

## A User's Guide to Indicator A9: Incentives to Invest in Education

Indicator A9 on incentives to invest in education brings together available information on educational investments and the benefits that education brings in terms of employment and earnings, both for the individual taking the education as well as for the public side. Using information on taxes and benefits makes it possible to calculate the net benefits for individuals and to account for public benefits flowing from educational investments (albeit not all public benefits).

The approach used in indicator A9 is that of an investment analysis from the financial literature. The calculations are made by comparing the specific costs associated with achieving a certain educational level and the benefits that flow from this level over the working life. These cash-flow streams are then discounted back in time to the start of the investment decision. More on how these calculations are done will follow in the next section. Some short notes on the discount (interest) rates and potential alternatives to evaluate investments are provided here.

An alternative to using an investment approach would be to use an econometric specification from the labour economics literature. The specification of the model originates from Mincer (1974), in which returns to education are estimated in a regression relating earnings to years of education, labour market experience and tenure. This basic model has been extended in subsequent work to include educational levels, employment effects and additional control variables such as gender and work characteristics. The drawback of a regression approach is typically the scarcity of information beyond gross earnings, which makes it difficult to assess the actual incentives to invest in education that individuals weigh.<sup>1</sup>

At this stage it is important to note that the main difference between the two approaches is that the investment approach is forward-looking (although historical data are typically used) whereas an econometric approach seeks to establish the actual or true contribution of education to earnings by controlling for other factors that can influence earnings and returns (see Box A9.1 for more elaboration on the different approaches).

The discount rate is important to understand as it forms the foundation of an investment analysis. The discount rate reflects the time-value of money and makes it possible to compare costs or payments (cash flows) over time. The discount rate can be estimated either by raising it to the level at which financial benefits equal costs, which is then the internal rate of return (IRR), or by setting the discount rate at a required rate, which is then a net present value calculation (NPV) with the gains expressed in monetary units.

Choosing an adequate interest rate for the net present value calculations is a difficult and critical issue as it should reflect the overall time horizon of the investment project and the cost of borrowing or the

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<sup>1</sup> Some recent developments have tried to incorporate taxes and social contributions into the framework but there are still shortcomings in these calculations, as the adjustments are made on regression coefficients that measure the average impact of education over the working life. Some other recent developments have attempted to reconcile the investments (financial) approach with the regression approach taken in labour economic. The labour market experience in the regression models acts as a discount rate in the sense that the further away one moves from graduation, the more of the earnings benefits are typically attributed to experience than to initial education. The discount rate works in a similar fashion, by putting less and less weight on benefits far in the future. The mathematics behind these efforts is complex, and further developments will likely be needed before the methodological issues are resolved.

perceived risk of the investment. To keep things simple, and to make the interpretation of results easier, the same discount rate is applied across all OECD countries.

The earnings profiles over the working life that are used in the calculations can be considered to prevail even in the presence of inflation; as such, these earnings profiles are in constant prices and should be discounted by a real interest rate (a rate that is purged from inflation). To arrive at a reasonable discount rate, long-term government bonds have been used as a benchmark. The average long-term interest rate across OECD countries was approximately 4.5% in 2006. Assuming that central banks in countries have succeeded in anchoring inflation expectations at or below 2% per year, a long-term nominal interest rate of 4.5% implies a real interest rate (or real return) of 2.5% to 3%. The 3% real discount rate used in this indicator thus corresponds to a nominal interest rate of approximately 5%.<sup>2</sup>

## General information on the approach and calculations

The indicator builds on information collected in other parts of *Education at the Glance* (EAG) with one exception: to be able to calculate public returns and to examining net benefits for individuals, information from the OECD's taxing wages database is used in the calculations. The earnings data used in assessing the benefits of education are the LSO network's own earnings data collection (available as relative earnings in EAG2009 indicator A7). Costs and benefits are calculated for three broad educational categories (below upper secondary education; upper secondary or post-secondary non-tertiary education; and tertiary education).

### Estimating the investments in education

In calculating the investment costs for the individual (private side), two main costs are typically driving the overall costs: foregone earnings and the direct costs for education. The direct cost for education hinges on the private expenditure per year and the length of education (EAG2009 indicator B1 and B3). Similarly, foregone earnings depend on the level of earnings that one could receive if not in school and the duration of studies. Earnings net of taxes, social contributions and social transfers are used in calculating foregone earnings. We also account for the probability of finding a job (unemployment rates for different educational categories and age groups EAG2009 indicator A6) to adjust the earnings potentials.

