The Policy Determinants of Investment in Tertiary Education — **Source link** ⧉

Joaquim Oliveira Martins, Romina Boarini, Hubert Strauss, Christine de la Maisonneuve ...+1 more authors

Institutions: Paris Dauphine University, Organisation for Economic Co-operation and Development, European Investment Bank, Sciences Po

Topics: Investment (macroeconomics), Higher education, Human capital and Public policy

Related papers:

- The policy determinants of investment in tertiary education

- Sharing Higher Education's Promise beyond the Few in Sub-Saharan Africa

- Equity and Access to Tertiary Education: The Case of Vietnam

- Study on the efficiency and effectiveness of public spending on tertiary education

- From higher to tertiary education : evolving responses in OECD countries to large volume participation

The Policy Determinants of Investment in Tertiary Education

by

Joaquim Oliveira Martins, Romina Boarini, Hubert Strauss and Christine de la Maisonneuve

Introduction

Human capital is seen to be a major driver of economic growth. In this context, the need for reforming higher education systems has been intensively debated in a number of OECD countries.[1] There are several sources of concern with the way core tertiary education services are currently provided. Among these, the following are widely shared:

- Tertiary education institutions do not always have the right incentives for achieving excellence and may not be sufficiently flexible and responsive to match changing labour market needs.

- Current settings often subsidise and provide large private returns to graduates, while the extent of social externalities is unclear.[2]

- Public subsidies for tertiary education are typically regressive and pre-empt the use of public resources to target groups that are liquidity-constrained or to fund improvements elsewhere in education systems. Moreover, subsidisation through low-price education or grants may lower students' incentives for successful and timely study completion.

- At the same time, many countries lack effective individual financing systems that would help students to cope with university fees (if any) and living costs during tertiary education, thereby jeopardizing equality of access.

- Finally, the high international mobility of high-skilled workers increases private returns but could reduce the fiscal returns to public spending on tertiary education.

The purpose of this article is to discuss how policies can affect investment in tertiary education in ways that would eliminate some of the perceived shortcomings of existing systems, while preserving or (preferably) enhancing equality of access to higher education. To this end, the analysis focuses on the institutional set-up of tertiary education that provides incentives for supplying quality educational services; the private returns from higher education which act to attract prospective students; and, individual funding mechanisms to help overcome the liquidity constraints that may restrict participation in higher education. These mechanisms should also be designed so as to prevent uncertainty about future incomes from unduly deterring investment in tertiary studies by risk-averse individuals.

The article draws on the extensive economic literature on the determinants of investment in tertiary education. Traditionally, this literature has focused on demand-side determinants of investment (*e.g.* Becker, 1967; Freeman, 1986; Heckman *et al.* 2005) and, more recently, on the role of the supply structure (*e.g.* Rotschild and White, 1995; Epple *et al.* 2006). The supply of tertiary education systems is still highly regulated in most OECD countries, with the exception of some English-speaking OECD countries where the provision of educational services has been increasingly organised on a market basis. In this context, the analytical framework used in this article accounts for the main demand-side determinants of the investment in tertiary education, but takes into account the supply-side determinants only through the effect of the institutional set-up of tertiary education

systems. A different, though related, set of issues have been raised concerning academic research activities, but these are beyond the scope of this article.

The article is structured as follows. First, tertiary education outcomes are documented (next section). Second, the paper explores the role of policies and institutions in affecting private incentives to invest in tertiary human capital,[3] the ability of individuals to finance this investment and the characteristics of university systems. Third, the relative importance of several policies affecting tertiary education outcomes is empirically assessed, with the analysis covering not only education policies but also taxation and social policies. The trade-offs involved for public policies are also examined in this context. A final section summarises the main insights and policy implications of the article.

Cross-country differences in tertiary education outcomes

Broad patterns in tertiary education investment

As a proxy for investment in tertiary education (see Box 1), average graduation ratios in the OECD area have increased steadily during the 1990s and accelerated at the turn of the century (Figure 1, Panel A).[4] The increase was particularly strong for women. By 2004, the average graduation ratio of women was 1.5 percentage points higher than the average ratio for men. Historically, the stocks of female tertiary graduates (as a share of the female population 25-64) were significantly smaller than the stocks of males, but reflecting the recent pattern of flows, by 2004 the two levels had nearly converged (Figure 1, Panel B).

In all countries, except Finland and Norway, graduation ratios have increased between 1995 and 2004. Female graduation ratios in 2004 reached above 7% in New Zealand, Korea and Iceland. In New Zealand in particular, they reached nearly 10%. For males, graduation ratios were above 5% in Korea, New Zealand, Japan and Ireland, whereas they were below 2% in Turkey, Mexico and Greece (Figure 2). Using harmonised graduation ratios modifies commonly accepted wisdom. For example, the United States and Canada appear to rank somewhat lower than in usual graduation statistics, which are affected by cross-country differences in the number of intermediate diplomas delivered during study years.

The structure of investment by fields of education

The structure of investment in tertiary education displays a considerable variation across countries, but certain common features emerge by field and gender (Figure 3). For the OECD average, the largest shares of tertiary graduates are in Social Sciences, Business and Law, with shares evenly distributed across female and male graduates. But striking gender differences characterise the next most populated fields. The share of women is higher in Education, Health and Welfare and Humanities and Arts, whereas that of males tends to be higher in Science and Engineering.

The structural and policy determinants of tertiary graduation ratios

The analysis of demand and supply of tertiary education is challenged by the large cross-country heterogeneity in the provision of educational services in OECD countries. In many countries, the supply is not directly responsive to market forces (*e.g.* Continental Europe), whereas in others (particularly English-speaking countries) there has been an evolution towards organising supply on a more market-oriented basis.

Against this background, this paper focuses on the following three main economic determinants of investment in tertiary education: *i)* the supply characteristics of education

Box 1. **Measures of investment in tertiary education**

Investment in tertiary education is usually measured through education outputs (see Le, Gibson and Oxley, 2005). Output measures can cover different (stock and flow) dimensions such as enrolment, literacy, graduation ratios and the average number of years of schooling (which may be adjusted or not for the returns on education as a proxy for quality, see below). The best measure depends on the issue at hand.

Attainment rates are a popular measure of stocks of human capital (Barro and Lee, 1993). However, these data contain a considerable amount of noise due to changes in classification criteria and other inconsistencies in the primary data (de la Fuente and Doménech, 2000). Enrolment rates cover all investment flows (leading or not to the obtainment of a degree), but may be affected by significant differences in drop-out rates (*i.e.* the proportion of students engaging in tertiary education without obtaining a degree) across countries. Graduation ratios only cover "successful" investments, but are less affected by the large cross-country differences in drop-out rates. Given that this paper focuses on incentives to invest in tertiary education it seemed appropriate to focus on graduation statistics.

To make cross-country comparisons of graduation numbers more meaningful, the OECD has produced harmonised statistics. National graduation statistics typically cover the number of diplomas rather than the number of graduates. These statistics are less comparable across countries since systems with more fragmented study programmes tend to deliver a higher number of degrees than systems where only one degree is obtained at the end of a longer track (*e.g.* before the implementation of the European Bologna process, the length of tertiary education in Germany was around five years and typically no intermediate diplomas were delivered, while in countries like France a similar study programme would give rise to three diplomas). For this reason, this paper relies on the OECD harmonised number of graduates so as to avoid multiple-counting.

It should be kept in mind, nevertheless, that countries with several intermediate diplomas and where the average duration of studies is lower will still display higher graduation ratios since students are likely to engage more often in shorter and more flexible study tracks, as well as to drop out less systematically. The cross-country comparability of graduation ratios may also be affected by the share of foreign students in total graduates. Countries that attract a lot of foreign students would, *ceteris paribus*, display graduation ratios that will not be totally reflected into the accumulation of human capital in the country.

In order to derive consistent time series for a sufficiently long period (1991-2004, whenever possible), the OECD harmonised graduation ratios for the year 2004 were combined with information on graduation ratios derived from other sources (notably UNESCO). More details on sources and methods are provided in Oliveira Martins *et al.* (2007), Annex A.

To avoid confusion, it should be stressed that the harmonised graduation ratios used in this paper are not directly comparable with the usual attainment rates (*i.e.* the percentage of individuals in a given age group having a tertiary diploma). Apart from reflecting a different measure (notably stocks *vs.* flows), attainment rates are derived from Labour Force Surveys, whereas graduation statistics are based on specific education surveys conducted by the OECD.

Figure 1. **Trends in tertiary human capital**[1]

OECD average
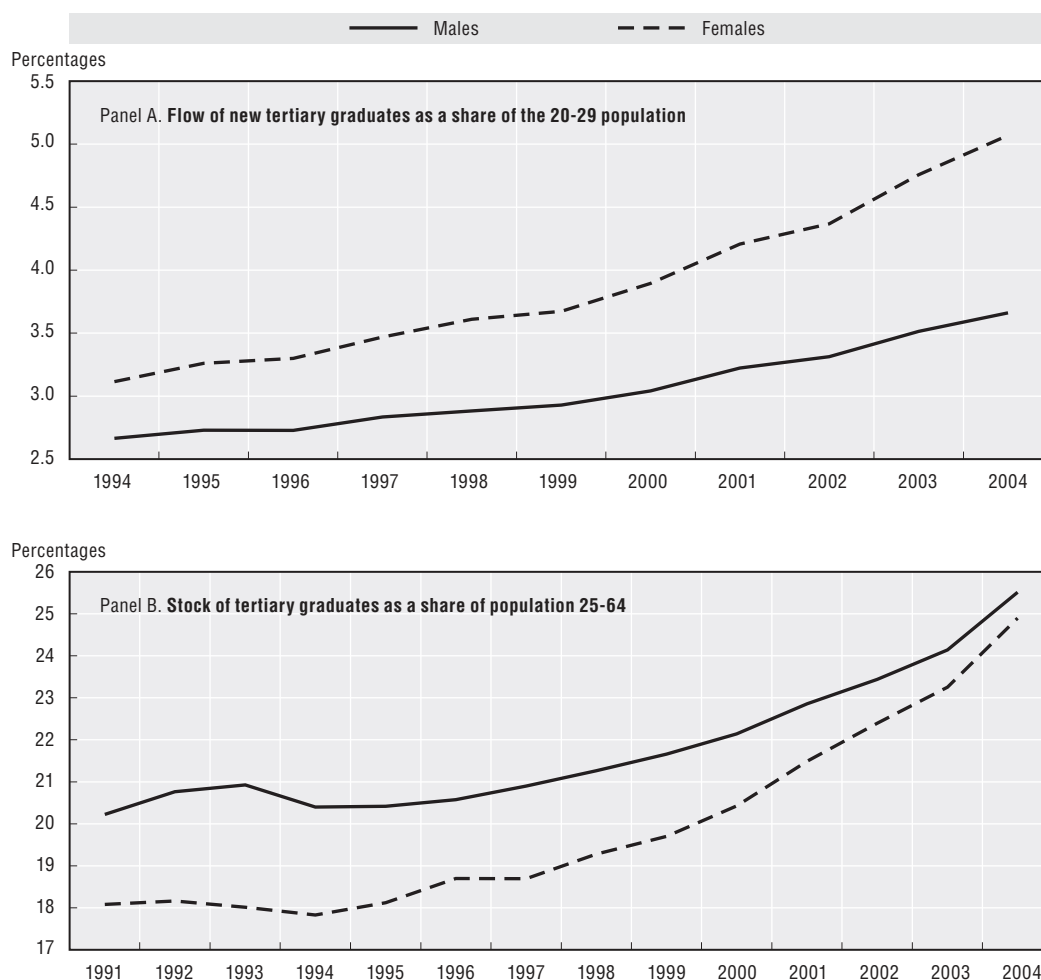
1. Tertiary graduates cover all individuals, including individuals over 29.
Source: OECD, EAG (2006), UNESCO education database, Eurostat and authors' calculations.

systems; *ii)* the expected private returns from engaging in tertiary education studies; and, *iii)* individual financing opportunities that are made available to students. This section describes cross-country patterns in these three areas and provides econometric estimates of their quantitative impact on investment in tertiary education, as measured by the annual graduation ratios described above. In the empirical analysis it is assumed that private returns to education are pre-determined (*i.e.* they are not affected in turn by investment decisions). However, relaxing this assumption does not invalidate the main conclusions (for a more comprehensive model introducing labour-market interactions, see Boarini *et al.*, 2008).

Supply-side factors: The institutional set-up of tertiary education

Research on higher education has identified a range of institutional features that may influence the supply of education by tertiary institutions (see Winston (1999); Teixeira *et al.* 2004). These include prominently freedom in managing resources and setting objectives, incentives to improve performance and rules for accessing funds.

Figure 2. **New tertiary graduates as a share of the 20-29 population by gender for selected years**[1]
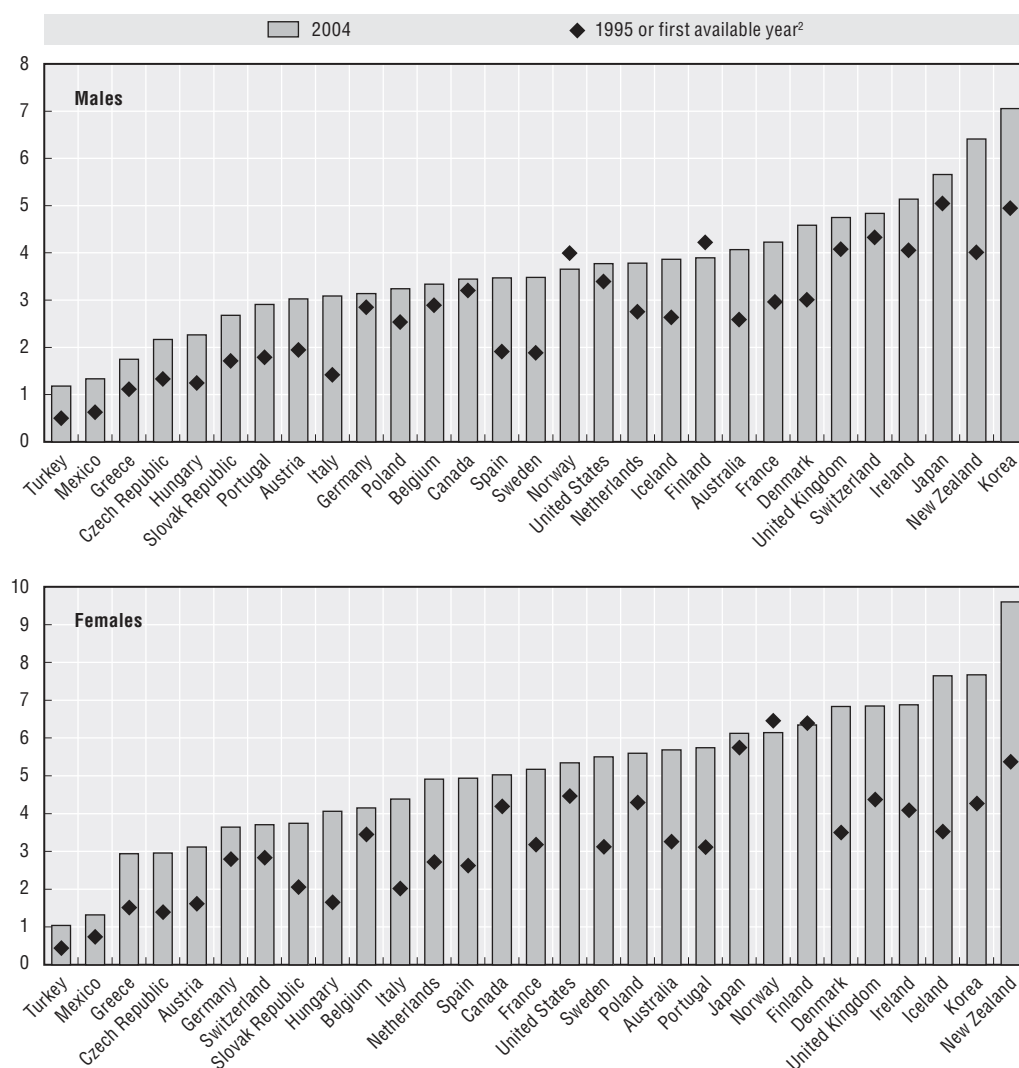
1. Tertiary graduates cover all individuals, including individuals over 29.
2. 1996 for Mexico and New Zealand, 1998 for Iceland, 1999 for Switzerland and 2000 for Belgium and Poland.

