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Financing Higher Education in Europe

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ABSTRACT

There exist different reasons to justify government intervention in higher education. Credit, insurance, education, and labour markets may not work properly (market failures), or individuals may turn out to be less rational than expected (behavioural failures). Also policy may face problems when attempting to correct these market and behavioural failures. In this paper, we explain the different failures, discuss the consequences for participation in higher education, and summarize the empirical evidence. Based on theory and evidence, we try to answer four questions in financing higher education from a European perspective.[3]

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CONTENTS

1. INTRODUCTION

Higher education strongly expanded during the last decades. In Europe, for example, enrolment in higher education doubled between 1970 and 2000 (Jacobs and van der Ploeg, 2006). Between 2000 and 2008 it increased by a further 20% in the EU-27 (Eurydice, 2011).

Increased enrolment puts pressure on public funding for higher education. Resources per student show a decline in the 1970s, stability in the 1980s, and a modest increase in the 90's (Jacobs and Van der Ploeg, 2006). The increase in expenditure per student persisted in the EU-27 between 2000 and 2008 (Eurydice, 2011). Very recently, however, a decrease occurred in Ireland, Greece, and Iceland, countries that were severely hit by the financial crisis (Eurydice, 2011).

Increased enrolment also puts pressure on private funding. Fees have been increased in Italy, the Netherlands, and Portugal, for example, and subsidies to cover living expenses have been decreased in Finland, Germany, and the Netherlands (OECD, 1998). Many countries also explore innovative and student-centered financing schemes (OECD, 1998 and Salmi and Hauptman, 2006). Merit fees—lower fees for bright high school students—have been introduced in Germany; and demerit fees—higher fees or reduced support for (s)low achievers in higher education—are current practice now in many countries including Austria, Belgium, Denmark, Finland, France, the Netherlands, Norway, and Sweden. Income-contingent loans have been introduced in Sweden and England, while grants in Germany, Sweden, and Norway have been replaced—in part or as a whole—by such loans.

The budgetary pressure on public and private means is not likely to decrease in the near future. The financial sustainability of pension and health care systems is high, if not higher, on the political agenda of several countries. In addition, the international mobility of students has increased considerably. The number of international students doubled between 1975 and 1995, and more than doubled between 1995 and 2009 (OECD, 2011). The internationalization of higher education may further increase the budgetary pressure, especially in countries with low tuition fees and high quality of education.

While budgetary pressure is a practical argument for higher education finance reform, we want to spell out economic arguments. A useful starting point is the 'invisible hand' paradigm: if there are no market failures and if individuals behave rationally, then the 'invisible hand' guarantees that what is best for the individuals is also best for society as a whole. Translated to higher education it says that—under the assumptions made—students must pay the full cost of higher education up-front.

Economic arguments for government intervention in higher education arise if the assumptions fail. There are indeed several reasons why credit, insurance, education, and labour markets can fail (so-called market failures). Similarly, individuals do not always behave rationally, and students turn out to be no exception (so-called behavioural failures). 'Homo psychologicus'—with bounded rationality, limited will power, and social interactions—provides sometimes a better description of participation behaviour compared to 'homo economicus'.

Market and behavioural failures can justify government intervention in higher education, but policies can fail as well. Subsidizing higher education from income taxes leads to a perverse life-time redistribution from poor and unskilled to rich and skilled individuals and distorts participation in the labour market. In addition, the increased internationalization of higher education may put pressure

in some countries to invest more in higher education, but it can also lead to a wasteful and unfair 'war on talent' among countries, which, in the case of the EU, can threaten social cohesion.

We start with a brief discussion of the rational participation decision in higher education. Next, we discuss potential failures—market, behavioural, and policy failures—in theory and provide the empirical evidence. Finally, we try to combine economic theory and empirical evidence to answer the following core questions in financing higher education from a European perspective: How much should be invested in higher education? Should students pay different contributions to higher education? When should students pay: before or after their studies? How should we deal with increasing international mobility?

Financing higher education is a complex question. In this paper we *mainly* focus on education (versus research), tertiary education (versus primary and secondary education), demand (versus supply), participation (versus success in higher education), who should pay (versus who pays and why), efficiency and equity (versus quality), causal evidence (at least, if available).

2. THE RATIONAL PARTICIPATION DECISION

Rational students participate in higher education if the expected private benefits of participation exceed the expected private costs. But what are the main costs and benefits and what are the risks?

The visible costs include fees, books, transport, and lodging. The invisible costs are the opportunity costs of time, i.e., the foregone earnings. The most apparent benefits of education are higher wages and lower unemployment. Non-pecuniary benefits such as better jobs, health, and personal relations may add to it as well.

A wide range of studies estimate the private pecuniary returns to education; see Harmon, Oosterbeek, and Walker (2004) for a review of the evidence. Estimates are on average 8% to 10% for one extra year of education. However, these averages hide considerable heterogeneity. Estimates based on exogenous variation in schooling (e.g., based on policy reforms or date of birth) are typically higher than estimates from twin studies, which are in turn (marginally) higher than studies that rely on OLS-estimates with controls for IQ. In addition, the estimates vary over individuals, depending on gender, IQ, birth cohort, and country. They also strongly differ across ages. Returns from education are reaped from age 30 onwards and stabilize around the age of 35; see Bhuller, Mogstad, and Salvanes (2011) and Carneiro, Hansen, and Heckman (2003) for evidence in Norway and the US. Estimates at the participation margin are typically lower than average estimates. This might explain why high average returns do not necessarily lead to more participation in some countries. Finally, a large part of the heterogeneity is not predictable at the time of the participation decision; see Carneiro, Hansen, and Heckman (2003). As Meghir and Pistaferri (2004) put it: "the higher returns from increased education come at the cost of higher earnings risk."[4]

There is also evidence of sizeable non-pecuniary private benefits of higher education. Many studies look at the impact of education on health outcomes; see, for example, Grossman (2000, 2006) and Cutler and Lleras-Muney (2006) for overviews of the empirical literature. The evidence shows a

[4] Earnings risk can be different for different graduates. Dearden, Fitzsimons, Goodman, and Kaplan (2008) show that female graduates in the UK have higher earnings and face lower risk compared to non-graduates.

strong link between education and smoking, drinking, mortality, drug use, and prevalence of several diseases. However, the reliability of estimates differs because of the complex relationship between health and education. Causality can run both ways, and many other relevant factors are correlated to both outcomes. Conti and Heckman (2010) provide causal evidence for the impact of education on the prevalence of smoking. Most studies treat education as a continuous variable (years of education) and do not specifically address the role of tertiary education. An exception is provided by Heckman, Humphries, Urzua, and Veramendi (2011). They find a strong causal impact of college attendance on several measures of health and risky behaviour, including smoking, physical and mental health, and self-esteem. Education has also been linked to other non-pecuniary benefits related to, for example, fertility, occupational choice, and consumption/savings behaviour; see Vila (2000), Wolfe and Haveman (2001), and Johnston (2004) for overviews.

If private benefits and costs (at the individual level) coincide with social benefits and costs (at the level of society), then the best private decisions will also be the best social decisions according to the invisible hand paradigm. But market failures can drive a wedge between private and social benefits and costs. Similarly, behavioural failures may imply that individuals mispredict the true costs and benefits of participation. In both cases, the invisible hand paradigm breaks down.

3. MARKET FAILURES

Suppose there is no government intervention and students therefore have to pay the full cost of higher education up-front. Some students may need a student loan. Other students may wish to insure against certain risks, like the risk of non-graduation. And the decision to participate or not typically depends on the value of higher education, which highly depends on the functioning of the education and the labour market. Each market—the credit, insurance, education, and labour market—can fail.

A. CREDIT AND INSURANCE MARKET FAILURES

THEORY

Education is a risky investment in private human capital. There is uncertainty concerning duration and success, future employment opportunities, earnings, and tax legislation. Such uncertainties imply that participation contains default risk, i.e., the risk of not being able to repay a loan that is used to finance higher education. Participation can also increase income risk, i.e., a higher variability of expected earnings in later life as shown by Meghir and Pistaferri (2004). Both default risk and income risk can lead to inefficiencies if it turns out that they are difficult to insure in a private market.

