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Explaining the Diversity of Industry Investment Responses to Uncertainty Using Long Run Panel Survey Data

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Abstract

This paper presents an empirical study of the channels of influence from uncertainty to fixed investment suggested by real options theory. Using panel data from the Confederation of British Industry (CBI) Industrial Trends Survey, we report OLS estimates of the impact of uncertainty on investment where the regressors are augmented by cross-sectional averages of the dependent variable and of the individual specific regressors, as recently suggested by Pesaran (2004). The cross-industry pattern of results is checked for consistency with the pattern predicted by real options theory, using a specially constructed data set of industrial characteristics. We find that irreversibility is able to predict the pattern detected, but only when combined with a measure of the information advantage of delay. There is also evidence for expansion options effects; industries with high R&D and advertising intensities tend to have positive uncertainty effects.

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1 INTRODUCTION

Theoretical developments over several decades have highlighted the potential significance of uncertainty for capital investment decisions. A standard argument is that uncertainty should raise the amount of investment because of the likely convexity of marginal profit in the uncertain variable working through Jensen's inequality (Abel 1983). However, traditional convexity models are subject to the critique that they often ignore irreversibility and the timing decision associated with a project. Real options theory provides one explanation for a delayed response under uncertainty to signals that would cause entry or exit in a frictionless world. In this paper we investigate the empirical validity of this approach.

In real options theory, the trigger values for irreversible investment or disinvestment are respectively above and below the corresponding Marshallian values (variable cost plus the servicing of sunk cost of entry or exit) in the presence of uncertainty, as long as information arrives stochastically over time and waiting is not too costly. Models of the relationship of adjustment speed to uncertainty for irreversible investment are developed in Brennan and Schwartz (1985), McDonald and Siegel (1986), and Dixit and Pindyk (1994). A similar approach, reconciling the theory with standard q-theory of investment, is developed in Abel and Eberly (1994) where it is shown that the extent of the zone of inaction with respect to the forcing variable depends on the level of uncertainty; furthermore, activity outside the zone of inaction is slowed by heightened uncertainty. While most of the literature is concerned with the option to wait, and its effect on delaying investment, under some circumstances, increased uncertainty can accelerate project development, particularly where there is a time to build or where first mover advantages are significant (Bar-Ilan and Strange 1996; Folta and O'Brien 2004). The theoretical rationale for this ambiguity in the real option effect is explained in Abel et al (1996) where the effect of irreversibility (no downward adjustment) is allied with lack of expandability (no upward adjustment). Much of the empirical literature finds a negative relationship between uncertainty and investment. Indeed, as the distribution of empirical results in Figure I suggests, this has become something of a stylized fact. Many of these studies report results for *aggregate* investment. However, in this contribution we find that there is considerable heterogeneity in the response of investment to uncertainty across industries.

[Insert Figure I about here]

The main aim of this paper is to exploit the observed heterogeneity across industries in order to examine the relevance of real options in explaining the pattern. The method we adopt is first to establish estimates of both the sign and the magnitude of the impact of uncertainty on investment for each industry. We then use measures of industry characteristics – as suggested by real options theory – to explain the pattern observed. In Section 2 we discuss real options models of investment and the implications for investment decisions under uncertainty. Section 3 introduces the basic investment model used in the paper and reports the results of estimating the model with indicators of uncertainty. Section 4 assesses whether the cross-sectional pattern of uncertainty coefficients can be reconciled with the theory discussed in Section 3. Section 5 concludes.

2 THE THEORETICAL EFFECT OF UNCERTAINTY ON INVESTMENT DEMAND

Theory suggests a number of possible channels of influence running from uncertainty to investment. In this section we focus on two opposing influences predicted by real options theory.

2.1 Deferment options and convexity

The basic "real options" approach stresses an additional cost to investment which attaches to any early exercise of an option to invest. By deferring the project and keeping the option open, costly mistakes may be avoided (Dixit and Pindyck 1994). The idea is very general: because of proprietary assets in knowledge, competences, or spare land, firms may choose the timing of their investment by balancing any loss from delay against the value of extra information that arrives over time. This may explain how uncertainty might raise the hurdle rate and delay investment projects.[1] Note that the empirical relevance of the argument stems from the existence of *both* irreversibility, and some feature of the firm's environment which makes delay valuable.

