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THE POLICY DETERMINANTS OF INVESTMENT IN TERTIARY EDUCATION

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THE POLICY DETERMINANTS OF INVESTMENT IN TERTIARY EDUCATION

1. Summary and conclusions

1. In a number of OECD countries, the need for reforms of higher education systems has been motivated on several grounds. The quality of education has been questioned, with calls for better use of public higher education spending and for increasing the resources available to tertiary institutions. Where these institutions are essentially publicly-funded, increased private sector participation has therefore entered the policy debate, especially in the context of mounting pressures from other public spending items. These policy orientations have been reinforced by the wariness of heavily supporting through the public purse an activity where private returns are high[1] but whose social externalities are difficult to measure (even though public finance externalities deriving from future increases in tax revenues may justify to some degree such subsidisation). Another concern has been the excessive duration of tertiary studies in many countries, which is likely to reduce both the fiscal and social returns to education. A more recent source of concern, particularly in countries where higher education is heavily subsidised, has been that the rising international mobility of high-skilled workers makes the social and public finance gains from higher education spending increasingly uncertain. Finally, with the benefits of public spending largely accruing to the better-off segments of the population, questions have arisen about how far equity objectives have been in fact realised, despite greater access to tertiary education.

2. The reform challenge facing OECD governments is to eliminate the perceived shortcomings of existing tertiary education systems while preserving or (preferably) enhancing equality of access to higher education. This requires an institutional set-up of tertiary education that provides incentives for supplying quality educational services; private returns from higher education sufficiently attractive to 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 to prevent uncertainty about future incomes from unduly deterring investment in tertiary studies by risk-averse individuals.

3. Against this background, the analysis proposed in the paper is organised in the following way. First, it documents tertiary education outcomes, focusing on the number of new tertiary graduates, their allocation across fields and the wages they earn once employed. Second, it explores the determinants of tertiary education outcomes, looking at both supply and demand factors. In this context, the focus is on the structure of tertiary education systems and the effect of policies on the private returns from tertiary education and the financing options available for individuals. Third, drawing on this analysis, several avenues for reform and the trade-offs they present for public policy are discussed. A further objective of this analysis is to provide new indicators that could be used *inter alia* in the context of the ongoing structural *Going for Growth* exercise.

1. Indeed, the decision to invest in tertiary education is voluntary and individuals can appropriate most of the returns attached to it. By contrast, the policy questions surrounding primary and secondary education are rather different in nature, as these levels of education are largely compulsory, see ECO/CPE/WP1(2006)15.

Main findings

- 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 Korea, New Zealand and Japan, 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 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) providing individual 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 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 and Switzerland. Their main determinants are gross wage premia (ranging across countries from 20% to 70% 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.

Avenues for reform

4. While the mix and focus of tertiary education reform will depend on each country's specific conditions, this paper has identified different 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, thereby jeopardizing equality of access.

- 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.

- 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.

- Student grants may seem debatable in conditions of high private returns and in view of prospective incomes of recipients. 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.

- 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.

2. Cross-country differences in tertiary education outcomes

2.1 Broad patterns in tertiary education investment

5. As a proxy for investment in tertiary education, average graduation ratios[2] in the OECD area have increased steadily during the 1990s and accelerated at the turn of the century (Figure 2.1, Panel A). The increase was particularly strong for women. By 2004, the average graduation ratio of women was 1.5 percentage points higher than the men's ratio. 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 2.1, Panel B).

[Figure 2.1 Trends in tertiary human capital]

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 education outcomes that may have an impact on economic performance it seemed convenient to focus on graduation statistics.

To make cross-country comparisons of graduation numbers more meaningful, the OECD Directorate for Education has produced harmonised statistics. Indeed, national graduation statistics typically cover the number of diplomas rather than the number of graduates. The former 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 number of graduates so as to avoid multiple-counting.

It should be nevertheless kept in mind 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 Annex 2.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 flows *vs*. stocks), attainment rates are derived from Labour Force Surveys, whereas graduation statistics are based on specific education surveys conducted by the OECD Directorate for Education.

6. 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

2 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).

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 2.2). 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 student years.

[Figure 2.2 New tertiary graduates as a share of the 20-29 population by gender for selected years]

2.2 The structure of investment by fields of education

7. The structure of investment in tertiary education displays a considerable variation across countries, but certain common features emerge by field and gender (Figure 2.3). 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 & Welfare and Humanities & Arts, whereas that of males tends to be higher in Science and Engineering.

[Figure 2.3: Flows of new tertiary graduates by field of education, 2004]

2.3 Wage premia from higher education and the quality of tertiary human capital

8. Tertiary education has an impact on wage earnings of the graduates, the so-called education wage *premia*. Measuring these *premia* is important on at least two counts. Education *premia* reflect to some extent the increase in labour productivity from investing in higher education, which could be a proxy for the quality of tertiary human capital.[3] As well, they affect the individual incentives to invest in tertiary education.

9. 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).

10. 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 Annex 3.B for details). The education wage *premia* range from slightly above 20% for men in Spain and slightly below 30% for women in Austria to around 70% for both men and women in Hungary (Figure 2.4), suggesting that tertiary education can provide indeed a substantial wage *premium* over secondary education. Estimates of the *Mincerian* coefficients for earlier periods (1994-2000, see Annex 3.B) also show that, despite some cyclical fluctuations, these *premia* are fairly stable over time.

[Figure 2.4: Gross wage premia from tertiary education]

11. To the extent that average productivity differentials associated with tertiary education are reflected in these estimates, the wage premia could be seen as a measure of the quality of human capital embodied in tertiary graduates (evaluated in units of secondary graduates). However, if the stocks of

3 . Accurately measuring differences in the quality of tertiary human capital across countries is clearly beyond the scope of this study. It would require an explicit indicator, equivalent to the OECD-PISA literacy tests available for 15-year olds. Some adult literacy tests are available, but they do not cover specifically the segments of the population having a tertiary degree.

tertiary human capital (expressed as a ratio to the population 25-64) are adjusted for the differences in the estimated wage *premia*,[4] the overall picture remains roughly the same (Figure 2.5). Captured in this way, quality differences do not appear to induce a large bias in the analysis of graduation ratios (at least as far as relative country rankings are concerned).

[Figure 2.5: Stocks of tertiary human capital: the effect of adjusting for wage premia]

3. The structural and policy determinants of tertiary graduation ratios

12. Among the economic determinants of investment in tertiary education are the following three main elements:[5] *i)* the supply characteristics of education 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 elements 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 makes little difference to the main conclusions (see Annex 3C).

3.1 Supply-side factors: the institutional set-up of tertiary education

13. A range of institutional features may be identified which influence the supply of education by tertiary institutions. Research on higher education has identified some important elements in this regard. These include freedom in managing resources and setting objectives, incentives to improve performance and rules for accessing funds.

14. Based on information concerning these characteristics, a summary indicator of supply of tertiary education (hereafter, STE) was constructed reflecting the situation in 2006 (see Annex 2B).[6] More precisely, the indicator covers the following three main sub-categories (Figure 3.1):

- *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.).

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4 . An important caveat to using education premia for adjusting stocks of human capital is that the estimated premia are at best an imperfect proxy of differences in quality of graduates for at least two reasons. First, as already mentioned, the education premia reflect the average quality of skills acquired by tertiary graduates (which partly depends on the structure of education by field) and their scarcity relative to other types of skills. Second, differences in these estimated premia across countries may deviate from marginal productivity gains from tertiary education due to a number of labour market imperfections.

5 . There is a longstanding theoretical and empirical literature addressing investment in tertiary education. Traditionally, it has been focusing on the demand-side determinants of investing in tertiary education (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). Both the demand and the supply-based approaches have been the object of uneven developments, as they are challenged by the large cross-country heterogeneity in the provision of educational services in OECD countries. In many countries, the supply is not responsive to market forces (*e.g.* Continental Europe), whereas in others (particularly English-speaking countries) there has been more evolution towards organising supply on a more market-structure basis. This heterogeneity partly justifies the more pragmatic approach followed in this paper (though in Annex 3C a more comprehensive model introducing a labour-market interaction is also tested).

6 Information was provided by member countries through a questionnaire.

- *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.

- *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 3.1: The structure of the supply of tertiary education indicator]

15. Figure 3.2 shows point estimates and confidence intervals for the three sub-categories. *Input flexibility* displays a wide variance across countries (Figure 3.2, 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, New Zealand, the Slovak Republic, Sweden and Mexico appear to have the most flexible systems. Confidence intervals obtained by random choice of the weights used to aggregate low-level indicators into the sub-category[7] confirm the relative positions of countries at the extreme bounds of the scale, whereas the relative position of countries closer to the middle of the range is open to some uncertainty.

[Figure 3.2: Tertiary education supply indicator by category, 2005-2006]

16. On the *output flexibility* side (Figure 3.2, 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 Japan, two Canadian provinces, Finland and Turkey. The confidence intervals for this sub-category are relatively wide, reflecting a large dispersion in the values of the low-level indicators characterising output flexibility.

17. The *accountability* indicator (Figure 3.2, 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. It should be stressed that in countries where reliance on market mechanisms is stronger in tertiary education, some of the aspects of accountability may not be adequately captured by the institutional features covered by 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.

18. Aggregating the scores of input and output flexibility, and accountability, the value of the *composite STE* indicator is estimated to be significantly below average for Greece, Germany, Belgium (French-speaking regions), Turkey and France, while being significantly above average for Australia, three Canadian provinces, the United Kingdom, Mexico and Japan (Figure 3.3).

7. This procedure is quite demanding as it abstracts from the nesting structure of the indicator. Since such a nesting is involved in the aggregation of the input and accountability indicators described in Figure 3.1, the 95% confidence intervals are not necessarily centred on the point estimates of these indicators. Nonetheless, the statistical average obtained trough the random weighting and the point estimates are very close.

[Figure 3.3: Composite supply indicator of tertiary education (STE), 2005-2006]

19. 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[8] 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 3.4). 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 on 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.

[Figure 3.4 Supply indicator and coherence of tertiary education systems]

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

20. 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 3.5 compares the profile of net lifetime earnings for a person who decides to take a tertiary education with the earnings profile of a person with upper-secondary education.[9]

[Figure 3.5: Individual returns to tertiary education illustrated]

8. 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:

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

The interpretation is relatively clear, 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 (2006) for a discussion of the use of this indicator to measure policy coherence and to test the existence of policy complementarities.

9. 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.

21. The higher net lifetime earnings of a tertiary-educated individual reflect different cost and benefit components:[10]

- 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*).

22. 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 described in Section 2 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 (details are provided in Annex 3B).

From gross wage premia to net labour market premia

23. 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, 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. In

10. More specifically, the following policy variables or parameters enter the calculation of the private IRR (see Annex 3B): 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.

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, data limitations prevent more precise estimates of these 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.

2001, the wage *premia* per year of tertiary education ranged across countries from 5 to 14%. They are particularly high in Hungary, Australia and Ireland, while they are quite low in Greece, Spain, Austria and Italy.

24. *Second*, wage premia are conditional on being employed. To estimate employment probability, individual-level data were used, controlling for other factors affecting employability that are unrelated to tertiary education and for the decision to participate in the labour force (see Annex 3B). 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 two percentage points (Figure 3.6). 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.[14,15]

[Figure 3.6: Marginal effect of higher education on the employment probability]

25. *Third*, the effect of tax systems must be taken into account. Both average and marginal tax rates are relevant (see Box 2). 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.[16]

26. 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 8.8% in gross to 4.8% in net terms (see Box 2 for details).

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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%).

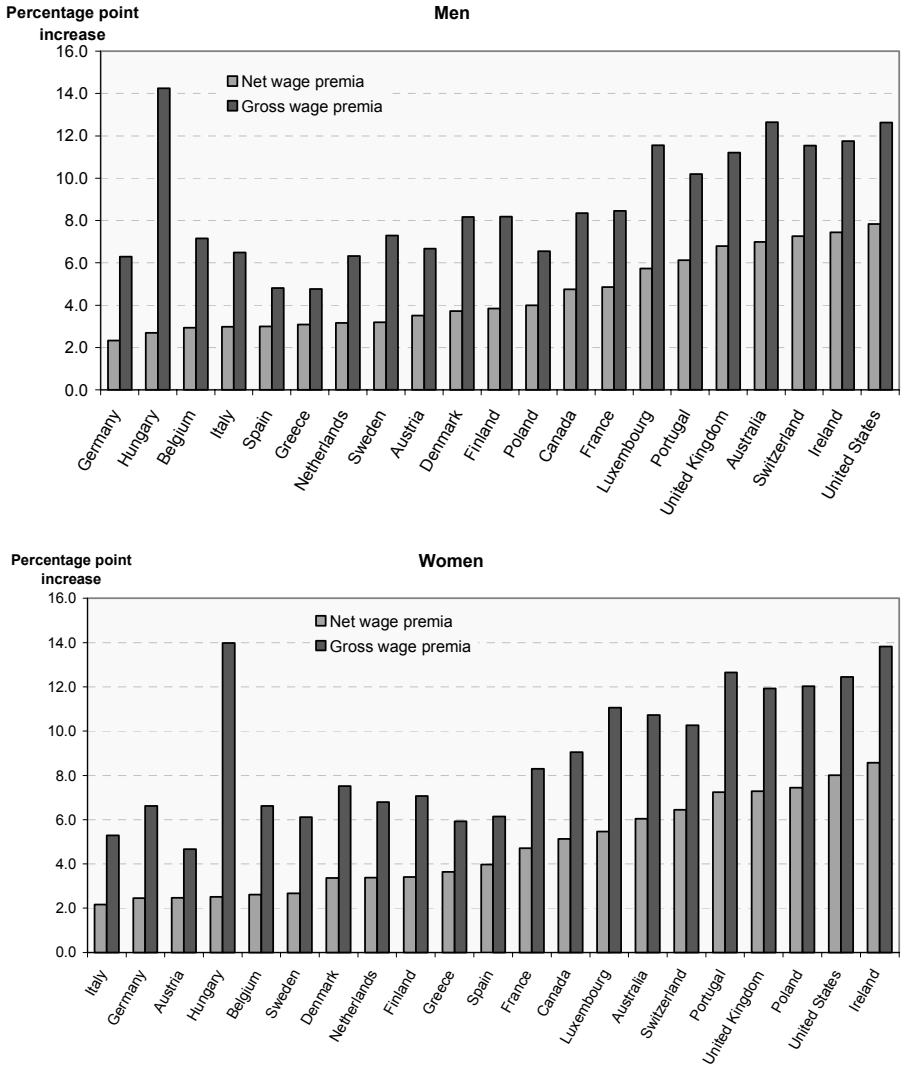
15 . Notably, gains in employability display a stronger cyclical sensitivity than wage premia (see Annex 4). For some countries and years, the effect on employability can even be negative.

16 . The calculation of these premia was based on the OECD Benefits and Wages Model. 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).

Box 2. From gross to net labour market *premia*

The net wage *premia* are calculated by multiplying the gross wage *premia* per additional year of tertiary education by the expected marginal tax factor. The latter is expressed as the average of the marginal tax rate for workers, weighted by the employment probability P_e, and the marginal tax rate of unemployed multiplied by the marginal replacement rate of out-of-work benefits, weighted by $(1-P_e)$. These probabilities are held constant (*i.e.* fixed at the level of an upper-secondary degree holder). The net wage *premia* also takes into account dropping-out rates of tertiary education.[1] A comparison of gross and net wage premia is provided in Figure A. In many countries, the changes are sizeable, reducing the *premia* by between 2 and 12 percentage points.

