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The Changing Pattern of Wage Returns to Education and its Implications

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It is commonly believed that labour-market returns to education are highest for the primary level of education and lower for subsequent levels. Recent evidence reviewed in this article suggests that the pattern is changing. The causes of such changes, and their implications for both education and labour-market policy, are explored.

Key words: Rates of return to education, labour markets, poverty alleviation

1 Introduction

While education has many important non-market benefits, it is also valued for its role in helping people to become more productive, achieve higher earnings and avoid poverty. The extent to which it raises earnings is loosely called the economic 'return' to education. Estimates of private and social returns to different levels of education have been undertaken for a large number of developing and developed countries.[1]

Usually the studies are based upon information drawn from samples of workers in waged work, rather than on all employed persons (i.e. including those in self-employment and agriculture). They are also typically not adjusted for unemployment among the educated, nor for ability.[2] Thus, the usual source of data for estimating

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1. Private rates of return (or, more accurately, 'wage returns') to education can be estimated by computing the difference in average post-tax earnings between those with a given level of education and those at the next level below it. The rate of interest which equates the discounted value of this net earnings stream with the cumulated discounted private costs (mainly earnings forgone) of attaining the level of education concerned is the private rate of return. Social rates of return can be similarly estimated, but using gross rather than post-tax earnings as an indication of benefits and, on the cost side, by adding the full resource costs of schooling to earnings forgone by students at each level. In practice, however, this full method of calculating the returns to education requires a set of data which is unusual in many countries. Accordingly, a shorter method first elaborated by Jacob Mincer (1974) is most often used. This estimates an earnings function whereby the log of average wages is explained by years of education, years of relevant work experience and its square. The coefficient on education can be interpreted as the return to an additional year of education, and can be calculated, using dummy variables, for each relevant level of education. For more details see Psacharopoulos (1994). Using this methodology, most studies do not take account of the costs and measure instead the wage increments to education.
2. An important challenge in estimating the return to education is 'ability bias'. If innate ability and years of education are highly correlated, then returns may be accruing to ability, rather than to education *per se*. If

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returns to education is not a random sample of the population. 'Social' rates of return to education are somewhat lower than private returns, due to the addition to the calculations of the publicly financed costs. Estimation of returns presupposes that markets function efficiently and that earnings are a reliable measure of productivity at the margin – not necessarily a realistic assumption in places where large proportions of wage- and salary-earners are employed by the public sector. Estimates also take no account of the external benefits of education, namely, the benefits of an individual's education for other people or for society in general. These are thought likely to be substantial in the case of primary schooling which is typically associated with the acquisition of basic cognitive skills; the securing of literacy and numeracy brings sets of behavioural changes that are beneficial to families and communities. Similarly, at higher levels of education, externalities from scientific research bring benefits which extend well beyond the direct benefits for the individual with that higher education. The presence of externalities is important to the case for *public* investment in education, because private individuals, not being the direct beneficiaries, are not influenced by them in making their schooling decisions. Although there have been important attempts to quantify their scale and impact (Haveman and Wolfe, 1984; McMahon, 1999), definitive results which allow for the impact of externalities remain elusive. Notwithstanding these omissions, the estimated size of the return to education compares favourably with the return to investments in many forms of physical capital. Accordingly, investment in education has been judged to have high social priority in developing countries.

2 The pattern of returns and its implications for poverty reduction

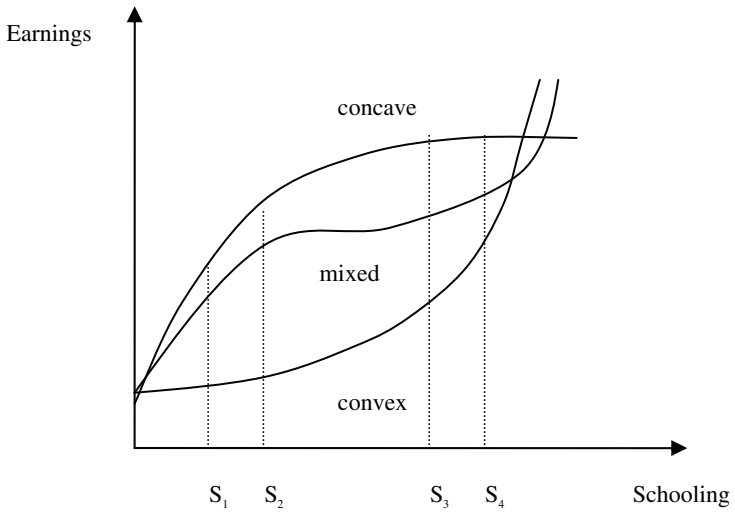
The evidence on wage returns to education in developing countries continues to grow. It shows that, internationally, one additional year of education adds approximately 10% to a person's wage, at the mean of the distribution (Psacharopoulos and Patrinos, 2004). However, returns vary at each level of education, and it is of interest to know how these differ from each other.