2.2 Expansion and compound options

The option to delay cannot always be presumed to exist, e.g. in industries characterized by first mover advantages. Under some circumstances, investment may be speeded up if other influences are favorable. For example in high-technology industries characterized by patent races, uncertainty may increase the value of the option obtained through early investment. Thus, the literature on real options does not unambiguously predict the sign of the uncertainty-investment relationship. Today, several different kinds of options are routinely identified,

[1] One criticism of this argument is that although the hurdle rate may be raised, so too may the probability of hitting the hurdle with ambiguous implications for investment. Simulation results in Sarkar (2000) for a single firm partial equilibrium model suggest that a positive effect of uncertainty is possible at low levels of uncertainty. It is not clear however whether this can be generalised to the industry case. A further potential criticism of the real options argument is that with perfectly elastic demand (and constant returns to scale), irreversibility is irrelevant since the marginal rate of return on capital is, in these circumstances, invariant to the quantity of capital installed (Caballero 1991). This model effectively neutralises irreversibility through the focus on individual firm price uncertainty with no linkages from investment in one period to the investment decision in the next. However, at the industry level, new entry can erode excess profit and, in conjunction with irreversibility, create an asymmetry in price that biases investment downward by lowering the expected realised price. Thus, "...industry-wide uncertainty will affect irreversible investment by a competitive firm with constant returns to scale much as it would a non-competitive firm or a firm with decreasing returns to scale" (Pindyck 1993, p.274)

leading to contradictory effects on investment (Copeland and Antikarov 2001). First, obtaining an option may in itself be a key part of each investment process, creating "compound options" where obtaining an option on an option is a key element in decision making. An example would be where follow-on products can more easily be launched on the back of a first success. Similarly, expansion options confer the ability to respond to higher than expected demand and are important in cases where lead times or adjustment cost would otherwise imply cost penalties. A variety of models have addressed the question of strategic decision-making in a real option framework and in particular whether the existence of FMA not only destroys the option to defer but actually speeds up investment due to the operation of expansion and compound options (Bar-Ilen and Strange 1996; Mason and Weeds 2001; Boyer et al 2004; Smit and Trigeorgis 2004).

The most likely industries where durable first mover advantages exist are those with high product R&D intensity and where switching costs are also high - as they may be when firms advertise intensively. In addition industries with high levels of advertising may exhibit first mover advantages as that allows firms to capture market share quickly and then hold it due to brand image. High technology and heavily branded goods will also tend to have high quasi-rents and this will give enhance the value of expansion options.

2.3 Testing the importance of the two channels

As noted above different industrial characteristics predict which real option influence is likely to operate in each case. We first identify which industries are affected (positively or negatively) by uncertainty and then, in a second stage, test whether the industrial characteristics can discriminate accurately which, if either, influence is present. The industry characteristics are of course only proxies for theoretical variables that feature in the two real option models. The theoretical variables, the predicted impact of uncertainty, and the industrial characteristics used to proxy the theoretical variables are detailed in Table I. We postpone to Section 4 the measurement of the proxy variables.

[Insert Table I about here]

3 ESTIMATES OF THE IMPACT OF UNCERTAINTY ON INVESTMENT

Our modeling strategy requires a panel with a reasonably large cross-section of industries and, given the likely presence of lagged dependent variables, a long time series. Official data series are not sufficiently disaggregated, at least for a sufficient length of time for current puposes, but a useful alternative is the data on investment *authorizations* for over forty industries and eighty quarters, publicly available from the Industrial Trends Survey of the Confederation of British Industries (CBI). Basic details of our use of the Survey can be found in

Appendix 1. The survey data we use in this paper records investment authorization rather than actual (gross) investment, though these two variables are linked by a well determined realization function (European Commission, 1997. See also Lamont 2000). One advantage in using this authorizations data is that gestation lags can be dispensed with. A disadvantage of our data is that it is qualitative - recorded in the form of the percentage of respondents replying "more" or "less" to the level of authorizations planned in the next period. A useful practical result for qualitative data is that the balance (more minus less) is closely correlated with rates of change (Smith and McAleer 1995; Driver and Urga 2004). Accordingly, we denote the investment authorization balance as "Auth", to represent investment growth.

