Abstract

Previous studies of the returns to education in terms of entrepreneurial profits, have failed to address the problem of a potential selection bias. This paper estimates the returns to schooling based on data from 3000 enterprises in Malawi, using access to land to control for selection. The results show that selection does not affect return to education; a year of additional schooling increases entrepreneurial profits by approximately 6 per cent. Selection does, however, affect the impact of other variables on profits. Importantly, the negative impact of health problems on profits increases markedly when taking selection into account. In other words, more funds should be allocated to health activities relative to schooling when these results are taken into account.
1 Introduction

It is well known that human capital is important for development and for individual earnings in particular. In a recent extensive robustness analysis by Sala-i-Martin et al. (2004), primary schooling turns out to be the second most robust factor influencing growth in GDP per capita out of sixty-seven explanatory variables in growth regressions on a sample of eighty-eight countries 1960–96. Later analyses have found a similarly clear positive association between years of schooling and growth, but results are sensitive to model specification, particularly which measures are applied for human capital (Hanushek and Woessmann, 2008). Macro studies indicate that the rate of return to schooling across countries is on average about 10 percent. Returns appear higher for low income countries, at lower levels of schooling and for women (Psacharopolous and Patrinos 2004).

Similarly, human capital influences occupational choice and performance patterns within occupations. Van der Sluis et al. (2005) perform a meta-analysis of micro-level studies with respect to the relationship between education on entry into and performance in entrepreneurship in developing countries. They find that an increase in education generally pull individuals out of farm work but its impact on the choice of wage work versus enterprise activities are ambiguous. However, the relationship between schooling and performance is unambiguously positive. In developing countries an additional year of schooling raises enterprise profits by 5.5% which is lower than the impact of an additional year of education on wage income and lower than the effect in developed countries, estimated to 6.1%.

There is a remarkable difference between studies analyzing the relationship between education and wage earnings (see for instance Card 2001; Harmon and Oosterbeck 2003) and studies analyzing the relationship between education and enterprise profits as the latter studies generally do not address issues of endogeneity and selection (van der Sluis et al 2005). Van der Sluis et al (2007) is an exception but is based on data from the U.S. As generally found in empirical studies, success of entrepreneurship increases with education but this might stem from the fact that more talented individuals are both more successful and more educated. Schooling is an endogenous decision and unobserved variables such as individual skills and talents might drive the results leading to biased estimates of returns to schooling. Nor do
previous studies control for the fact that the choice of becoming an entrepreneur (rather than a farmer or wage worker) is itself endogenous. On the one hand, more education increases the profit-generating capabilities of the entrepreneur, making more highly educated individuals become entrepreneurs. Not taking this effect into account leads to overestimation of returns to schooling. On the other hand, more education increases the outside opportunities and drive potentially successful entrepreneurs to other occupations where the marginal value of additional education is higher than for entrepreneurship. In that case, standard least squares estimates may underestimate the impact of education on performance.

This paper addresses these methodological problems by using distance as an instrument of education while landownership as a selection variable for occupational choice.\(^1\) Our results show that controlling for endogeneity increases the importance of education along the lines normally found in the literature on wage employment, but one should be cautious in drawing too strong conclusions as there is a risk that our instrument is not completely exogenous. As regards selection, we do not find that selection bias affects the returns to education, which we estimate to just over 6\% for an added year of education. We do, however, find that selection substantially increases the effect of health on entrepreneurial profits. This means that the return of health relative to education is higher when selection bias is accounted for. One implication of this is that more resources should be devoted to health relative to education when taking selection into account. Another implication is that there may be an excessive focus on education relative to health in research into the preconditions of entrepreneurial success. Not taking selection into account may thus lead to misguided priorities in policy and research.

