

# **Economic Returns to Education for Farm Households**

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Note: This is a working paper and readers are requested not to quote without first contacting the authors.

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## Abstract

*This paper explores the causal effect of education on off-farm wages of farm operators and their spouses in Northern Ireland. In addition, it seeks to ascertain if there are differences in returns to education between rural and urban based individuals. A Mincerian human capital earnings equation is estimated to identify the marginal return to additional time spent in education by individuals according to location. In an extension of the initial model, instrumental variables are used to control for the potential endogeneity of education in the econometric estimation of the earnings equation. The analysis shows significant returns to education which are somewhat higher for females than males. However, returns are significantly lower for rural-based females than their urban counterparts. The paper also examines the returns to specific qualifications. We find that returns to higher qualifications (degree level) in the case of farm operators and especially their spouses are somewhat lower than comparable estimates for the Northern Ireland labour force as whole. This may indicate that rewards for high-level qualifications are probably constrained by the “thinness” of the labour markets in some rural areas.*

## Introduction

Historically education has been viewed as central to the formation of human capital (Schultz, 1960). Previous research evidence shows that better educated individuals earn higher wages and experience less unemployment than their less educated counterparts; providing evidence of strong financial returns to investing in education (Card, 1999). Within the UK, since the early 1970s, there has been a significant increase in the number of people obtaining educational qualifications. In more recent times, government policies, including the White Paper issued in early 2003, have pushed for expansion of the further and higher education sectors in order to meet rising skill needs; this drive being reiterated in the UK government’s goal of fifty per cent participation in higher education among the 18-30 age cohort by 2010 (Department of Education and Skills, 2003).

Economists view the decision to invest in human capital through increasing education as a private decision and have typically explored the 'internal' rate of return from this investment decision in terms of the wage gain from investing in more education. While there have been a number of studies of returns to schooling and education in the mainstream economics literature (see review in Card, 1999) there are few empirical studies that have estimated labour market returns to education for farm households (Goetz & Rupasingha, 2004 provide a rare example). Previous evidence shows that farm operators within the UK have tended to acquire few formal qualifications. Generally males from farming backgrounds have fewer secondary and tertiary qualifications compared to the wider male population (Gasson, 1998). However, spouses generally have higher levels of educational attainment compared to their farming partners (Moss *et al.*, 2004).

However, the changing nature of global agriculture, from a market and policy perspective, increasingly requires farm families to have a strong basic education in order to adopt new technologies and integrate them into the farm business (Huffman, 2004). In addition, as it becomes increasingly difficult for farm businesses to generate an adequate level of household income, there is an increased trend towards off-farm employment in western agriculture, with the agricultural labour force supplying labour to other sectors of the economy. In this environment, the available returns to education will be an important factor in determining the educational attainment and labour market participation of individuals. As labour markets demand more skilled workers, education levels in rural areas, particularly for farm males, are likely to constrain employment opportunities and this is of increasing concern to policymakers (EU Commission, 2006). To achieve both occupational and sectoral labour mobility in the off-farm labour market, skill levels and educational attainment have a critical role in determining participation by farm household members in the off-farm labour market and ultimately determining wages and farm household incomes.

The general human capital investment model (Mincer, 1974) predicts a positive correlation between levels of education and its return. However, level of investment in education is also likely to vary with individual characteristics such as family background and ability. Card (1999), extended the human capital investment model

of returns to education by incorporating the idea that returns will vary not only by individual ability but also because individuals may have different rates of substitution between current and future earnings. In other words, two individual with equal abilities may exhibit different preferences for educational attainment depending on future expectations. In addition, such variation in discount rates may come, for example, from variation in access to funds or taste for schooling (Lang, 1993). More recent research has explored the extent of heterogeneity in returns to education (e.g. Harmon *et al.* 2003a). If average returns to education are lower for certain groups within the population then the equilibrium may be one where, on average, individuals within these groups obtain less education. For farm based individuals, it is anticipated that they will select an optimal level of schooling by equating their marginal cost of an extra unit of time spent in education to their expected marginal return from that extra unit of time spent in education. So individuals will select that level of schooling which they judge will give them the best return in the local labour market. However, there may be spatial variation in returns to education in particular between rural and urban residents. This variation is expected to be the result of the thinness of rural labour markets and mobility constraints affecting some rural residents. This effect is likely to contribute to the rural/urban pay gap identified in several studies (e.g. Vera-Toscano *et al.* 2004; LeClere, 1991).

Within rural labour markets the range and diversity of employment opportunities may be more restrictive reducing the options available to individuals in these areas. When there are few high quality jobs, better educated workers may be forced to seek employment for which they are overqualified (McLaughlin and Perman, 1991). Consequently, such workers will be rewarded less for their education and training in more restricted labour markets. Restricted opportunities also limit options for career progression, reducing the value of experience or tenure with an employer. For these reasons, it can be expected that returns to education may be less for workers in rural labour markets.

The willingness to relocate in response to job opportunities is a source of spatial differences in incomes (Ofek and Merrill, 1997). Farm operators and spouses are likely to have reduced mobility because of ties associated with running a farm business. A reluctance to forego the non-pecuniary benefits of a farming/rural way of life, imposes geographic constraints on the range of employment opportunities

available to some farm families. In addition, the mobility of rural residents may also be constrained by family ties in terms of caring responsibilities for children and elderly relatives. These ties become more acute for rural residents because access to higher quality jobs may necessitate lengthy commutes and longer working days reducing the flexibility needed to balance work and caring commitments. Moreover, facing spatially dispersed job opportunities, family members may impose mobility constraints on each other. Ofek and Merrill (1997) suggest that such constraints are likely to be more acute in local/rural labour markets than in urban ones and tend to affect secondary family earners (typically the wife) more than the primary earners (typically the husband). Given these constraints rural women in particular may be more inclined to 'trade down' and accept a local job for which they are overqualified. The economic return to education for such individuals is reduced compared to what might occur in a larger urban labour market where individual may more readily find jobs that match their level of training and skills.

This paper aims to estimate returns to education and qualifications for males and females within farm households in Northern Ireland. Specifically, we explore the extent of possible differences in average returns to education according to gender and between farm-based (rural) and non-farm based (predominantly urban) individuals. The paper contributes to existing literature by exploring how differences in returns to education may contribute to urban/rural pay gaps.

