

Please cite this paper as:

Blöndal, S., S. Field and N. Girouard (2002), "Investment in Human Capital Through Post-Compulsory Education and Training: Selected Efficiency and Equity Aspects", *OECD Economics Department Working Papers*, No. 333, OECD Publishing.

<http://dx.doi.org/10.1787/778845424272>



OECD Economics Department  
Working Papers No. 333

# Investment in Human Capital Through Post-Compulsory Education and Training

SELECTED EFFICIENCY AND EQUITY ASPECTS

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JEL Classification: D63, I21, I22, I28

**Unclassified**

**ECO/WKP(2002)19**



Organisation de Coopération et de Développement Economiques  
Organisation for Economic Co-operation and Development

**11-Jul-2002**

**English text only**

**ECONOMICS DEPARTMENT**

**ECO/WKP(2002)19**  
**Unclassified**

**INVESTMENT IN HUMAN CAPITAL THROUGH POST-COMPULSORY EDUCATION AND  
TRAINING: SELECTED EFFICIENCY AND EQUITY ASPECTS**

**ECONOMICS DEPARTMENT WORKING PAPER NO. 333**

by  
**Sveinbjörn Blöndal, Simon Field and Nathalie Girouard**

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**JT00129531**

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## ABSTRACT/RÉSUMÉ

### **Investment in human capital through post-compulsory education and training**

This paper examines various efficiency and equity aspects related to the skill acquisition of young people and older adults. The analysis suggests that such human capital investment is associated with significant labour-market gains for individuals, including higher post-tax earnings and better employment prospects, which exceed the investment costs, mainly foregone earnings and tuition fees, by a significant margin. It also shows that the net benefits are strongly influenced by policy-related factors, such as study length, tuition subsidies and student support. Overall, the estimates reported in the paper indicate that there are strong incentives for the average student to continue studying beyond the compulsory schooling age, and also point to the benefits of such investment in education for society as a whole. However, the net gains fall with age, mainly reflecting a shorter period to take advantage of the benefits that come with education. Finally the paper notes that students in higher education tend to come from more affluent backgrounds and that they benefit from large public subsidies, whereas young people from disadvantaged backgrounds are less likely to participate in tertiary education and thus benefit from public subsidies.

*JEL classification:* I21, I22, I28, D63

*Keywords:* Human capital, earnings, unemployment, taxes, student support

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### **Investissement en capital humain au travers de l'éducation et la formation post-obligatoires**

Le présent document porte sur divers aspects de l'équité et de l'efficacité qui sont liés à l'acquisition de qualifications par les jeunes et les adultes relativement âgés. L'analyse donne à penser que ce type d'investissement dans le capital humain procure aux personnes d'importants avantages sur le marché du travail, notamment des gains, après impôt, plus élevés et de meilleures perspectives d'emploi, avantages qui compensent largement le coût des investissements, c'est à dire, principalement, le manque à gagner et les frais d'études. Il ressort également de cette analyse que les avantages nets varient considérablement sous l'effet de facteurs liés à l'action des pouvoirs publics, tels que la durée de la scolarisation, les allocations d'études, et le soutien apporté aux élèves. Globalement, les estimations indiquées dans le rapport montrent que l'élève moyen serait fortement incité à poursuivre ses études au-delà de l'âge de l'obligation scolaire et elles mettent également en évidence les avantages que cet investissement dans l'éducation procure à la société dans son ensemble. Toutefois, les gains nets sont d'autant plus faibles que l'étudiant est âgé, ce qui tient surtout au fait que les avantages découlant de la formation s'étalent sur une plus courte durée. Enfin, il est signalé dans le document que les élèves fréquentant l'enseignement supérieur appartiennent en général aux classes aisées et qu'ils profitent donc d'importantes subventions publiques alors que les jeunes issus de milieux défavorisés ont moins de chances de suivre des études supérieures et, partant, de bénéficier des subventions publiques.

*Classification JEL :* I21, I22, I28, D63

*Mots-clés :* Capital humain, gains, chômage, impôts, soutien aux élèves, équité

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## INVESTMENT IN HUMAN CAPITAL THROUGH POST-COMPULSORY EDUCATION AND TRAINING

Sveinbjörn Blöndal, Simon Field and Nathalie Girouard<sup>1</sup>

### 1. Introduction and summary

1. Human capital accumulation is an important determinant of individuals' earning capacity and employment prospects, and therefore plays an important role in determining the level and distribution of income in society. Recent OECD work has confirmed the importance of investment in education as a determinant of economic growth<sup>2</sup> and education is also found to be associated with various non-economic benefits.<sup>3</sup> Across countries, there is a broad consensus that some degree of government involvement is needed in the provision of educational services. All OECD countries seek to ensure that all young people enter working life with a minimum amount of human capital acquired during the years of compulsory education. However, governments are also heavily involved in the financing and delivery of post-compulsory education and training where returns may to a larger extent accrue to the individual and where participation is by choice. This element of discretion highlights the importance of incentives, raises certain equity issues and indeed questions about the appropriate role of government in the provision of such education and training.

2. This paper examines various efficiency and equity aspects of post-secondary education and training. Section 2 assesses current incentives for young people to participate in upper-secondary and tertiary education<sup>4</sup> immediately following compulsory schooling and the extent to which these incentives are aligned with the returns to society. The following section addresses the incentives for adults to invest in human capital through formal education and for employers to offer training to their employees. The final section discusses some equity issues related to post-compulsory education and training.

### *Summary of main findings*

3. Section 2 documents the net gains to young individuals from pursuing upper-secondary and tertiary education. Human capital investment in all countries is associated with significant labour-market gains:

- Higher post-tax earnings on average, especially in some of the English-speaking countries, though the distribution of earnings of the better educated tends to be particularly wide.

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1. The authors are indebted to Paul Atkinson, Jørgen Elmeskov, Michael P. Feiner, John P. Martin, Barry McGaw, Mark Pearson, Ignazio Visco, Alan Wagner and Gregory Wurzburg for their extensive comments on earlier drafts of this paper. They are also grateful to Anne Eggimann, Janice Gabela and Anick Lotrous for technical assistance. The views expressed in this paper are those of the authors and are not necessarily shared by the OECD.

2. See Bassanini and Scarpetta (2001) and OECD (2001a).

3. These may include better health and, for many people, enjoyment derived from the process of learning and the exercise of learnt skills independently of monetary rewards. See OECD (2001b) for a review of studies on the non-economic benefits of education.

4. See the Appendix for definitions of upper-secondary and tertiary education.

- Improved employment probability, with unemployment differentials by education levels, notably between lower and upper-secondary education, especially wide in some countries.
- Stronger attachment to the labour market in the form of increased labour force participation.

The opportunity and direct costs for individuals of pursuing post-compulsory education differ across countries and are strongly influenced by policy-related factors:

- Foregone earnings depend on the length of study periods, which at the tertiary level tend to be relatively long in some continental European countries and relatively short in some English-speaking countries.
- Private tuition costs tend to be low at the upper-secondary level in most countries and at the tertiary level in most European countries because of public subsidies, whereas there are sizeable private tuition costs at the tertiary level in many non-European countries.
- Financial support to students in the form of grants and favourable loan arrangements are particularly generous in some English-speaking and Nordic countries.

The net gains due to human capital investment from upper-secondary and tertiary education, as summarised in private internal rates of return, are estimated to vary from 7 to 19 per cent.

4. These private internal rates of return that are available to those who successfully complete upper-secondary and tertiary education programmes suggest that there are strong incentives for the average student to engage in education activity. Indeed, the excess of private returns over estimated social returns suggests that policy is set so as to internalise a substantial part of any externalities that may be associated with post-compulsory education. Furthermore, the large gap between these estimated rates and the risk-free interest rate point to super-normal returns to investment in human capital. This could be interpreted as a signal of temporary excess demand for higher educated workers, with market forces being expected to eventually drive down returns to rates that are similar to those on alternative productive assets -- though this transition might take a long time. Additionally, it is likely to reflect economic rent related to a scarce resource, namely ability and motivation, with the internal rates of return for the marginal student being lower than for the average student. In either case, the authorities could enhance incentives for investment in education, for example, if it were to be possible to reduce the standard length of education programmes without compromising their quality and if they were to increase the generosity of student financial support. The estimated high social rates of return point to the benefits of investment in post-compulsory education for society as a whole.

5. The main findings reported in section 3 concerning incentives for older adults to participate in formal education programmes and for employers to offer training to their adult workers include:

- Incentives to invest in formal education diminish at an increasingly rapid rate as a function of age under existing institutional arrangements. This reflects a shorter period to amortise investment costs as older adults' remaining working life becomes shorter with age and because costs in terms of foregone earnings will tend to be higher as wages increase with experience.
- The limited evidence available suggests that employers benefit from training their employees through higher productivity and profits. However, even if there are various mechanisms that should help to reduce the problem related to the "poaching" of trained workers, the fact that

trained employees appear to be able to appropriate some of the productivity gains through higher wages raises the risk of under-supply of company training.

6. Against the background of the weak financial incentives for older adults to invest in formal education, it would seem inefficient to expand long-lasting adult education programmes. If further adult participation in formal education is to be encouraged, it will be necessary to reduce the cost of such education, *e.g.* by use of special intensive courses for adult workers, and/or increase the benefits, *e.g.* through later withdrawal from the labour market. As for company training, concerns about a chronic lack of supply has prompted governments to offer subsidies to businesses for training their workers, to spend a certain proportion of their wage bill on training and to give employees the right to training. But it is uncertain to what extent such measures have been successful in increasing gainful adult training for individuals and society. By artificially increasing the bonding between employees and employers, strict employment protection legislation could act to stimulate training, but at the risk of undermining the efficient functioning of the labour market.

7. Section 4 raises questions about some equity aspects of post-compulsory education:

- Notwithstanding the expansion of enrolments in tertiary education in recent decades, students in higher education still tend to come from relatively favoured background.
- Financing arrangements in post-compulsory education tend to be regressive. Those not participating in post-compulsory education -- typically people from disadvantaged backgrounds and with modest income prospects -- do not benefit at all from public funding in this area. By contrast, tertiary graduates receive large benefits from government post-compulsory educational spending, even though they are likely to come from relatively well-off families and have high-income prospects. The regressivity in this area tends to reduce the progressivity of the overall tax-transfer system.

8. There are several possible ways in which these equity outcomes can be altered. One important reason why the expansion of post-compulsory education has not significantly improved equality of opportunity could be that compulsory education has not succeeded in sufficiently reducing the link between basic educational attainment and children's parental background. This would point to the importance of interventions at early stages when children's cognitive and non-cognitive abilities are being developed so as to equalise their chances of taking advantage of post-compulsory education. The regressivity of the post-compulsory financing system could be reduced by increasing tuition fees. However, this would reduce the financial gains from investing in tertiary education and might have adverse effects on the access of people from disadvantaged background to higher education. An accompanying expansion of students' access to loans to finance their education could offset such effects, and the experience of countries that have combined an increase in tuition fees and an increase in student loan facilities suggest that there are no significant adverse effects on participation.

## **2. The benefits of post-secondary education for individuals**

9. This section examines the incentives for young individuals to invest in human capital. Benefits associated with education may accrue to individuals in the form of additional earnings, improved employment probability, stronger attachment to the labour market, better health and a range of other non-monetary benefits. The net benefits will also be influenced by policy-related factors such as the length of study periods, student loan and grant arrangements and the design of the tax system. In addition to reviewing the different types of monetary benefits and costs related to human capital investment, the section reports estimates of private and social rates of return as a summary measure of their combined

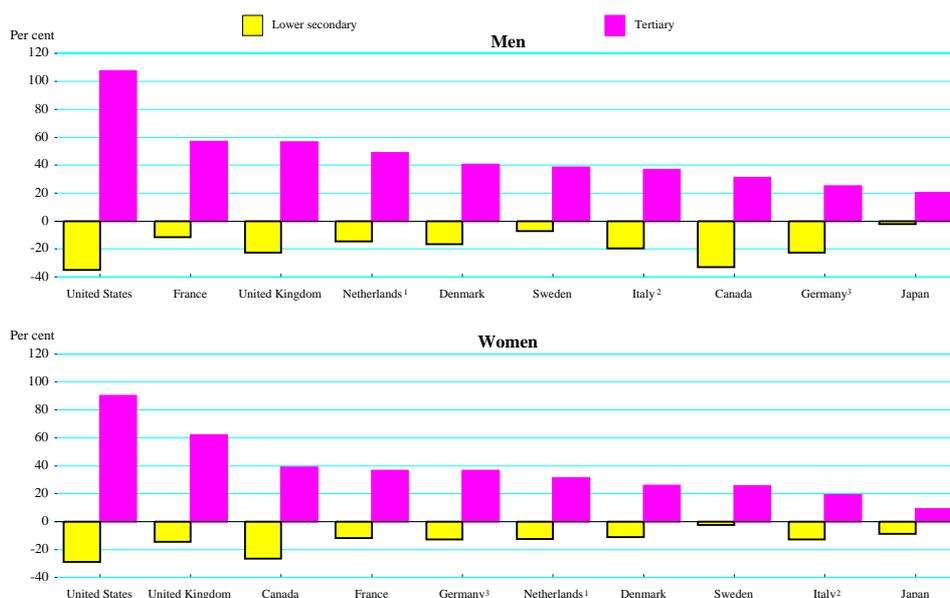
incentive effects. The analysis presented in this paper abstracts from any non-economic benefits, reflecting the difficulty to translate these into monetary values.<sup>5</sup>

## 2.1 Labour market benefits of additional human capital for individuals

### 2.1.1 The education wage premium

10. An important motivation for individuals to invest in education is that the acquired knowledge and skills tend to raise productivity and hence earnings potential. Figure 1 shows that the wage premium earned by tertiary graduates is substantial in all countries considered, and particularly high in the United States, France and the United Kingdom. Investment in upper-secondary education is also associated with significant wage premia over lower-secondary education, especially in the United States and Canada. This wage pattern is broadly the same for both men and women, although education wage premia tend to be somewhat smaller for women. Some research indicates that the distribution of non-wage benefits tend to reinforce rather than offset observed wage differentials by education level.<sup>6</sup>

**Figure 1. Relative earnings of full-time workers by gender and level of educational attainment, 1999/2000**  
Per cent deviation from mean earnings at the upper secondary level



1. 1997.

2. Annual post-tax earnings.

3. 1998.

Note: Countries are ranked in descending order in terms of the tertiary earnings progression. Wage premia are not standardised for different age and seniority compositions of educational groups across countries.

Source: National statistical institutes. See Appendix.

5. The non-monetary benefits of education are reviewed in OECD (2001b).
6. Piece (1997) finds that high-wage jobs in the United States are more likely to have comprehensive benefits (especially employer-provided health insurance, pensions, and paid leave). Moreover, data from the Current Population Survey indicate that changes in the incidence of employer-provided health insurance and pension coverage have exacerbated relative wage changes, with a substantial decline in the relative likelihood of coverage for less-educated workers from 1979 to the mid-1990s.

11. In several countries, the education wage premium has tended to rise since the early 1980s, suggesting that the significant expansion in the relative supply of educated workers (reflecting fast increases in post-compulsory school enrolment) has failed to keep up with an even stronger increase in relative demand.<sup>7</sup> There has been a notable decline in the wage of the lower educated relative to more highly educated workers in the United Kingdom, the United States and to a lesser extent in Canada and Sweden. By contrast, wage relativities by educational level have been stable in Japan, Germany and France.<sup>8</sup>

12. Average wages for broad education groups mask significant dispersion within each group. Indeed, for the two countries depicted in Figure 2, the wage distributions for the three main attainment groups overlap over large ranges, implying that a proportion of individuals receives similar earnings irrespective of their different educational qualifications. The earnings distribution of tertiary-educated persons is particularly wide, reflecting the heterogeneity of tertiary education. For example, art degrees are typically associated with lower earnings than engineering and science degrees. By contrast, the log-normal earnings distribution for those with lower-secondary education only is much more compressed around a low median.

### 2.1.2 *Wage structure by age*

13. Education appears to provide not only an initial earnings advantage but also a wage premium that increases with time spent in the labour market. Figure 3 suggests that in most countries the earnings of tertiary-educated men and women increase more sharply with age than is the case for less-educated workers.<sup>9</sup> The main exception is Japan where all the three educational groups considered above register a decline in earnings towards the end of their careers.<sup>10</sup> The progression of women's earnings towards the end of their working life is somewhat smaller than for men in some countries which could reflect greater barriers for them to advance to higher levels in the job hierarchy (Blau and Kahn, 2000).