In calculating the foregone earnings at an upper secondary level of education we have had to resort to using the minimum wage as an approximation for what a student potentially could earn if not in school. This is due to the fact that we are not able to distinguish student earnings from earnings of those in the labour market (non-students). On balance, the minimum wage is, in this context, probably not a bad approximation as some students most likely have some earnings, whereas those out of school probably

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<sup>2</sup> Taking the benefits (and costs) back to the time of the investment with a discount rate is analogous to comparing the investment with, for instance, buying government bonds or putting the money in the bank with a 3% annual interest rate. To put this in perspective: depositing USD 100 in the bank at the age 25 will yield USD 330 at age 65 with an interest rate of 3%. By the same token, USD 330 received at age 65 would only be valued as USD 100 because of this. Something that will be received far in the future (in this case 40 years from now) will have relatively little impact on the calculations, and the impact diminishes sharply with higher interest rates (USD 100 is worth USD 30 with a 40-year discount horizon and 3% interest rate and only USD 10 with a 6% interest rate. This is generally why internal rates of returns (IRR) of 10% or more needs to be interpreted with some caution because of their harsh treatment of benefits and cost far in the future (a 10% interest rate values something received at age 65 at less than one cent to the dollar).

earn somewhat more than this floor. However, being able to distinguish earnings by students and non-students would be a key development area for this and other indicators in EAG.

The main investment costs for the public side are lost tax receipts during the years of schooling (income tax and social contributions) and public expenditures. Public expenditures on education include direct expenditures (such as payment of teachers' salaries or spending for the construction of school buildings, purchase of textbooks, etc.) and public-private transfers (such as public subsidies to households for scholarships and other grants and to other private entities for providing training at the workplace, etc.). Again, both of these investment costs are adjusted for the length of studies.

Since studies extend over several years, each of the cash flows are discounted back in time to the start of the investment.

### *Estimating the benefits of education*

When examining the benefits of tertiary education, differences in earnings compared to those who have completed an upper secondary education is calculated; and when benefits to upper secondary education is in focus, the earnings of those without an upper secondary graduation is used as a benchmark. It is also important to note that males are benchmarked against males and females against females throughout this indicator, so even if males typically have higher earnings than females, the earnings differentials between educational levels can benefit females more than males and, as such, returns can be higher for females than males even if earnings are generally lower.