The specification for the investment authorisations (*Auth*) equation follows the standard accelerator-type specification (e.g. Berndt 1990) modified to include an uncertainty term:

$$\begin{aligned} Auth_{it} = b_{i,0} + b_{i,1}Auth_{i,t-1} + b_{i,3}Auth_{i,t-2} + b_{i,4}opt_{it} + b_{i,5}yf_{i,t} + \\ b_{i,6}yb_{i,t} + b_{i,7}yb_{i,t-1} + b_{i,8}cu_{i,t-1} + b_{i,9}unc_{i,t-j} + b_{i,10}fi_{i,t-1} + \\ b_{i,11}dlcu_{i,t} + \textit{cross-sectional means} + e_{i,t} \end{aligned} \quad (1)$$

Following Pesaran (2004), equation (1) is augmented by cross-sectional averages of the dependent variable and the individual specific regressors. This augmentation is able to take into account the multivariate error structure and thus control for the unobserved common factors across units which most likely will be correlated with the individual specific regressors. The estimation method used is a simple OLS.

Equation (1) is derived in Driver *et al.* (2004). The accelerator form is chosen over the more common q-form in the light of the finding in Mairesse et al (1999). Note that equation (1) includes an error correction term in the form of a capacity utilization variable directly recorded in the Survey (*cu*). The main regressor is a term in actual past output (*yb*). A term in expected output (*yf*) was constructed analogously to this, using expected figures from the Survey. The variables *yb* and *yf* are both included as regressors because the expected output term relates solely to short-term expectations (over the next quarter) and thus cannot fully supplant the lag structure on actual past output. The basic specification is modified by terms reflecting confidence (*opt*), uncertainty (*unc*), change in capacity utilization (*dlcu*), and the possibility that capital market imperfections, in the form of finance constraints, may be influencing investment outcomes (*fi*)[2]. The explanatory variables are all derived from transformation of the survey questions reported in Appendix 1. Our uncertainty variable (*unc*) is based on the cross-sectional dispersion of beliefs across firms in an industry about prospects for the *industry*. Assuming a high degree of homogeneity in demand conditions within the industry, cross-section dispersion of beliefs about the same sector may be regarded as a measure of uncertainty. The precise measure of uncertainty that we use is the concentration of responses to the survey

[2] See Hubbard (1998) for a survey of financial effects on fixed investment.

question on industry optimism[3]. We therefore compute the measure as the entropy (negative concentration) of the three replies (up/same/down). Writing S_j for the share of reply j, we define: $unc_{it} = \Sigma_{j=1}^{3}[-S_{ijt} log S_{ijt}]$ .The constructed measure is not highly correlated with the level of optimism; the mean absolute value of the correlation coefficient over our sample of industries is 0.13. The entropy variable has been used successfully in other contexts involving surveys with three possible replies to measure the extent of disagreement among respondents (Fuchs, Krueger and Poterba 1998). An even spread in the replies (each share S_i equal to one third) corresponds to maximum entropy and maximum uncertainty. Using lack of consensus as a measure of uncertainty receives empirical support in a number of studies (Zarnowitz and Lambros 1987, Bomberger 1999). A graph of the entropy variable for each industry in our sample is shown in Figure II[4].

[Insert Figure II about here]

Finally, we allow for the potential role of financing constraints (*fi*) by using the responses to question 16(c) of the Industrial Trends Survey which allows for both internal and external constraints as a reason for limiting authorisations. After experimentation, our preferred measure sums both internal and external constraints.

Results from the augmented OLS regression of (1) are given in Table II which summarises the impact of the uncertainty term (*unc*) only. We report estimations from both a complete set of explanatory variables as well as a restricted model obtained by eliminating insignificant *unc* coefficients. A complete tabulation of the results is reported in Appendix 2. Our preferred specification may have omitted variables (such as taxation effects of the kind imposed in the UK in 1984) that are essentially common across industries. We deal with this by including cross-sectional averages of the dependent variable and the individual specific regressors (Pesaran, 2004). In virtually all cases we find that at least one coefficient of the set of averages from the dependent variable and its lags is significant at 5% level. Further, in the majority of cases at least one extra

[3] Uncertainty in real option models is generally captured by the volatility of some key variable. However, it is not always simple to measure such a volatility. GARCH models can be used to estimate conditional volatilities but convergence is often a problem and in our case we wished to retain the full sample of industries. Furthermore it can be argued that it is the future path of conditional volatility that is important (Leahy and Whited, 1996) so that our measure, which is based on forward expectations, is particularly appropriate in this regard. Guiso and Parigi (1999) have used Italian data with similar cross-section dispersion.