Default risk is difficult to insure in a private market. Friedman (1955) argues that students have little collateral to offer to investors to secure human capital investment; and parents are often reluctant to do so (Mazzeo, 2007). If the default risk cannot be insured by a collateral, creditors could include a risk premium in the interest rate. A risk premium increases the instalment however, and thus increases the default risk, leading to a vicious circle for some students. Introducing a risk premium will therefore be accompanied by constraining credit, to keep the instalment, and thus the default

risk, fixed. Hidden information about the default risk of students may further aggravate the problem, as it may cause adverse selection: low risk students are driven out of the market by high risk students (Akerlof, 1970). Moral hazard, i.e., studying or working less hard if the insurer bears the risk, may also complicate loan and insurance provision (Arrow, 1963). Finally, a considerable part of the default risk (e.g., caused by unemployment, earnings, and tax legislation risk) has a collective component that is difficult to insure in a private market (Connolly and Munro, 1999).

One possible consequence of the lack of insurance is that capital markets do not provide sufficient credit, unless securitized by, for example, the parents. Poor but otherwise talented students may be financially constrained and refrain from participation (Gross, Cekic, Hossler, and Hillman, 2009). Another possible consequence is that the lack of insurance for income risk leads to inefficiently low participation levels if students are risk averse. We summarize the empirical evidence for both consequences in the remainder of this section.

EVIDENCE

The evidence on credit constraints is mixed: while there is ample evidence for long-run constraints, short-run credit constraints are small. Still, short-run credit constraints have become more important recently and turn out to be twice as large when also family wealth is taken into account.

US based research finds strong and increasing correlations between family income and college attendance; see Lochner and Monge-Naranjo (2011). However, we have to distinguish between short-run credit constraints and long-run constraints (not necessarily credit constraints). Cameron and Heckman (1999) show that the effect of income on college attendance is low once we correct for maternal ability. If maternal ability is a good proxy for long-run family factors like genetics, early family environment, and previous school quality, then long-run constraints are crucial. Carneiro and Heckman (2002) indicate that at most 8% of the population faces short-run credit constraints with respect to college enrolment. Keane and Wolpin (2001) use a structural model and show that (short-term) credit constraints exist and are tight. But in line with the previous evidence, these constraints turn out to have little effect on college attendance. Relaxing the constraints mainly affects other choice margins, e.g., students work less and consume more while in college. Although short-run credit constraints are weak in the US, they have become more important over time and are much higher if also wealth is taken into account. Belley and Lochner (2007) use more recent US data and show that the conditional effect of parental income on participation is twice as high in the 90's compared to the 80's. Lochner and Monge-Naranjo (2011) indicate that the combined effect of income and wealth is twice the effect of income alone.

There is little European evidence on credit constraints. But because the private costs of education are much lower in Europe, the US estimates could serve as an upper bound for Europe. Indeed, Chowdry, Crawford, Dearden, Goodman, and Vignoles (2008) find that the substantial gap in higher education enrolment by income in England almost completely disappears once they control for secondary school achievement. More precisely, the 'controlled' gap in participation rates falls to 1.0 percentage points for males and 2.1 percentage points for females. However, as mentioned before, wealth can play a role as well. Moreover, when European policies towards higher education would shift in the direction of increased contribution from students, European estimates of credit constraints could move towards those found in U.S.-studies. The cohort studied in Chowdry et al.

(2008) was eligible for higher education just before the major reforms and increased tuition rates introduced in the U.K. from 2006 onwards.

Brooks-Gunn and Duncan (1997) confirm that college attendance is more affected by long-run constraints. Wealthy and highly educated families can send their children to better (pre-)primary and secondary schools, which is reflected in the academic performance of their children. This can also explain why the take-up of many grants is low and often concentrated in the top half of the socio-economic distribution (Stanley, 1999 and Orfield, 1992). To alleviate long-run constraints, interventions must take place early in the life of a child. A large body of research demonstrates that early childhood interventions can have considerable benefits in later life, both for the individual and for society as a whole (Cunha, Heckman, Lochner, and Masterov, 2006). The Abecedarian pre-school experiment in the US increased college enrolment by a factor of 2.5 (Anderson, 2008).[5] The Perry pre-school program led to strong increases in high school graduation, and a substantial reduction in crime (Heckman, Moon, Pinto, Savelyev, and Yavitz, 2010). However, these studies focus on small groups of severely disadvantaged children, which might make them less generalizable to a European context. Evaluations of American large-scale early intervention programs, generally focusing a less disadvantaged population, might be more relevant. The most evaluated of these programs is the pre-school program Head Start. Estimates of the impact of Head Start on educational attainment differ per study but are generally positive. Deming (2009) finds an increase in attending college of 6 percentage points, while Garces, Thomas, and Currie (2002) find a treatment effect of 9 percentage points.[6] The Chicago CPC-program, a pre-school plus school-age program for inner city children in the city of Chicago, raised the fraction of students who achieved some college credit by 4 percentage points (the largest impact of the program was on high school dropout).

All of the above evidence on intervention programs is U.S. based. European evidence is much more scarce, and evaluations are generally less robust. Few ECEC (early childcare and education) programs have long-term follow-ups and randomized evaluations are very rare. A recent report by the European Commission (2012) provides a thorough overview. This review shows that positive effects of ECEC are found for early cognitive and non-cognitive development in the U.K., Ireland, Italy, Sweden, Norway and the Netherlands.[7] Studies with follow-ups into adulthood are rare. Martin (2010) finds that the Early Start program in Ireland led to higher performance in science and math at age 15, and higher parental aspirations towards college attendance. Havnes and Mogstad (2011) show convincing results that an expansion in subsidized child care in Norway had positive effects for educational attainment (an increase in college attendance of 7 percentage points), labour market participation and dependence on welfare. These effects were strongest for girls and those with low educated mothers.

Little is known about moral hazard and the participation decision under uncertainty. Garibaldi, Giavazzi, Ichino, and Rettore (2012) demonstrate that a 1000 euro increase in tuition reduces the probability of delayed graduation by 5.2% in Italy without changing student performance. Carneiro, Hansen, and Heckman (2003) show that reducing uncertainty increases enrolment. If individuals

[5] The enrolment rate for 4-year colleges was 14% and 35% in the control and treatment group.

[6] Interestingly, Deming (2009) finds a very strong effect for blacks (14 pp) but no effect for whites, while Garces, Thomas, and Currie (2002) find a very strong effect for whites (28 pp) but no effect for blacks.

[7] Some Dutch evaluations as well as one Danish study find no positive effects, but these are exceptions among all of the studies evaluated.

were to know their private rate of return to education *ex ante* for sure, 12 percent of those with only high school education would attend college, and 2 percent of college students would not have enrolled.

B. EDUCATION AND LABOUR MARKET FAILURES

THEORY

Spill-over effects occur when individual decisions also affect other individuals in a direct way. For example, positive spill-overs in higher education could occur if graduation increases the productivity of all individuals in society (Lucas, 1988). Graduates can also accelerate economic growth via learning-by-doing, technological diffusion, and innovation (Arrow, 1962, Nelson and Phelps, 1966, and Romer, 1990). If positive spill-overs exist, then there is too little participation from a societal point of view, because individual decisions are based only on private benefits and therefore neglect the positive spill-overs on others.[8]

Peer effects are spill-over effects in the production of knowledge. They arise if learning in higher education, and thus also earnings in later life, depend on the quality of one's peers in higher education. Suppose that students cannot easily sort according to ability, a situation that probably applies to many European higher education systems. Students at the choice margin can gain from participation, but have a negative effect on existing participants as they typically reduce peer quality. This would imply that peer effects result in too much participation.

The view that educational attainment can signal productivity, besides enhancing it, has been raised first by Arrow (1973) and Spence (1973). We distinguish between the strong and the weak signalling hypothesis depending on whether higher education only signals productivity (strong) or whether it both signals and enhances productivity (weak). To explain the mechanism, we focus on the strong hypothesis; the weak hypothesis leads to the same qualitative conclusion. Suppose that employers do not observe individual productivities and they therefore pay wages based on average productivities. High productivity types could then earn more if they can signal their type to employers in a credible way, i.e., such that low productivity types do not mimic their behaviour. Higher education offers a plausible signal. If it is less costly for high productivity types to graduate, then equilibria may occur in which only high types invest in higher education and thus succeed in distinguishing themselves from low types. But signalling (under the strong signalling hypothesis) is costly and only redistributes income from low to high productivity individuals. It therefore leads to too much participation from a societal point of view.[9]

An important caveat applies. Stiglitz (1975) discusses the possibility that higher education increases productivity by sorting individuals. For example, if one individual has a comparative advantage in engineering and another in brain surgery, then society gains by putting the right (wo)man in the right place. In such a case, the costs of signalling in higher education have to be weighed against the benefits that result from sorting.