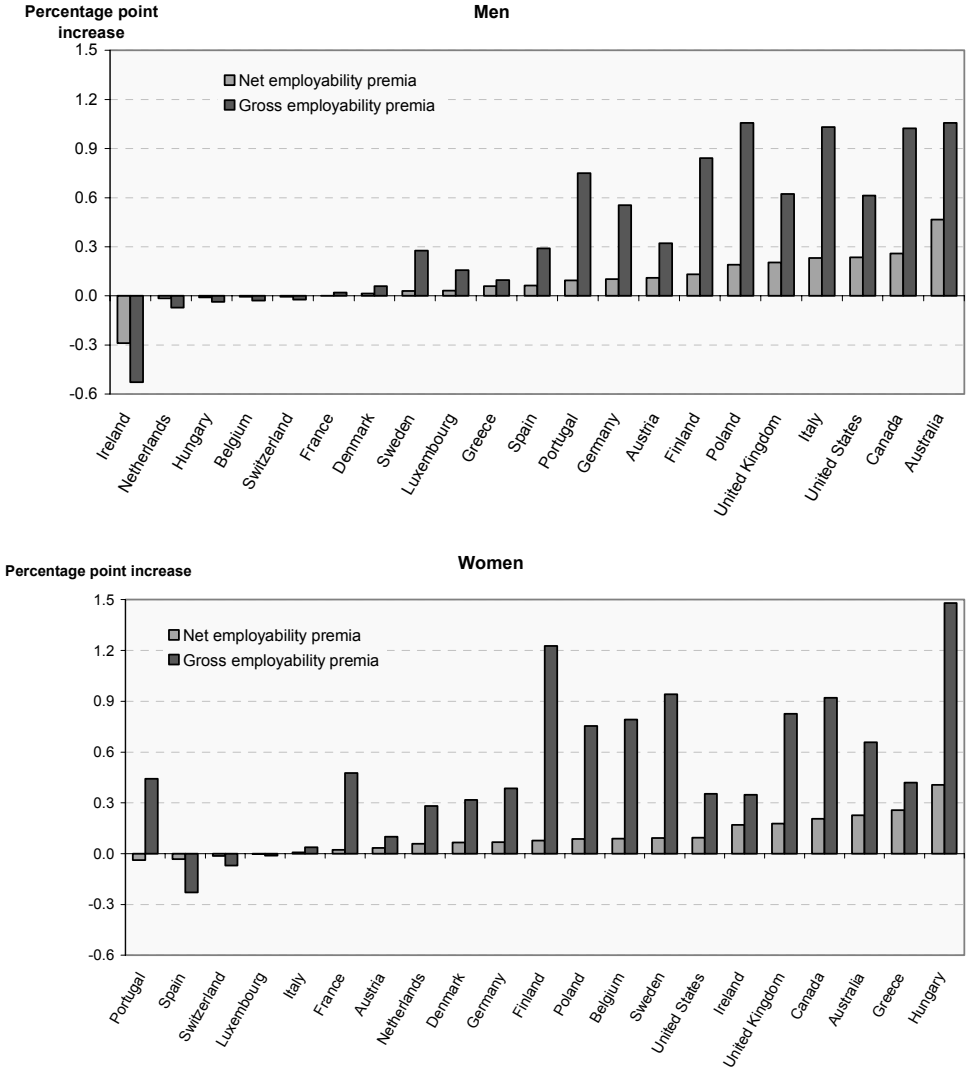
Figure A. **Comparison of gross and net wage premia**[1]
(Per year of tertiary education, 2001)



1. Adjusted for survival rates, experience premia, marginal tax rate for employed and unemployed, marginal gross out-of-work replacement rates, probability of unemployment and duration of studies.

The net employability *premia* (Figure B) are the monetary equivalent of the increase in the probability of employment as a result of tertiary graduation. The increase represents the net expected income due to the change in the probability of employment given by an additional year of tertiary education. In this calculation, wages are fixed at the level of an upper-secondary degree holder. The net employability *premium* depends on the marginal effect of schooling on employment, but also on the size of out-of-work replacement income and taxation. There are marked differences between net and gross employability *premia* across countries, but as these *premia* are expressed in monetary equivalents their magnitude is small compared with other drivers of the returns. In gross terms, employability *premia* are on average around ½% whereas, in net terms, they decrease to a negligible 0.1%. Negative premia are mostly due to the effect of the cycle in 2001 (see Annex 3B for details).

Figure B. **Comparison of gross and net employability premia**[1]
(Per year of tertiary education, 2001)



1. Monetary equivalent adjusted for the difference between net labour market earnings and net out-of-work benefits, survival rates and duration of studies.

1. In practice, the gross wage *premia* per additional year of tertiary education is multiplied by the survival rate in tertiary education. The survival rates are based on OECD estimates (see OECD, 2004b).

27. To complete the calculation of the benefits, pension premia should also be taken into account (see Annex 3B). Indeed, individual pension savings 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.[17]

Direct and indirect costs of tertiary education

28. 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 3.7).[18] Net tuition fees were also relatively high in Australia and Poland, where public subsidies to higher education 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.

[Figure 3.7: Net direct costs of tertiary education]

29. Living expenses are not a direct cost of education (as secondary graduates also have living expenses), but in some countries there are public subsidies targeted for these costs. In principle, these grants for living expenses should be included in the baseline calculation, but cross-country data are not fully available. For the same 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 3.7, 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.

30. The indirect cost of tertiary education is essentially the opportunity cost of foregone earnings while studying.[19] Intuitively, high labour income taxation and low unemployment benefits reduce opportunity costs. Opportunity costs appear to be relatively uniform across countries (Figure 3.8), though

17 . The pension benefits incorporated in this calculation reflect the pension entitlements for a worker entering the system in 2002 at the age of 20 and retiring after a full career. These entitlements include changes in pension rules that have been legislated and are being implemented. It is assumed that they will remain unchanged over the life cycle of the representative individual. The gross pension replacement rates were drawn from the new OECD Pensions Model (see OECD, 2005). The pension model includes all mandatory pension schemes for private-sector workers as well as systems with near-universal coverage (at least 90% of the employees). Both mandatory individual accounts and resource-tested benefits are also included. Replacement rates are calculated separately for men and women whose gross pre-retirement earnings were 100% of the average earnings. As for other out-of-work benefits, specific average and marginal tax rates were applied to, respectively, average and marginal pension replacement rates.

18 . 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.

19 . 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.

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 3.8: Opportunity costs of tertiary education]

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

31. Incorporating all the elements described above, as well as an estimate for future productivity growth,[20] yields internal rates of return that vary from over 3 to nearly 12% in 2001 for the 21 OECD countries covered by the analysis (Figure 3.9). The average return (across both countries and gender) is 7½%, which is lower than previous OECD estimates 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 3 to 12% *vs.* over 4 to 10%). Gender differences in the *IRR* are particularly large in Poland (almost four percentage points).

[Figure 3.9: Estimates of the Internal Rates of Return to Tertiary Education]

32. By country, low average returns are found (by ascending order) in Italy, Spain, the Netherlands, Sweden, Germany, Austria, Belgium, Greece and Finland. In all these countries, low *IRRs* are driven by below average net labour market *premia*, despite low direct and/or opportunity costs. Moderate *IRR* are found in Poland, France, the United States, Denmark and Canada, where labour market *premia* are around the country average. Finally, Australia, Luxembourg, Switzerland, Portugal, the United Kingdom, Hungary and Ireland have the highest returns because these countries have the highest wage *premia*, reinforced either by high employability *premia* and/or low costs of education.

Main drivers of the Internal Rates of Return

33. To compare the sensitivity of the *IRR* to changes in its different drivers, each component was increased by one percentage point (holding all the others constant), except for study duration, which was increased by 1% (with working life shortened accordingly).[21] Figure 3.10 shows the results for the OECD average, but their cross-country variance is sometimes considerable (as shown by the maximum and minimum values). Main conclusions are:

- *Taxation:* A one percentage point increase in the marginal tax rate reduces the net *IRR* by about 0.1 percentage points. By contrast, a similar increase in the *average* income tax rate tends to

20 . 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.

21. Over and above those reported, a number of other parameter changes have been analysed. In most cases, their IRR effect is very small, such as for the pension benefit replacement rate, the degree of pension indexation, the length of the working life, and the average experience premium. As to changes in the growth rate of average labour productivity (assumed to be at 1.75% in all countries in the baseline), they raise the IRR almost one to one and are therefore important for policymakers concerned with tertiary education incentives.

increase the *IRR* by half this amount, mainly *via* a reduction in opportunity costs, which represent the bulk of total private costs.[22] A joint one percentage point increase in average and marginal tax rates reduces the *IRR* in all countries.

- *Unemployment benefits*: An increase in the *average unemployment benefit replacement rate* by one percentage point reduces returns to education (as long as tertiary degree holders have a higher employment probability than upper-secondary degree holders) and slightly increases the expected opportunity cost of studying. But the total negative effect on the *IRR* is very small.[23,24]

- *Education policy:* A rise in *tuition costs* by one percentage point (as a fraction of gross annual earnings of the average upper-secondary degree holder) reduces the *IRR* by around 0.1 percentage points. A marginal increase in the *study duration* of 1% (corresponding to around two weeks) also reduces the return per year of tertiary education.

- *Labour market characteristics*: An increase in the gross wage premium on tertiary education by one percentage point increases the private *IRR* by 0.14 percentage points on average, with the effect ranging from less than 0.1 to 0.2 percentage points. A one percentage point increase in the employability premium results in a somewhat smaller average increase in the *IRR*, albeit with wide country variation. Finally, if students devote one percent of their time to paid work (a share that is assumed to be zero in the baseline) with no repercussions on study duration, opportunity costs are reduced and, therefore, the *IRR* increases by around 0.1 percentage points.[25]

[Figure 3.10: Sensitivity analysis on the *IRR*s: effects of changes in the main drivers]

Can the structure by fields of education explain differences in returns across countries?

34. Evidence available for a few OECD countries suggests that the returns to education can vary significantly across fields (Box 3). In this context, cross-country differences in average returns could partly reflect a composition effect. While no comprehensive data are available to compare returns to education by fields for all countries, a simple counterfactual simulation can be carried out. For each country, an *IRR* was calculated by multiplying the country-specific field mix by an estimate of the returns by field available for Canada (Stark, 2006). The resulting counterfactual *IRRs* were compared with an average OECD *IRR* computed in the same way. The differences to the average show the contribution of the field mix to the *IRR* obtained for each country.[26] It turns out that their magnitude is relatively small, ranging from -0.6 to 0.4 percentage points (Figure 3.11). It can be concluded that the observed differences in returns across countries can not be attributed to the effect of field structure.

22 . Tax changes in Figure 3.10 and thereafter are jointly applied to labour and replacement incomes.

23. The effect is small because the conditional probability of unemployment and, hence, the resulting reduction in life-time earnings are fairly small for upper-secondary degree holders in most countries, limiting employment-related increases in lifetime earnings for tertiary degree holders.

24 . No side-effects of higher UB on employment of secondary degree holders are taken into account.

25 . Albeit occurring through the same channel (change in opportunity costs), the average IRR elasticity with respect to student work (at 0.10) is somewhat higher than that with respect to the average income tax rate (0.07) because a tax hike also lowers the net benefit from higher employability. No such offsetting force is at play with student work.

26 . For comparison with the actual IRRs, the differences presented in Figure 3.11 were normalised by the ratio between the average actual and counterfactual IRRs.

Box 3. Returns to education by fields: evidence from national studies

Given that the data sources used in this paper do not allow for computing returns by field of education or by level of diploma, this box briefly reviews evidence for Canada and Australia on these issues.

Canada

Based on 1995 earnings, Stark (2006) estimated private education returns for men at 9.9%, 4.1% and 1.3% respectively for Bachelor's, Master's level and PhD level. The corresponding returns for women are respectively 12.1%, 8.6% and 4.3%. Taking into account the relative weights of each degree in the total number of graduates, these rates are comparable with an average return of around 8% (both men and women) for Canada computed in this paper (see Figure 3.9). Concerning fields, scientific fields tend to be more rewarding than non-scientific fields at the Bachelor's level, but there is a large dispersion (*e.g.* from 3.9% in Zoology and 4.4% in Fine Arts to 14.6% in Commerce and 23.3% in Actuarial science). By contrast, a Master's degree is generally more rewarding in non-science fields.

Australia

Borland (2002) founds an average *IRR* in Australia of 14.5%. This contrasts with an *IRR* of 9% in this study, but the gap may be due to the different method. Borland (2002) reports that when using *Mincerian* wage regressions, controlling for other individual characteristics, hours worked and cohort effects, the estimated *IRR* falls to around 10.5%. By level of diploma, returns to tertiary education tend to decrease beyond the Bachelor's degree, much in line with the Canadian study. Concerning fields, business & administration and engineering diplomas yield much higher returns (close to 20%) than those of scientific, social and cultural fields (around 11%).

[Figure 3.11: Cross-country differences in *IRR*s implied by country-specific field composition]

3.3 Financing the individual investment in tertiary education

35. 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.[27] 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).[28]

Financing systems in OECD countries

36. 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.

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

28. 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.

37. 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.[29] 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 individual choice. The United Kingdom also recently introduced an income-contingent loan system while raising tuition fees.

38. A snapshot of the characteristics of existing loan systems in five OECD countries (Table 3.1) 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[30] of student loans can be below 50%in some countries (Table 3.2) and why debt levels at graduation are often much below average income at that point (last row in Table 3.1).

[Table 3.1: A comparison of loan systems for selected OECD countries]

[Table 3.2: A comparison of take-up rates for student loan systems]

39. 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 3.3). Only in Nordic countries, Luxembourg, the United States and the Netherlands 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.

[Table 3.3: A comparison of take-up rates for student grants)]

An evaluation of financing constraints

40. 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.

41. This attempt to compare total investment costs with the available financing sources is displayed in Table 3.4. Typically, the average ratio of total costs to total funding is somewhat lower in universal

29. 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 below, Section 4).

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

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 costs to financing ratios are particularly high, including Mexico, Korea and Turkey.

[Table 3.4: An estimation of total student cost and available financing per year (in US$ PPP)]

3.4 Explaining aggregate investment in tertiary education

42. 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.[31] The analysis is performed in an unbalanced panel using 19 countries[32] 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.

43. Private returns and the availability of individual financing are expected to influence graduation ratios positively. The responsiveness of supply of tertiary education, as measured by the STE indicator, is also 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 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.

44. Taking into account some of these determinants,[33] 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 3.4), a dummy for females and an output-gap indicator as a way of capturing possible cyclical components in the graduation ratios. Several specifications were tested (Table 3.5), 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.[34]

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31 See Annex 3C for an in-depth discussion of the conceptual framework.

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

33 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 does control 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. These issues are further discussed in Annex 3C.

34. Broader sensitivity analysis on the specification of the reduced form was carried out in Annex 3C. The Annex also shows regressions on graduation ratios where the assumption of pre-determined IRR is relaxed. Both analyses show that the signs of coefficients shown in Table 3.5 are robust to the choice of regressors and to the assumptions of given IRR, while their absolute values may change to a larger extent.

45. 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 3.5) 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.

[Table 3.5: Reduced form regression results]

4. Policies to enhance tertiary education outcomes

46. There are several sources of concern with the way core tertiary education services are currently provided, which have motivated discussion about reform in many OECD countries.[35] 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 provide large private returns to graduates, while the extent of social externalities is unclear;[36]
- Public subsidies are typically regressive and crowd out public resources that could be used to target groups that are liquidity-constrained. 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.

47. The analysis and empirical tools developed in previous sections provide a basis for assessing various policies that could address some of these problems. These include institutional reform of educational supply, introduction or greater reliance on fees and loan systems, reform of grant systems, easier access to student work, shortening study duration and 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 unduly avoid negative repercussions on aggregate investment in tertiary education, equality of access and income distribution more broadly.

48. The policy simulations presented below are of various kinds. Some policies affect directly the investment in tertiary education (such as the reform of the supply or easing liquidity constraints) while others (such as tax and student work) affect investment through their impact on the *IRRs*. It is difficult to

35. A different, though related, set of issues have been raised concerning Research activities performed in higher education institutions. These are beyond the scope of this paper.