The structure of the remainder of the paper is as follows. Section 2 summarises the theoretical framework underpinning the analysis. Section 3 describes the data sources and the empirical specifications employed. The main results of the analysis are presented in Section 4. Finally, a summary of the main findings as well as a critique of the analysis are provided in Section 5.

## **Section 2: Theoretical context**

In his human capital theory, Becker (1964) assumes that individuals chose their levels of educations within the context of a standard optimisation framework. The return to an incremental year of education comprises the expected additional earnings (consumption) attributable to that extra schooling. On the other hand, extra

education involves additional direct (e.g. fees) and indirect costs (e.g., time, foregone earnings while in education, disutility of study). Thus the optimum level of education equates the present value of the  $s^{\text{th}}$  year of education with the costs of the  $s^{\text{th}}$  year of education:

$$\sum_{t=1}^{T-s} \frac{w_s - w_{s-1}}{(1+r_s)^t} = w_{s-1} + c_s \quad (1)$$

Where  $T$  = span of earning life (years)

$w_s$  = annual earnings with  $s$  years of education

$c_s$  = cost of the  $s^{\text{th}}$  year of education

$r_s$  = internal rate of return

Optimal investment would imply that an individual would invest in the  $s^{\text{th}}$  year of education if  $r_s$  exceeds the individual's rate of time preference.

If  $T$  is large and  $c_s$  is small (relative to life-time earnings) then from equation (1) the return to education ( $r_s$ ) can be approximated by:

$$r_s \approx \frac{w_s - w_{s-1}}{w_{s-1}} \approx \log w_s - \log w_{s-1} \quad (2)$$

Hence it is possible to estimate returns to education ( $s$ ) from an analysis of how log wages varies with  $s$ .

Using US Census data, Mincer (1974) conducted one of the first empirical analyses of Becker's theory. His specification extended the basic theory by allowing for post-schooling human capital accumulation. Mincer does this by including quadratic terms in work experience in the Human Capital Earnings Function:

$$\log W_i = \alpha + \rho s_i + \delta_1 e_i + \delta_2 e_i^2 + u_i$$

Where:  $W_i$  = individual  $i$ 's labour market wage rate

$s_i$  = years of education completed by individual  $i$

$e_i$  = years of experience of individual  $i$  (i.e. years individual has worked since completing education).

The Mincer model has provided the template for a large number of studies (see for example Trostel et al. 2002; Card, 1999). In this paper we employ an extension of the Mincer approach to estimate returns to education for farm and non-farm based individuals in Northern Ireland.

### **3 Data sources and empirical specifications**

#### *3.1. Data sources*

Data for the study is drawn from two data sources, namely a farm household survey and the NI sub-sample of the BHPS. The target group were males and females, aged under 65, and who were in employment. In addition, we restrict our samples to cohabiting individuals to reduce the potentially confounding effects of marital status within our analysis.

The farm household survey was conducted during spring 2008 and involved separate face-to-face interviews with farm operators and their spouses. Along with detailed farm level data, the survey collected detailed information on respondents' education and qualifications, labour supply and off-farm wages. The farm sample used in the analysis comprised 503 individual engaged in off-farm employment (164 males and 339 females).

A counterfactual non-farm sample was drawn from the Northern Ireland sub-sample of Wave 16 (2006/07) of the British Household Panel Survey (BHPS). The sample selection used in our analysis excluded those individuals who indicated that they were involved in agriculture and those designated as self-employed. The resulting sample comprised 591 individuals (283 males and 308 females), two-thirds of which were resident in urban areas.

The validity of using the separate datasets for comparative analysis was reinforced by the fact that the survey questions on education, and incomes/wages were identical for both survey questionnaires. In addition, the fieldwork for the survey was also conducted by the same ‘interview team’ which undertakes the BHPS, further enhancing comparability of the data.

For the purposes of the analysis and in line with previous studies we computed an hourly wage rate, for the sample groups (see Gosling *et al.*, 2000; and Harmon *et al.* 2003b). The hourly wage is calculated by average weekly net pay by normal working hours per week. Hourly pay is preferable to weekly pay as it controls for any changes in earnings due to hours at work e.g. part-time versus full-time work.

Within our analysis, years in education is calculated based on the age at which the respondents finished their formal education less school starting age (5). For the small number of individuals within the sample group who indicated that their schooling went beyond the age of twenty three (perhaps where there has been a break in education and the individual has returned) we follow Harmon and Walker (1995) by recoding their school finishing age to a maximum of twenty three years of age.

### 3.2 Empirical specifications

#### (i) Basic OLS Regression

Our basic specification estimates the following OLS model:

$$\text{Log}W_i = \mathbf{X}_i'\beta + \rho S_i + \delta(F_i \times S_i) + \gamma(RNF_i \times S_i) + \lambda F_i + u_i$$

Where  $W_i$  is average hourly labour market earnings of individual  $i$ .  $F_i$  is a dummy variable that is equal to 1 if individual  $i$  is in the farm subsample and 0 otherwise.  $RNF_i$  is a dummy variable with value equal to 1 where an individual is in the rural non-farm subsample.  $S_i$  is the years of schooling obtained by individual  $i$ . Finally,  $\mathbf{X}_i$  is a vector comprising a constant term, age and age squared divided by 100 (as



proxies for levels of experience) and a set of spatial dummies (rural west, urban east urban west, Belfast with the omitted category being rural east). The parameter  $\lambda$  captures the average difference in wage rates between the farm and non-farm groups. Note that the coefficients on the spatial dummies in  $\mathbf{X}_i$  capture and difference in average wages between rural and urban residents. The parameter  $\rho$  measures the average return to education for members of the urban subsample. Finally, the parameters  $\delta$  and  $\gamma$  capture any difference in the average returns to education between urban residents and farm and rural non-farm residents, respectively. Thus a test that there is no difference in returns to education for each group is simply a test of the null hypothesis that parameters  $\delta$  and  $\gamma$  are not significantly different from zero.