[8] Alternatively, if all individuals in society intrinsically value higher education, then participation leads to a positive consumption spill-over effect with the same consequences.

[9] Note that signalling is sometimes interpreted as a 'kind of' negative spill-over effect.

EVIDENCE

Macro-economic studies claim that the average educational attainment of a country has positive effects on macro-economic performance over and above the enhancement of individual productivity. Sianesi and Van Reenen (2003) review the evidence and conclude that there is some justification for this hypothesis, but that the estimates are likely to grossly overstate the true effects. Krueger and Lindahl (2001) argue that estimates of the effect of education on growth rely on restrictions that are rejected by the data. Their results especially cast doubt on the added value of tertiary education. This view is largely shared by Lange and Topel (2006), who state that the evidence on large social returns of education is mixed, and that the private benefits outweigh the spill-overs by far. Moretti (2004) takes a different approach by looking at productivities at the plant level. He finds that less educated workers are more productive in locations with more highly educated workers. There is little evidence whether pecuniary spill-over effects differ by type of post-secondary education. Murphy, Schleifer, and Vishny (1991) identify a positive correlation between growth and the share of engineering majors in a country, while the correlation with the share of legal majors is negative. More precisely, an increase in the share of engineering majors of 10% (which would double the current share) would have increased the 1970-1985 growth rate by 0.5%. However, these results are based on small samples and border on statistical significance.

There is also empirical evidence linking education to non-pecuniary spill-overs on public health, crime, pollution, and social cohesion; see McMahon (2004) for an overview of macro-economic evidence.[10] Recent studies have shown that those links are often causal. Heckman, Humphries, Urzua, and Veramendi (2011) demonstrate that attending college leads to a higher probability of voting, lower chance of divorce, lower use of welfare, and higher trust. Lochner and Moretti (2004), and Machin, Marie, and Vujic (2011) show that compulsory schooling law changes lead to lower crime rates in both the U.S. and the U.K. Other studies also find an impact of education on voter turn-out, but these effects tend to be lower in Europe than in the United States (Dee, 2004; Milligan, Moretti, and Oreopoulos, 2004; and Siedler, 2007). Furthermore, spill-over effects can expand over time through intergenerational transmission. Holmlund, Lindahl, and Plug (2011) use twin and adoptee data as well as policy reforms in Scandinavia and the U.S. to show that more educated parents 'produce' more educated children. The causal estimates indicate an increase of child's educational attainment of 0.1 years for every extra year of schooling for the parent.[11] Recent evidence from Sweden has identified intergenerational effects in educational attainment across 4 generations (Lindahl, Palme, Massih and Sjögren, 2012). This study finds that the effect of the educational attainment of grandparents and great-grandparents is larger than the effect predicted by the correlations from one generation to the next. In other words, grandparents have an independent transmission effect on the completed years of education of their grandchildren.

Empirical research on peer effects in higher education is limited. The quality of college roommates has a positive effect on academic performance (Sacerdote, 2001, 2011; Zimmerman and Winston, 2004), but these effects are very modest in magnitude. The intensity of the interaction plays a role, however. A unique experiment at an air force academy shows that peer effects are larger if peers

[10] Lochner (2011) provides an overview of both correlational and causal research on the non-production benefits of education, thereby mainly focusing on secondary education.

[11] There is some evidence that these intergenerational effects are slightly larger in the U.S., at least for twin samples.

eat, study, and work together in small and isolated groups. Peer effects in primary and secondary education could be important as well, because they may strengthen or alleviate the aforementioned long run constraints in higher education. Sacerdote (2011) provides an overview. Peer effects in primary and secondary education appear to be large at the bottom and the very top of the ability distribution, but are largely absent for intermediate students. Peer effects cannot only explain variation in cognitive outcomes, but also variation in drop-out, participation, and choice of discipline in higher education. We come back to peer pressure when we discuss social interactions later on.

There is substantial causal evidence of an impact of higher education on individual productivity, as discussed before; thus higher education is not only about signalling. But the rejection of the strong signalling hypothesis does not tell us that signalling cannot occur. The early literature used several strategies to test for the presence of signalling. For example, Layard and Psacharapoulos started a long-running debate on whether obtaining a degree (a 'sheepskin') has an effect on earnings over and above the effect of the number of years in education. This would be the case if credentials signal desirable traits like perseverance to employers.[12] Overall, the early and recent evidence turns out to be mixed and varies over estimation strategies and countries; see Sessions and Brown (2005) for a comprehensive overview. Sheepskin effects have been found in the United States (Hungerford and Solon, 1987, Belman and Heywood, 1991, Jaeger and Page, 1996) and New Zealand (Gibson, 2000). However, multiple other studies contradict these conclusions. Patrinos (1996) and Griffin and Cox Edwards (1993) do not find evidence of sheepskin effects for Guatemala and Brazil, respectively.

Sheepskin effects can also result from classical human capital models, if, for example, better learners in education are more likely to earn a degree, and also more likely to earn a higher wage (Card, 1999). Natural experiments are better equipped to deal with endogenous schooling decisions. Lang and Kropp (1986) and Chevalier, Harmon, Walker, and Zhu (2004) use changes in compulsory schooling laws to test for the presence of signalling in the United States and the United Kingdom. If signalling were prevalent, one would expect these reforms to increase educational attainment throughout the distribution. Low-ability individuals experience a compulsory increase in their completed years of schooling, requiring high-ability individuals to distinguish themselves again. The two studies obtain opposite results: the evidence in the United States is consistent with the signalling hypothesis (enrolment rates for unaffected age groups increased), while the signalling hypothesis is rejected for the United Kingdom.[13] One possible reason is that the tuition differences in the UK are smaller and therefore less prone to signalling compared to the US.[14]

C. SUMMARY

Table 1 summarizes the different market failures, the theoretical consequences, and the evidence, i.e., whether the failure exists, how large it is, and whether it is based on ample or limited evidence.

[12] If such effects exist one can also check whether they decrease over time, e.g. because firms are likely to learn about your true type.

[13] Bedard (2001) finds additional evidence for signalling in the U.S. She shows that having a local university increases high school drop-out, presumably because when high-ability individuals are not constrained anymore in attending higher education, there is no reason for low-ability individuals to mimic their behaviour and complete high school.

[14] The precise relation between tuition differences and signalling is more complex in the presence of for-profit higher education institutions: tuition differences occur because institutions can profitably exploit signalling.

Table 1. Market failures in higher education

Market failures	Theory w.r.t. participation level	Evidence of effect	Comments
(Credit) constraints	Too low	Exists	Ample number of studies. Short-term credit constraints are small, but increasing over time and larger when wealth is also taken into account. Short-term credit constraints are smaller than long-run constraints. Credit constraints are weaker in the EU compared to the US.
Partial insurance	Too low	Exists	Limited number of studies. Although risks are considerable, their effect on participation appear to be small.
Moral Hazard	Too high	Exists	Limited number of studies. Effects on study duration appear to be small.
Spill-over effects	Too low	Exists	Ample number of studies, but difficult to identify causal effects. Recent studies provide more robust evidence of spill-over effects in production, crime, and other social outcomes. Spill-overs tend to be relatively larger at lower levels of education.
Peer effects	Too high	Exists	Ample number of studies, although less in higher education. Effects are small for educational outcomes (higher for social outcomes).
Signalling	Too high	Mixed	Ample number of studies, but difficult to identify causal effects. More robust evidence finds signalling in the US, but not in the UK.

4. BEHAVIOURAL FAILURES

Behavioral economics has flourished over the past decades; see Rabin (1998) and DellaVigna (2009) for an overview. 'Homo Economicus'—a calculating individual, with unbounded rationality and will-power, and without social interactions—has been falsified as a decision maker in many settings. Applied to higher education, the misprediction of costs, benefits, and probabilities may lead to non-optimal participation decisions. Also social interactions, like social status concerns and conformity, can lead to inefficiencies.