36. Rather, empirical evidence suggests that private returns are typically higher than social returns, weakening the case for the current level of public subsidies (cf. Psachoroupolos, 1995; Sianesi and Van Reenen, 2003).

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).

4.1 Reform of tertiary education institutions

49. As documented by the OECD surveys of tertiary education (OECD, 2006b), 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 Section 3, 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 (currently the Australian system) (Figure 4.1). The results show that all other OECD countries would benefit from such a reform, particularly so continental European countries (Greece, Germany and France).

[Figure 4.1: Impact of increasing the flexibility and accountability of tertiary education supply on graduation ratios]

50. 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 on graduation ratios, 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 between 0.2 to 0.8 percentage points, with the largest effects obtained for Finland, France and Germany (Figure 4.2).

[Figure 4.2: Impact of reducing study duration on graduation ratios]

51. 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 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.

4.2 Introduction or greater reliance on tuition fees

52. A number of countries have been introducing (or re-introducing) tuition fees (Australia, Austria, the United Kingdom, and Poland), considerably increasing them (Portugal, the Netherlands) or contemplating this possibility (Germany, Central European countries) (Table 4.1). However, in most countries the level of fees remains well below the overall costs per student (Figure 4.3). 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).

[Table 4.1: Introduction of tuition fees and loan systems in selected OECD countries]

[Figure 4.3: Ratio of tuition fees to costs per student, selected OECD countries]

53. Increased reliance on tuition fees can help address some of the shortcomings of current tertiary education systems. For instance, tuition fees can encourage competition 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 Section 3). 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.

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

55. 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 (distorsive) taxes. This implies deadweight losses and involves income redistribution from low- to middle- and upper-income families.

56. Finally, fees can also contribute to increasing resources per student without creating budgetary pressures. A simple correlation for a cross-section of OECD countries (Figure 4.4) suggests a positive relation between graduation ratios and the spending per student. While the expansion of tertiary education and increase in quality 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.

[Figure 4.4: Graduation ratios vs. costs per student, 2001]

57. In 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 US$ at PPPs). In most countries, this implies a substantial increase, notably where currently fees are very small or non existent (*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 2.2 percentage points for Finland, Denmark and Sweden). Taken at face value, this result suggests that an increase in tuition fees may call for other, flanking policies. 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 usually taken simultaneous action in this field.

[Figure 4.5: Impact of an increase in tuition fees on graduation ratios

4.3 Introduction or greater reliance on student loans

58. 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 depending on their families' willingness 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.

59. 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.[37] 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 presence of an effective tax collection. Hence, a country with a leaky tax system may have problems implementing income-contingent loans.

60. 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).

61. Moreover, any student loan system is faced with the prospect that able 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.

62. 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 (Table 3.4 above) to the minimum in the sample. The impact ranges from nearly 1.5 percentage points in Portugal and Spain to virtually zero in Denmark and Finland (Figure 4.6). The simulation is necessarily illustrative, as in countries with universal funding systems covering most investment 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.

[Figure 4.6: Impact of easing liquidity constraints on graduation ratios]

4.4 Reform of grant systems

63. 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).

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

64. Some studies have found that low-income students and their families usually overestimate the costs and under-estimate the returns of tertiary education.[38] 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.

65. 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 particular relevant issue in countries where tertiary education is heavily subsidised - but could also be seen as unduly restricting migration flows.

4.5 Access to student work

66. 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 Job Strategy. Greater scope for student work may also help address excessive risk aversion.[39] 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.

67. 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 *IRR*, which in turn increase graduation ratios**.** This increase reaches around one percentage point in Denmark and Finland (Figure 4.7). 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 4.7: Impact of introducing or increasing part-time student work on graduation ratios]

4.6 Changes in the tax systems

68. 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.

69. 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

38. 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.

39. 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).

the previous simulations. Therefore, the marginal rates were arbitrarily reduced by 5 percentage points in all countries. This increases the *IRR*s, which in turn leads to higher graduation ratios (Figure 4.8). On average, reducing marginal tax rates by 5 percentage points increases graduation ratios by 0.32 percentage points, with the largest effects in Hungary, Germany and Finland.

[**Figure 4.8: Impact a decrease of marginal tax rates on graduation ratios**]

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Working Party No. 1 on Macroeconomic and Structural Policy Analysis

THE POLICY DETERMINANTS OF INVESTMENT IN TERTIARY EDUCATION

ANNEX 1: TABLES AND FIGURES

This document has been prepared by the Economics Department for the Working Party No.1 of the Economic Policy Committee.

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ANNEX 1: TABLES AND FIGURES

Tables

Figures

Table 3.1. **A comparison of loan systems for selected OECD countries**

	Australia	Netherlands	Sweden	United Kingdom	United States
Income threshold for repayment	A$38 149 (74.5% of AW)	€15 000 (40% of AW)	None	£15 000 (52.5% of AW)	US$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
Amortization period	..	25 years	25 years	..	10-25 years
Loan forgiveness	At death/ disability	After 25 years of repayments	At age 70/death	At death/disability/ after 25 years of 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 subsidized 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	A$14 697 (29% of AW)	€8 700 (23% of AW)	SEK230 000 (74% of AW)	£8 800 (31% of AW)	US$19 300 (61`% of AW)
Average income at graduation	A$38 000 (74% of AW)	€28 000 (74% of AW)	SEK290 400 (94% of AW)	£22 000 (77% of AW)	US$34 100 (107% of AW)

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

Table 3.2. **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
Canada	50
Denmark	50
United States - Total loans	50
of which: Federal loans	*48*
Finland	40
Hungary	30
Japan	24
Germany	23
The Netherlands	20
Poland	11
Slovak Republic	3

Table 3.3. **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	23
Spain	23
Slovak Republic	13
Mexico	10
Italy	9

1. Take-up rates represent the number of aid recipients over the total number of students entitled to receive aid.
2. When available, or the most recent year.
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.
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 3.4 An estimation of total student cost and available financing per year (in US$ PPP)

		Average of public and private sector's tuition fees[1]	Living costs[2]	***TOTAL INVESTMENT COSTS***	Maximum amounts of loans and grants[3]	Expected earnings for student part-time work[4]	Median equivalised disposable income[5]	***TOTAL RESOURCES***	***Total investment costs/Total resources (in %)***
UNIVERSAL FUNDING	**Sweden**	0	5431	***5431***	10534	2544	17157	***30234***	***18.0***
	Iceland	390	5769	***6159***	11531	4255	18085	***33871***	***18.2***
	Norway	630	5769	***6399***	8711	4119	22131	***34962***	***18.3***
	Denmark	0	6647	***6647***	10294	5606	19832	***35731***	***18.6***
	Finland	0	5229	***5229***	7015	3703	17070	***27788***	***18.8***
	Netherlands	1565	4924	***6489***	8427	5201	20050	***33677***	***19.3***
	Luxembourg	0	8325	***8325***	5020	3176	27403	***35599***	***23.4***
	Canada	2967	4909	***7876***	8750	2591	21172	***32512***	***24.2***
	United Kingdom	1794	8602	***10396***	11644	4620	18987	***35250***	***29.5***
	United States - Federal loans	8653	6344	***14997***	18500	2105	23954	***44559***	***33.7***
	United States - Private loans[6]	8653	6344	*14997*	40000	2105	23954	*66059*	*22.7*
	New Zealand	2548	7546	***10094***	7849	2696	13680	***24225***	***41.7***
	Australia	3791	6720	***10511***	3791	4631	16371	***24793***	***42.4***
	Average	*2384*	*6351*	***8735***	*11697*	*3642*	*19988*	***35328***	***24.7***
FAMILY-BASED FUNDING	**Czech Republic**	172	2057	***2230***		923	9411	***10334***	***21.6***
	Switzerland	849	4881	***5730***		1836	23534	***25370***	***22.6***
	Belgium	625	4380	***5005***		3903	16919	***20822***	***24.0***
	Greece	0	3618	***3618***		2040	11656	***13696***	***26.4***
	Poland	426	1444	***1871***		654	6308	***6962***	***26.9***
	Ireland	1160	4957	***6117***		3902	17824	***21726***	***28.2***
	Slovak Republic	0	2165	***2165***		659	6757	***7416***	***29.2***
	Germany	1535	4417	***5952***		4217	15632	***19849***	***30.0***
	Italy	1174	4421	***5595***		3104	14794	***17898***	***31.3***
	France	703	5401	***6104***		2997	16178	***19175***	***31.8***
	Austria	847	5821	***6668***		2940	16419	***19358***	***34.4***
	Spain	801	5563	***6364***		3047	12084	***15131***	***42.1***
	Hungary	426	2995	***3421***		1155	6743	***7898***	***43.3***
	Portugal	1688	4030	***5718***		1864	10714	***12578***	***45.5***
	Japan	5285	6156	***11441***		2244	17871	***20114***	***56.9***
	Turkey	274	4800	***5074***		862	4568	***5429***	***93.5***
	Korea	6210	9100	***15310***		1445	10182	***11628***	***131.7***
	Mexico	0	5625	***5625***		386	3816	***4203***	***133.8***
	Average	*1232*	*4546*	***5778***		*2121*	*12300*	***14422***	***40.1***
	Average excluding Korea, Mexico, Turkey	*1046*	*4154*	***5200***		*2366*	*13523*	***15889***	***32.7***

1. Weighted by the percentage of full-time students in each type of institution. Where data were not available, tuition fees were assumed to be zero. Public institutions only for Canada, Spain and Switzerland. Derived from Usher for Germany and Ireland. 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.
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 mean “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 mean 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

Sources: Education at a Glance; OECD.Stat; Usher and Cervenan (2005) and Secretariat estimates.

Table 3.5. Reduced form regression results

	Pooled model	Pooled model with country-specific time trend	Pooled model with country-specific time trend and year fixed effects [1]
	(1)	(2)	(3)
Dependent Variable : Log of graduation ratio			
IRR	7.29***	4.00***	3.99***
	[1.02]	[1.11]	[1.16]
Supply indicator	0.16***	0.19***	0.20***
	[0.02]	[0.03]	[0.03]
Financial constraints	-0.02***	-0.02***	-0.02***
	[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	0.05	0	-0.25
	[0.13]	[0.19]	[0.24]
Observations	266	266	266
R-squared	0.51	0.83	0.84

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

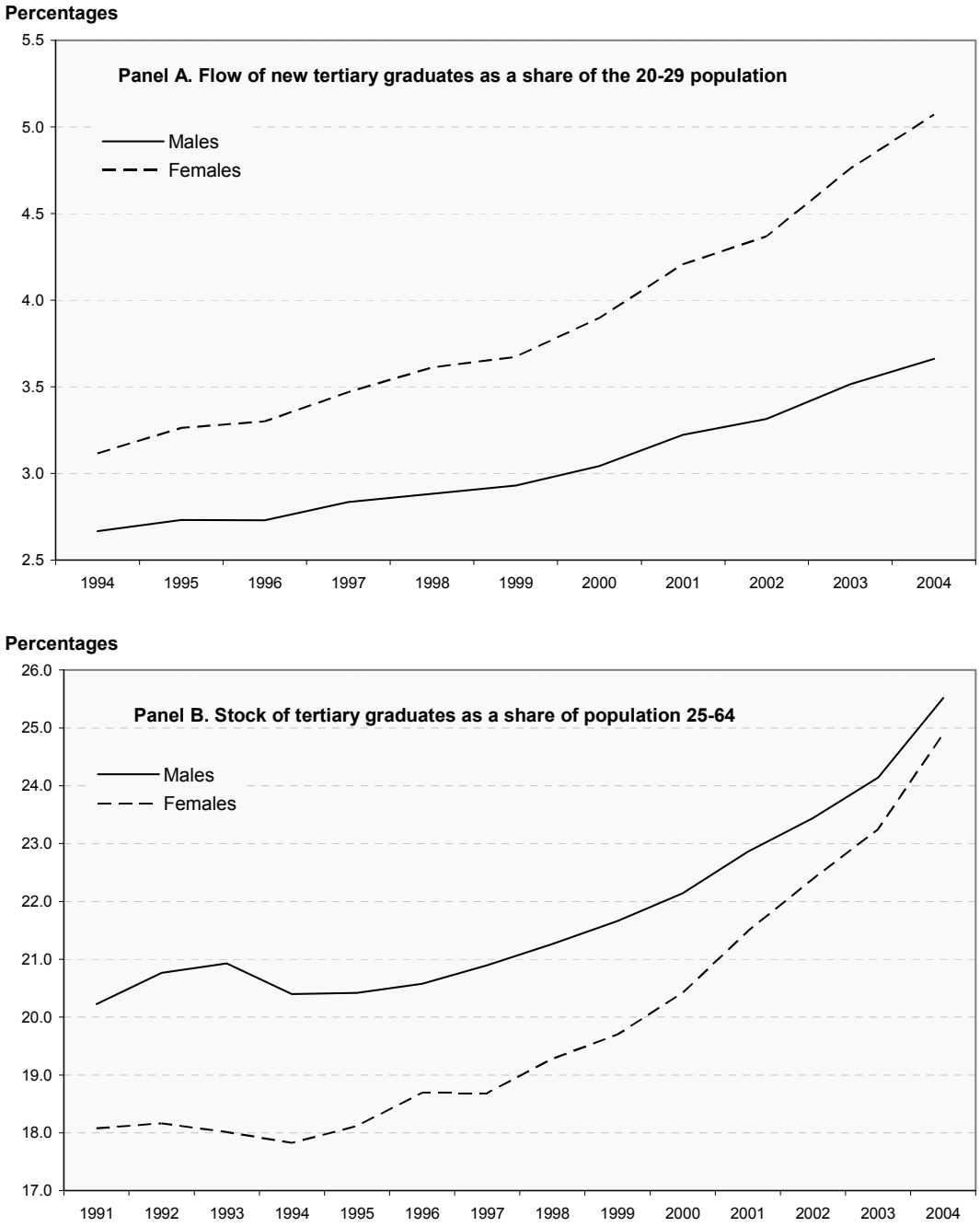
1. This is the specification used in the simulations presented in section 4.
Note: See Annex 3C for an in-depth discussion of the general empirical strategy supporting the regressions, as well as for a detailed description of the variables and for further sensitivity analysis around the baseline specification. This annex also provides system estimations carried out to allowing for endogenous IRR.
Source : OECD calculations.

Table 4.1 **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 average cost of tuition (around $A1 800)	Income-contingent system introduced
	1996	Fees increased by 40%, and tuition bands were introduced for different fields going, in 2005, from A$4 808 (US$3 509) to $A8 018 (US$5 853)	The income threshold for repayment decreased
Austria	2001	Introduction of tuition fee of €363 36 per semester	Introduction of loans exclusively to pay for tuition fees, for student 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 NZ$3 736 for Arts and Social Sciences and the higher one will be NZ$9 582 for Medical studies.	
Poland	1990	Fee-paying studies were allowed, for evening and extra mural studies at state institutions. Fees range from PLN1 600 to PLN12 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 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 of £1 000	Loans changed from mortgage-style (created in 1990) to income-contingent loans covering tuition costs.
	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	

Source: Different national sources.

