attention of economists, and which is relevant from the perspective of education investments, is debt aversion. This refers to the fact that people dislike carrying debt over and above the consequences of debt on consumption patterns.

2.2 Equity

Probably the most important reason for intervening in education markets is the widely supported view that participation in learning activities should depend only on characteristics that are relevant to education, such as motivation, effort and ability, and not on other factors such as social background, gender or race. In many countries, much effort is put into realizing equal opportunities. Here again, a distinction can be drawn between elementary and secondary schooling, on the one hand, and post-secondary schooling on the other.

With regard to equity, it is important to distinguish between static measures and dynamic

measures. In the static case, it is only current income positions that matter, whereas in the dynamic case it is the lifetime perspective. Put differently, with the static equity concept, it matters that students with poorer social backgrounds have equal access to post-compulsory schooling. Whereas from a dynamic point of view, it matters that those who have attained the highest levels of schooling are among the richest of their cohort. Thus, for the evaluation of subsidies to students, it matters not only whether these students come from poor families, but also whether the subsidies take the lifetime position of the recipients into account.

Related to equity is that individuals may underestimate the value that schooling has for them. If a government thinks it knows better what is good for a person than the person himself, this is a case of paternalism. The general belief is that paternalism plays a role in education at the elementary and secondary level, but not at the post-secondary level. The reason for this is that there is a contradiction in thinking that people who are qualified to enroll in post-secondary schooling are so ignorant that they do not know what value education has for them.

The notion of dynamic spillovers reinforces the case for paternalism. It is very likely that young children are unaware of this mechanism and will therefore under-invest in early learning. This is especially a concern for young children with less-educated parents.

2.3 Evidence-Based Policies

Financial arrangements are a form of policy interventions. In recent years the evaluation of policy intervention has gained much attention in scholarly papers. To identify the impact of an intervention one has to know what would have happened to persons who were exposed to the

intervention in its absence. The construction of a credible counterfactual is often a difficult task. Just comparing outcomes of those who were treated by the intervention with the outcomes of those who were not treated is likely to be misleading. The reason is that in most cases treatment is not provided randomly, but is based on (self-) selection.

An experimental setup with randomized assignment to treatment and control groups is by many people regarded as the gold standard to estimate the impact of an intervention. While this is probably true in many relevant applications, it is important to realize that even such a setup can give biased results. This is, for instance, the case when there are spillover effects in which outcomes of untreated people are also affected by the policy. An example is that the provision of training for some unemployed persons can reduce the employment prospects of unemployed people who did not receive the training. Another potential problem with the experimental setup is that untreated persons may attempt to obtain substitute treatment. Experimental designs should be set up in a way that such potential problems can be addressed.

In addition to the experimental design with randomized assignment other methods have been developed and applied that operate in the same spirit. In such natural or quasi-experiments, researchers exploit circumstances in which very comparable observations are treated very differently. In the ideal situation, subjects cannot affect their treatment status. The trick is to find some source of exogenous variation that affects (the probability or intensity of) treatment and has at the same time no direct effect on the outcomes of interest. A by now classic example is to use quarter of birth as a source of variation for years of education to estimate the causal impact of years of education on earnings (Angrist and Krueger 1991).

Attention to "evidence-based policies" requires consideration about how the counterfactual was constructed. Our view here is that there is only evidence in favor or against certain policy interventions if it results from research with a carefully constructed control group.

3. How to Stimulate Lifelong Learning?

This section presents various forms of funding governments use with respect to schooling and training. It provides brief descriptions of the instruments, discusses how these forms are connected to the reasons for government intervention that were introduced in the previous section, and discusses credible research findings regarding the effects of actually implemented funding schemes.

3.1 Stimulating Successful Early Learning

Vouchers. A voucher is a permit by which parents are given the ability to pay for the education of their children at a school of their choice. The basic idea is that by enhancing choice, consumers will make more conscious choices and suppliers will be more responsive to the needs and preferences of these consumers.

For compulsory education, different voucher proposals have been put forward. They differ in terms of the amount of regulation, the provision of information, and whether they are geared to compensate disadvantaged groups. Consequently, they also differ in their probable effects. Jencks (1971) and Friedman (1955) have defended extreme voucher models. In Jencks' (1971) model, there is extensive regulation and there are additional "compensatory" vouchers for

students from low-income families. Friedman's model, on the other hand, is very deregulated and does not include any compensatory element.

By making consumers more aware of the costs of education and by making providers more responsive to consumers' wishes, there is a belief that this will bring parties closer to a situation in which marginal costs equal marginal benefits. By conditioning the amount of the voucher on the type of education pursued and characteristics of the student, voucher schemes can in principle also take externalities and equity considerations into account.

The effectiveness of vouchers in primary education is intensively studied and debated in the United States. A first wave of studies is based on experiments in Milwaukee and Cleveland. As Carnoy (2001) observes, however, these studies suffer from the fact that vouchers were generally undersubscribed and that those applicants who did not receive vouchers were not necessarily randomly rejected nor carefully followed up. Consequently, it is unclear to what extent the results of these studies report the true causal effect of these studies and to what extent results can be generalized to the population at large. For instance, it is found that parents who received vouchers are more satisfied with the schools their children attend than parents in the comparison group. This finding can, however, easily be attributed by the fact that parents who actively seek vouchers are more dissatisfied initially than others with public schools (as, for instance, in Rouse 1998).

The second wave of studies in the United States is based on experiments conducted in Dayton, Ohio; Washington, D.C. and New York City. Evaluation studies by Howell and

Peterson (2002) and Mayer *et al*. (2002) indicate positive effects of vouchers on achievement scores of African-Americans. In New York, this effect is around 5 percentile points. The careful reanalysis of the New York data by Krueger and Zhu (2004) does, however, cast doubt on this positive result. They show that if the analysis also includes observations with missing baseline test scores the positive effect gets smaller and is statistically insignificant. When they subsequently redefine the category of African-Americans the effect is again smaller and statistically insignificant.

More convincingly and less controversial positive results about the effects of vouchers on achievement come from the targeted secondary school voucher program, known as PACES, in Colombia. Angrist *et al*. (2002, 2006a) analyze this program that provided over 125,000 poor children with vouchers covering half of the cost of private secondary school. The evaluation is based on the fact that vouchers were allocated through a lottery. The vouchers contain a performance incentive as they are only renewed in case of sufficient academic progress. The results indicate that the program increased school completion rates by 15-20 percent and that test scores increased by 0.20 of a standard deviation, a truly substantial amount.

In a follow-up study on the PACES program, Bettinger *et al*. (2007) provide evidence showing that lottery winners had better educational outcomes than lottery losers, even if they applied to schools with peers that have inferior observable characteristics. This is an important finding, as it cast doubt on the argument sometimes raised by voucher skeptics that vouchers benefit recipients only through peer effects, in which case the net benefit of vouchers to society as a whole might be small.

Conditional cash transfer programs. A conditional cash transfer (CCT) is a cash payment to a family where the payment is conditional on some requirements being met. Many countries in Latin America operate such programs and the conditioning in almost all cases includes school attendance of the children in the family. Countries that adopted such programs include Brazil (in 1995), Mexico (1997), Honduras (1998), Nicaragua (2000), Costa Rica, Colombia (2001), Argentina, Uruguay, Chile and Jamaica. Rawlings and Rubio (2003) and Caldés *et al*. (2004) provide overviews.

CCT programs are implemented because it is believed that current school attendance levels fall short of the optimum level. More attendance will then enhance efficiency. To some extent the CCT policy also expresses some concern for paternalism. In a sense the CCT program is comparable to compulsory schooling laws. But where compulsory schooling laws place a punishment on not attending school, CCT-programs place a reward on school attendance. It is akin to the difference between a stick and a carrot. The effect of this policy on equity depends on the exact target group of the policy. In most (all) cases, poor families are the target group and, therefore, the policy redistributes from average or rich families to poor families.

