A CASE FOR RE-INTRODUCING THIRD-LEVEL FEES? AN ECONOMETRIC ANALYSIS.

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While possible re-introduction of third-level fees in Ireland has been a central topic for policy debate and a great worry for the Irish student body for two years now, very little research has been done to date concerning the effect of the free fees initiative. Did free fees really have a positive impact on participation levels of the lowest socio-economic groups? Tara McIndoe examines the equity-enhancing effect of government expenditure on third level education and of the free fees initiative in particular at a most pertinent time. Using an econometric model of her own design to conduct the analysis, she concludes that although in general government expenditure on tertiary institutions contributes towards equitable participation, the free fees initiative has not been a success we might have thought it was!

Introduction

Education is an arguably important part of the reason that Ireland was able to experience the Celtic Tiger years that occurred between the late 1980s and 2001.

The Irish government has, for decades, prioritised education as a corner stone of the state's contribution to national development and as a means of achieving equity among its people. As such the 1960s saw the introduction of free secondary education; in the 1970s and 1980s education policy was focussed on raising participation levels of all socio-economic groups at primary, secondary and tertiary education levels; and the 1990s saw a strong movement to counter educational disadvantage in Irish places of learning (McCoy and Smyth 2004).

As Ireland enters the 21st century, however, education remains a topic of hot debate among policy makers, students and those who provide this integral service. Although there are many contentious issues surrounding education in Ireland, I would like to focus on that of the free fees initiative and government expenditure at tertiary level institutions.

Empirical Questions

I propose to carry out an econometric regression analysis on government expenditure at third level and the free fees initiative introduced in 1996 examining exactly how these have affected the participation levels of the lowest socio-economic groups of Irish society in third-level publicly funded institutions.

I anticipate this to be a linear regression relationship over the given time period. I expect to find that although government expenditure is positively related to these participation levels, this expenditure, which represents a significant proportion of public spending, needs to be more wisely allocated in order to have the maximum equity enhancing effect. Secondly, I anticipate that the effect of the free fees initiative on increasing the level of the lowest socio-economic groups' participation at third-level has been negligible or negative. I expect this due to current discussion in the public arena indicating that policy makers view the initiative as having failed to achieve this crucial objective.

Literature Review

Ireland is a small, egalitarian society that has commissioned a vast amount of literature over the years documenting the effects of government-funded schemes aimed at enhancing the education system within its borders. The most recent and pertinent examples of these come from the Economic and Social Research Institute and the Department for Education and Science.

The ESRI paper by Selina McCoy and Emer Smyth specifically investigates the implications for equality from educational expenditure from primary to tertiary level. Their detailed analysis concludes that:

> "In the Irish context, initial educational qualifications are highly predictive of employment chances, quality of employment and pay levels … The benefits of education accrue not only to individuals but to the broader society with increased educational investment associated with a reduction in welfare costs and crime levels." (McCoy and Smyth 2004).

Although they did not carry out a specific econometric analysis they found that despite increased government focus on eliminating education disadvantage via increased government expenditure and the introduction of the free fees initiative in 1996; this has had no noticeable effect on the equality of participation at third-level education.

The second report, for the Minister of Education and Science, was based heavily on Patrick Clancy's work in the area of education equality. This mirrored the ESRI paper, maintaining that:

> "For tertiary education to be equitable, early childhood, primary and secondary education, too, must be equitable – otherwise the pool of students is not available." (Department of Education and Science, 2003).

Significantly this work was commissioned under a rationale centred on: "the lack of success of the free fees initiative" (Ibid). It took into consideration action group feedback stating that: "it is not equitable or efficient for students from more advantaged social backgrounds to be in receipt of financial aid from the State to attend higher education" (Ibid).

None of the authors carried out an econometric analysis of their data, a task I will undertake in an attempt to verify, or otherwise, their conclusions.

Econometric Analysis

Data

Dependent Variable (SES[1])

The dependent variable in this analysis results from the simple sum[2] of the participation of Semi-skilled and Unskilled SES groups in third-level education. SES is expressed as the proportion of school-leavers leaving school at the Leaving Certificate level and entering third-level institutions immediately.

Data was sourced from the ESRI School-Leavers Surveys from various years between 1979 and 1998, complied and collated by ESRI statisticians. Unfortunately the latest School-Leavers Survey has not as yet been published. The latest data available for this variable then refers to school-leavers entering the tertiary-level in the year 1997/1998. Key information on whether the free fees initiative has had a visible, permanent effect on SES participation will only become available when this latest data is published.