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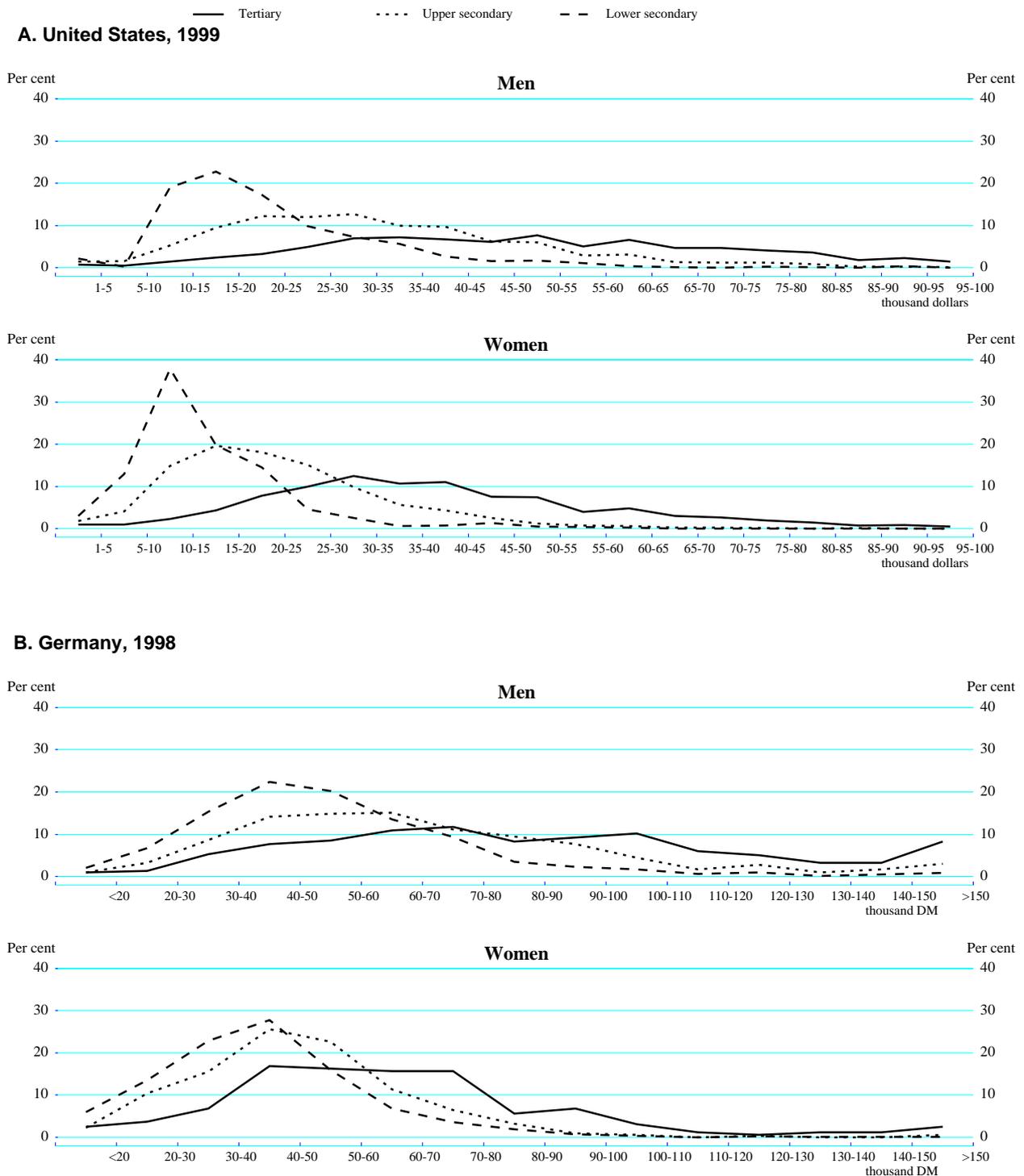
7. Various hypothesis have been advanced for the shifts in relative demand and supply: skill-biased technical change that has increased the relative demand for highly educated and more skilled workers; international trade that has reduced the demand for the less educated in some manufacturing industries (Wood, 1998, and Borjas and Ramsey, 1995); and, in the United States, the declining size of cohorts entering the labour market and increased rate of unskilled immigration (Katz and Murphy, 1992; Borjas *et al.*, 1997). Other hypothesis for the increase in wage premiums in recent decades in the United States and the United Kingdom include the decline in unionisation (and, in the case of the United States, the fall in the real value of the minimum wage), and in Sweden and Italy it has been related to the weakening of centralised wage setting situations.

8. See, for example, Katz and Autor (1999) for an analysis of the changes in the wage structure and earnings of several OECD countries.

9. The age-earnings relationship across birth cohorts is another factor contributing to changes in the wage structure by age, but it has not been taken into account in this study. Moreover, human capital depreciation due to technological change could also influence the wage profile of ageing workers by reducing faster individual's earning capacity over the life cycle (Ramirez, 2001).

10. This pattern reflects the Japanese seniority pay system and the mandatory age of retirement. This arrangement results from the well-known fact that older workers in Japanese firms leave their "career" employer prior to permanent withdrawal from the labour market, transferring to a related company (subsidiary) where earnings are lower. Because the mandatory retirement age from a career job intervenes before the employee becomes eligible for a public pension, there are strong incentives for older workers to continue work at lower wages.

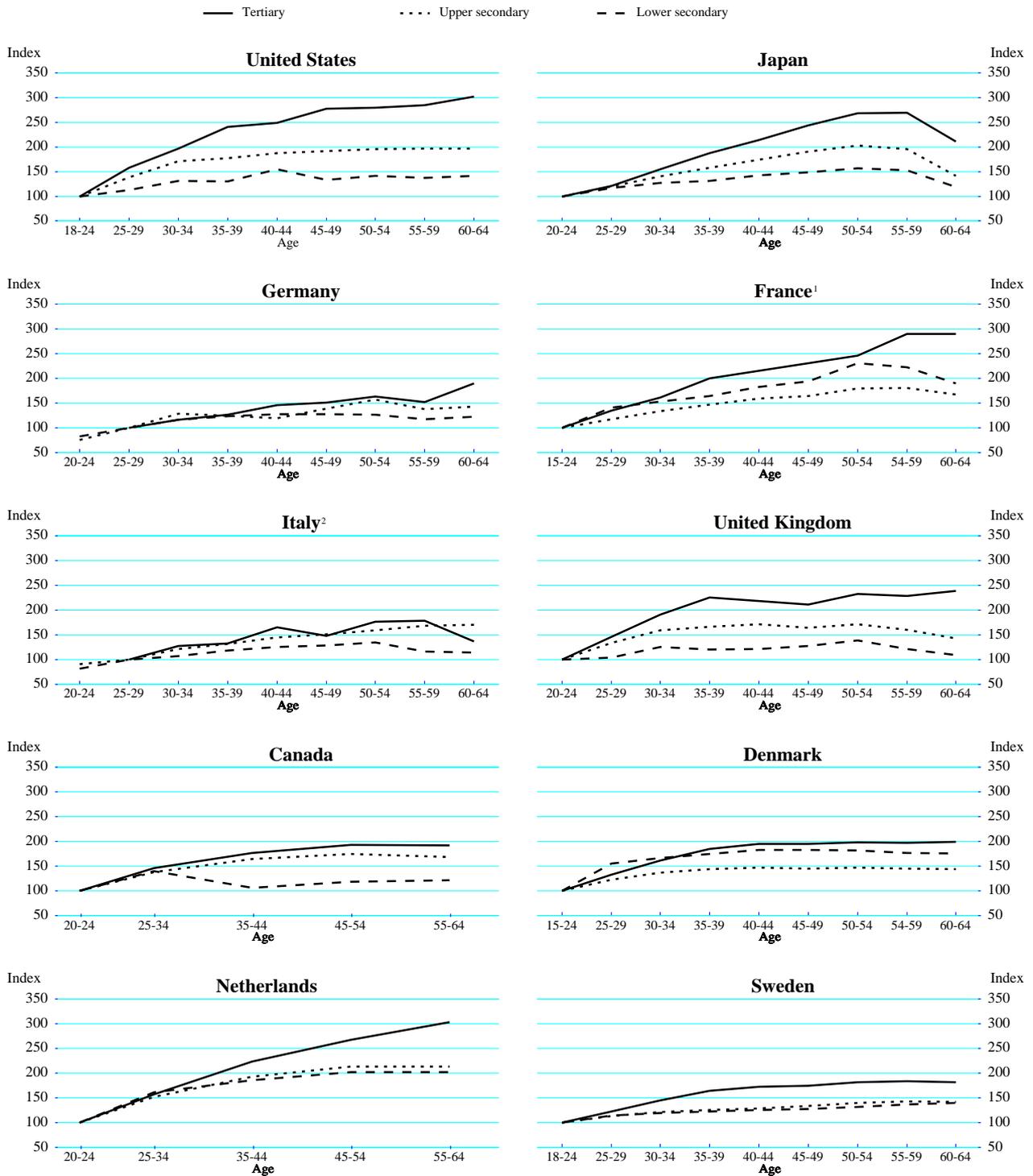
**Figure 2. Distribution of annual earnings of full-time workers in the United States and Germany**



Source: Current Population Survey, Bureau of the Census; German Socio-Economic Panel (unweighted sample).

Figure 3. The structure of earnings by age and gender

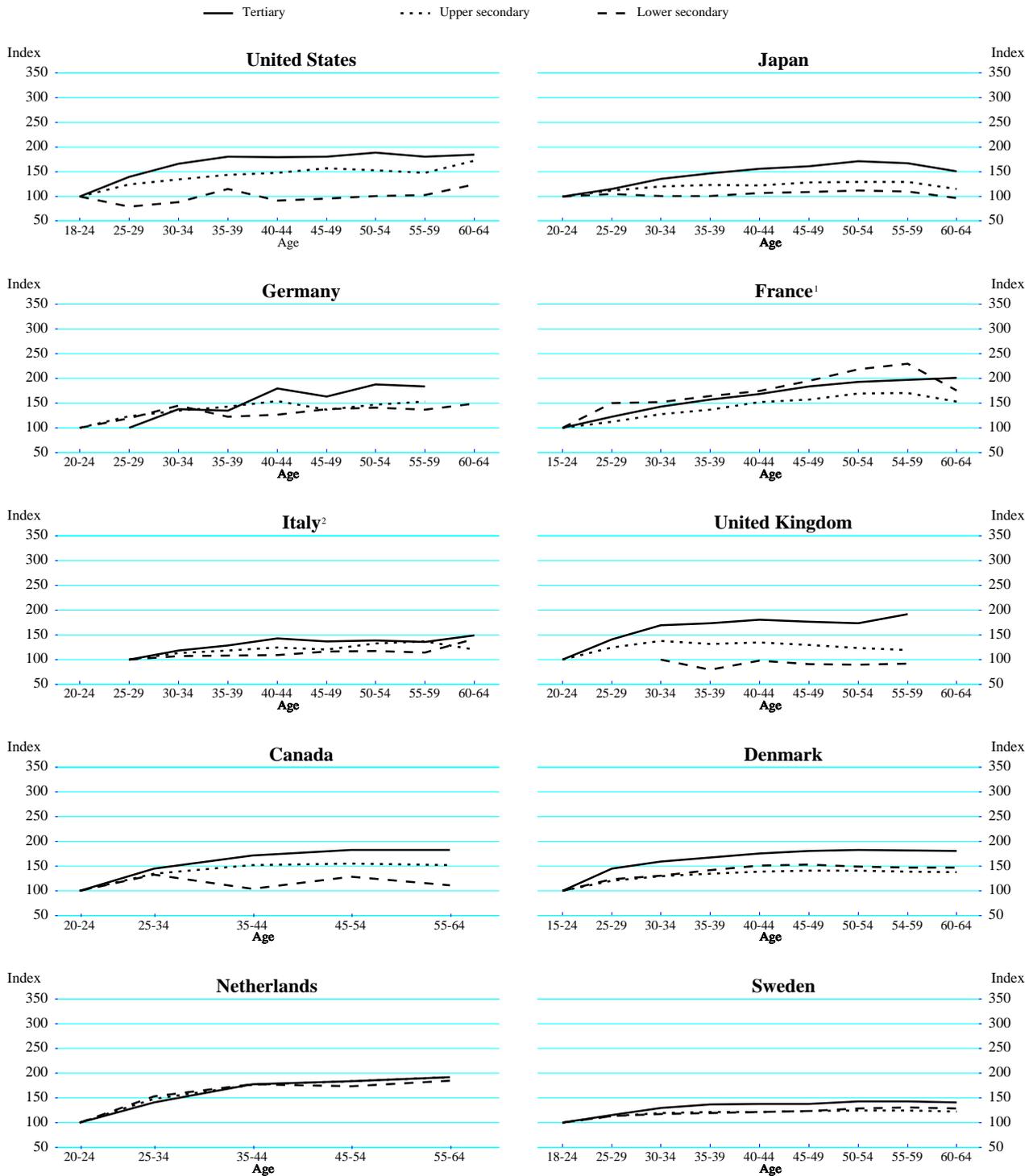
A. Men



1. Median wage.  
 2. After tax.  
 Source: See Appendix.

Figure 3.(continued). The structure of earnings by age and gender

**B. Women**



1. Median wage.  
 2. After tax.  
 Source: See Appendix.

14. Relatively high minimum wages for young people may discourage enrolment in upper-secondary education to the extent they raise the opportunity cost of human capital investment. Several US studies have found evidence of significant enrolment and employment shifts associated with minimum wages changes. An early study by Cunningham (1981) using US state-level panel data found that minimum wages both reduced employment of teenagers and reduced youth school enrolment. Similarly, Card (1992) found that enrolment declined with the 1988 minimum-wage increase in California, relative to other state labour markets that did not experience a minimum-wage increase. Neumark and Wascher (1995a) using US aggregate data indicated that an increase in minimum wages decreased enrolment of teenagers and increased the proportion of teenagers neither enrolled nor employed. Neumark and Wascher (1995b) in another paper using individual-level panel data found that minimum-wage increases induce employers to substitute away from less-skilled teenagers and toward more-skilled teenagers drawn into the labour market. This results in fewer youth remaining in school, while the lowest-skilled teenagers are displaced from their jobs. There are fewer studies on the possible impact of minimum wages on school enrolment in other countries; in some of them (such as the Netherlands), special low minimum wages for youth are likely to limit any possible enrolment effects.

### 2.1.3 *Unemployment risks across different education groups*

15. A further important motive behind acquiring more education is to gain a stronger foothold in the labour market and thus lower the risk of unemployment. The reduction in risk is particularly large for those investing in upper-secondary education, whereas the gap in unemployment rates between upper-secondary and university-educated workers is comparatively small (Figure 4). The difference in unemployment risk across educational categories is notably large for young persons, but it tends to narrow with age.

16. High youth unemployment may also provide a strong incentive for young people to continue their studies beyond the compulsory school-leaving age, as this will tend to reduce the opportunity cost of such activity. Thus, young people (*e.g.* in France, Italy, and Spain) sometimes do not face the choice of being gainfully employed or increasing their human capital, but rather being out of work or in education.<sup>11</sup> The increasing number of youths participating (and staying longer) in education in the 1990s in these and some other countries is partly a natural response to the weak state of the youth labour market.

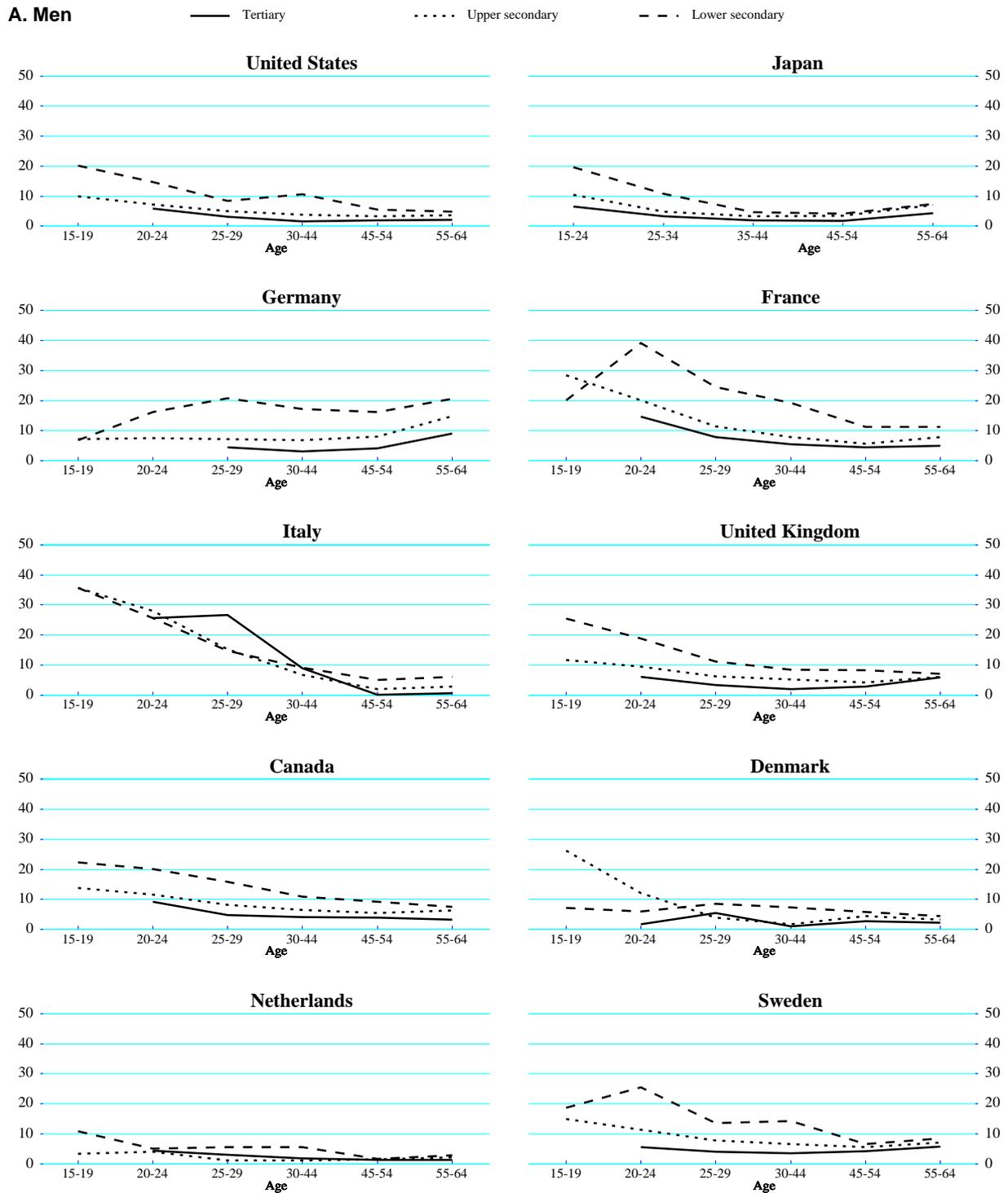
### 2.1.4 *Labour force participation by education*

17. Educated workers are more likely to participate in the labour market, and their active working life is generally longer than that for those with lower educational attainment (Figure 5). With very few exceptions, the participation rate for male graduates of tertiary education is markedly higher than that for upper-secondary graduates. The gaps are even wider between those with and without an upper-secondary qualification. And among women, the differences in labour force participation by level of educational attainment are much wider still. While the education-related effects on male participation in the labour force are strongly influenced by differences among the older population, the educational effects in female labour force participation are relatively wide in all age groups.

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11. However, in some countries, notably the United States and the United Kingdom, young people often combine participation in education and part-time work. Recent studies have suggested that student subsequent employability may be enhanced by part-time work experience (UK Department of Education and Employment, 2000a).

