Estimating Human Capital Spill-Over in the UK: Evidence from Understanding Society

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Abstract

This paper examines whether the average level of human capital in a region affects the earnings of an individual residing in that region, net to the individual's own human capital. To this end we used data from Understanding Society, panel data across 11 British regions for the period 2009 to 2020. Our results suggest that there is no statistically significant effect of area-average educational attainment on area-level gross annual earnings.

Key-words: Human Capital Spill-over; Human Capital Externalities; Endogenous Growth

Introduction

For decades, economists have investigated the private benefits of human capital. The vast majority of the literature indicates that *ceteris paribus* one extra year of education increases earnings by about 8-12%. [1]Much less is known about the impact at the societal level. Such phenomenon has been labelled "human capital spill-over".[1-3]

From a theoretical point of view, the aggregate effect of human capital in an area can either increase or decrease the effect of an individual's schooling on their earnings. Individuals residing in the same area might, for example, share knowledge and skills through formal training or spontaneous interactions, which might lead to positive externalities across those individuals. Besides its effect on earnings, education may have other economic and non-economic benefits, such as a better understanding of politics which in turns will lead to individuals making better decisions over politics that affect the economy. [4] As such, education – or human capital – will generate a positive effect on earnings which are higher at aggregate level than at the individual level.

Some literature, however, suggests that education has little to do with productivity, but it is instead a signal of innate ability. Therefore, education generates either no or negative effects on earnings and the effect of aggregate level schooling on aggregate earnings is smaller than the effect of increased individual schooling on individual earnings.

Investigating the impact of human capital spill-over is of paramount importance for policy makers. If the average level of education in a region acts to augment the productivity of its residents, there will be a gap between the private and social returns to schooling. Quantifying

human capital spill-over is, therefore, essential to assess the efficiency of public investment in education. Notwithstanding the relevant policy implications and the large growing literature, the evidence on the magnitude of spill-overs is currently limited and non-conclusive.

This paper investigates the association between productivity, proxied by earning, and human capital spill-overs, proxied by the average educational level, using data for the UK for the period 2008 to 2019. In so doing, this paper contributes to the evidence base in several distinctive ways. Firstly, it provides evidence on the impact of human capital spill-over in the UK, a country that has been largely neglected in the literature. Secondly, it uses very rich longitudinal data from Understanding Society, a panel of over 11,000 individuals, which allows including a wide range of fixed-effect characteristics likely to be correlated with both productivity and spill-overs therefore elimination or reducing potential bias.

Here, we present the methodological approach in section 2, the data description in section 3 and preliminary results in section 4.

2. The Methodological Approach

In line with previous literature, we adopt a Mincerian[5] model as follows:

$$lny_{its} = \alpha + \gamma X_{its} + \beta E_{is} + \delta R_s + \theta H_s + \varepsilon_{ist} \ (1)$$

where *y* represents the earnings for individual *i* in geographical unit *s* at time *t*, measured as annual gross wage for those in a employment and gross annual salary for the individuals self-employed.
X represents a set of individual characteristics, namely age, gender, household size, ethnicity, and marital status.
E represents the individual educational attainment, categorised into five possible educational qualifications: no degree, General Certificate of Secondary Education (GCSE) qualification (year 11), university entrance (A-levels) qualification (year 13), higher education degree or more (university degrees or more), other degree.

R represents an area-specific effect proxied by regional dummies.

H represents area-specific human capital. We are interested in the direction and magnitude of θ which represents the so-called human capital spill-over, specifically how the human capital in that specific area can be explained in terms of earnings. *H* is per-se unobservable as we can only observe the area schooling level ($\bar{S}$), instead. If $\bar{S}$ correlates with the error term, then ordinary least square estimates will be biased. This, for example, can be the case when the worker ability (which is unobserved) correlates with the schooling structure.
ε represents a random error term.