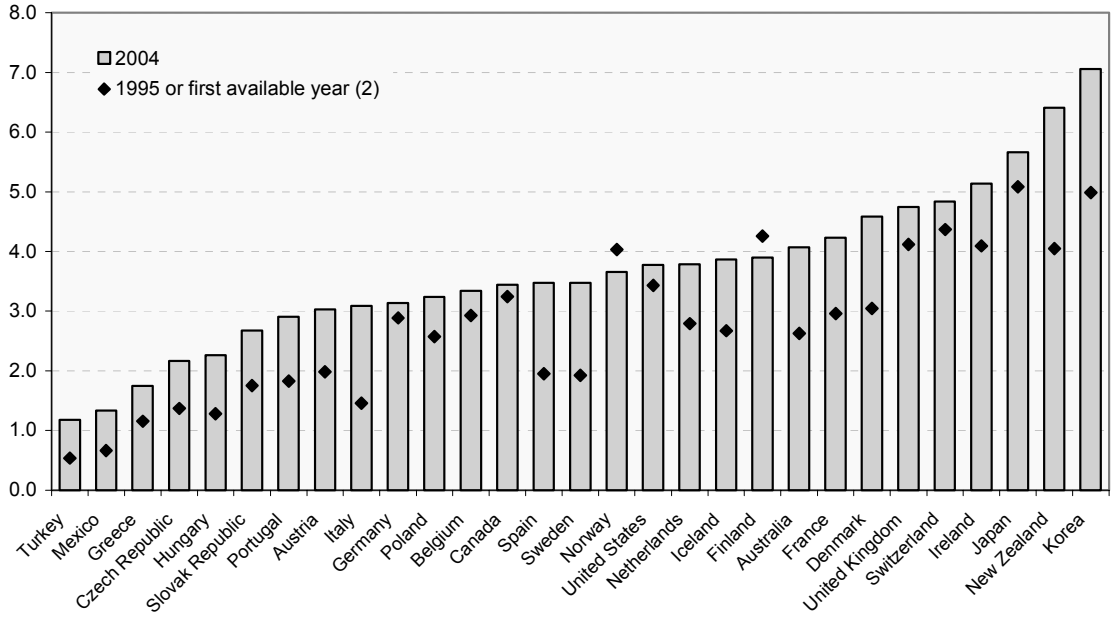
Figure 2.1 Trends in tertiary human capital [1]
OECD average



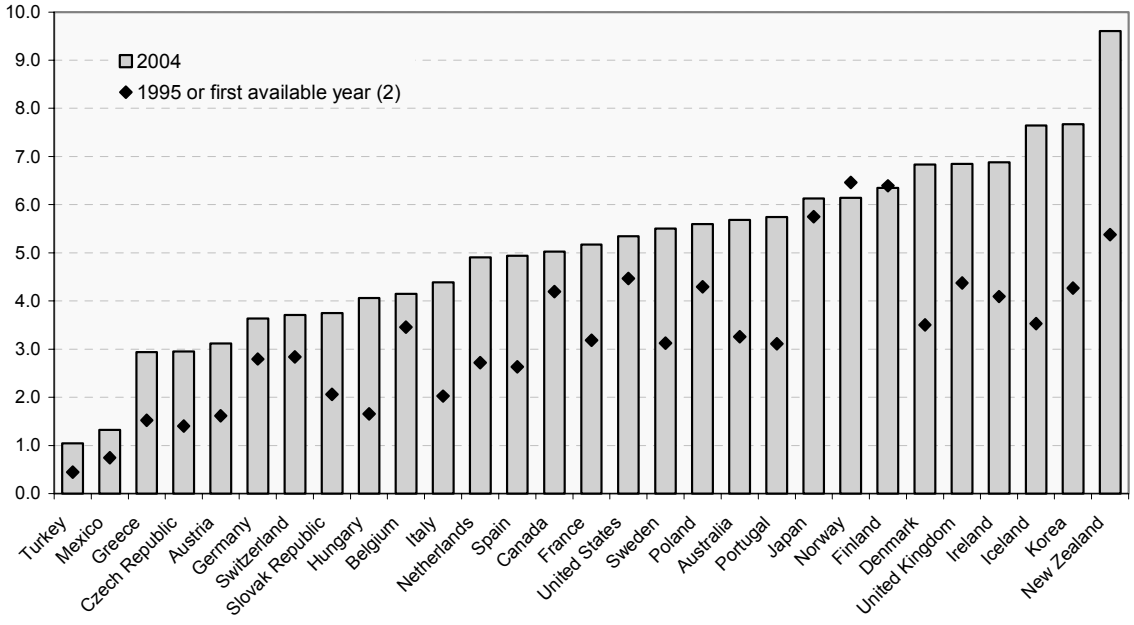
1. Tertiary graduates cover all individuals, including individuals over 29.
Source : OECD, EAG (2006), UNESCO education database, Eurostat and OECD calculations.

Figure 2.2 New tertiary graduates as a share of the 20-29 population by gender for selected years [1]

Males

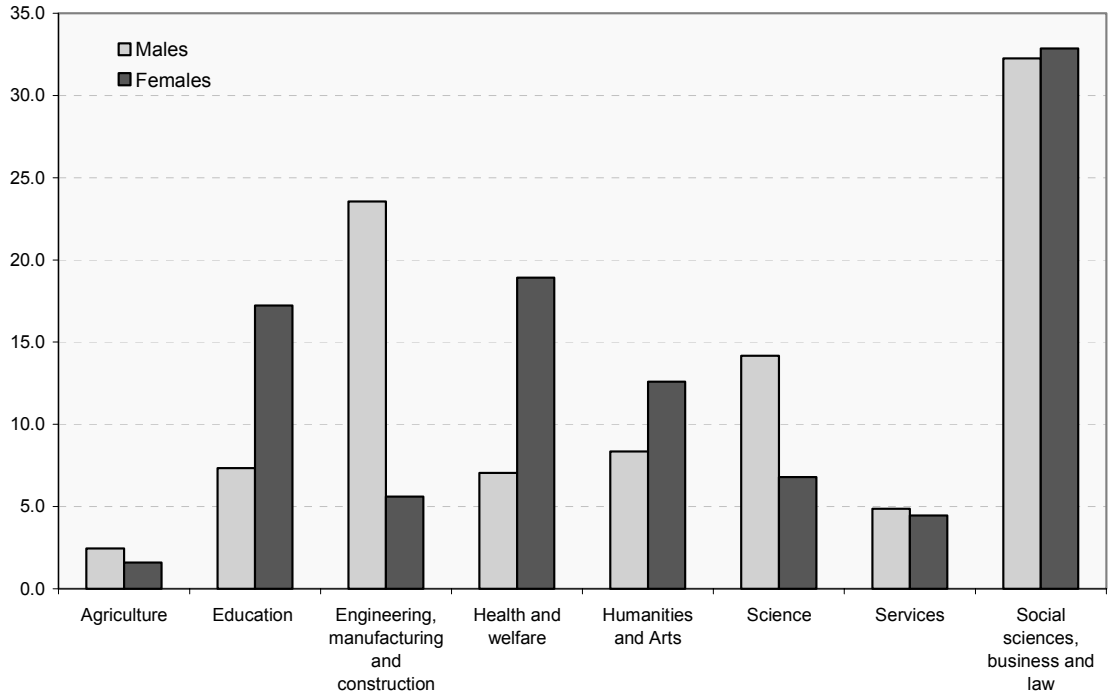


Females



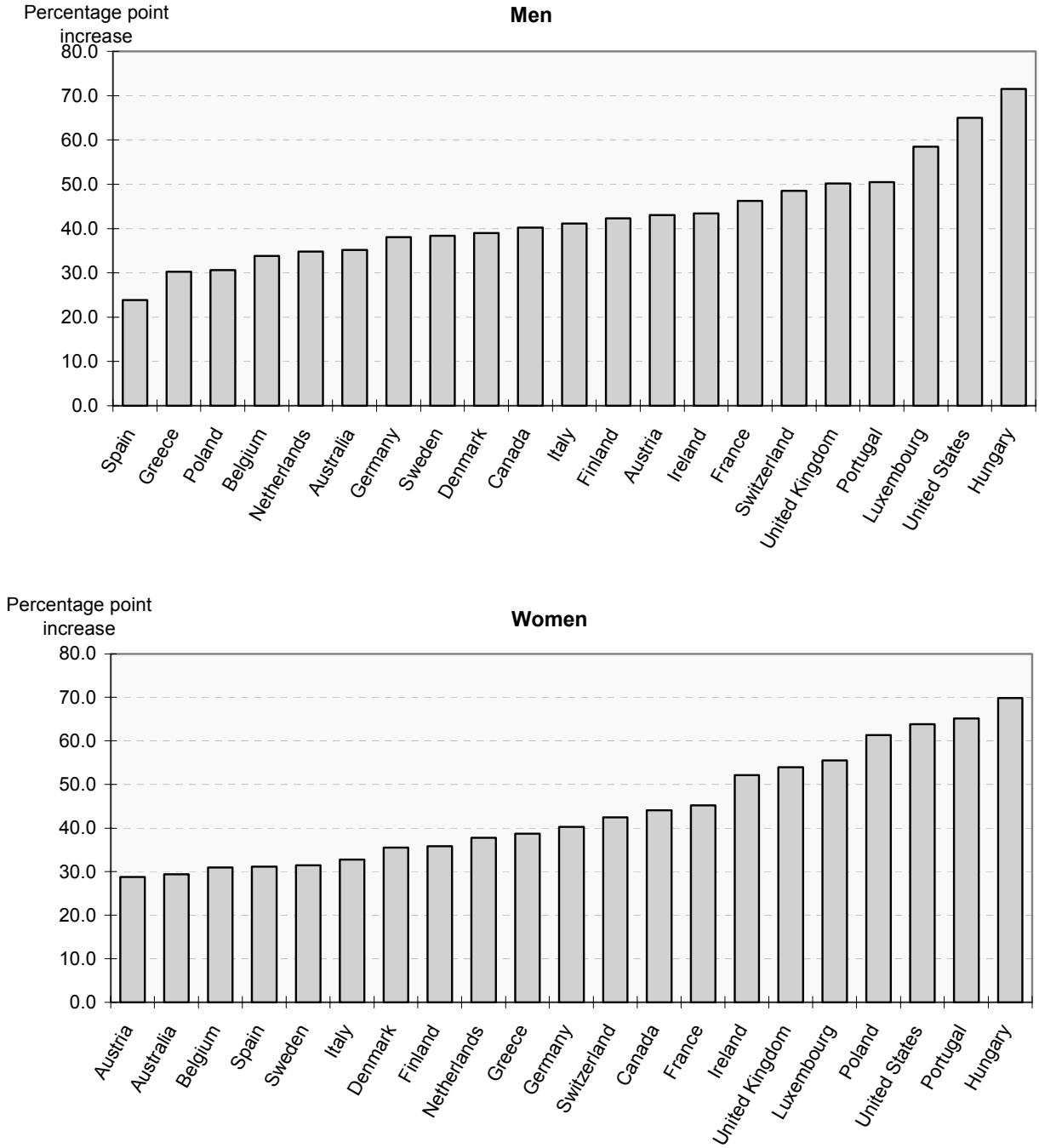
1. Tertiary graduates cover all individuals, including individuals over 29.
2. 1996 for Mexico and New Zealand, 1998 for Iceland, 1999 for Switzerland and 2000 for Belgium and Poland.
Source: OECD, EAG (2006), UNESCO education database, Eurostat and OECD calculations.

Figure 2.3. Flows of new tertiary graduates by field of education, 2004
(OECD average, shares in total graduates)



Source : OECD, EAG (2006).

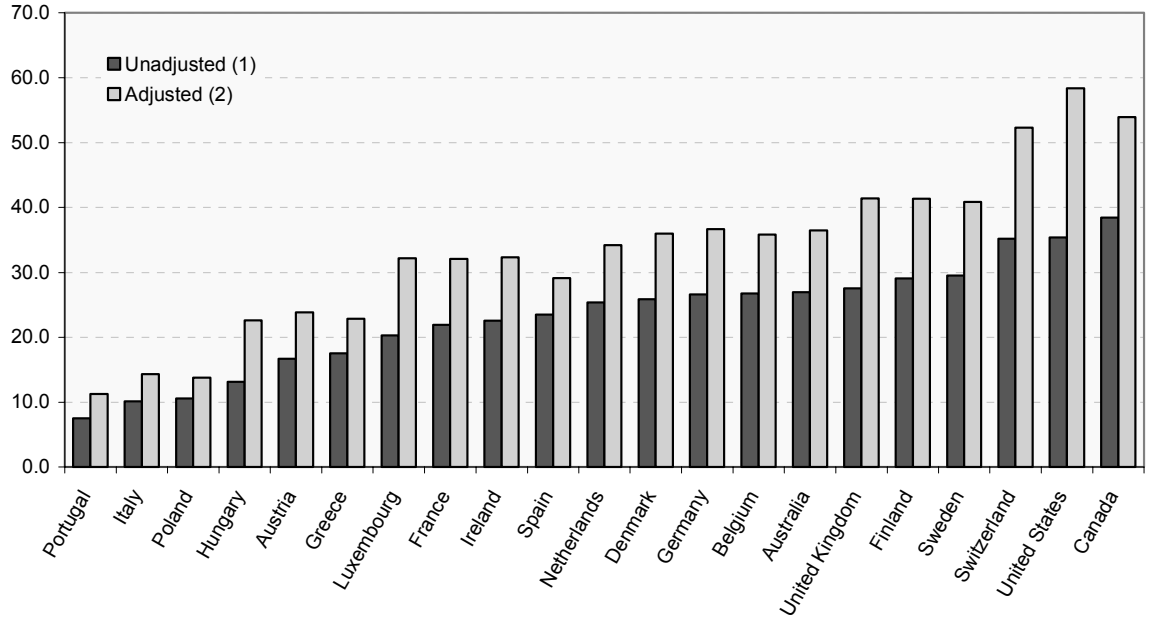
Figure 2.4 Gross wage premia from tertiary education [1]
2001 [2]



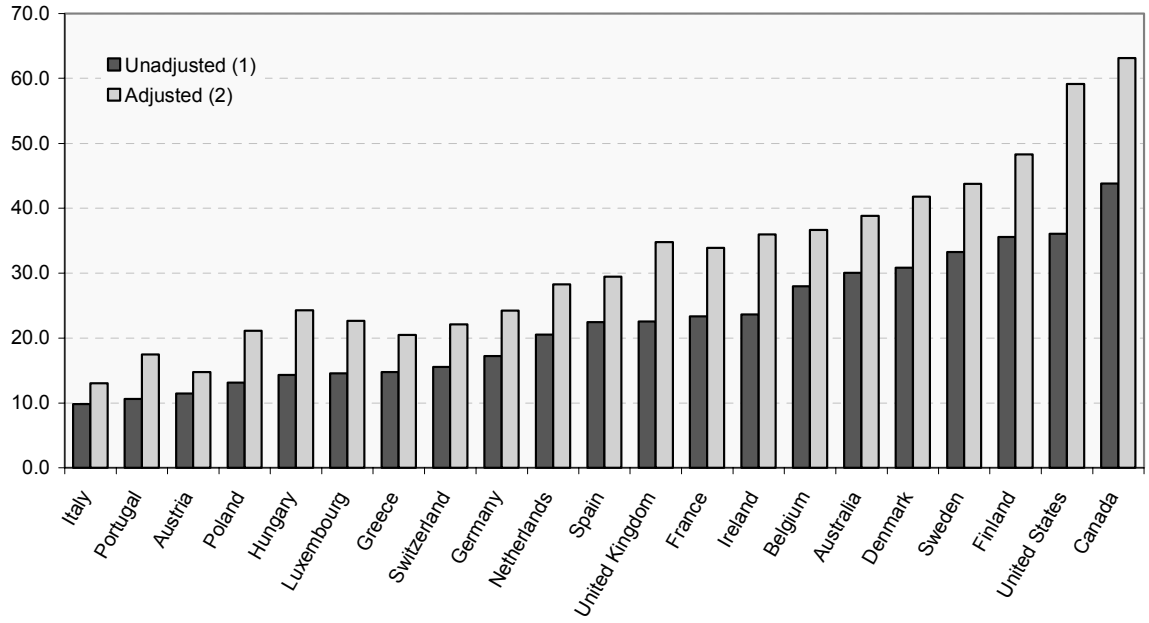
1. Estimates of the increase in gross hourly earnings relative to a worker with a secondary education degree, controlling for individual characteristics other than education attainment.
2. Except Hungary 1997 and Poland and Switzerland 2000.
Source : the European Community Household Panel (ECHP), the Consortium of Household Panels for European Socio-Economic Research (CHER), the Cross-National Equivalent File (CNEF), and the Household, Income and Labour Dynamics in Australia Survey (HILDA) and OECD calculations.