**Figure 4. Unemployment by level of educational attainment, gender and age, 1999**  
*Percentage of labour force*

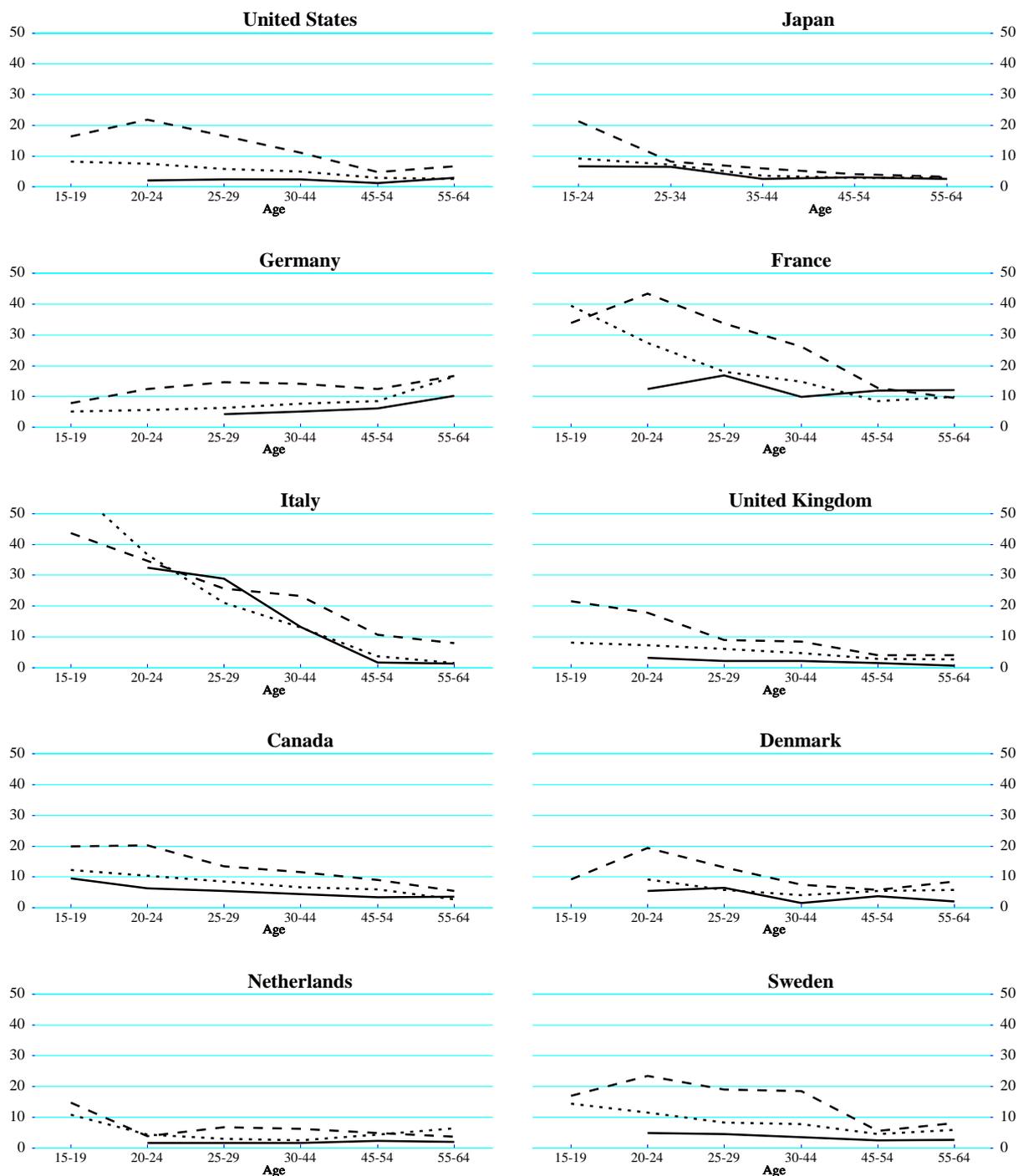


Source: OECD (2001d).

**Figure 4.(continued). Unemployment by level of educational attainment, gender and age, 1999**  
*Percentage of labour force*

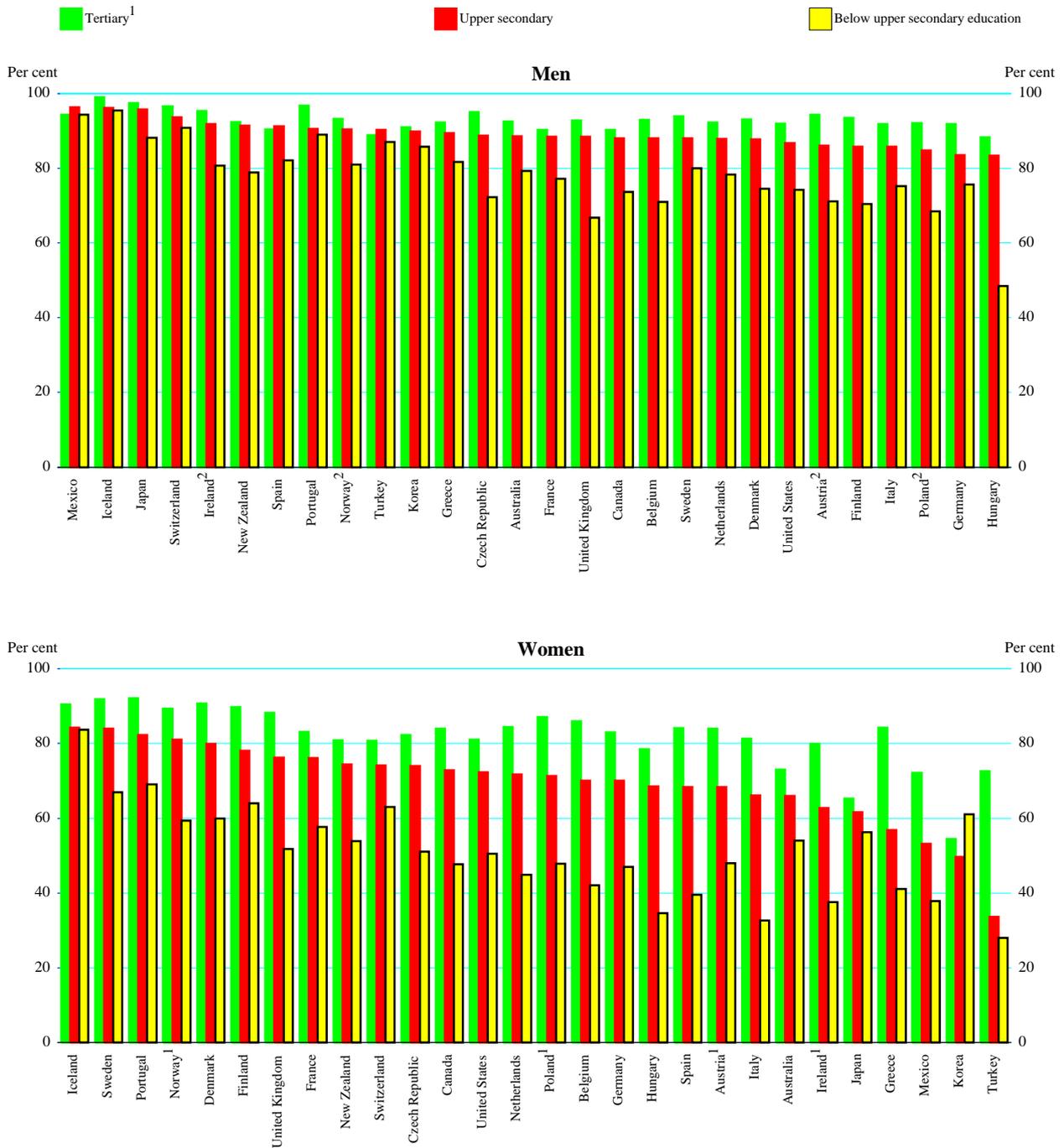
**B. Women**

— Tertiary      ····· Upper secondary      - - - Lower secondary



Source: OECD (2001d).

**Figure 5. Labour force participation rates (1999)**  
for the population 25 to 64 years of age



1. Tertiary type A and advance research programmes.

2. 1998.

Note: Countries are ranked in descending order of the labour force participation rate with upper-secondary educational attainment.

Source: OECD (2004).

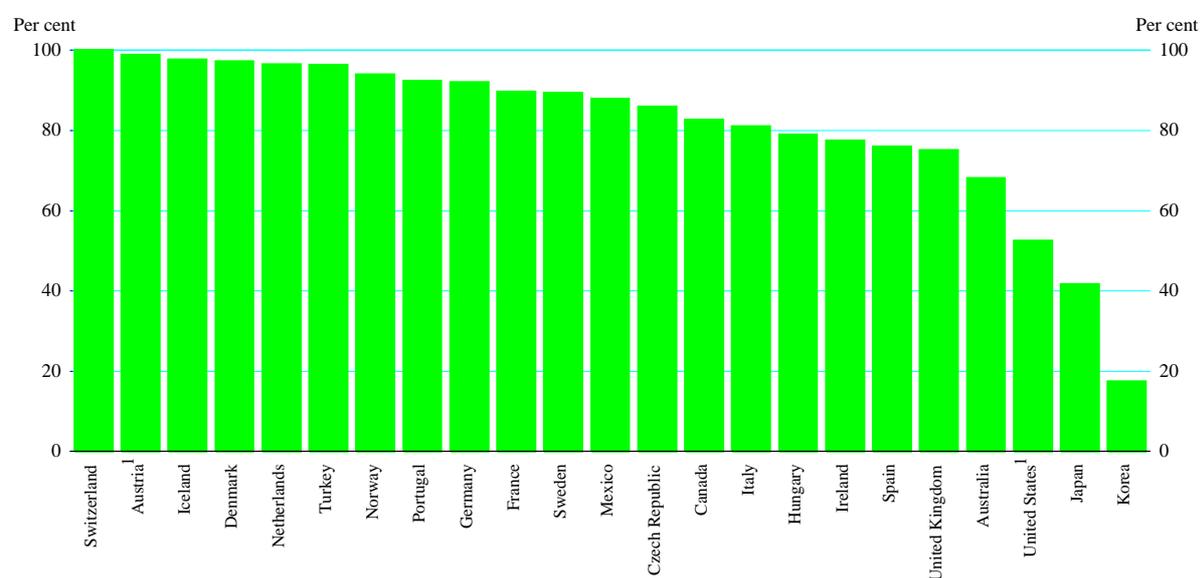
## 2.2 Policy factors affecting the costs and benefits of additional human capital for individuals

18. Most policy levers influencing labour market performance also affect incentives to acquire education, but some policy instruments may have more direct effects. For instance, progressive income taxation reduces the return to human capital investment. Public financial support for education in the form of free or heavily-subsidised tuition increases the incentive to invest in education by lowering the price of investment. Student loans and grants alleviate financing constraints and often involve a significant subsidy element. Finally, the length of study periods influences financial rewards from human capital accumulation.

### 2.2.1 Financing of provision and the length of study periods

19. Public financing of provision has been the traditional means in most countries to encourage post-compulsory education. Although tuition fees have been introduced in some OECD countries for tertiary and upper-secondary education, educational institutions in most Member countries provide their services free at the point of delivery, implying a subsidy rate of 100 per cent. At the upper-secondary level the general academic stream is predominantly funded by government in most countries, while vocationally-oriented programmes are often privately funded. At the tertiary level, the average subsidy rate ranges from 50 per cent or less in Japan, Korea and the United States to close to 100 per cent in some European countries such as Austria, Denmark, Iceland, the Netherlands and Switzerland (Figure 6).<sup>12</sup>

Figure 6. Subsidy rates in tertiary education, 1998



1. Post-secondary non-tertiary is included in tertiary or missing.

Note: Share of direct public expenditure on educational institutions and total public subsidies to households and other private entities (excluding public subsidies for student's living costs) in total sources of funds (private and public) for tertiary education.

Source: OECD (2001d).

12. The subsidy rate includes student grants for tuition but excludes those for living costs.

20. Given their importance in determining the opportunity costs of education, the theoretical or minimum length of study periods is another policy variable that influence the financial rewards from human capital accumulation. Thus, very long study periods will tend to discourage investment in education unless they are associated with equivalently extra gains in productive capacity, and hence earnings potential. Standard upper-secondary education programmes in most OECD countries last for two or three years in principle, and the proportion of students that extend their studies beyond the theoretical length is small. The standard length of tertiary education programmes varies somewhat across the OECD countries, the theoretical length of standard first-degree tertiary education programmes varies from three to five or more years across OECD countries (Table 1).<sup>13</sup> Countries with relatively short first-degree programmes include France and the United Kingdom, while long programmes are standard in Germany and Austria. In a few countries (*e.g.* Germany and Austria, and to a lesser extent the Netherlands and Switzerland), there is a large gap between the theoretical and typical length of first-degree tertiary programmes.

Table 1. **The length of standard first-degree tertiary education (years)**

	Theoretical length	Typical length
Australia	3	3
Austria	5	7
Belgium (Flanders)	4-7	4-7
Canada	4	5
Czech Republic	3-4	3
Denmark	3	3
Finland	3	3-4
France	3	3-4
Germany	5	6.5
Greece	4-6	4-6
Hungary	5	5
Iceland	3	3-4
Ireland	3-4	4
Italy	4-6	4-6
Japan	4	
Korea	4	4
Mexico	4-5	4-5
Netherlands	4	5-6
New Zealand	3	3
Norway	4	4
Portugal	4-6	4-6
Spain	4-6	4-6
Sweden	3-4	
Switzerland	4	5-6
United Kingdom	3-4	4
United States	4	5

*Note:* The theoretical duration of a programme may not accurately reflect the amount of time that the typical student studying full-time should take to complete the programme in some countries. This is particularly the case where the theoretical duration has a legal basis (*e.g.* it is tied to the amount of time during which a student receives a subsidy) rather than a credit or course hour requirement.

*Source:* OECD (1999b).

13. In the internal rate-of-return calculations that are reported in Section 2.3, the theoretical length of tertiary education is a weighted average of the theoretical lengths of first and advanced degrees (*e.g.* master and professional degrees).

### 2.2.2 Student loans and grants

21. Most OECD countries have also sought to support educational activity by offering financial assistance to individuals during their tertiary studies. Indeed, in the absence of government intervention, investment in human capital is difficult to finance with loans for persons without collateral. Such financial support is generally limited to tertiary education, but some countries, such as the United Kingdom, Sweden, Denmark and Canada, have also made assistance available to students at the upper-secondary level under certain circumstances. Private foundations in some countries also offer financial assistance to students as a condition for being tax-exempt. As documented in OECD (2000), student loan and grant arrangements differ significantly across countries in terms of the extent of income and asset testing of both students and their parents, the amount of financial assistance, and the interest rate and repayment schedules of loans.

22. As a gauge of the overall subsidy element involved in the various schemes for tertiary students, Table 2 reports the net present value (NPV) of future streams of grants, loans and the associated repayments for an individual coming from a family with average earnings at the start of his or her tertiary studies. As a proportion of the NPV of the overall cost involved with the studies (*i.e.* lost earnings and tuition fees), the NPV of the grants and loans varies significantly across the countries reviewed. The implied subsidy rate is over 20 per cent in the Netherlands, Germany, Denmark and the United Kingdom while it is around 10 per cent or less in Japan and France. These rates could, however, be biased downwards as the interest rate employed to discount future flows is set equal to the mortgage interest rate, the interest-rate-related subsidies implicit in loans thus being the spread *vis-à-vis* mortgage rates.<sup>14</sup> Since future earning streams cannot be used as a collateral for student loans, market interest rates for such loans if they are available at all would most likely include a significant premium over mortgage rates.<sup>15</sup>

Table 2. **Maximum loans and grants for first-degree tertiary students**

	Net present value of future streams of grants, loans and repayments as a percentage of net present value of overall cost involved with the studies <sup>1</sup> at the start of first-degree study	Loans and grants as a percentage of overall cost involved with the studies <sup>1</sup> in the penultimate year of first-degree study
United States	15.0	33.0
Japan	7.7	53.4
Germany	24.9	30.8
France	9.9	9.9
Italy	n.a.	n.a.
United Kingdom	22.3	47.3
Canada	18.2	23.2
Denmark	24.3	33.0
Netherlands	29.6	39.6
Sweden	17.5	32.3

*Note:* The figures refer to students whose both parents earn average production worker wages. The students are assumed to be dependent, not have any earnings of their own and take the maximum amount of support available. For the calculation of the net present value of future streams of grants, loans and the associated repayments, the mortgage interest rate is used as a discount rate.

1. The overall cost of studies is defined as the lost earnings plus the tuition fees.

*Source:* National sources.

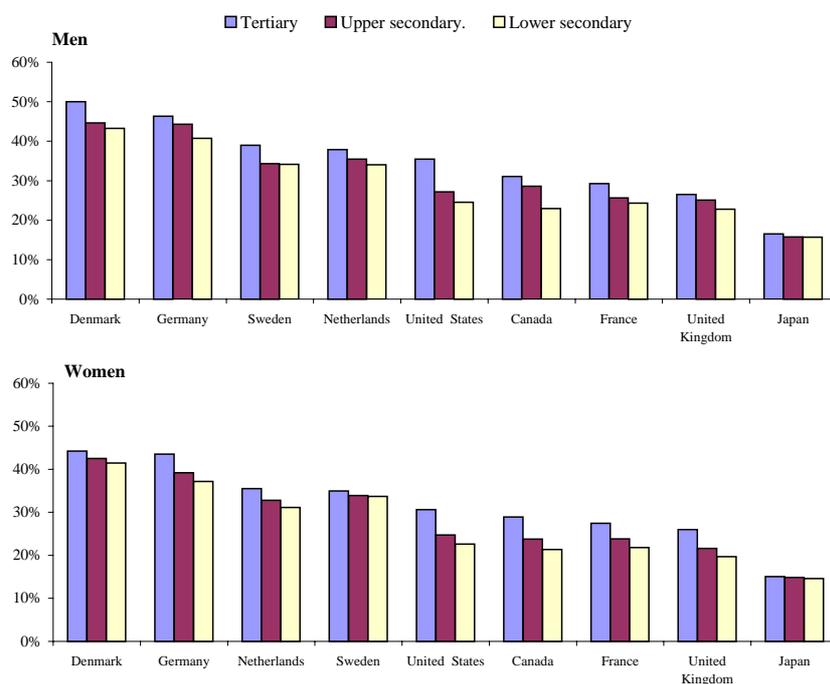
14. For instance, a rise in the discount rate by one percentage point translates into an increase in the subsidy rate of ½ percentage point for Canada and of ¾ percentage point for the Netherlands.
15. There could also be a bias upwards as this study assumes that the family has the Average Production Worker (APW) earnings. But, given the social origins of students in tertiary education, most come from families with two earners and often earnings well above APW levels, which affects their loan entitlement.