Source: OECD, EAG (2006), UNESCO education database, Eurostat and authors' calculations.

Based on information concerning these characteristics, a summary indicator of supply of tertiary education (hereafter, STE) was constructed reflecting the situation in 2006 (see Oliveira Martins *et al.*, 2007, Annex B).[5] More precisely, the indicator covers the following three main sub-categories (Figure 4):

● *Input flexibility* comprises the criteria for the selection of students, institutional autonomy to decide on the sources and structure of funding (*e.g.* level of tuition fees), and staff policy (*e.g.* hiring/firing rules, wage setting, etc.).

● *Output flexibility* includes the possibility to decide on course content, product diversity (short-term, part-time, distant learning studies), existing regional restrictions to access universities (captured by the degree of regional mobility of students) and the existence of *numerus clausus* for the number of diplomas attributed each year.

Figure 3. **Flows of new tertiary graduates by field of education, 2004**

OECD average, shares in total graduates
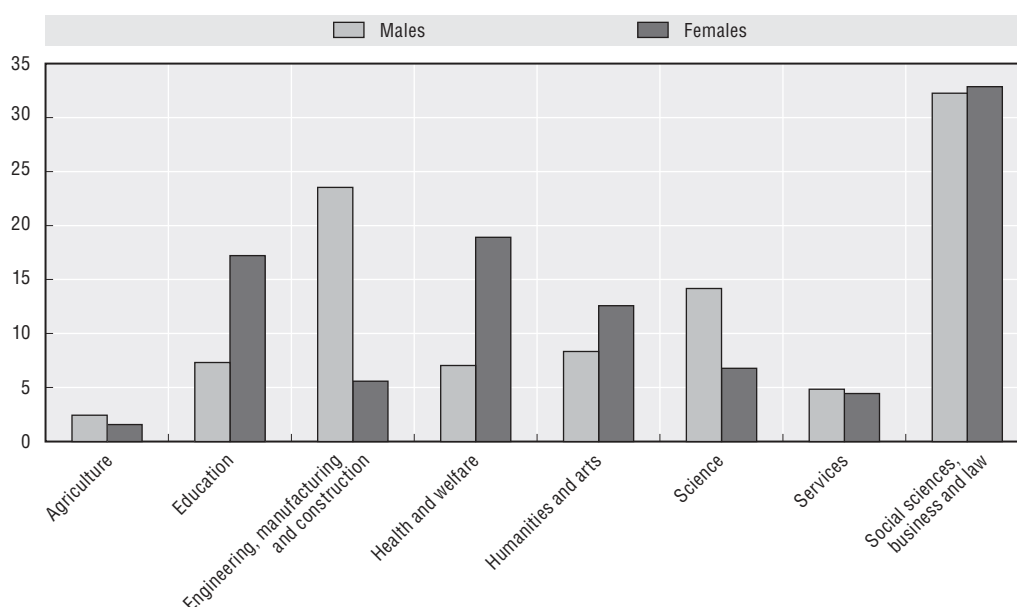
Source: OECD, EAG (2006).

- *Accountability* of tertiary education institutions covers features of evaluation and funding. Relevant aspects of evaluation include the type of evaluation (independent agency, stakeholders) and the public availability of evaluation reports. Funding rules can be output-based (*e.g.* graduation, quality rankings) or based on grand-fathering or inputs (*e.g.* number of students). Information on the types of private entities that provide funding (*e.g.* households, businesses) is also covered.

Figure 5 shows point estimates for the three sub-categories. *Input flexibility* displays a wide variance across countries (Figure 5, Panel A). Particularly rigid systems from this point of view appear to characterise tertiary education in Greece, France, Turkey and Belgium, while some Canadian provinces, Mexico, the Slovak Republic and the United States (Ohio) appear to have the most flexible systems.

On the *output flexibility* side (Figure 5, Panel B), Germany and Greece appear to have particularly rigid systems. Conversely, institutions seem to have the largest scope for deciding on their education outputs in the United States (Texas), Japan, two Canadian provinces, New Zealand and Turkey.

The *accountability* indicator (Figure 5, Panel C) displays a slightly more uniform pattern across countries, but education systems in Australia and Canada (New Brunswick) appear as the most accountable, whereas in Turkey, Greece and Belgium (French-speaking region) the levels of accountability seem to be significantly below average. The USA-Federal indicator may not adequately reflect the actual level of accountability existing in the US university system. Indeed, state-level authorities in the USA may have a substantial autonomy to assess and fund tertiary education, which is reflected in the higher accountability scores obtained for the states of Texas and Ohio.[6]

Figure 4. **The structure of the supply of tertiary education indicator**
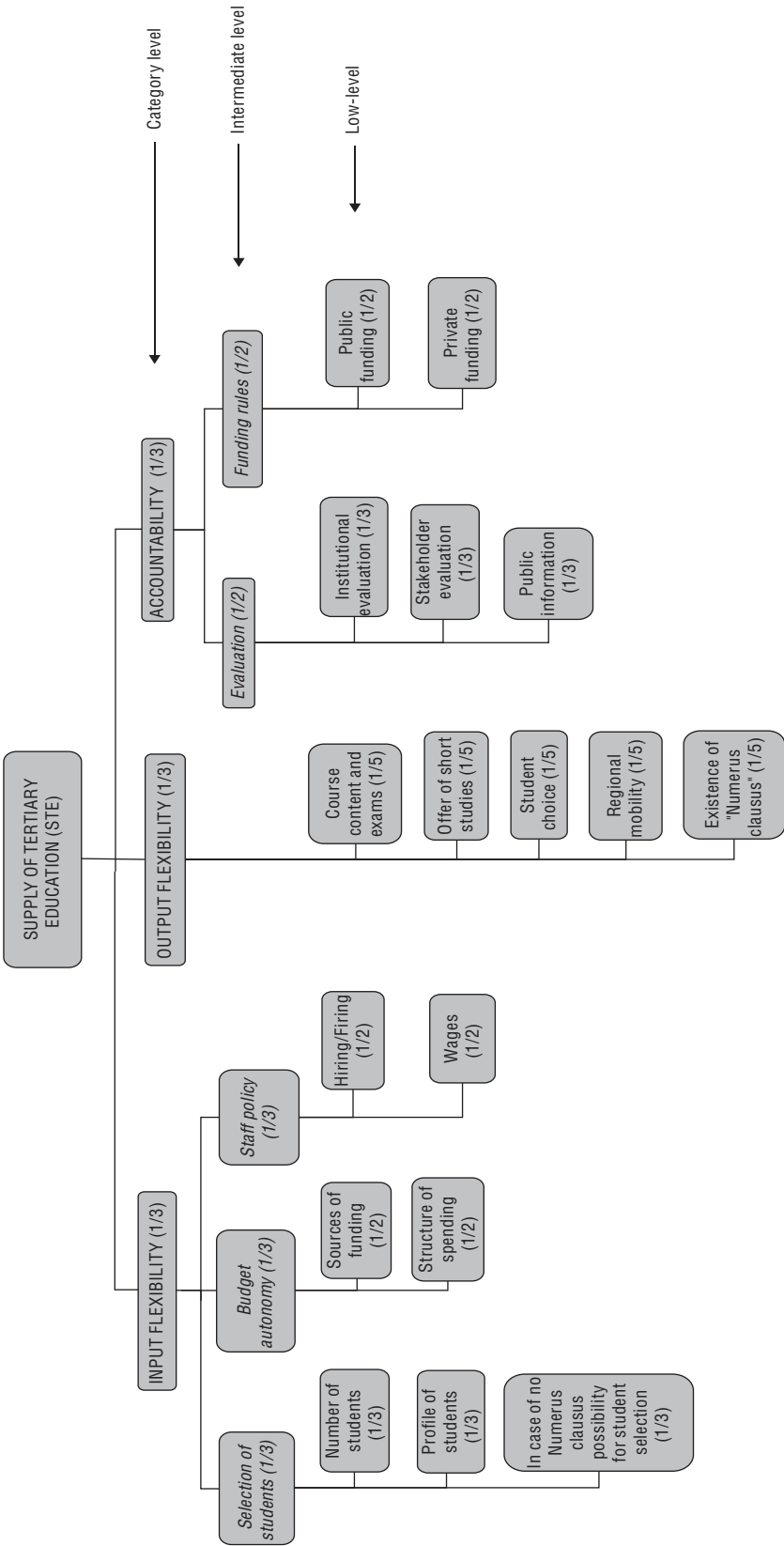
Figure 5. **Tertiary education supply indicator by category, 2005-2006**
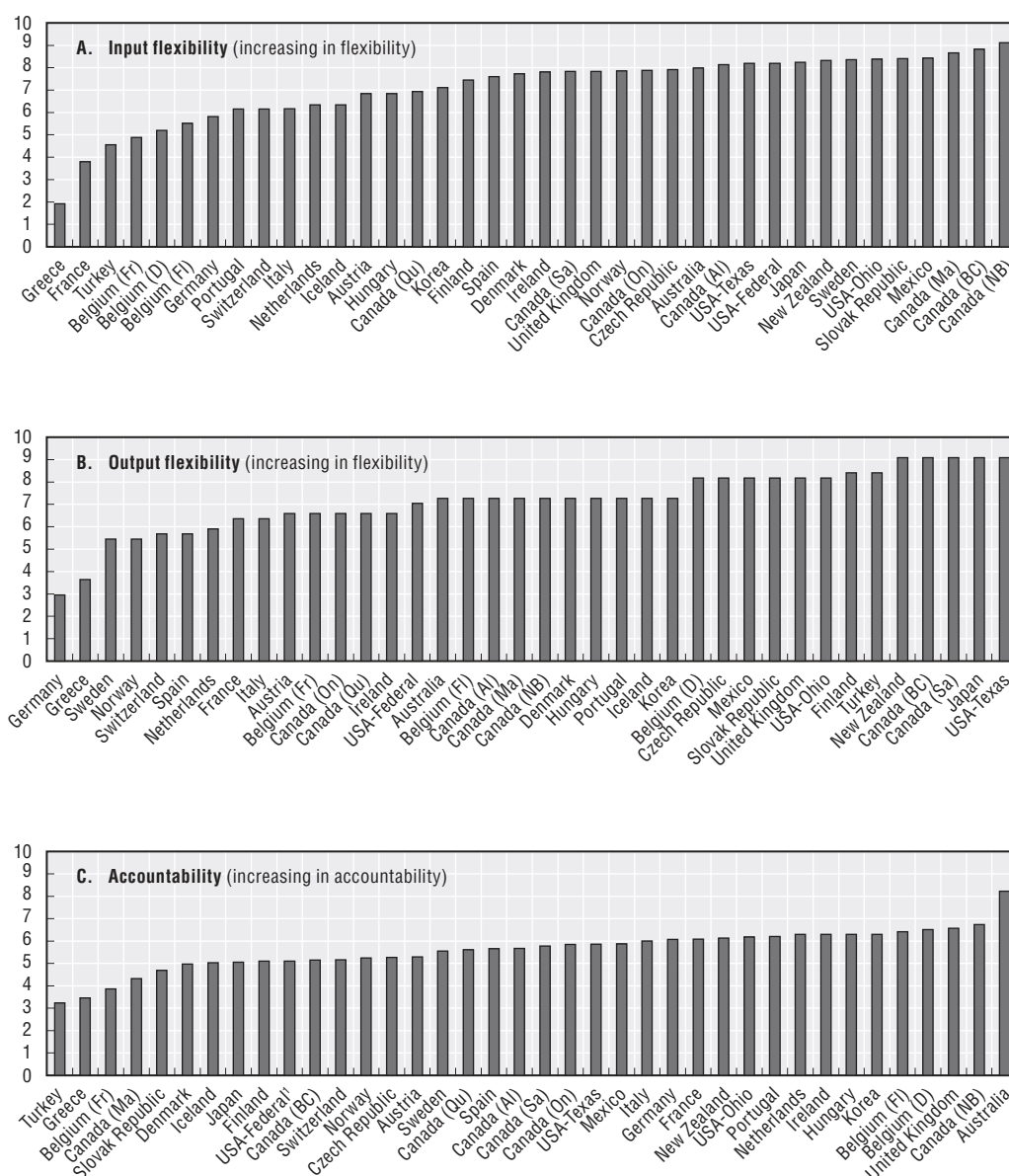
Note: Canadian provinces are: Al: Alberta, BC: British Columbia, Ma; Manitoba, NB: New Brunswick, On: Ontario, Qu: Quebec and Sa: Saskatchewan. Belgian regions are: Fr: French community, Fl: Flemish community and D: German-speaking community.

1. This value for USA-Federal is indicative as federal funds only account for a small share of total funding of tertiary education institutions.

Source: Authors' calculations based on questionnaire answers received from OECD member countries.

It should also be stressed that in countries with a stronger reliance on market mechanisms, some of the aspects of accountability in the education sector may not be adequately captured by the institutional features covered in the indicator. For example, higher education institutions in the United States are subject to evaluation by bond-rating firms that review and assess the credit-worthiness of institutions, a feature that is not reflected in the STE indicator. Capturing these market-based mechanisms of accountability was beyond the scope of the present paper.

Figure 6. **Composite supply indicator of tertiary education (STE), 2005-2006**

Increasing in input and supply flexibility and accountability

Note: Canadian provinces are: Al: Alberta, BC: British Columbia, Ma; Manitoba, NB: New Brunswick, On: Ontario, Qu: Québec and Sa: Saskatchewan. Belgian regions are: Fr: French community, Fl: Flemish community and D: German-speaking community.

1. In interpreting this value for federal provisions concerning output flexibility and accountability it should be taken into account that federal funds only account for a small share of total funding of US tertiary education institutions.

Source: Authors' calculations based on questionnaire answers received from OECD member countries.

Aggregating the scores of input and output flexibility, and accountability, the value of the *composite STE* indicator is estimated to be below average for Greece, Germany, Belgium (French-speaking regions), Turkey and France, while being above average in cases such as New Zealand, Australia, the United States (Texas and Ohio), three Canadian provinces, the United Kingdom and Mexico (Figure 6).

It is also important to consider the overall coherence of the education system. For example, a system having full flexibility but no accountability could be inferior to a more centralised system, even if the composite indicator would display a higher value for the former. To measure institutional coherence, a concentration indicator was calculated[7]and compared with the supply indicator (STE). As a broad pattern, the STE rankings are positively related to the coherence in the tertiary education systems (Figure 7). In other words, countries having a low STE also tend to have a less coherent system. In Turkey, for example, the high output flexibility is neither matched by high input flexibility nor by high accountability, resulting in both a low STE and a low level of coherence. This suggests that a reform path increasing the composite STE indicator could also lead to a more coherent institutional set-up. In turn, exploiting synergies (or complementarities) across different areas is likely to have a positive impact of performance.