Until recently, the evidence has suggested that the wage returns in developing countries are generally larger at primary level than at secondary and higher levels of education. Some have interpreted this to be consistent with a notion of diminishing returns to education. A pattern of high returns to primary and lower returns to subsequent levels of education indicates that even where most children leave the system at or before the end of primary school, poor families are still likely to value educational outcomes highly. Thus, primary schooling, even where it is terminal, has historically been interpreted to be a profitable investment of time (and money, to the extent that direct costs have to be met) for the poor.[3]

true, this 'screening' hypothesis challenges the human capital interpretation of education, and weakens the economic efficiency rationale for public investments in education. However, there is little empirical support for ability bias affecting the results.

3. The idea that returns to primary education were high was, however, challenged by a number of authors during the 1990s (Knight et al., 1992; Bennell, 1996).

Figure 1: Alternative education-earnings relationships



Source: The authors.

In Figure 1, the slope of the education-earnings relationship provides a measure of the private rate of return to education.[4] It is clear that in the curve marked 'concave', the slope is steep at low levels of education (i.e. the return to education is high), but becomes progressively flatter (i.e. the marginal returns fall) at higher levels. If the shape of the education-earnings relationship is concave, then an extra year of education at low levels of education (S_1 to S_2 in Figure 1) brings substantially greater increases in earnings than it does at higher levels of education (S_3 to S_4). Similarly, marginal increases in education at low levels of education (where the poor are typically concentrated) raise earnings substantially. However, if the relationship is convex, the

4. The education-earnings relationship is often referred to as an 'earnings function'. It allows us to detect the shape of the relationship by showing the wage increment associated with each level of education. For example, suppose we estimate the earnings function with 'no education' as the base category, and include dummy variables for each level (primary, secondary and higher). The estimated coefficient on the 'primary education' dummy variable shows the average wage increment that is enjoyed by primary educated persons over those with no education. Similarly, the coefficient on the 'secondary education' dummy variable shows the wage increment enjoyed by secondary educated persons over those with no education. Finally, the coefficient on the 'higher education' dummy variable shows the wage increment enjoyed by those with tertiary education compared with those with no education. The marginal return to each extra year of, say, secondary education is calculated by subtracting the coefficient on the primary education dummy variable from that on the secondary education dummy variable and dividing the answer by the number of years of education in the secondary school cycle, and similarly for 'higher' education. If the marginal return to each extra year of schooling at the primary level is lower than that to secondary and that, in turn, is lower than that to tertiary education, we would say that a convex pattern of returns to education prevails, since each extra year of education yields a higher return at the tertiary education level than at the secondary and that in turn is higher than the wage-value of each extra year of primary education obtained. Such a pattern of marginal returns to education at different levels of education leads to an education-earnings relationship that looks in shape like the curve marked 'convex' in Figure 1. The slope of the curve at any given level of education measures the marginal rate of return to that level of education.

slope of the curve, and thus returns to education, *increase* rather than decrease with education level. In that case, additional education has a much stronger proportionate impact on earnings at higher than at lower educational levels.