Caution is needed, however, for at least three reasons (see e.g. Camerer, Issacharoff, Loewenstein, O'Donoghue, and Rabin, 2003). First, behavioural economics is still in its infancy, especially in higher education. Some experimental results need further exploration and experimentation; and some of the behavioural mechanisms that can explain these facts are speculative at this stage. Second, it is not always clear whether behavioural failures are truly failures. Individuals often identify themselves with 'wrong' choices. Therefore, government intervention must often balance between libertarianism (respecting 'wrong' choices if individuals identify themselves with these choices) and paternalism (correcting 'wrong' choices, even if individuals identify with these choices). Third, behavioural mistakes are far from universal. Policies should try to focus on removing irrational choices, while safeguarding as much as possible the choices made by rational individuals. Rational individuals should not be punished for the irrational behaviour of others.

A. MISPREDICTION

A rational participation decision requires a correct knowledge of costs, benefits, and probabilities. There is evidence of misprediction in each step. We first provide the evidence and the implications for participation. Afterwards we suggest potential behavioural mechanisms that can explain these facts. In particular, the behavioural mechanisms show that the solution to misprediction is more complex than simply providing the correct information.

EVIDENCE

The costs of higher education tend to be overestimated. Students and parents in the US have an upwardly biased estimate of college costs, especially for public education (Horn, Chen, and Chapman, 2003). Socio-economically disadvantaged and minority parents have a similar bias compared to others, but face higher uncertainty. They are less likely to make a prediction, and if they do, the variance in their prediction is larger (Grodsky and Jones, 2007).

Benefits are likely to be underestimated. Canadian students widely underestimate the annual income differential between high school and university graduates (Usher, 2005). Students are also largely unaware of financial aid, especially those who are eligible (Chan and Cochrane, 2008). They often assume incorrectly that their family income is too high or that good grades are required to be eligible (Matus-Grossman, Gooden, Wavelet, Diaz, and Suepersad, 2002, and Zarate and Pachon, 2006).

The previous evidence suggests that the net benefits of higher education—i.e. benefits minus costs—are underestimated. This would undermine participation in higher education. Overconfidence can counteract this pattern. Students, especially low performers, tend to overestimate their skills

(Grimes, 2002, and Nowell and Alston, 2007). As a consequence, potential students may also overestimate their probability of success in higher education, leading to too much participation.

UNDERLYING MECHANISMS: THEORY AND EVIDENCE

If the previous facts were simply a matter of misinformation, then it suffices to provide students with the correct information about the costs, benefits, and probabilities of success in higher education. But behavioural economics suggests that the problem is more complex. We discuss possible behavioural mechanisms that can explain these facts, even if individuals would have correct information.

Framing can provide an explanation for some of the mispredictions. The presentation of the choice options may matter, even if the choices are otherwise equivalent. For example, tuition and grants are paid and received at approximately the same time. A combination of high tuition and high grants can be made financially equivalent to a combination of low tuition and low grants. But if tuition (the sticker price) is a more salient feature, then too much weight is put on tuition relative to grants, and the second option leads to more participation. Other framing effects like loan or debt aversion imply that credit take-up by students is lower if credit is labelled as a loan or a debt, *ceteris paribus*.

The evidence on the role of framing in financing of higher education is mixed. Heller (1997) finds some evidence that students in the US have distinctive responses towards changes in tuition, grants, loans, and work studies. More specifically, enrolment is more sensitive to changes in tuition than to changes in financial aid. Within the latter group, changes in grants have stronger effects than changes in loans or work studies. They also identify higher sensitivities for low-income students, black students, and students in community colleges. However, the results are not fully consistent across studies and opposite findings are relatively frequent. Falch and Oosterbeek (2011) review the evidence in Europe and conclude that responses towards aid and tuitions have similar elasticities. The elasticities in Europe (an increase of tuition with 1000 euro lowers participation with 1 to 5%) are lower compared to the US (an increase of tuition with 1000 dollar lowers participation with 5 to 10%; see Heller, 1997). In addition, college attendance is even less elastic compared to university attendance, and (community) college and university attendance are found to act as substitutes (Hilmer, 1998).

We can only speculate on the origin of the difference between US and EU based studies. Dynarski and Scott-Clayton (2006) show that US student aid schemes are often complex, diverse, and uncertain, while European aid is often universal. Complexity can actually provide a rational explanation of framing effects. The complexity of grants in the US may simply increase uncertainty about receiving aid, and therefore risk-averse students may attach less weight to grants compared to tuition. Related to complexity, there is evidence that providing information alone is not sufficient to change participation and graduation in higher education. McGuigan, McNally, and Wyness (2012) and Oreoupolos and Dunn (2012) both use an experimental set-up and show that information provision raises expectations and aspirations of students in the UK and Canada. But Bettinger, Long, Oreopoulos, and Sanbonmatsu (2012) show that information provision alone is not effective to raise college participation in the end. Only information provision combined with grant application assistance increased the likelihood of college attendance, persistence, and completion in the United States.

Framing effects are often attached to 'labels'. Caetano, Palacios, and Patrinos (2011) provide evidence based on an experiment in three Latin American countries suggesting that labels matter. Labelling a contract as a 'loan' reduces the chance of take-up *vis-a-vis* a financially equivalent alternative labelled as a 'human capital contract'. Similarly, Avery and Hoxby (2004) find that US students are more attracted to grants when they are specifically labelled as a 'scholarship'.

Non-standard preferences may provide an alternative explanation for misprediction. But in contrast to the previous framing effects, there is limited evidence. Time preferences, i.e., a preference for immediate over delayed utility, can be one explanation for misprediction. Higher education is indeed an investment with immediate costs and delayed benefits, and potential students may overweigh costs and underweigh benefits. Risk preferences may also play a role. According to prospect theory, individuals are risk averse for gains and risk lovers towards losses, with gains and losses calculated with respect to a reference situation. If the education level of the parents is the reference, more risk will be taken when the parental education level is higher. Students with highly educated parents will participate too much, while the opposite holds for students with poorly educated parents. An experimental set-up in Page, Levy Garboua, and Montmarquette (2007) that mimics that of an educational career path demonstrates that reference points may matter for participation. Players for which outcomes were presented as losses relative to an initial sum were more likely to go further in the experiment. Finally, self-enhancing preferences, i.e., a preference for positive over negative self-views, may explain overestimation of success probabilities, and this may be especially true for low performers.

B. SOCIAL INTERACTIONS

Rational individuals are modelled as self-centred, i.e., they only care about their own material well-being. But individuals also care about what others possess, or about what their consumption signals to others. We discuss social interactions and the consequences for participation in higher education. For example, individuals may care about their social status or like to conform to others.

THEORY

Social pressure can arise via a desire for social status and conformity. If individuals derive status from degrees or income, and if status is a positional (zero-sum) game, then it may lead to too much participation in higher education. Job offers can also be positionally dependent on education, i.e., the one with the highest schooling level gets the first job offer, and may also imply too much participation. Conformity occurs if the willingness to participate in higher education positively depends on the proportion of your social group that participates and vice-versa. Or similarly, individuals may suffer an identity loss if they deviate from the social group ideal; see Akerlof and Kranton (2002). At the end of secondary school, pupils belong to different social groups, for example, as a consequence of tracking. If the peers of a pupil are less likely to participate in higher education, then this might discourage the pupil to enrol. The opposite is true if peers are more likely to participate. Therefore, the effect of conformity on participation is ambiguous, depending on the peer group one belongs to.

EVIDENCE

Higher education may have a direct social status effect. Solnick and Hemenway (2005) and Solnick, Hong, and Hemenway (2007) analyze the extent to which different goods are 'positional', i.e., whether the utility derived from specific goods depends on the consumption level of others. Their survey data show that education *in se* also exhibits a relatively high degree of 'positionality'. Celse (2012) claims however that the (supposed) positionality of education is actually driven by egalitarian concerns. There is abundant evidence in the happiness literature that income is a positional good. Happiness increases with personal income, but decreases with reference income such as past personal income or mean income in society (Clark, Frijters, and Shields, 2008). Because higher income can be obtained via higher education, the 'positionality' of income may indirectly lead to too much participation: attaching value to relative income can induce people to take up education even when the benefits do not fully cover the costs. Finally, if jobs depend positionally on education levels, then lower skilled workers would be replaced by higher skilled workers during recessions (the so-called crowding-out hypothesis). The evidence is mixed.[15] Teulings and Koopmanschap (1989) support the crowding-out hypothesis for the Netherlands, while Gautier, van den Berg, van Ours, and Ridder (2002) reject it. Pollman-Schult (2005) finds evidence in West Germany that the competition between low and high skilled workers for low-skilled jobs increases during recessions.