Many CCT programs have been assessed through impact evaluation studies. Nearly all studies show substantial positive effects of conditional cash transfers on school enrollment. The programs in Mexico and Nicaragua have been evaluated using randomized field experiments. In Mexico, enrollment rates at the secondary level increased from 67 percent to around 75 percent for girls, and from 73 percent to 78 percent for boys (Schultz 2004). In Nicaragua, the program

was targeted to pupils up to fourth grade in primary school. The program increased the enrollment rate for this group by 18 percentage points (Maluccio and Flores 2004).

Other programs have been evaluated using non-experimental research designs. Duryea and Morrison (2004) used propensity score matching to evaluate the program in Costa Rica, and find increases in the probability to attend school of 5 to 9 percentage points. Attanasio *et al*. (2006) have evaluated the program in Colombia using propensity score matching in a difference-in-differences framework. They find an increase in school enrollment of 5 to 7 percentage points for 14 to 17 year-olds.

Some recent studies deal with the question of whether the success of CCT programs is due to the cash transfer itself that enhances school enrollment, or that the requirement that children attend school is the driving force (Attanasio *et al*. 2005; Bourguignon *et al*. 2003; De Brauw and Hoddinott 2007; De Janvry and Sadoulet 2006; Oosterbeek and Ponce 2007; Schady and Araujo 2005; Todd and Wolpin 2003). All these studies point in the same direction, namely that the requirement that children attend school is the driving force. For example, Oosterbeek and Ponce (2007) estimate the effect of unconditional cash transfers in Ecuador and report a rather precisely estimated zero effect for families around the eligibility threshold (the second quintile of the poverty index). The fact that families behave differently under conditional cash transfers than under unconditional cash transfers implies that families reach higher utility levels without the conditioning. The requirement that children should attend school is, therefore, only justified if there is a clear belief that families behave sub-optimally. An important consideration for the Ecuadorian government not to impose school attendance requirements was that this

would involve substantial administrative costs. Moreover, interviews with teachers hinted to the fact that they might not report children's absence in case this would have negative consequences for the families.

Financial incentives. Financial incentives are rewards promised and paid to pupils or to their teachers depending on pupils' achievement. Such rewards can have the form of piece rates or of tournaments. In the case of piece rates a specified amount of output is rewarded with a known piece rate. In the case of tournaments only the pupils (or teachers) with the highest rank(s) receive a reward.

Financial incentives have the intention to make pupils (teachers) work harder than they currently do. This is only a sensible policy if there are clear indications that current effort levels are below the optimum effort levels. To make a judgment about current sub-optimality, the reason for the under-provision of effort should be known. In a sense, the reward distorts the current time/effort allocation, which is not necessarily sub-optimal and may, therefore, induce effort levels that are too high.

Financial incentives potentially benefit high-ability pupils more than low-ability pupils. This would be the case if it were easier for good students to pass the grade or to rank in the top. In that case, high ability pupils benefit most because they respond more to the incentive; and, moreover, they are more likely to earn the reward.

Kremer *et al*. (2004) conducted a randomized experiment in which girls in primary

schools in Kenya could earn a reward for ending up in the top of the achievement distribution. Incentives are thus provided in the form of a tournament. The study reports substantial positive effects on school attendance and achievement. Interestingly, the positive effects are not limited to high ability girls but also spill over to boys (who could not earn a reward) and low ability girls (who are very unlikely to earn a reward). The spillover effects are almost as large as the direct effect on treated girls. A possible explanation for the large spillovers is that the introduction of the reward scheme increased attendance and preparation by teachers.

Angrist and Lavy (2004) investigated the effects of financial incentives in the context of secondary schools in Israel. Now the reward is given as a fixed amount upon matriculation and, thus, in the form of a piece rate. Here, too, positive effects are found on achievement.

Lavy (2002, 2007) reports the effects of financial incentives for teachers on pupils' achievement. In both cases the research design is quasi-experimental studies (regression discontinuity, propensity score matching). The first study deals with the effects of group incentives (a team bonus) while the second deals with the effects of an individual tournament scheme. For both schemes the effects on achievement are significantly positive, with the tournament being more cost-effective than the group incentives.

Also, Brasilia, Brazil had a savings incentive program in the 1990s, which was poorly implemented and never evaluated (Panagides 2003; Lindert *et al*. 2007). In Mexico, as part of the Oportunidades CCT Program, *Jovenes con Oportunidades* targets low income students at the upper secondary level, rewarding them with points for every year they complete. At the end of

high school they can redeem the points for further training, college, housing or cash. The program is currently being implemented and subject to rigorous impact evaluation.

3.2 Cost-Sharing Schemes

To address the inefficiency of capital market failure, governments around the world have implemented or support student financial aid schemes in which students can borrow against conditions that are more favorable than the conditions the private capital market would offer. We consider the following financial aid schemes: (1) mortgage-type loans, (2) income contingent loans, (3) graduate tax and (4) human capital contracts. Moreover, we will summarize other fresh evidence on the effect of financial incentives on achievement of students in higher education.

Mortgage-type loans. The most popular student finance scheme is traditional mortgage-type loans. This scheme is likely to be offered only to families who already have enough assets to serve as collateral—that is, precisely those who need financial aid the least. In a mortgage-type loans model, students are given loans, which they are required to repay in the form of fixed installments. The interest rate is typically below the rate that private banks would charge.

At first sight, the mortgage loans model seems to address the capital market failure. The exact details of such models may differ from country to country. A textbook example of a mortgage model is the current system operating in the Netherlands. In this scheme, the loan only has to be repaid over a particular period if the borrower's income exceeds a certain threshold. Also, in this model there is a rule that fixes the number of years in which the loan has to be

repaid to 15 years. If the repayment is not completed within that period, it is remitted. This restricted repayment duration is however at odds with the idea that schooling is an investment in future opportunities. Comparing age-earnings profiles by level of schooling, it is evident that the returns to schooling materialize at later ages. It would be optimal to synchronize repayment and obtaining the returns. A short repayment period is not appropriate.

Traditional student loans have been collected by the state, by private banks, and by universities. Collection has been poor or costly where the taxing power of the state has not been used as a last resort to collect the loans. In some cases, as in the Philippines, poor collection rates have caused such schemes to operate at a loss.

Income contingent loans. During the past decades some economists have advocated a system with income contingent loans (Barr 1993; Barr and Falkingham 1993; Chapman and Harding 1993; Chapman 2006 provides a recent survey of theoretical and empirical issues regarding income contingent loans). Students can take up a loan, which they have to repay in the form of a percentage of their earnings after graduation. Compared with the mortgage-type loans schemes, repayment is more evenly spread over graduates' professional careers. That is, the costs of the investment in schooling are repaid when the returns materialize.

A separate issue relates to the interest rate that students should pay. From the point of view of the lender, it is desirable that the interest rate includes a premium for defaulters. This is feasible if an individual's probability of default is as uncertain to the borrower as it is to the lender. That is, however, not very likely; borrowers know more about their own characteristics

and, therefore, about their own risk than do lenders. As a result, bad risks will drive good risks out of the market. The relevance of this mechanism increases with the heterogeneity of the student population. Since enrollment in post-secondary education has increased in most countries over recent decades, the student population may indeed be quite diverse. The important message from this is that the government has to be very careful when determining the default premium included in the interest rate. Moreover, adverse selection may become a serious problem. If the lender is unable to shift the risk of default to the borrowers, it is reasonable that the lender should screen students for eligibility. Academic records are likely to be a good indicator of the student's future default probability.

Chapman (2006) summarizes the experience with the practical implementation of income contingent loan schemes in various countries. This includes descriptions from the Yale Plan (in the United States), Sweden, Australia, New Zealand, South Africa, the United Kingdom, United States and Chile. According to Chapman (2006), the (more) successful adoptions of income contingent loan schemes took place in Australia, New Zealand, South Africa and the United Kingdom. He identifies two critical aspects of the schemes in these countries relative to others. The first is that these countries all have a taxation system in place that could be used to collect repayments effectively. The second is that in these countries the vast majority of universities are public sector institutions, so that the collection (tax) authority and the education providers operate under the same system and the same terms.