Figure 2.5 Stocks of tertiary human capital : the effect of adjusting for wage premia, 2001

Males



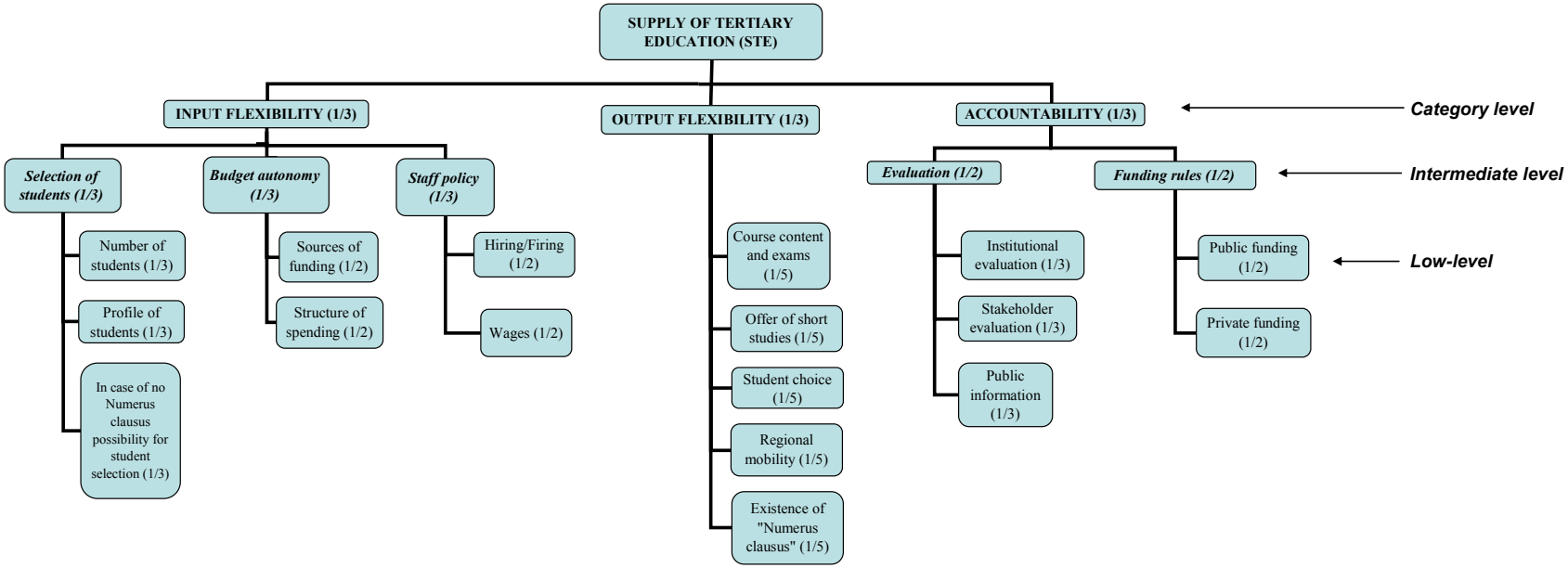
Females



1. Population that has attained tertiary education, as a % of population aged 25-64.
2. Unadjusted stock of tertiary human capital multiplied by (1+wage premia) derived from figure 2.4

Source : OECD, EAG (2006) and OECD calculations.

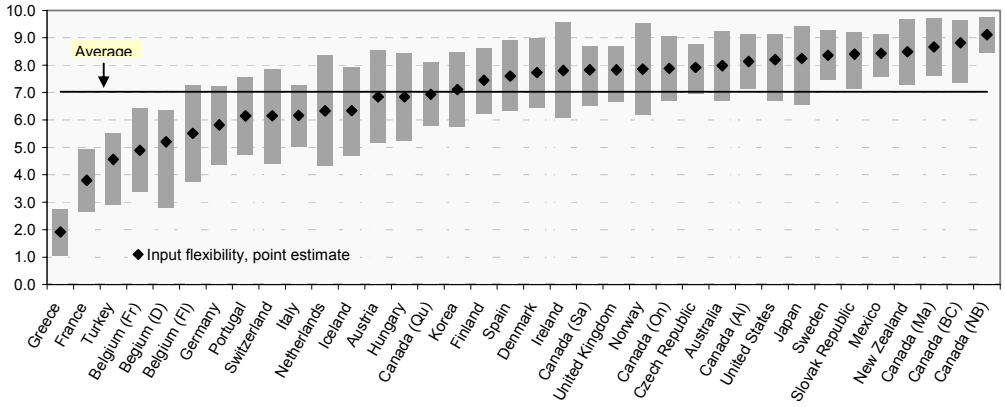
Figure 3.1. The structure of the Supply of Tertiary Education indicator



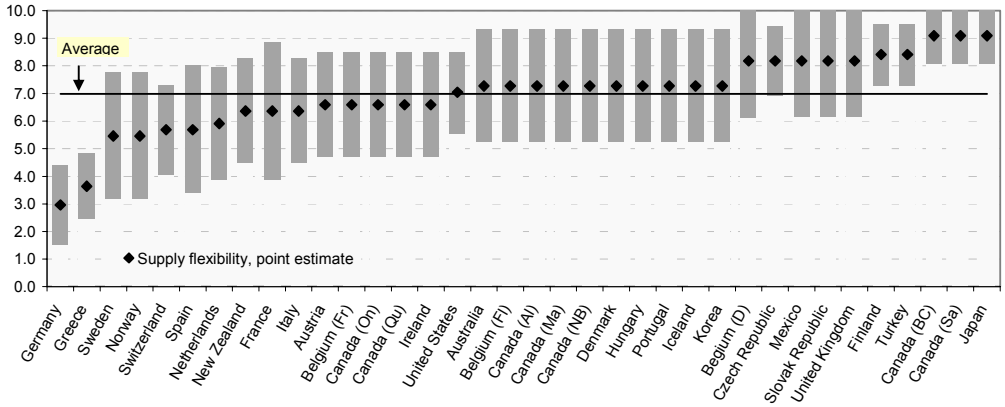
Note: The weights of each sub-level indicator are in parentheses. For the composition of the low-level indicators see Annex 2.

Figure 3.2. Tertiary education supply indicator by category, 2005-2006

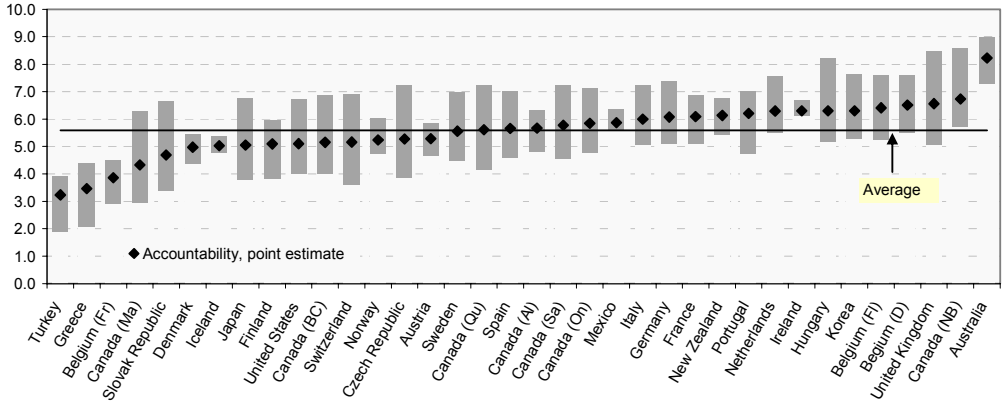
A. Input flexibility
(Increasing in flexibility)



B. Output flexibility
(Increasing in flexibility)

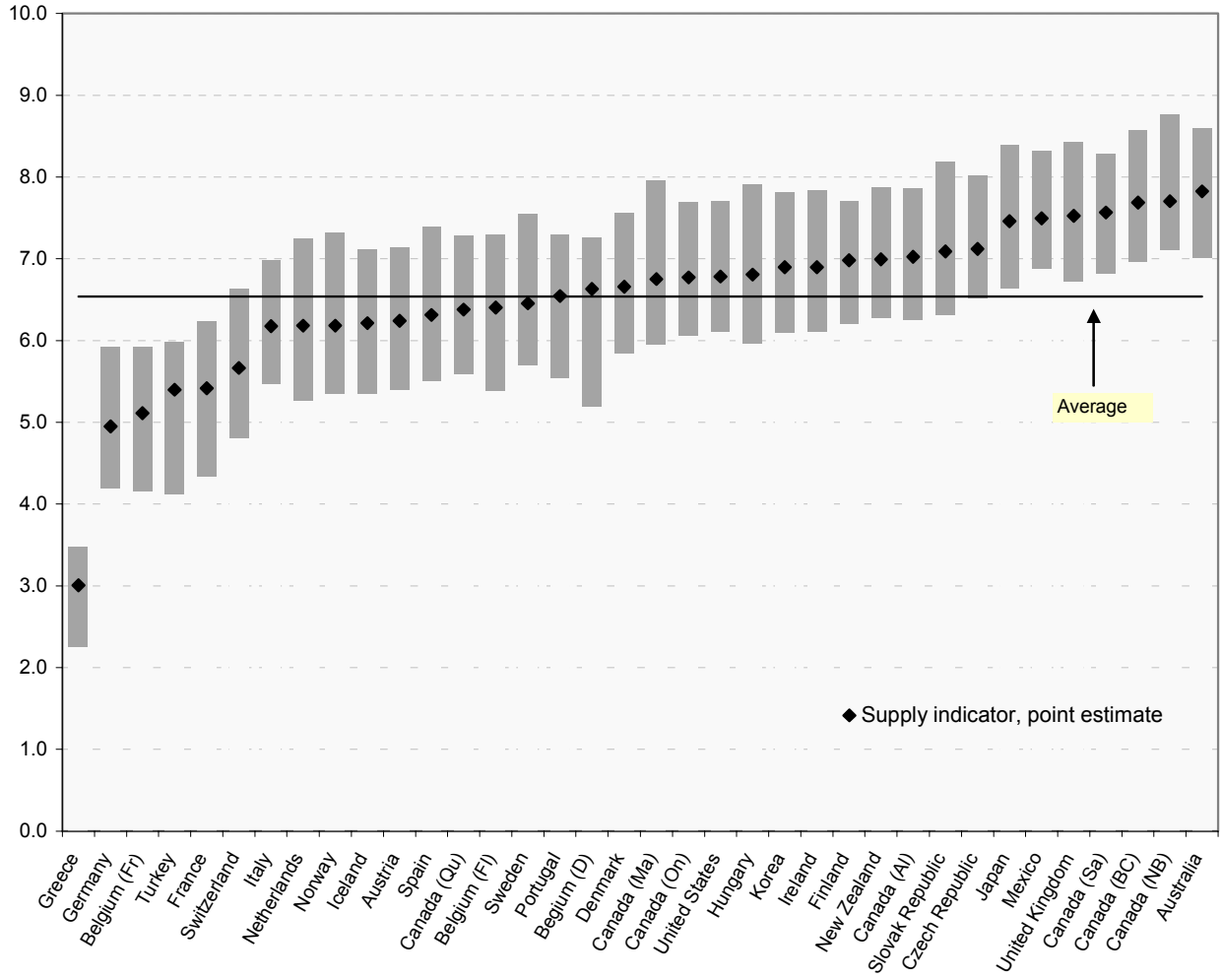


C. Accountability
(Increasing in accountability)



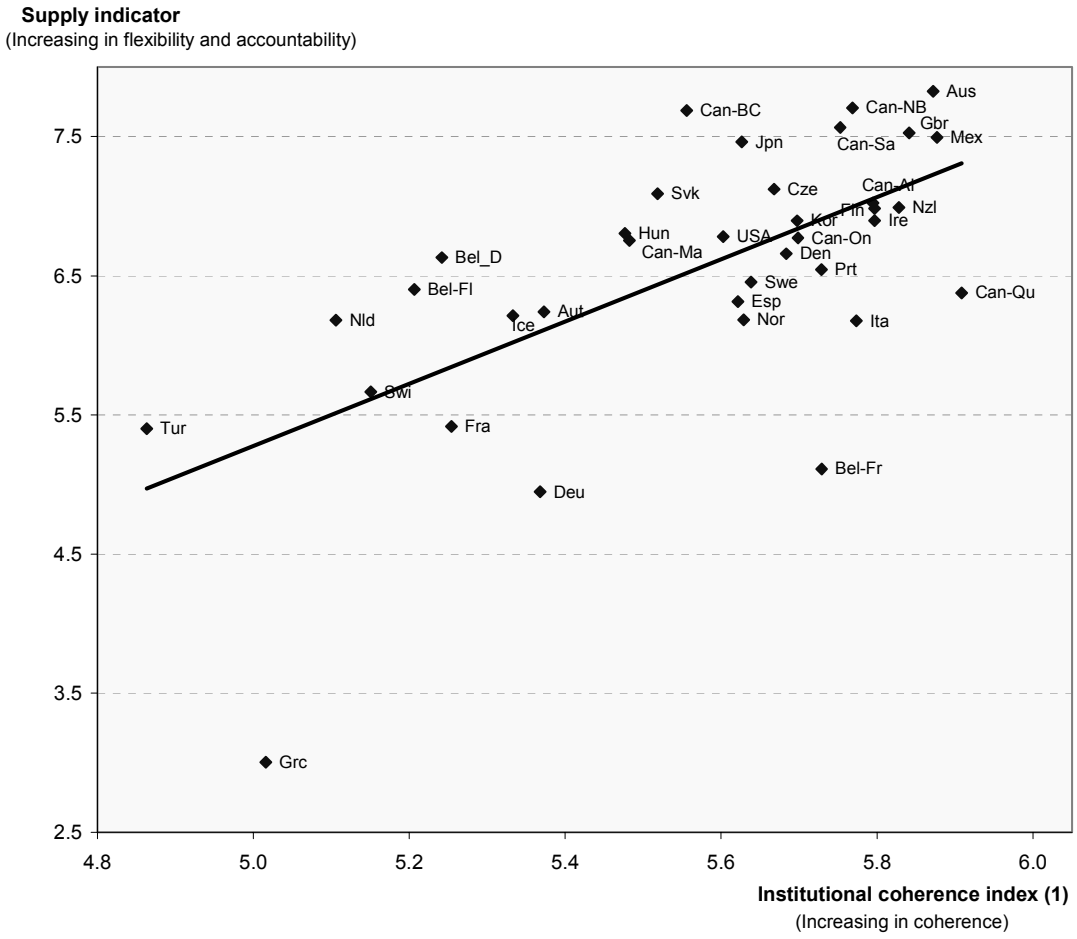
Note: Canadian provinces are : Al: Alberta, BC: British Columbia, Ma: Manitoba, NB: New Brunswick, On: Ontario, Qu: Québec and Sa: Saskatchewan. Belgian regions are : Fr: French Community, Fl: Flemish Community and D: German-speaking Community.
The bars correspond to the 95% confidence intervals obtained through the random weight technique.
Source: OECD calculations based on questionnaire answers received from member countries.

Figure 3.3. 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.
The bars correspond to the 95% confidence intervals obtained through the random weight technique.
Source : OECD calculations based on questionnaire answers received from member countries.