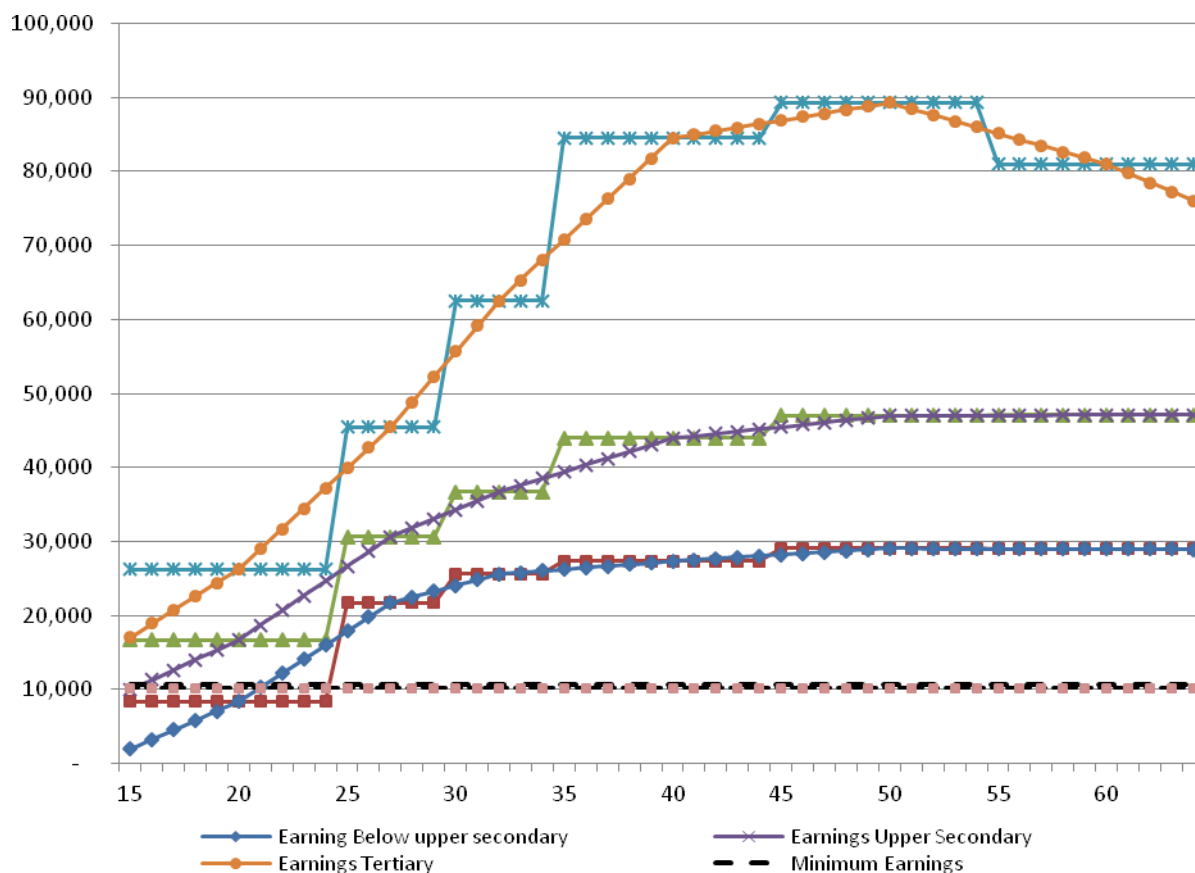
These earnings differences between educational groups are calculated each year over the working life. Figure 1 provides an illustration of how different gross-income streams can look like over the working life, with annual earnings on the vertical axis and age on the horizontal axis. Because the data used in this exercise is based on earnings by age groups, a linearization of the data has been done to better reflect how earnings evolve over age (the smooth lines in the chart). The lower dotted line constitutes the minimum wage that exists in the country. The minimum wage measure is used in calculating earnings foregone during studies in upper secondary. The earnings benefits for upper secondary are typically discounted from age 18-19 whereas for tertiary education from age 23-24, but this depends on country-specific graduation rates (starting ages and duration of studies).

These gross earnings differences are then adjusted for taxes, social contributions and potential social transfers that exist in different countries to arrive at net earnings differences (note that these "costs" make up the benefits for the public side). Furthermore, the annual net earnings are adjusted for differences in unemployment between different educational levels at different stages over the working life to account for differences in labour market prospects. These adjustments are done at each stage (age) over the working life.<sup>3</sup>

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<sup>3</sup> To be able to calculate taxes, social contributions and social transfers at each stage over the working life is one of the strengths of this approach compared to regression-based estimations, as these models typically only use the average earnings over the lifespan to adjust for taxes. Since there are substantial differences in earnings over the working life, paid taxes will vary significantly over age. This is particularly important in progressive tax systems, where average lifetime earnings would underestimate actual taxes paid, especially for those with higher education. On the other hand, one need also to note that tax policies in some countries grant tax relief on labour income, e.g. tax deductions on mortgage interest rates, which typically favour those with high income and high marginal tax rates.

**Figure 1. Example of age-earnings profiles used in the calculations of indicator A9**



The benefits for the public sector are essentially the flip-side of the costs carried by the individual (the difference between gross and net earnings) and include the additional tax and social contribution receipts associated with higher earnings and savings on transfers, *i.e.* housing benefits and social assistance that the public sector does not have to pay because of higher levels of earnings.

To account for the time-value of money, these cash flows that will occur in the “future” as the individual progresses in his or her working life are discounted back with a 3% interest rate. Discounting all cash flow streams (costs and benefits) back to the start of the investment means that we have all components in the same unit. It is thus possible to model things freely. Total net benefits can, for instance, be calculated by adding public and private net present values; or if one would like to know what the net benefits are for bringing someone from below upper secondary education to a tertiary graduation, this can be done by adding the net present value for upper secondary education and tertiary education.