3 Changes in the pattern of returns

The empirical evidence from the 1960s to the 1990s suggested that in most countries the relationship between education and earnings was concave (Psacharopoulos, 1994; Psacharopoulos and Patrinos, 2004). However, more recent evidence suggests that the rate of return to primary education may now be lower than that to post-primary levels of education.[5] Many studies using cross-section data from the 1990s and early 2000s find that the return to primary education in wage employment is significantly lower than that to post-primary education. Table 1 lists 31 such studies with evidence on returns from 34 countries spanning Asia, Africa, Latin America and the Caribbean. Tables 2 and 3 report some of the results obtained for a range of these countries from two recent cross-section studies (Schultz, 2004; Kingdon et al., 2008). These allow standardised comparisons (using the same method and the same definitions of education levels across the countries), and show that, in general, the return to an extra year of education increases as the level of education rises. While in some countries the pattern of increase is not monotonic with the level of education (corresponding to the 'mixed' curve shown in Figure 1), a generally convex pattern of returns is nevertheless observed across most countries.

Results from a further set of the studies from Table 1 are shown in Table 4. These employed similar earnings-function methods to estimate returns. In two cases the estimates have been recalculated by the present authors using changed assumptions, to enable comparison with the other studies. Otherwise, comparable methods and broadly similar assumptions were used. Once again, it can be seen that a generally concave pattern of returns emerges – more sharply so for the studies using data from 2000 onwards than for all the studies shown in Table 4. Taking the results of Tables 3 and 4 together, of the 18 published studies using data from 2000 onwards, 17 showed greater wage returns to higher education than to primary, and of these 14 showed higher wage returns to both secondary and higher education levels than to primary education.

It has been possible to combine these results with an earlier data-base showing the wage returns to schooling from more than 100 studies published prior to the mid-1990s. These data include the results of studies which use a variety of assumptions, many of which have not been standardised across countries. Nevertheless, such differences do not vary systematically with the dates of the studies, and a linear trend-line fitted to these results reveals a compelling picture of a fairly steep decline in the wage returns to primary schooling across the developing world over the past half-century (Figure 2). It

5. An issue that arises in estimating the return to each extra year of education at the primary level is what number of years to assign for 'years of forgone earnings', given that, in the first few grades, primary age children are too young to work. Different studies appear to follow different rules. However, some studies apply the same rule across a range of countries (as in Table 3 here which assigns 3 years of forgone earnings for primary education).

can be seen from the graph that this is true both absolutely and relative to the wage returns to secondary and tertiary levels of education.

Table 1: New evidence on wage returns to primary vs. higher levels of education

Country	Study
Argentina	Fiszbein et al. (2007)
Argentina, Brazil, Chile, Guatemala, Indonesia, Mexico, Mongolia, Philippines, Singapore, Thailand, Venezuela, Vietnam	Patrinos et al. (2006)
Bangladesh, Sri Lanka, India, Pakistan	Riboud et al. (2006)
Belarus	Pastore and Verashchagina (2006)
Brazil	Blom et al. (2001)
China	Li (2003)
Côte d'Ivoire, Burkina Faso, Ghana, Kenya, Nigeria, South Africa	Schultz (2004)
Côte d'Ivoire, Ethiopia, Uganda	Appleton et al. (1999)
Dominica	Reilly and Bellony (2009)
Guatemala	Porta et al. (2006)
India	Kingdon (1998); Kingdon and Unni (2001); Duraisamy (2002); Vasudeva-Dutta (2006); Kijima (2006)
Indonesia	van Leeuwen (2005)
Mexico	Lachler (1998)
Nicaragua	Laguna and Porta (2004)
Pakistan	Aslam (2009); Jamal et al. (2003)
Philippines	Maluccio (2003)
Rwanda	Lassibille and Tan (2005)
South Africa	Moll (1996); Fryer and Vencetachellum (2005)
St Lucia	Bellony and Reilly (2010)
Sudan	Ali (2006)
Taiwan	Wu (1999)
Tanzania, Kenya	Söderbom et al. (2006)
Turkey	Tansel (2008)
Venezuela	Patrinos and Sakellariou (2006)
Vietnam	Nguyen (2002)

Source: The authors.