Chapman (2006) also provides a summary of application issues for income contingent loans in developing countries. He discusses experiences in countries such as Ethiopia, Namibia,

Indonesia, Rwanda, Mexico and the Philippines. He concludes that the systems and structures most resembling the successful developed countries are not available and that many developing countries have difficulties associated with the establishment of the policy's integrity, credibility and collection. He even concludes that given this policy context, it may be desirable that developing countries proceed with the imposition of up-front fees and scholarships instead of income contingent loans.

An important issue concerning the introduction of income contingent loans is to what extent it affects access to higher education, especially for students from poor families. The only country for which this has been documented extensively is Australia. Chapman and Ryan (2002) compare participation rates for 18-year-olds by family wealth before the introduction of the scheme, after the introduction of the scheme, and after some substantial changes have taken place. Over time participation rates for all family wealth categories – including those from the lowest quartile – have increased. This is presented as evidence that the system "did not result in decreases in the participation of prospective students from relatively poor families" (Chapman 2006: 1493). While factually correct, this statement is somewhat misleading. Introduction of the income contingent loan scheme is Australia was not associated with a reduction in participation of students from poor families when participation rates before and after the introduction are compared. This does not exclude, however, the possibility that participation rates of this group measured after the introduction would have been higher if the system had not been introduced. In other words, Chapman's (2006) statement takes the before participation rates as counterfactual, thereby ignoring changes that would have occurred in the absence of the policy. The positive evaluation of the Australian model would have been much more convincing when

based on a randomized experiment or some other design in which a proper comparison group could be constructed.

Graduate tax. In a system with graduate taxes, students receive a grant from the government while studying and they repay this in the form a special tax rate after their graduation. Graduate taxes are often regarded as an imperfect substitute of the ideal system with income contingent loans. Graduate taxes and income contingent loans are the same in many respects, but graduate taxes have the disadvantage that they also provide funding to students who do not want it or need it, and that graduates may end up paying (much) more than they received in the form of a grant. This latter feature may provide a disincentive to study to those who would also without further study have earned a high income. (The problem is that the graduate tax is levied on the basis of total earnings rather than the earnings increment due to the extra education.)

The relative appraisal of graduate taxes changes when prospective students are debt averse. In that case it makes a difference that under an income contingent loans scheme students carry debt whereas under a graduate tax scheme they do not carry debt, even though the actual "repayment" of the loan/grant are exactly the same. Theory predicts that debt-averse individuals are more willing to enroll in education when financial aid is in the form of a graduate tax then when given in the form of an income contingent loan.

Graduate taxes are not in operation anywhere in the world, and it is thus hard to evaluate this scheme. Yet, some insight about its potential can be gained from studies that inform us

about the relevance of debt aversion. Two recent empirical studies from selective colleges in the United States provide evidence for the presence of debt aversion.

In a recent study Field (2006) reports on an experiment in which law students at New York University were randomly assigned to one of two financial aid conditions. The first, standard, condition is a loan repayment assistance program (LRAP) which forgives all graduates who choose careers in the public sector or other low paying fields of law the majority of educational loans incurred during law school through quarterly prospective funding for up to ten years following graduation. The second, innovative, condition consist of public service scholarships (PSS) that provide grants of two-thirds tuition that converted to a loan in the event that a recipient did not pursue a public interest law career. The two schemes are identical in terms of their financial consequences, and differ only in the duration of indebtedness. Under the LRAP scheme people have a debt position right from the start. Under the PSS scheme people only carry a debt burden when they do not pursue a public interest law career. Field's (2006) results show differences in outcomes between the two treatments. In classes for which the lottery was announced prior to enrolment, those in the PSS treatment are twice as likely to enroll. Moreover, those in the PSS treatment are also substantially more likely to have a first job in public interest law. Fields (2006) interprets her findings as evidence of debt aversion: behavior is consistent with utility being negatively affected by carrying debt loads.

Rothstein and Rouse (2007) analyze data from a highly selective university that introduced a "no-loans" policy under which the loan component of financial aid awards was replaced with grants. They use this natural experiment to identify the impact of student debt on

employment outcomes. They find that debt causes graduates to choose substantially higher-salary jobs and reduces the probability that students choose low-paid “public interest” jobs. They also find some evidence that debt affects students' academic decisions during college. The authors offer two potential explanations from their findings: one being that young workers are credit constrained; the other that they are averse to holding debt.

Data from a recently collected survey amongst higher education students in the Netherlands indicate that debt aversion is significantly higher among students whose father has a lower level of education. A regression of debt aversion (measured on a scale from 1 to 4 with a standard deviation of 0.8) on level of father’s education (and controls for gender, age and ability) gives a coefficient of -0.028 (with a standard error of 0.008), suggesting that especially children from poorer backgrounds may benefit from the introduction of a graduate tax scheme.

Human capital contracts. A human capital contract is a contract in which students agree to pay a percentage of their income for a specified period after graduation in exchange for funds to finance their education. Originally proposed by Milton Friedman (Friedman and Kuznets 1945; Friedman 1955), the idea of such contracts has re-emerged in recent years. The development of financial markets since the 1980s has created favorable conditions for private initiatives to invest in human capital.

An essential characteristic of human capital contracts is that investors determine the percentage of future income that students have to commit, which could vary depending on the type of learning undertaken and the investor’s judgment about the borrower’s likely future

income. From an efficiency perspective, optimal results are achieved when market forces determine the percentage of income that learners have to commit and externalities are covered by public subsidy. For the outcomes to optimize social welfare, distributional considerations must also be taken into account by targeting public subsidies in order to achieve equity.

Implementation of human capital contracts is constrained by the difficulty of obtaining information on learners, the need for a developed tax collection agency, and the problem of adverse selection (Palacios 2004). There are now some examples of human capital contracts in practice. MyRich Uncle was the first and only company offering human capital contracts in the United States. The company has now switched, however, to offer student loans. CareerConcept in Germany has until now financed hundreds of students and continues growing. Lumni in Chile and Colombia is still very small but continues growing. Until now, it funded almost 100 students, 30 of whom are now paying. Obviously with this limited scale of operation and without any attempt to evaluate, little can be said about the effectiveness of this instrument.

Financial incentives for students. Financial incentives for students in post-compulsory education are comparable to financial incentives for pupils in compulsory education, and have the same rationale and predicted effects in terms of efficiency and equity. Some recent studies shed light on the effectiveness of such incentives.

Angrist *et al*. (2006b) report on a randomized field experiment involving two strategies designed to improve outcomes among first-year undergraduates at a large Canadian university. One group was offered peer advising and organized study group services. Another was offered

substantial merit-scholarships for solid first year grades. A third group combined both interventions. The authors find that service take-up rates were much higher for students offered both services and scholarships than for those offered services alone. They also find that females used services more than males. No program had an effect on grades for males. First-term grades were significantly higher for females in the two scholarship treatment groups. These effects faded somewhat by year's end, but remain significant for females who planned to take enough courses to qualify for a scholarship. There also appears to have been an effect on retention for females offered both scholarships and services. This effect is large enough to generate an overall increase in retention. The authors conclude that the results suggest that a combination of services and incentives is more promising than either alone, especially for females. Fall term grades for females in the combined group were 0.35 of a standard deviation higher than in the control group.

Leuven *et al.* (2005) conducted a randomized field experiment where first-year university students could earn financial rewards for passing all first year requirements within one year. They find small and non-significant average effects of financial incentives on the pass rate and the numbers of collected credit points. There is, however, evidence that high ability students collect significantly more credit points when assigned to (higher) reward groups. Low ability students collect less credit points when assigned to higher reward groups. After three years these effects have increased, suggesting dynamic spillovers. The small average effect in the population is, therefore, the sum of a positive effect for high ability students and an (partly) offsetting negative effect for low ability students. A negative effect of financial incentives for less able individuals is in line with research from psychology and recent economic laboratory

experiments, which shows that external rewards may be detrimental for intrinsic motivation.