Demand-side factors: The Internal Rate of Return to education and its drivers

The private internal rate of return (*IRR*) to tertiary education is a comprehensive measure of economic incentives for individuals to take up tertiary education. It can be defined as the discount rate that just equates the future benefits with the costs of education. From an economic point of view, the benefits of tertiary education essentially consist in a higher future stream of earnings after graduation. To illustrate the costs and benefits of tertiary education, Figure 8 compares the profile of net lifetime earnings for a person who

Figure 7. **Supply indicator and coherence of tertiary education systems**

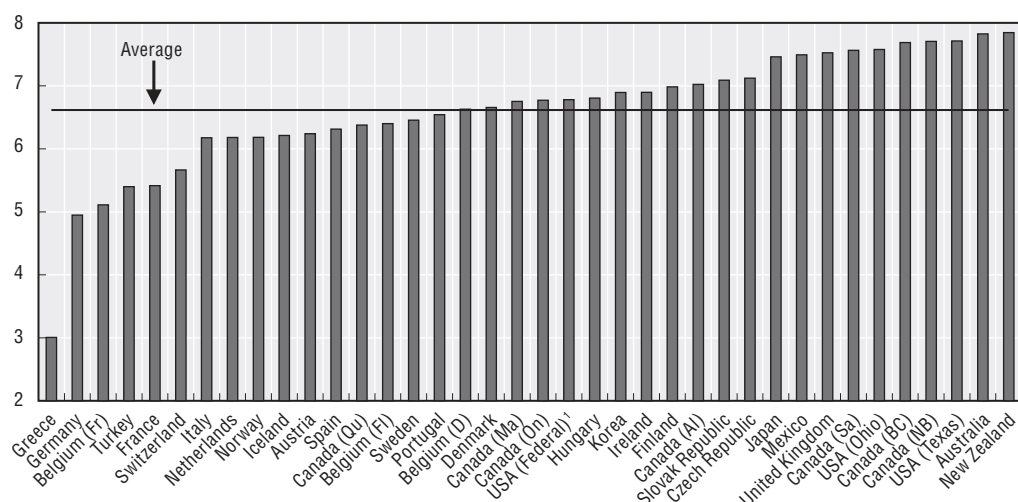Supply indicator (increasing in flexibility and accountability)
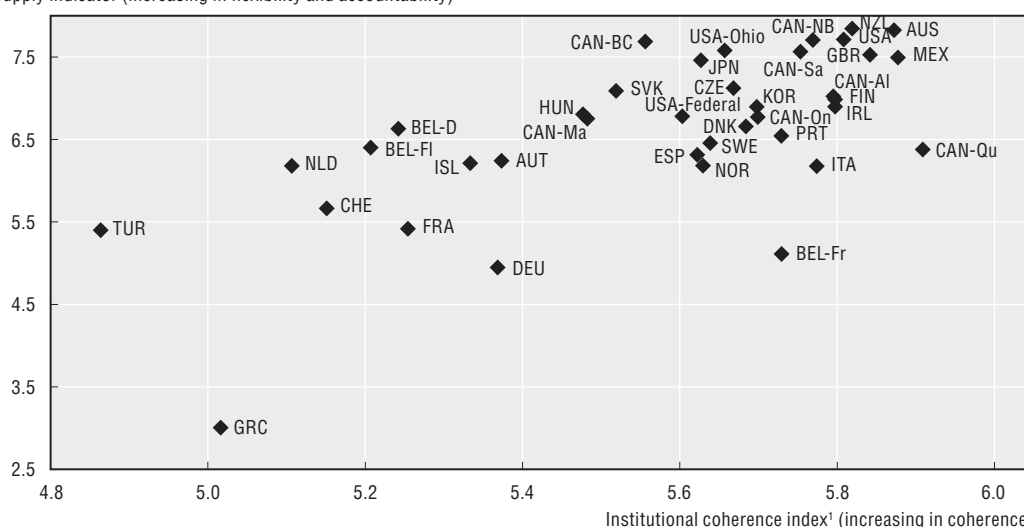
Note: Canadian provinces are: Al: Alberta, BC: British Columbia, Ma; Manitoba, NB: New Brunswick, On: Ontario, Qu: Québec and Sa: Saskatchewan. Belgian regions are: Fr: French community, Fl: Flemish community and D: German-speaking community.
1. The institutional coherence index is based on five intermediate level indicators (selection of students, budget autonomy, staff policy, evaluation and funding rules) completed by the output flexibility (see main text).

Source: Authors' calculations based on questionnaire answers received from OECD member countries.

Figure 8. **Individual returns to tertiary education illustrated**
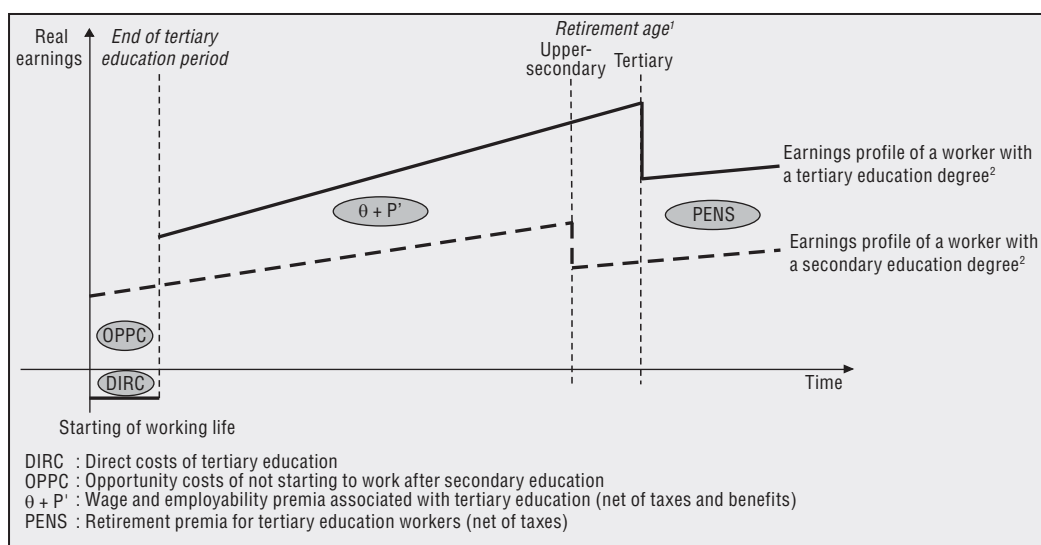
Note: DIRC: Direct costs of tertiary education; OPPC: Opportunity cost of not starting to work after secondary education; ₍ + P: wage and employability premia associated with tertiary education (net of taxes and benefits); PENS: retirement premia for tertiary education workers (net of taxes).
1. Assuming the same length of working life.
2. Assuming partial indexation of pension benefits.

decides to take a tertiary education with the earnings profile of a person with upper-secondary education.[8] The difference between the earnings lines gives the average rate of return. From the point of view of the choice to participate an extra year in higher education, it is the marginal rather than the average *IRR* that matters. While it is not possible to compute

such marginal rates, the subsequent calculations of the returns are adjusted for the numbers of years in tertiary education.

The higher net lifetime earnings of a tertiary-educated individual reflect different cost and benefit components:[9]

- The *direct costs* of education.

- The *opportunity costs* associated with the several years of income of an upper-secondary educated individual foregone during the duration of studies.

- Higher net wages driven by the gross education *premium*, discussed above.

- A higher probability of being employed throughout working life (or *employability premium*).

- Eventually higher statutory pension benefits (or *pension premium*).

- Tertiary-degree holders enjoy a *higher labour productivity level* throughout their career, as they usually enter and quit the labour market later than workers with upper-secondary education, and aggregate productivity tends to grow over time.

The computation of the *IRR* combines information concerning labour market outcomes and government policies affecting the costs and benefits of tertiary education in two main steps. First, the gross hourly wage *premia* from tertiary education are translated into net labour market *premia* – taking into account the duration of studies, the higher probability of employment after study completion and the influence of tax and benefit systems on net earnings. Second, the costs of tertiary education are considered – taking into account both the direct costs and the opportunity costs of studying. These two steps are summarised below (more details can be found in Boarini and Strauss, 2007).

Gross wage premia from higher education

Tertiary education has an impact on wage earnings of the graduates, the so-called education wage *premia*. Measuring these *premia* is important as they reflect to some extent the increase in labour productivity from investing in higher education and affect the individual incentives to invest in tertiary education.

Controlling for a number of individual and context-specific characteristics (other than the level of education) that may affect individual wage earnings, it is possible to estimate the percentage increase in the gross hourly wage earned by an individual completing higher education relative to the wage earned by an otherwise similar individual holding an upper-secondary degree (so-called *Mincerian* approach).

The gross education *premia* estimated in this way reflect *inter alia* both the average quality of skills acquired by tertiary graduates and their scarcity relative to other types of skills. The results presented here are based on individual household panel data (see Strauss and de la Maisonneuve, 2007, for details).The education wage *premia* range from above 25% for men in Spain and around 33% for women in Austria to above 90% for both men and women in Hungary (Figure 9), suggesting that tertiary education can provide indeed a substantial wage *premium* over secondary education.[10] Estimates of the *Mincerian* coefficients for earlier periods (1994-2001) also show that, despite some cyclical fluctuations, these *premia* are fairly stable over time.

Figure 9. **Gross wage premia from tertiary education**[1]

2001[2]

Percentage point increase

Men

Percentage point increase

Women
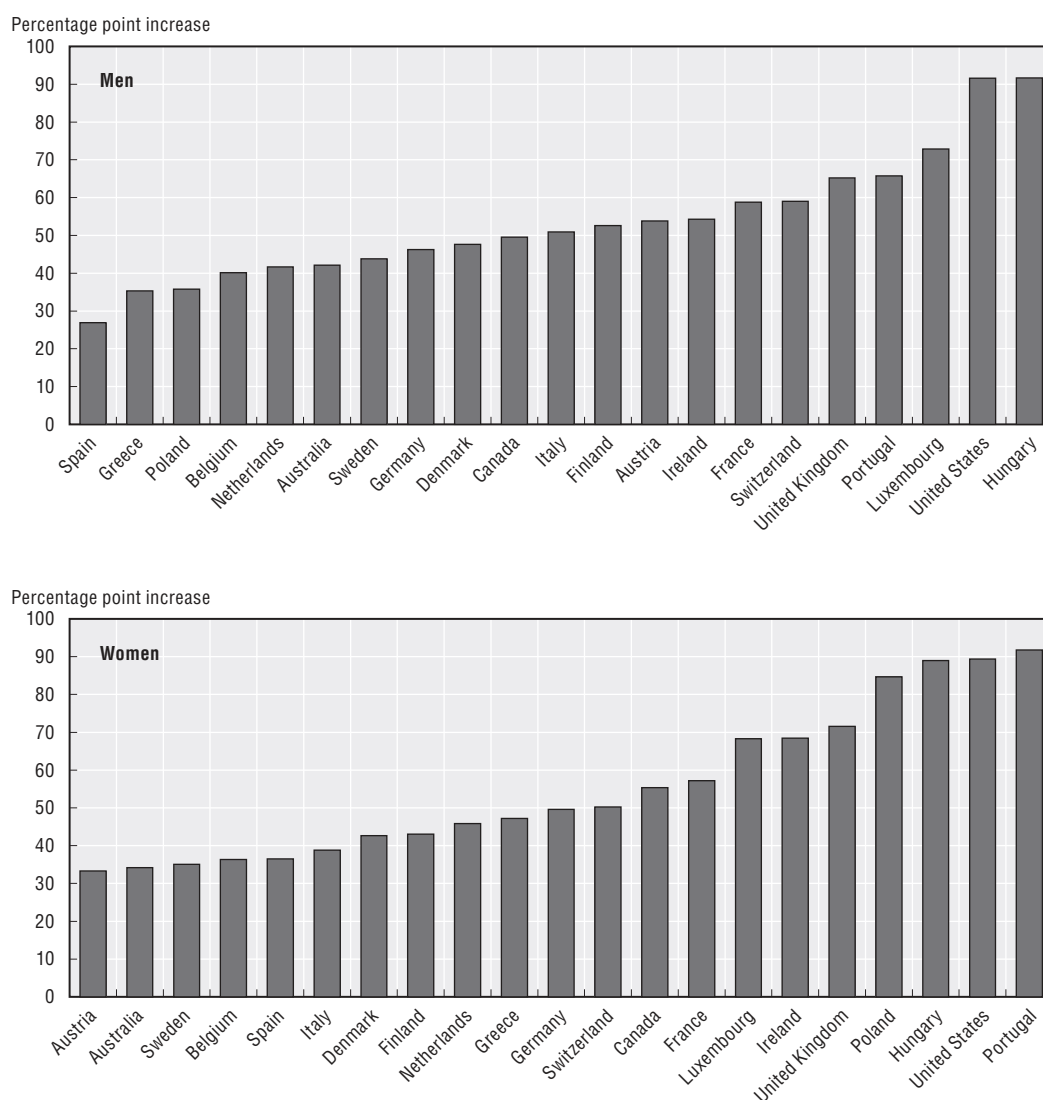
1. Estimates of the increase in gross hourly earnings relative to a worker with a secondary education degree, controlling for individual characteristics other than education attainment.
2. Except for Hungary 1997 and Poland and Switzerland 2000.

Source: European Community Household Panel (ECHP), the Consortium of Household panels for European Socio-Economic Research (CHER), the Cross-National Equivalent File (CNEF), the Household, Income and Labour Dynamics in Australia Survey (HILDA) and authors' calculations.

From gross wage premia to net labour market premia

A number of adjustments must be made to the gross wage *premia* from tertiary education to derive the corresponding net labour market *premia*, which summarise the expected increase in net lifetime earnings from engaging in tertiary education. *First*, in order to reflect as closely as possible the returns per additional year of education (or the marginal returns), the *Mincerian* coefficients have been adjusted for the length of tertiary studies.[11] This adjustment improves the wage *premia* of countries with short study duration.[12] For example, gross wage *premia* are roughly comparable in Spain and Australia

but Spanish students take almost twice as long to graduate as their Australian counterparts, so the adjusted wage *premia* is higher for Australia.

Second, wage *premia* are conditional on being employed. To estimate employment probability, individual-level data were used, controlling for both factors affecting employability unrelated to tertiary education and the decision to participate in the labour force (Boarini and Strauss, 2007). In 2001, the estimated probability of employment (conditional on participating in the labour market) for an upper-secondary degree holder was around 92% for women and 95% for men in most countries. With a tertiary education degree, the conditional employment probability increases on average by around 2 percentage points (Figure 10). The largest gains in employability (between 4 and 6 percentage points) are found, for men, in Italy,[13] Poland, Canada and Finland; and, for women, in Hungary, Finland, Sweden and Canada. The gender differences are large in Italy and Belgium. The marginal effect of higher education on employment probabilities estimated on micro-data are generally in line with the gaps between aggregate unemployment rates of upper-secondary and tertiary degree holders and display some cyclical sensitivity.[14]

Third, the effect of tax systems must be taken into account. Both average and marginal tax rates are relevant. The reason is that the higher absolute amount of money earned by a tertiary degree holder can be decomposed into two components: an increase in net wages (*i.e.* adjusted for *marginal* tax rates) holding employment probability constant and the monetary equivalent of an increase in the employment probability holding net wages constant (*i.e.* adjusted for *average* tax rates). Analogously, marginal and average tax rates are respectively applied to marginal and average unemployment replacement rates.[15]

Accounting for the combined effect of unemployment benefits and taxation makes it possible to compute *net* labour market *premia*. This calculation, involving the wage *premia* and the monetary equivalent of gains in employability (employability *premia*), changes somewhat country rankings obtained in gross terms. These adjustments lower the average wage *premium* from 10.8% in gross to 5.6% in net terms (see Boarini and Strauss, 2007 for details).

To complete the calculation of the benefits, pension *premia* should also be taken into account. Indeed, individual pension savings and entitlements are heavily subsidised in most OECD countries and can attract tertiary graduates. Nonetheless, net pension *premia* occur in a distant future and therefore, due to discounting effects, play a relatively minor role on the total returns to education (see Boarini and Strauss, 2007).