Social pressure may especially arise for social outcomes such as drinking, smoking, substance use, and crime among students; and these effects turn out to be rather large. For example, Sacerdote (2011) demonstrates that having a roommate in college who smokes increases the chance of smoking by around 5 to 10 percentage points. Estimates are even larger for binge drinking. In addition, similar effects have been found to play a role in whether students select a high paying job as their first job after college, and also can affect their choice of major. Italian evidence, for example, shows that one additional classroom peer who chooses economics over business increases the chance of others also choosing economics as a major by 1 percentage point (De Giorgi, Pellizzari, and Redaelli, 2007). As a consequence, students do not necessarily choose the major that best reflects their academic ability. Conformity in secondary education may also hinder academic preparation for college. 'Acting white', for example, refers to the fact that good study ethics are socially undesirable in some minority youth cultures. Fryer and Torelli (2010) present a rare empirical study on this topic. They find that in-group status monotonically increases with academic performance for white students. For black and especially Hispanic students, this positive relationship reverses above a certain threshold. It implies that too much diligence at school may lead to expulsion from the social group. The fear of expulsion and identity loss may lead to underperformance in high school, and, as a consequence, too little participation in higher education.

C. SUMMARY

Table 2 summarizes the different behavioural failures, the theoretical consequences, and the evidence, i.e., whether the failure exists, how large it is, and whether it is based on ample or limited evidence.

[15] Leuven and Oosterbeek (2011) review the related overeducation literature.

Table 2: Behavioural failures in higher education

Behavioural failures	Theory w.r.t. particapation level	Evidence of effect	Comments
Misprediction - Framing - Time preferences - Risk preferences	Too low - Too low - Too low - Ambiguous[(a)]	Exists - Exists - -	Prospective students tend to underestimate the net benefits of higher education. An ample number of studies confirms framing effects, but they are smaller in Europe than in the US. There is no direct evidence of risk and time preferences in the specific context of higher education.
Social status	Too high	Exists	Ample number of studies. Effect of degree itself seems lower than effect of corresponding higher income.
Conformity	Ambiguous[(a)]	Exists	Limited number of studies. Some evidence on the effect of peers on choice of major. Other studies find that good study behaviour can be undesirable in some ethnic minorities. This could endanger proper preparation for higher education.

(a) both effects depend on the reference position of the prospective student. For example, low status pupils will participate too little, because of either risk aversion and conformity.

5. POLICY FAILURES

Most developed nations take the view that higher education has to be subsidized to some extent. But subsidizing higher education causes new problems, in terms of redistribution and coordination. First, if subsidies are paid from general taxes, then they are likely to redistribute over the life-time from the uneducated poor (non-students) to the educated rich (students). A classical equity-efficiency trade-off occurs: subsidizing higher education improves efficiency, but worsens equity. In addition, if subsidies are paid from income taxes, then labour market distortions may create extra costs for society. Second, subsidies in one country may have consequences for participation in other countries, especially in a globalized world with mobile students. Countries with low tuition rates can face high educational costs from a large influx of international students, which are not redeemed when those students will return to the home country upon graduation. Additionally, when international students do remain in the host nation, countries with large outflows of students are faced with a severe brain drain. In the absence of sufficient coordination between countries, national policies will no longer be efficient. In the particular context of the European union, national policies may also threaten social cohesion. In the following part, we discuss redistribution and coordination failures in detail and summarize the available evidence.

A. REDISTRIBUTION

THEORY

Realistic policy instruments often face a trade-off between efficiency and equity: improving efficiency comes at a cost of decreasing equity. Subsidizing higher education is no exception. If subsidies in higher education are paid from general tax revenues, then the poor and uneducated will over their life-time co-finance an investment that mainly benefits the rich and educated. Besides the possible equity cost caused by a perverse redistribution, subsidizing higher education via income taxes may also lead to labour supply distortions.[16]

An alternative equity aspect of higher education finance is inequality of opportunity, i.e., whether students with the same relevant characteristics have the same access to and success in higher education. Subsidizing higher education may affect both types of equity in different ways. In particular, it may decrease equality in terms of life-time incomes, but can increase equality of opportunity, especially if the resources are targeted to specific pupil groups. We argue later on that unequal opportunities should not be addressed by subsidizing higher education.

Note that general equilibrium effects and positive non-linear spill-over effects in higher education may counteract the perverse redistributive effect of higher education subsidies.[17] Subsidies encourage higher education and will increase the supply of high-skilled relative to low-skilled labour. General equilibrium theory predicts that the relative wage of the high-skilled to the low-skilled will

[16] Note that the educational choices are of course distorted as well, but that is meant to restore inefficiencies caused by failures, and thus a gain rather than a cost. Trostel (1996) and Jacobs and Bovenberg (2005) show that, even if there is no failure and thus no efficiency reason to subsidize higher education, subsidies may lower the distortion of educational choices caused by redistribution via income taxation.

[17] Note that even if non-graduates, or low income groups, are better off, inequality can still rise if other groups gain more. Hence, Pareto improvements might not imply reductions in inequality.

drop as a consequence and therefore reduce inequality. Also positive non-linear spill-over effects may reduce the inequality, if spill-over effects of graduates are higher for non-graduates compared to (other) graduates.

Finally, it is worth mentioning that subsidies to higher education can also be funded by alternative student-centered financing schemes. (Obligatory) income-contingent loans and graduate taxes are both schemes in which the student contributes to the cost of higher education after studying as a function of his or her income.[18] Both schemes have desirable properties in common; see Chapman (2006) for a complete overview. Because only students pay, these schemes are not regressive. In addition, because the contribution is a function of income, they provide insurance against income risk. A low income implies a low instalment, and vice-versa for high incomes. [19] The main difference is that income-contingent loans are capped such that students never pay more than their contribution; default on an income-contingent loan (not paying the full contribution within a certain time period because income is too low) is then typically paid from general tax means. [20] From an ex-ante viewpoint, an (obligatory) income-contingent loan then keeps the good risk (if your income turns out to be above average), but shifts the bad risk (if your income is below average) to society, including non-students.[21] Graduate taxes share the risk among the main risk-takers, being the students.

EVIDENCE

There is an on-going debate on the possible regressivity of educational subsidies. The first empirical studies on the topic take a cross-sectional point of view, meaning that they address the distributional impact of subsidies and taxes on the income of the parents. Hansen and Weisbrod (1969) show that educational subsidies are regressive in the Californian higher education system. But Pechman (1970) contests the thesis and initiates the so-called Hansen-Weisbrod-Pechman debate. In his overview of the empirical literature, Barbaro (2005) concludes that regressivity is far from clear. Few studies consider the distributional impact of educational subsidies in a longitudinal view, i.e., looking at lifecycle earnings of graduates and non-graduates. Grüske (1994) and Johnson (2006) are rare exceptions: they find a regressive impact in Germany and a neutral or mildly progressive impact in the US, respectively.

As mentioned before, general equilibrium and non-linear spill-overs effects reduce the regressivity and may play a role in the ambiguous findings of the empirical literature. There is clear evidence that general equilibrium effects exist in higher education. Several authors, including Autor, Katz, and Kearney (2008) provide evidence that the significant rise in the college premium in the 1980s can be largely attributed to a sharp deceleration in the relative supply of college workers. There is also limited evidence for non-linear spill-over effects. Moretti (2004) reports direct evidence that a one percentage point increase in the labour force share of college graduates in a metropolitan area

[18] A graduate tax is a misleading name. Also students who start but do not graduate can be required pay the tax, e.g., if the contribution is a function of credits taken-up by a student. Furthermore, the name suggests that it is a tax, while it has more of a deferred contribution to the cost of higher education with insurance.
[19] They also provide income smoothing over time compared to classical student loans.
[20] There are also more subtle differences between income-contingent loans and graduate taxes. For example, from a legal point of view, the first is a loan, and remains to be paid, e.g., if students work abroad.
[21] (Income) solidarity cannot be the reason either, because it shifts the risk to a poorer society.

raises wages of high-school dropouts by 1.9%, those of high school graduates by 1.6%, and those of college graduates by 0.4%.