#### (ii) Instrumental Variables (IV) Estimation

There are a number of sources of bias associated with OLS estimates of the return to schooling. Firstly, in terms of the individual's optimisation problem we expect a positive correlation between levels of education and its return which is likely to lead to upward bias in the OLS estimate of the rate of return to education. Secondly, there is the issue of 'ability bias.' Levels of academic ability are usually unobservable (to the researcher) but are expected to be correlated with levels of education and wages resulting in upward bias of OLS estimates. Thirdly, potential bias arises from measurement error in schooling resulting in downward bias in OLS estimates (Harmon and Walker, 1995)

The usual route to tackling the endogeneity and measurement error problems is through the application of Instrumental Variables (IV). To explore the effects of endogeneity on our estimates of the returns to education we estimate the following two system for each sample subgroup:

$$\text{Log}W_i = \mathbf{X}_i'\beta + \rho S_i + u_i$$

$$S_i = \mathbf{Z}_i'\alpha + v_i$$

$$\text{With: } E(\mathbf{X}_i, u_i) = E(\mathbf{Z}_i, v_i) = 0$$

Here  $Z_i$  comprises a vector of instrumental variables. Valid instruments need to be strongly correlated with the endogenous regressor but uncorrelated with the error term of the schooling equation.

The instruments contained in  $Z$  comprise:

*Siblings*: Number of siblings of the respondent. For a given level of parental income, family size is likely to reduce the per capita resources that can be spent on educational investments.

*Border*: An index for birth order, i.e. the respondent's place in the family. If respondent is the first born then border = 1, if second born then border = 2 and so on up to border = 10 (for tenth or more child ion the family). The reason for including this variable is that the shares of family resources that each child receives are likely to differ across birth order. In particular, given that parents have a fixed time endowment, the first born will receive a greater time endowment than subsequent children who have to compete for parental attention.

*FewBooks, LotsBooks*: Two dummy variables concerning the presence of books in the parental home when the respondent was a child are used as a proxy for family-specific attitudes to education<sup>1</sup>.

*SLA16*: Individual faced minimum School leaving age of 16 instead of 15. We follow Harmon and Walker (1995) by using likely changes in the educational distribution of individuals caused by the raising off the minimum school-leaving age. In 1973, the minimum school leaving age in the United Kingdom was raised from 15 to 16. We create a dummy variable (SLA16) equal to 1 for individuals who entering their 16<sup>th</sup> year after 1973.

*FatherProf*: A dummy variable with value equal to 1 if the respondent's father was employed in a professional or associate professional occupation.

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<sup>1</sup> Respondents were asked: "Thinking about the time from when you were a baby until the age of ten, which of the following statements best describes your family home: There were a lot of books in the house; There were quite a few books in the house; There were not very many books in the house; Don't know." We constructed dummy variables for "a lot of books in the house" and "quite a few books in the house". The base in the regressions is "not many books in the house".

*MotherProf*: A dummy variable with value equal to 1 if the respondent's mother was employed in a professional or associate professional occupation.

*DadFarm*: A dummy variable with value equal to 1 if the respondent's father was a farmer and zero otherwise.

### (iii) Sheepskin Effects

The basic Human Capital Earnings Function (HCEF) assumes linearity in  $S$  and that  $\rho$  is a constant. However, it is likely that “credentials” matter more than years of schooling implying the existence of non-linearities in the HCEF associated with specific stages of the  $S$  distribution (e.g. completion of A levels, university graduation). This hypothesis is referred to as the “sheepskin effect” and estimates the wage premiums associated with fulfilling the final years of school or college and securing a qualification (Card, 1999). In the final part of our analysis we test for Sheepskin effects by estimating the wage premium associated with qualification levels.

In this case we estimate the following regression equation with qualification dummies for each sample sub-group:

$$\text{Log}W_i = \mathbf{X}_i'\beta + \rho_1\text{Qual1}_i + \rho_2\text{Qual2}_i + \rho_3\text{Qual3}_i + \rho_4\text{Qual4}_i + \rho_5\text{Qual5}_i + u_i$$

The vector  $\mathbf{X}$  comprises a constant, age and age squared and a set of spatial dummies. Qual1, Qual2, Qual3, Qual4 and Qual5 are dummy variables taking value 1 where a respondent's highest qualification is at level 1, 2, 3, 4 or 5, respectively. The omitted category is “no qualifications.” Actual qualifications within each level are defined according to Office for National Statistics “Harmonised Concepts and Questions for Government Social Surveys: Secondary Standards.” Level 1 comprises entry level qualifications including GCSE below grade C and GNVQ foundation level. Level 2 includes trade apprenticeships, GCSE grades A\*-C, GNVQ intermediate, City and Guilds Craft/Part II. Level 3 includes A Levels, and higher vocational qualifications such as NVQ level 3, OND, ONC and City and Guilds Craft

Part III. Level 4 comprises higher education qualifications below degree level, e.g. HNC, HND, Nursing qualifications. Level 5 comprises degree level qualifications. A full listing of qualifications within each level is provided in Appendix A.

## **Section 4: Results**

### *4.1. Summary Statistics*

Summary descriptive statistics by gender for the farm and non-farm sub-samples are provided in Table 1. Amongst farm males, on average, there is a lower level of education compared to the non-farm males as measured by years in full-time education 14.12 years for the non-farm males, 12.85 for the farm based males. In addition, there is a large percentage of the farm males (47%) who have no or minimum qualifications (i.e. up to NVQ level 1 and Equivalent). In addition they also have a low level of attainment at the higher level i.e. further and higher education (18%) compared to 51% in the non-farm population.

Farm females obtain a similar level of educational attainment compared to non-farm females but the wage rate for farm females (return) is much lower compared to the non-farm cohort. The indication is that the intercept shifts down on this earnings equation. This may suggest that the choices which farm females make in terms of living on a farm and work is impacting on their returns to education and this is demonstrated by what may be, in essence, from a female perspective a farm/non-farm pay gap.