Figure 3.4. Supply indicator and coherence of tertiary education systems

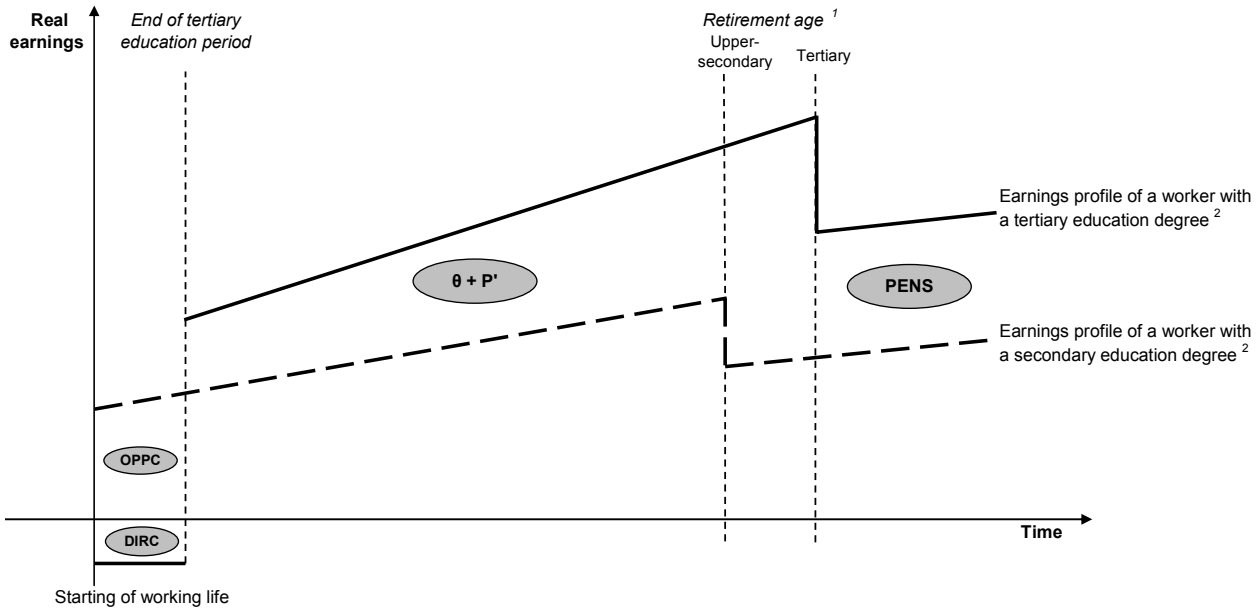


Note : Canadian provinces are : Al: Alberta, BC: British Columbia, Ma: Manitoba, NB: New Brunswick, On: Ontario, Qu: Québec and Sa: Saskatchewan. Belgian regions are : Fr: French Community, Fl: Flemish Community and D: German-speaking Community.

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.

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

Figure 3.5. Individual returns to tertiary education illustrated

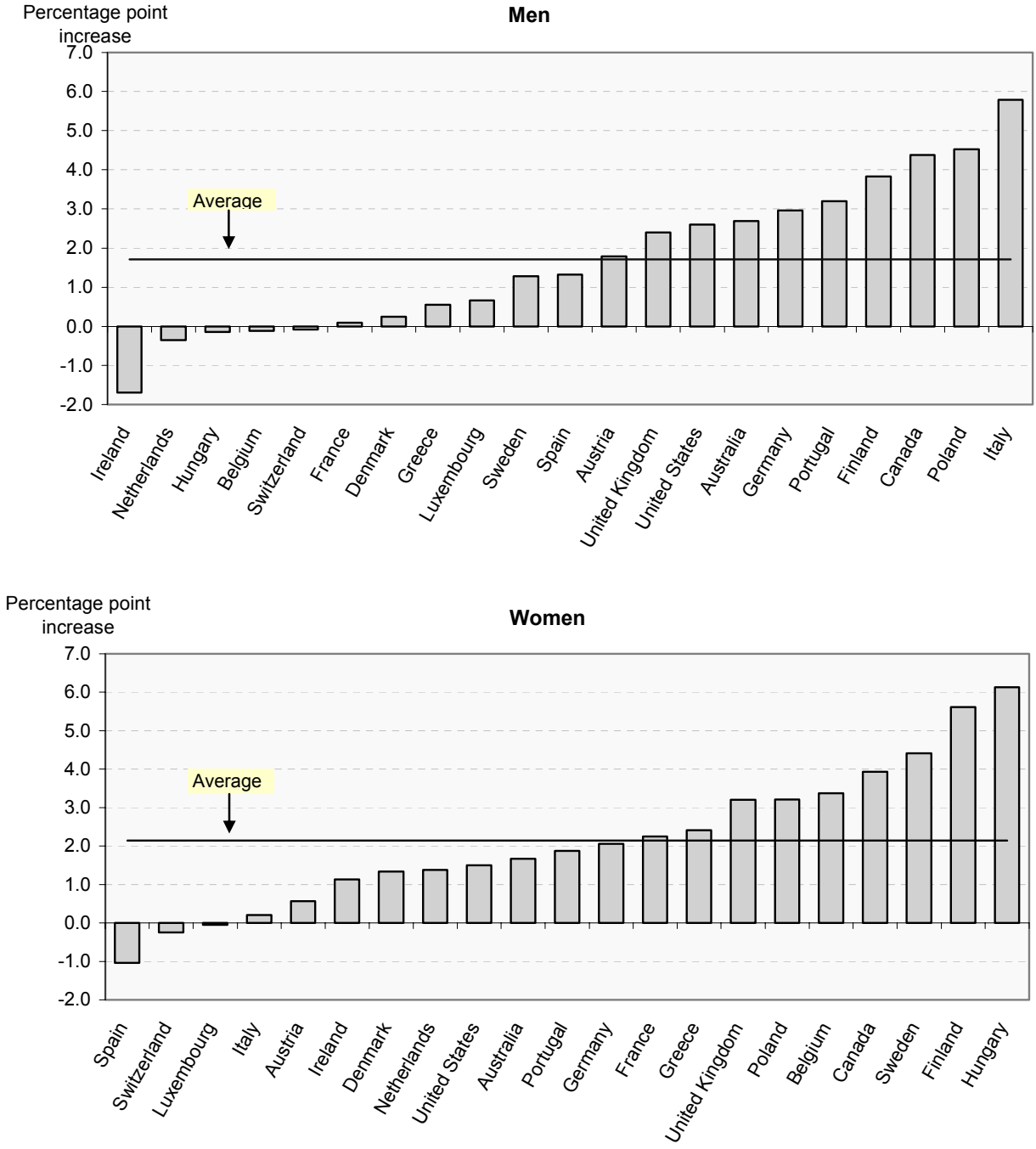


DIRC : Direct costs of tertiary education
OPPC : Opportunity costs of not starting to work after secondary education
θ + P' : Wage & employability premia associated with tertiary education (net of taxes and benefits)
PENS : Retirement premia for tertiary education workers (net of taxes)

1. Assuming the same length of working life.
2. Assuming partial indexation of pension benefits.

Figure 3.6. Marginal effect of higher education on the employment probability [1]

2001 [2]

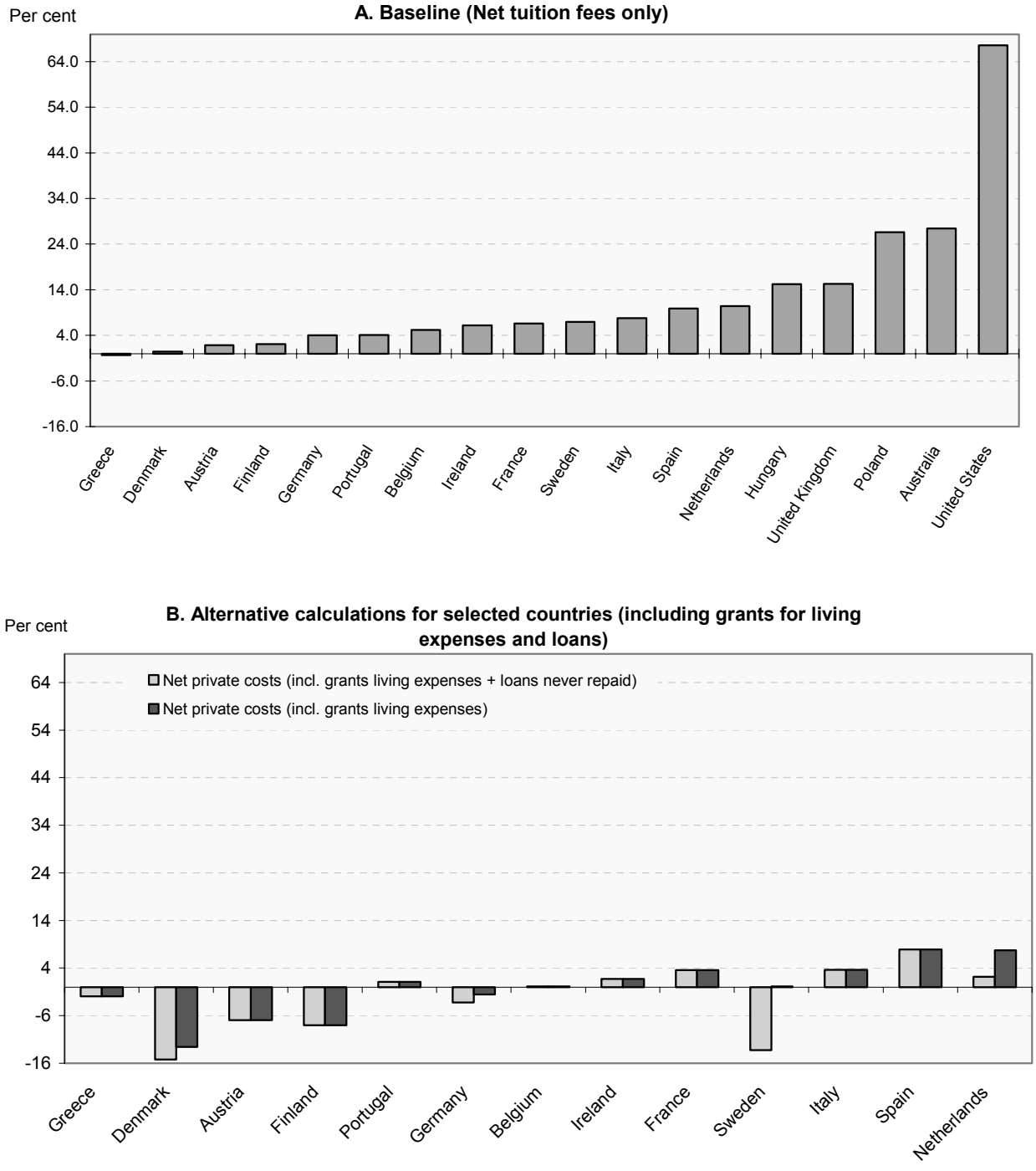


1. Increase in probability of employment: Tertiary degree holders relative to holders of upper secondary degree.

2. Except Hungary 1997 and Poland and Switzerland 2000.

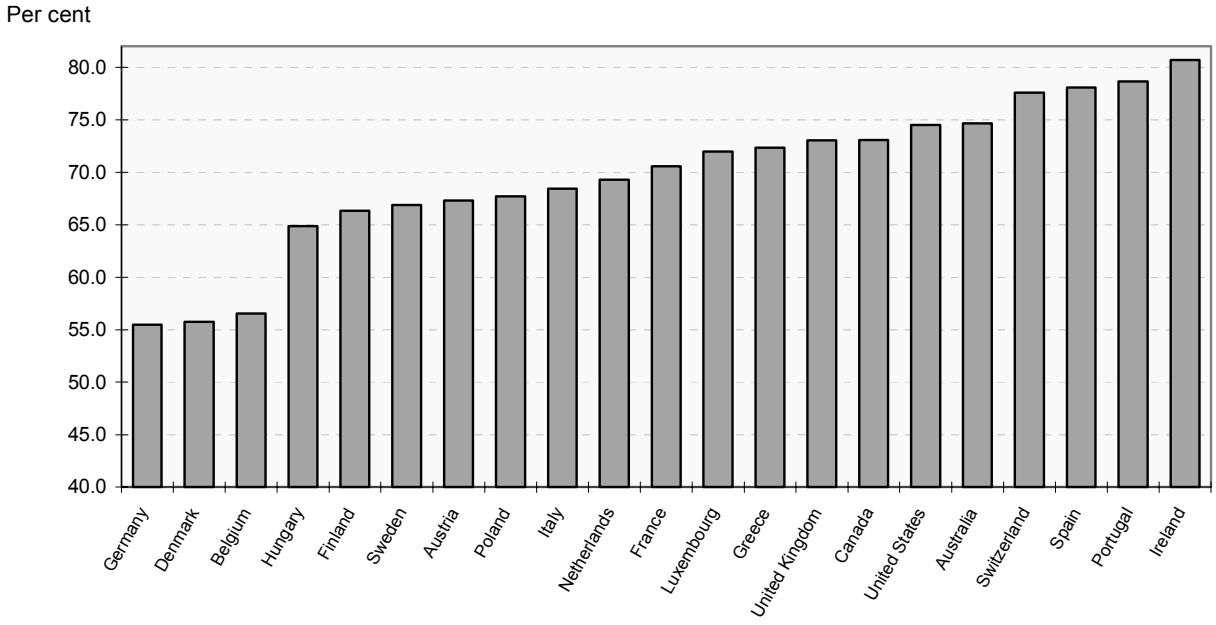
Source : the European Community Household Panel (ECHP), the Consortium of Household Panels for European Socio-Economic Research (CHER), the Cross-National Equivalent File (CNEF), and the Household, Income and Labour Dynamics in Australia Survey (HILDA) and OECD calculations.

Figure 3.7. Net direct costs of tertiary education [1]



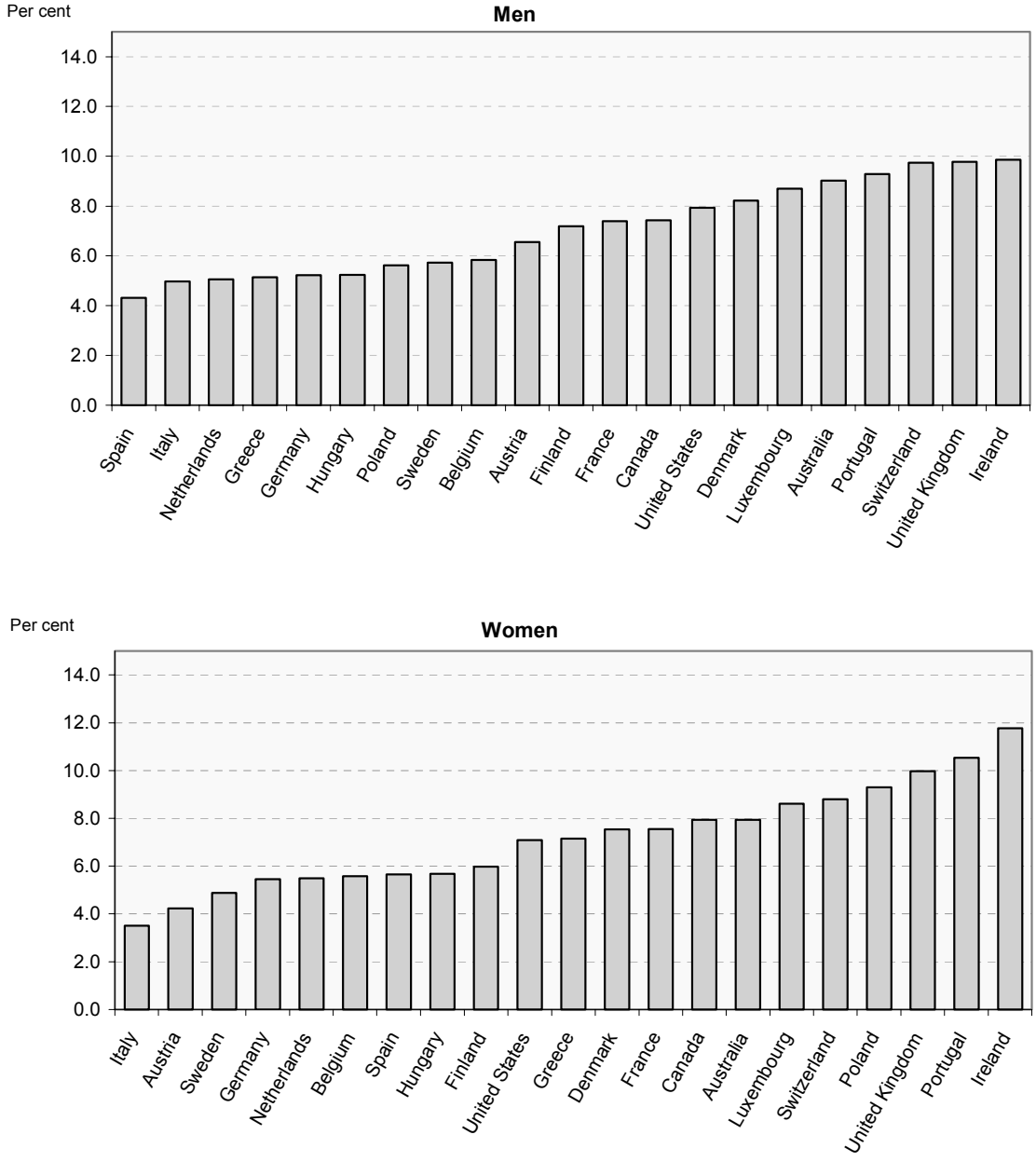
1. In % of gross annual wages of an upper-secondary degree holder.
Source : OECD calculations based on EAG (2005), indicators B1.1 and B3.2b.