We also mentioned that equity can have different interpretations. Income inequality over a life-time is different from unequal opportunities. Recall that unequal opportunities in higher education can be largely traced back to differences in investment in earlier life.[22] It has been argued that investments at later ages have lower returns, see, e.g., Cunha, Heckman, and Schennach (2010) and Cunha, Heckman, Lochner, and Masterov (2006). Interventions in adolescent years are generally more scarce and less well-evaluated. There is some indicative evidence that these programs tend to be less successful than early childhood interventions. The programs with positive effects generally have short follow-ups while evaluations with long-run follow-ups often show strong initial effects that disappear over time. There are some primary school programs with favourable effects on educational attainment. The SSDP program (a program that promoted a socio-emotional learning approach in class) increased the share of students that obtained an Associate's Degree by 12 percentage points, while LA's BEST (an after-school program based in Los Angeles) reduces school dropout by around 10 percentage points. There are several studies of programs targeted at adolescent youth at risk of dropping out of school or committing crime (e.g. QOP, ChalleNGe, Job Corps, Sponsor-a-Scholar). Multiple of these programs positively affected educational attainment, but later evaluations often show that this is not reflected in higher earnings or other related outcomes. These results could suggest that these programs achieve short-term success in terms of educational attainment, because they 'push' students to finish high school and apply for college, but that this has no payoffs in the long run, when the guidance of the program has disappeared.[23]

European evidence regarding this issue if limited. Exceptions are provided by evaluations of the British EMA program, which gives children from low-income families a weekly allowance of 30 to 40£ if they stay in education after the age of 16. The program increased participation in full-time education at early follow-ups, but no differences between control and treatment group were found by age 19, and there was no significant cumulative effect on post-16 attainment either (Middleton et al., 2005). Unequal opportunities should therefore be dealt with preferably at an earlier stage of education, for example, by providing pre-school facilities for the disadvantaged, or other types of interventions that can enhance cognitive and non-cognitive skills.[24] The higher estimated returns from early childhood interventions stand in sharp contrast to the current allocation of investments, which is focused on school ages and late remediation, rather than early prevention.

Finally subsidies paid from income taxes can distort labour choices and lead to efficiency costs. The conventional wisdom is that labour supply responses to taxes are low, especially for males; see, e.g., Saez, Slemrod, and Giertz (2012). Another review by Keane and Rogerson (2012) challenges the conventional wisdom. Taking human capital accumulation (via learning-by-doing) into account implies that the labour supply elasticities are much higher. In addition, including participation responses to taxes (the so-called extensive margin) in the analysis shows that participation responses are far more important compared to the labour hour responses (the intensive margin). XXX

[22] We discussed these differences before as long-run constraints, which were far more important than the short-run (credit) constraints.

[23] See Borghans, Diris, Heckman, Kautz, and Ter Weel (2013) for an overview.

[24] Recall the Perry Pre-school project and the Abecedarian project that we discussed before.

B. STUDENT MOBILITY, COMPETITION, AND COOPERATION

THEORY

Student mobility has increased considerably in recent decades. The number of students who enrolled outside their country of residence doubled between 1975 and 1995 and more than doubled between 1995 and 2010 (OECD, 2011). Student mobility can lead to permanent migration of international students. About 25% of international students who study in OECD countries stay afterwards; and 75% of the stayers do so for work-related reasons (OECD, 2011).

Student mobility may lead to more permanent forms of migration of high-skilled international students. If one takes the perspective of the sending and receiving countries, then a war for talent may result. Sending and receiving countries may improve the quality of higher education, ultimately to keep or attract good international students. This is a good thing if the current quality of higher education is deemed inefficiently low; otherwise, competition leads to 'too much' quality in higher education. In the latter case, investments into educational quality do not have a positive economic return anymore. Sending and receiving countries may also compete via other instruments: it can be beneficial for sending countries to restrict studying abroad or to force international students to return. In the same vein, receiving countries can subsidize talented students and try to keep them in the country afterwards. Such efforts are typically zero-sum and lead to inefficient outcomes. In the long run however, countries can also cooperate and coordinate their efforts. In contrast to the policy failures we discussed before, policy interaction is an issue that transcends national borders and, if inefficient, it requires international cooperation.

EVIDENCE

Increased international student mobility can lead to increased policy interaction in the field of higher education. This can occur when certain countries face strong increases in educational costs through large influxes of foreign students, especially if such countries do not reap the benefits of such investments because students move back to the home country upon completion of their study. But policy interaction can also occur if the receiving countries obtain benefits if highly skilled students stay to work.[25] Empirical research mainly concentrates on short-term mobility, i.e., mobility up to one year and often under the flag of international programmes such as ERASMUS, because of data availability. Short-term mobility is becoming increasingly common.[26] At several higher education institutions, such study visits abroad are even a mandatory part of the curriculum.

Mobility of students can provide several private and social gains. Although there is much descriptive research on student and staff mobility, only little empirical work focuses on the impact. Empirical studies are generally based on survey data, using subjective information, but some more robust studies have also emerged in recent years. We focus first on the private (market) gains.

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[25] We only focus on student mobility, neglecting researcher, staff, program, and institutional mobility; see, e.g., OECD (2004).

[26] Some students take their complete studies abroad. This type of mobility is strongly increasing as well, but still far less common than short-term mobility. There is no evidence as far as we know on this type of mobility and we will therefore not discuss it hereafter.

Short-term abroad studies mainly improve language skills (Stronkhorst, 2005; Rud, 2009, Teichler and Janson, 2007). Estimates of gains in other domains tend to be inconsistent, smaller, and are often short-lived. There is mixed evidence of earnings gains for those individuals that are given the opportunity to stay abroad. Oosterbeek and Webbink find no earnings effects from international mobility, but their estimates are imprecise. Teichler (2007) shows that mobile students have 10% higher wages, but this difference is highly selective. Regression analysis that controls for several confounding factors shows significant earnings gains for around half of the countries examined (not for the Netherlands, which confirms Oosterbeek and Webbink, 2006). Moreover, they show that there was no effect of mobility on the usefulness of the study program for current work tasks. Teichler and Janson (2007) provide estimates of short-term mobility on subjective labor market outcomes. Students indicates that their study abroad helped them in getting a job and, in some cases, earning a higher income, but these effects were steadily declining over time. Of the ERASMUS students from 2001 (the latest cohort in the study) only 16 percent believed that the study abroad led to a higher income. Analysis shows that the stated gains are significantly higher in Central- and Eastern-European countries.[27]

The private market gains are moderate at best, but, in the end, the social net benefits must guide policy. We focus on the impact of short-term mobility on long-term mobility and on the quality of higher education. Research shows that short-term mobility strongly affects later mobility. Students that make short-term abroad studies are more likely to work abroad later in life, and they are very likely to do so in the host nation of their initial visit (Oosterbeek and Webbink, 2006; Parey and Waldinger, 2008). Encouraging short-term mobility within the EU entails losses and gains of high-skilled labour for the member states. But from a EU perspective, the resulting long-term mobility can lead to spill-overs, for example, if it improves the performance of the European economy as a whole. Although country-level evidence is not available to the best of our knowledge, there is some limited evidence at the regional and the city level. Boschma, Erikkson, and Lindgren (2009) show evidence for Sweden that labour mobility increases the productivity growth of firms, but only if the skills of the new employees are 'related' (in between similar and unrelated) to the skills of the existing employees in a firm. Timmermans and Boschma (2013) confirm that the labour mobility of employees with related skills positively affects firm performance, and add that the impact is larger in case of interregional mobility. Ottaviano and Peri (2006) show that US-born citizens living in more diverse cities (a higher share of foreign born citizens) have higher wages and housing rents. Although the evidence of benefits of long-term mobility at the European level is suggestive at best, one must also keep in mind that the total costs of mobility programs are relatively low.

Mobility within the EU may also affect the quality of higher education via competition. Short-term mobility has a strong effect on long-term migration of high-skilled labour, being a gain for the migrant and his family in the first place, as well as for the receiving country, but a loss for the sending country.[28] This may result in a competition for talent. Competition may have good and bad

[27] There can be several potential explanations for this. These students are more likely to also work in Western-European countries, which have higher salaries. It can also indicate that studying abroad is a more valuable signal in these countries, since it is relatively more rare. Finally, it is possible that the qualitative difference in education is higher for these students, which implies that the study abroad effectively leads to higher later productivity.

[28] The sending country loses high-skilled labour, but admittedly, these losses are somewhat compensated by remittances, return migration, and diaspora effects on trade and FDI (Gibson and McKenzie, 2012). It is

consequences. If the sending country currently invests too little in higher education, they may decide to invest more to keep talented students within the country. In the long-run, it is also possible that cooperation emerges between countries. But competition and policy interaction may also lead to a wasteful rat race. Sending countries may restrict scholarships and receiving countries may invest too much in higher education to attract talent. But what is the evidence on competition and cooperation?