**Table 1 Summary Statistics**

	Male		diff sig	Female		diff sig
	Farm	Non-Farm		Farm	Non-Farm	
Education (Years)	12.85 (2.53)	14.12 (2.63)	***	14.05 (2.50)	13.92 (2.58)	ns
Wage rate (£/hour)	10.27 (6.06)	14.54 (6.70)	***	8.99 (4.45)	11.12 (5.18)	***
Labour market hours/week	33.92 (1.06)	38.39 (0.38)	***	26.97 (0.66)	29.82 (0.54)	***
Age (Years)	47.95 (8.23)	41.79 (9.97)	***	47.10 (8.53)	41.15 (10.31)	***
Highest qualification:						
No qualifications	0.40	0.11	***	0.10	0.10	ns
Basic, e.g. GCSE, NVQ level1	0.07	0.03	**	0.09	0.08	ns
Trade apprenticeships/ NVQ Level 2	0.19	0.19	ns	0.21	0.22	ns
A Level, OND, NVQ level3	0.16	0.16	ns	0.19	0.11	***
Higher, below degree, e.g. HND	0.07	0.25	***	0.24	0.27	ns
Degree level	0.11	0.26	***	0.17	0.22	*
Observations	164	283		339	308	

**Note:** Standard deviations in parentheses. Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, ns = not significant.

One other result that is worth noting is the large difference in wage rates between those from non-farm and farm based households. This is demonstrated by the wage rate returns at each qualification level as presented in Table 2.

**Table 2 Mean Wage Rate by Level of Highest Qualification**

	Male		Female	
	Farm	Non-Farm	Farm	Non-Farm
<u>Highest Qualification:</u>				
No qualifications	7.93 [66] (2.63)	9.11 [31] (2.23)	6.43 [34] (2.18)	6.94 [31] (1.99)
Basic, e.g. GCSE, NVQ level1	10.64 [11] (6.46)	14.40 [8] (6.18)	6.20 [32] (1.95)	8.83 [24] (2.86)
Trade apprenticeships	10.84 [31] (5.60)	10.96 [53] (3.32)	7.76 [71] (3.07)	8.88 [67] (3.62)
A Level, OND, NVQ level 3	10.26 [27] (5.36)	12.70 [47] (5.52)	7.93 [64] (2.40)	9.38 [35] (2.57)
Higher, below degree, e.g. HND	13.79 [11] (12.35)	15.39 [71] (6.25)	10.68 [81] (4.46)	11.73 [83] (4.93)
Degree level	15.53 [18] (7.27)	19.83 [73] (7.14)	12.39 [57] (6.35)	16.18 [68] (5.39)

**Note:** Standard deviations in parentheses; Sample size shown in square brackets

Table 2 provides evidence on the relative value of different levels of qualifications ranging from no formal qualifications to academic/professional qualifications for those males and females. The results clearly indicate that time spent participating in education and attaining qualifications has a positive effect on earnings. An outcome

of interest is the significant difference in the wage level at degree level for both farm males and farm females compared to the non-farm group.

#### 4.2 Econometric results

##### OLS estimates of return to education

Results for the OLS individual subsamples regressions by farm and non-farm and rural urban sub-samples are presented in Appendix B. Table 3 presents the OLS estimates, for the entire sample group for males and females, incorporating farm, rural non-farm interaction terms to test for differences in returns to education by sub-group.

**Table 3 OLS Model Estimates by Gender**

	<b>Males (1)</b>	<b>Females (2)</b>
Education (years)	0.065 (0.010)***	0.098 (0.010)***
Farm x Education	0.001 (0.016)	-0.022 (0.013)*
Rural x Non-Farm x Education	0.001 (0.013)	-0.023 (0.012)*
Age	0.063 (0.015)***	0.018 (0.012)
Age squared/100	-0.067 (0.017)***	-0.016 (0.014)
Belfast (D)	-0.073 (0.191)	-0.298 (0.182)
Urban East (D)	0.052 (0.076)	-0.024 (0.075)
Urban West (D)	-0.045 (0.092)	-0.099 (0.090)
Rural West (D)	-0.043 (0.189)	0.287 (0.180)
Farm (D)	-0.293 (0.233)	-0.254 (0.198)
Constant	0.261 (0.361)	0.529 (0.293)*
Observations	447	646
R-squared	0.319	0.284

**Note:** Robust standard errors in parentheses; Significance: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

(D) indicates regressor is a dummy variable; Omitted spatial category is Rural East

The rate of return to education for males (column 1) is 6.5 per cent and for females (column 2) 9.8 per cent, both of which are significant. The interaction terms are used to identify possible differences in returns to education for farm and rural non-farm individuals compared to urban-based individuals. The results indicate that for males, whether they are farm, rural or urban based there is no significant difference in returns to education. However, for the rural females (farm and non-farm), returns to

education are 2 per cent lower compared to the urban female group, indicating that for the females in the sample there are urban/rural differences in relation to the returns to education.

For those in the male sample (see Table 3, column 1) age and aged squared are significant. This result is expected and consistent with previous studies; as age increases people gain further experience in employment, and their earnings continues to rise eventually peaking around middle age, and declines thereafter. For females however, the age effect is poorly determined, i.e. age does not prove to be significant in determining returns to education.

#### Instrumental Variables estimates of returns to education

The IV estimates of the human capital earnings functions for each of the sample groups are presented in Table 4. The IV estimates of the return to education are considerably higher than the OLS estimates presented earlier. The highest returns to education of over 15 per cent are associated with non-farm females with a somewhat lower rate of about 13 percent for farm-based females. The IV estimates suggest average marginal returns to education of almost 11 per cent for non-farm males compared to about 8 per cent for farm-based males. Our diagnostic tests indicate that the basic identification tests are satisfied for all but the farm male group. In addition, our instruments are generally quite weak especially for the farm-based male group. Consequently, our IV estimates especially for farm males group should be treated with caution. Finally, it is interesting to note that Durbin-Wu-Hausman tests suggest that education is endogenous in the human capital earnings equations for the non-farm groups but surprising not so for the farm-based groups. This would suggest that unobserved ability bias is less prominent in the estimates for the farm-based individuals perhaps because they are less heterogenous than the non-farm group. However, it may equally be a reflection of the weakness of the instruments used to identify the models for these groups.