Figure 3.8 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 : OECD calculations.

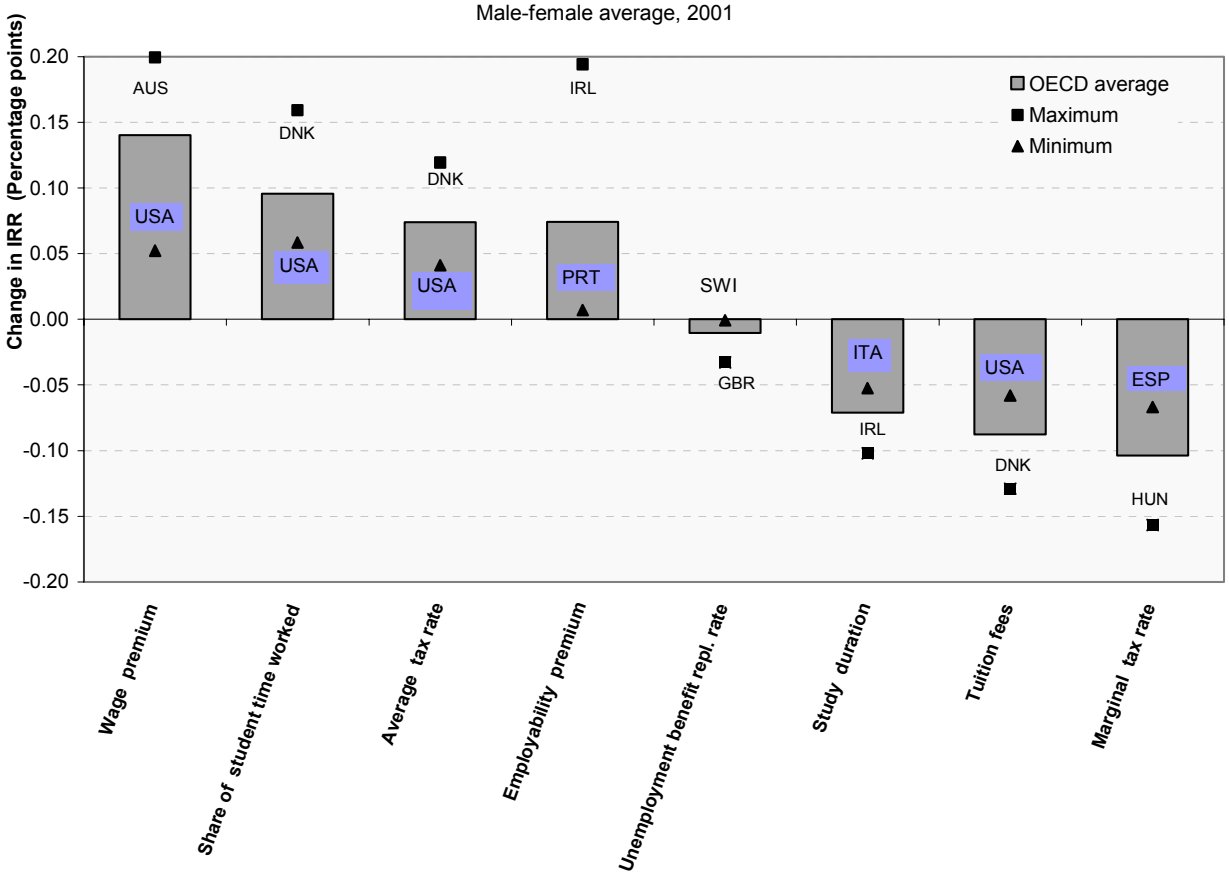
Figure 3.9 Estimates of the Internal Rates of Return to Tertiary Education [1]
2001 [2]



1. Uniform labour productivity growth across countries assumed to be 1.75% per year.
2. Except Poland and Switzerland: 2000 and Hungary: 1997.
Source : OECD calculations.

Figure 3.10. Sensitivity analysis on the IRRs: effects of changes in the main drivers [1]

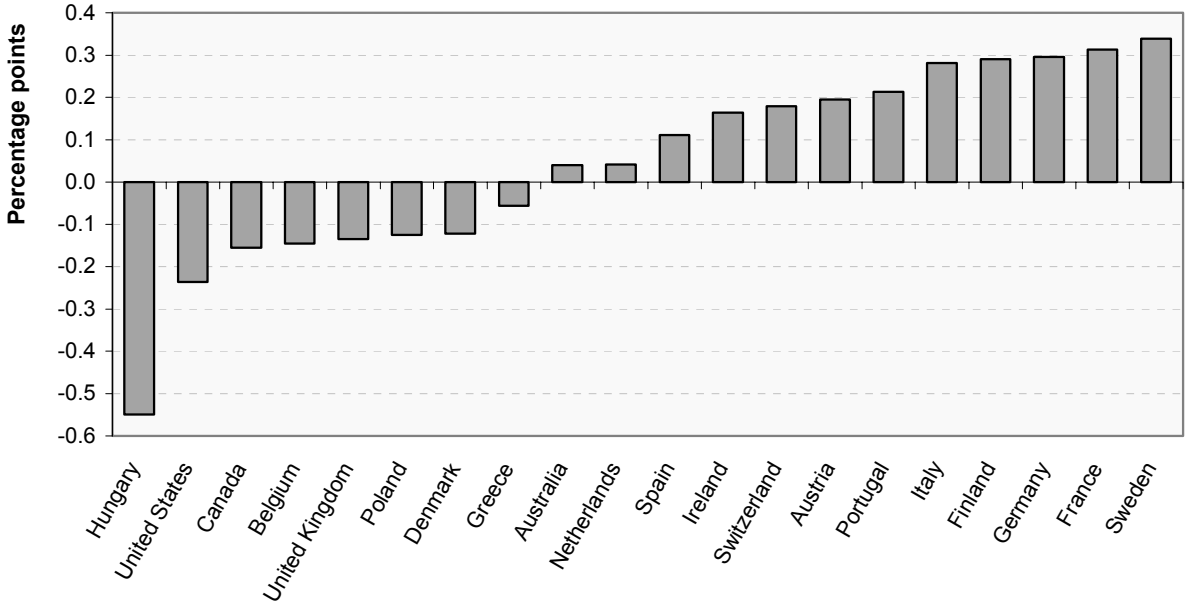
Male-female average, 2001



1. All drivers are changed by 1 percentage point except study duration that is changed by 1%.

Source : OECD calculations.

Figure 3.11. Cross-country differences in the IRRs implied by country-specific field composition [1]

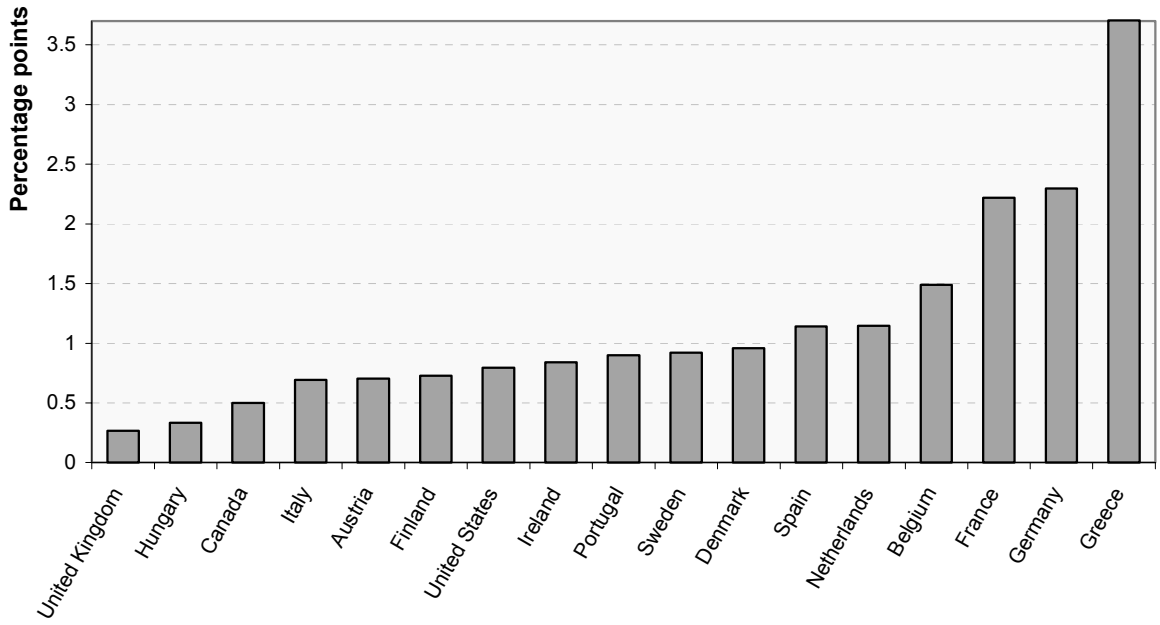


1. Assuming that returns by field are the same as estimated by Stark (2006) for Canada.

IRR by field	
Agriculture	4.9
Education	5.4
Engineering, manufacturing and construction	13
Health and welfare	12.75
Humanities and Arts	4
Science	11.9
Services	9.1
Social sciences, business and law	11.65
Average	**9.1**

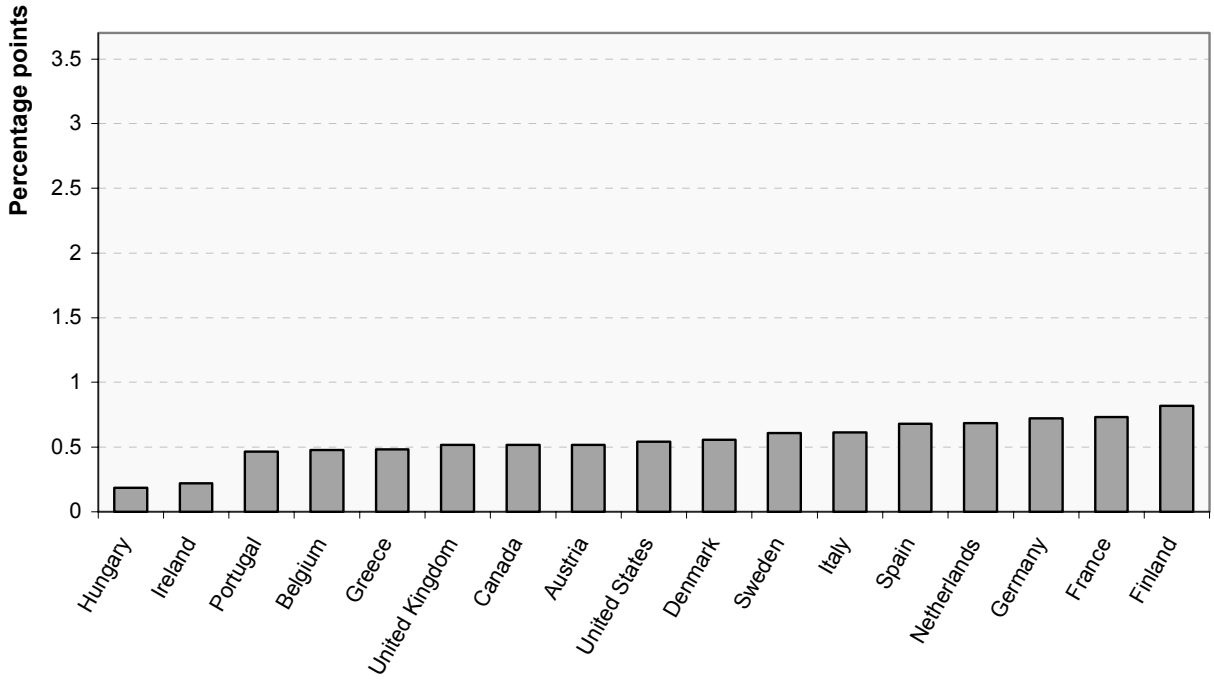
Note: The figure displays the differences between the counterfactual IRRs by country and their OECD average. For comparison with the IRRs computed in the text, the differences were normalised by the ratio between the actual and the counterfactual average IRR.
Source : OECD, EAG(2006) and Stark (2006).

Figure 4.1. Impact of increasing the flexibility and accountability of tertiary education supply on graduation ratios [1]



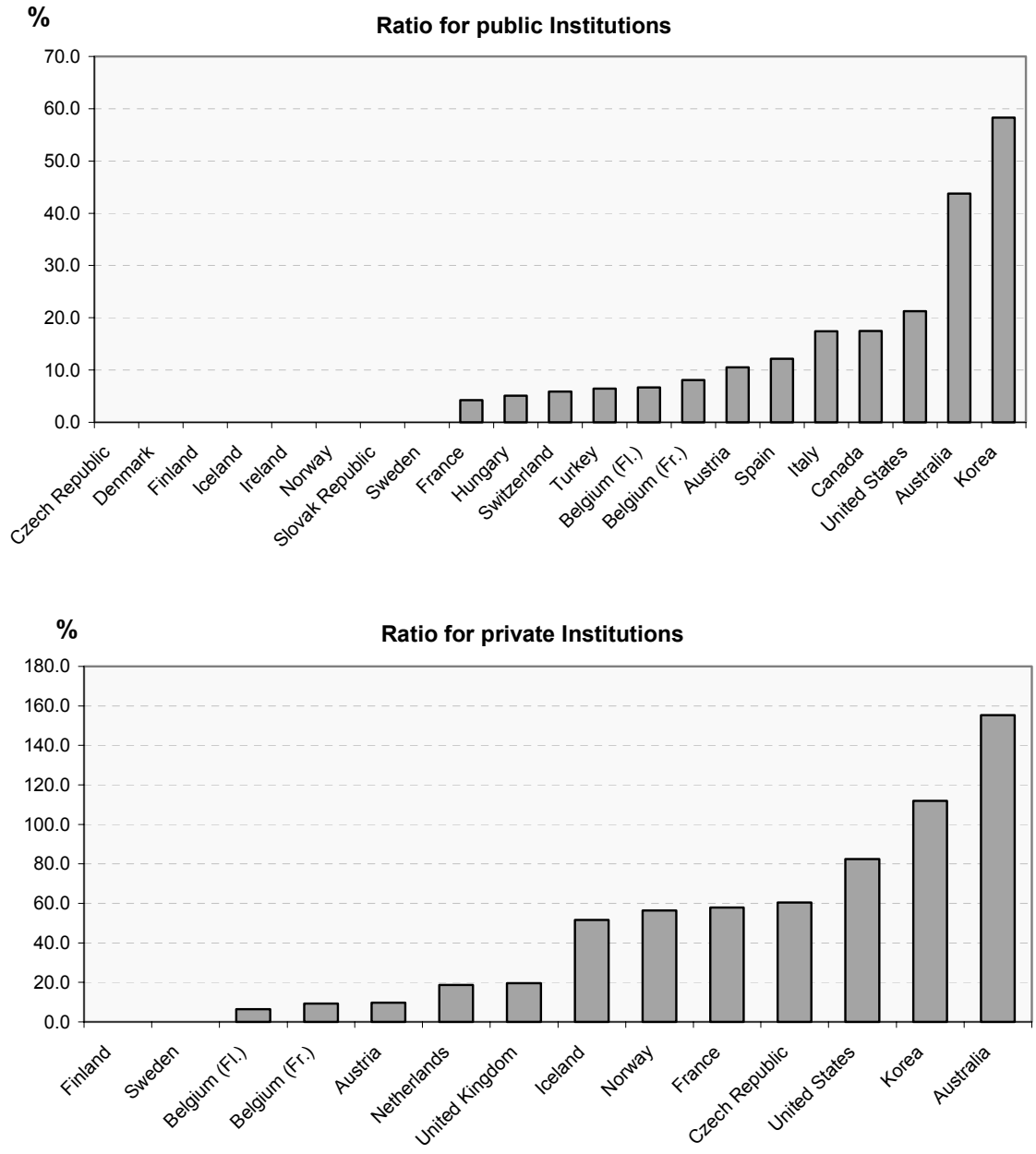
1. Effect of aligning the STE indicator on the maximum in the sample (Australia).
Source : OECD calculations.