Direct and indirect costs of tertiary education

The gross direct costs of tertiary education are mostly related to tuition fees. However, in most countries, tertiary education is publicly provided or heavily subsidised with tuition fees set at low levels. The tuition fees (net of grants) in 2001 appeared to be much higher in the United States than in other OECD countries (Figure 11).[16] Net tuition fees were also relatively high in Australia and Poland, where public subsidies for tuition fees are negligible. At the other end of the scale, there are virtually no direct costs in Greece due to large public subsidies. In Nordic and Continental European countries, the net direct costs of tertiary education studies are also estimated to be relatively low.

Living expenses are part of student costs, but are not a direct cost of education (as secondary graduates also have living expenses). In some countries there are public subsidies

Figure 10. **Marginal effect of higher education on the employment probability**[1]

2001[2]

Percentage point increase
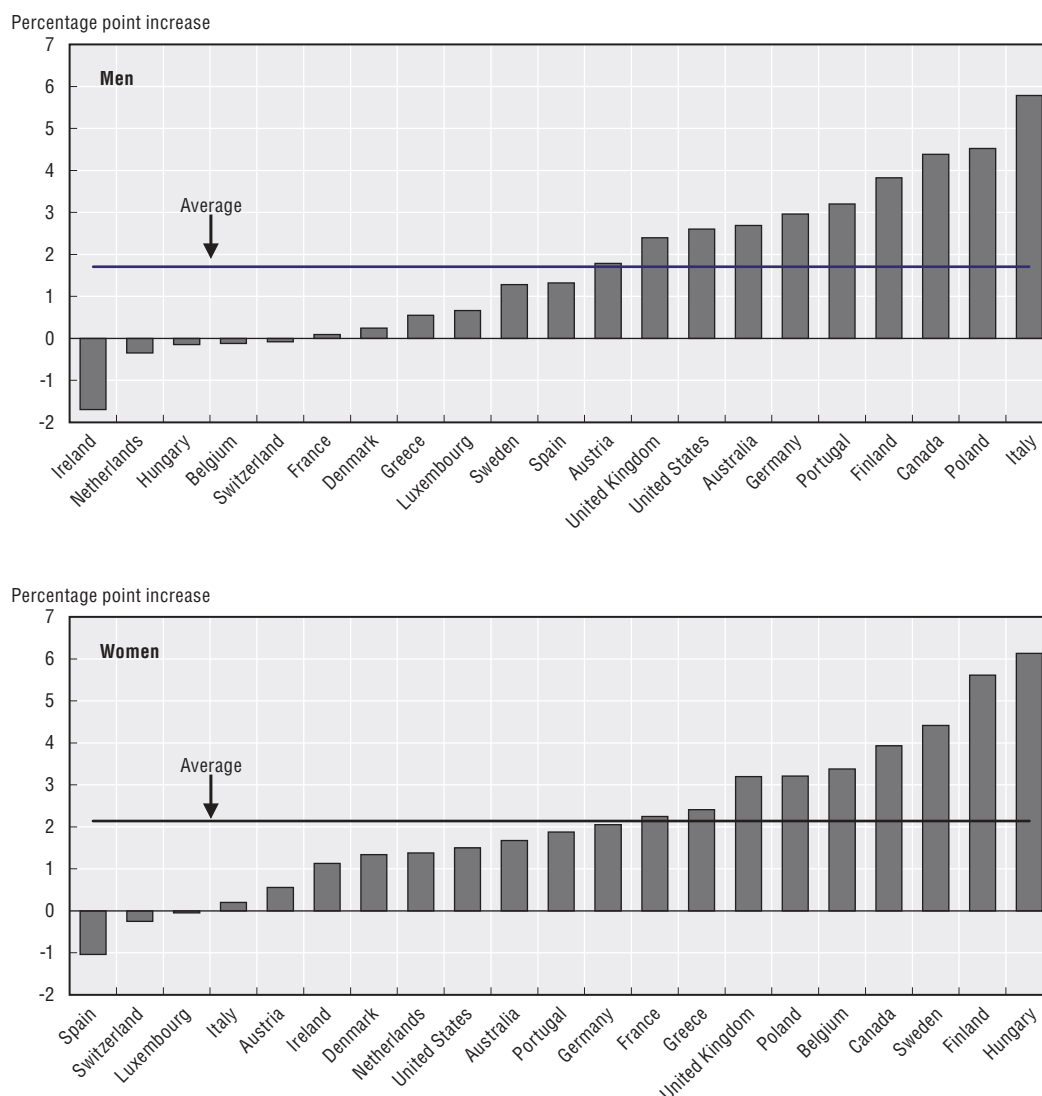
1. Increase in probability of employment. Tertiary degree holders relative to holders of an upper secondary degree.
2. Except for Hungary 1997 and Poland and Switzerland 2000.
Source: European Community Household Panel (ECHP), the Consortium of Household panels for European Socio-Economic Research (CHER), the Cross-National Equivalent File (CNEF), the Household, Income and Labour Dynamics in Australia Survey (HILDA) and authors' calculations.

targeted for these costs (see below) and these grants for living expenses should, in principle, be included in the baseline calculation. Unfortunately, cross-country data are not fully available. For this reason, the calculation implicitly assumes that students' loans are fully repaid and abstracts from any implicit subsidisation of such loans. Only for a limited set of countries, it was possible to compute direct costs including grants for living expenses and loans that are not repaid (Figure 11, Panel B). With this more comprehensive measure, direct costs turn out to be negative for Greece, Denmark, Austria, Finland, Germany and Sweden. Therefore, it should be borne in mind that the omission of grants for living expenses may introduce a downward bias in the baseline calculation of the returns for these countries.

Figure 11. **Net direct costs of tertiary education**[1]

Per cent

A. **Baseline** (net tuition fees only)

(Countries along horizontal axis: Greece, Denmark, Austria, Finland, Germany, Portugal, Belgium, Ireland, France, Sweden, Italy, Spain, Netherlands, Hungary, United Kingdom, Poland, Australia, United States)

☐ Net private costs (incl. grants living expenses + loans never repaid)
■ Net private costs (incl. grants living expenses)

Per cent

B. **Alternative calculations for selected countries** (including grants for living expenses and loans)

(Countries along horizontal axis: Greece, Denmark, Austria, Finland, Portugal, Germany, Belgium, Ireland, France, Sweden, Italy, Spain, Netherlands)

1. In % of gross annual wages of an upper-secondary degree holder.
Source: Authors' calculations based on EAG (2005), indicators B1.1 and B3.2b.

The main indirect costs of tertiary education are essentially the opportunity costs of foregone earnings during the duration of studies.[17] Intuitively, high labour income taxation and low unemployment benefits reduce opportunity costs. Opportunity costs appear to be relatively uniform across countries (Figure 12), though they tend to be higher in countries with low wage taxation (*e.g.* Ireland, Portugal, Spain and Switzerland). In Nordic countries, Belgium and Germany opportunity costs are low, primarily reflecting high average tax rates, and notwithstanding relatively high unemployment benefit replacement rates. The possibility for student part-time work is not introduced in the baseline calculation of the opportunity costs, but will be considered in the sensitivity analysis below.

Figure 12. **Opportunity costs of tertiary education**

Foregone income while studying[1]
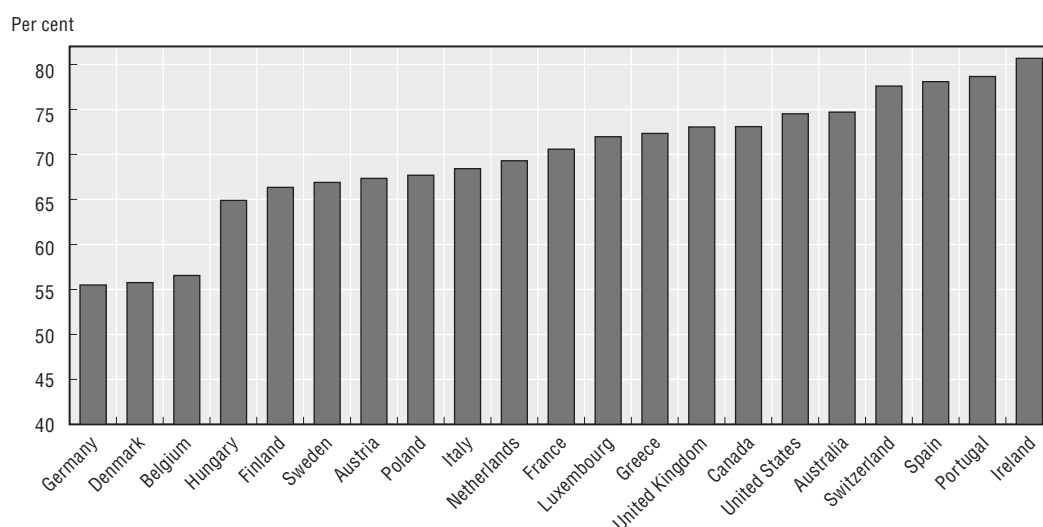
1. Adjusted for average tax rate, average tax on unemployment benefits and unemployment replacement rate. Average for men and women. The data in the figure are expressed in % of the gross annual wages of an upper-secondary degree holder.

Source: Authors' calculations.

Cross-country differences in the Internal Rates of Return to education

Incorporating all the elements described above, as well as an estimate for future productivity growth,[18] yields internal rates of return (henceforth *IRR*) that vary from over 4 to over 14% in 2001 for the 21 OECD countries covered by the analysis (Figure 13). The average return (across both countries and gender) is 8.5%, which is lower than previous OECD estimates (see Blöndal, Field and Girouard, 2002) but still substantially higher than current market interest rates adjusted for inflation. The range of returns for women is somewhat wider than for men (from over 4 to over 14% *vs.* 5 to 12%). Gender differences in the *IRR* are particularly large in Poland (above 5 percentage points).

Relatively low returns for both men and women are found in Spain, Italy, the Netherlands, Sweden and Belgium. These low education returns are driven by below-average wage and employability *premia*, which more than offset low (direct or opportunity) costs. Hungary, although with very high wage *premia*, also displays relatively low returns due to very high marginal taxes. In contrast, Ireland, the United Kingdom and Portugal have among the highest returns for both men and women because these countries have high wage *premia*, reinforced either by high employability *premia* and/or low costs of education. Other countries display either moderate returns or significant differences by gender. In most cases, wage and employability *premia* are just around average or are offset by high direct costs of education.

While the main drivers of the IRRs are the wage *premia*, each country specific conditions generate a wide variation of the effects of the different components on total returns to higher education (see sensitivity analysis provided in Boarini and Strauss, 2007). It should be noted, however, that numerical simulations provided in Oliveira Martins *et al.* (2007) show that observed differences in average returns across countries cannot be attributed to differences in returns across education fields.

Figure 13. **Estimates of the Internal Rates of Return to Tertiary Education**[1]
2001[2]
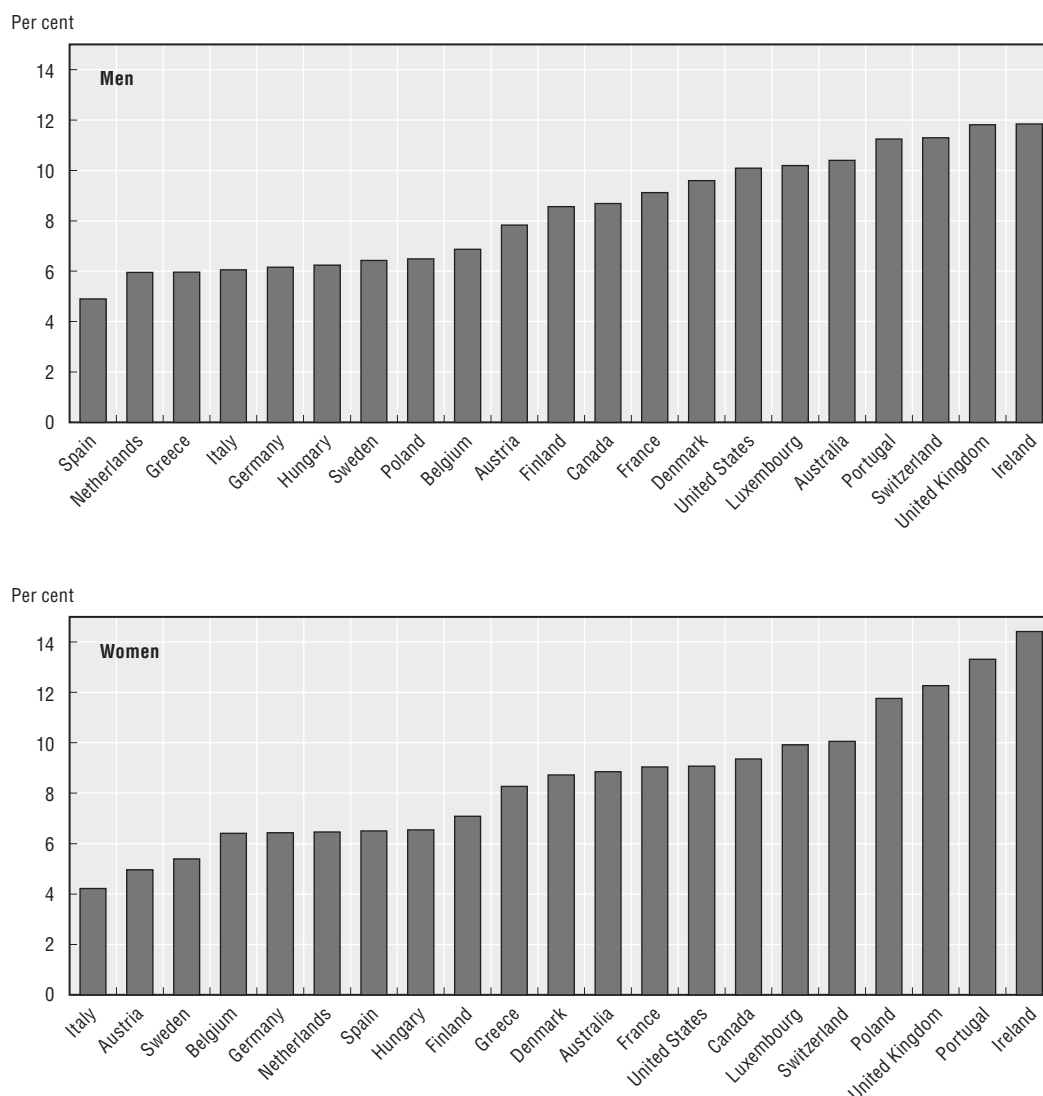
1. Uniform labour productivity growth across countries assumed to be 1.75% per year.
2. Except for Poland and Switzerland 2000 and Hungary 1997.
Source: Authors' calculations.

Financing the individual investment in tertiary education

The relatively large individual returns to education observed in many countries in principle provide strong incentives for individual investment in tertiary education. However, the existence of market imperfections hinders the financing of this investment through market mechanisms such as individual student loans. On the supply side, the imperfections are mainly related to asymmetric information on students' abilities and motivation, the uncertainty about their future income and the lack of collateral.[19] On the demand side, students engaging in higher education are neither sure of completing the degree nor of the level of returns to be expected from it. Thus, students' risk aversion may further inhibit the development of loans. Because risk may be less bearable in low-income conditions, some government intervention in higher education may be justified on both efficiency and equity grounds (Chapman, 2005).[20]

Financing systems in OECD countries

In countries where fully private loans to students exist, they are often limited to students with collateral or creditworthy co-signatories, and to students in fields offering high future earnings (Johnstone, 2005). The information asymmetries behind this outcome are often seen to call either for a governmental guarantee on a private loans, or for the government itself to be a lender. Government-supported loans are generally either mortgage-type or income-contingent.