**Table 4 IV Estimates by Sample Sub-group**

	Farm Males (3)	NonFarm Males (4)	Farm Females (5)	NonFarm Females (6)
Education (years)	0.078 (0.046)*	0.109 (0.027)***	0.131 (0.039)***	0.153 (0.032)***
Age	0.037 (0.038)	0.064 (0.021)***	0.037 (0.024)	-0.007 (0.019)
Age squared/100	-0.041 (0.040)	-0.068 (0.023)***	-0.034 (0.026)	0.015 (0.023)
Belfast (D)	-	-0.094 (0.099)	-	0.016 (0.093)
Urban East (D)	-	-0.055 (0.072)	-	0.017 (0.071)
Urban West (D)	-	-0.165 (0.091)*	-	-0.054 (0.090)
Rural West (D)	-0.111 (0.065)*	-0.139 (0.090)	0.010 (0.047)	0.022 (0.084)
Constant	0.475 (1.182)	-0.279 (0.532)	-0.713 (0.871)	0.180 (0.464)
Observations	164	250	338	293
Regression F-Statistic	2.01 [0.095]	5.49 [0.000]	3.20 [0.013]	4.21 [0.000]
Centred R-squared	0.166	0.154	0.106	0.105
<b>Diagnostics:</b>				
<u>Under-identification</u>				
(Anderson), Chi-sq (8)	11.82 [0.160]	33.57 [0.000]	17.48 [0.015]	27.95 [0.000]
<u>Overidentification</u>				
(Sargan) Chi-sq (7)	3.47 [0.838]	6.66 [0.465]	2.51 [0.867]	3.43 [0.842]
<u>Weak identification</u>				
F-statistic (8, 152)	1.48 [0.171]	4.56 [0.000]	2.55 [0.015]	3.66 [0.000]
<u>Endogeneity of Education</u>				
Durbin-Wu-Hausman				
Chi-sq (1)	0.088 [0.767]	3.49 [0.062]	2.27 [0.132]	6.05 [0.014]

**Note:** Standard errors in parentheses; Significance \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

P-Values for diagnostics shown in square brackets

(D) indicates regressor is a dummy variable; Omitted spatial category is Rural East

Excluded instruments as described in Section 3.2: *dadfarm(D)*, *dadprof(D)*, *mumprof(D)*, *border*, *siblings*, *fewbooks(D)*, *lotsbooks(D)*, *sla16(D)*

#### 4.4 Sheepskin Effects

Finally Table 5 presents the OLS estimates from estimating the human capital earnings function using qualification levels rather than years of education for the relative value of highest levels of academic /vocational qualifications against having no qualifications. For both males and females, the returns to each higher level of education are consistently higher, with the highest level for degree around 74 per cent for males and 87 per cent for females. So for instance, men choosing to do a degree will earn on average, a 74 per cent higher wage compared to men without



qualifications. The *Farm x Qual Level* interaction terms capture the difference in returns to qualification levels for farm-based individuals relative to non-farm based individuals. In the case of farm-based males and females, it is noted that average returns to higher qualifications such as degree level are significantly lower than those achieved by non-farm based individuals. In particular, farm-based males with degree level qualifications earn on average 28 per cent less than non-farm males with an equivalent level of qualification. The return to level 5 qualifications in the case of farm females is one third less than that achieved by non-farm females.

**Table 5 OLS estimates of returns to qualification levels**

	Males (7)	Females (8)
Age	0.059 (0.015)***	0.017 (0.012)
Age squared/100	-0.061 (0.016)***	-0.014 (0.013)
Qual Level 1 (D)	0.484 (0.147)***	0.241 (0.099)**
Qual Level 2 (D)	0.206 (0.083)**	0.249 (0.080)***
Qual Level 3 (D)	0.327 (0.086)***	0.370 (0.091)***
Qual Level 4 (D)	0.481 (0.079)***	0.512 (0.077)***
Qual Level 5 (D)	0.749 (0.079)***	0.873 (0.080)***
Farm x Qual Level 0 (D)	-0.153 (0.087)*	-0.118 (0.093)
Farm x Qual Level 1 (D)	-0.453 (0.174)***	-0.390 (0.101)***
Farm x Qual Level 2 (D)	-0.099 (0.089)	-0.156 (0.067)**
Farm x Qual Level 3 (D)	-0.297 (0.093)***	-0.231 (0.080)***
Farm x Qual Level 4 (D)	-0.245 (0.123)**	-0.124 (0.064)*
Farm x Qual Level 5 (D)	-0.279 (0.102)***	-0.326 (0.071)***
Belfast (D)	-0.105 (0.076)	-0.023 (0.074)
Urban East (D)	-0.023 (0.054)	-0.032 (0.050)
Urban West (D)	-0.107 (0.071)	-0.128 (0.070)*
Rural West (D)	-0.107 (0.047)**	-0.055 (0.036)
Constant	0.865 (0.334)***	1.451 (0.264)***
Observations	447	646
R-squared	0.418	0.364

**Note:** Robust standard errors in parentheses; Significance: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
(D) indicates regressor is a dummy variable; Omitted qualification level is Qual level 0 (no qualifications)  
Omitted spatial category is Rural East

## Section 5 Summary and Conclusions

This paper estimated returns to education and qualifications for males and females within farm households in Northern Ireland. In addition, it examined differences in average returns to education according to gender and between farm-based (rural) and non-farm based (predominantly urban) individuals.

### *5.1 Overall returns to education*

Our basic OLS estimates indicate significant average returns to education of about 6.5 per cent for males and over 9 per cent for females. These estimates are consistent with previous research on returns to education in a number of countries (see review by Trostel et al. 2002). For example, comparable estimates by Harmon and Walker (1995) found returns of about 6 per cent for British males. In a later study (Harmon and Walker, 2000) they obtain estimates of estimates of 6.4 per cent for UK men and 10 per cent for UK women and in the case of their Northern Ireland subsample 7.6 per cent for men and 11.8 per cent for women.

When we control for the endogeneity of schooling using IV methods our estimates of returns to education are considerably higher. They ranged from almost 8 per cent for farm males to about 15 per cent for non-farm females. This is consistent with previous research evidence reviewed by Card (1999) which found that IV estimates of returns to schooling are typically double those obtained from OLS estimation of the human capital earnings function. In this paper our IV estimates are generally about 50 percent higher than those obtained by OLS although somewhat lower than comparable estimates obtained by Harmon and Walker (1995). For example, Harmon and Walker (2000) obtain IV estimates of returns to education ranging from 13.9 percent for men to 24.1 percent for women in Northern Ireland.

The high level of returns to education would indicate a substantial financial incentive for enrolment in third level education. This has certainly been reflected in the dramatic increases that have occurred in third level participation rates over the last decade. However, the sustained high returns suggest also that a high proportion of individuals in the population find post compulsory education more expensive or more difficult to acquire, holding other things constant. Moreover, this situation may contribute to observed differences in returns to education according to gender and between farm-based (rural) and non-farm based (predominantly urban) individuals.