Figure 4.2. Impact of reducing study duration on graduation ratios [1]



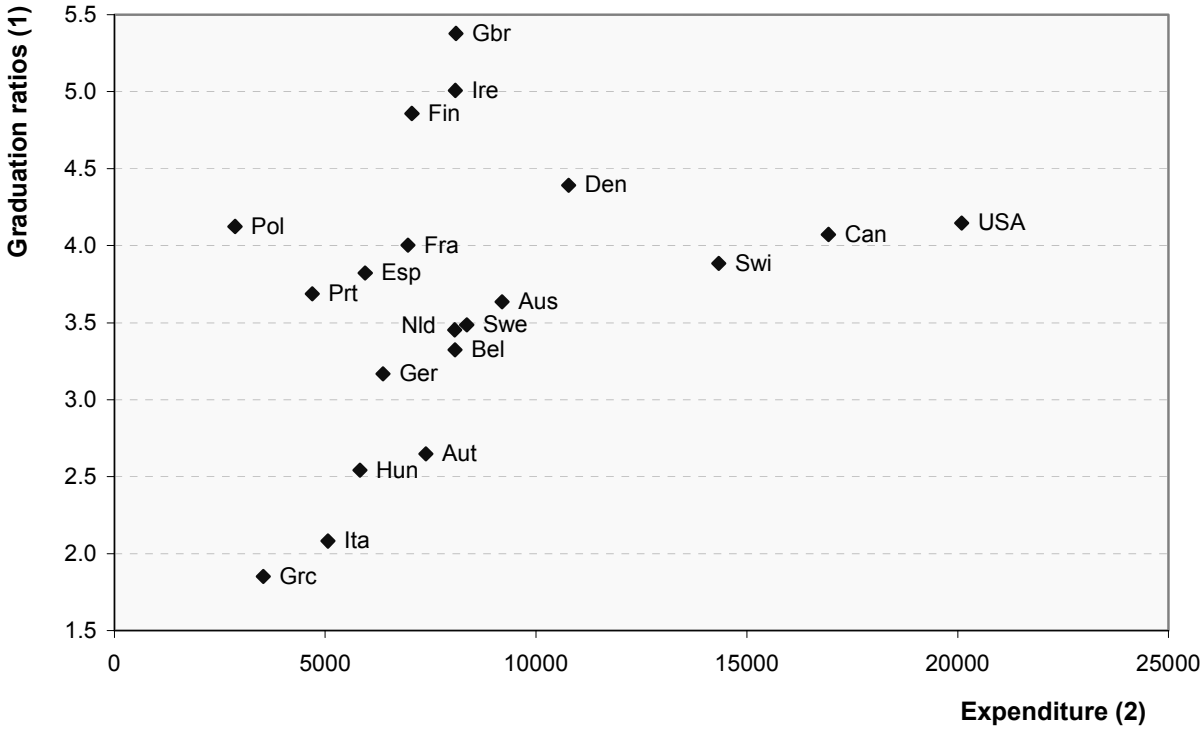
1. Effect on graduation ratios of setting study duration at the sample mean level minus two standard deviations.
(Australia is not included because the study duration is already below the sample mean minus two standard deviations).
Source : OECD calculations.

Figure 4.3 Ratio of tuition fees to costs per student, selected OECD countries



Source : OECD Education at a glance (2006).

Figure 4.4. Graduation ratios vs. costs per student, 2001



1. Tertiary graduates as a share of the 20-29 population.

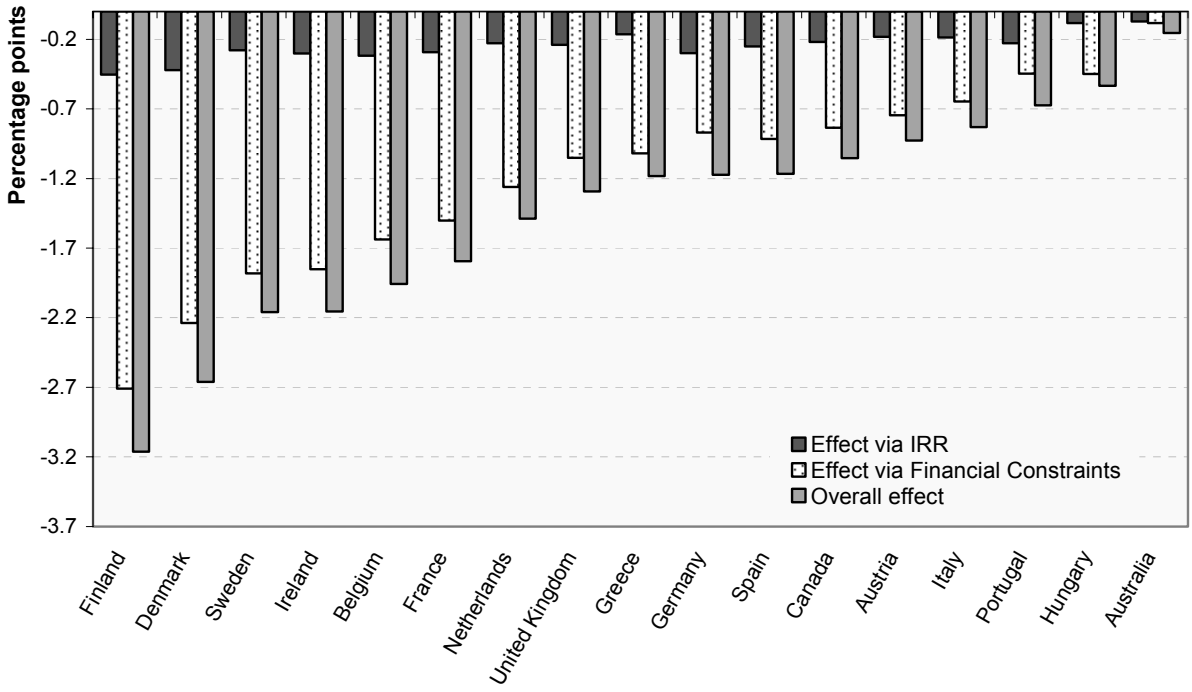
2. Annual expenditure on educational institutions per student for all services.

In equivalent US dollars converted using PPPs for GDP, based on full-time equivalents.

All tertiary education excluding R&D activities.

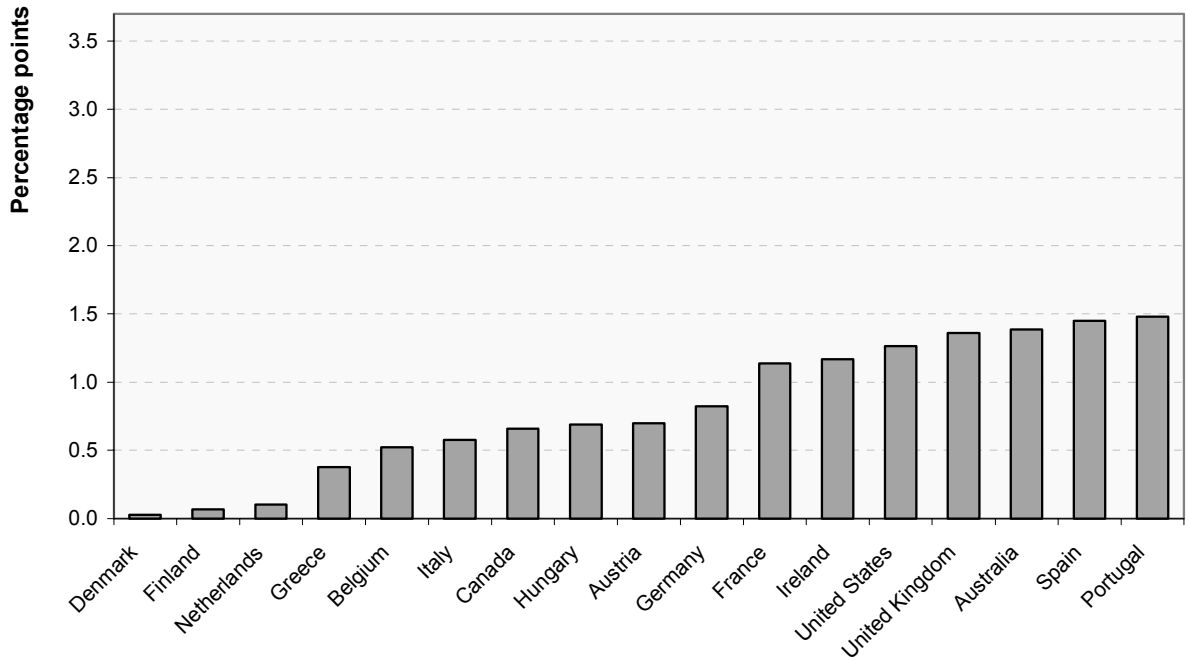
Source: OECD, EAG (2006) and OECD calculations.

Figure 4.5. Impact of an increase in tuition fees on graduation ratios [1]



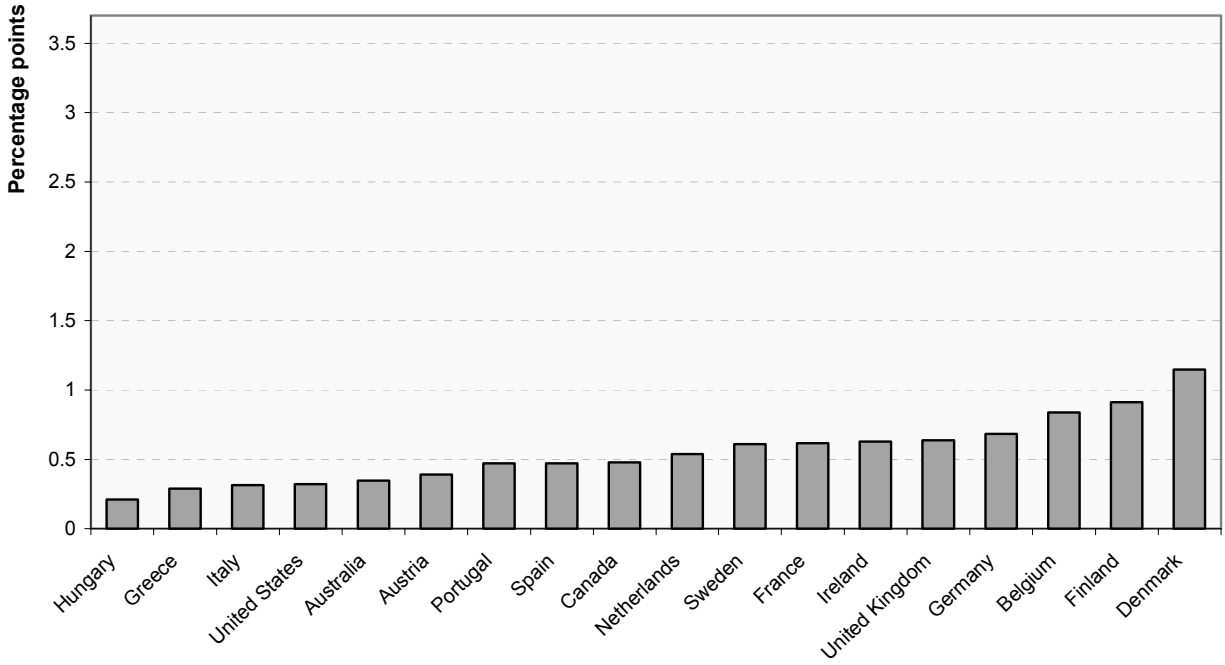
1. Effect on graduation ratios of increasing tuition fees up to the sample mean plus two standard deviations.
(The United States are not included because the level of net tuition fees are already above the sample mean plus two standard deviations).
Source : OECD calculations.

Figure 4.6. Impact of easing liquidity constraints on graduation ratios [1]



1. Effect of an alignment of the ratio of investment costs to financing resources (see table 3.4) on the minimum in the sample. (This benchmark was preferred as the sample mean minus two standard deviations is below the minimum).
Source : OECD calculations.

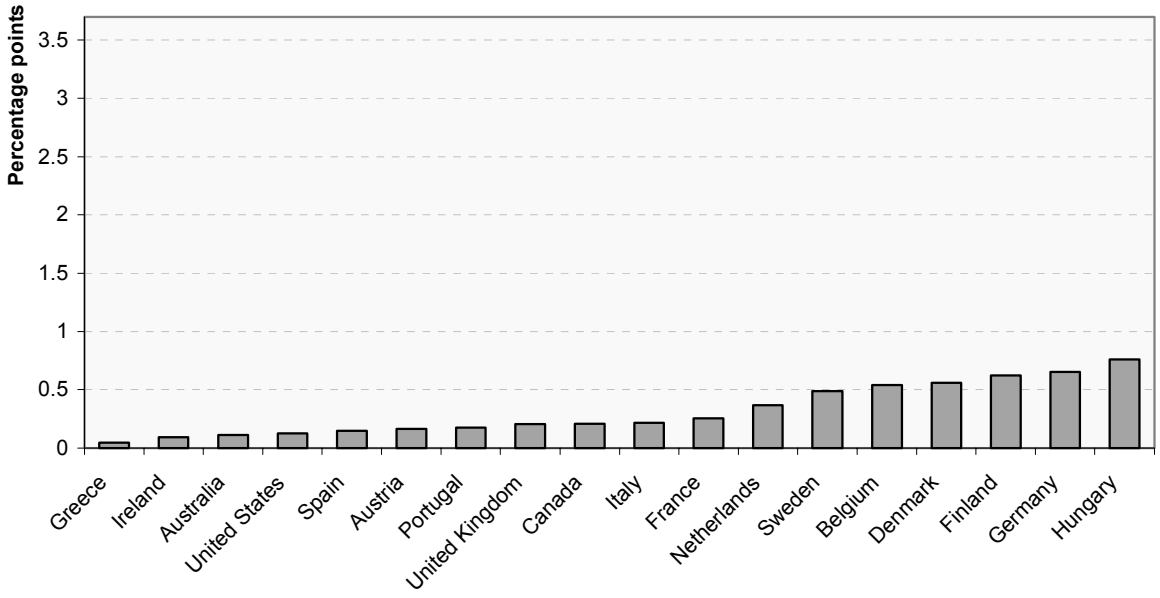
Figure 4.7. Impact of introducing or increasing part-time student work on graduation ratios



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 : OECD calculations.

Figure 4.8. Impact of a decrease of marginal tax rates on graduation ratios [1]



1. Effect on graduation ratios of decreasing marginal tax rates by 5 percentage points.
Source: OECD calculations.