Research shows that international students certainly take quality into account in their selection of a foreign university (Findlay, King, Smith, Geddes, and Skeldon, 2011). It is difficult however to quantify the effect of increasing competition on quality in higher education. The literature on competition and quality generally finds positive, but small effects on student outcomes, but these are generally estimated for primary and secondary schools (e.g., Hoxby, 2000; Belfield and Levin, 2003). It is likely that the effects for competition at the local level are very different than for competition in tertiary education at the international level. International students for example use rankings based on research quality, rather than educational quality. As a consequence, increased mobility may be more likely to affect research quality in the first place. In addition, contrary to primary and secondary education, there are no quality measures—output corrected for intake—available in higher education.[29] Uncorrected output measures, like the average literacy and numeracy levels of adults with a tertiary education degree, are however reassuring in Europe. Literacy is relatively high in many European countries, and moreover, it is increasing (i.e., higher for younger adults) especially in continental European countries (OECD, 2000). Finally, increased competition may lead to more investment and more quality in higher education, but this is efficiency-improving only in countries with an inefficiently low investment in higher education.

Policy interactions can also lead to inefficient competition for talent. We focus on anecdotal evidence here. Uganda for example requires that their international students in medicine sign a return declaration, while Algeria restricted foreign scholarships at some point. In the Netherlands, the socio-economic council is asked to prepare advice on how to hold international students in the country. Effort to keep or attract talented students can be zero-sum in nature, and therefore inefficient at a global level. There is also anecdotal evidence of cooperation and coordination in educational policies. Rizzo and Ehrenberg (2004) report on tuition reciprocity agreements between public colleges in different states. Such agreements allow non-resident students to enrol at a lower tuition than the normal out-of-state tuition. Interestingly, if the flow of students between states is not balanced, then interstate transfers may occur to compensate. Coordination can also take other forms. Gibson and McKenzie (2012) report that the World Federation of Public Health Associations adopted a resolution to restrict international recruitment of health professionals from developing countries.

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generally believed that the gains to the migrants and their family, but also to the receiving countries, are more certain compared to the losses to the sending countries (Bhagwati, 1979).

[29] The OECD has recently launched a pilot project called AHELO (Assessing higher education learning outcomes) to fill this gap. If higher education is similar to the value added literature in primary and secondary education, then we can reasonably expect that value added at the institutional level is small and very difficult to link to observable determinants. Besides direct quality measures, one can also use earnings and employment as a proxy for quality. We are not aware of studies that relate the increasing internationalization to graduate earnings.

Table 3: policy instruments in higher education

Policy instruments	Theoretical implications	Evidence of effect	Comments
Subsidies (paid from general tax) - GE effects - Non-linear spill-overs	Regressive - Progressive - Progressive	Weak - Exists - Exists	Ample number of studies. Some find no effect, others find a regressive effect. Few studies consider a lifetime perspective. Ample evidence of general equilibrium (GE) effects, but they are probably small. Limited evidence for (small) non-linear spill-overs
Income taxes (to finance subsidies)	Distortive	Exists	Ample number of studies. Effects are small at the intensive margin (working more hours), but large at the extensive margin (labour force participation)
Mobility - Short term mobility - Long-term mobility - Competition for talent	 - Long-term mobility - Productivity spill-overs - Non-cooperation - Quality - Wasteful interactions - Cooperation	 - Exists - Limited - Limited - Anecodotal - Anecdotal	A few (causal) studies show that short-term mobility leads to (large) long-term mobility effects. There is some evidence of positive spill-over effects in production for general labour mobility, especially for 'related' skills and for interregional mobility. Strictly anecdotal evidence that policy interactions can be non-cooperative (e.g. restricting students to leave) or cooperative (e.g. compensation schemes if states face increased costs from inflow of students).

C. SUMMARY

Table 3 summarizes the different policy failures, the theoretical consequences, and the evidence, i.e., whether the failure exists, how large it is, and whether it is based on ample or limited evidence.

6. SOME RECOMMENDATIONS

Based on the theoretical economic arguments and the available empirical evidence, we try to answer the following core questions in financing higher education. How much should be invested in higher education? Should students pay different contributions to higher education? When should students pay, before or after their studies? How should we deal with increasing international mobility? We take a European perspective from now on. We deal with each question in isolation, but we will illustrate that the answers to the different questions are not necessarily independent.

A. HOW MUCH SHOULD BE INVESTED IN HIGHER EDUCATION?

The typical observation for Europe is that there is a funding gap, i.e., too little total (i.e., public and private) spending on higher education compared to other developed (non-European) countries; see, e.g., the European Commission, 2011.[30] The funding gap is mainly caused by a gap in private spending. Therefore one often concludes that more funding is needed, especially private funding.[31]

From a societal point of view, the crucial issue is how much public funding there should be. International comparisons show that public spending in Europe (around 1% of GDP) is comparable to other developed (non-European) countries, but there is considerable heterogeneity. The European Commission (2011) reports percentages of GDP from a low 0.84% (in Italy and the UK) to over 2% (in Norway and Denmark) in 2008.

How much a society should subsidize higher education from general tax means is a trade-off between correcting the inefficiencies caused by market failures and behavioural failures, and the perverse redistributional effects and the distortions caused by the tax financing of these subsidies.[32] Empirics could in principle be helpful to assess the magnitude of the different components of the trade-off, but, unfortunately, we know very little. First, the different components of the trade-off are country-specific, but there is no clear evidence on each component in each country. Second, if we look at European evidence, then recall that many effects were not overwhelmingly clear.[33] Third, although one could think that the absence of clear effects suggests that there is no argument for intervention at all, the absence of an effect often only indicates that there is no effect at the margin, i.e., given the current state of government intervention. So, if we focus on higher education in isolation, then it is unclear whether subsidies to higher education should increase or decrease.

The consequences of subsidizing higher education however also depend on the investment in (pre)primary and secondary education. An interesting observation is that most developed countries

[30] Although we only focus on education, typical funding figures also include funding for research.
[31] "For the future, it seems likely that the bulk of resources needed to close the funding gap will have to come from non-public sources (Commission of the European Communities, 2006)."
[32] We assume that all failures together indicate that participation would be inefficiently low in the laissez-faire.
[33] Admittedly, also recall that some effects, like spill-overs and signalling, are notoriously hard to identify.

spend much more on tertiary education relative to secondary, primary, and pre-primary education, even if we exclude the R&D funding in tertiary education (OECD, 2011). There is convincing empirical evidence, also in Europe, showing considerable returns on early interventions. It suggests that the opposite funding pattern—more funding in (pre-)primary and, eventually, in secondary education compared to higher education—makes more sense from an economical viewpoint.[34] These funds must then be used to detect and remediate early lags in the cognitive and non-cognitive development of pupils. Given the total public investment in education in a country, subsidies to higher education should decrease and subsidies to (pre)primary education should increase. Because students in higher education pay the cost of higher education minus the subsidy, this implies that students should contribute more.

To sum up, theory and evidence suggests in our view that students in higher education should be subsidized less from general tax means, and therefore contribute more to their cost of higher education. The money raised should be invested primarily in pre(primary) education, with a focus on early detection and remediation. We realize that the political feasibility is far from guaranteed, because the benefits can only be expected in the long-run. We also want to stress that raising contributions of students does not necessarily mean raising tuitions; we will come back to the timing issue later on.

B. SHOULD STUDENTS PAY DIFFERENT CONTRIBUTIONS?

Suppose we have an answer to the first question, i.e., how much subsidies there should be, and thus, how much each student should contribute (being, the cost minus the subsidy). Tacitly, we discussed the average contribution per student. The question we deal with here is whether there are arguments to differentiate the (average) student contribution according to discipline (e.g., engineering versus law students), level (e.g., bachelor versus masters versus PhD level courses), and study duration (low versus high-performing students).

First, because the contribution of a student is equal to the cost minus the subsidy, differentiation according to discipline can only occur if there are differences in costs between disciplines or good reasons for differential subsidies. We start with the latter. As we have seen before, there exist empirical studies showing that the spill-over effect of an engineer is positive, while the spill-over effect of a law student is negative, at least in the US. This would imply a subsidy for engineering and a tax for law students. Unfortunately, the evidence is very limited and probably country-specific, and the reported effects border on statistical significance; further research is definitely needed before one could recommend such policies in Europe. More obviously, there are clear cost differences between many disciplines. Following this line, the contribution should be higher, the more costly a discipline is.