In order to fully account for a potential selection bias, one needs a comprehensive dataset of occupational choices, including the choices of households/individuals that are not engaged with enterprise activities. Standard enterprise surveys do not have such comprehensive information as they are drawn from a population of enterprises only. In Malawi, a recent household survey has been undertaken which includes a comprehensive enterprise module. As entrepreneurship is perceived as an important strategy for poverty reduction and relevant and recent data are available in Malawi, we have selected to use Malawi as a case in point. There are no available studies on enterprise performance based on these data, but Hatlebakk (2008)

\(^1\) Card 2001 provides an overview of the literature on using various instruments for education and distance have frequently been applied (see for instance Card 1995)
perform an analysis of factors that determine occupational choices in Malawi. We are also aware of one other study on factors that influence the success of entrepreneurial performance in Malawi. Based on a national sample of small and medium enterprises in Malawi, Chirwa (2008) found that education was the only individual-level characteristic that significantly explains profit margins. This study does not, however, address the methodological issues of endogeneity and selection bias.

The paper is structured as follows. Section 2 presents an overview of theoretical arguments on the importance of education for entrepreneurship, and a summary of empirical findings. Section 3 presents the data and methodology used in the paper. In section 4, the results of our estimations or presented. Section 5 concludes.

2 Theory and evidence on the entrepreneurial returns to education

In the classic Mincer (1974) human capital model, education has a productive impact. Schooling reflects an investment decision by an agent who compares future net benefits and current costs of education, including forgone income. The optimal investment decision is where the marginal return of investment in education (s'th year of schooling) is equal to marginal costs (of the s'th year of schooling) and generally one assumes a concave return function. As there is heterogeneity across individuals according to marginal costs and marginal returns, the optimal decision varies across individuals. Mincer treats earnings as separable in years of schooling and experience and more schooling generally improve performance (otherwise it would not been initiated). However, the theory does not provide any clear answer on the impact of education on performance of different occupational groups. The Mincer model focuses on income from wages and does not analyse the selection and performance decisions simultaneously.

The econometric evidences on the role education play for occupational choice and performance are mixed. However, generally education improves performance. The mixed

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2 The return to the s'th year of schooling is approximately the difference in log wages between leaving at s and at s-1 and normally one estimate the returns to s by analysing how log wages varies with s. See Card 2001 for a review of the model.

3 Concavity is achieved by using a decreasing experience function.
results can partly be explained by differences in methodological approaches for dealing with selection, endogeneity and unobserved heterogeneity. Mincer (1974) found that the returns to schooling on wages were 10% in the US. Harmon, Oosterbeek and Walker (2003) find that the return of education was 9% for men and 16% for women in the UK. These results were robust controlling for plant size, union membership, part time status, marital status and family size. However, traditional OLS estimates of returns from schooling show substantial variations across countries and gender. Harmon, Oosterbeek and Walker (2003:120) show that in developed countries, the range varies from 1% (for females in Netherlands) to 17% (for females in Northern Ireland). One generally finds that the relative returns to education among women increase in countries with low female participation rate and that the impact of education is higher for rich households (the complementarity of ability and education is highest for the most able and this relationship has grown stronger over time). In a meta-analysis of OLS studies Harmon, Oosterbeek and Walker (2003) found that on average the return of education is 6.5% which are in line with the results of Angrist and Krueger (1991).

From the literature on schooling and wages, we know there are various strategies for dealing with endogeneity and unobserved heterogeneity. One approach is to make the unobserved observable, in this case making the ability measureable. For countries where we have test scores for cognitive skills, one generally finds that the importance of education decrease when controlling for cognitive skills (see Hanushek and Woessman 2008). Another approach is to apply a natural experiment that treat individual different in a way that affect their education level but not the entrepreneurial outcome. IV techniques based on family background variables, time of the year borned, whether parents were self employed, policy changes in schooling laws, differences across regions in implementing laws, distance to school are among the various IV variables used. IV estimates are generally found higher (more than 20%) than OLS which to some extent is a puzzle as one on apriori grounds would expect that OLS methods lead to upward-biased estimates of the true causal effect of schooling (which indicates that the instruments are weak in the sense that they are not completely exogenous (school reforms are for instance targeted to specific groups).