23. To the extent that students or their families face liquidity constraints in financing their tertiary education, the amount of loans, irrespective of repayment terms, and grants made available to them, could be a more relevant incentive mechanism than the implicit subsidy rate. There is, in principle, no relationship between the financial resources that can be made available and the NPV of grants and loans. For example, student loans granted on market terms have a zero NPV by definition, irrespective of how large they are. The example of Japan shows that it is possible to combine low subsidy rates and high loan amounts, the maximum annual loan entitlement being close to a half of the opportunity cost of lost earnings plus fees. The “replacement ratio” is similarly very high in the United Kingdom and in the Netherlands; it ranges from a tenth to a third in the other countries.

### 2.2.3 The tax system

24. A progressive income tax system implies a tax on human capital and will thus work to discourage education activity.<sup>16</sup> By taxing the earnings of the better-educated at a higher rate than applied to the earnings of the less-educated, the post-tax earnings differential is narrowed and the gains from human capital investment lowered. Among the countries depicted in Figure 7, the gap between the average tax rate on the earnings of upper-secondary and tertiary graduates is particularly large in the United States due to large earnings differential. By contrast, earned income of lower, upper-secondary and university-educated workers are taxed at a similar rate in Japan.

Figure 7. Average tax rate<sup>1</sup> by educational groups, 1999



1. Taxes include personal income taxes and social security contributions paid by employees; they correspond to earnings of 15-64 years old.

Note: Countries are ranked in descending order of the average tax rate for tertiary education.

Source: OECD.

16. With a proportional tax regime, changes in the level of the tax will have no effect on human capital accumulation. Increases in the tax rate reduce the earnings by the same proportion as they reduce the costs; so the return should not be much affected by the rate.

## 2.3 *Internal rates of return to education*

### 2.3.1 *Private internal rates of return to invest in education*

25. The overall incentives to invest in human capital that are embedded in the labour market benefits, financing and tax arrangements discussed above can be summarised in estimates of the private internal rates of return (Table 3).<sup>17</sup> The internal rate is equal to the discount rate that equalises the real costs of education during the period of study to the real gains from education thereafter (see Box 1 for a discussion of methodological issues). In its comprehensive form, the costs equal tuition fees, foregone earnings net of taxes adjusted for the probability of being in employment minus the resources made available to students in the form of grants and loans. The benefits are the gains in post-tax earnings adjusted for higher employment probability minus the repayment, if any, of public support during the period of study. The calculations assume that the student is full-time in education<sup>18</sup> and has no work activity, and hence no earnings while studying. The calculated rates of return are, however, likely to be biased upwards as unemployment, retirement and early retirement benefits are not taken into account.<sup>19</sup> The bias could potentially be large, as unemployment benefits typically have a progressive structure and low-skilled workers usually have higher replacement rates than their more-skilled counterparts. However, Brunello (2001) suggests that the inclusion of the unemployment risk may exaggerate the impact of unemployment on the financial rewards on education because unemployment may have more detrimental effects on subsequent earnings of those with higher education. Another source of upward bias in the calculated rates of return is that the probability of course drop-out has not been taken into account, implying that the reported internal rates are conditional on successful completion of the relevant education programmes. The rate-of-return calculations reported below abstract completely from any non-monetary benefits of education.

- 
17. An alternative way to assess the rate of return to education is to include measures of human capital in standard earnings regressions based on micro-data. The measures could be the number of years spent in education or binary dummy variables for the highest level of educational attainment. Under simplifying assumptions (notably the absence of tuition fees and student financial support), the coefficients on years spent in education should be approximately equal to the private internal rate of return (see Harmon *et al.*, 2001). However, the coefficients on the binary dummy variables will differ from the internal rates because the regression specification captures neither the private opportunity and direct costs related to education nor the impact of student loans and grants. In general, the direct derivation of the internal rate of return allows for better treatment of education costs, but regression-based measures can better control for the various factors other than educational attainment that influence earnings.
18. In many countries, young people combine study with part-time work. If the opportunity cost of foregone leisure is equivalent to foregone earnings, the rate of return is not affected by such arrangements. If, on the other hand, the opportunity cost of leisure is assumed to be less than lost earnings, the internal rates of return in Table 3 would be understated in such circumstances.
19. Indeed, calculation of the estimated rates of return implicitly assume a replacement ratio for unemployment benefits equal to 0 per cent. Should the unemployment benefits cover 50 per cent of the lost earnings, the estimated impact of the unemployment risk on the rate of return would be cut at least by half.

**Box 1. The calculation of private internal rates of return**

The internal rate of return in real terms is the discount rate ( $\delta$ ) that equalises the future flows of real benefits ( $B$ ) and real costs ( $C$ ) associated with investment in upper-secondary ( $s$ ) or tertiary ( $u$ ) education, *i.e.*

$$\sum_{t=a}^{a+l} (1 + \delta)^{-(t-a)} \times C^{s,u}(t) = \sum_{t=a+l+1}^{64} (1 + \delta)^{-(t-a)} \times B^{s,u}(t)$$

where  $t$  is age,  $a$  is the typical age at the start of upper-secondary (tertiary) education and  $l$  is the theoretical length of upper-secondary (tertiary) education. The benefits are assumed to last until the age of 64.

The costs of tertiary education are defined as

$$C^u(t) = [1 - \tau(E^s(t))] \times [1 - ur^s(t)] \times E^s(t) \times (1 + g)^{(t-a)} + F^u(t) \times (1 + g)^{(t-a)} - S(t)$$

where  $\tau$  is the average tax rate for base-year earnings of a single person with upper-secondary education at age  $t$  ( $E^s(t)$ ),  $ur^s(t)$  is the unemployment rate for people with upper-secondary education at age  $t$ ,  $g$  is the growth rate of labour productivity in the economy as a whole,  $F^u(t)$  is the annual private cost of tertiary education, and  $S(t)$  is student grants and loans at age  $t$ . The scaling factor at the end of the first term of the right-hand side of the equation is there to obtain future earnings by the scaling up of base-year earnings with the productivity growth rate for the economy as a whole. The costs of upper-secondary education are similarly defined.

The benefits of tertiary education are defined as

$$B(t) = (1 - \tau(E^u(t))) \times (1 - ur^u) \times E^u(t) \times (1 + g)^{(t-a)} \\ - (1 - \tau(E^s(t))) \times (1 - ur^s) \times E^s(t) \times (1 + g)^{(t-a)} - R(t)$$

where  $R(t)$  is the repayment of loans, if any. According to this equation, the benefits are equal to the difference between post-tax earnings adjusted for unemployment risk for tertiary and upper-secondary educated persons minus the repayment of student support. The benefits of upper-secondary education are similarly defined.

These estimations have several important limitations. They assume stability in the wage premia through the life cycle and are based on average earnings and costs. In practice, there can be considerable variation in rates of return for different fields of study or particular social groups. The rate-of-return calculations do not incorporate unemployment benefits or other social and personal benefits. Differences in retirement incomes for different educational groups are not included in the estimates and they do not take into account broader social benefits flowing from investment in education such as better health or lower crime. Finally, there are no private tuition costs included in upper-secondary education.

Table 3. Private internal rates of return to education, 1999-2000

Per cent											
A. Men											
	United States	Japan	Germany	France	Italy <sup>a</sup>	United Kingdom	Canada	Denmark	Netherlands <sup>b</sup>	Sweden	Unweighted average
<b>Tertiary education</b>											
Return based on pre-tax earnings and the length of studies (narrow rate)	18.9	8.0	7.1	13.3	8.0 <sup>d</sup>	18.1	8.4	7.9	11.7	9.4	11.4 <sup>c</sup>
<i>Impact of (in percentage points)</i>											
Taxes	-2.3	-0.3	-1.5	-1.6	..	-2.1	-0.5	-2.1	-2.0	-1.5	-1.5
Unemployment risk	0.9	0.9	1.1	2.4	0.3	1.6	1.3	1.0	0.0	1.2	1.1
Tuition fees	-4.7	-2.0	-0.3	-1.1	-0.8	-2.7	-2.3	-0.1	-0.6	-0.7	-1.5
Public student support	2.1	1.3	2.7	1.3	0.0	3.6	1.8	4.8	2.9	3.0	2.4
<b>Comprehensive rate</b>	<b>14.9</b>	<b>7.9</b>	<b>9.1</b>	<b>14.3</b>	<b>7.5</b>	<b>18.5</b>	<b>8.7</b>	<b>11.5</b>	<b>12.1</b>	<b>11.4</b>	<b>11.6</b>
<b>Upper-secondary education</b>											
Return based on pre-tax earnings and the length of studies (narrow rate)	14.4	4.4	10.0	7.5	9.5 <sup>d</sup>	12.4	11.9	11.3	6.9	3.9	9.2 <sup>c</sup>
<i>Impact of (in percentage points)</i>											
Taxes	-0.9	-0.2	-2.1	-1.0	..	-1.5	-1.6	-2.2	-0.2	-0.6	-1.1
Unemployment risk	2.9	2.6	2.9	7.0	1.7	4.2	3.6	2.2	1.2	3.1	3.1
<b>Comprehensive rate</b>	<b>16.4</b>	<b>6.8</b>	<b>10.8</b>	<b>13.5</b>	<b>11.2</b>	<b>15.1</b>	<b>13.6</b>	<b>11.3</b>	<b>7.9</b>	<b>6.4</b>	<b>11.3</b>
<b>B. Women</b>											
	United States	Japan	Germany	France		United Kingdom	Canada	Denmark	Netherlands <sup>b</sup>	Sweden	Unweighted average
<b>Tertiary education</b>											
Return based on pre-tax earnings and the length of studies (narrow rate)	18.8	8.0	7.0	12.1		16.4	10.6	6.0	9.4	7.4	10.6
<i>Impact of (in percentage points)</i>											
Taxes	-2.0	-0.2	-1.6	-1.7		-2.3	-1.3	-1.1	-1.0	-0.7	-1.3
Unemployment risk	1.4	0.5	0.6	4.8		1.3	1.2	0.7	0.7	1.6	1.4
Tuition fees	-6.0	-2.4	-0.6	-1.7		-2.5	-2.9	-0.1	-0.7	-0.8	-2.0
Public student support	2.7	1.3	3.0	1.9		3.2	2.4	5.6	4.1	3.3	3.1
<b>Comprehensive rate</b>	<b>14.7</b>	<b>7.2</b>	<b>8.4</b>	<b>15.4</b>		<b>16.1</b>	<b>9.9</b>	<b>11.1</b>	<b>12.5</b>	<b>10.8</b>	<b>11.8</b>
<b>Upper-secondary education</b>											
Return based on pre-tax earnings and the length of studies (narrow rate)	10.6	6.6	6.1	10.5		..	10.8	8.3	7.9	..	8.7
<i>Impact of (in percentage points)</i>											
Taxes	-1.3	-0.2	-1.7	-0.7		..	-1.2	-1.4	-1.6	..	-1.2
Unemployment risk	2.5	3.0	2.6	8.1		..	3.1	3.6	2.1	..	3.6
<b>Comprehensive rate</b>	<b>11.8</b>	<b>9.4</b>	<b>7.0</b>	<b>17.9</b>		<b>..</b>	<b>12.7</b>	<b>10.5</b>	<b>8.4</b>	<b>..</b>	<b>11.1</b>

*Note:* The rates of return to tertiary education are calculated by comparing the benefits and costs with those of upper-secondary education. In the case of rates of return to upper-secondary education, the calculation compares the benefits and costs with those of lower-secondary education. In Sweden, the theoretical length of standard tertiary courses is used in the calculations rather than the average theoretical length of different programmes. Moreover, earnings differentials for women between upper and lower-secondary levels are not large enough to permit a positive rate-of-return calculation. In the United Kingdom, data on earnings of women up to age 30 with lower-secondary education were not available. In Italy, reliable data on earnings for women were not available.

a) 1998.

b) 1997.

c) Excluding Italy.

d) Post-tax earnings.

Source: See Box 1 and Appendix.

26. The estimated private real internal rates of return to upper-secondary and university education differ significantly across the countries listed in Table 3 but are in all cases higher than the real interest rate or the rate of return on other productive assets, suggesting that human capital investment is an attractive way for the average person to build up wealth.<sup>20</sup> For tertiary studies, three groups of countries can be identified depending on the estimated values of the “comprehensive” internal rate. Firstly, with its very high rewards from tertiary education, the United Kingdom is in a group of its own. Second, the United States, France, Denmark, the Netherlands and Sweden are characterised by relatively high internal rates of return, ranging from 11 to 15 per cent. Third, in the remaining countries rates are below 10 per cent, with the lowest rates recorded for Italy and Japan. For upper-secondary education, the internal rate is calculated to exceed 10 per cent in all countries listed in Table 3 with the exceptions of Japan, the Netherlands, Sweden and Germany (women). At the tertiary level, the gender differential in rates of return calculations is very limited in most countries. However, at the upper-secondary level, gender differences are more marked in Germany and in the United States with returns cut by a quarter to a third for women, due to relatively narrow earnings differentials. Reflecting somewhat different data sources and methodology, these estimates differ in some cases from earlier OECD estimates of internal rates of return.<sup>21</sup> The estimates reported in Table 3 are broadly in line with the results of empirical studies that derive rates of return from earnings regressions (*e.g.* Card, 1999 and 2000; O’Donoghue, 1999; and Barceinas-Paredes *et al.*, 2000).

27. As can be seen from Table 3, earnings differentials and the length of education are generally the prime determinants of the private internal rates of return. Thus, countries with strong overall incentives to invest in human capital are typically characterised by high education-earnings differentials and/or relatively short education programmes, and *vice versa*. The influence of other factors (elaborated below) does, however, generate notable exceptions to this general pattern. Thus, despite narrow wage differentials and long study periods, Denmark and Sweden offer comparatively strong incentives to acquire university education. And France has strong incentives for young people to invest in upper-secondary education despite relatively small wage gains compared to the length of such education.

28. The contribution of the other factors can be evaluated by adding them successively to the estimate of the “narrow” rate of derived from only pre-tax earnings and study length:<sup>22</sup>

- *Taxes* reduce the narrow rate by 1½ percentage points on average for tertiary education and 1 percentage point for upper-secondary education in the countries under review. At the tertiary level, the impact of taxes is particularly strong in the United Kingdom, Denmark, the United States and the Netherlands. At the upper-secondary level, the depressing effect of the tax system is most notable in Germany, due to the strong degree of progressivity of the tax system over the relevant earning range, and in Denmark, while it is the smallest in Japan.
- *Unemployment* risk increases the internal rate of return for upper-secondary education, the effect, averaging more than 3 percentage points for the countries under review.<sup>23</sup> The

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20. The existence of non-economic benefits would reinforce this argument as, if quantified, they would raise further the calculated rates of return.

21. For earlier OECD estimates of internal rates of return, see OECD (1997*b* and 1998). The previous OECD exercise from 1998 involved the collection of information via country representatives through a questionnaire. The current exercise is based directly on data sets for each country available to the OECD.

22. This implies that the impact of the other factors is conditional on the earnings gains and the length of education.

23. The inclusion of unemployment benefits in the rate-of-return calculation would lower the impact of the unemployment risk. As replacement rates move towards 100 per cent, the impact of the unemployment risk would go to zero.

relatively high unemployment differential in France adds as much as 7 to 8 percentage points to the internal rate of return. For tertiary education, the differential unemployment risks have much less effect on the rates of return, adding on average 1 to 1.5 percentage point for men and women, respectively, in the countries included in Table 3.

- *Tuition fees* reduce significantly rates of return to tertiary education in the United States, and, to a lesser extent, in the United Kingdom and Canada. In the continental European countries, the impact is significantly smaller due to the much lower level of tuition fees.
- *Public student grant and loan arrangements* at the tertiary level give a significant boost to incentives, adding on average 2½ to 3 percentage points in the countries under review, compared with rates of returns excluding such support. The impact is particularly strong in Denmark, while it is weak in Japan and France, and absent in Italy.

29. Because wage differentials are likely to respond to policy, the contributions of taxes, school fees and student support presented in Table 3 may overstate the importance of these factors in determining internal rates of return to education. Indeed, in the long run the workings of market forces may imply that policy variables have modest effects on the rewards from human capital investment, wage differentials adjusting to align returns to human capital to those for other productive assets.<sup>24</sup> Thus, an increase in school fees may in the long run show up in lower supply of human capital (see Box 2) and a correspondingly increased education wage premia, with small, if any, effects on the rates of return. Similarly, an increase in student support could result in higher supply of human capital and a compensating reduction in education wage premia.

30. However, since the supply of human capital is not elastic in the short run, policy variables may have powerful effects on rates of return to education for some time. An increase in school fees will therefore tend to depress the rate of return to education during the period in which supply has not fully adjusted, and higher student support and shorter education periods will have the opposite effects. The adjustment period may be protracted. With market incentives mostly acting on the investment decisions of young people, the supply response will depend in part on the size of the youth cohort and it may take several “vintages” of young people, and hence a long time, before supply changes shift the education wage premia significantly.

31. Of the policy variables discussed above, the length of education appears to have a particularly powerful influence in shaping the internal rate of return in the short run. Thus, the calculated high rates of return to tertiary education in the United Kingdom and France are to an important extent due to relatively short standard university studies, whereas the low rates of return in Germany are strongly influenced by comparatively long study periods. Indeed, if the average length of tertiary studies were to be shortened by one year without compromising quality, the internal rate of return for men in the countries under review would increase by 1 to 5 percentage points, if all other factors are held constant. To put such a hypothetical shortening of tertiary studies into perspective, it should be noted that to achieve the same increase via wider wage differentiation would require an increase in the tertiary wage premium by 5 to 14 percentage points.