[4] The *unc* variable may be measured with error. However, using the standard Hausman test procedure, we rejected the hypothesis that OLS estimates were statistically different from IV counterparts. A further possible criticism of this uncertainty measure is that respondents will mistakenly reply to the survey question by projecting forecasts for their own firm on to the industry as a whole so that the spread of replies on industry optimism becomes an indicator of objective diversity. However the question posed in the survey is quite explicit on this point. Furthermore, we find that the entropy of optimism (relating to the industry) is significantly less than the entropy of output (relating to the firm) in all but four of the industries. This is evidence that firms are not just looking at their own fortunes in answering the optimism question.

average is statistically significant. Finally, we tested for the joint significance of all the cross-sectional averages and we found that the F-tests were significant or borderline significant at the 10% level in over a third of the industries (Details of these results are available on request from authors).

The results in Table II do not support a simple pattern of a negative relationship of investment to uncertainty as suggested by much of the current literature, reviewed by Carruth *et al* (2000). Instead we find a range of coefficients, from positive to negative, though a substantial number of values are insignificant. The next Section examines the predictability of this pattern.

[Insert Table II about here]

4 OPTION VALUES AND THE PATTERN OF UNCERTAINTY IMPACTS ON INVESTMENT

To what extent can real options explain the pattern of coefficients in Table II? For reference, the basic set of results is illustrated in Figure III, which plots both the level of significance and the magnitude of the predicted effect for the 11 industries for which the restricted model estimates were statistically significant and for which the overall F-test was statistically significant at 1% level.

[Insert Figure III about here]

The magnitude and sign of the uncertainty effect depends on the *balance* of the value of the deferment and expansion options. For the former, we need to measure the irreversibilty associated with investment in any particular industry. For the latter, we require an indicator of the opportunities that will follow on from first-stage investments or indicators of the value of expansion options such as profitability. We describe below our construction of the proxy variables listed in the last column of Table I.

The measure of irreversibility (*irr*) is constructed from a ratio of second hand plant and equipment sales to the acquisition of such assets. The ranking of this ratio is expected to capture the marketability of the asssets; those industries with the least marketable assets are ranked the highest. Further details can be found in Appendix 1

The option to wait will be more valuable when the random process determining investment decisions is highly persistent. Although mean reverting behaviour does not destroy option value it will reduce it (Sarkar 2003). Accordingly we also develop a measure of the persistence of the process, which in our case is calculated from the optimism variable in the investment equations. It is based on the normalised variance ratio (Cochrane, 1988; Proietti, 1996):

$$V_k = (1/k)(Var(opt_t - opt_{t-k})/Var(opt_t - opt_{t-1})) \quad (2)$$

where k is the chosen lag length (20 quarters in our case). We call this variable *persis_ opt*. However, the theory of real options suggests that *irr* and the measure of persistence should be seen as interactive. Accordingly, we constructed a new variable, based upon the joint distribution of the two variables, which combines *irr* with our measure of persistence into an augmented measure of irreversibility: *irraug.* This used the quartiles of both distributions, attaching the highest score to industries which were in the highest quartile on both measures (=6). Those in the lowest quartile on both variables had a zero score.

Turning now to the measurement of opportunities for expansion, one appropriate indicator is R&D intensity; an alternative is the brand position of the firm that would allow it for example to market spin-off projects associated with a product market success. The latter is measured here as advertising intensity. A combination of these variables is also constructed (*rdad*), a dummy variable based on R&D and advertising intensity, which is the variable we report here. As well as representing expansion options, a high score on *rdad* indicates possible preemption where competing technologies and brands are engaged in winner-takes-all competition. The option to wait would not exist in such circumstances.

We also constructed a profitability index as a rate of profit (*nprtea*) on total capital installed, adjusted for depreciation (See Appendix 1). However, as this was not significant in any of the equations reported below we do not discuss it further.