## Interpretation of results

Indicator A9 is not a good ranking measure but should be used to understand what the main economic drivers are in different countries. For instance, very high net present values (NPV) and very high internal rates of returns (IRR) suggest, in many cases, that educational institutions have not been able to keep up with the demand side for education. This shortage can, in many instances, be a constraining factor for

overall growth in countries. Similarly, too low returns (NPV or IRR) indicate that the incentives to invest in education are weak and might signal that recruitment to education might slow or decrease in the future. It is thus difficult to assert on this indicator whether one country is better than another.

There is generally a clear element of supply and demand driving overall returns, but reward structures look different in different parts of the world, depending on, for instance, overall inequalities in societies and variations between countries in how large productivity differentials are between educational groups. As such, these comparisons should be made with caution, and interpretations should be done, account taken of a range of other indicators in EAG that have trend data over time (particularly indicator A7 on earnings).

Dividing financial gains into private and public returns can often shed light on how overall cost and benefits are shared between the individual and the government. In some cases, this will give an indication whether gains can be divided differently. The components of the returns are the key tools in understanding the main drivers and obstacles that exist in different countries. These are described in more detail below.

### ***Direct costs for education***

At the upper secondary level (ISCED 3/4), the direct costs are typically carried by the public side whereas financing for tertiary education is more differentiated between countries. Direct costs are a reflection of how much is spent on students per year, but costs also depends on the length of schooling. As with all components, these are discounted values, and the comparison is made in Purchasing Power Parity (PPP) adjusted US dollar. Nevertheless, some care still needs to be taken in making direct comparisons across countries as PPP adjustments do not purge all differences in overall cost structures in different countries.

At the tertiary level, comparing public and private direct costs gives a good overview of the policy choices countries have made in regard to financing higher education and how this influences overall returns. A general observation is that in countries with low or no tuition fees, individuals typically pay back public subsidies later in life through progressive tax schemes. In countries in which a larger portion of the direct investment falls on the individual, earnings differentials are generally larger and a larger portion of the earnings differential also accrues to the individual.

### ***Foregone earnings and foregone taxes on earnings***

The earnings foregone while in education depend foremost on the level of earnings that a non-student can expect to receive, the likelihood to find a job and the length of the studies. The individual's foregone earnings are net of taxes, social contributions and social transfers, whereas these elements make up the foregone income for the public side. The likelihood of finding a job is taken into account, and poor labour market prospects, particularly among young lower-educated individuals, thus have an impact on the incentives to invest in education.

Conversely, good labour market prospects for young individuals typically raise the potential earnings foregone; this is in line with the general observation that enrolments increase in times of economic hardship. For upper secondary education, some caution is required when interpreting foregone earnings, as the minimum wage is used as an approximation (see discussion above). Apart from these labour market-related cost drivers, the length of education has a major impact on the amount of money foregone and is directly linked to educational policy.

### ***Total investment costs***

The two cost measures are summarised in an estimate of the total cost for the investment. In general, direct costs make up the main component for the public side and the opportunity costs, in form of foregone earnings, is the main investment cost for the individual. It is important to note that the overall direct costs are generally substantially lower than overall costs in terms of foregone earnings (productivity losses).

### ***Gross earnings benefits***

Education generates substantial gains over the working life and these earnings differences tend to increase over time. Earnings for higher-educated individuals typically continue to increase well after the age of 50, whereas earnings for lower-educated individuals level off relatively early in the career. This is one of the reasons why sometimes internal rates of return diverge from the net present value, as the generally high discount rate used in IRR puts more emphasis on earnings close in time with the investment (early on in the discount window).

Although gross earnings benefits provide an indication of supply and demand (with the caveats noted in the introduction of this section), they say less about the incentives to invest in education, as the rewards from the labour market is typically split between the individual and the public. These transfers between the individual and the government are discussed below.

### ***Income tax effects***

Income taxes are usually the main source of public revenue from investments made in education. The higher earnings that come with more education, combined with progressive tax systems that exist in many countries, make income taxes the main source of benefits for the government and the main source of cost for the individual. Income tax effects are substantially more pronounced at the tertiary level than at the upper secondary level of education due to progressive income taxes. This is typically the main reason why tertiary education yields higher public returns.