Second, a different contribution at bachelor and master level could be desirable if the different levels have different costs, as before. But there might also be other reasons to subsidize bachelors more than masters. Many European countries already have a high participation in higher education. As a consequence, the signaling value of a bachelor degree is low, and probably masters, and especially advanced (or second) masters degrees are more frequently used to signal ability. In addition, there are considerable social gains (spill-over effects) of (pre)primary education, while we

[34] Recall again that we exclude funding for research, so, the total investment in higher education can be larger.

reported ambiguous effects in tertiary education. It suggests that spill-over effects decrease with the level of education. Extrapolated to the current discussion, it would suggest that spill-over effects are larger at bachelor level compared to master level, but further evidence is definitely needed. To sum up, if signalling is more frequent at master and advanced (or second) master level compared to bachelor level and if spill-over effects are smaller at master level, then bachelors should be more subsidized compared to masters, and especially advanced (or second) masters.

Third, a different contribution according to study duration could be desirable if for example high-performing students (in terms of study duration) contribute more to the educational process compared to low-performing students. One possible reason is provided by the peer effects literature. High-performing students have positive effects on other students, and should therefore be encouraged to participate by larger subsidies. Peer effects in higher education are probably too small however to provide a clear case. Another reason is related to incentives: should we differentiate the contribution according to study duration to motivate students? Also here the (limited) empirical literature provides some guidance: financial incentives—a higher contribution rate as a function of study duration—to limit study duration helps, but the effects are small.[35] It would be worth looking at the effects of non-financial incentives.

C. WHEN SHOULD STUDENTS PAY: BEFORE OR AFTER THEIR STUDIES?

Suppose again that we have an answer to the first question, i.e., how much subsidies there should be and therefore also how much students should contribute, being the cost minus the subsidy. The question we deal with here is when students must pay their contribution, before or after studying. Although we treat the size and the timing of the student contribution as independent questions, they can be interrelated. Timing choices are likely to change participation in higher education. This may influence spill-over effects and lead to a different optimal size of the student contribution.

Students can pay their contribution before studying, e.g., in the form of tuition. Some students then probably need a student loan to afford higher education. Evidence suggests that credit constraints exist, especially if also wealth is taken into account, and become more important recently as a consequence of rising tuitions. This implies that society should guarantee credit provision. Alternatively, students can be asked to pay their contribution afterwards as a function of their income, e.g., via an income-contingent loan or a graduate tax. In contrast with a classical loan, both schemes have in common that the instalment is a function of income and therefore also provides insurance to some extent.

The question when students should pay their contribution for higher education is a trade-off between guaranteeing credit and insuring students against default/income risk, and the resulting perverse moral hazard (studying or working less hard) caused by providing insurance. In Europe, increasing tuition decreases study duration and increases participation in the labour force. The effect

[35] Note that a longer study duration implies a higher contribution, because contributions (like tuition) are paid on a yearly basis. The question here is whether it should also lead to a higher contribution rate (say a higher tuition or a higher graduate tax rate for an extra year if you already study too long). Also recall that in Europe, increases in study duration translates into even larger class sizes in many disciplines, with limited effects on marginal costs and benefits.

on study duration is small and the labour participation effect is moderate.[36] At the other hand, the default risk and income risk are considerable in magnitude, so, under the assumption of risk aversion, income-contingent loans, and especially graduate taxes, provide insurance. Since credit constraints are likely to be an issue as well, both schemes ensure sufficient credit, also for poor talented students. Theory and empirics suggest that there is a limited role for tuition, as a kind of co-payment, while the main part of the contribution should be a deferred payment as a function of income.

Insights from behavioural economics may reinforce the case for a deferred payment as a function of income (but recall that the evidence in the specific context of higher education is limited). A time preference for delayed contributions suggests that raising contributions via deferred payment has a less negative effect on participation compared to tuitions. Risk preferences, with parental education as a reference point, suggest that more insurance will imply more participation among students with lower educated parents.

We recommended before to raise the contribution of students in tertiary education and invest the money in (pre)primary education for early remediation. We add here that the increase in the contribution should be insured by a deferred payment as a function of income. Furthermore, from an insurance perspective, graduate taxes are superior over income-contingent loans and therefore preferable.

D. HOW SHOULD THE EU DEAL WITH INCREASING INTERNATIONAL MOBILITY?

Increasing international mobility changes the rules of the game, especially because the demand for a high-skilled labour force is rapidly growing in many developed countries, including Europe. Long-term mobility within the EU is a desirable spill-over effect of short-term mobility because it for example improves productivity growth in labour markets. The EU should therefore continue encouraging short-term mobility within the EU, especially because the costs are relatively low. The EU should however monitor the short- and long-term migration streams of high-skilled students within the EU. A brain drain from East to West may put pressure to invest more in higher education in the East, which may be desirable if public investment is inefficiently low. But brain drain also risks to undermine the social cohesion in the EU and may result in inefficient and unfair competition for talent within the EU. If needed, the existing US transfer scheme between public universities in different states could inspire a European transfer scheme to compensate receiving countries in the short-run (if students are subsidized, but return) as well as to compensate sending countries in the long-run (if students stay in or return to the receiving country).

The competition for talent within the EU is different from the one outside the EU. The EU attracts relatively many foreign students, but most of these students come from within the EU. The EU should coordinate the competition for talent among its member states to attract more talented students from outside the EU, Asia for example. The EU should also avoid brain drain at master and research level to non-EU countries, e.g., the United States. The European Institute of Technology and the European University Institute could play a role. Joint education and research programmes of

[36] The main effect of a decrease in study duration is a decrease in average class size. In Europe, many disciplines in tertiary education have large class sizes, so a small reduction in study duration has probably negligible effects on personnel costs and student learning.

high quality could attract talented non-EU students to the EU and keep talented EU students in the EU.

7. CONCLUSION

This paper has reviewed several potential failures that can justify government intervention in higher education. The evidence on market failures shows that most failures—in particular, credit constraints, partial insurance, moral hazard, spill-over effects, and peer effects—clearly exist. We cannot assess however whether market failures as a whole lead to too low or too high participation. Spill-over effects, for example, may imply too little participation, while peer effects and signalling can lead to too much enrolment from a societal point of view. There is evidence for all these effects, but we do not know enough about their relative sizes to estimate a precise trade-off. A similar problem arises when assessing potential behavioural failures. There is ample evidence that students underestimate the net benefits of higher education, leading to suboptimal levels of participation. Framing effects are one possible explanation and are confirmed by the empirical evidence. For other potential behavioural failures however there is little evidence on their existence in the specific context of higher education, let alone their effect sizes. Empirical evidence also confirms the existence of policy failures in the financing of higher education, mainly the regressivity of educational subsidies and the distortive nature of increasing taxes to finance such subsidies. There is also evidence that short-term mobility increases long-term mobility, which may lead to a war for talent between sending and receiving countries. There is no clear evidence whether such competition will enhance the quality of higher education or lead to wasteful effort to keep and attract talent.

The different potential failures and their evidence are insightful to understand the complexity of financing higher education. They do not allow however to answer the question whether subsidies to higher education should be increased or decreased, at least if we look at higher education in isolation. However, if we broaden our scope, there is increasing evidence that interventions in early childhood education are relatively more effective and should therefore obtain relatively more resources. This fact runs exactly opposite to the current allocation of resources across educational stages. Therefore, we propose that students should contribute more to their cost of higher education, and that these contributions should be used to invest in (pre-)primary education, especially towards remediating lags in cognitive and non-cognitive skills. We also propose that the bulk of the student contribution should be paid after studying, in the form of a 'graduate tax'. Such a financing scheme protects against credit constraints and default risk, while it has superior insurance properties compared to income-contingent loans.

We also recommend an active role of the European Union in governing the strong increases in international student migration. The EU should continue encouraging (short-term) mobility within the EU, but should also monitor the (long-term) migration of high-skilled students between member states to avoid excessive imbalances. If needed, the EU could take inspiration from the US transfer schemes between public universities in different states to support cooperation between its member states. In addition, the EU should take action to attract more talented international students from outside the EU, while avoiding excessive brain drain of EU students at master and research level. Joint education and research initiatives, like the European University Institutes and the European Institute of Innovation and Technology, could play a role.

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