Table III reports some experiments with these variables. The first four results consider the simplest case, where the pattern of coefficients in Table II is treated as a random process with −1,0,1 outcomes (*OPROB*) depending upon statistical significance and the predicted sign of the effect (-1 indicating a statistically significant and negative coefficient). The reported experiments use an ordered probit model and are based upon the coefficients for 37 of the industries in Table II. By itself, *irr* has no explanatory power (column 1). When *persis_ opt* is added however, both variables are correctly signed and significant at the 10% level (column 2). Moreover, the augmented measure of irreversibility *irraug* is significant at the 5% level (column 3), and when *rdad* is included this is also correctly signed and significant (column 4).

The importance of *irraug* appears robust to a number of alternative dependent variables and specifications. We also present results for dependent variables that use a different ordering for the logit. In column 5, *olognpp* allows for different levels of significance (5% and 10%). The overall level of significance is now at 5%. Of course, as Figure III illustrates, the log-levels of significance (measured on the horizontal axis) at which the null can be rejected are not the same as estimates of relative magnitudes (indicated by the vertical axis). Accordingly, column 6 allows for the strength of the uncertainty effect to differ across industries in a simple fashion This dependent variable is based upon the sum of the uncertainty coefficients, using a limited dependent variable that indicates a ‘high’ or a ‘low’ magnitude. The demarcation – common to both positive and negative effects - was based upon the average of the absolute sum of the values of the significant *unc* coefficients (in Figure III the demarcation is indicated is indicated in the bold dotted horizontal lines). In this specification both *irraug* and *rdad* are significant at the 5% level. Finally, we also experimented with OLS point estimates of the magnitude of the uncertainty effect using the sum of the uncertainty coefficients from the full model (SUM). The results are basically similar (See column (7) in Table III).

[Insert Table III about here]

5 CONCLUSIONS

We have estimated a set of investment authorisation equations that are mostly well determined and with acceptable diagnostics using OLS augmented by cross-sectional averages to control for unobserved common effects. Our main interest is in the sign, significance and magnitudes of the uncertainty coefficients. In a second stage estimation we used this information to construct a set of limited dependent variables that indicate the importance and sign of the uncertainty effects by industry. These limited dependent variables are then regressed on a specially constructed set of industrial characteristics using probit and ordered probit.

Our overall conclusion is that the industries showing positive or negative effects from uncertainty to investment are not random draws; in particular two strong conclusions are evident from the second stage regressions. First, in keeping with the predictions from real (deferment) options, irreversibility is a predictor of a negative effect from uncertainty, but only when combined with a measure of the value of waiting. Secondly, there is evidence that indicators of FMA advantage such as R&D intensity offsets the irreversibility effect and contributes to explaining a positive effect of uncertainty on investment in some industries. These results are robust to using different categorisations of the importance of the uncertainty effects.

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APPENDIX 1: CBI AND INDUSTRY CHARACTERISTICS DATA

A. The CBI Industrial Trends Survey

In this paper, we draw upon the Industrial Trends Survey carried out by the UK employers' organisation, the Confederation of British Industry (CBI) with over 1000 replies on average each quarter. It has been published on a regular basis since 1958 and has been widely used by economists. Our panel data set is restricted to the period 1978 Q1 to 1999 Q1, since the question on authorisation of investment was added in 1978. The responses in the survey are weighted by net output with the weights being regularly updated. The survey sample is chosen to be representative and is not confined to CBI members

Survey Questions

CBI Industrial Trends Survey Questions

Question 1

Are you more, or less, optimistic than you were four months ago about the general business situation in your industry?

Ques*tion 3b*

Do you expect to authorise more or less capital expenditure in the next twelve months than you authorised in the past twelve months on: plant and machinery? (Possible Choices: 'More', 'Same' or 'Less')

Ques*tion 4*

Is your present level of output below capacity (i.e., are you working below a satisfactory full rate of operation)? ('Yes', or 'No')

Question 8

Excluding seasonal variations, what has been the trend over the PAST FOUR MONTHS, and what are the expected trends for the NEXT FOUR MONTHS, with regard to: Volume of output? ('Up', 'Same' or 'Down')

Question 16(c)

Part C of the question invites respondents to consider which factors, including uncertainty about demand, are "expected to limit capital expenditure authorisations over the next twelve months". Among the possible replies are:

- an inability to raise external finance;
- the cost of finance;

We sum thos replies to obtain an indication of financial constraints.