2.2 Modelling the Association at Regional Level – Fixed Effect Composition

Following Rudd (2000), we estimate the association using a two-step approach, where the first step estimates the earning separately by year using area fixed-effects (f_{is}) in lieu of the area specific characteristics *H* and *R*, as follows:

$$lny_{is} = \alpha + \gamma_1 X_{is} + \beta_1 E_{is} + \phi_1 f_{is} + \eta_{is} \ (1b)$$

The second step treats the estimated coefficient ϕ as a panel and regresses them over *R* and *H* as follows:

$$\phi_{st} = \tau_t + a_s + \delta_1 R_{st} + \theta_1 \bar{S}_{st} + e_{st} \ (2)$$

Where τ_t represents a time-trend, and both η and e represent two error components. *R* now includes some area-time specific variables such as unemployment and crime rate. $\bar{S}$ represents the percentage of area-population having the following five possible educational qualifications: no degree, GCSE qualification, A-levels, higher education degree or more, other degree.

This approach has the advantage is that it does not require knowledge of where individuals have studied (or any individual's ex-ante characteristic). However, this procedure is data demanding and it assumes that fixed-effects are able to control of any unobserved correlation between earnings and area specific human capital. Therefore, to accept such an assumption, it requires a large number of fixed-effect controls (at area level).

Specifically, in the first step we use individual data for a sample of over 11,000 working individuals. In step two, we move to area level by aggregating the information to area level.

3. The Data

To investigate the human capital spill-over we use data from Understanding Society (UKHLS). UKHLS is since its inception in 2009 the largest British panel, with a sample size of 40,000 UK households, including approximately 100,000 individuals. It superseded the British Household Panel Survey (BHPS), which has been included in UKHLS since 2010 (wave 2). We focus in our analyses on the regional level, including nine English regions, Northern Ireland, Scotland and Wales. Our data covers the period 2009-2020.

4. Preliminary Results

Table 1 reports the preliminary results of our models of equation 2 presented above with95% confidence intervals (CI) in brackets. The coefficient associated with the variable Educational Measure represents our Human Capital Spill-Over effect. Model 1 presents the bivariate estimation results. Our results show a negative and significant effect of the educational measure on the area specific effects. In the second model we adjust for time fixed-effect, proxied by year dummies, and in model 3 we adjust for area-time specific effects, namely area unemployment rate and area crime-rate. The effect of state average education on individual earnings becomes statistically non-significant once we adjust for time fixed-effect. The effect remains statistically not significant at when we also control for area-time specific effects.

Table 1. Regional-level pooled UKHLS regressions (Equation 2)

	Model 1 (N=121)	Model 2 (N=121)	Model 3 (N=121)
	b/95%CI/*p*-value	b/95%CI/*p*-value	b/95%CI/*p*-value
Educational Measure	-2.42***	0.07	0.07
	[-3.547,-1.302]	[-0.511,0.659]	[-0.511,0.659]
	0.000	0.803	0.803
Constant	10.07***	9.62***	9.62***
	[9.694,10.453]	[9.469,9.765]	[9.469,9.765]

Time Fixed-Effect	No	Yes	Yes
Unemployment Rate	No	No	Yes
Crime Rate	No	No	Yes

Notes: * p<0.10; ** p<0.05; *** p<0.01.

5. Preliminary Conclusions and Future Developments

This paper attempted to determine whether human capital spill-overs are observable at the regional level in the UK. We used a Rudd (2000) framework, which involved adding measures of educational attainment at regional level to a standard Mincerian earnings regression. Our results show that we can reject the hypothesis that human capital spill-overs affect individual earnings. One potential explanation for these results is that all the possible effects are captured by time-invariant fixed effects and/or by area time specific effects.

One limitation of this study is that at the current stage we are investigating the effect at regional level and this might mask some area heterogeneities, such specific niche industries located in some small areas, on that would be identifiable only at a more granular geographical level. We plan to tackle this issue by replicating our analysis at finer geographical level such as at the LSOA level. Moreover, we plan to adjust by environmental factors such as air pollution and social hazard.

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