A good example of a mortgage-type system is the Dutch student loan system where fixed monthly repayment instalments are calculated in such a way that the debt is repaid over a relatively long period (typically 25 years). A well-known income contingent loan programme was developed in Australia in 1989. Under the Higher Education Contribution Scheme (HECS), students do not pay up-front for tuition fees, but after graduation they start reimbursing the costs of their higher education to the state, through the tax system.[21] In New Zealand both tuition fees and an income contingent loan programme were introduced in 1992, but contrary to the Australian system, the fees are paid by students and their families directly to the university, and the choice of taking-up a loan is left open to the individual. The United Kingdom also recently introduced an income-contingent loan system while raising tuition fees.

A snapshot of the characteristics of existing loan systems in five OECD countries (Table 1) suggests that loan systems are designed not only to limit individual financial risks but also to provide a direct subsidy. Income thresholds for repayment range from 34% to 75% of average wages, the amortisation period is relatively long and all systems contain elements of interest rate subsidisation. In the five OECD countries under consideration, student work is also widespread providing a complementary form of financing and reducing the risk associated with loan-financed education. This may partly explain why, despite advantageous financial conditions, the take-up rates[22] of student loans can be below 50% in some countries (Table 2) and why debt levels at graduation are often much below average income at that point (last row in Table 1).

Student grants are another form of individual financing support. However, grants are generally targeted, often with cumbersome administrative requirements, and thus take-up rates can be low in some countries (Table 3). Only in Nordic countries, Luxembourg, the United States and the Netherlands do grants have a large, sometimes universal, coverage. In the countries where grants play a limited role and where no loan systems have been developed the bulk of the individual financing has to rely on family networks and on student work.

An evaluation of financing constraints

A crude approximation of the degree of financial and/or liquidity constraints faced by prospective tertiary education students is provided by the ratio of the average annual expenses during study for a tertiary degree to the sum of the available sources of financial support. These include the amount of available individual loans and grants, but also family resources, for which calculations are less straightforward. As a very rough approximation, the latter can be set equal to the equivalised median household disposable income (*i.e.* adjusted for family size). In addition, estimates of expected earnings from part-time student work (adjusted for country-specific youth employment rates) are also included among possible financing sources for these computations.

Table 1. **A comparison of loan systems for selected OECD countries**

	Australia	Netherlands	Sweden	United Kingdom	United States
Income threshold for repayment	AUD 38 149 (74.5% of AW) or $27 622[1]	€ 15 000 (40% of AW) or $16 687[1]	None	£15 000 (52.5% of AW) or $23 946[1]	$10 712 (34% of AW)
Standard repayment rates	From 4% to 8% of all income	Mortgage-style	Mortgage-style with an upward-adjustment index of 2% per year	9% of income above the threshold	Mortgage-style or Income-contingent
Amortisation period	..	25 years	25 years	..	10-25 years
Loan forgiveness	At death/disability With a limit of $57 554 for most full-free courses and $71 942 for dentistry, medicine and veterinary science	After 25 years of repayments	At age 70/death	At death/disability/after 25 years of entering repayments	At death/disability/after 25 years of repayments
Subsidies during studies	Real interest subsidy (interest = inflation): 2.8%	Interest = government's rate of borrowing: 3.05%	Subsidy of 30% of the cost of borrowing: 2.8%	Real interest subsidy (interest = inflation): 2.4%	No interest rate for subsidised loans. Market rate for the other loans.
Subsidies after studies	Real interest subsidy (interest = inflation): 2.8%	Interest = government's rate of borrowing: 3.05%	Subsidy of 30% of the cost of borrowing: 2.8%	Real interest subsidy (interest = inflation): 2.4%	No subsidy, market rates
Percentage of students working during term	70%	91.1%	..	56%	80%
Average debt at graduation	AUD 14 697 (29% of AW) or $10 642[1]	€ 8 700 (23% of AW) or $9 678[1]	SEK 230 000 (74% of AW) or $25 308[1]	£8 800 (31% of AW) or $14 048[1]	$19 300 (61% of AW)
Average income at graduation	AUD 38 000 (74% of AW) or $27 514[1]	€ 28 000 (74% of AW) or $31 148[1]	SEK 290 400 (94% of AW) or $31 954[1]	£22 000 (77% of AW) or $35 121[1]	$34 100 (107% of AW)

.. = not applicable.
AW = Average worker's annual wage. For a definition, see *Taxing Wages* (2006).
1. Converted with the 2006 PPPs.
Source: Usher, A. (2005). *Global Debt Patterns: An International Comparison of Student Loans Burdens and Repayment Conditions*, *EuroStudent Report 2005*, US National Center for Education Statistics, Student Income and Expenditure Survey for 2004/2005 (UK), *www.csn.se* (Sweden), *www.goingtouni.gov.au* (Australia).

Table 2. **A comparison of take-up rates[1] for student loan systems, 2003-2004[2]**

Per cent

Sweden	85
United Kingdom	81
Australia	77
Luxembourg	72
New Zealand	60[3]
Canada	50
Denmark	50
United States – Total loans	50
Of which: Federal loans	48
Finland	40
Hungary	30
Japan	24
Germany	25
The Netherlands	20
Poland	11
Slovak Republic	3

Note: Countries with the same take-up rates for grants and loans are those with student aid packages that include a combination of both funding forms.
1. Take-up rates represent the number of aid recipients over the total number of students entitled to receive grants or loans.
2. When available, or the most recent year.
3. Average of part-time and full-time students. Among full-time students, the take-up rate is about 76%.
Source: Usher, A. (2005), *Global Debt Patterns: An International Comparison of Student Loans Burdens and Repayment Conditions*, US National Center for Education Statistics, HIS, *Eurostudent Report 2005* and national sources.

Table 3. **A comparison of take-up rates[1] for student grants, 2003-2004[2]**

Per cent, non-repayable financing

Sweden	85
Denmark	80
Finland	80
Norway	78
Luxembourg	72
United States – Total grants	63
Of which: Federal grants	34
The Netherlands	62
Korea	40
Ireland	31
France	30
Belgium (Flemish)	29
Australia	27
Portugal	25
Poland	25
Germany	25
Spain	23
Slovak Republic	13
Mexico	10
Italy	9

Note: Countries with the same take-up rates for grants and loans are those with student aid packages that include a combination of both funding forms.
1. Take-up rates represent the number of aid recipients over the total number of students entitled to receive grants or loans.
2. When available, or the most recent year.
Source: Usher, A. (2005), Global Debt Patterns: An International Comparison of Student Loans Burdens and Repayment Conditions, US National Center for Education Statistics, HIS, Eurostudent Report 2005 and national sources.

This attempt to compare total student costs (tuition fees and cost of living) of higher education with the available financing sources is displayed in Table 4 (details about this indicator are provided in Oliveira Martins *et al.* (2007), Annex C). Typically, the average ratio of total costs to total funding is somewhat lower in universal funding systems than in family-based systems, despite tuition fees and living costs often being relatively high. A few countries stand out among family-based systems with particularly high costs-to-financing ratios, including Mexico, Korea and Turkey.

Explaining aggregate investment in tertiary education

The calculated private returns to education (*IRR*), the information concerning student financing and the characteristics of tertiary education supply can be used to explain aggregate graduation patterns in OECD countries. The analysis is performed in an unbalanced panel using 19 countries[23] and gender as the cross-section dimension. The maximum time span covered is 1992-2002, but for several countries only the most recent years are available.

On the demand side, private returns are expected to influence graduation ratios positively. The ratio of education costs to the availability of individual financing, as proxy for the existence of liquidity constraints, is expected to display a negative sign. The responsiveness of supply of tertiary education, as measured by the STE indicator, is expected to be positively related to graduation ratios. For example, a university system that better matches students' preferences (*e.g.* because it offers a larger choice of programmes) is likely to attract more students. In addition, systems allowing for shorter study duration

Table 4. **An estimation of total student costs and available financing per year (in $ PPP)**

Data correspond to the latest available date up to 2006

	Average of public and private sector's tuition fees[1]	Living costs[2]	Total student costs	Maximum amounts of loans and grants[3]	Expected earnings for student part-time work[4]	Median equivalised disposable income[5]	Total resources	Total student costs/Total resources (in %)
Universal funding								
Denmark	0	6 647	**6 647**	10 294	5 606	19 832	**35 731**	18.6
Finland	0	5 229	**5 229**	7 015	3 703	17 070	**27 788**	18.8
Luxembourg	0	8 325	**8 325**	5 020	3 176	27 403	**35 599**	23.4
Sweden	0	5 431	**5 431**	10 534	2 544	17 157	**30 234**	18.0
Iceland	390	5 769	**6 159**	11 531	4 255	18 085	**33 871**	18.2
Norway	630	5 769	**6 399**	8 711	4 119	22 131	**34 962**	18.3
Netherlands	1 565	4 924	**6 489**	8 427	5 201	20 050	**33 677**	19.3
United Kingdom	1 794	8 602	**10 396**	11 644	4 620	18 987	**35 250**	29.5
New Zealand	2 548	7 546	**10 094**	7 849	2 696	13 680	**24 225**	41.7
Canada	2 967	4 909	**7 876**	8 750	2 591	21 172	**32 512**	24.2
Australia	3 791	6 720	**10 511**	5 995	4 631	16 371	**26 997**	38.9
United States – Federal loans	8 653	6 344	**14 997**	18 500	2 105	23 954	**44 559**	33.7
United States – Private loans[6]	8 653	6 344	**14 997**	40 000	2 105	23 954	**66 059**	22.7
Average	2 384	6 351	**8 735**	11 867	3 642	19 988	**35 497**	24.6
Family-based funding								
Greece	0	3 618	**3 618**		2040	11 656	**13 696**	26.4
Mexico	0	5 625	**5 625**		386	3 816	**4 203**	133.8
Slovak Republic	0	2 165	**2 165**		659	6 757	**7 416**	29.2
Germany	55	4 417	**4 472**		4 217	15 632	**19 849**	22.5
Czech Republic	172	2057	**2 230**		923	9 411	**10 334**	21.6
Turkey	274	4 800	**5 074**		862	4 568	**5 429**	93.5
Hungary	426	2 995	**3 421**		1 155	6 743	**7 898**	43.3
Poland	426	1 444	**1 871**		654	6 308	**6 962**	26.9
Belgium	625	4 380	**5 005**		3 903	16 919	**20 822**	24.0
France	703	5 401	**6 104**		2 997	16 178	**19 175**	31.8
Ireland	748	4 957	**5 705**		3 902	17 824	**21 726**	26.3
Spain	801	5 563	**6 364**		3 047	12 084	**15 131**	42.1
Austria	847	5 821	**6 668**		2 940	16 419	**19 358**	34.4
Switzerland	849	4 881	**5 730**		1 836	23 534	**25 370**	22.6
Italy	1 174	4 421	**5 595**		3 104	14 794	**17 898**	31.3
Portugal	1 688	4 030	**5 718**		1 864	10 714	**12 578**	45.5
Japan	5 285	6 156	**11 441**		2 244	17 871	**20 114**	56.9
Korea	6 210	5 890	**12 101**		1 445	10 182	**11 628**	104.1
Average	*1 127*	*4 368*	***5 495***		*2 121*	*12 300*	***14 422***	*38.1*
Average excluding Korea, Mexico, Turkey	*920*	*4 154*	***5 074***		*2 366*	*13 523*	***15 889***	*31.9*

1. Weighted by the percentage of full-time students in public and private institutions. When range of fees was provided in OECD Education at a Glance, a point estimate was derived by taking the middle value. Where data were not available, tuition fees were assumed to be zero. Public institutions only for Canada, Spain and Switzerland. For Germany, the value refers to contributions paid to TE institutrions for the use of social facilities and to other registration fees. For Ireland, the value refers to registration, examination and services charges. For Poland, tuition fees were assumed to be the same as in Hungary.
2. Living costs were derived from Usher and Cervenan (2005) and other sources. When not available in this source, living costs were estimated using the average share of living costs to average wages of an upper-secondary educated worker (around 40%). For Czech Republic, Korea, Mexico and Turkey, living costs are derived from International Student Guides. For Iceland and Norway, living costs were estimated as the average of Nordic countries and for Slovak Republic as the average of Eastern European countries.
3. Universal grants and loans only. For Australia, corresponding to the HECS-HELP loan.
4. 80% of the part-time wage, calculated as 1/3 of a secondary worker's average wage or 1/3 of a minimum wage and adjusted for youth unemployment rate. For Iceland and Norway, income from student work was estimated as the average of Nordic countries.
5. The "equivalised" income is the household income adjusted for household size (*i.e.* the household divided by the square root of household size). For Belgium, Iceland, Korea and Slovak Republic, the equivalised disposable income was estimated as a share of GDP per capita (using the OECD average share).
6. Government guaranteed loans, such as the Sallie Mae scheme.

Source: OECD, *Education at a Glance*; Usher and Cervenan (2005); Center for Higher Education Policy Studies, *Student Financial Report* (for Germany and Ireland) and authors' estimates.

and intermediate diplomas are more attractive since they provide students with the option of deciding when to stop the investment (see Heckman *et al.*, 2005). For similar reasons, those systems may induce lower drop-out rates in case of high subjective discount rates.

Taking into account some of these determinants, a reduced form was estimated where tertiary graduation ratios are regressed on the *IRR*, the STE indicator, an indicator of financial constraints (derived from the last column of Table 4), a dummy for females and an output-gap indicator as a way of capturing possible cyclical components in the graduation ratios.[24] Several specifications were tested (Table 5), including or not time fixed-effects and country-specific trends to capture other cross- and country-specific unobservable factors driving graduation ratios. In all specifications the explanatory variables have the expected sign and are significant. Higher *IRR*s, higher responsiveness of supply and lower liquidity constraints are associated with higher graduation ratios. As suggested by the effect of the female dummy, graduation ratios are generally higher for women than for men. The results are consistent across specifications, though the *IRR* and the supply indicator coefficients are fairly sensitive to whether fixed time effects and country-specific time trends are included.[25]

Table 5. **Determinants of tertiary graduation ratios: regression results**

	Pooled model (1)	Pooled model with country-specific time trend (2)	Pooled model with country-specific time trend and year fixed effects[1] (3)
Dependent Variable: Log of graduation ratio			
IRR	5.84***	3.27***	3.19***
	[0.77]	[0.82]	[0.85]
Supply indicator	0.17***	0.20***	0.21***
	[0.02]	[0.03]	[0.03]
Financial constraints	−0.02***	−0.03***	−0.03***
	[0.00]	[0.00]	[0.00]
Output gap	0	−0.03***	−0.03***
	[0.01]	[0.01]	[0.01]
Female dummy	0.22***	0.21***	0.21***
	[0.04]	[0.02]	[0.02]
Constant	0.09	0	−0.21
	[0.12]	[0.17]	[0.22]
Observations	266	266	266
R-squared	0.54	0.84	0.85

Standard errors in brackets.
* significant at 10%; ** significant at 5%; *** significant at 1%
1. This is the baseline specification.
Source: Authors' calculations.

The next section discusses a number of potential policy reforms and in that context makes use of the above empirical results to present some stylised simulations that illustrate the effect of policy change on graduation ratios. For the sake of these simulations, the retained specification (shown in the third column of Table 5) is the one including fixed time effects and country-specific time trends since the omitted variable bias is likely to be smaller in this case. Since the size of coefficients varies to some extent across specifications, while their sign is systematically in line with priors, the simulations are best seen as illustrative of the qualitative impact of policy changes on graduation ratios rather than specific numerical quantifications.

Policies to enhance tertiary education outcomes

The analysis and empirical tools developed in previous sections provide a basis for assessing various policies that could address some of the shortcomings existing in current higher education systems, as discussed in introductory section. These include: *i)* institutional reform to enhance the supply of tertiary education; *ii)* introduction or greater reliance on fees and loan systems, reform of grant systems, easier access to student work; *iii)* shortening study duration; and, *iv)* tax reform. Policy change in each of these areas may reduce distortions to incentives but may also present trade-offs in respect to other policy objectives. The main challenges are to avoid negative repercussions on aggregate investment in tertiary education, equality of access and, more broadly, income distribution.