### *5.2 Male/Female differences*

Our data indicate that on average women from farm households have higher levels of educational attainment than their spouses. In contrast, women and men from non-farm households on average have similar levels of education. However, at each

qualification level, women earn on average less than men, identifying the presence of a gender wage gap. However, the econometric estimates highlight that there are significant gender differences in terms of the returns to education with on average higher returns for women than men. But it must be noted that the higher percentage returns for females may in part be a reflection of their lower average earnings. This variation reflects different occupational characteristics between men and women and coupled with the need to balance work and child care commitments. In some cases women may be prepared to sacrifice higher levels of pay in order to secure jobs which offer non-pecuniary benefits, such employment conditions which allow for flexible working around childcare and other family commitments. This is consistent with the higher levels of part-time employment among women in our dataset. Females worked on average 28 hours per week compared to 36 hours per week for males. Despite this factor there remains tentative evidence of the continued existence of a regional gender pay gap, and given the age range of the sample group may support previous research suggesting that this pay gap becomes increasingly evident as women progress in the labour market (Manning, 2003).

A further feature of the male/female comparison is that the age-earnings profile is relatively well determined for non-farm males but not for females. This was reflected by the significance of the age and aged squared terms in the regression equations for non-farm males (Table 4). Consistent with previous studies (Mincer, 1974) there is a convex relationship between earnings and age and at least for males age related experience has a strong positive effect on earnings in the early stage of the life cycle which diminishes as individuals approach retirement. For females and also farm-based males however, the age effect is less defined, i.e. age does not prove to be significant in determining returns to education. There maybe a number of explanations of this, perhaps for the females it may be higher job turnover or breaks in employment due to time out from the labour market in order to have children or undertake family caring responsibilities. In the case of farm males, the non-significance of age related experience may reflect their participation in lower-skilled manual jobs and also the relatively recent engagement of many of these individuals in the off-farm labour market.

### *5.3 Farm/Non-Farm Differences*

Our estimates suggest that average marginal returns to schooling are similar for farm and non-farm males but that differences do exist in the case of farm and non-farm females. For males the estimated returns to education across model specifications ranged from 6.5 to 10.9 per cent. While there was no statistically significant difference in average marginal returns for farm and non-farm males further results suggested that returns to some qualifications (esp. degree level) are somewhat lower for farm operators compared to the wider male population. It should be noted that our measure of returns is based only on the labour market earnings for those farm operators who have off-farm jobs. A future development of our research is investigating the extent to which education enhances productivity of farm operators in the running of their farm businesses as well as in the off-farm labour market.

Average wage rates for farm males were about 30 per cent below those of non-farm males. This reflects the lower average levels of educational attainment among farm males compared to their non-farm counterparts. In particular, distribution of schooling attainment is much more heavily concentrated at the minimum school leaving age. The low levels of educational attainment by farm males is not new, but it presents a concern for policy makers in the context of farm adjustment. Previous research has identified the importance of parental aspirations on young people's educational choices and that it is mothers in particular who influence the educational pathway within households (Feinstein 2003; Brooks, 2004). This perhaps raises further research questions regarding attitudinal differences within farm families towards the educational attainment of males particularly towards those who have been identified as potential successors on the farm. There is a clear need to increase and improve the overall basic level of educational attainment amongst farm based males.

It also must be noted that the results are affected by the conditions within the labour market at the time of the survey. The returns to different qualifications will reflect the supply and demand for those individual characteristics at a particular point in time. Many of the farm based males were employed in unskilled/semi-skilled construction and transport related occupations. Strong industry effects on earnings cannot be ruled out as the survey was undertaken in early 2008 when the construction industry

was buoyant. Farm males may also be off-setting lower wages by travelling to jobs beyond their local labour market in the wider regional labour market.

In the case of farm females, OLS estimates of returns to schooling were 7.6 per cent compared to 9.8 per cent for their urban counterparts. However, the difference in returns was significant only at the  $P < 0.1$  level. The IV estimates of returns to education were 13.1 per cent in the case of farm females compared to 15.3 per cent for non-farm females. Moreover, estimated returns to degree level qualifications are almost one third lower than the return achieved by urban females with the same qualification level ( $P < 0.01$ ). The estimated difference in returns to schooling between the farm and non-farm females would suggest that farm females face additional constraints that reduce their returns to higher level skills. These may reflect a combination of factors such as the need to balance longer commutes to higher paid urban-based employment opportunities against farm and caring responsibilities. In this context the utility maximizing choice for some farm-based females may be to select lower paid local employment where it provides the flexibility to accommodate other commitments.

#### *5.4 Urban/Rural differences*

Rural areas may have disadvantages relative to urban areas in terms of offering employees competitive returns to education, or returns that are commensurate with the costs incurred by individuals as they pursue education (Goetz and Rupasingha, 2004). Employment in rural areas is often focused on traditional industries which are characterized by lower skills requirements and low wage levels. Mirroring the effects for farm-based females the returns to education for non-farm rural women, are less, compared to their urban counterparts. The OLS estimates of returns to education are equal for farm and rural non-farm women at about 7.5 per cent compared to 9.8 per cent for urban females. This may reflect the thinness of rural labour markets. In the case of rural-based females our data indicates a predominance of employment within the public sector at local level (esp. health and education sectors). Rural labour markets sustain a less diverse range of employment opportunities making it more difficult for individuals to find jobs that closely match their skills and education. Where individuals have a preference (or need) to find local employment better educated workers may be forced to seek

employment for which they are overqualified. The effect of this mismatch is likely to lower average rewards for educational attainment.

### *5.5 Returns to qualifications (Sheepskin Effects)*

Our analysis suggests that the human capital earnings function is non-linear in schooling due to sheepskin effect. In particular, there are much higher return associated with critical points of the education distribution especially with the completion of A levels and especially degree level qualifications. It is clear that higher level qualifications (i.e. degree and professional qualifications) provide a substantial earnings premium within the Northern Ireland Labour market. In general, returns to academic qualifications are higher than those to vocational qualifications.