The data quality, sourced from the ESRI through an effective *Annual School Leavers Survey* is assumed to be adequate. Correction however for both lagged population growth[3] and inclusion of a broader range of third-level entrants

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[1] SES means 'Socio-economic Status' but is also used as an abbreviation of socio-economic.
[2] It must be noted that data for 1995 were not available and were constructed as a simple average of immediately preceding and following figures. This was unfortunate as 1995 represents the first year of the free fees initiative when fee levels were decreased by 50%. (Department for Education and Science, 2003)
[3] Impossible to obtain exact data as population censuses are only carried out once every 5 years.

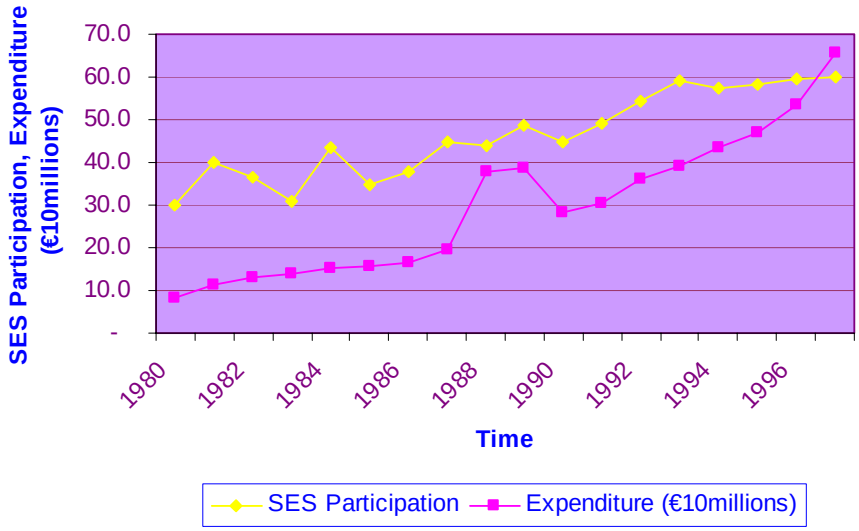
(for example second-chance[4] and mature students) would have been desirable, had the data been available.

First Independent Variable (E)

The first X variable measures government expenditure on third-level education. These observations are made up of the simple sum of total current and total capital expenditure at the third-level, deflated for alterations in the Consumer Price Index.

The quality of the data, measured at source (from the department of Education and Science) is again assumed to be adequate for the purposes of this analysis, that is, as a representative sample. Although a heavier weighting for government expenditure specifically aimed at increasing SES participation at tertiary institutions could conceivably be more instructive.

Figure 1: SES, E Against Time



This simple plot of SES and E against time shows that there appears to be a positive relationship between the two variables over time.

[4] i.e. students who have attended but not completed approved courses and who return after a break of at least 5 years to pursue approved courses (Ibid).

Second Independent Variable (F)

The final X variable is a dummy variable indicating the presence or otherwise of compulsory fees for all third-level students. As previously indicated, the Irish government introduced this initiative in 1995. 0 indicates the years that fees had to be paid in (including 1995 when the fee level was decreased by 50%), 1 indicates the years in which no fees were required by the state.

It is unfortunate that the dependent variable observations curtail the use of this second independent variable. Analysts eagerly await the release of the latest School-Leavers Survey in order to understand more fully the impact of the free fees initiative on SES participation at the third-level.

Excluded Variables

Variables such as indicators on government programs designed specifically to decrease educational disadvantage at third-level institutions (including the presence or otherwise of the Trinity Access Program) have been omitted from this analysis, it is recognised that their inclusion in future investigations may be highly instructive.

Regression

SES on E and F

Table 1: Summary Regression Result. SES on E, F
Dependent Variable is SES
18 Observations used for estimation from 1980 to 1997

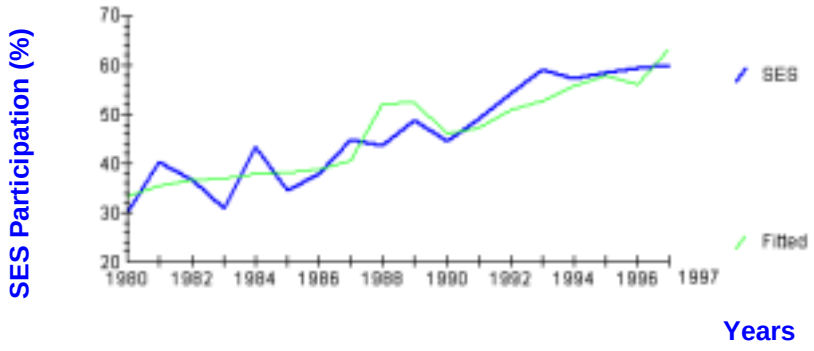
Regressor	Coefficient	Standard Error	t-Ratio	Probability
C	28.4469	2.5351	11.2212	.000
E	0.062608	0.0088009	7.1139	.000
F	-6.0181	4.4956	-1.3387	.201
R-Squared	0.82511			
F-Statistic	(2, 15)		35.3835	.000

The Coefficient for determination is an indicator of the goodness of fit of the model. R-Squared for this multiple regression is 0.825 indicating that the fitted regression line explains more than 82% of the variation of E and F in terms of SES.