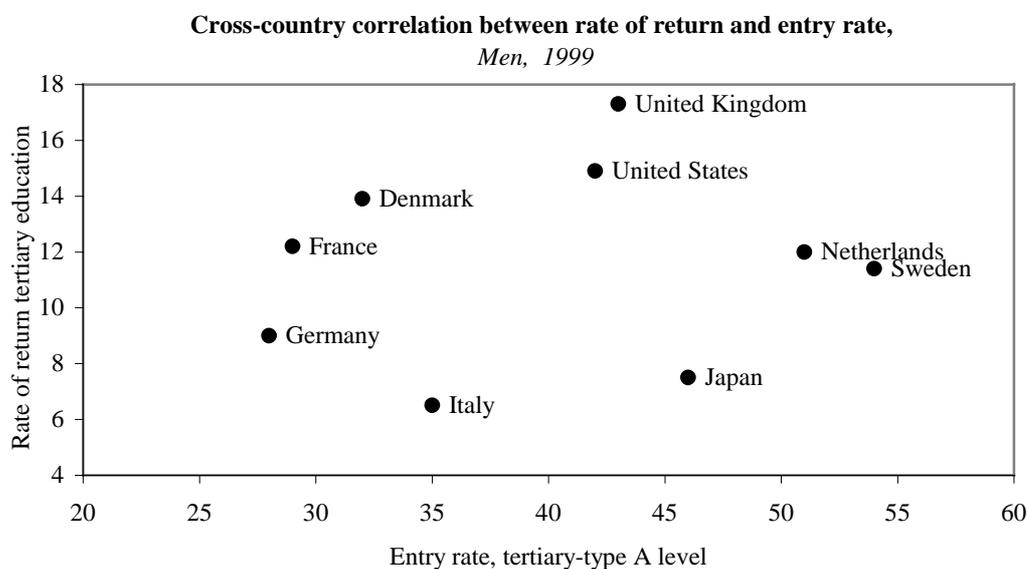
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24. It should be noted, however, that wage relativities also reflect other things than market forces.

### Box 2. Returns to education and enrolment in tertiary education

Schooling could be considered as an optimising investment decision based on future benefits and on the total costs of education. More education is a worthwhile investment for individuals if the private internal rate of return is greater than the market rate of interest plus a risk premium. There should accordingly be a positive correlation between private internal rates of return and enrolment in tertiary education.

Indeed, as depicted in the figure below, there is some tendency for individuals to undertake tertiary education if the return to such education is high. In the United States and in the United Kingdom, high entry rates at tertiary level are associated with a higher rate of return. In Germany and to a lesser extent in France, a lower entry rate is correlated with a lower rate of return. However, the sample of countries is very small and the bivariate correlation is not strong, and high entry rates are sometimes associated with low internal rates of return.



*Note:* The entry rate represents the proportion of a synthetic age-cohort who enter the tertiary level of education irrespective of changes in the population size and differences between countries in the typical entry age.

The decision of students to enrol in tertiary education has been widely examined in the literature.<sup>1</sup> Some studies have focused on the elasticity of demand for education with respect to earnings while others have concentrated on rates of return to education. The empirical findings reveal significant and high elasticity responses to wages and rates of return. The estimated elasticity of enrolment to earnings in the United States was reported between  $\frac{1}{2}$  and  $2\frac{1}{2}$  in Tinbergen (1974), at  $1\frac{3}{4}$  in Freeman and Hansen (1982) and at about 2 in Willis and Rosen (1979). Using rates of return, Mattila (1982) and Rouse (1994) estimated analogous results for the United States with supply elasticities ranging between 1 and 5. In the United Kingdom, estimates of the supply response for educated labour ranged between  $\frac{3}{4}$  in Dolphin (1981) and  $1\frac{1}{4}$  in Pissarides (1982).

1. For a survey of research on the demand for education, see R. B. Freeman (1986). See also Fredricksson (1997) for a Swedish review. The sensitivity of enrolment yields to changes in cost has been analysed by McPherson and Schapiro (1991) See Sakellaris and Spilimbergo (2000) for a study of the effect of economic fluctuations on investment in higher education for a wide range of countries.

### 2.3.2 *Social rates of return of investment in education*

32. The benefits to society of additional education should be assessed on the basis of social rates of return. The social internal rate of return needs to reflect the costs and benefits to society of investment in education, and these can differ significantly from private costs and benefits. The social cost includes the opportunity cost of having people not participating in the production of output and the full cost of providing education rather than only the cost borne by the individual. The social benefit includes the increased economy-wide productivity associated with the investment in education and a host of possible non-economic benefits, such as lower crime, better health, more social cohesion and more informed and effective citizens.<sup>25</sup> While data on social costs are available for most OECD countries, information about the full range of social benefits is less readily available. For example, the possibility of growth externalities associated with education suggests that the observed earnings differentials might not fully account for the economy-wide efficiency gains even if such externalities may be relatively smaller at the post-compulsory level of education. On the other hand, studies suggest that a (small) part of the wage premium received by better educated individuals is due to the fact that educational attainments signal their inherent abilities to employers, rather than their higher productivity arising from investment in human capital.<sup>26</sup> And while the non-economic benefits of education are found to be important,<sup>27</sup> it is often difficult to translate these into monetary values for inclusion in rate-of-return calculations.

33. In view of the difficulty in constructing comprehensive social rates of return, Table 4 presents estimates of a “narrow” definition that abstracts from any externality effects, non-economic benefits and assumes that all wage gains from education represent associated gains in productivity (see Box 3). To the extent that there are sizeable positive externalities related to human capital investment by the average student, these estimates will thus be biased downwards. Primarily reflecting that the social cost of education is higher than the private cost, the social internal rates of return are generally significantly lower than the private internal rates of return. Even so, social internal rates of return are typically well above 5 per cent in real terms for both upper-secondary and tertiary education. Although these rates are conditional on the absence of educational failure and, thus, may overstate ex ante returns, they suggest that investment in education may often be a productive use of public funds. The estimates suggest that the social internal rate of return is particularly high at both the upper-secondary and tertiary levels in the United States and the United Kingdom while it is the lowest in Japan at both of these education levels. In France, it is small for upper-secondary education but comparatively high at the tertiary level.

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25. See OECD (2001*b*) for a review of studies measuring the social benefits of education.

26. The signalling role of education is analysed in Bedard (2001) for the United States and in Harmon and Walker (2001) for the United Kingdom.

27. See *e.g.* OECD (2001*b*).

Table 4. **Narrow estimates of social rates of return to education, 1999-2000**  
Per cent

	Upper-secondary education		Tertiary education	
	Men	Women	Men	Women
United States	13.2	9.6	13.7	12.3
Japan	5.0	6.4	6.7	5.7
Germany	10.2	6.0	6.5	6.9
France	9.6	10.6	13.2	13.1
Italy <sup>a</sup>	8.4	..	9.7	..
United Kingdom <sup>b</sup>	12.9	..	15.2	13.6
Canada <sup>c</sup>	..	..	6.8	7.9
Denmark	9.3	8.7	6.3	4.3
Netherlands	6.2	7.8	10.0	6.3
Sweden <sup>d</sup>	5.2	..	7.5	5.7

*Note:* These calculations relate to a narrow definition of the social rate of return which exclude any possible positive external effects due to education. The rates of return to tertiary education is calculated by comparing the benefits and costs with those of upper-secondary education. In the case of the rates of return to upper-secondary education, the calculation is done by comparing the benefits and costs with those of lower-secondary education.

a) In Italy, reliable data on earnings for women were not available.

b) In the United Kingdom, data on earnings of women up to age 30 with lower-secondary education were not available.

c) In Canada, no data are available on expenditure per student at the upper-secondary level.

d) In Sweden, earnings differential for women between upper and lower-secondary levels are not large enough to permit a positive rate of return calculation.

*Sources and Methods:* see Box 1 and Appendix.

### Box 3. The calculation of social internal rates of return

As in the case of the private internal rate of return, the social rate of return is the discount rate that equalises future costs and benefits:

$$\sum_{t=a}^{a+l} (1+\delta)^{-(t-a)} \times SC^{s,u}(t) = \sum_{t=a+l+1}^{64} (1+\delta)^{-(t-a)} \times SB^{s,u}(t)$$

where  $SC$  and  $SB$  are social costs and social benefits, respectively, and other variables are defined as in Box 1.

The social cost of tertiary education is the opportunity cost of lost output and the direct total cost of providing such education

$$SC^u(t) = [1 - ur^s(t)] \times [E + ST]^s(t) \times (1+g)^{(t-a)} + [F + G]^u(t) \times (1+g)^{(t-a)}$$

where  $ST^s$  is employers' social security contributions for workers with upper-secondary education and  $G$  is the annual public cost (i.e. excluding private fees) of tertiary education. Compared to the private costs, the social costs exclude taxes and student grants and loans as these items involve transfers between individuals. The opportunity cost is also expanded to include all labour costs and the direct costs include the public subsidies involved in tertiary education.

The social benefits of tertiary education are defined as

$$SB(t) = (1 - ur^u) \times [E + ST]^u(t) \times (1+g)^{(t-a)} - (1 - ur^s) \times [E + ST]^s(t) \times (1+g)^{(t-a)}$$

As compared to the private benefits, taxes and repayment of loans are excluded from the social benefit formula for the reasons discussed above and productivity is proxied by total labour costs.

### 2.3.3 *The interpretation of the internal rates of return*

34. The private and social internal rates of return reported above are generally well above the real interest rate and the rate of return on other productive assets.<sup>28</sup> Given that the return on human capital accumulation is subject to considerable uncertainty (as indicated, *inter alia*, by the wide dispersion of earnings among the better educated), investors are likely to require a compensating risk premium. However, the size of the premium of the internal rates of return over the real interest rate is higher than would seem to be warranted by considerations of risk alone. The high internal rates of return can be interpreted in two different ways.

35. One interpretation is that the high rates indicate a disequilibrium in the market for educated workers, with shortages of better-educated workers driving up their earnings. This might imply a temporary situation, where super-normal returns to education would subsequently generate enough supply response to push the rates down into line with returns available on other productive assets. However, the adjustment would importantly depend on the capacity of the education system to respond to the derived increase in demand and the capacity of the labour market to absorb the changing relative supplies of labour. The re-balancing mechanism could also be accelerated by better availability of information to students about the returns to different courses of study, thereby helping them to make more informed choices.

36. While temporary disequilibrium may account for some of the apparent “excess” returns, part of the super-normal returns may also reflect an equilibrium situation. This second interpretation would be relevant if the marginal rates of return are significantly lower than the average rates and thus closer to marginal rates on alternative productive assets.<sup>29</sup> The marginal rate would indeed be lower than the average rate if the students at the margin are of lower ability and motivation than the average existing students, and thus unlikely to be able to command the average wage premium in the labour market. On this interpretation, the high internal rates of return would partly reflect economic rents on a scarce resource, namely ability and motivation.

37. On either of the two interpretations, the authorities could enhance incentives for investment in education, for example, if it were to be possible to reduce the standard length of education programmes without compromising their quality and if they were to increase the generosity of student financial support. On the other hand, stronger incentives may not elicit a large supply response if there is a serious shortage of young people with the abilities and motivation required to profit from continued education. In this case, it might be more appropriate to improve the average abilities of young individuals through interventions at pre-schooling ages and in compulsory schooling, with studies indicating that cognitive abilities can be developed into teenage years.

### 3. **Adult education: incentives for post-compulsory education and training**

38. Human capital acquired during compulsory and initial post-compulsory education may be augmented through participation in adult education and training. Adult learning is diverse in both form and content, ranging from long-lasting full-time upper-secondary or university education to short part-time courses or on-the-job enterprise training. Adults are likely to decide alone on their participation in full-time

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28. This may partly reflect that the calculations ignore educational failure but even correcting for this, rate-of-return is likely to remain high.

29. High private internal rates of return would also be compatible with equilibrium if individuals apply a high discount rate to future gains. Indeed, some studies on time preferences of individuals report very high discount rates, see *e.g.* Alessie and Kapteyn (2001).

education programmes, whereas participation in enterprise training is likely to be largely determined by employers.

39. The first part below examines the incentives for older adults to pursue formal education programmes which involve them bearing the costs of the programmes themselves. Since most adults would find it difficult to accept the temporary reductions in earnings that this would normally involve and to combine full-time study with their family responsibilities, even if financial support could be found to cover tuition costs, the analysis presented may not apply to the most realistic choices about investment in human capital which most adults face. However, many of the forces likely to influence adult choices have much in common with those that are examined here and much of the analysis may well generalise to other, more limited, programmes of education and training which are not provided by employers. The following part examines the incentives for employers to train their workforce. Although informal learning for adults is also very important, this section does not address this issue given the complex and difficult measurement problems attached to it.

### **3.1 *Incentives for older adults to pursue formal education programmes***

#### **3.1.1 *Labour-market incentives for adults to invest in human capital through formal programmes***

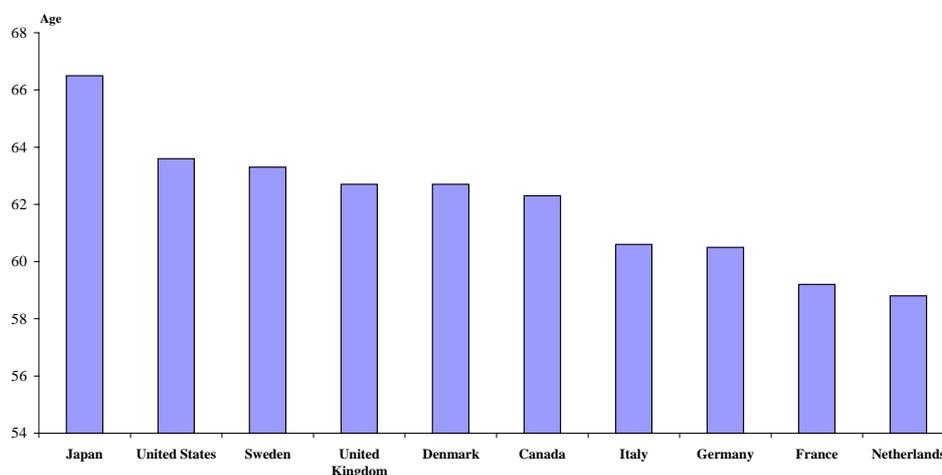
40. The incentives for adults to participate in formal education programmes depend on the same factors as discussed earlier for initial education, *i.e.* the costs of education, and the subsequent benefits. However, the costs and benefits will differ from those for young people in important ways:

- The opportunity costs of foregone earnings will be significantly higher for older adults if education requires time out of work. As depicted in Figure 3, earnings tend to rise with age in all the countries for which data are available, even if the progression is weaker for the lower educated than for the higher educated. For example, a 40-year old male with upper-secondary education earns from 47 per cent (in Sweden) to 87 per cent (in the United States) more than his counterpart in his early twenties. This rising cost as adult workers age acts as a disincentive for them to invest in additional human capital.
- The eventual return in the form of higher earnings from formal education or training at older ages may be subject to considerable uncertainty. Making use of enhanced human capital may often require switching to another employer, in which case wage premia due to seniority or employer-specific skills will be lost and thus cancel part of the expected gains due to more education and training *per se*.
- Adult workers will often not have the same access to public financial support as their younger counterparts. In some countries, such as Germany and Sweden, there is an age limit for entitlements to standard student grants and loans. In other countries, the means testing of such support on students' assets is likely to limit the availability of any support to adult students.

41. The shorter remaining length of the working life for adult workers also implies a compression of the period to amortise the investment costs associated with such programmes. For young persons, the termination of working life is so distant that it is of marginal importance in influencing education choices. However, a 40 year-old person will, on average, only have a remaining expected working life of 20½ years (in Germany) to 26½ years (in Japan) if he retires at the average age of withdrawal from the labour market (Figure 8). Pursuing long formal programmes would tend to reduce even further the period in which the benefits from such investment can be enjoyed. Even if such education contributes to an extension of the

period until retirement (see Section 2.1.4), the short remaining working life is likely to be a greater disincentive for human capital acquisition with age, and can eventually eliminate all financial gains from such investment.

Figure 8. Estimated average age of withdrawal from the labour market, 1995 (men)



Source: See Blöndal and Scarpetta (1998) for conceptual and measurement issues.

42. To illustrate the combined impact of the various individual effects discussed above on incentives facing mature adults, Table 5 presents stylised internal rates of return to standard first-degree university education for a male starting studies at the age of 40, 45 and 50. All the calculations assume that the wage premia at the end of study are identical to those received by a young male finishing his degree as a part of initial education, and that they evolve over time in line with those for a young graduate. The length of study is assumed to be identical to that for young persons, and adult students are assumed to have no public grants or loans.

Table 5. Private internal rates of return to tertiary education for older adults (men)

Per cent

	Age 40	Age 45	Age 50
United States	8.9	6.7	3.5
Japan	0.9	-3.0	-10.5
Germany	-1.5	-9.7	-23.0
France	7.3	1.9	-11.4
Italy	0.4	-4.1	-21.6
United Kingdom	11.1	8.8	5.5
Canada	1.0	-3.0	-10.5
Sweden	3.9	0.6	-7.5

Note: The internal rates of return to tertiary education are calculated by comparing the benefits and costs with those of upper-secondary education

Source: OECD

43. The table shows clearly that under prevailing policies private incentives to increase human capital diminish with age. By the age of 40 the internal rate of return to tertiary education is considerably lower on average than that shown in table 3 for young men undertaking such studies as a part of their initial education (excluding student support). The rate of return at this age is still around 10 per cent for the United States, the United Kingdom and France, but is well below 5 per cent for the other countries and is even negative for Germany (largely because of long education periods and a low average retirement age). The drop in returns accelerates after the age of 40, the rate falling by 10 percentage points on average in the ten years up to the age of 50. Indeed, on the assumptions used for the calculations, by the age of 50 only the United States and the United Kingdom offer a positive rate of return to tertiary education. These calculations show that, under existing institutional arrangements, the labour market offers scant, if any, financial incentives for adults to pursue long-lasting studies. This is an important reason why adults rarely participate in long formal education programmes.<sup>30</sup> Adult participation in formal education would be stimulated if programmes could be designed in a way that reduces the opportunity cost for older workers to participate, *e.g.* through greater use of intensive or modular courses, or if benefits could be increased, *e.g.* through longer working lives.