Some policy simulations presented below may affect directly the investment in tertiary education (such as institutional reform or easing liquidity constraints), while others (such as easing taxation and student work) affect investment through their impact on the *IRRs*. As it is difficult to find a common metric for assessing policy changes in different areas, as far as possible, the variables corresponding to particular policies were changed according to the dispersion observed in the sample (typically the shock corresponds to a move by all countries to the mean –/+ two standard deviations or alternatively to the minimum/maximum of the policy variable in question across the countries for which data are available).

Reform of tertiary education institutions

As documented by Santiago *et al.* (2008), over the past decade many OECD countries have moved in the direction of increasing the autonomy and the accountability of tertiary education systems. Nonetheless, as highlighted in the previous section, OECD indicators on the institutional set-up of tertiary education suggest that in several countries considerable scope remains for moving towards more incentive-based and coherent systems. Using the regression results to provide an indication of the potential gains, in terms of graduation ratios, that could be obtained from institutional reforms to enhance the flexibility and the accountability of tertiary institutions, reforms were simulated corresponding to an alignment of the STE indicator on the maximum observed in the sample of the regression (Australia) (Figure 14). The results show that all other OECD countries would benefit from such a reform, particularly so some continental European countries (Greece, Germany and France).

A related area in which most OECD countries have implemented reforms is the shortening of the study *curricula* offered by tertiary institutions. Within the EU, the Bologna process has had this effect. Again, empirical estimates obtained in the previous sections can be used to gauge the effects of such shortening through their effect on the *IRR* and subsequently on graduation ratios. On average, a reduction of study duration from current levels to the cross-country mean less two standard deviations (*i.e.* to around three years) would increase graduation ratios by between 0.2 to 0.8 percentage points, with the largest effects obtained for Finland, France and Germany (Figure 15).

In practice, deep reforms of tertiary institutions are not easy because they imply changing entrenched beliefs and practices. Implementation therefore involves transitional costs and needs to overcome resistance from stakeholders. These costs are not accounted for in the simple experiments performed above. Also, these experiments are conducted under the assumption that the quality of graduates is not affected by reforms, while a

Figure 14. **Impact of increasing the flexibility and accountability of tertiary education supply on graduation ratios**[1]

Percentage points
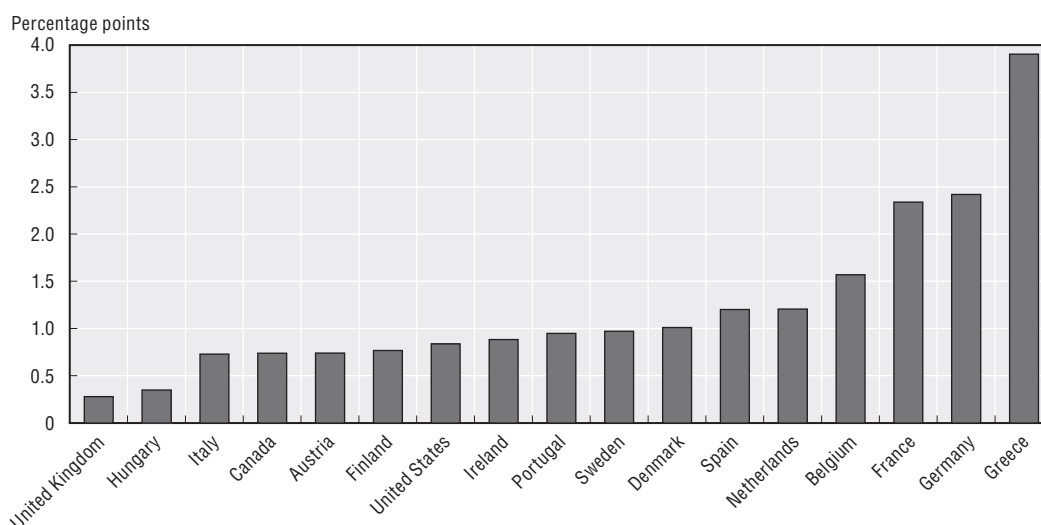
1. Effect of aligning the STE indicator on the maximum in the sample of the regression presented in Table 5 (Australia).
Source: Authors' calculations.

Figure 15. **Impact of reducing study duration on graduation ratios**[1]

Percentage points
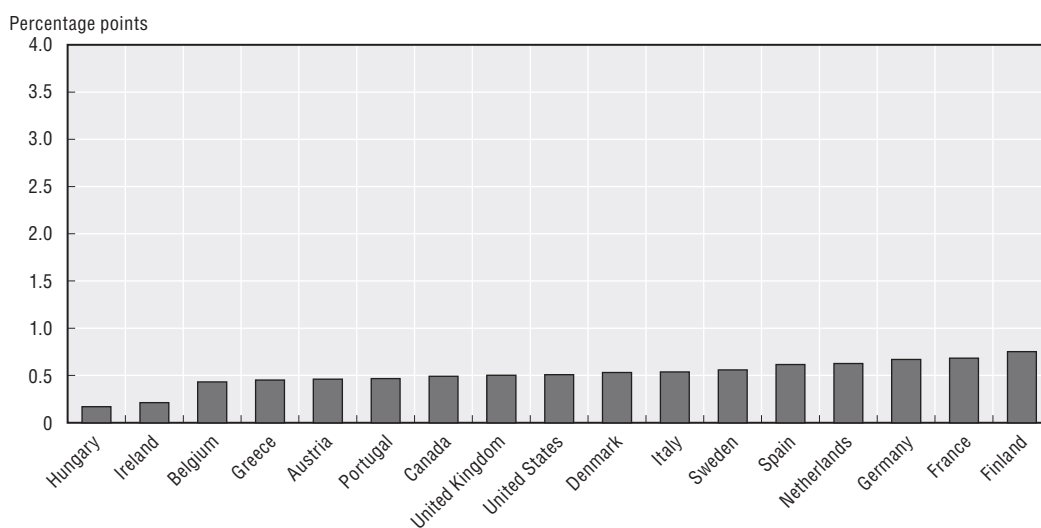
1. Effect on graduation ratios of setting study duration at the sample mean level minus two standard deviations (Australia is not included because the study duration is already below the sample mean minus two standard deviations).
Source: Authors' calculations.

trade-off could appear for instance between study duration and the quality of education. Similarly, shorter study duration might reduce the scope for student work.

Introduction or greater reliance on tuition fees

A number of countries have introduced (or re-introduced) tuition fees (Australia, Austria, the United Kingdom, and Poland) or considerably increased them (*e.g.* Portugal, the Netherlands) (Table 6). However, in most countries the level of fees remains well below the

overall spending per student (Figure 16). Raising tuition fees has often been accompanied by the introduction or reform of student loan systems that make available sufficient individual financing to cover fees, as well as living costs (see below).

Increased reliance on tuition fees can help address some of the shortcomings of current tertiary education systems. For instance, tuition fees can encourage competition for quality amongst universities and make them more responsive to students' preferences, providing that the flexibility and accountability of the system is sufficient. The case for variable fees across institutions offering different *curricula* and programmes is also strong: different fields have different costs and returns (as outlined in the previous section).

Table 6. **Introduction of tuition fees and loan systems in selected OECD countries**

	Date	Tuition fees	Student loans
Australia	1989	Introduction of a centrally-set tuition fee of about a quarter of the observed average tuition costs (around AUD 1 800)	Income-contingent system introduced
	1996	Fees increased by 40%, and tuition bands were introduced for different fields ranging, in 2005, from AUD 4 808 ($3 509) to AUD 8 018 ($5 853)	The income threshold for repayment decreased
Austria	2001	Introduction of tuition fee of € 363 per semester	Introduction of loans exclusively to pay for tuition fees, for students who have not received grants (very limited).
The Netherlands	1986		All support was put together in one system of direct support for students, including voluntary loans for all students. The maximum loan amount for tuition fees was € 7 500 annually and the maximum for living expenses was € 266 per month, in 2004.
	1990	Since 1991/92, full-time students have to pay tuition fees. Tuition in 2005 started at approximately € 1 500 a year	
New Zealand	1992	Introduction of tuitions fees set by universities with no constraint on fee levels	Introduction of student loans with income-contingent repayments
	2003	A maximum tuition fee level was introduced, for every band of subject studied. In 2007, the lower band will be NZD 3 736 for arts and social sciences and the higher one will be NZD 9 582 for medical studies.	
Poland	1990	Fee-paying studies were allowed, for evening and extra mural studies at state institutions. Fees range from PLN 1 600 to PLN 12 000	
	2004		Students enrolled in all types of institutions and studies can now apply for financial support. However, eligibility is still dependent on the earnings of the student's family. The monthly instalment that can be granted to a student was PLN 600 in 2004/05.
Portugal	1994	Introduction of tuition fees equal to 1.3 times the minimum monthly wage	No loan system
	2003	Public universities are free to set tuition fees in a range set by the Ministry. Most public universities are close to the maximum of € 902 annually	
United Kingdom	1998	Introduction of a flat tuition fee of £1 000	Loans changed from mortgage-style (maintenance loans created in 1990) to income-contingent loans covering tuition fees.
	2004		The loans were extended to cover living costs
	2006	Introduction of fees that can vary at the university's discretion, up to £3 000 a year	The loans were extended to cover tuition fees

Source: National sources.

Figure 16. **Ratio of tuition fees to costs per student,**[1] **selected OECD countries**
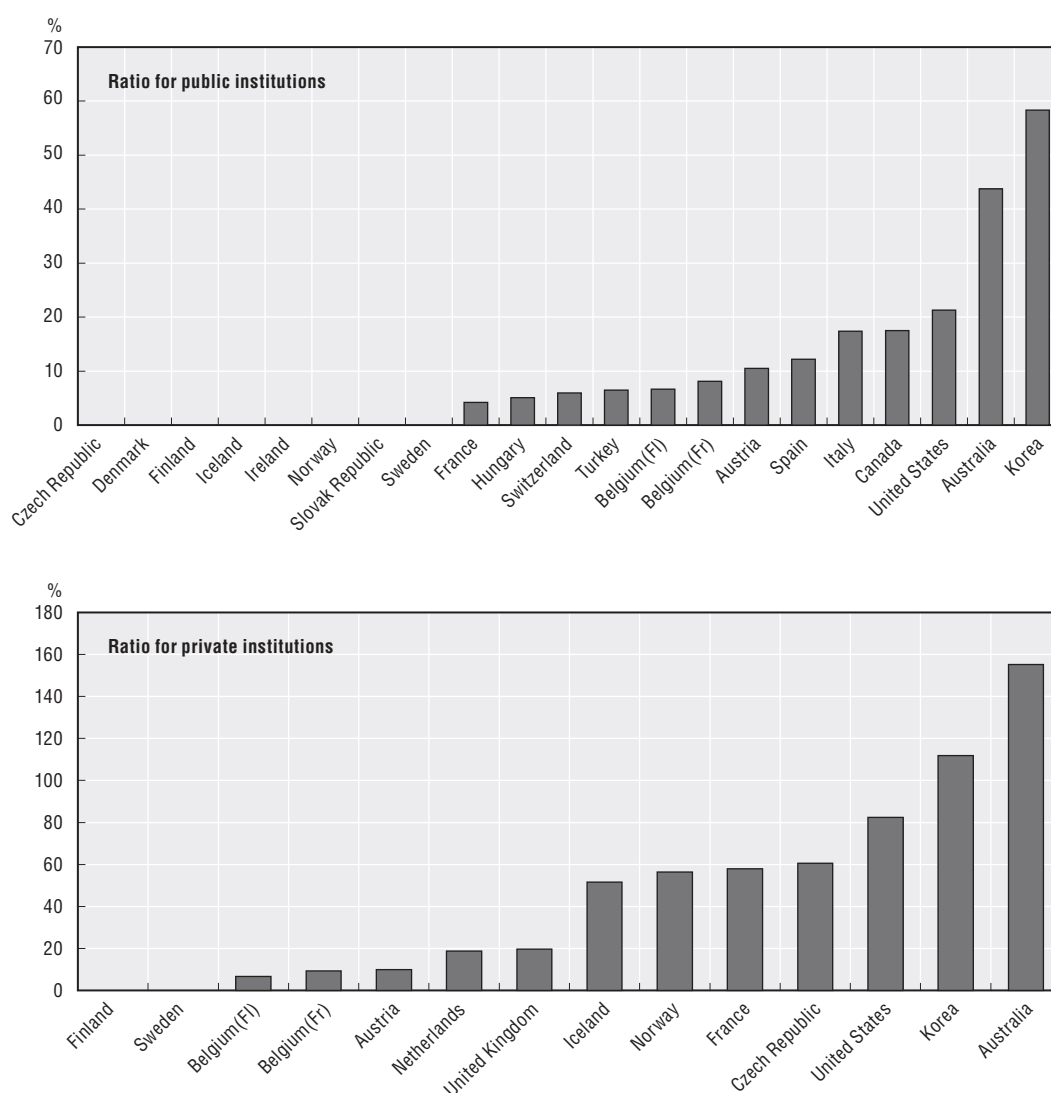
1. Costs per student borne by tertiary education institutions.
Source: OECD Education at a Glance (2006).

Variable fees may also meet differences in students' willingness to pay, allowing for example a local university to charge lower fees than an internationally renowned one.

Aside from orienting decisions about fields, fees are likely to affect positively student effort to successfully complete tertiary studies and to discipline the mere consumption of education services. For similar reasons, fees could also lead to a shortening of the average duration of studies, providing a fiscal dividend.

Another potentially positive effect of fees is to help reduce the risk of economic waste and the undesirable distributional effects implicit in systems that heavily subsidise all students. "Free" higher education benefits people who are likely to end up with high incomes and/or who originate disproportionately from high-income families, and is paid for by all citizens through (distortive) taxes. This implies deadweight losses and involves income redistribution from low- to middle- and upper-income families.

While the expansion and increase in quality of tertiary education may require more resources per student, public budgets are confronted with many other competing demands (notably in the social area). Indeed, when tertiary education systems are faced with such constraints, two basic alternatives are available: an increased use of private resources or rationing of enrolment or quality (where access to tertiary education is unrestricted). Rationing may not seem desirable and also raises equity problems since upper-income students may have more alternatives (such as studying abroad), and the students who will potentially be hurt the most by declining quality or *numerus clausus* are those that do not have these options.

However, when introducing or raising fees, their positive effects should be weighed against their potentially negative influence on incentives to invest in tertiary education. Earlier *IRR* estimates and regression results can be used to illustrate this trade-off. Tuition fees (net of the associated grants) by country were set to the sample mean plus two standard deviations (around $4 000 at PPPs). In most countries, this implies a substantial increase, notably where currently fees are very small or nonexistent (*e.g.* Nordic countries). The increase in fees negatively affects graduation ratios both through a fall in the *IRR* (as it increases direct costs) and *via* stronger liquidity constraints (assuming that all other factors remain equal). The cumulated negative effect can be large in absolute terms (above 2.7 percentage points for Finland, Denmark and Ireland, see Figure 17). This result suggests that increases in tuition fees need to be accompanied by well-designed financing systems to ensure good study access to all students, regardless of their family background. Given that the main effect relates to increased liquidity constraints (the indirect impact through the *IRRs* being relatively minor) among possible compensating policies, a natural candidate is the development of individual financing. Indeed, countries introducing or raising tuition fees have taken simultaneous action in this field.