The t-statistics of the multiple regression analysis individually test the hypotheses that each variable's coefficient is equal to zero. For the SES and E variables, these probabilities are of negligible value indicating that the null hypotheses in both cases can be rejected. For the F variable the null hypothesis can only be rejected at a significance level of more than 20%. Thus the regression analysis suggests the coefficient of the dummy variable is statistically not different from zero. Explicitly the high probability value of the dummy variable t-statistic indicates that the presence or absence of fees at tertiary-level institutions in Ireland has little or no effect on the third-level SES participation of the lowest income groups in Irish society. It is important to note also that the coefficient displayed for the F is negative. This implies that if the absence of fees had an effect on lower SES participation at tertiary-level institutions that this effect would be negative. This displays intuitive sense as equal government subsidy of both high and low SES groups at third-level institutions is an inefficient use of funds and will subtract from the resources available to fight disadvantage on other important fronts.

The F-Statistic displays the overall significance of an observed multiple regression that is, it simultaneously tests the hypothesis that the coefficient of all the variables are zero. In this case the probability of the obtaining an F-statistic of more than 35.38 is negligible. This is a very positive result for the model and will allow a significant degree of confidence in forecasting and inference, despite the poor t-statistic relating to the dummy variable as discussed. It is interesting to note also that in the case of simple regression of SES on E barring the test for functional form (which is significantly different from the corresponding multiple regression result) all other diagnostic and inference statistics confirm the validity of this model.

Figure 2: SES Against Fitted SES



Indeed the figure above does indicate to the naked eye a good relationship between the fitted and actual SES values. Further inference will only be available on construction of relevant confidence intervals.

Table 2: Diagnostic Regression Tests

Test Statistics (LM Version)		Probability	
Durbin Watson		2.2199	
Serial Correlation	(1)	0.44714	0.504
Functional form	(1)	0.83155	0.362
Normality	(2)	0.83171	0.66
Heteroscedasticity	(1)	0.045448	0.831

The diagnostic results above are generally good, this is crucial in order to preserve the critical assumptions underlying the Classical Linear Regression Model (CLRM) on which the Ordinary Least Squares estimation method is based. It must be noted, however, except for the Durbin-Watson test statistic, that these tests rely on large sample sizes, a feature that the current regression lacks. This will invalidate their high probabilities to some extent a situation that may have to be addressed.

Firstly, the Durbin-Watson statistic, a test for the presence of autocorrelation, is close to 2 (2.22 above) thus indicating that there is little or no evidence of first order auto-correlation. This is a better test for correlation than the serial correlation test which relies on large sample sizes.

Secondly, the result on the Ramsey test[5] is not significant at over 36%, however, this test relies on large sample sizes. In order to attempt a suitable analysis of the sufficiency of the linear functional form in this small sample regression four other good indicators of functional form will be examined. Namely, the preceding R-squared result, t-ratios, Durbin-Watson result and the signs on the estimated coefficients however all indicate that functional form is adequate despite the small sample size analysed.

Thirdly we examine the Chi-squared test for normality. Although the high probability value of 66% indicates that the null hypothesis[6] cannot be rejected; it is noted that again a larger sample size is required to accept this result with any confidence. Rather then a histogram plot of residuals should be examined:

[5] Null Hypothesis states that a linear functional form is correct.
[6] Null Hypothesis states that the OLS residuals display no skewness and normal kurtosis.

Figure 3: Histogram of Residuals and the Normal Density

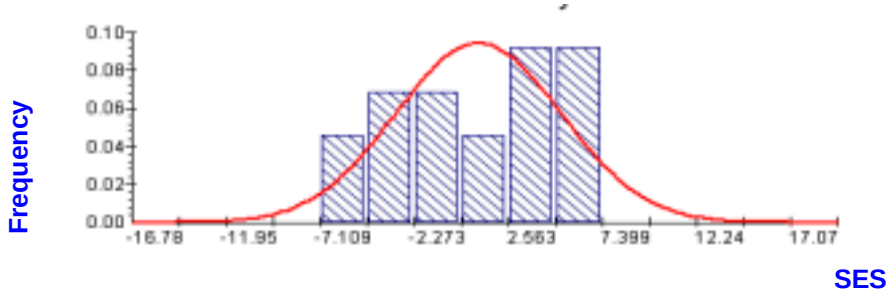


Figure 3 indicates that the residuals of the model do not conform to a normal distribution. This is a significant weakness in the data. Various corrective measures including increased sample size may alleviate this problem. In view of this both the t and F statistics should be treated with caution.