### 3.2.2 *The impact of public pensions on incentives to acquire education at older ages*

44. The design of the pension system can encourage or discourage mid-career investment in human capital depending on how retirement pension wealth is affected by the subsequent increases in earnings. If pensions and contributions are unaffected by earnings, they will have no impact on the incentives to pursue education. An increase in pension wealth due to a strong effect on eventual pension payments compared to the induced increase in contributions will tend to encourage adults to increase their human capital. A possible education-induced reduction in pension wealth which could result, for example, from any reduction in effective working life if pensions were dependent on years of service while higher contributions had to be paid on induced higher earnings, would act as an implicit tax on human capital. This would, of course, reduce incentives for education activity.

45. In practice, current pension systems seem to have only limited direct effects on incentives to invest in adult learning. In some countries, such as Japan and the United Kingdom, this is partly due to a large basic pension component that is unrelated to past earnings (Table 6). Long periods used to determine reference earnings for pension purposes in most countries also reduce the pension gains from investing in education at older ages. Even where this period is comparatively short, like in Sweden, the education-induced increase in pension is completely cancelled by comparatively low statutory ceilings on pensions. Moreover, overly rigid retirement ages may also act as a disincentive to invest in human capital by older workers, since they preclude any extension of working lives which would contribute to the returns from such investment. The only countries in Table 6 where pensions would be markedly increased by education at older ages would be France, reflecting the relatively short earnings history to determine pensions, and, to a lesser extent, the United States. However, even if this acts to slow down the rapid drop in the return to tertiary education in France (Table 7), it does not prevent the rate from turning negative with age. But even if the direct impact of public pension systems on human capital formation by adult individuals is small, they have an important indirect effect through their influence on the age at which people retire from the labour market.

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30. Other explanations include family responsibilities, difficulties in adapting to a university environment after a long period out of study and difficulties in recognising non-formal qualifications.

**Table 6. Public pension arrangements and adult education**

	Earnings-related pensions of persons with upper secondary education	Length of earnings history used to compute reference earnings in earnings-related pension schemes	Pension gains from tertiary education starting at age of 40 <sup>1</sup>	Notes
	<i>Per cent of total pensions</i>		<i>Per cent</i>	
United States	100	Best 35 years	16.5	
Japan	47	Best 40 years	4.3	
Germany	100	All years between 16 and retirement age	2.9	Years of education credited with earnings
France	100	Best 25 years	21.8	
Italy	100	All years between 16 and retirement age		
United Kingdom	48	All years between 16 and retirement age	5.7	
Sweden	20	Best 15 of the last 30 years	0.0	Relatively low ceiling on pensions

1. See the main text for assumptions about the wage impact of tertiary education and length of study. Real earnings are assumed to grow in line with trend labour productivity growth.

Source: OECD calculations on the basis of details about pension systems from national sources.

**Table 7. Pension-inclusive internal rates of return to tertiary education for older adults**

	<i>Per cent (men)</i>		
	Age 40	Age 45	Age 50
United States	10.5	8.6	6.3
Japan	1.6	-2.0	-9.8
Germany	-1.7	-11.0	--
France	11.1	7.7	-0.2
United Kingdom	11.2	8.8	5.5
Sweden	3.9	0.6	-7.5

Note: Pensions are assumed to be indexed to prices in all countries. The amount of pensions is based on details of national pension arrangements.

Source: OECD.

## 3.2 Incentives for employers to invest in training

### 3.2.1 The profit motive: the impact of training on productivity and wages

46. The principal incentive for firms to spend on training is that such activity may increase profits. The volume of training will depend on the same principles as applied to any other investment project: training will be expanded as long as the rate of return is higher than on alternative assets. Training is likely

to be concentrated on those groups with the highest investment returns. Thus, the better educated may be disproportionately selected for training as they could be easier to train. Also, the training of older workers may be associated with lower rates of return than the training of people with longer potential working lives ahead of them.

47. Enterprise training involves costs for the employer in the form of the absence from work of the employees taking part during the course of training and direct costs related to training courses. There is little hard evidence on the average time spent on training by those who receive any training at all, with household surveys recording much more training activity than employer surveys (Table 8).<sup>31</sup> According to an employer survey for the EU countries in the mid-1990s, the average time spent by those workers taking part in training amounted to one to two weeks per year in most countries, or the equivalent of 2 to 4 per cent of average annual hours worked. In principle, individual employees can contribute to training costs through temporary reduction in wages and/or increased work outside normal working hours to make up for time spent in training. There is little or no evidence that workers co-finance training by wage cuts, and it is uncertain to what extent other mechanisms are used for this purpose.

Table 8. **Average annual hours of training *per* participating person, various sources**

	International adult literacy survey	OECD indicators of education systems	Eurostat's continuing vocational training survey
	1994-95	1991-96	1994
Belgium	87		41
Denmark			39
Finland		42	
France			54
Germany	203	105	34
Greece			138
Ireland	185		25
Italy			41
Luxembourg			40
Netherlands	147		66
Portugal			85
Spain			50
Sweden		49	
United Kingdom	90		41
Canada	109	77	
United States	95	65	
Australia	137	128	
New Zealand	141		

Source: OECD (1999a).

31. This is likely to be related to the design of the different surveys, with household surveys picking up informal training whereas employer surveys are typically limited to formal training courses.

48. Although it has proved difficult to isolate the impact of training on productivity, empirical studies provide some direct evidence that training activity has succeeded in raising productivity in the enterprises and sectors involved. Country studies that find significant impacts of training on firm productivity include Holzer *et al.* (1993) in respect of the United States, De Koning (1994) for external training in the Netherlands, Alba-Ramirez (1994) for large companies in Spain, and Barrett and O'Connell (1998) for general training in Ireland. Dearden *et al.* (2000), using industry-level data for the United Kingdom, suggest that a 5 percentage point increase in training incidence could lead to an increase in the level of labour productivity by 4 per cent.

49. Work by the OECD reported in Table 9 suggests that training is also found to raise wages in several countries. In the seven countries examined, all those who have received some training over the past 12 months have significantly higher wages than others in Canada, Italy and Britain, but the difference is comparatively small in the Netherlands. The important influence of training on wage determination in Australia, Canada, Germany and Great Britain is confirmed in an econometric study that controls for a wide range of individuals' characteristics. The strength of the estimated training effect varies across these countries, with training in the past 12 months in some cases being associated with significant wage gains. On the other hand, the study was unable to detect a significant general impact of training on wages in France and Italy after controlling for human capital characteristics of individuals, though there is evidence that training increases wages of those with no tertiary education in these countries. Other studies have corroborated the existence of a "genuine" wage premium related to company-based training in the United Kingdom, United States, Australia and Germany, while also supporting the absence of such effects in France and Italy.<sup>32</sup>

50. Notwithstanding the reaction of wages to training, the limited evidence available suggests that training does indeed increase profits of the affected companies and sectors. Thus, a study of US companies (Barron *et al.*, 1989) indicates that a 10 per cent increase in training is associated with a 3 per cent increase in labour productivity and only 1½ per cent increase in wages. A recent study for the United Kingdom (Dearden *et al.*, 2000) also suggests that productivity gains are significantly larger than the wage gains, implying a fall in unit labour costs of ½ percentage point for a one percentage point increase in the incidence of training.

51. While training that is undertaken appears to be profitable, the fact that employees seem able to appropriate some of the gains of such activity raises the question as to whether the supply of enterprise training is sub-optimal. The wage response suggests that some training at least is general in nature and thus exportable to other firms, making trained workers "poachable". The main reason for the "poaching" problem is that employees and employers are not able to enter into contracts that ensure that employees remain with the employer for a sufficiently long time for him to amortise the investment costs. Though this is potentially a serious problem, there are several possible offsetting mechanisms:

- Asymmetric information about the quality of trained workers. The employer responsible for training is likely to know more about its effectiveness in raising the productive capacity of the workforce than other employers, and this informational advantage may act to encourage enterprise training.

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32. For a review of these studies, see OECD (1999a).

Table 9. **Training and wages**

	Australia	Canada	France	Germany	Italy	Netherlands	Great Britain
<b>A. Proportional mean wage differences for workers trained<sup>1</sup> (percentages)</b>							
All	9.6	26.4	11.1	18.5	25.0	3.1	19.3
Men	9.6	32.0	17.2	17.6	29.1	0.0	15.1
Women	11.2	12.2	20.7	16.5	20.0	-2.3	25.0
Less than upper secondary	6.9		30.2	16.0	15.7	17.6	20.2
Upper secondary	8.6		16.1	9.5	23.8	0.7	4.3
Non-university tertiary	4.2		2.3	-7.6		-0.3	19.8
University	1.8		-1.3	17.9	6.8	-15.9	3.0
<b>B. Results of estimation of OLS regression<sup>2</sup> (dependent variable: log of gross hourly wage)</b>							
Had training	0.05*	0.14*	0.00	0.08*	0.38*	-0.04	0.74*
Woman who have had training	0.00	-0.02	0.03	0.09*	0.00	-0.02	0.04
Less than upper secondary workers who have had training	0.02	0.02	0.16*	-0.01	0.26*	0.17*	0.09*
Upper secondary workers who have had training	-0.01	-0.04	0.07*	-0.04	0.22*	0.04	0.03

Note: \* = significant at the 5 per cent level.

1. Generally refers to workers reporting that they have received training over the past 12 months.

2. In addition to the reported variables, the equation included controls for gender, age groups, tenure, educational attainment, firm size, part time/temporary work, sectoral affiliation and selection. The estimates reported in the table refer to parameters on dummy variables.

Source: See OECD (1999a).

- Costly job search, by acting to reduce mobility, may give the employer some market power (at least in the short run), and this could help to stimulate training.
- Steep wage-tenure profiles tend to discourage mobility as the cost of changing employers becomes high for individuals, and this bonding mechanism works to increase the profitability of training.
- Institutionally-driven wage compression could reduce relative wages for some groups, effectively implying that they co-finance part of the costs of their training, and the employer might be less averse to offer training under such circumstances.

### 3.2.2 *Policies on enterprise training*

52. In view of perceived failures in the training market, many countries have policies that help to encourage or finance enterprise training. Such interventions have included requirements that employers spend a certain proportion of their wage bill on training and giving employees the right to training. Reflecting the limited evaluation available of these schemes, it is uncertain to what extent such measures have been successful in increasing gainful adult training for individuals and society.

53. Favourable tax treatment of company training expenses has provided considerable support for such activities. Most countries allow direct training costs to be treated as expenses for tax purposes rather than being gradually amortised over the period in which the investment is being used. This instantaneous depreciation allowance gives rise to what could be regarded as an implicit subsidy, which depends on the economic depreciation rate of the new skill, the corporate tax rate and the real interest rate. Apart from the support through tax expenditures, government subsidies for company training have traditionally been defensive in nature and targeted at sectors or firms that are under pressure to reduce activity.

54. Some countries have, or have had in the past, tax levies that require employers either to spend beyond a certain threshold level on training, or pay a training levy. At present, French companies with 10 or more employees have to spend a minimum of 1.5 per cent of their wage bill on training, or pay a corresponding levy. Most of the programmes target the already well educated, and workers in large enterprise have a higher access rate to training than workers in small and medium-sized enterprise. Most training financed by French enterprises is of short duration, does not lead to a diploma and aims at adapting employees to new working conditions rather than promoting their careers. Moreover, the levy scheme provides companies with strong incentives to reclassify spending as training. Partly on these grounds, the 1997 OECD survey of France recommended to enlarge training access to under-achievers and to upgrade technical and vocational training for those who are not admitted to academic education.

55. Korea and Australia both had similar training levies in place in the 1990s, but they have now been abolished. An assessment of the levy in Australia suggested that it had increased spending on training, but as seems to have been the case in Korea, had not been effective in stimulating such activity in small and medium-sized enterprises that preferred to pay the levy rather than spend on training. As in France, the Australian levy also left the distribution of training across different categories of workers relatively unchanged, as most of the training went to higher educated and more skilled workers, as it does in the absence of a levy.

56. Some countries, including France, Belgium and Denmark, grant workers a right to paid training leave under certain conditions. This option puts the onus on the individual, rather than the firm, to choose to be trained, and to choose the type of training. In France, beneficiaries of the programme must have an indefinite work contract, thereby excluding temporary workers, while in Belgium the scheme is restricted

to full-time workers. The 1997 OECD country survey of Denmark encouraged the social partners to take the main responsibilities for the paid-leave scheme for training on the grounds that this would accentuate their role in preventing less-skilled labour from being marginalised from the labour force.

57. Finally, employment protection legislation (EPL) and industrial-relation regimes could influence the amount of training a firm offers to its employees. Lax EPL and decentralised bargaining regimes raise job turnover and tend to increase wage dispersion and skill premia. This encourages firms to lay off part of the staff and hire more skilled worker on the labour market, possibly “poaching” into other firms’ pool of skilled labour. Conversely, strict EPL and highly co-ordinated bargaining regimes encourage firms to resorts to internal labour reallocations and undertake firm-sponsored training.<sup>33</sup> Indeed, Soskice (1997) reports evidence of higher firm-sponsored training in more co-ordinated countries. But even if strict EPLs may act to stimulate employer-sponsored training, there is concern that such statutory arrangements could reduce the overall efficiency of the labour market.

#### **4. Equity in post-compulsory education**

##### **4.1 Introduction**

58. In the compulsory phase of education, participation is by definition near universal, and equity issues arise over the extent to which such participation realises the potential of all, regardless of social background or circumstances (see Box 4). In post-compulsory education, the equity issue arises in a quite different form because of the extent of individual variation in participation. Two such issues addressed below are: (i) the extent to which the expansion of post-compulsory education has enhanced equality of opportunities to access; and (ii) the distribution of costs and benefits of public spending on post-compulsory education.

##### **4.2 Expansion of post-compulsory education and the equality of opportunity**

59. Over the past 30 years participation rates in post-compulsory education have increased rapidly. This is reflected in the higher attainment rates of people. Thus, on average in OECD countries, nearly three quarters of the younger cohort aged 25-34 have completed upper-secondary education, and one quarter have completed tertiary education (Table 10). Conversely, among those currently aged 55-64, under half have completed the upper-secondary phase of education, and only one in seven has completed tertiary education.<sup>34</sup> Much of the progress is attributable to women catching up with men -- the attainment levels of younger men and women aged 25-34 are now very similar. For those aged 55-64, only 6 per cent of women (compared with 12 per cent of their male counterparts) have university degrees and 38 per cent have upper-secondary qualifications (compared with 50 per cent of men. A question arises over whether this overall expansion in educational opportunity has been equitably shared.

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33. See Nicoletti *et al.* (2001).

34. This picture of increased attainment is common to virtually all OECD countries for which data are available. The sole exceptions are very slight declines in male tertiary participation rates in Poland and Hungary.

#### Box 4. The dimensions of educational equity

The central goal of education and training is to ensure that all individuals develop to their full potential. A realisation of this goal would not remove differences between individuals in educational achievement and the associated benefits. It would not necessarily mean access for all to the same educational and training experiences but would imply access to skill development that would enable each individual to develop his or her full potential. In practice, it will often be unclear whether differences in educational outcomes reflect variation in “full potential” or differentially effective provisions.

Consideration of equity in education must address outcomes as well as access. The question to be addressed is not whether outcomes vary but whether they do to an extent that is unreasonable and whether the distributions of outcomes are equivalent in groups between which it is not reasonable to expect differences. For example, it is accepted in OECD countries that no factors (genetic, social or cultural) should automatically constrain female educational achievement to a different level or distribution from that of men and many countries have increased female achievement to match or go beyond that of males.

Socio-economic equity raises different issues. General cognitive abilities are significantly heritable, and these genetic effects are sustained throughout life (McLearn *et al.*, 1997). To the extent that innate abilities determine the educational attainment and socio-economic level of parents, and are genetically linked to the capacities of their children, success in one generation will be correlated with that of the next. However, the evidence suggests that socio-economic privilege confers many direct benefits, both through a home culture which tends to reinforce the goals of formal education and through the capacity to fund access to education in private schools and post-compulsory education (Dearden, 1998; McPherson and Schapiro, 2000).

Particularly in the post-compulsory phase, systems of educational finance also have an impact on outcomes by virtue of how they distribute the costs of human capital investment between different parties. Overall outcomes for any individual depend not only on the benefits of educational attainment, but also on how much of the cost of that education falls on the individuals who benefit.

New research (OECD, 2001*e*), will show that in the compulsory phase of education, the relationship between socio-economic background (measured on a variety of dimensions) and educational achievement is present in all OECD countries but varies in strength, and is independent of average achievement. The message is that national educational policy and practice can ameliorate the influence of social and economic privilege on educational achievement without sacrifice to the overall level of achievement.

Table 10. **Educational attainment in 1999**

Percentage of the population that has completed at least upper secondary or tertiary phases of education by gender and age group.