Partly motivated by the negative incentive effect on low-ability students, Leuven *et al*. (2007) conducted another randomized field experiment in which first year students attending an introductory microeconomics course were invited to participate in a rank-order tournament. Three leagues were created, one with a high prize (€5,000), one with a medium prize (€3,000) and one with a low prize (€1,000). The best performing student in each group wins the prize. Upon application, students were asked to choose for which of the three prizes they wanted to play. The motivation for this is that this could (self-)select students into more homogeneous ability groups such that low-ability students compete with each other. Within each group students were randomly assigned to treatment groups (these could actually win a prize) and control groups (they could not win a prize). The results are somewhat disappointing. Students in treatment groups have the same effort (measured as attendance and preparation time) and achievement (measured as exam score) as students in the control groups. The only exception is that treated students tend to attend the very first meeting after announcement of the results of the randomization more often than control students. This suggests that financial incentives for students (of the size used in this experiment) only have short run effects but no long run effects. (Psychologists refer to this as the difference between hot and cold decision-making.) This is important to keep in mind when talking about incentives elements in other financial arrangements (Gneezy and List 2006).

3.3 Subsidization Mechanisms

Another category of financial instruments consists of subsidization mechanisms. In this

subsection we discuss the following: (1) scholarships and grants, (2) vouchers, entitlements and learning accounts, and (3) tax instruments.

Scholarships/grants. In many countries, tuition fees are heavily subsidized and cover only a small part of the actual costs of education. Motives to do so can be related to the alleged relevance of externalities and may be due to equity considerations. To the extent that equity considerations matter, the subsidies should somehow be related to recipients' social background.

From an efficiency-perspective the provision of scholarships and grants has two potential drawbacks. First, since students pay only a modest contribution, they are not pressed to make efficient choices and to judge whether they get value for money. Also, consumption of free goods is often wasteful. Second, public rather than private funding of education "creates institutions which become oriented toward serving bureaucratic and political interests rather than student needs" (Eicher and Chevalier 1993: 484).

The impact of tuition on enrollment choices has received considerable attention. Kane (2006) provides a brief summary of such studies pertaining to the United States. Using different datasets and different identification methods, different studies arrive basically at the same conclusion: an increase in tuition of $1,000 translates in a decrease in college enrollment of 4 to 6 percentage points. The lower estimate comes from a study by Dynarski (2003) who exploits the sudden discontinuation of the Social Security Student Benefit program to measure the impact on college attendance. The higher estimate comes from studies that exploit variation in tuition policies across states. Only studies that include state fixed effects tend to report smaller

estimates of the effect of a change in tuition on enrollment (1 to 2 percentage points per $1,000).

Studies looking at the impact of college costs on enrollment in countries outside the United States tend to find smaller effects. An example is the study by Kodde and Ritzen (1984) for the Netherlands. In a survey they asked prospective students about the earnings expectations with and without further education and about parents' income. They use the estimates on the impacts of these variables to simulate the effect of a change in tuition and find that enrollment is insensitive to such changes. Similar conclusions are drawn from studies that exploit variation in tuition and enrollment over time (see, for example, Pissarides 1981, 1982, or, more recently, Canton and De Jong 2005).

Vouchers. The most elaborated and consistent voucher plan applicable to post-compulsory education is the model proposed by Levin (1983). This model contains the following elements. First, as in all voucher models, participants receive the entitlements and the funding follows their choices. In principle, every supplier can offer a course and receive the funding as long as it has been accredited.

In this model, vouchers are not necessarily grants but can also consist of a mixture of grants and loans. The composition of the voucher, in this respect, may vary with the type of study and student characteristics. For types of studies that are supposed to generate larger externalities, students receive vouchers with a larger grant component. Moreover, it is possible to give vouchers with a larger grants component to students from low-income families. Such a construction might be motivated by equity considerations. Furthermore, within this model, it is

feasible to endow students with lower initial ability with more or larger vouchers. Note, however, that moral hazard problems may arise with vouchers differentiated by ability level. The possibility of a loans component in the voucher scheme provides the opportunity to combine the voucher scheme with one of the loan schemes discussed above. The next element of this model is that vouchers retain their real value during the entire lifetime of the owner. This implies that initial schooling and lifelong learning are treated as equivalents.

Finally, Levin (1983) is aware of the crucial role that information plays in a market system. But suppliers and demanders of educational services need to be provided with accurate information. Levin (1983), therefore, proposes to establish a special agency to collect, analyze and disseminate information with regard to schooling and training.

The unique features of the proposed scheme are its comprehensiveness and the loans element. The model covers not only the courses for which the government traditionally takes responsibility, but also schooling forms thought to be the prime responsibility of private employers. A likely consequence of this might be a partial displacement of private training expenditures by public training expenditures. It seems reasonable, therefore, to establish a fund that is fed by firms in proportion to the extent to which their workers use vouchers for firm-specific training courses.

Implementation of Levin's (1983) model will affect both the supply-side and the demand-side of the schooling market. On the supply-side, new courses will be offered which are aimed at persons who currently do not enroll in post-compulsory schooling. That such new supply will

indeed be offered is shown by experience in the United States with the so-called GI Bill. In a sense, this law constitutes a pilot study with vouchers (see O'Neill 1977). Under the GI Bill, veterans of war are entitled to attend up to 45 months of education during a 10-year period after their active duty. They are entitled to receive an allowance if they attend an accredited schooling or training program. The allowance may be used either to meet the direct schooling costs or to cover costs of living. Many newly established courses have been approved in relation to the GI Bill. Many of these courses were geared towards low-ability veterans, and these courses are believed to have a positive effect on earnings. This contradicts the belief that the voucher mechanism leads to the supply of inferior quality.

Bound and Turner (2002) and Turner and Bound (2003) have looked at the effects of the GI Bill on educational attainment of veterans. Using variation in service during World War II between cohorts, Bound and Turner (2002) estimate significantly positive effects on years of college completed and on the probability of college completion. Turner and Bound (2003) show that this has been accompanied by a widening of the gap in educational outcomes between African-Americans and others.

Changes at the supply-side are mirrored on the demand-side. There will be higher participation rates in schooling if people who do not attend post-compulsory schooling under the current system will collect their vouchers. Furthermore, the supply of shorter courses will be reflected by less concentrated school attendance: patterns in which people switch back and forth between education and work will become usual.

A voucher scheme is believed to change the composition of suppliers of educational services. Existing boundaries between publicly and privately financed institutes will disappear. Institutes that are now privately financed may increase their market share. Furthermore, it is likely that there will be a shift from more expensive to less expensive courses because students will have to pay higher contributions (in the form of higher loans) for the more expensive courses and will, therefore, be more cost-conscious.

Paraguay has used vouchers to finance training since 1995 (Botelho and Goldmark 2000). Kenya provides training vouchers to entrepreneurs in the' *jua kali* (cottage' industry) sector through the Micro-Small Enterprise Training Fund (Middleton, Ziderman and Adams 1993). Five of Austria's eight provinces provide training vouchers co financed by the provincial government and voucher recipients (West, Sparkes and Balabanov 2000). Private and company-sponsored voucher schemes are also in place. In the United Kingdom, the Ford Employee Development and Assistance Program has been operating since 1989 (West, Sparkes and Balabanov 2000). It functions as a voucher that allows employees to receive education and training. Unfortunately, no impact estimates are yet available.

Individual Learning Accounts. Individual learning accounts (ILAs) encourage savings for education while providing vouchers to people interested in pursuing training. An ILA is a base amount of resources set aside for an individual to use for his or her learning. ILAs can be used to develop knowledge, skills and abilities that increase their human capital. The United Kingdom introduced such accounts (although it has since abandoned the program because of fraudulent activity by training providers), and several other European countries are either

piloting or considering setting them up.