Most studies of how education influence the performance of enterprises apply traditional OLS tools and on average an additional year of schooling increase enterprise income by 5.5% per year according to the meta analysis by van der Sluis et al (2005:252). The authors bemoan the lack of sophistication of studies of entrepreneurial profits and underline the importance of
drawing upon the experience from the extensive literature on the impact of education on labour market outcomes discussed above. The research design should apply an integrated model where the selection and performance decisions are analysed simultaneously while at the same time controlling for the fact that education is an endogenous variable (high ability persons will generally select more education).

Education influences the selection to become an entrepreneur through various mechanisms. More education is generally correlated with higher wealth and consequently lower start-up costs for enterprise activities. The direct impact of education might also differ across occupations and therefore influence the initial choice of occupation. If education has a higher impact on the productivity in business activities compared to other occupational choices, more talented persons become entrepreneurs. When education improves the entrepreneurial ability, but not the productivity of an individual employee – education will increase both the likelihood of becoming an entrepreneur and the performance of the entrepreneur. To the extent that education is more profitable for entrepreneurs than for wage earners, more talented potential entrepreneurs will become entrepreneurs and traditional OLS estimate will therefore provide an overestimate of the effect of education.

Education also influences the diversification strategies within a household (more education provides more room for diversification within the household). Education leads to diversification strategies away from farming activities (Reardon et al., 2001; Hatlebakk 2009; van der Sluis et al 2005). Hatlebakk (2009) finds that persons completed primary school in Malawi generally tends to work as wage earners, but he does not find a corresponding significant impact of education on the choice to become an entrepreneur. In their review of studies from developing countries van der Sluis et al (2005:248) find that more educated individuals are more likely to become wage earners and/or entrepreneurs and that women are more likely to become wage earners when education increases. The above referred separation effect between wage earners and entrepreneurial activities further increase with the level of urbanisation and in countries where agriculture is dominating. In contrast, in their review of enterprise literature in industrialised countries van der Sluis et al (2008) do not find that education influence the choice to become an entrepreneur. Neither do they get support for the hypothesis that the return from education is higher for employees than for entrepreneurs (through for instance a stronger screening effect). van der Sluis et al (2007) finds the opposite based on US data. They use the entrepreneurship status of the father (assume a positive
relationship) and religion (a negative relationship) as instruments for the entrepreneurship selection equation.

Given the choice to become an entrepreneur, education can have a further impact on business performance. To measure the impact of education on entrepreneurship performance and to prescribe policy education, one need to distinguish between these two effects. As regarding selection, there are generally two mechanisms or channels that are pointed to in the literature. On the one hand, education increases managerial ability and thereby increases the probability of entrepreneurship (particularly if this ability effect is higher for entrepreneurs than for other occupational groups). On the other hand, education generates better outside opportunities and thus decrease the likelihood of entrepreneurship. For instance, increased education increases the opportunities for (high) wage income. According to van der Sluis et al (2008:798), theory does not provide any clear answers to which effects that dominate the decision to become an entrepreneur. While there is a lot of literature on factors determining diversification strategies of the rural poor (see for instance Barret et al 2001, Reardon 1997), this literature generally do not analyse how education influence the decision to become an entrepreneur versus for instance a wage earner.

In addition to increased profits, education can have further productive effects on business performance that are more difficult to measure. Education can for instance increase the survival rate of the firm through the facilitation of improved capabilities of the entrepreneurs, including capabilities to adjust to new external conditions and to adopt new technology. Education might also reflect signalling activities by the firm. Rather than improving productivity, education is in many circumstances used to signal existing productivity. As for the human capital model, the signalling model is not able to provide policy prescriptions about the relative importance of education for various occupational groups – for instance whether entrepreneurs gain more from education than wage employees. For instance, one might claim that entrepreneurs do not need to signal their productivity as they are self-employed, but on the other hand the self-employed are also dealing with uninformed stakeholders such as clients and providers of credit and might need signalling devices. Also at this point, the theory is ambiguous and it is therefore not obviously clear that education only play a signalling role for wage earners.
According to Lazear (2005), entrepreneurship requires general knowledge and the formal education system normally increase this, particularly at the lower levels that are most common in developing countries. To the extent that wage earners are more specialised and general competence do have a small impact of wage earners ability, education also has a limited impact on the selection to become a wage earners. On the other hand, the distribution of individual ability is heterogeneously distributed and there might be differences across groups - for instance that women tend to become wage earners when their education level increases.