Age group	Men						Women					
	At least upper secondary <sup>1</sup>			Tertiary			At least upper secondary <sup>1</sup>			Tertiary		
	25-34	55-64	total 25-64	25-34	55-64	total 25-64	25-34	55-64	total 25-64	25-34	55-64	total 25-64
Australia	70	54	65	26	19	26	61	33	50	32	15	27
Austria <sup>2</sup>	87	70	81	12	9	12	79	48	67	13	4	10
Belgium	70	40	57	30	18	25	76	32	56	38	12	26
Canada	86	64	79	42	28	37	89	60	80	52	27	41
Czech Republic	93	86	91	12	12	13	92	65	81	10	7	9
Denmark	88	75	83	28	21	26	87	58	76	29	17	27
Finland	84	46	70	30	22	28	87	46	73	45	19	34
France <sup>3</sup>	76	48	65	29	14	21	77	36	59	33	11	22
Germany	87	83	86	23	28	28	84	63	76	20	11	17
Greece	69	30	52	22	12	20	73	19	48	28	5	16
Hungary	81	32	37	11	14	13	79	29	47	16	9	14
Iceland	64	55	63	25	14	22	65	26	49	30	9	23
Ireland <sup>2</sup>	63	30	48	30	14	23	71	32	54	29	9	20
Italy	53	25	44	9	7	10	58	17	41	11	4	9
Japan	91	63	81	44	19	35	95	57	81	46	10	29
Korea	93	43	75	39	15	29	92	13	58	31	2	17
Luxembourg	62	55	61	22	5	22	60	28	51	20	7	15
Mexico	23	11	20	19	9	16	27	8	21	14	3	10
Netherlands	m	m	m	25	23	25	m	m	m	25	11	20
New Zealand	79	65	75	24	20	24	80	55	72	28	26	30
Norway <sup>2</sup>	93	72	85	29	22	27	95	64	84	36	15	28
Poland <sup>2</sup>	63	43	57	10	11	10	61	32	51	14	9	11
Portugal	27	11	20	9	6	8	34	3	23	15	8	11
Spain	51	18	37	31	12	22	58	9	34	36	5	20
Sweden	87	60	75	29	21	27	88	62	78	34	22	30
Switzerland	92	82	87	36	29	34	86	62	77	16	7	14
Turkey	30	13	25	10	7	9	22	9	18	7	3	6
United Kingdom <sup>3</sup>	70	61	69	29	20	26	60	39	53	28	16	24
United States	87	81	86	36	32	37	89	81	87	39	24	35
<b>Country mean</b>	<b>72</b>	<b>51</b>	<b>63</b>	<b>25</b>	<b>17</b>	<b>23</b>	<b>72</b>	<b>39</b>	<b>59</b>	<b>27</b>	<b>11</b>	<b>21</b>

1. Excluding ISCED 3C Short programmes.

2. Year of reference 1998.

3. Not all ISCED 3 programmes meet minimum requirements for ISCED 3C Long programmes. Full details of the ISCED 97 classification system used to define upper secondary and tertiary in individual countries are given in Annex 3 of OECD (2001d).

m = missing data.

Source: OECD, 2001d.

#### 4.2.1 Upper-secondary education

60. Evidence from a number of countries suggests that the minority of young people who fail to complete upper-secondary education tend to come from less affluent backgrounds. Thus in France in the late 1990s, 62 per cent of the 15-year olds coming from the poorest two deciles of families have had to repeat at least one year in school compared with 17 per cent from the richest two deciles (INSEE, 2000). In the United States in 1999, over three quarters of high-school drop-outs came from families with below median income, and only 8 per cent from the highest family income quartile (National Center for Education Statistics, 2000). In the United Kingdom in the late 1990s, young people from households headed by a professional and managerial worker were twice as likely to remain in full-time education at the age of 18 as those from households headed by an unskilled manual worker (UK Department for Education, 2000b).<sup>35</sup>

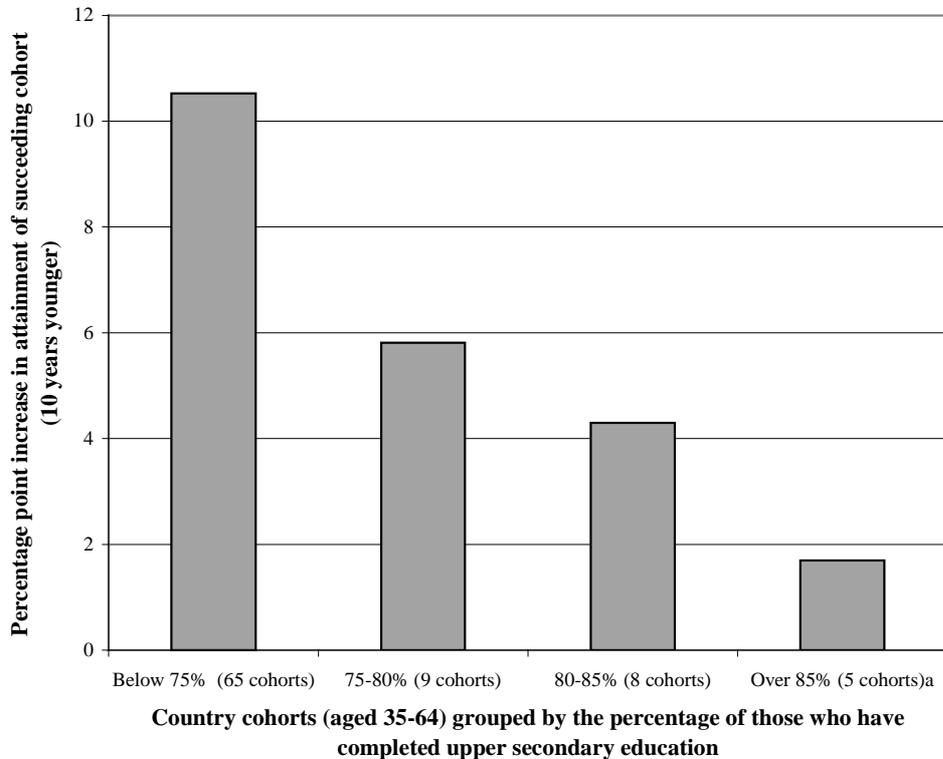
61. Given that young people from poorer backgrounds are most likely to lack upper-secondary education, the extension of upper-secondary education targets benefits at young people from poor backgrounds. Thus, in the United States, for example, between 1970 and 1999 the high-school drop-out rate fell from 28 to 21 per cent among students from the lowest family income quartile, and from 5 to 4 per cent among students from the highest income quartile. Although the proportionate change was similar in the two quartiles, there were roughly seven times more additional participants in the lowest than in the highest family income quartile (National Center for Education Statistics, 2000).

62. Several countries have set universal participation (at some stage in life) in upper-secondary education as a policy goal, but achievement of this goal remains a challenge in virtually all OECD countries (Figure 9). The relatively small group of remaining non-participants often suffer severe problems of disaffection from secondary schools and lack of interest in formal education. Private rates of return for this group may therefore be lower than those reported in Section 2, although broad measures of the social rates of return may be higher (because of the high social costs imposed by factors like crime). As participation rates rise above 75 per cent further increments in participation rates appear to diminish sharply.<sup>36</sup>

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35. The links between childhood experiences and educational attainment are analysed in Gregg and Machin (2001) for Britain and in Büchel *et al.* (2001) for Germany.

36. OECD, (2001c) pp. 22-23, describes how countries have responded with a variety of policy measures to keep young people in education beyond the school-leaving age, to ensure that they see what they are being taught as of practical relevance, and to support their future motivation to learn.

**Figure 9. The challenge of universal upper secondary education**

*Note:* This chart analyses data for three ten-year age cohorts aged 35-64 in 29 countries, splitting these 78 cohorts into four groups according to the 1999 level of upper-secondary attainment in each cohort. The increase in attainment for the succeeding cohort is determined by reference to the cohort ten years younger – for example, showing a 10 percentage point increase when the 35-44 cohort shows a 60 per cent participation rate, and the 25-34 cohort for the same country shows a 70 per cent participation rate.

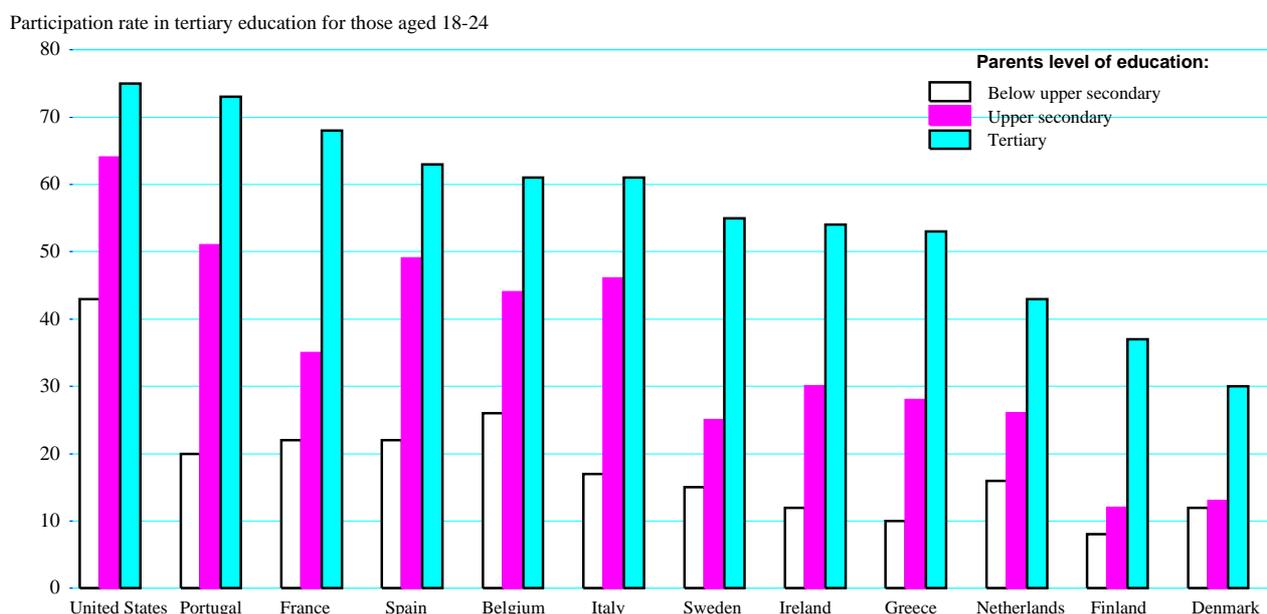
a) Only one of these was over 90 per cent.

*Source:* Table A.2.2a in OECD (2001c).

#### 4.2.2 Tertiary education

63. The participation of young people in tertiary education is highly correlated with the educational attainment of their parents (Figure 10). In many countries, those whose parents have completed some tertiary education are about twice as likely to participate in tertiary education as those whose parents lack upper-secondary education qualifications. This correlation between the educational attainment of successive generations within families acts to limit inter-generational income mobility.<sup>37</sup>

37. For evidence on intergenerational income mobility, see *e.g.* Solon (1992), Björklund and Jantti (1997), Couch and Dunn (1997), and Checchi *et al.* (1999).

**Figure 10. The influence of parental education on tertiary participation in 1994-95**

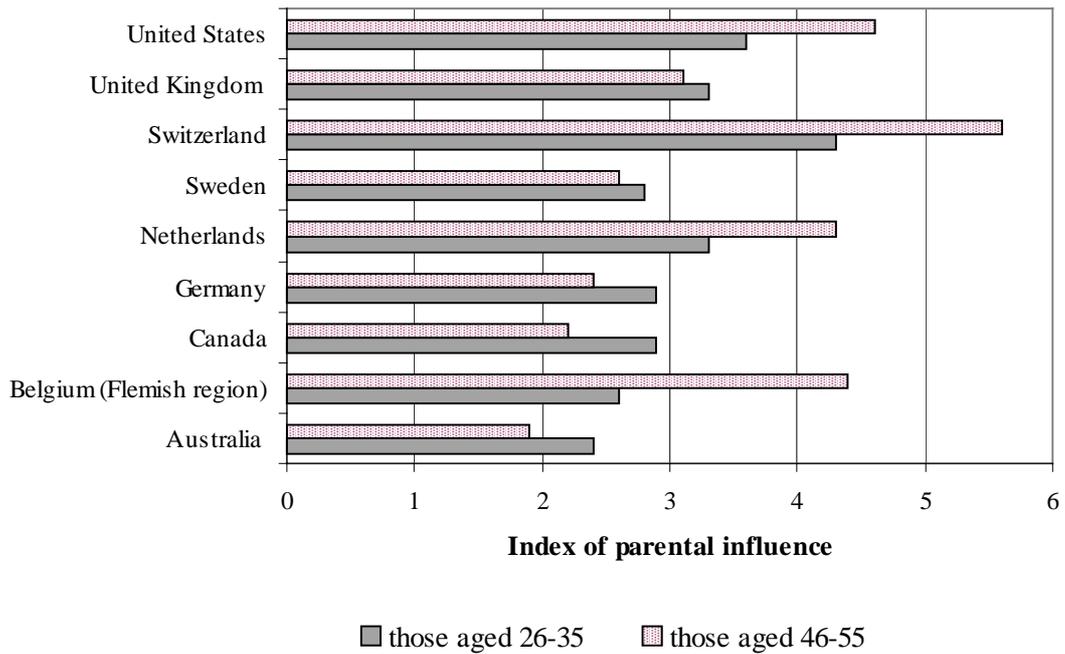
Note: Overall participation rates cannot be inferred from this figure since the reported participation rates refer only to those aged 18-24.

Sources: EURYDICE (1997), Key Data on Education in the European Union 1997 European Communities, Luxembourg; U.S. Bureau of the Census (1995), Social and Economic Characteristics of the Population: School Enrolment, October 1994, Current Population Reports, Series P-20, Table 17. National surveys in Denmark, Finland and Sweden.

64. Increased tertiary participation has improved the *absolute* prospects of those from less advantaged backgrounds, but there is a concern over whether it has also improved their *relative* prospects and therefore equalised opportunities. In Figure 11 two generations of adults are compared to see if the influence of parental background has changed over time. A cohort of secondary school students in the late 1980s was compared with a cohort twenty years older (secondary school students in the late 1960s). The relative influence of parental educational background appears to have declined in Belgium (Flanders), Switzerland, the Netherlands and the United States, but increased in Canada, Germany and Australia. Table 11 shows that the average annual increase in the participation rates of young people from low socio-economic groups has in most cases failed to keep up with the increase in the total participation rates.

65. Over the shorter term up to the mid-1990s, for six OECD countries with available data, rates of participation from low income or social class groups have increased over the 1990s. However, young people from better-off backgrounds are also participating more (Table 11). There are many hazards in the interpretation of the data in Table 11. Other things being equal, one might expect a decline in the proportion of students whose parents have manual jobs, because the base population from which these students are drawn is in decline. Where that percentage holds up (as in Australia, France and the United Kingdom), one might argue that this represents a gradual equalisation of opportunities. However, such a conclusion is speculative because of the other factors involved, and any such trend has been extremely slow, particularly when set against the rapidity of the general increase in participation.

**Figure 11. The influence of parental education on access to tertiary education, 1994-95**



Note: The index shows the multiplicative effect on the probability of tertiary participation by the child, of tertiary participation by the parent (relative to lower secondary). For example, an index of '3' shows that persons whose parents had a tertiary education are three times more likely themselves to enter tertiary education than persons with parents who had no more than lower secondary education.

Source: OECD and StatsCAN analysis if IALS.

Table 11. **Is increasing participation in tertiary education widening participation?  
A comparison of available international data**

	Average annual percentage point increase in participation		Characteristics of the data			Other and latest evidence
	Total	Low socio-economic group	Time period	Low socio-economic group definition	Special features of student data	
<b>Australia</b>						The percentage of tertiary students from a low socio-economic background has changed little, dropping from 15% in 1991 to 14.5% in 1997
<b>Belgium</b> (Flemish Community)	1.6	0.7	1985-92	Families whose heads are labourers	Those aged 18-25 in higher education	
<b>France</b>	1.2	0.6	1982-93	Fathers are blue collar workers		Percentage of students whose fathers are blue collar workers remained unchanged at 12% between 1982-83 and 1996-97
<b>Germany</b>						23% of higher education students in the old Länder were from a low socio-economic background in 1982, compared with 14% in 1997
<b>Ireland</b>	1.8	1.5	1986-92	Unskilled workers	Entering full-time students	The gap between participation rates of low and high status groups has changed little since 1980
<b>Japan</b>	1	0.6	1990-96	Families in the lowest two income quintiles	Enrolment in day courses at universities as a percentage of 18 to 21 year olds	
<b>United Kingdom</b>	1.8	1	1991-97	Unskilled	Home entrants to higher education as proportion of the averaged 18 to 19 year old population	Little change in the social class mix of entrants to higher education between 1994 and 1999
<b>United States</b>	0.9	1.2	1990-96	Lowest income quartile	Dependent family members aged 18-24	By 1999 college completion rates for the lowest income quartile returned to a previous peak, but that peak is little higher than the 1970 level

*Note:* Average annual percentage point increase is calculated as the percentage point change in participation rate divided by the number of years in the reference period.

*Sources:* For main table, OECD based primarily on country provided information for the thematic review of the first years of tertiary education. For left hand column information, see OECD (2001c); for Ireland, see Clancy and Wall (2001); for the United Kingdom, see UCAS (2000); and for the United States, see Mortenson (2001).

66. Overall, the expansion of tertiary education in OECD appears to have had little impact on the *relative* prospects of young people from less advantaged backgrounds. This is hardly a surprising finding. Parental and school influences are extremely important determinants of participation at post-compulsory level. In most countries tertiary education requires prior qualifications -- generally at upper-secondary level -- so that attainment in the compulsory phase of education, as much as anything which occurs

subsequently, is a key to tertiary participation.<sup>38</sup> Therefore, the expansion of capacity at the tertiary level will not, in itself, have much impact on these factors. The challenge to public policy of delivering equality of opportunity in tertiary education is sizeable, and falls not only on the system for tertiary education itself, but also on support for children and their families, reaching back to pre-schooling and into compulsory and upper-secondary schooling.

#### 4.2.3 *Training*

67. As discussed in Section 3, workers with a good initial education, and with high levels of literacy, are much more likely to receive employment training than other workers. There is no conclusive evidence on the reasons for this.<sup>39</sup> Possible factors include institutional barriers to training for less well-educated workers (including perhaps the conditions of temporary or casual work), and better rates of return to previously well-educated workers.

68. In some OECD countries, women with low levels of education have somewhat less access to training than their male counterparts,<sup>40</sup> 19 per cent of women with only lower secondary education participating on average compared to 25 per cent of men. However, at the upper-secondary and tertiary levels training intensities are approximately equal for men and women.

### 4.3 *The distribution of the costs and benefits of public post-compulsory education spending*

#### 4.3.1 *The implication of funding arrangements*

69. Public policy enters this picture most directly through the arrangements for public funding of post-compulsory education.<sup>41</sup> The compulsory phase of education accounts for nearly two thirds of the 15 years of full-time education which young people in OECD countries may expect, on average, to receive. However, since the unit cost of tuition rises with the phase of education, more than half of public expenditure on education is in fact devoted to the post-compulsory phase, split roughly equally between upper-secondary and tertiary levels (Figure 12). On average, annual expenditure per student in OECD countries is about \$4 000 at primary level, \$5 000 at lower secondary level, \$6 000 at upper-secondary level, and \$9 000 in tertiary education.