An ILA initiative has been running in the Netherlands since 2001. It involves eight pilot projects, each serving up to 150 people. The project includes contributions from learners, employers, and the state. State contributions are budgeted at about $400 per learner; employers contribute about $130—$400 per learner. The pilots have been confined to particular training fields. Renkema (2006) conducted an in-depth study of the effect of ILAs on recipients' educational intentions. To this end, he focused on two sectors: elderly care and technical installation services. In the first sector he fails to find any effect at all, for the second sector he reports modest positive impacts on intentions; the experimental condition of respondents accounted for only 5 percent of the variation of educational intention, compared to 27 percent for age and 10 percent for prior participation.

In Spain, the Basque Country launched a program in September 2000 that gives secondary school teachers vouchers worth $130 to $600. The funds cover 75 percent of training costs and are intended to be used for enhancing computer skills. Sweden has proposed creating ILAs in which learners and employers deposit funds for competency training. These funds would be tax free when placed in the account but treated as income once withdrawn. Accumulating assets in the learning account would thus allow learners to defer taxes. The subsidy comes as a tax reduction when the individual withdraws funds from the account. The tax reduction depends on two factors: the amount the individual withdraws and the "scope of competency development," measured by a predetermined scale for each kind of training. The proposal thus uses a voucher that is proportional to the amount invested by the individual and to an objective measurement of the intensity of the program. As an alternative to state-sponsored

initiatives, the corporation Scandia introduced "competency assurance" accounts in Sweden. These accounts allow learners to save up to 20 percent of their income for future use to cover training expenses and, when studying full time, forgone income. The employer contributes the same amount that the learner does to the account. This example stands out as a private initiative to financing lifelong learning (Palacios 2002).

In the United States individual development accounts (IDAs)—dedicated savings accounts similar in structure to Individual Retirement Accounts (IRAs)—can be used only for education, job training, capitalizing a small business, or purchasing a first home. The accounts are managed by community organizations and held at local financial institutions. Contributions for lower-income participants are matched using both private and public sources (Edwards 1997; Scanlon 2001). Education Savings Accounts (ESAs) in Canada use the same general approach. Unlike in an entitlement program, in which each learner is entitled to a certain amount, in an ESA the amount to which a person is entitled depends on the amount saved and the kind of training pursued. No evidence is available regarding the impact of these savings accounts.

Payroll Levies. Payroll levies are often used to finance occupational training. In some countries, including Brazil and France, they are used to finance civics education. There are two general approaches. In the first, the government levies a payroll tax on employers. The central government or a quasi-government agency then conducts training using funds from the levy. In some countries, such as Nigeria, this model has encountered problems, because it tends to create large, self-perpetuating bureaucracies. Some countries, including the United Kingdom, have stopped imposing such levies.

An alternative model is one in which employers manage the levy. In this model, in place in France, Hungary and Malaysia, employers who document that they have provided training to their employees are forgiven part of the levy. One problem with this approach is that companies can use the funds for other activities and charge them to training. Moreover, even these levies can create entrenched bureaucracies. Levies can also drive up the cost of labor. Brazil, for example, has multiple payroll taxes, including training levies, which amount to 80 to 110 percent of net wages. The net impact of these levies also remains unclear, as the policy may encourage employers to provide more internal training than they otherwise would have.

As they do in many Latin American countries, national training organizations in Brazil receive payroll tax funds to provide training for workers in enterprises and to sponsor apprentices on a cost-sharing basis. The level of financing, which is under review, is currently about 2.9 percent of wages. There is some concern that the organizations are over funded, and options for refining the system are being discussed. Since 1971 French enterprises with more than 10 employees have had to devote 1.5 percent of gross payroll to training their staff, either internally or by contracting with an external training provider. Enterprises that choose to train their employees themselves do so within the framework of an annual or multiyear training plan. The employer can choose the type of training and designate which employees should attend it. This system is believed to have contributed to a large increase in training in enterprises and to have helped ensure equity and access to training by workers in small enterprises. The 1992 Human Resources Development Act instituted a human resources development levy of 1 percent of the total monthly basic wages or fixed allowances of the employees. It currently covers firms with 10 or more employees and represents one of the major streams for financing training in Malaysia

(Fretwell and Colombano 2000).

Tax instruments. Some countries subsidize training participation through tax instruments. This can be done either by allowing firms to deduct training expenditures from the tax bill, or to allow individuals (workers) to deduct their training expenditures from their income tax. As firms' training expenditures are part of their normal operation costs, firms will normally be allowed to deduct such costs from their tax bill. This is possible in many countries including for instance the Netherlands, Japan, Chile and Canada.

Leuven and Oosterbeek (2004) evaluated to what extent the firms' tax deduction for training expenditures affects training participation. To this end, they exploited the feature that the Dutch tax scheme allowed firms to deduct an extra amount in case the training expenditures pertained to the training of workers older than 40 years. This policy created a discontinuity in firms' training costs at the age of 40. For a worker (just) over 40 years old, training is 14 percent cheaper than for a worker (just) under 40 years old. While the policy was implemented with the aim to stimulate training participation among older workers, the empirical results suggest that this did not happen. Training participation among workers just above 40 is substantially above training participation among workers just below 40. This difference is, however, not the result of increased training rates among older workers but results from decreased training rates among younger workers. Apparently, training participation by workers just below 40 was postponed.

Another possibility is to allow individuals to deduct direct training expenditures from their taxable income. Such tax deduction of training expenditures is possible in various countries

including Germany, Italy and the Netherlands (in Italy against the lowest marginal tax rate), but not in other countries such as France, Sweden, Norway and the United Kingdom (where it was recently been replaced by the now abandoned individual learning accounts). In some other countries, including the United States, Canada and Australia, training expenditures can be deducted as long as they are made to maintain existing skills. The differences across countries show that tax (non-)deductibility of training expenditures is a policy variable, which is used by some countries, but not by others, as an instrument to stimulate training participation.

Leuven and Oosterbeek (2007) evaluate the deductibility of direct training expenditures from taxable income using two different approaches. The main challenge is to isolate the effect of tax deductibility of direct training expenditures from the (implicit) tax deductibility of opportunity costs of training investment and from the taxation of returns to training investments. The first method exploits differences in deductibility rates around kinks in the tax schedule. By choosing the intervals around the kinks such that average net wage rates are equal, they get rid of the tax deductibility of opportunity costs. They also show that future marginal tax rates for individuals who are above and below kinks in a given year are very similar. This eliminates differences in taxation of returns to training. Results based on this approach indicate that a 10 percentage point increase in the tax deductibility rate of direct training expenditures increase training participation by 0.33 percentage points (which is a 10 percent increase of the training rate).

Their second method takes advantage of the 2001 tax reform, which implied a substantial change in marginal tax rates. Investment costs in 2000 (before the reform) were subject to the

old tax code, while investment costs in 2001 (after the reform) were subject to the new tax code. Because returns to training materialize with some delay, returns to investments made in 2000 and 2001 were both subject to the new tax code. Accordingly, this method isolates changes in taxation of costs from changes in taxation of returns. It does not, however, isolate tax deductibility of direct training expenditures from tax deductibility of opportunity costs. This method identifies the joint effect of these two deductibility rates, and since these operate in the same direction, it will overestimate the effect of interest. Results based on this approach indicate that a 10 percentage point increase in the tax deductibility rate of training costs increase training participation by 0.8 percentage points (which is a 25 percent increase of the training rate). The authors show that the ratio of the results from the two methods are informative about the ratio of the opportunity costs of training investments and the direct expenditures of training investments, implying that opportunity costs are 1.5 times as large as direct expenditures.

There is reason to believe the true effect of tax deductibility of direct training expenditures is somewhere in between the estimates from the two methods. To the extent that the first approach does not fully neutralize differences in the taxation of returns, the estimates based on this method underestimate the true effect. Moreover, this method assumes that individuals are fully aware of the marginal tax rate applicable to their training expenditures. If this assumption does not hold for some individuals with incomes close to a kink, these individuals will not act on their tax treatment and their responsiveness will thus be zero. This also biases the estimate from the local identification method downwards.