Figure 17. **Impact of increasing tuition fees on graduation ratios without changing individual financing systems**[1]
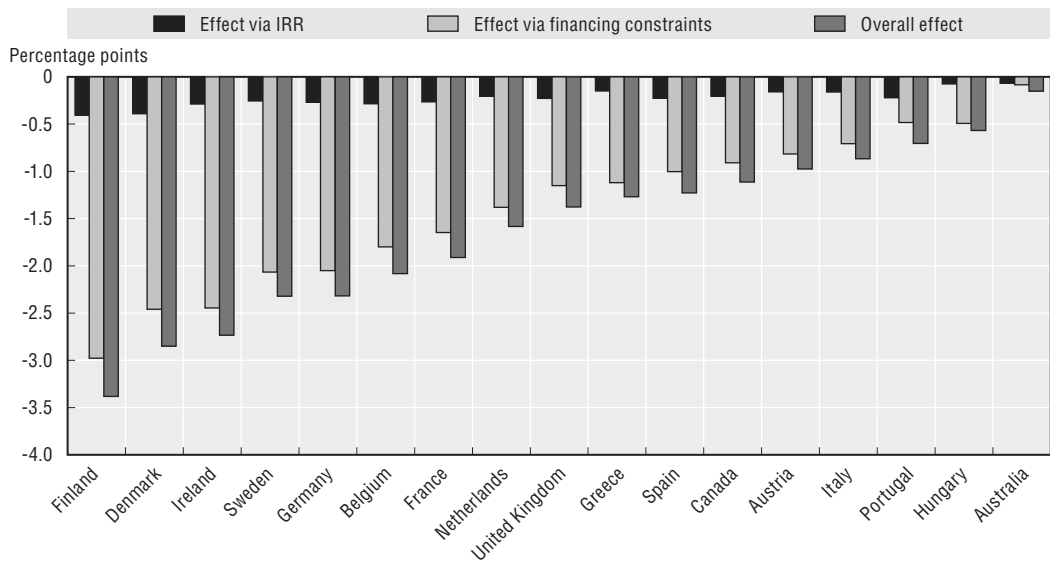
1. Simulated effect on graduation ratios of increasing tuition fees up to the sample mean plus two standard deviations (The United States is not included because the level of net tuition fees are already above the sample mean plus two standard deviations).

Source: Authors' calculations.

Introduction or greater reliance on student loans

Loan systems can reduce liquidity constraints and thereby enhance equality of access. Moreover, as compared with other financing channels, such as grants, loans may raise incentives for swift and successful study completion. In turn, loans could have a positive effect on graduation ratios. As a generic feature, universal (as opposed to means-tested) government-supported loan systems may be seen as desirable to prevent students from needing to depend on their families to pay for tertiary education. In this context, it also seems desirable for the loan system to include a loan entitlement large enough to cover both tuition fees (where applicable) and living costs.

In order to address risk aversion, which may be particularly pronounced among students from a low-income background, loan repayments are often made income-contingent.[26] However, income-contingent loans may sometimes present some complications related to the verification of graduates' income. This verification is best done through the tax system, in the presence of an effective tax collection. Hence, a country with a leaky tax system may have problems implementing income-contingent loans.

The implementation of a loan system may also entail a liquidity burden for the public sector, in that the flow of repayments from graduates may approach the flow of new loans only after some time (Barr, 2001).

Moreover, any student loan system is faced with the prospect that graduates may migrate. In general, it could be complicated to enforce repayment in these conditions and, more specifically, loans with income-contingent repayment would pose a particular challenge. To create financial incentives for graduates to remain in the country, New Zealand recently introduced interest write-offs for borrowers living in the country for at least six consecutive months.

To assess the effect of easing liquidity constraints on investment, the regression results were used to simulate the impact of aligning the ratio of costs to financing resources (above) to the minimum in the sample. The impact ranges from above 1.5 percentage points in Portugal and Spain to virtually zero in Denmark and Finland (Figure 18). The simulation is necessarily illustrative, as in countries with universal funding systems covering most student costs, the need to further ease liquidity constraints could be questioned. The simulation results are clearly more relevant in the case of family-based systems, where the liquidity constraints are likely to be more binding. However, insofar as reforms of universal funding systems involve use of tuition fees, easing liquidity constraints will have a positive impact in those systems too.

Reform of grant systems

The main argument used for the introduction of grants is that, despite the appealing features of the loan systems, information problems may still prevent loan systems from completely addressing asymmetric information and risk aversion that may have a special bearing for low-income households. But this is not the only rationale for having grants, which could also be seen as a way of offsetting the negative incentives created by progressive taxes (*e.g.* Nordic countries).

Some studies have found that low-income students and their families usually overestimate the costs and under-estimate the returns of tertiary education.[27] In these cases, a possible solution would be the existence of means-tested grants only for the first years of higher education, after which students would be better informed and willing to take loans to continue studying.

Figure 18. **Impact of easing liquidity constraints on graduation ratios**[1]

Percentage points
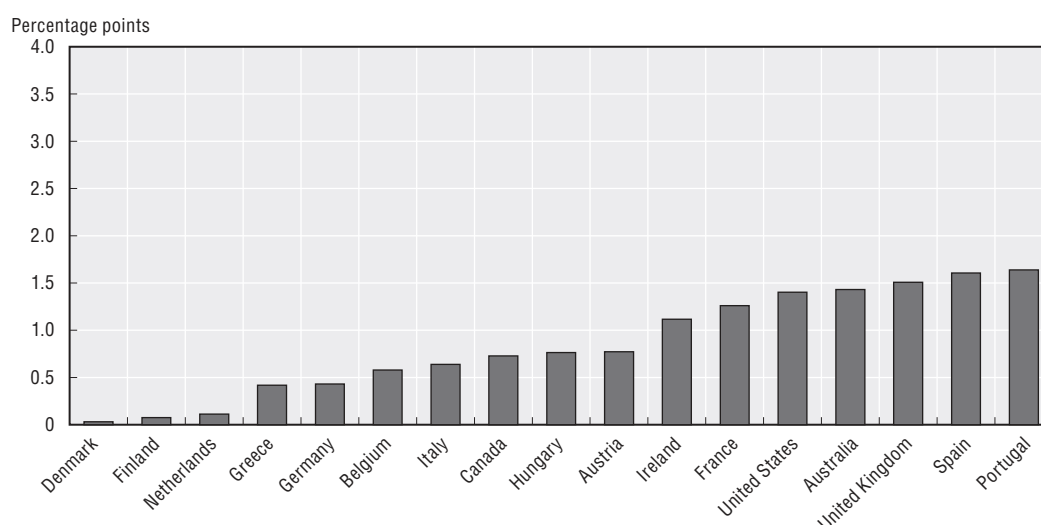
1. Effect of an alignment of the ratio of investment costs to financing resources (see Table 4) on the minimum in the sample. (This benchmark was preferred as the sample mean minus two standard deviations is below the minimum.)
*Source:* Authors' calculations.

Where grants are maintained to preserve returns and equality of access, they could be reformed. At least two options that are not mutually exclusive could be contemplated. Both involve support being given initially as loans, but then, under certain conditions, being converted to grants. One condition would be the finalisation of studies within a given time frame. This would create incentives to reduce study duration and student performance. Another condition would be to have sufficient tax liabilities to allow the loan repayment to be offset by the grant. This option would reduce migration of high-skilled workers – a particularly relevant issue in countries where tertiary education is heavily subsidised – but could also be seen as unduly restricting migration flows.

Access to student work

Another way to relax liquidity constraints and encourage private incentives to invest in higher education is to make access to part-time student work easier, for instance by implementing recommendations contained in the OECD Jobs Strategy. Greater scope for student work may also help address excessive risk aversion.[28] The potential trade-off between raising fees and increasing graduation ratios could be eased if the labour market is flexible enough to accommodate additional part-time labour supply by students.

To illustrate the impact of additional income from student work, a simulation was carried out assuming that students spend one-third of their time working in paid employment at the gross wage rate of upper-secondary degree holders; their earnings are taxed at 10% on average. These additional revenues reduce the opportunity cost of studying and, hence, increase the *IRR*, which in turn increase graduation ratios**.** This increase reaches around one percentage point in Denmark and Finland (Figure 19). These results should be taken with caution, however, because they do not factor in the potential repercussions of student work for the quality and the duration of studies.

Figure 19. **Impact of introducing or increasing part-time student work on graduation ratios**[1]

Percentage points
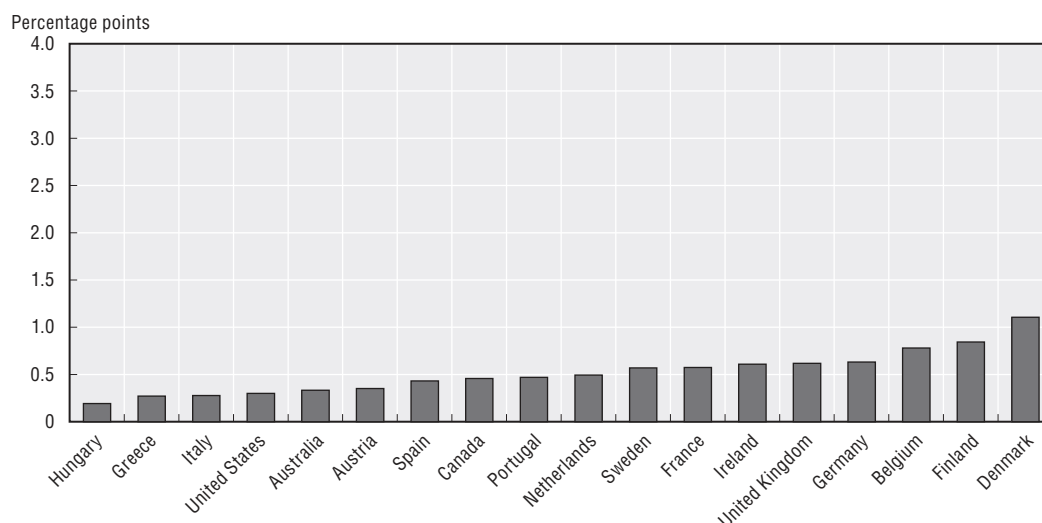
1. Effect on graduation ratios of introducing or increasing part-time work for students (corresponding to 33% of their time, taxed at 10%). (Due to the lack of available data, it was not possible to compute a sample mean and standard deviation of student part-time work).
Source: Authors' calculations.

Changes in the tax systems

Tax reforms are rarely motivated with reference to their effects on incentives for investment in higher education but, nonetheless, may have such effects. In particular, lower marginal tax rates on labour earnings have a positive effect on returns to education. At the same time, however, such changes could have a distributional effect that may be seen as undesirable, but that might be offset by other changes in tax systems, such as *e.g.* higher property taxes. Lower marginal tax rates will also increase the dispersion of returns, with the increased risk possibly providing an offset to the increase in tertiary education investment led by higher average returns.

The dispersion of marginal tax rates is particularly wide across OECD countries in the sample (ranging from nearly 70% in Hungary to 28% in Greece); this makes it difficult to use the metric used in the previous simulations. Therefore, the marginal rates were arbitrarily reduced by 5 percentage points in all countries. This increases the *IRRs*, which in turn leads to higher graduation ratios (Figure 20). On average, reducing marginal tax rates by 5 percentage points increases graduation ratios by 0.3 percentage points, with the largest effects in Hungary, Germany and Finland.

Summary of main findings and policy implications

The analysis and indicators provided in this paper highlight a number of stylised facts and some avenues for reform of higher education systems in the OECD:

● There are significant cross-country differences in *tertiary graduation ratios*, defined as the yearly number of new graduates over the population 20-29 years old, with the highest observed in New Zealand, Korea and Ireland, and the lowest in Turkey, Mexico and Greece. However, these ratios have been growing steadily everywhere, much faster for females than for males, such that gender convergence has been almost achieved in

Figure 20. **Impact of a decrease of marginal tax rates on graduation ratios**[1]
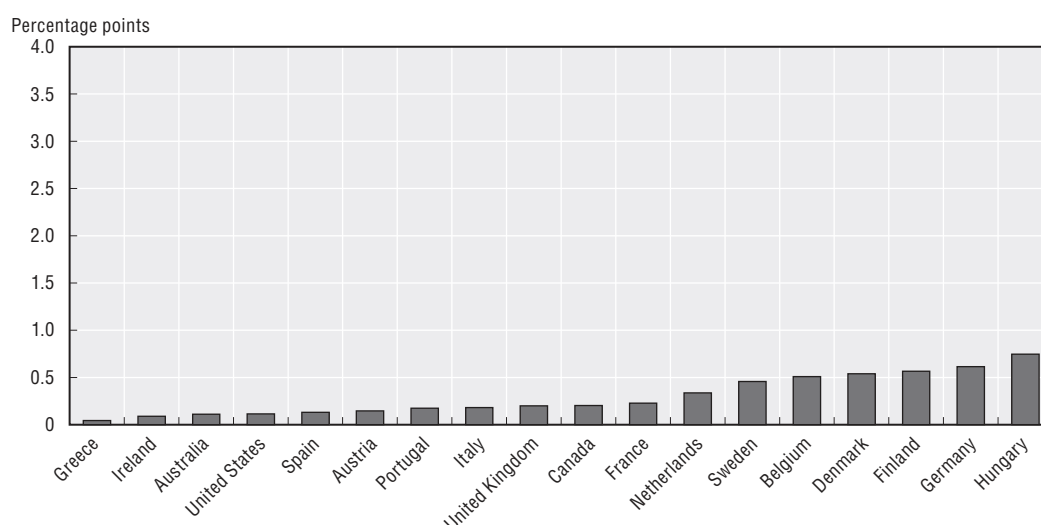
Percentage points

1. Simulated effect on graduation ratios of decreasing marginal tax rates by 5 percentage points.
Source: Authors' calculations.

many countries. Stocks of tertiary human capital still differ widely across countries, ranging from around 10% of the population 25-64 years old in Southern Europe to above 35% in North America. The distribution of graduates by field is skewed, with Social Sciences and Law generally accounting for the largest share; male and female graduates tend to be concentrated in different fields.

● The *institutional set-up of university systems*, summarised by an indicator of the supply of tertiary education, varies considerably across OECD countries, with some of them (*e.g.* Greece, Germany) having institutions with little room for autonomy, flexibility and accountability relative to others (*e.g.* Australia, Canada, the United Kingdom). Funding mechanisms also differ markedly across countries, but private participation has generally been extended over recent years, by increasing the share of private institutions, the share of costs covered by student fees or both.

● The development of *financing systems for students* has been uneven across OECD countries. Some countries have created universal loan systems (*e.g.* most English-speaking countries), and others provide generous grants (*e.g.* Nordic countries), but the majority of countries still rely mainly on intra-family transfers. In many countries, the amount of annual investment in tertiary education (*e.g.* for living expenses and other costs of education) represents a significant share of resources for a median household, even where tuition fees are heavily subsidised.

● Investment in tertiary education generates private benefits, summarised by the *internal rates of return to tertiary education*. These are large relative to investments in alternative assets, but to a different extent across countries, ranging from around 4%-6% per year of education in Spain, Italy, Germany, Greece and Sweden to above 10% in Ireland, Portugal, the United Kingdom, Poland (women) and Switzerland. Their main determinants are gross wage *premia* (ranging across countries from about 25% to 90% above the salary of an upper-secondary educated worker) and a number of policy-related factors that affect the costs and benefits of investing in higher education.

- Policy-driven differences in private returns to education and institutional features of the tertiary education systems are important *determinants of the investment in tertiary human capital*. Higher private returns to tertiary education, more incentive-based university systems and lower financial constraints are found to lead to higher investment, as measured by graduation ratios.

  While the mix and focus of tertiary education reform will depend on each country's specific conditions, this article has identified several possibilities for reforms of tertiary education systems, each of them requiring arbitration among different public policy objectives:

- Empirical results suggest that *changing tertiary education systems* in the direction of higher supply flexibility and accountability is likely to improve graduation ratios. Directions for reform would involve more autonomy for universities in student selection and staff policy, more reliance on independent and public evaluation and funding based on outputs rather than inputs. The possibility for offering more diversified studies, notably shorter duration grades, could help meeting individual demands for education more effectively.