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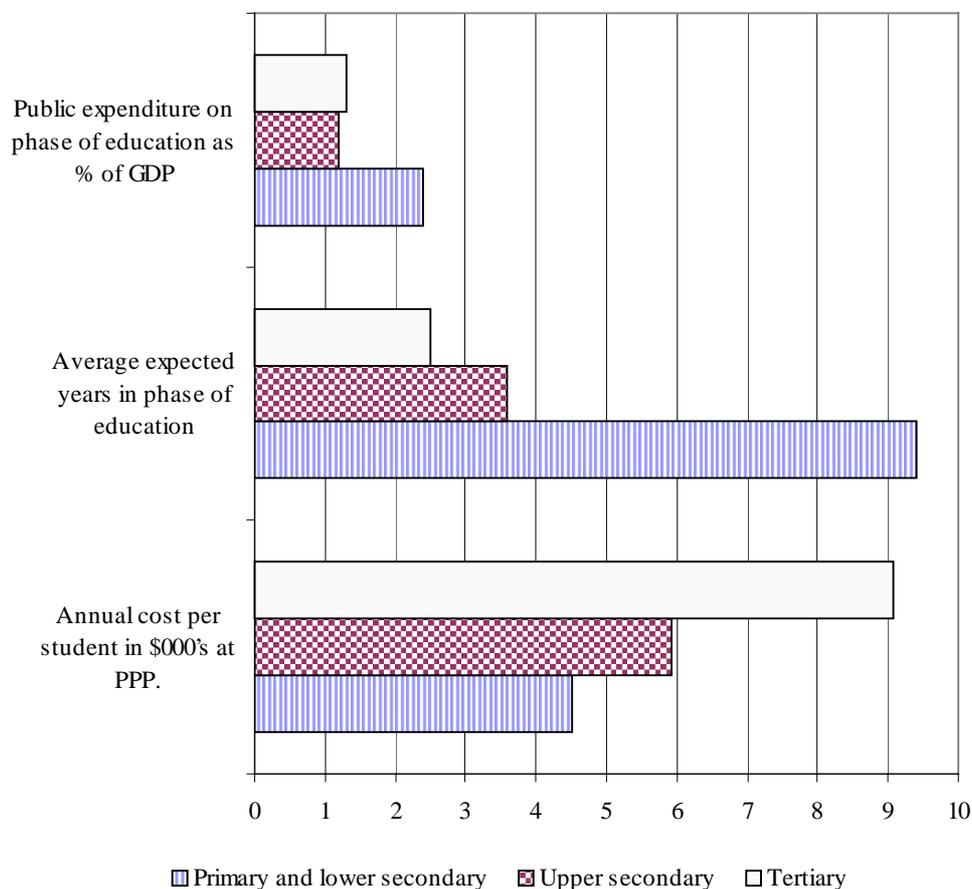
38. In the United Kingdom, for example, 44 per cent of 18 year olds from better-off backgrounds obtain the upper-secondary qualification of two A levels, compared with only 18 per cent from less-affluent backgrounds. However, for those who do obtain two A levels, social origin appears to have little bearing on the prospects of entering higher education, (UK Department for Education, 2000c).

39. Arulampalam *et al.* (1995), suggests that training of workers who already have a good education realises *larger* wage gains. However, OECD (1999a) suggests that better-educated workers (in France, Italy, the Netherlands and Great Britain), when trained, realise *smaller* wage gains.

40. This is not universal. In Ireland, women are more likely than men to receive job-related training (OECD, 1999a).

41. The figures given here are for tuition only. OECD governments also provide a substantial stream of public funding to tertiary institutions for research purposes and, in practice, cross-subsidies between tuition and research funding certainly occur.

**Figure 12. Expenditure on education in OECD countries 1998**  
*OECD country averages*



Note: Data subject to some OECD estimates. OECD countries devote about 0.5 per cent of GDP in public expenditure to other types of education, mostly pre-primary.

Source: OECD (2001c).

70. In practice, financing education has implications for parents and other family members as well as students. Parents usually contribute towards the costs of human capital investment, and therefore may take part in the initial decision to invest in human capital. Some policy arrangements take explicit account of this, either by assuming that parents will provide some financial support according to their means, or by providing tax breaks for student households where the benefits tend to go directly to the parents rather than to the student. For the sake of simplicity in this paper, the distributional implications of educational finance will be considered primarily from the viewpoint of the individual student over their lifetime rather than from a family perspective. It is here assumed that the costs and benefits of educational finance arrangements for parents, such as tax allowances, are simply handed on to the student (somewhat similar assumptions often underpin the policy arrangements).

71. Among young adults aged 25-34 in OECD countries, about a quarter have tertiary qualifications (Table 10), and will usually have benefited from public funding at both upper-secondary and tertiary levels. It can be estimated that, on average in OECD countries, individuals in this group receive a transfer from public funds of about \$50 000, taking into account the public financing of tuition as well as student grants and loans.<sup>42</sup> Individuals in an intermediate group whose highest qualification is upper-secondary -- about half the cohort -- receives a transfer from public funds of about US\$18 000. The worst-off group -- those who drop out of school at the compulsory school-leaving age -- do not obtain such transfers.<sup>43</sup> However, in the context of a progressive tax system, such regressiveness may merely act to limit the net transfer of resources from the richer to the poorer segments of society that is embedded in the overall tax-transfer system.

72. Various design features of tertiary funding schemes complicate, but do not fundamentally alter this picture. In countries where public funding of tertiary institutional fees, subsidised loans<sup>44</sup> or grants are means-tested, support is more concentrated on those from less affluent backgrounds. Conversely, in other countries, where tax allowances<sup>45</sup> are used to support participation in tertiary education, the biggest beneficiaries will tend to be high earners with high marginal tax rates. Although such measures are important in individual countries, their overall impact on income distribution in OECD countries tends to be modest, since 82 per cent of public expenditure on tertiary education is devoted to the direct funding of tertiary institutions.<sup>46</sup>

#### 4.3.2 *Increasing the private cost of tertiary education: evidence of the impact on demand*

73. If public funding for tertiary education were to be cut, to reduce the regressive transfer from public funds, there would be a risk that participation in such education might fall. However, the limited

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42. In OECD countries, the average tuition cost of a tertiary qualification is \$35 000, with over 80 per cent coming from public funds. In addition, student grants and loans represent 17 per cent of total government expenditure on tertiary education. The net result is a transfer from public funds to the graduate of about \$35 000. On the premise that schooling is compulsory up to the 16<sup>th</sup> birthday, and upper-secondary education typically lasts until age 18, it can be assumed that a tertiary graduate has also benefited from three years of upper-secondary education, with the average transfer of public funds estimated at \$6 000 per year -- yielding a separate transfer of about \$18 000. The total subsidy to tertiary graduates is therefore about \$50 000. See OECD (2001*d*) for more details.

43. The regressive nature of funding arrangements in tertiary education has been recognised for many years. For an early analysis, see Hansen and Weisbrod (1969).

44. There are two main types of government-supported student loan -- "mortgage" and "income-contingent" loans. Under mortgage schemes, repayments are typically triggered by debtors achieving a certain income level, at which point they pay off regular amounts of their loan each year until it is fully repaid. Under income-contingent schemes, repayments may again be triggered by the debtor reaching a threshold income level, but the repayment then takes place as a fixed proportion of the debtor's income (or income above the threshold level) until the debt is repaid. Given that the interest rate charged on student loans is typically below the market rate and low earners pay off income-contingent loans more slowly (and therefore at a lesser real cost) than high earners, income-contingent loans are more equitable in their impact than mortgage-style loans.

45. On efficiency grounds, the argument for tax relief for investment in human capital is that it avoids the distortionary double taxation which would arise if income is taxed prior to its use to fund human capital investment and then again at the point where that investment is transformed into an income stream. Tax breaks on physical capital investment are commonly justified on similar grounds.

46. For a general picture of the mix of grants, loans, specific subsidies and tax breaks used by OECD countries, see OECD (2000).

direct experience of changes in public funding arrangements suggests that the impact on student numbers is likely to be relatively small:

- In the United Kingdom, the replacement of grants by loans and the introduction of tuition fees in the 1990s had no obvious effect on participation rates (UCAS, 2000).<sup>47</sup>
- In New Zealand, the replacement of grants by a loan system in 1992 had no marked observable effect on the growth rate of participation in tertiary education (New Zealand Ministry of Education, 1999).
- In Australia, according to one study, the introduction of tuition fees in 1989 reduced applications by school leavers by 14 per cent below what they would otherwise have been, but did not affect application rates by older applicants (Andrews, 1997). However, another study suggested that tuition fees have had no discernible negative effects on student enrolment (Vossensteyn and Canton, 2001).

74. As for possible adverse effects on particular groups, policy has sought to minimise such negative effects on access by students from disadvantaged backgrounds. In many cases, loan and fee regimes have been introduced with elements of means-testing, and loan arrangements are often structured so that the lifetime repayments are lower for graduates with lower incomes and/or do not begin until graduate incomes exceed a set threshold in the future. Experience to date also suggests limited negative effects on access by disadvantaged groups:

- In the United Kingdom, the replacement of grants by loans and the introduction of tuition fees has left the social class mix of entrants to universities unchanged, and the proportion of ethnic minority entrants and women slightly higher than before (UCAS, 2000). The take-up of student loans has been approximately equal across students from more and less affluent backgrounds. Just as many students from well-off as from poor backgrounds reported worries about getting into debt. The implication is that debt-aversion may mean that some students do not take advantage of subsidised loans, but this does not seem to particularly disadvantage those from less affluent backgrounds. Some ethnic minority students are more reluctant to take out loans but there is no evidence that this translates into under-participation (UK Department for Education and Employment, 2001).
- In New Zealand, despite the introduction of a loan scheme in 1992 and substantial fee increases, Maori and Pacific Island groups increased their participation rates significantly (by 24 per cent and 28 per cent respectively between 1994 and 1998 (New Zealand Ministry of Education, 1999)).
- In 1974, Australia abolished tuition fees and introduced income support measures for all students in an attempt to widen access. A number of studies have shown that the socio-economic mix of students in Australian universities was little changed as a result (Committee on Higher Education Funding, 1998). Nor did the socio-economic mix of students change following the re-introduction of tuition fees in 1989 based on an income contingent loan, or following the more recent increase and differentiation in fees (Vossensteyn and Canton, 2001).

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47. The introduction of fees introduced a one-year blip in applicant figures as some students sought to enter higher education one year early to escape paying fees, but this blip was corrected the following year.

75. The limited evidence reviewed above suggests that the simultaneous increase in tuition fees and an expansion of student loan arrangements might advance equity objectives without compromising efficiency goals. An increase in tuition fees would reduce the regressive nature of financial arrangements in post-compulsory education, while the greater availability of student loans would act to offset the impact of increased private costs on enrolment. At the same time, easier access to student loans, even without a subsidy element, may be particularly important for young people from disadvantaged backgrounds, improving opportunities for all individuals to develop to their full potential.

## *Appendix*

### **Data sources for the calculation of internal rates of return**

Earnings data have been obtained from national sources and refer to male and female full-time workers. They are generally available for five-year age intervals, and the most recent data are from either 1999 or 2000.

- For the *United States*, earnings data are from the CPS Annual Demographic Survey, March 2000. They refer to 1999 annual earnings by educational attainment, by age for men and women 18 years old and over who worked full time year round. The educational categories are defined as “not high school graduate” for lower secondary, “graduate” for upper-secondary, and “total college” for tertiary education.
- For *Japan*, earnings data are from the Ministry of Health, Labour and Welfare, June 1999. They refer to 1999 gross monthly earnings by educational attainment by age for men and women 18 years old and over who worked full time year round. These earnings data do not include bonuses. However, as they are proportional to the monthly wage, they do not affect the calculation. The educational categories are defined as lower secondary, upper-secondary and “junior college and university” for tertiary education. This latest category was aggregated using the weighted average of people in each educational category.
- For *Germany*, earnings data are derived from an unweighted sample of the German Socio-Economic Panel Study (GSOEP). They refer to 1998 average annual earnings by educational attainment, by age for men and women who worked full time year round. The educational categories are defined as “between ten and 13 years of education” for lower secondary, “between 13 and 17 years of education” for upper-secondary and “superior or equal to 17 years of education” for tertiary education.
- For *France*, earnings data are from the Enquête-Emploi from INSEE. They refer to 2000 average and median monthly earnings by educational attainment, by age for men and women who worked full time year round. The educational categories are defined as “enseignement secondaire inférieur” for lower secondary, “enseignement secondaire supérieur et post-secondaire” for upper-secondary and “enseignement supérieur” for tertiary education.
- For *Italy*, earnings data are from the Survey of Italian Households’ income and wealth from Banca d’Italia. They refer to 1998 annual post-tax earnings by educational attainment, by age for men and women who worked full time year round. The educational categories are defined as “middle school” for lower secondary, “high school” for upper-secondary and “university degree” for tertiary education.
- For *Canada*, earnings data are from the Labour Force Survey, Statistics Canada. They refer to 2000 annual average earnings by educational attainment, by age for men and women who worked full time year round. The educational categories are defined as “études secondaires complétées et études post-secondaires partielles” for lower secondary, “certificat ou diplôme d’études post-secondaires” for upper-secondary and “grade universitaire, baccalauréat,

maîtrise ou doctorat” for tertiary education. These categories were aggregated using the weighted average of people in each educational category.

- For *the United Kingdom*, earnings data are from the Labour Force Survey, Office for National Statistics United Kingdom. They refer to 2000 average weekly earnings by educational attainment, by age, 16 years old and over for men and women who worked full time. The educational categories are defined as “no qualification, secondary education up to the age of 14” for lower secondary, “GCSE A to C or equivalent and GCE A level or equivalent” for upper-secondary and “higher education and degree or equivalent” for tertiary education. These categories were aggregated using the weighted average of people in each educational category.
- For *Sweden*, earnings data are from Statistics Sweden. They refer to 1999 annual average earnings by educational attainment, by age for men and women who worked full time. The educational categories are defined as “level 2, nine-year compulsory school” for lower secondary, “level 3-4, upper-secondary school, two years or shorter and upper-secondary school, three years” for upper-secondary and “level 5, 6 and 7, tertiary education, shorter than three years, tertiary education three years or longer and postgraduate education” for tertiary education. These categories were aggregated using the weighted average of people in each educational category.
- For *the Netherlands*, earnings data are from Statistics Netherlands. They refer to 1997 yearly earnings of full-time employees by gender, age group and education level. The educational categories are defined as “MAVO+VBO” for lower secondary, “HAVO/VWO+MBO” for upper-secondary and “HBO+WO” for tertiary education. These categories are aggregated using the weighted average of people in each educational category.
- For *Denmark*, earnings data are from Denmark Statistics. They refer to 1999 income from wages and salaries for full-time employees by gender, age and educational level. The educational categories are defined as “basic school including lower secondary” for lower secondary, “upper-secondary, vocational secondary and post-secondary not tertiary” for upper-secondary and “medium long tertiary and long tertiary” for tertiary education. These categories were aggregated using the weighted average of people in each educational category.

The unemployment rates by education and age come from *Education at a glance* and refer to 1999.

The labour productivity growth rate used in the calculation is set equal to the average rate in ECO’s medium-term reference scenario for 2002-06.

The theoretical length of studies is taken from OECD (1999b), *Classifying Educational Programmes, Manual for ISCED-97 Implementation in OECD Countries*. For tertiary studies, the weighted average theoretical length of the different programmes are used (e.g. master and professional degrees), the weights being the share of students in the different programmes.

The private cost of tertiary education is computed as the average total cost per full-time student multiplied by the share of private funds in total tertiary education spending. The data on total cost per full-time student and the share of private spending in total spending comes from *Education at a Glance* (see OECD, 2001b) and refer to the year 1998 (which is scaled up by the GDP price deflator to get 1999 values).

The data on student loans and grants are derived from details of such systems from national sources. The maximum length of the associated repayment schedule has been used for the calculation.

The income tax rates and the social security contributions paid by employers come from DAFPE's tax data files and refer to 1999.

### **Definitions of upper-secondary and tertiary education**

The categorisation of phases of education in this paper follows the internationally agreed 'ISCED' convention adopted in 1997 and agreed internationally by the OECD, and the United Nations. The system divides education into six levels based on a range of criteria, including years of study, type and level of educational programme, linkage with subsequent ISCED levels, and vocational or non-vocational orientation.

For the purposes of this study the main categories employed are ISCED 3 (upper-secondary), and ISCED 5 and 6 jointly (tertiary). In addition, there is a quantitatively much less important category of ISCED 4 (post-secondary non-tertiary), which mainly covers shorter post-compulsory courses.

A full description of the criteria used to allocate individual country programmes into ISCED levels is given on pages 340-341 of OECD (2001*c*). The great diversity of national education systems inevitably means that the application of a complex range of overlapping criteria requires some judgement, and, in practice, the assignment of national programmes to ISCED levels is agreed between individual OECD countries and the OECD in the context of preparation of the annual compendium of OECD education statistics -- *Education at a Glance*. A summary of the criteria used to distinguish between levels is given below.

*Upper-secondary* programmes are the final stage of secondary education. They are primarily determined by nationally defined boundaries between lower and upper-secondary programmes, with completion of the lower-secondary programme normally being a precondition of entry into an upper-secondary programme. There are substantial differences in the typical duration of upper-secondary programmes both across and between countries, ranging from two to five years of schooling.

Upper-secondary programmes can include a mix of compulsory and non-compulsory education, as the year in which compulsory schooling ends is not part of the defining criteria used by ISCED to define upper-secondary education.

*Tertiary* programmes are divided into first and second stage programmes -- the latter leading to an advanced research qualification. Entry to tertiary education normally (but not exclusively) requires completion of upper-secondary education. They normally require at least two years of full-time study (or the part-time equivalent). Second stage programmes require the submission of a thesis or dissertation of publishable quality (alongside coursework).

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