### ***Social contribution effects***

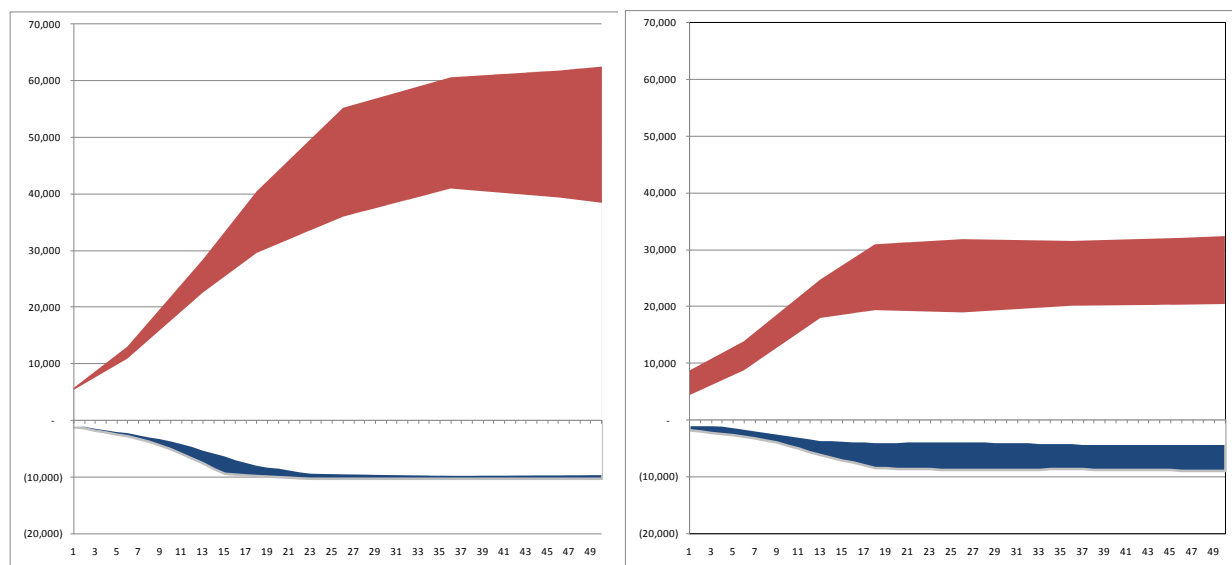
In most countries individuals pay social contributions on a flat rate and, as such, differences between educational groups are smaller and proportional to earnings levels. It is important to note that the social contributions in the calculations only concern those paid by the individual and not those paid by employers, which would be an additional source of public income. Employer contributions are typically also paid at a flat rate independent of the level of earnings, which results in less pronounced differences between educational groups. Nevertheless, this additional income stream for the public side could be incorporated into future calculations to provide a more complete picture of the benefit side. At this stage it is worth noting that the public benefits are somewhat understated (further details follow in the next section).

### ***Social transfer effects***

Those with low incomes are, in some countries, supported by government transfers, such as housing benefits and social assistance, to improve their living conditions. In most of these countries, social transfers benefit those without an upper secondary education and are paid out to a much lesser extent to those with earnings at the upper secondary level of education. As such, this constitutes substantial public savings in terms of the need to ensure reasonable living conditions. At the same time, it is important to note that these social transfers remove some of the income differences between those with and without an upper secondary education. In a few countries, social transfers extend to earnings levels that are enjoyed by those with an upper secondary education and, in these cases, they will influence public benefits and income differences at the tertiary level of education.

That social transfer depends on the level of earnings, and sometimes with a relatively sharp cut-off from these benefits at certain levels of earnings, sometimes generates large differences between educational groups in access to these support schemes. It is also notable that social transfers are more pronounced at early stages of the working life because of the lower wages that younger individuals receive. Similarly, social transfer effects are generally more marked for females than males because of lower wages and more interactions with these social transfer systems.

**Figure 2. Example of earnings differentials and impact of social transfers over the working life**



Notes: Males (on the left) and females (on the right) earnings differentials over working life in red and corresponding social transfers differentials in blue.

Social transfers, as well as progressive income taxes, can influence the value of education and also the supply of labour. As such, tax and social security policies are important factors to consider in providing the right incentives to encourage investment in and use of these skills later on in the working life.