Multicollinearity is not a significant issue in this analysis given that the second explanatory variable itself a dummy variable with no obvious linear dependence on the E variable.

Homoscedasticity is the last Classical Linear Regression Model (CLRM) assumption to be explicitly tested. The OLS regression has indicated an 83.1% probability value for the heteroscedasticity test, this is not significant and implies that the regression model displays significant homoscedasticity. It must be noted that the small sample size employed negates to an extent the validity of this diagnostic test.

Confidence Interval

Policy makers typically use econometric results to make specific policy proposals. In order to offer the policy maker the maximum amount of information, this econometrics based report includes the following: a 95% Confidence interval on E, the coefficient for expenditure is found to be bound by the limits (0.08136, 0.04385). The two-tailed 95% interval is fairly narrow: the coefficient of interest has a value of 0.06261, the CI binds this value at 29.96% of the coefficient's value above and below the actual estimated value

Forecast

Figure 4: Model's Forecast Power for the 1990s

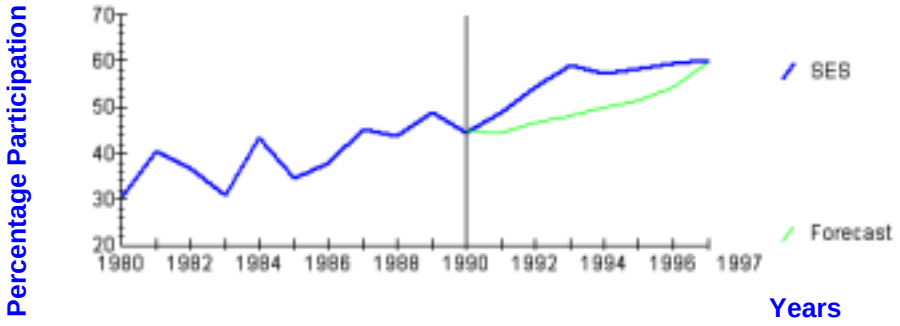


Table 3: Single Equation Static Forecasts

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Based on OLS regression of SES on:
C E
11 observations used for estimation from 1980 to 1990

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Observation	Actual	Prediction	Error	S.D. of Error
1991	49.0000	44.2195	4.7805	4.7380
1992	54.4000	46.6602	7.7398	5.0027
1993	59.0000	47.9766	11.0234	5.1832
1994	57.3000	49.9508	7.3492	5.4964
1995	58.4000	51.5029	6.8971	5.7738
1996	59.4000	54.4274	4.9726	6.3571
1997	60.1000	59.6296	0.47043	7.5385

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The figure and results above show that although the prediction power of the test seems quite poor in the mid-1990s, at the beginning and end of the 1990s, its prediction power improves dramatically. This is mirrored by the low structural stability of the test for example the F-statistic probability value is low at 3%. The predictive failure test gives a high F-statistic probability value of more than 35% however, inferring that the model has weak predictive power throughout the 1990s.

The loss of predictive power during the mid-1990s may be explained by various shocks to the model. For example, various government schemes aimed at

decreasing educational disadvantage not accounted for in this model may have had significant effects on lower SES participation at third-level institutions. It is possible that these effects had stabilised towards the end of the 1990s although a detailed investigation of these would be highly instructive.

Conclusion

It has been shown then that the conclusions reached by both the Economic and Social Research Institute and the Department for Education and Science have been validated by the above econometric analysis.

Specifically, government expenditure on third-level education has a positive relationship with increased participation in third-level institutions by low socio-economic groups in Ireland. This is a long-term stable relationship and it would be advisable for the government to continue and increase its current and capital expenditure towards increasing third-level education as a proven way to decrease inequality of opportunity and outcome as regards the Irish education system.

Secondly, the econometric findings in this report have indicated that the introduction of the free-fees initiative has had a negative effect (although the coefficient is not significantly different from zero at the 5% significance level) on the SES participation of lower income groups at tertiary-level institutions. As previously stated this makes intuitive sense. Literature on educational inequality has shown that the earnings and welfare possibilities for non-graduates are depressed in relation to those opportunities for graduates, this is detrimental to Irish society as a whole.

Although this report bases its analysis on limited data the main conclusions are inescapable. In order for Ireland to maintain its competitive skills level and continue to strive for equality of educational opportunity and outcome it would be advisable not only to increase the scope and volume of government expenditure at and towards tertiary-level education but to re-evaluate the third-level free fees initiative which has not achieved one of its primary objectives, that is to increase the equity of SES participation at third-level institutions throughout Ireland. Discussions towards these ends are urgently required.

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