3 Data and methodology

The data used in this paper is taken from the Malawi Second Integrated Household Survey (IHS-2) 2004-2005. The survey covers 11280 households and 52707 individuals. The survey also has a module on entrepreneurship covering 3913 enterprises. For our analysis we have merged survey modules B (household roster), C (education), D (health), O (agriculture – rainfed cultivation), and V (household enterprises). This is complicated somewhat since the modules do not all have the same observation units, in modules B through D the observation unit is the individual, in module O it is the agricultural plot, and in module V the enterprise. Module O has been added to modules B through D by aggregating plots per household. Merging with the enterprise module V is somewhat less straightforward, as each individual may have more than one firm, and one firm may have more than one owner (up to two owners are registered in the data). We have addressed this problem by randomly selecting one enterprise per owner, and excluding enterprises with more than one owner from our estimations. This leaves about 3100 enterprises for our main estimations.

The standard approach to measuring the impact of education on entrepreneurial profits, is to estimate an equation like the following:

\[
\ln(\text{profits}_i) = \alpha + \beta_1 \text{age}_i + \beta_2 (\text{age}_i)^2 + \beta_3 (\text{education}_i) + \gamma X_i + \epsilon_i
\]  

(1)

where profits of firm $i$ are seen as a function of the age and education of the owner of firm $i$ following Mincer (1974), and a number of other control variables $X$, capturing characteristics of the firm such as size, firm age, and status of registration, and characteristics of the owner such as gender, marital status, ethnicity, health and so on. Age of the owner is typically taken to reflect general experience of the owner, which is assumed to increase with age, but to have a decreasing marginal effect on profits, hence the squared term. Education is typically measured as years of education. In our initial estimations and for reasons of comparison, we run an OLS regression on an equation of the above form. As our dependent variable, we use the profits reported by the owner. While one may question the accuracy of reported profits, this appears to be the best available indicator of entrepreneurial success in our data set.

As noted in a number of studies of returns to schooling in terms of earnings of profits, there are several problems with estimating these returns through ordinary least squares regressions. Notably, education is unlikely to be exogenous, and results therefore suffer from an endogeneity bias. For instance, both profits and education are likely to be driven by unobserved variables such as talent. Any estimated association between profits and education may thus reflect more talented individuals getting both more education and greater profits, rather than an effect of education on profits. In other words, OLS estimation likely overestimates the effect of education on entrepreneurial profits, by not taking into account underlying variables such as talent.

The problem of endogeneity of education is typically addressed by using some instrument for education, i.e. a variable that is correlated with education but not with entrepreneurial profits. By regressing education on the instrument, and using predicted education values in the profit equation, the endogeneity bias is corrected for. A number of different instruments for education have been used in previous studies, broadly relating to either school system features, or family background variables. Following Card (1995) and subsequent studies, we use distance to school as an instrument for education. While distance at community level is available in the survey data, we instead computed distance at the household level using the minimum of reported time of travel to school across household members. While several school reforms have been implemented Malawi in recent decades, such as the abolition of school fees in 1994, it proved hard to use these kinds of features to address endogeneity.
Moreover, there is a dearth of family background variables for enterprise owners available in our dataset, making it hard to find useful alternative instruments.