### **Unemployment effects**

Education generates not only higher earnings but also improves the prospect of finding an employment. Unemployment typically falls with higher levels of education, and the contrast is especially stark between upper secondary and below upper secondary education (see indicator A6). How different unemployment rates translate into monetary gains is accounted for by using the level of earnings for different

educational categories over the working life. Net employment effects are then calculated for the individual by using tax information. The difference between gross and net unemployment effects constitutes the gains for the public side.

It is notable that in some countries good labour market prospects make up the overwhelming part of the value of education at the upper secondary level. With few exceptions, unemployment effects also contribute positively to the returns at the tertiary level of education.

### ***Total (net) benefits***

These measures summarise the net gains for the individual (private) and the public side. Net benefits for the individual are given after adjusting for taxes, social contributions, social transfers, and unemployment effects. Note that the difference between gross and net benefits for the individual mirrors the revenues that flow to the public sector.

Total net benefits give some indication of the potential rewards that an individual can expect to receive in different countries and, as such, give a hint of the overall incentives that exist for considering jobs outside one's own country. Similarly for the public sector, the net benefits indicate the expected gains that will accrue if the individual stays in the country. Although not all public benefits are currently accounted for in the calculations, the benefits that flow from education in terms of additional revenues far outweigh the initial investment made by the public sector. This is particularly true for tertiary education, where the discounted benefits are about 3 times larger than the initial investment.

### ***Net present value***

The net present value is simply the difference between the discounted benefits and the discounted investment costs, and represents the additional value that education produces over and above the 3% real interest that is charged on these cash flows. Public investment in education, particularly at the tertiary level, generates substantial future gains for the public sector and would be important to maintain, even in the face of running a deficit in public finances. The current sovereign debt crisis notwithstanding, government bonds can, in most countries, be issued at lower real rates. Note that the internal rates of return provide some indication of the level of those rates at which the investment would still generate a positive contribution (break even).

On average, tertiary education generates more in (net present) value than upper secondary education, both for the individual and the public, typically because of higher earnings potentials and, to a lesser extent, better employment prospects. To have the different components at the start of the investment makes it possible to analyse the main drivers of these overall returns (NPV and IRR) and to understand what policies are important to address in the context of improving overall incentives, if necessary.

### ***Internal rate of return***

As noted above, the internal rate of return (IRR) indicates at what real interest rate the investment breaks even. The rates of returns are, in many instances, very high in comparison to other asset classes. In comparison, returns on stocks over long investment periods generally yield a real return around 6%-8%. Considering that stocks carry a substantial risk, the rates of return observed in some countries are substantial. Part of the explanation is linked to the risk of investing in education. For the public sector,



these investments are essentially risk free, as one can expect to receive the average return whereas the individual faces a large variation in possible outcomes.<sup>4</sup>

However, it is also important to note that large shifts in the demand for education can drive up earnings and returns considerably before supply catches up. The high returns that some countries exhibit can thus be seen to come down once the supply catches up with demand. High returns provide a strong signal both to individuals and to the education system about the need for additional investment. Indicator A1 on attainment levels and indicator A3 on graduation rates are informative in this regard as these chapters provides context to and explanations about current returns and how future returns could potentially evolve.

## Other notes, caveats and further developments

First, it is important to note that this indicator should be viewed and interpreted in the context of other indicators in EAG to have a better understanding of the results. While the current indicator on incentives to invest in education accounts for substantially more factors that influence returns than past research on this topic, further developments are needed to provide a more accurate picture of the costs and benefits of education. Even so, one has to recognise that to be able to make comparisons across countries, simplifications are needed for reasons of comparability and consistency. Countries will undoubtedly have better and more detailed national data at their disposal. Results and findings in this indicator (as in any indicator) should thus be a vehicle for initiating more thorough national studies when and if a problem is perceived to exist in an area.

The components of the returns reflect interactions between education, labour markets and public policies related to taxation and social security. These interactions are essential to understand in providing the right incentives and to put the right policies in place that rewards skills acquisition and the use of these skills in the labour market.

In this work, it is important to have some idea about the issues and limitations with the current indicator. These are discussed below.