Table 2: Estimates of wage returns to different levels of education for males aged 25-34 in Africa, using recent data

Country	Year of data	Primary	Middle	Secondary	Higher
Ghana	1998	11.0[a]	3.9	12.0	44.0
Côte d'Ivoire	1987	15.0	14.0	22.0	16.0
Kenya	1994	---	11.0	7.4	21.0
South Africa (1)[b]	1993	---	7.3	22.0	32.0
South Africa (2)[b]	1993	---	1.4	20.0	20.0
Nigeria	1999	1.6	---	4.0	12.7
Burkina Faso	1998	7.9	---	10.9	12.9
Africa		*8.9*	*7.5*	*14.0*	*22.7*

Notes: a) An estimate of the earnings function for Ghana using the same 1998 data as that used by Schultz (see Table 3 below) shows that the coefficient on the primary completion dummy variable was not statistically significantly different from zero. b) South Africa (1) refers to black males and South Africa (2) to white males. Schultz (2004) does not report standard errors or t-values.
Source: Schultz (2004).

Table 3: Estimates of wage returns to different levels of education, using recent data – standardised estimates

Country	Year of data	Primary	Middle or lower secondary	Secondary or higher secondary	Higher
Ghana	1998	8.9	8.5	8.8[b]	16.9[b]
Kenya	2000	11.6[a]	---	16.4[b]	25.5[b]
Tanzania	2001	10.2[b]	---	12.0[b]	27.3[b]
South Africa	2003	12.0[b]	21.6[b]	24.4[b]	34.1[b]
India	2004	0.0	7.2[b]	12.6[b]	15.6[b]
Pakistan	2001	6.0[b]	6.1[b]	13.2[b]	15.3[b]
Indonesia	2000	5.0[b]	8.4[b]	13.7[b]	17.2[b]
China	2004	0.0	7.8[b]	7.5[b]	10.1[b]
Philippines	1999	8.4[b]	7.8[b]	8.4[b]	21.6[b]
Thailand	2002	13.5[b]	13.4[b]	10.6[b]	23.1[b]
Cambodia	2004	5.3[b]	5.6[b]	7.7[b]	11.1[a]
Average		*7.4*	*9.6*	*12.3*	*19.8*

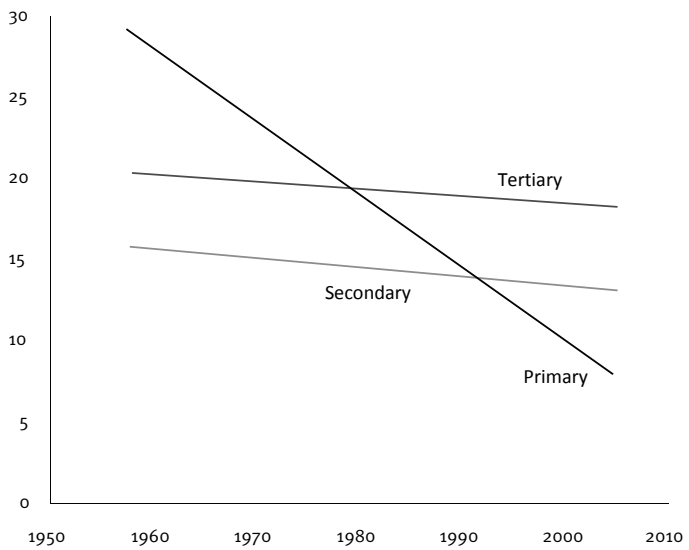
Notes: a and b represent statistical significance at the 10% and 5% levels respectively. Returns estimates here are reported for male waged workers of all working ages. The authors used a common methodology and also common definitions for each level of education and for the number of years of earnings forgone across the eleven countries.
Source: Kingdon et al. (2008).

Table 4; Further estimates of wage returns to different levels of education, using recent data

Country	Year	Primary	Secondary	Higher	Source
Turkey	2005	4.36	9.45	22.54	Tansel (2008)
St Lucia	2004	3.50	7.30	20.90	Bellony and Reilly (2010)
Argentina	2002	10.60	9.20	13.80	Fiszbein et al. (2007)
Indonesia	2002	4.50	20.80	20.10	van Leeuwen (2005)
Venezuela	2002	17.00	19.00	13.00	Patrinos and Sakellariou (2006)
Belarus	2001		11.50	9.30	Patrinos and Verashchagina (2006)
Pakistan	2001	3.40	16.30	11.00	Jamal et al. (2003)
Nicaragua	2001	6.30	9.30	18.60	Laguna and Porta (2004)
Guatemala	2000	13.30	22.50	15.80	Porta et al. (2006)
Sudan	2000	8.95	0.73	15.02	Ali (2006)
Dominica	1999	15.10	10.98	15.10	Reilly and Bellony (2009)
India	1999	5.93	9.27	11.00	Kijima (2006)
Nepal	1999	16.60	8.50	12.00	Psacharopoulos and Patrinos (2004)
Rwanda	1999	19.40	29.00	33.30	Lassibille and Tan (2005)
Vietnam	1998	14.30	4.10	23.50	Nguyen (2002)
Average for all		10.23	12.53	17.00	
Average for 2000-09 studies		7.99	12.61	16.01	