Finally, there is evidence of significant differences in returns to qualifications between farm-based and non-farm based individuals. Most notably the earnings premium (over wage with no qualifications) for degree level qualifications is about 30 per cent lower for farm-based individuals compared to non-farm based individuals. This again appears to be a reflection of the thinner nature of rural labour markets typically focused on traditional sectors. In such areas there is likely to be fewer opportunities for highly qualified individuals.

### *5.6 Critique of the analysis*

There are a number of limitations of our analysis that deserve comment. First, there are significant differences in key characteristics of our farm and non-farm samples which may limit the effectiveness of the BHPS sample as a valid control. Although we control for life-cycle stage in our analysis by including age and age squared in the regression equations the average age of individuals in the BHPS sample was significantly lower than in our farm sample. However, if there are differences between the age-earnings profiles of the separate subsamples this would generate bias as variation in returns to tenure would be attributed to differences in between-group returns to education. However, our supplementary estimations of the human capital earnings function for individual sample subgroups suggest that this effect is likely to be quite small.

A more acute problem was the very small proportion of farm males with higher level qualifications. Forty per cent of the farm males had no qualifications meaning that estimates of returns to education for this group were impeded by the relatively small numbers of observations in the upper range of the schooling distribution. In addition, this meant that it was difficult to properly identify differences in returns to education between farm and non-farm males since the educational characteristics of the groups are quite dissimilar.

OLS estimates are likely to be biased due to the endogeneity of education variable in the human capital equation. The conventional approach for controlling for this bias is through the use of instrumental variables methods. However, it has been recognized that these estimators often perform poorly in small samples and where the instrumental variables are weak (Bound et al. 1995; Flores-Lagunes, 2007). Our IV analysis experiences both of these problems. In particular, the F-statistic for the joint significance of our excluded instruments was below 5 for each sample subgroup indicating that our instruments are quite weak. Moreover, for the farm male subgroup we our identification diagnostic tests are unsatisfactory suggesting that the IV estimates for this group need to be interpreted with caution. Again, the probable cause appears to be the very narrow range of education levels within that group of the sample.

Finally, it should be noted that the relatively small geographic scale of Northern Ireland weakens the power of our test for differences in returns to schooling between rural and urban based individuals in our sample. Most rural-based individuals in the province are within an hour and a half commute to the main urban centre of Belfast, however there is a weak public transport infrastructure so commuting is very much car dependent . A more powerful test might compare returns between individuals in the Belfast metropolitan area with those in more remote rural locations (e.g. rural west). We also tested this specification and found that the negative rural effect becomes much larger. However, this approach means that we would exclude from our analysis a large proportion of our dataset and our statistical inferences become impeded through the reduction in degrees of freedom.

### *5.7 Concluding remarks*

The preliminary results presented in this paper would appear to demonstrate a farm versus non-farm pay gap and that labour market returns to education may be somewhat lower for rural based individuals and especially for females compared to their urban counterparts. Lower educational attainment and lower rewards to higher education in rural areas have previously been identified as key factors in explaining a rural earnings gap (Goetz and Rupasingha, 2004). If higher educational attainment in a rural area typically earns less than in an urban area, there is a strong incentive for more mobile individuals to seek employment in urban areas. However, some rural dwellers face particular constraints affecting their employment mobility. For example, farm operators and their spouses may be restricted in terms of where and how they can work off-farm due to farming and family commitments. Faced with such constraints these individuals may be forced to seek employment locally despite lower rates of pay due to the thinness of many rural labour markets. In this situation it may be optimal for some rural-based individuals to select low levels of education if obtaining that education is costly and/or they perceive that there are weak returns on such investment from within their local labour market. However, the results of our analysis discount this latter point by indicating that there are in fact strong positive returns to education in general. An issue for policy makers concerns how to encourage more positive attitudes to educational attainment particularly among farm-based males.



## References

- Becker, G. (1964). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. New York: Columbia University Press.
- Bound, J., Jaeger, D.A. and Baker, R.M. (1995). Problems With Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable Is Weak. *Journal of the American Statistical Society*, **90** (430, June), 443-450.
- Brooks, R. (2004) "My mum would be pleased as punch if I actually went, but my dad seems more particular about it": Paternal involvement in young peoples higher education choices. *British Educational Research Journal*, **30**, 495-514.
- Card, D. (1999). The causal effect of education on earnings. In O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, vol. 3, Amsterdam: Elsevier-North Holland.
- Card, D. (2001). Estimating the returns to schooling: progress on some persistent econometric problems. *Econometrica*, **69**, 1127-60.
- Commission of the European Communities (2006). Employment in rural areas: closing the jobs gap, SEC (2006) 1772.
- Department of Education and Skills (2003). *The future of higher education*. London: HMSO.
- Feinstein, L. (2003). Inequality in the Early Cognitive Development of British Children in the 1970 Cohort. *Economica*, **70**, pp. 73-97.
- Flores-Lagunes, A. (2007). Finite Sample Evidence of IV Estimators Under Weak Instruments. *Journal of Applied Econometrics*, **22**, 677-694.
- Gasson, R. (1998). Educational Qualifications of UK Farmers: A Review. *Journal of Rural Studies*, **14** (4) 487-498.
- Goetz, S.J. and A. Rupasingha. (2004) "The Returns to Education in Rural Areas." Review of Regional Studies **34** No. 3.
- Gosling, A., Machin, S. and Meghir, C. (2000). The changing distribution of male wages, 1966-93. *Review of Economic Studies*, **67**, 635-666.
- Harmon C and Walker I (1995). Estimating the economic return to schooling for the United Kingdom. *American Economic Review*, **85** (5), 1278-1286.
- Harmon, C. and Walker, I. (2000). *Education and Earnings in Northern Ireland*, A Research Report to Analyse the Economic Returns to Education in Northern Ireland. Belfast: Department of Higher and Further Education, Training and Employment.
- Harmon, C. Oosterbeek, H. and Walker, I. (2003a). The Returns to Education': Microeconomics. *Journal of Economic Surveys*, **17**, 115-156.
- Harmon, C., Hogan, V. and Walker, I. (2003b). Dispersion in the Economic Return to Schooling. *Labour Economics*, **10**, 205-214.
- Huffman W and Orazam P (2004). The Role of Agriculture and Human Capital in Economic Growth: Farmers, Schooling, and Health. Working Paper Series