Another problem in estimating the returns to education is that of selection. Whether or not to become an entrepreneur is an endogenous choice, which may depend on the level of education. On the one hand, education may increase the chance that an individual starts a business as he may be able to operate it more profitably. On the other, education may also increase the return from other activities such as wage employment, possibly making individuals select out of entrepreneurship. By not taking into account the endogeneity of the entrepreneurship choice, standard estimations based on firm data again comes with a bias. Addressing this problem in an empirical setting requires finding an instrument which affects the decision to become an entrepreneur, but not entrepreneurial performance. We use the availability of land per household member as an instrument to this end, since scarcity of land is likely to make household members look for alternative ways of making a living, such as starting a business. And availability of land is also not very likely to affect business profitability. Other studies of entrepreneurship in developed countries have used the entrepreneurship status of the father, and religious affiliation as selection variables (van der Sluis et al, 2007), which given our data are not viable strategies.

4 Results

Table 1 reports the results from our basic specification. The dependent variable is reported profits of the firm. The independent variables include three firm-level variables: Firm age, registration status, and size (measured by the number of employees from outside the household of the owner). It also includes location of the owner’s household (urban/rural), and five owner-level variables: Age and age squared, gender, whether the owner suffers from a chronic illness, and education measured as years of schooling. A number of additional variables proved highly insignificant in preliminary estimations, and have been excluded from our basic specification: The number of household members working in business (another measure of firm size), ethnic minority status of owner, marital status of owner.5

5 But marital status proves important to selection into entrepreneurship and is hence included in that equation.
Table 1. Main results. Dependent variable: ln profits.

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IVREG</th>
<th>Heckman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm age</td>
<td>0.022***</td>
<td>0.027***</td>
<td>0.023***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Registered firm</td>
<td>1.01***</td>
<td>0.79***</td>
<td>0.93***</td>
</tr>
<tr>
<td></td>
<td>(0.122)</td>
<td>(0.182)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.072</td>
<td>0.049</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
<td>(0.037)</td>
<td>(0.084)</td>
</tr>
<tr>
<td>Urban</td>
<td>0.045***</td>
<td>0.037***</td>
<td>0.75***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.204)</td>
<td>(0.096)</td>
</tr>
<tr>
<td>Age of owner</td>
<td>0.001***</td>
<td>-0.0004***</td>
<td>0.0002</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.012)</td>
<td>(0.015)</td>
</tr>
<tr>
<td>Age squared</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.0002</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.0002)</td>
</tr>
<tr>
<td>Male owner</td>
<td>0.67***</td>
<td>0.516***</td>
<td>0.328***</td>
</tr>
<tr>
<td></td>
<td>(0.052)</td>
<td>(0.117)</td>
<td>(0.078)</td>
</tr>
<tr>
<td>Chronic illness</td>
<td>-0.094</td>
<td>-0.11</td>
<td>-0.273***</td>
</tr>
<tr>
<td></td>
<td>(0.072)</td>
<td>(0.083)</td>
<td>(0.085)</td>
</tr>
<tr>
<td>Education</td>
<td>0.061***</td>
<td>0.149**</td>
<td>0.065***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.066)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Constant</td>
<td>5.176***</td>
<td>4.976***</td>
<td>8.703***</td>
</tr>
<tr>
<td></td>
<td>(0.183)</td>
<td>(0.518)</td>
<td>(0.592)</td>
</tr>
<tr>
<td>Obs</td>
<td>3141</td>
<td>1961</td>
<td>3026</td>
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<tr>
<td>R-sq</td>
<td>0.28</td>
<td>0.216</td>
<td></td>
</tr>
</tbody>
</table>

Standard errors in parentheses. *** indicates significance at the 1% level, ** at 5%, * at 10%.

The first column in Table 1 reports standard OLS results. The results show that education significantly affects profits, an additional year of schooling increases entrepreneurial profits by an estimated 6.1 per cent. This is in line with (or slightly above) similar estimations from other developing countries (van Sluis et al, 2005). Older owners have higher profits, but at a decreasing rate, and male-owned firms earn on average 67% more than female-owned. Health is negative, but insignificant. Older firms are more profitable, as are registered firms. Firm size does not, however, significantly affect profits.