Net present value, internal rate of return and regression-based approaches use **current age-earnings profiles** to estimate returns to education. The use of current age-earnings profiles in estimating (future) returns is essentially the only way to approach an estimate of benefits to education. A true cohort approach (following the same individuals over their working lives) would provide information on those leaving the work force and thus has less value in assessing the incentives for those currently considering enrolling in education.

Using current age-earnings profiles is possibly less of a problem for gauging incentives as it likely mimics the way individuals make up their minds about potential future earnings advantages of continuing the education. Note also that all three methods are based on differences in outcomes between educational groups. As such, overall shifts in, for instance, earnings or employment over time will have a marginal

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<sup>4</sup> Because of the differences in risk, there is a case to be made for assisting individuals in financing their education, as the investment is essentially risk free for the public side and as governments can typically borrow at a lower rate than individuals. The possibility of transferring lower government borrowing costs to the individual can, in many instances, make a substantial difference to the value of education due to lower discount rates.

effect, whereas shifts between educational groups will influence the returns to a larger extent. In the end, the main determinant of whether current age-earnings profiles will remain is the supply and demand for education. So far, most indications suggest that the demand has kept up with or, in many countries, exceeded the supply (see trend data on, for instance, unemployment A6 and earnings differentials A7).

It is sometimes argued that we overstate the value of education, since **not everyone who begins an education completes their studies and graduates**. This observation is interesting, but the bias introduced is not given since it is likely that uncompleted education will yield some benefits in terms of earnings and this will, in essence, show up as earnings at the lower level of education. For instance, someone with some (but not completed) university education will be classified as having an upper secondary education, and this will negate some of the true earnings differences between the two educational categories. Depending on the degree to which uncompleted education is rewarded in the labour market, it could well be that returns from education are understated in the current calculations.

It is important to note that public returns are somewhat understated in the current calculations mainly because **employers' social contributions** and **value-added taxes** are not taken into account. Some initial analysis has been done on including VAT, and the results suggest that different consumption patterns do not result in much variation in VAT between different income groups. It thus seems that both VAT and employer contributions could potentially be captured by applying a flat rate based on average taxation in countries.

Further, underestimations of both private and public returns are due to the fact that **retirement benefits** are not included in the calculations. Although retirement benefits make up substantial amounts for those at the age of retirement, the impact on internal rates of return will be marginal because of the generally high discount rate in many countries. Including retirement benefits could potentially have a greater impact on net present value calculations. **Student loans and grants** increase the incentives by reducing the investment costs, and if interest rates charged on student loans are low, they will lower the financing costs and discount rate for the individual. Student grants are part of the indicator from the 2011 edition of EAG and student loans will likely be incorporated in the coming year.

In the absence of these factors, the overall returns to education should be seen as a lower bound of the financial benefits that are generated by these investments. Note, however, that some of these components will shift the returns from the public to the private side and vice versa (employers' social contributions and retirement benefits could potentially add to the overall returns).

The quality of the earnings data is of key importance for any approach, discounting- or regression-based, as it constitutes the underlying foundation for all other calculations and evaluations. An important contribution to improving the quality of the analysis and enhancing the understanding of how education and labour markets interact would be to **distinguish earnings by those in education from those that have entered the labour market**. This would not only improve the estimates of foregone earnings, but could also provide an interesting complement to existing data in other indicators (C3 transition from school to work or the earnings indicator A7).

For some countries, the earnings data appears to be of somewhat lower quality. **Sometimes age-earnings profiles are a bit irregular**. However, whether this is a consequence of poor data quality or an interaction with tax and social security systems is difficult to know. Similarly, some countries display **changes in relative earnings between years that appear to be too large** to be explained by shifts in wage-bargaining power or by redundancies in different sectors. The most obvious quality improvement would be for

countries to revise their time-series data on earnings, particularly if there have been changes in methodology. This would not only improve the quality of the current indicator but would also help in interpreting the trend data on relative earnings in indicator A8. In the absence of improvements to the original earnings data, a second way to counterbalance poor earnings data would be to smooth out errors by applying a moving-average approach, where earnings from 2-3 years are used in constructing age-earnings profiles. Note that indicator A8, on relative earnings, provides a good gauge of the quality of the earnings data and indicates where potential improvements could be made.

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