Note: Results for the studies in the above table have not been standardised. However, the studies use similar earnings-function methods. Recalculation of estimates has been undertaken in the cases of Sudan and India to allow comparison with others.

Figure 2: Returns to schooling over time (linear trendlines)

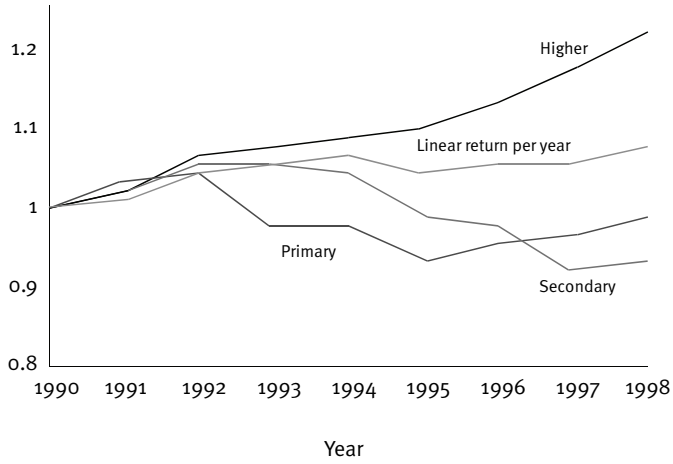


Source: Database of rate-of-return studies (Patrinos and Psacharopoulos (forthcoming)).

A similar pattern emerges from the limited number of studies which have used time-series data for a given country. Blom et al. (2001) find that, in Brazil, between 1982 and 1998, returns to tertiary education increased sharply while returns to primary and lower secondary education dropped. Riboud et al. (2006) find that, between the early 1990s and early 2000s, rates of return to higher secondary and tertiary education increased in all three countries for which they had time-series data, namely, India, Pakistan and Sri Lanka. Mehta et al. (2007) find that the education-earnings relationship became more convex in Thailand, Philippines and India over the 1990s. Fiszbein et al. (2007) show that in Argentina over the period 1992-2002, returns to primary education decreased, returns to secondary remained stable and returns to higher education increased substantially, with university education exhibiting the highest returns among all levels by 2002. Lachler (1998) finds that, in Mexico between 1984 and 1994, the marginal return to primary education (i.e. the return to each extra year of primary education) fell by 3.1 points (from 16.9% to 13.8%) whilst the marginal returns to both secondary and higher education rose, with the latter nearly doubling (from 10.3% to 19.9%). This pattern of decreased primary returns in Mexico is confirmed by Psacharopoulos et al. (1996). Finally, a study of 16 Latin American countries (CEPAL, 2002), and another of 18 Latin American countries (Behrman et al., 2003), both conclude that returns to tertiary education have greatly increased in the 1990s whilst those to primary and secondary education have fallen (for the latter, see Figure 3).

In sum, this evidence indicates that primary education now tends to be associated with somewhat lower wage returns than those accruing from education at higher levels, and that this tendency has become more marked in recent years.

Figure 3: Changes in marginal returns to education in Latin America in the 1990s



Note: Linear return refers to yearly change in returns.
Source: Behrman et al. (2003).