Estimates using the minimum distance of the household to a school as an instrument for education are shown in the second column. In line with other studies instrumenting for education, the coefficient of education rises sharply. The estimate of the effect of an additional year of schooling more than doubles, to 14.9%. As has been suggested, this could be due to the poor quality of the instrument. Notably, distance is likely to play a role in determining the rate of return of education, as individuals located close to schools may have higher returns due to peer effects or for other reasons. Since the instrument picks up these individuals, the estimated return may reflect their return rather than the average return to education.
schooling. Unfortunately, useful alternative instruments do not seem to be available in our data set.

The final column in Table 1 shows the results when selection is taken into account. The selection variable used is land area per person in the household, which is negative and highly significant in the selection equation and thus appears to perform well. The results reveal that selection does not appear to bias the OLS estimates on returns to schooling much. The rate of return to education is estimated at 6.5%, only slightly above the OLS estimate. For a number of the other explanatory variables, however, selection does matter. Importantly, chronic illness has a significantly negative effect on profits once selection into entrepreneurship is taken into account. Moreover, the estimate of the effect of being healthy is 27%, almost three times as high as the OLS estimate. In other words, OLS underestimates the importance of health to entrepreneurship success.

This is important for policy arguments related to improving entrepreneurial profitability. While OLS results suggest that being healthy has an effect on entrepreneurial profits comparable to 1.5 years of education, the health effect corresponds to more than four extra years of education once selection is controlled for. This means that standard estimations of the relative effect of education and health to entrepreneurial success would lead to too great an emphasis on education reform over health interventions. Or to put it differently, while both formal educational skills and the capacity to exercise those skills are important components of what we might term functional human capital, our results suggest that relatively too much weight may be attributed to formal skills if selection is not adjusted for. In a practical sense, this does not necessarily mean that too much resources are currently being spent on education over health, as there is usually a great gap between research results and actual policy. However, our results do suggest that a reorientation of research on entrepreneurial success, which has so far predominantly focused on education, may be in order.

While one explanation of the results on health may be that people with a chronic illness and low entrepreneurial potential select out of entrepreneurship and into for instance agriculture or unemployment, this is unlikely to explain our findings as the results from our selection equation suggest that chronic illness increases the chance of becoming an entrepreneur. A more likely explanation is that individuals with greater entrepreneurial potential also have more profitable outside options, for instance in wage employment, and may therefore select
out of entrepreneurship into employment. As healthy individuals likely have a higher potential for profits or high wages than sick individuals, this means that more healthy individuals will select out of entrepreneurship, consistent with the results from the selection equation. Estimations that do not take into account the fact that healthy and successful individuals tend not to be entrepreneurs, and hence are absent from the dataset of entrepreneurs, thus arrive at too low an estimate on the importance of health to entrepreneurial success.

Selection is also important for the results on a number of other variables. The gender difference in entrepreneurial profits is approximately halved when taking selection into account, which is consistent with previous results that women tend to prefer wage employment. The age of the owner becomes insignificant when taking selection into account, suggesting general experience of the owner is not as important as OLS results would have us believe. The advantage of being in an urban area is somewhat reduced when selection is controlled for.

In sum, where many previous studies of the determinants of entrepreneurial success fail to address methodological challenges of endogeneity and selection, our analysis shows that this produces in part misleading results. While selection does not appear to affect the returns to schooling, it affects the relative returns of education compared to health, which is important for policy purposes, as well as the impact of a number of other determinants. Endogeneity is also likely to matter for the impact of education, but it is hard to find appropriate instruments in the type of household data used here. This is a challenge that should be addressed in the design of future household surveys, and in future studies.

5 Concluding remarks

Previous studies of the returns to education in terms of entrepreneurial profits, have failed to address the problem of a potential selection bias. This paper estimates the returns to schooling based on data from 3000 enterprises in Malawi, using access to land to control for selection. The results show that selection does not affect return to education; a year of additional schooling increases entrepreneurial profits by approximately 6 per cent. Selection does, however, affect the impact of other variables on profits. Importantly, the negative impact of health problems on profits increases markedly when taking selection into account. In other
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