In Equation (1), the variables *Auth*, *opt*, *yf & yb*, *cu*, *unc* and *fi* are constructed respectively from the responses to Questions 3b,1,8,4,1,16(c). See Driver et al (2004)

B. Other Data

Additional Data used for Ordered Probit analysis:

persis_ opt = Measure of demand persistence based on question 1 of Industrial Trends Surveys (optimism) see text.

rdad = Indicator variable based upon advertising and R&D intensities; 0=low R&D and low adversting; 1=high on one source but not the other; 2 if high on both. (see Davies and Lyons 1996).

nprtea = The data used is based on a concordance between the CBI sectors and the 1980 Standard Industrial Classification (1980 SIC) and uses capital stock data kindly supplied by Mary O'Mahony of the National Institute of Economic and Social Research (see Oulton and O'Mahony, 1994). These however were on the basis of the 1968 Standard Industrial Classification (SIC). A correspondence with CBI tables was made using a published reconciliation between the SIC and that for 1980. Profits were calculated from gross value added in each industry less employee compensation and less estimated depreciation in each industry.

irr =This irreversibility measure constructed from UK Census of Production data for disposals and acquisitions of plant and machinery (for the period 1979-1989) at the 3-digit level of the 1980 Standard Industrial Classification. The ratio of dsiposals to acquisitions may be expected to provide a measure of the marketability of second-hand assets. These 3-digit data were then matched with the CBI industries used for the estimation in this paper. With no strong reason for supposing cardinality, *irr* was constructed as a reverse ranking of the ratio.

irraug = This used the quartiles of both the *irr* and the *persist_ opt* distributions, attaching the highest score to industries which were in the highest quartile on both measures (=6). Those in the lowest quartile on both variables had a zero score.