On the other hand, the estimate from the reform method is interpreted as the joint effect

of tax deductibility of direct training expenditures and tax deductibility of opportunity costs. The underlying economic model assumes that an individual's opportunity costs of an hour spent on training changes abruptly if this person's taxable income passes a kink in the tax schedule. For people who work full-time (as most people with incomes at least just below the first kink will do) and have little scope to adapt their working hours marginally, this assumption implies that these persons experience an abrupt change in the valuation of their leisure. To the extent that one is unwilling to believe this, a larger share of the effect estimate from the reform approach is attributable to the tax deductibility of direct training expenditures.

The reported effect sizes are evaluated at an average marginal tax rate equal to 0.4. If it is assumed that effects are constant over tax rates the low estimate of 0.33 percentage points change in training participation per 10 percentage point change in deductibility rate, suggests that abolishing the tax deductibility of direct training expenditures reduces the share of individuals who spend money on training for career purposes by almost one half: from 3 percent to 1.7 percent. Using the high estimate of 0.8 percentage points change in training participation per 10 percentage point change in deductibility rate, even suggests that without tax deductibility of direct training expenditures no one would spend money on training for career purposes. In any case, tax deductibility of direct training expenditures appears to be a fairly effective instrument to enhance human capital accumulation. At a marginal tax rate of 0.40, every Euro invested by the government in the form of a tax deduction, leads to 0.75 to 1.5 euros of private expenditures on training investments.

4. Summary and Conclusions

This paper provides a fresh attempt to take stock of the available knowledge and insights regarding schemes to finance lifelong learning. The financial arrangements that we considered include financial instruments to stimulate successful early learning such as vouchers, (conditional) cash transfers and financial incentives for pupils and their teachers. We also cover various financial aid schemes such as income contingent loans and graduate taxes and subsidization mechanisms such as vouchers, grants/scholarships and tax rebates.

In our analysis we applied the standard normative framework of welfare economics that emphasizes the importance of efficiency and equity. In addition, we include discussions of relevant empirical findings where we focus on findings that pass the test of being based on a research design that includes a proper control group. Doing so reveals that much more is known about the effects of some instrument than of others. This identifies gaps in our knowledge regarding some instruments.

Table 1 summarizes our findings. First consider the instruments aimed at stimulating early learning: vouchers, conditional cash transfers and financial incentives for pupils. Notice that these three instruments are in some sense closely related. All three imply a financial transfer from the government to pupils and their parents. With vouchers families receive an earmarked transfer allowing them (but not requiring them) to "buy" education. With conditional cash transfers, families receive a financial transfer that they can spend as they like but children are required to attend school. With financial rewards for pupils, pupils (or their families) receive a financial transfer that they can spend as they like, but the children are required to qualify for

(win) the reward. Theoretical analyses have mainly focused on the voucher instruments and not on the other two. This is probably due to the fact that vouchers intend to enhance the market power of consumers by providing them earmarked purchasing power and that providers are assumed to respond to this. Yet, the available empirical evidence is ambiguous about the effects of vouchers than about the effects of the other instruments. While school attendance and achievement in Colombia have improved due to vouchers, it is difficult to show similar effects for voucher experiments in the United States. Vouchers in the United States remain controversial. The experience with conditional cash transfers in various Latin American countries shows that such transfers increase school attendance. Different analyses also suggest that the conditionality of the transfers is the decisive factor here. Financial rewards for students have positive effects on pupils' achievement. Unexpectedly, these positive effects are not restricted to high ability pupils; low ability students also seem to benefit.

The education finance literature has traditionally paid much attention to financial aid schemes for (higher education) students. A standard economic analysis of capital market failures provides reasons for government intervention. According to such an analysis the favored form of financial aid is through income contingent loans. Such loans solve the capital marker inefficiency and at the same time confront students with the (marginal) costs of their choices. Moreover such loans can also serve equity goals quite well.

Despite the almost universal enthusiasm about income contingent loans among economists, practical experience with such schemes is very limited. Only a few countries have actually implemented such schemes, the best-documented example being Australia. It is often

claimed that the introduction of income contingent loan schemes in Australia did not harm the accessibility of higher education for students from low-income families. This claim is probably too optimistic because it is based on comparisons of attendance of these students before and after the introduction of income contingent loans and not on an estimate of what attendance of these students in the period after the introduction would have been in the absence of the income contingent loans.

Another noticeable thing is that two recent studies have found indications of debt aversion among students at elite universities in the United States. Debt aversion refers to disutility of carrying debt over and above the effects of debt on lifetime consumption patterns. If student at elite universities in the United States are already debt averse, it is very likely that students from poorer social backgrounds are also debt averse. The presence of debt aversion restricts the potential for income contingent loans.

Two Dutch experiments on the role of financial incentives for students show two interesting results. In one experiment students were given incentives in the form of piece rates. While students belonging to the top half of the ability distribution responded to this by collecting more credit points, students belonging to the bottom half of the ability distribution responded by collecting fewer credit points. An explanation for this is that explicit financial incentives have crowded out intrinsic motivation resulting in lower performance. It is useful to know that financial incentives can have such perverse effects. In the other experiment students were given incentives in the form of a tournament. The interesting finding from this study is that students only responded to the incentive in the “hot” initial decision making stage, but not later on.

Lifelong learning activities can be subsidized in various ways. Providing (implicit or explicit) scholarships or grants to those enrolled is heavily used in many (higher) education systems around the world. Such subsidies confront students with prices that do not reflect the true marginal costs of their activities. From an efficiency perspective this is only justified if the social marginal returns of their activities exceed the private marginal returns. The mixed evidence on the relevance of externalities casts doubt on the validity of this argument. A vast number of studies using data from the United States indicate that student enrollment in higher education is responsive to changes in prices. A $1,000 change in tuition fees changes enrollments rates by 4 to 6 percentage points. Results for other countries suggest that students in these countries are less responsive to price changes. This is probably due to the fact that tuition levels in these countries are below United States levels.

To stimulate lifelong learning activities of adult workers, it is often believed that simply making such activities available below marginal costs provides insufficient incentives. Instruments such as vouchers, entitlements and individual learning accounts give potential learners a very explicit confirmation of their increased purchasing power. This should strengthen people's awareness of the availability and importance of learning activities. The available evidence regarding the effects of these subsidy forms is rather limited. Evidence from United States veterans indicates that the voucher type education subsidies that they received through the GI Bill, increased their educational attainment, but also widens the education gap between various groups. This evidence obviously pertains to a rather particular group, and the estimation results should be interpreted as the joint effects of military service and the GI Bill.

A less explicit way of subsidizing learning activities is in the form of tax deductions. Existing evidence is restricted to one country (the Netherlands). An age dependent tax deduction for firms appears to have led to postponement of training activities rather than to an increase. An income tax deduction for individuals appears to have substantially positive effects on training participation. Unfortunately, the available data do not permit an analysis of the wage returns to these extra training activities.

We conclude with a brief listing of the most prominent knowledge gaps regarding the effects of various financing schemes related to lifelong learning. Too little is known about the effect of vouchers on compulsory education. The evidence in Colombia is promising, but the United States evidence is unclear. Too little is also known about the effects of different financial aid schemes for students. The emphasis in some studies on the advantages of income contingent loan schemes is at odds with the lack of convincing empirical studies about the effects of such schemes. Finally, too little is known about the impacts of vouchers, entitlements and individual learning accounts on youth and adult learning. It would be worthwhile to undertake well-designed field experiments to study the working of such schemes. Moreover, it would be useful if the limited evidence about the impacts of tax deductions obtained from the Netherlands can be supplemented with results from other countries.

In recent years some progress has been made, especially about the impact of (conditional) cash transfer programs in Latin America. In many cases these programs have been implemented in ways that allow for solid impact evaluations. Much can be gained by following the same strategy for other financial arrangements. The details of such arrangements should be adjusted to

local specificities and needs, and should not be designed at headquarters of international organizations.