- Lang, K. (1993), Ability Bias, Discount Rate Bias and the Return to Education, Mimeo, Boston University.
- LeClere, F.B. (1991). The Effects of Metropolitan Residence on the Off-Farm Earnings of Farm Families in the United States. *Rural Sociology*, **53** (3, Fall), 366-390.
- Manning, A. (2003). Life's ups and downs: understanding the earnings profile. Paper presented at the Royal Economic Society annual conference, University of Warwick, April 2003.
- McLaughlin, D.K. and Perman, L. (1991). Returns vs. Endowments in the Earnings Attainment Process for Metropolitan and Nonmetropolitan Men and Women. *Rural Sociology*, **56** (3), 339-365.
- Mincer, J. (1974), Schooling, Experience and Earnings, Columbia University Press: New York.
- Moss, J.E., Jack, C.G and Wallace, M.T. (2004). Employment location and associated commuting patterns for individuals in disadvantaged rural areas in Northern Ireland. *Regional Studies*, **38** (2).
- Ofek, H. and Merrill, Y. (1997). Labor Mobility and the Formation of Gender Wage Gaps in Local Markets. *Economic Inquiry*, **35** (January), 28-47.
- Schultz T.W. (1960). Capital Formation by Education. *Journal of political economy*, **68**, 571-83.
- Trostel, P., Walker, I. and Woolley, P. (2002). Estimates of the Economic Return to Schooling for 28 Countries. *Labour Economics*, **9**, 1-16.
- Vera-Toscano, E., Phimister, E. and Weersink, A. (2004). Panel Estimates of the Canadian Rural/Urban Women's Wage Gap. *American Journal of Agricultural Economics*, **86** (4, November), 1138-1151.

## **Appendix A**

### **Classification of Qualifications**

#### **Level 0**

- No qualifications

#### **Level 1**

- NVQ or SVQ level 1
- GNVQ Foundation level, GSVQ level 1
- GCSE or O level below grade C, SCE Standard or Ordinary below grade 3
- CSE below grade 1
- BTEC, SCOTVEC first or general certificate
- SCOTVEC modules
- RSA Stage I, II, or III
- City and Guilds part 1
- Junior certificate

#### **Level 2**

- Trade Apprenticeships, GCSE/O Level grade A\*-C, vocational level 2 and equivalents
- NVQ or SVQ level 2
- GNVQ intermediate or GSVQ level 2
- RSA Diploma
- City & Guilds Craft or Part II (& other names)
- BTEC, SCOTVEC first or general diploma et
- O level or GCSE grade A-C, SCE Standard or Ordinary grades 1-3

#### **Level 3**

- Vocational level 3 and equivalents
- A level or equivalent
- AS level
- SCE Higher, Scottish Certificate Sixth Year Studies or equivalent
- NVQ or SVQ level 3
- GNVQ Advanced or GSVQ level 3
- OND, ONC, BTEC National, SCOTVEC National Certificate
- City & Guilds advanced craft, Part III (& other names)
- RSA advanced diploma

#### **Level 4**

- Other Higher Education below degree level
- Diplomas in higher education & other higher education qualifications
- HNC, HND, Higher level BTEC
- Teaching qualifications for schools or further education (below Degree level standard)
- Nursing, or other medical qualifications not covered above (below Degree level standard)
- RSA higher diploma

#### **Level 5**

- Degree or Degree equivalent, and above
- Higher degree and postgraduate qualifications
- First degree (including B.Ed.)
- Postgraduate Diplomas and Certificates (including PGCE)
- Professional qualifications at degree level e.g. graduate member of professional institute, chartered accountant or surveyor
- NVQ or SVQ level 4 or 5

**Source:** <http://www.ons.gov.uk/about-statistics/harmonisation/secondary-concepts-and-questions/S1.pdf>

## Appendix B

### OLS Estimates for Farm and Non-Farm Subsamples

	Males		Females	
	Farm (1)	Non-Farm (2)	Farm (3)	Non-Farm (4)
Education (years)	0.065 (0.012)***	0.065 (0.009)***	0.077 (0.008)***	0.091 (0.009)***
Age	0.035 (0.038)	0.068 (0.017)***	0.033 (0.023)	0.011 (0.015)
Age squared/100	-0.040 (0.040)	-0.073 (0.019)***	-0.033 (0.025)	-0.008 (0.018)
Belfast (D)	-	-0.095 (0.085)	-	0.034 (0.085)
Urban East (D)	-	-0.040 (0.064)	-	0.001 (0.063)
Urban West (D)	-	-0.143 (0.083)*	-	-0.032 (0.082)
Rural West (D)	-0.112 (0.066)*	-0.129 (0.081)	0.005 (0.044)	-0.006 (0.072)
Constant	0.699 (0.918)	0.231 (0.381)	0.223 (0.542)	0.741 (0.332)**
Observations	164	283	338	308
R-squared	0.171	0.233	0.204	0.274

**Note:** Robust standard errors in parentheses; Significance: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
(D) indicates regressor is a dummy variable; Omitted spatial category is Rural East

### OLS Estimates for Rural and Urban Subsamples

	Males		Females	
	Rural (5)	Urban (6)	Rural (7)	Urban (8)
Education (years)	0.073 (0.010)***	0.068 (0.011)***	0.073 (0.007)***	0.100 (0.011)***
Age	0.027 (0.025)	0.065 (0.020)***	0.014 (0.017)	-0.001 (0.019)
Age squared/100	-0.036 (0.027)	-0.068 (0.023)***	-0.015 (0.019)	0.004 (0.022)
Belfast (D)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Urban East (D)	0.000 (0.000)	0.052 (0.078)	0.000 (0.000)	-0.032 (0.077)
Urban West (D)	0.000 (0.000)	-0.055 (0.094)	0.000 (0.000)	-0.110 (0.093)
Rural West (D)	-0.173 (0.051)***	0.000 (0.000)	-0.040 (0.038)	0.000 (0.000)
Constant	1.043 (0.566)*	0.110 (0.460)	0.838 (0.381)**	0.915 (0.413)**
Observations	256	191	452	194
R-squared	0.242	0.231	0.182	0.313

**Note:** Robust standard errors in parentheses; Significance: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
(D) indicates regressor is a dummy variable; Omitted spatial category is Rural East