4 Causes of the changed pattern

In principle, the relative decline in the wage returns to primary education over time may be due to both supply-side and demand-side factors – working separately or in combination. The context in which these changes have been taking place is a world which has been characterised by increased openness to trade and foreign investment over the past two or three decades. A particular preoccupation in the literature has been to examine the extent to which this increased openness has been associated with changes in skilled/unskilled wage ratios. The traditional theoretical expectation, based upon relative factor endowments, is that in poorer countries increased openness would lead to reduced wage inequality as a consequence of an increase in demand for unskilled relative to skilled labour and that, in the more developed world, the opposite would happen.[6] Evidence from the 1960s and 1970s suggests that the expected reduction of wage inequality did occur in many parts of the developing world, particularly in East Asia (Wood, 1994). However, more recent time-series analyses, mainly for particular middle-income countries in Latin America, suggest that the demand for skilled labour has actually increased relative to that for the unskilled, and that wage inequality has tended to widen as a result (Wood, 1997). Although this evidence may seem to conflict with the expectations of traditional Heckscher-Ohlin (HO) trade theory, the circumstances of middle-income countries – having, as they do, relatively larger supplies of skilled workers than the poorest countries – suggest that such an increased demand for skilled, relative to unskilled, labour may remain consistent with their comparative advantage. (See Anderson (2005) for a survey of this empirical material and a synthesis.)

The evidence is much more limited, from labour-market surveys, for increases in the relative wage of skilled labour in low-income countries (two exceptions being for Ghana (Teal, 2000) and Nicaragua (te Velde, 2003)) and, even there, there is little attempt to investigate why such puzzling trends have occurred. This is an important omission because such experiences run counter to the expectations of standard HO theory and it is much less likely that they will have occurred as a consequence of trade and foreign investment pressures alone.

Yet we have seen that recent evidence on returns to education suggests that similar tendencies exist in a good number of low-income as well as middle-income countries. This appears to add a new dimension to the existing body of evidence on wage and inequality trends. As indicated above, whilst there are some theoretical arguments to suggest that increased openness can cause an increase in net demand for skilled workers (and greater wage inequality) in both Northern and Southern countries, it is less likely that widening wage differentials will be a *general* consequence of trade and foreign investment pressures in the Southern states. The main causes are likely to be supply-side rather than demand-side pressures, stemming, in particular, from changes in the domestic relative supplies of skilled and educated labour. In recent years, particularly in

6. Such a phenomenon would, *ceteris paribus*, imply an increase in the rate of return to primary schooling relative to that associated with higher levels of education over the same period – a result largely consistent with the reported returns to education from the 1960s to 1980s (Psacharopoulos, 1994).

poorer countries, these changes may have had a more dominant effect on wage ratios than the impact of trade and greater openness *per se*.

For example, the supply of primary completers has greatly increased over the past 20 years in most developing countries. Primary enrolments in developing countries are estimated to have comprised some 75% of the age group in 1990 and 80% in 1999, and had increased to some 86% by 2007. Over the 1999-2007 period, the number of children out of school world-wide fell by some 33 million – with their numbers being halved, by 21 million, in South and West Asia (UNESCO, 2010). Educational expansion at the primary level proceeded at a rate which exceeded that of job creation in many of the poorer countries. In consequence, it became increasingly difficult, in most Southern continents, to find jobs in the formal sector without having already had some education at post-primary level. More generally, as education systems expand to include greater proportions of the school-age group, the qualifications required for eligibility for particular jobs rise. In these circumstances, it is to be expected that the reduced access to jobs provided by primary schooling will be associated with downward pressure on its wage rewards.

Quite separately, the rapid expansion of school systems in low-income countries has often been difficult to resource at earlier levels of unit expenditures. In some countries, the abolition of fees – introduced to facilitate access to schooling by the poor – has resulted in reduced real per-student expenditures and declines in school quality (World Bank and UNICEF, 2009). In a number of African cases, the expansion of primary systems appears to have been accompanied by literacy and numeracy being less readily delivered by primary schooling (Postlethwaite, 2004; UNESCO, 2004: 46-7). Recent evidence from India also suggests that completion of 5 years of education does not guarantee the acquisition of basic literacy and numeracy skills for a high proportion of students.[7] In addition, as expansion has proceeded, the quality of school intakes may have changed. Recent students may generally have been less well-prepared for school than earlier cohorts: they may have come from homes where parents were less educated than the average, and/or where informal home-based learning was more constrained. All the above factors will have helped to reduce the measured returns to primary schooling, and have bolstered an already growing demand for higher-schooled workers.