References

Acemoglu, D. and J. Angrist (2000). "How large are the social returns to education? Evidence from compulsory schooling laws." *NBER Macroannual* 9-59.

Acemoglu, D. and J.-S. Pischke (1999). "The structure of wage and investment in general training." *Journal of Political Economy* 539-572.

Angrist, J. and A. Krueger (1991). "Does compulsory school attendance affect schooling and earnings?" *Quarterly Journal of Economics* 970-1014.

Angrist, J., E. Bettinger, E. Bloom, E. King and M. Kremer (2002). "Vouchers for private schooling in Colombia: Evidence from a randomized natural experiment." *American Economic Review*

Angrist, J. E. Bettinger and M. Kremer (2006a). "Long-term consequences of secondary school vouchers: Evidence from administrative records in Colombia." *American Economic Review*

Angrist, J., D. Lang and P. Oreopoulos (2006b). "Lead them to water and pay them to drink: An experiment with services and incentives for college achievement." NBER Working Paper 12790.

Angrist, J. and V. Lavy (2004). "The effect of high-stakes high school achievement awards: Evidence from a school-centered randomized trial." IZA Discussion Paper 1146.

Ashenfelter, O., C. Harmon and H. Oosterbeek (1999). "A review of estimates of the schooling/earnings relationship, with tests for publication bias." *Labour Economics* 453-470.

Attanasio, O., C. Meghir and A. Santiago. (2005). "Education choices in Mexico: Using a structural model and a randomized experiment to evaluate Progresa." Unpublished manuscript, University College London.

Attanasio, O.. E. Fitzsimons, A. Gomez, D. Lopez, C. Meghir and A. Mesnard (2006). "Child education and work choices in the presence of a conditional cash transfer programme in rural Colombia." The Institute of Fiscal Studies WP 06/01.

Barr, N. (1993). "Alternative funding resources for higher education." *Economic Journal* 103: 718-728.

Barr, N. and J. Falkingham (1993). "Paying for learning." WSP/96 (London).

Bettinger, E., M. Kremer and J.E. Saavedra (2007). "How do vouchers work? Evidence from Colombia." Unpublished working paper.

Botelho, C. and L. Goldmark (2000). "Paraguay vouchers revisited." ILO.

Bound, J. and S. Turner (2002). "Going to war and going to college: Did World War II and the G.I. Bill increase educational attainment for returning veterans?" *Journal of Labor Economics* 784-815.

Bourguignon, F., F. Ferreira and P. Leite (2003). "Conditional cash transfer, schooling, and child labor: Micro-simulating Brazil's Bolsa Escola Program." *World Bank Economic Review* 17(2): 229-254.

Caldés, N., D. Coady and J. Maluccio (2004). "The Cost of Poverty Alleviation Transfer Programs: A Comparative Analysis of Three Programs in Latin America." IFPRI, Washington.

Canton, E. and F. de Jong (2005). "The demand for higher education in the Netherlands, 1950-1999." *Economics of Education Review* 24: 651-663.

Carnoy, M. (2001). "School vouchers: Examining the evidence." Washington D.C.: Economic Policy Institute.

Chapman, B. (2006). "Income contingent loans for higher education: international reforms," in E. Hanushek and F. Welch, eds., *Handbook of the Economics of Education.* Amsterdam: North Holland.

Chapman, B. J. and A. Harding. (1993). "Australian student loans." ANU Discussion Papers 287 (Canberra).

Chapman, B. and C. Ryan (2002). "Income contingent financing of student higher education charges: Assessing the Australian innovation." *Welsh Journal of Education* 64-81.

Cuhna, F., J. Heckman, L. Lochner and D. Masterov (2006). "Interpreting the evidence on life cycle skill formation," in: E. Hanushek and F. Welch, eds., *Handbook of the Economics of Education*. Amsterdam: North Holland.

De Brauw, Alan and John Hoddinott (2007). "Must conditional cash transfer programs be conditioned to be effective? The impact of conditioning transfers on school enrollments in Mexico." Working paper.

De Janvry, A. and E. Sadoulet. (2006). "Making Conditional Cash Transfer Programs More Efficient: Designing for Maximum Effect of Conditionality." *World Bank Economic Review* 20(1): 1-30.

Duryea, S. and M. Andrew (2004). "The Effect of Conditional Transfers on School Performance and Child Labor: Evidence from an Ex-Post Impact Evaluation in Costa Rica." Inter-American Development Bank, Washington.

Dynarski, S. (2003). "Does Aid Matter? Measuring the Effect of Student Aid on College Attendance and Completion." *American Economic Review*

Edwards, K. (1997). "Individual Development Accounts: Creative Savings for Families and Communities." Working paper. University of Washington, Center for Social Development, St. Louis.

Eicher, J.-C. and T. Chevalier (1993). "Rethinking the finance of post-compulsory education." *International Journal of Educational Research* 19: 445-519.

Field, E. (2006). "Educational debt burden and career choice: evidence from a financial aid experiment at NYU law school." NBER Working Paper No. 12282.

Fretwell, D.H. and J.E. Colombano (2000). "Adult continuing education: an integral part of lifelong learning." Working Paper, World Bank.

Friedman, M. (1955). "The role of government in public education," in: R.A. Solo, ed., *Economics and the public interest*. New Brunswick, NJ: Rutgers University Press.

Friedman, M. and S. Kuznets (1945). *Income from independent professional practice*.

Gneezy, U. and J. List (2006). "Putting behavioral economics to work: testing for gift exchange in labor markets using field experiments." *Econometrica* 74: 247-277.

Grossman, M. (2006). "Education and non-market outcomes," in E. Hanushek and F. Welch, eds., *Handbook of the Economics of Education*. Amsterdam: North Holland.

Haveman, R.H. and B.L. Wolfe. (1984). "Schooling and Economic Well-Being: The Role of Nonmarket Effects." *Journal of Human Resources* 19(3): 377-407.

Howell, W. and P. Peterson (2002). *The Education Gap: Vouchers and Urban Schools*. Washington, DC: Brookings Institute Press.

Jencks, C. (1971). "Giving parents money for schooling." *Compact* 5: 25-7.

Kane, T. (2006). "Public intervention and post-secondary education," in E. Hanushek and F. Welch, eds., *Handbook of the Economics of Education*. Amsterdam: North Holland.

Kodde, D. and J. Ritzen (1984). "Integrating investment and consumption motives in a Neoclassical model of demand for education." *Kyklos* 598-608.

Kremer, M., E. Miguel and R. Thornton. (2004). "Incentives to learn." Unpublished working paper, Harvard University.

Krueger, A. and M. Lindahl (2001). "Education for growth: why and for whom?" *Journal of Economic Literature* 1101-1136.

Krueger, A. and P. Zhu (2004). "Another look at the New York school voucher experiment." *American Behavioral Scientist*

Lange, F. and R. Topel (2006). "The social value of education and human capital," in E. Hanushek and F. Welch, eds., *Handbook of the Economics of Education.* Amsterdam: North Holland.

Lavy, V. (2002). "Evaluating the effect of teachers' group performance incentives on pupil achievement." *Journal of Political Economy* 1286-1317.

Lavy, V. (2007). "Performance Pay and Teachers' Effort, Productivity and Grading Ethics." Unpublished working paper.

Leuven, E. and H. Oosterbeek (2004). "Evaluating the effect of tax deductions on training." *Journal of Labor Economics 22*(1): 461-488.

Leuven, E. and H. Oosterbeek (2007). "The responsiveness of training participation to tax deductibility." Unpublished working paper.

Leuven, E., H. Oosterbeek and B. van der Klaauw (2005). "The effect of financial rewards on students' achievement: Evidence from a randomized experiment." CEPR working paper.

Leuven, E., H. Oosterbeek, J. Sonnemans and B. van der Klaauw (2007). "Rank order tournaments as incentive devices: Evidence from a field experiment." Unpublished working paper.