- Acknowledging the large private returns from higher education, a number of countries have been *raising (or introducing) tuition fees* to ease financing constraints of universities, while at the same time enhancing the efficiency of tertiary education systems and the effectiveness of public support. Raising fees can be helpful for improving students' incentives and reducing study duration. However, they also have a negative impact on returns and may strengthen liquidity constraints. Therefore, generally they have been accompanied by appropriate individual financing policies.

- With or without fees, a *student loan system* to finance the direct and living costs of tertiary education would help maintain equality of access and exploit at best the pool of talents in the population. Either public loans or public guarantees for private loans can soften liquidity constraints and ease the access to tertiary education for low-income students. However, these systems may not fully address the problem of an excessive risk aversion by potential students, especially when coupled with insufficient information about the returns to education. Some countries have addressed this problem by tying loan repayments to future incomes after graduation.

- Student grants may seem debatable in conditions of high private returns and in view of the prospective incomes of recipients after graduation. Even when grants are justified as a way of maintaining returns in the face of progressive taxation or ensuring equality of access, *reforms in grant systems* may be desirable to strengthen individual incentives. For example, loans could be (partly or fully) converted to grants upon finalisation within a set time in order to encourage shorter study duration. As well, loans could be offset against future tax liabilities, increasing the incentives to seek jobs in the country of graduation. However, trade-offs would still arise as the first solution may curb enrolment of risk-averse students and the second solution may be seen as unduly restricting migration of high-skilled workers.

- Policies aimed at *improving the dynamism of labour markets*, such as those recommended in the OECD Jobs Strategy, can have a positive effect on incentives to engage in tertiary education by making part-time work more easily accessible to students, thereby reducing the opportunity cost of studying and helping them finance their living costs

while enrolled in university. This could also contribute to reduce risk aversion, but may have costs in terms of increasing study duration.

● While investment in tertiary education has typically not been a primary motivation for *tax reforms*, changes in taxation can have implications for incentives to invest in tertiary education. In particular, a less progressive tax system will increase average returns to tertiary education, although it may raise general distributional concerns. In addition, a less progressive tax system implies a higher dispersion of returns, thereby potentially raising the risk of investing in education.

Notes

1. Notably in Continental Europe, see for example Aghion and Cohen (2004) and Jacobs and Van der Ploeg (2006).

2. Empirical evidence suggests that private returns are typically higher than social returns, weakening the case for the current level of public subsidies (*cf.* Psacharopoulos, 1995; Sianesi and Van Reenen, 2003).

3. This paper draws from estimates of labour market rewards to tertiary education, commonly known as wage premia, from Strauss and de la Maisonneuve (2007). Estimates of internal private returns to tertiary education are drawn from Boarini and Strauss (2007), who also provide more detail on the impact of policies and other factors on these returns.

4. This study uses the harmonised number of graduates, *i.e.* new graduates recorded by highest diploma achieved divided by the population in the age group 20-29 (see Box 1 for a discussion).

5. Information was provided by OECD member countries through a questionnaire [see Oliveira Martins *et al.* (2007)]. For Belgium and Canada the answers were provided by region/province. For Canada, these answers were aggregated into a single country estimate by using weighted averages, the weights corresponding to the population in each province/region. For Belgium, the country level indicator is a simple average of the Flemish and Francophone regions. For the United States, the questionnaire was answered by the Federal authorities and was also used to collect state-level information for Texas and Ohio. Given that a representative sample of state-level data was not available, the economy-wide indicator for the United States corresponds to the framework at the federal level, but some caveats apply (see below).

6. Nevertheless, the Federal-level indicator may still capture important shortcomings in the way accountability mechanisms are set-up at the federal level. For example, federal funds are allocated on the basis of inputs (number of students and teachers) rather than outcomes, which tends to decrease the value of the accountability sub-indicator. Ideally, given diversity at the state level, the economy-wide indicator should have been calculated on the basis of a representative number of state-level survey data and then aggregated according to some weighting scheme. Unfortunately, this wider collection of information was not possible.

7. This indicator is based on the scores obtained by each country on the five intermediate indicators (selection of students, budget autonomy, staff policy, evaluation rules and funding rules) supplemented with the indicator for the output flexibility category (for which no intermediate indicators are available). More precisely, institutional coherence (IC) across these six indicators (Ii, i = 1,...,6) is defined as follows:

$$\frac{1}{IC} = \sum_{i=1}^{6} \left(\frac{I_i}{\sum_{j=1}^{6} I_j} \right)^2$$

Note that the more concentrated the indicator structure is, the lower the coherence. By construction, IC varies from 1 to 6. The maximum is attained when all the Ii have the same value. See Braga de Macedo and Oliveira Martins (2008) for a discussion of the use of this indicator to measure policy coherence and to test the existence of policy complementarities.

8. In both cases, real earnings slope upward due to individual accumulation of labour market experience and overall labour productivity growth. Note that, even with the same annual

experience premia, the income of a tertiary educated worker has a steeper slope than the one with a secondary degree. As pensions are usually not fully indexed to productivity growth, pension benefits grow more slowly than labour earnings.

9. More specifically, the following policy variables or parameters enter the calculation of the private IRR: average and marginal tax rates on labour earnings (including employees' contributions to social security); average and marginal unemployment benefit replacement rates; average and marginal tax rates on replacement income (unemployment and pensions); tuition fees, student grants and loans; the average duration of (completed) tertiary studies; benefit replacement rates of pension systems and their indexation to productivity growth (only public pension systems are considered here, but this simplification is not overly restrictive if private pension systems are actuarially fair). As all these flows have to be properly discounted, the pension premia that occur in the distant future typically have a lower weight in the calculations than, say, immediate direct or opportunity costs.

10. The premia displayed in the figure correspond to the coefficient of tertiary education in the usual Mincerian equation (see Psacharopoulos, 1981), where the log of hourly wages is regressed on a string of dummy variables corresponding to the different levels of education, experience and a number of other control variables. In order to have a better estimate for larger values, the wage premium was approximated by $e^{\beta} - 1$, where β is the estimated coefficient from the Mincerian equation.

11. To make this calculation, it was assumed that every year of tertiary studies yields the same percentage wage gain. While this linear interpolation is crude, as typically marginal returns tend to decrease by additional year of education, data limitations prevent precise estimates of incremental gains. The direction of the potential bias introduced by this simplifying assumption is not clear, because it depends on the distribution of the incremental gains over the study cycle, which could be different across countries.

12. For six countries (Belgium, Canada, Poland, the United States, Portugal, Luxembourg) the average duration of studies was not available, so the OECD average for available countries was applied. In all countries, the average duration is assumed to be the same for men and women.

13. The employment probabilities refer to the average woman/man for all countries except Italy, where these probabilities are calculated for a woman/man coming from middle-income regions (mostly central regions). This isolates the impact of education on the employment probabilities from the impact of idiosyncratic labour market conditions. Italy is the country where the regional characteristics of the reference individual matter the most for the marginal effect of schooling on the employment probability.

14. The microeconomic estimates are generally lower than aggregate figures (on average across countries, 2.2% *versus* 3% for women, and 1.9% *versus* 2.1% for men) and show a lower cross-country dispersion (1.8% *versus* 2.8% for women, and 1.7% *versus* 2.3% for men). Also, gains in employability display a stronger cyclical sensitivity than wage premia. For some countries and years, the effect on employability can even be negative.

15. The calculation of these premia was based on the OECD Benefits and Wages Model (OECD, 2004, 2006). The marginal replacement rate for unemployed could only be calculated for year 2001 and was assumed to remain constant over the sample period. The tax rates used in the calculations are specific to the labour force status of individuals (employed, unemployed or retired) but not to gender, and are assumed to be constant over the life-cycle. While taxation is not usually indexed on labour productivity growth or experience, it may change over the individual life-cycle. This potential source of error is somewhat mitigated by the fact that all calculations are done for a representative individual at the mid-point of his/her career (see de la Fuente and Jimeno, 2005).

16. The estimates of direct annual costs are normalised by the annual average earnings of a mid-career secondary-education worker (man or woman). While private direct costs are not gender specific, the denominator of the ratio reflects gender differences. For Canada, Luxembourg and Switzerland no comparable data were available on direct costs. Computation of internal rates of return for these countries was made under the assumption that direct costs were at the average OECD level.

17. These opportunity costs were calculated as the average of net wages and unemployment benefits for an individual who participates in the labour market instead of studying, weighted by the probabilities of being employed or unemployed.

18. Since the duration of working life is assumed to be the same for all educational levels, tertiary-degree holders enter and quit the labour market later than upper-secondary degree holders. With aggregate productivity growing over time, they therefore enjoy a higher labour productivity level throughout their career. This effect enters in the calculation of the education premium. In the baseline, labour productivity growth is assumed to be uniform across countries and set equal to

     1.75% per year. As an alternative, internal rates of return were also calculated using country-specific average labour productivity growth rates over the past decade.

19. For a survey of these issues see Barr (2001).

20. In this context, equity can be defined as the equality of opportunities for two people with identical abilities and taste, irrespective of factors such as parental income.

21. Note that the system entails a budgetary burden for the initial payment of the fees before maturity is reached, in which fees for new students are broadly balanced by revenues from previous graduates (see the section on policies to enhance tertiary education outcomes). There could be additional problems related to changes in the demographic structure of the population.

22. Take-up rates correspond to the number of students taking loans over the total number of students.

23. This includes all countries for which the IRRs were available except Luxembourg and Poland, where the STE indicator was not available.

24. As a caveat, it could be noted that tertiary graduation ratios can also depend on a number of other structural, cultural and socio-economic factors. For example, the demand for tertiary education may depend on the secular increase in the labour force participation of women; for this reason, the specification controls for gender. The shocks affecting the long-term job prospects of tertiary graduates, such as skill-biased technological progress and globalisation are implicitly taken into account through the differences in the IRRs. Other omitted variables are to some extent controlled for by introducing trends and time fixed effects in the equation.

25. Broader sensitivity analysis on the specification of the reduced form is carried out in Boarini *et al.* (2008) including regressions where the assumption of a pre-determined IRR is relaxed. Both analyses show that the signs of coefficients shown in Table 5 are robust to the choice of regressors and to the assumptions of given IRR, while their absolute values may change to a larger extent.

26. Mortgage-type loans and a "graduate tax" system have been also proposed, but they seem less appealing (see Barr, 2001).

27. See Usher (2006). Hence, a flanking policy would be to inform students about the average returns of their education, the risks associated with such investments (*e.g.* employment probabilities) and the conditions for repayment of student loans.

28. Note that the base calculation of IRR assumes that students do not earn income from paid employment (reliable data on student employment, hourly wages and tax rates is rarely available).

Bibliography

Aghion, P. and E. Cohen (2004), *Éducation et croissance*, Rapport Conseil Analyse Économique, La Documentation française, Paris.

Barr, N. (2001), *The Welfare State as Piggy Bank: Information Risk, Uncertainty and the Role of the State*, Oxford University Press, Oxford.

Barro, R. and J. Lee (1993), "International Comparisons of Educational Attainment", *Journal of Monetary Economics*, 32(3), pp. 363-394.

Becker, G.S. (1967), "Human Capital and the Personal Distribution of Income: An Analytical Approach", Ann Arbor, Michigan: University of Michigan Press.

Blöndal, S., S. Field and N. Girouard (2002), "Investment in Human Capital through Upper-Secondary and Tertiary Education", *OECD Economics Studies*, 34 (1), pp. 41-90.

Boarini, R. and H. Strauss (2007), "The Private Internal Rates of Return to Tertiary Education: New estimates for 21 OECD countries", *OECD Journal: Economic Studies*, this issue.

Boarini, R., J. Oliveira Martins, H. Strauss, C. de la Maisonneuve and G. Nicoletti (2008), "Investment in Tertiary Education: Main Determinants and Implications for Policy", *CESifo Economic Studies*, Vol. 54, pp. 277-312.

Braga de Macedo, J. and J. Oliveira Martins (2008), "Growth, Reform Indicators and Policy Complementarities", *Economics of Transition*, Vol. 16(2), pp. 141–164.

Chapman, B. (2005), "Income Contingent Loans for Higher Education: International Reform", Centre for Economic Policy Research, *The Australian National University Discussion Paper* No. 491.

De La Fuente, A. and R. Doménech (2000), "Human Capital In Growth Regressions: How Much Difference does Data Quality Make?", *OECD Economics Department Working Papers* No. 262.

De La Fuente, A. and J.F. Jimeno (2005), "The Private and Fiscal Returns to Schooling and the Effect of Public Policies on Private Incentives to Invest in Education: A General Framework and Some Results for the EU", *CESifo Working Paper* No. 1392.

EAG (see below OECD, *Education at a Glance*).

Epple, D., R. Romano and H. Sieg (2006), "Admission, Tuition, and Financial Aid Policies in the Market for Higher Education", *Econometrica*, 74 (4).

Freeman, R. (1986), "Demand for Education", in *Handbook of Labor Economics*: Vol. I, edited by O. Ashenfelter and R. Layard, Netherlands: Elsevier Publishers.

Heckman, J.J., L.J. Lochner and P.E. Todd (2005), "Earnings Functions, Rates of Return, and Treatment Effects: The Mincer Equation and Beyond", *NBER Working Paper* No. 11544.

Jacobs, B. and F. Van der Ploeg (2006), "A Guide to Reform of Higher Education", *Economic Policy*, 21 (47).

Johnstone, B. (2005), "Higher Education Accessibility and Financial Viability: The Role of Student Loans", *World Report on Higher Education: The Financing of Universities*, Barcelona.

Le, T., J. Gibson and L. Oxley (2005), "Measures of Human Capital: A Review of the Literature", *New Zealand Treasury Working Paper* No. 05/10.

OECD (2004), *Education at a Glance*, Paris.

OECD (2005), *Education at a Glance*, Paris.

OECD (2006), *Education at a Glance*, Paris.

Oliveira Martins, J., R. Boarini, H. Strauss, C. de la Maisonneuve and C. Saadi (2007), "The Policy Determinants of Investment in Tertiary Education", *OECD Economics Department Working Paper* No. 576.

Psacharopoulos, G. (1981), "Returns to Education: An Updated International Comparison", *Comparative Education* No. 17, pp. 321-341.

Psacharopoulos, G. (1995), "The Profitability of Investment in Education: Concepts and Methods", *The World Bank Human Capital Development and Operations Policy Working Paper* No. 63.

Rotschild, M. and L.J. White (1995) "The Analytics of Pricing in Higher Education and Other Services in Which Customers are Inputs."*Journal of Political Economy*, June, 103, pp. 573-86.

Santiago, P., K. Tremblay, E. Basri and E. Arnal (2008), *Tertiary Education for the Knowledge Society*, OECD, Paris.

Sianesi, B. and J. Van Reenen (2003), "The Returns to Education: Macroeconomics", *Journal of Economic Surveys*, Vol. 17(2).

Strauss, H. and C. de la Maisonneuve (2007), "The Wage Premium on Tertiary Education: New Estimates for 21 OECD Countries", *OECD Economics Department Working Papers* No. 589 (forthcoming in *OECD Journal: Economic Studies*).

Teixeira, P., B. Jongbloed, D. Hill and A. Amaral (2004), *Markets in Higher Education: Rhetoric or Reality?*, Kluwer Academic Publishers, Dordrecht.

Usher, A. (2005), "Global Debt Patterns: An International Comparison of Student Loans Burdens and Repayment Conditions", ON: Educational Policy Institute, Toronto.

Usher, A. (2006), "Grants for Students: What They Do, Why They Work", ON: Educational Policy Institute, Toronto.

Usher, A. and A. Cervenan (2005), "Global Higher Education Rankings 2005", ON: Educational Policy Institute, Toronto.

Winston, G.C. (1999), "The Awkward Economics of Higher Education", *The Journal of Economic Perspectives*, Vol. 13 (1), pp. 3-12.