5 Conclusion

The changes in the relative wage returns to primary schooling are likely to have a number of consequences. Most obviously, reduced returns imply reduced private profitability. Other things being equal, this could be expected to cause the demand for primary education to fall. However, where the returns to secondary and higher education have been increasing, the impact on the demand for primary schooling will be uncertain. The outcome will depend partly upon the extent to which the returns at post-primary levels have increased (since primary education is a necessary precursor to education at higher levels) and partly upon the perceived likelihood of children being able to proceed from primary to secondary education and beyond (which depends partly

7. Pratham (2008) showed that only 58.7% of children in grade 5 could read a piece of text at the grade 2 level of difficulty and only 42.4% could do a sum dividing three digits by 1 digit.

on the poverty status of households) . These outcomes will vary from case to case, and it is not possible therefore to predict the impact on the household demand for primary schooling of a decline in its associated wage returns. On the other hand, these changes in the pattern of wage returns could be expected to increase pressures to expand the system at secondary and higher levels, and the proportion of children seeking to stay in school longer could be expected to rise.[8]

Secondly, falling wage returns to primary education reduce the poverty-mitigating scope of primary schooling for those who proceed no further in the education system. This is because, where returns are falling, the wage increment associated with each extra year of education is less than before. Nevertheless, as long as wage returns remain greater than zero, primary education does continue to help increase individual incomes and thus provides a means for individuals and families to fight poverty.

Thirdly, where reduced private primary returns derive partly (or wholly) from a decline in school quality and thus from a reduction in the cognitive skills of the average primary graduate, it is to be expected that the relative labour-market demand for primary school leavers will be reduced – being reflected in either lower wages/employment at this level and/or in a higher demand for those with post-primary levels of schooling.

Fourthly, these results have implications for the pattern of public funding of education. In particular, given its high and rising returns, large public subsidies to tertiary education should be avoided. The private profitability of higher education in most low-income countries should be enough to motivate students to enrol in and pay for their tertiary studies. This is particularly so where access to higher education has been strongly skewed towards the progeny of upper-income families. Subsidies will still be needed where credit-market failures deny poor people access to tertiary education, but such markets have been developing rapidly over the past decade, particularly in South Asia.

Finally, the fact that primary education has lower earnings increments associated with it than in the past – thereby reducing its direct poverty-mitigating potential – does not imply that the strong overall rationale for the importance of public investments in good-quality primary education is weakened. The returns to education discussed in this article have been estimated using wages. Waged workers typically constitute a fairly small fraction of the total workforce in many developing countries, and the pattern of returns to education in self-employment and – perhaps particularly – in agricultural employment may be different.[9] Similarly, wage returns take no account of externalities,

8. This reflects the fact that, if the benefit that primary education confers by permitting access to more lucrative levels of education is taken into account, its 'true' private return is higher than its measured wage return would suggest. See Heckman et al. (2006) for an estimation method which integrates this 'option value' of gaining access to higher levels of education within the calculation of returns to schooling.
9. There are very few studies which estimate returns to education in both wage- and self-employment using the same data set. Some evidence from Ghana and Pakistan (Kingdon and Söderbom, 2007) indicates that returns to education are convex not only in wage employment, but also for some worker groups in agricultural and non-agricultural self-employment, although the convexity is less pronounced than in wage employment. There is a literature on the impact of education on agricultural productivity, which generally finds positive returns to schooling, particularly in areas where innovation is occurring. The evidence, however, is of variable quality and raises an important set of technical issues, the assessment of which would require a separate article.

and the size of the positive *economic* externalities of basic education could be comparable to, or greater than, that of other levels of education, although there is little testing of this issue. Further, basic education is valued not only for its economic benefits but also for its non-market benefits (reductions in fertility and mortality, empowerment, better environment, lower crime, democratic participation, etc). There is persuasive evidence that basic education has substantial beneficial non-market externalities, although it is not straightforward to assign monetary values to these nor to integrate them into a single measure of the overall return to education (see McMahon, 1999, for review and extensive treatment of these issues). Each of these factors continues to underpin the case for the public financing of education throughout the basic cycle, and its importance as part of a strategy for poverty alleviation.

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