Levin, H.M. (1983). "Individual entitlements," in Levin, H.M. and H.G. Schutze, eds., *Financing Recurrent Education*. Beverly Hills: Sage.

Lindert, K., A. Linder, J. Hobbs and B. de la Briere (2007). "The Nuts and Bolts of Brazil's Bolsa Família Program: Implementing Conditional Cash Transfers in a Decentralized Context." Washington, DC, World Bank. SP Discussion Paper No. 0709.

Maluccio J. and F. Rafael (2004). "Impact Evaluation of A Conditional Cash Transfer Program: The Nicaraguan Red de Protección Social." FCND Discussion. No. 184.

Mayer, D., P. Peterson, D. Myers, C. Clark Tuttle and W. Howell (2002). "School Choice in New York City after Three Years: An Evaluation of the School Choice Scholarships Program." Washington, DC, Mathematica Policy Research, Inc.

Middleton, J., A. Ziderman and A. Van Adams (1993). *Skills for productivity; vocational education and training in developing countries*. New York: Oxford University Press.

Moretti, E. (2003). "Estimating the social return to higher education: Evidence from longitudinal and cross-section data." *Journal of Econometrics*

O'Neill, D. (1977). "Voucher funding of training programs: evidence from the GI Bill." *Journal of Human Resources* 12: 425-445.

Oosterbeek, H. and J. Ponce (2007). "The impact of (unconditional) cash transfers on school enrollment: Evidence from Ecuador." Unpublished working paper.

Palacios, M. (2004). *Investing in human capital: a capital markets approach to higher education funding*. Cambridge: Cambridge University Press.

Panagides, A. (2003). "A Review of School Savings Incentive Program Poupança Escola: Federal District of Brasilia (1995-2001)." Washington, DC, World Bank, Human Development Network (processed).

Pissarides, C.A. (1981). "Staying-on in school in England and Wales." *Economica* 48: 345-363.

Pissarides, C.A. (1982). "From school to university: the demand for post-compulsory education in Britain." *Economic Journal* 92: 654-667.

Rawlings, L. and G. Rubio (2003). "Evaluating the Impact of Conditional Cash Transfer Programs: Lesson from Latin America." World Bank Policy Research Working Paper No. 3119.

Renkema, A. (2006). "Individual learning accounts: a strategy for lifelong learning?" Den Bosch: CINOP.

Rothstein, J. and C. Rouse (2007). "Constrained after college: student loans and early career occupational choices." NBER Working Paper 13117.

Rouse, C. (1998). "Private school vouchers and student achievement: an evaluation of the Milwaukee parental choice program." *Quarterly Journal of Economics* 113: 553-602.

Scanlon, E. (2001). "Toward a Theory of Financial Savings and Child Well-Being: Implications for Research on a Children and Youth Savings Account Policy Demonstration." Research Background Paper CYSAPD 01–11. University of Washington, Center for Social Development, St. Louis.

Schady, N. and M. Araujo (2005). "Cash transfers, conditions, school enrollment, and child work in Ecuador." The World Bank. Mimeo.

Schultz, P. (2004). "School subsidies for the poor: evaluating the Mexican Progresa poverty program." *Journal of Development Economics* 74: 199-250.

Todd, P., and K. Wolpin. (2003). "Using a Social Experiment to Validate a Dynamic Behavioral Model of Child Schooling and Fertility: Assessing the Impact of a School Subsidy Program in Mexico." Unpublished manuscript, University of Pennsylvania.

Turner, S. and J. Bound (2003). "Closing the gap or widening the divide: The effects of the G.I. Bill and World War II on the educational outcomes of black Americans." *Journal of Economic History*, 145-177.

West, A., J. Sparkes and T. Balabanov (2000). "Demand-Side Financing: A Focus on Vouchers in Post-Compulsory Education and Training: Discussion and Case Studies." European Centre for the Development of Vocational Training (CEDEFOP). Thessaloniki, Greece.

World Bank (2003). *Lifelong Learning in the Global Knowledge Economy: Challenges for Developing Countries*. Washington, DC: World Bank.

Table 1: Evaluation of Financing Schemes

Scheme	*Main motivation*	*Efficiency effect (in theory)*	*Equity effect (in theory)*	*Evidence*	*Remarks*
Early learning					
Vouchers	Enhance market power of consumers	Equality of MC and MB; possible internalization of externalities	Various possibilities depending on exact format	Evidence from US very mixed. Evidence from Colombia shows positive effects on school attendance and achievement.	Positive effects unlikely to be entirely due to peer effects.
Conditional cash transfers	Increase school attendance	Increases efficiency if current attendance levels are too low. The conditionality makes it very equal to compulsory education. Difference as "carrot or stick"	Depending on target group Expresses paternalism	(Quasi-)experimental evidence from various countries in Latin America shows positive effects on school attendance	It is the conditionality that matters not the cash transfer per se
Financial incentives for pupils	Increase effort of pupils	Unknown. It can potentially increase effort to levels above the optimum. Creates a windfall gain for those who would also perform well without an incentive	Likely to favor better pupils; these pupils are more likely to win and to be more responsive	Evidence from Kenya and Israel shows positive effects on achievement.	Both studies ignore some results contradicting their conclusions
Financial incentives for teachers	Increase effort of teachers	Unknown. It can potentially increase effort to levels above the optimum. Creates a windfall gain for those who would also perform well without an incentive	Likely to favor teachers with better students; these teachers are more likely to win and will therefore be more responsive	Quasi-experimental evidence from Israel reports positive effects from group and tournament incentives	Tournament more cost-effective than group incentives

Table 1: Evaluation of Financing Schemes

Scheme	*Main motivation*	*Efficiency effect (in theory)*	*Equity effect (in theory)*	*Evidence*	*Remarks*
Cost sharing					
Mortgage type loans	Lift liquidity constraint	Addresses capital market imperfection but imperfectly since does not align repayment & realization of benefits	Likely to be more attractive for students from rich backgrounds	No evidence available	
Income contingent loans	Lift liquidity constraint	Addresses capital market imperfection & aligns repayment & realization of benefits	Equalizing under traditional assumptions but not when students debt-averse	No evidence available on causal impact of ICL on access	
Graduate tax	Lift liquidity constraint	Addresses capital market imperfection, aligns repayment & realization of benefits; does not equalize repaid & received amount	Progressive since graduates earning more pay more.	No evidence on impacts, some evidence suggests debt-aversion important	
Human capital contracts	Lift liquidity constraint	Market forces determine payback percentage		Limited experience, no evidence	
Financial incentives	Increase effort of students	Unknown. It can potentially increase effort to levels above the optimum	Likely to favor better students; these students are more likely to win and to be more responsive	Evidence from Holland on piece rates indicate high ability students benefit, low ability students harmed; tournament effects short lived	Results may be useful to include incentives in financial aid schemes

Table 1: Evaluation of Financing Schemes

Scheme	*Main motivation*	*Efficiency effect (in theory)*	*Equity effect (in theory)*	*Evidence*	*Remarks*
Subsidization					
Scholarships/ grants	Lift liquidity constraint	Does not address capital market imperfection. Possibly internalizes externalities. Consumers are not confronted with true marginal costs.	Depends whether based on merit or on student characteristics	U.S. evidence indicates that $1000 change in price changes enrollment by 4-6 percentage points; results from other countries suggest low elasticities	
Vouchers/ entitlements/ learning accounts	Lift liquidity constraint and increase market power of consumers	Equality of MC and MB; possible internalization of externalities	Various possibilities depending on exact format	Quasi-experimental evidence shows that GI Bill increased educational attainment	But gap in educational attainment between African-Americans and others increased
Tax deductions for firms	Stimulate participation through cost reduction	Possibly internalizes externalities	Depending on target group	Dutch evidence shows that age dependent deduction let to training postponement (rather than increase)	
Tax deductions for workers	Stimulate participation through cost reduction	Possibly internalizes externalities	Likely to be regressive as cost reduction increases with marginal tax rate	Dutch evidence shows substantial effects	