APPENDIX 2
Results from Estimation of Restricted Model

TABLE A2

Industry	24	25	26	27	28	30	32	33	35
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)
Auth-1	0.2781	0.2304	0.1169	0.3753	0.2947	0.1833	0.1234	0.0934	0.1774
	(2.27)	(1.78)	(0.86)	(2.99)	(2.2)	(1.45)	(0.91)	(0.75)	(1.57)
Auth-2	0.2352	0.1831	0.0332	0.1565	-0.1592	0.0697	0.1211	0.1567	0.2134
	(1.88)	(1.45)	(0.27)	(1.25)	(-1.09)	(0.6)	(0.91)	(1.21)	(1.86)
Opt	0.2898	0.1071	0.4051	0.1167	0.246	0.2806	0.4561	0.0445	0.4235
	(2.3)	(0.73)	(2.81)	(0.89)	(1.42)	(1.88)	(2.69)	(0.25)	(3.18)
Yf	0.0636	0.0682	-0.135	-0.0216	-0.0299	-0.0257	-0.0473	-0.0386	0.0046
	(0.66)	(0.65)	(-1.35)	(-0.25)	(-0.28)	(-0.23)	(-0.53)	(-0.35)	(0.05)
Yb	-0.0299	0.004	0.1545	-0.0545	0.0771	-0.0723	0.0379	0.1562	0.1768
	(-0.31)	(0.03)	(1.77)	(-0.69)	(0.58)	(-0.57)	(0.3)	(1.52)	(1.88)
Yb-1	0.1239	0.0679	0.077	0.0381	-0.0722	-0.0922	0.1999	0.2959	0.1399
	(1.32)	(0.59)	(0.82)	(0.49)	(-0.53)	(-0.71)	(1.88)	(3.07)	(1.46)
Cu-1	-0.4055	-0.5358	0.4773	0.3697	0.589	0.3196	-0.1044	-0.0331	-0.5718
	(-1.79)	(-2.04)	(1.98)	(2.21)	(1.93)	(1.11)	(-0.39)	(-0.11)	(-2.61)
Unc	-0.2065								
	(-2.11)								
Unc(-1)								-0.1829	-0.2858
								(-2.17)	(-3.21)
Unc(-2)			-0.1368					-0.1481	
			(-1.7)					(-1.7)	
fi-1	-0.117	-0.1669	-0.073	0.003	-0.0282	0.1862	-0.0024	-0.0761	0.052
	(-1.16)	(-1.58)	(-0.81)	(0.04)	(-0.21)	(1.66)	(-0.03)	(-1.14)	(0.62)
Dlcu	0.1876	0.4971	-0.366	-0.1847	-0.3527	-0.0791	0.0346	0.1158	0.4665
	(0.93)	(1.99)	(-1.74)	(-1.3)	(-1.2)	(-0.32)	(0.17)	(0.52)	(2.42)
mean(Auth)	0.7697	0.4382	0.6931	0.2319	0.1815	1.0414	0.7212	0.595	0.5911
	(2.19)	(1.12)	(2.17)	(0.88)	(0.44)	(2.41)	(2.21)	(2.08)	(1.75)
mean(Auth-1)	0.2083	-0.3671	0.0625	0.2768	0.0456	-0.1992	0.088	0.0346	0.0668
	(0.61)	(-0.91)	(0.21)	(1.09)	(0.11)	(-0.48)	(0.28)	(0.12)	(0.19)
mean(Auth-2)	-0.4626	0.2876	0.0683	-0.1418	-0.0085	-0.0997	-0.2421	-0.3192	-0.2009
	(-1.89)	(1.02)	(0.3)	(-0.77)	(-0.03)	(-0.35)	(-1.02)	(-1.49)	(-0.85)
mean(Opt)	-0.2313	0.3045	0.1544	0.3747	0.2342	0.1848	-0.4365	-0.2085	0.0265
	(-0.77)	(0.86)	(0.54)	(1.47)	(0.68)	(0.5)	(-1.59)	(-0.76)	(0.09)
mean(Yf)	-0.13	-0.0069	-0.2899	-0.1773	-0.1037	-0.3637	0.2223	0.2113	-0.3154
	(-0.61)	(-0.03)	(-1.58)	(-0.97)	(-0.43)	(-1.41)	(1.17)	(1.19)	(-1.47)
mean(Yb)	0.0609	-0.4006	-0.1914	-0.0172	-0.1488	-0.7787	-0.1542	0.0962	-0.0888
	(0.31)	(-1.8)	(-1.1)	(-0.12)	(-0.7)	(-3.43)	(-0.85)	(0.66)	(-0.48)
mean(Yb-1)	-0.1316	-0.1385	-0.1639	-0.3268	-0.0032	-0.1034	-0.2856	-0.0945	-0.3389
	(-0.73)	(-0.62)	(-1.06)	(-2.58)	(-0.01)	(-0.44)	(-1.57)	(-0.67)	(-1.91)
mean(Cu-1)	0.1899	0.4242	-0.2545	0.0149	0.1112	0.0885	0.2893	0.2277	0.3315
	(0.82)	(1.73)	(-1.34)	(0.09)	(0.39)	(0.38)	(1.01)	(0.77)	(1.74)
mean(Unc)	0.0753								
	(0.79)								
mean(Unc(-1))								0.0989	-0.1038
								(1.19)	(-1.11)
mean(Unc(-2))			-0.0157					0.0708	
			(-0.18)					(0.88)	
mean(fi-1)	-0.0805	-0.1585	0.0378	0.0839	-0.2014	-0.2444	0.0868	-0.0546	0.0363
	(-0.62)	(-1.31)	(0.35)	(0.86)	(-1.59)	(-1.62)	(0.79)	(-0.63)	(0.29)
mean(Dlcu)	-0.0936	-0.1203	0.108	-0.0062	-0.15	0.0732	-0.0885	-0.1113	-0.1228
	(-0.71)	(-0.8)	(0.88)	(-0.06)	(-0.85)	(0.48)	(-0.55)	(-0.67)	(-0.96)
constant	-14.904	-30.1328	42.3072	-40.7825	-50.9396	-26.2482	-61.7355	-18.9169	86.0311
	(-0.14)	(-0.52)	(0.93)	(-1.08)	(-0.66)	(-0.47)	(-1.23)	(-0.44)	(1.71)
Number of obs	78	78	78	78	78	78	78	78	78
R-squared	0.7251	0.5896	0.7872	0.8373	0.6055	0.5162	0.7632	0.8342	0.7307
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000
Sum of Unc's								-0.331	
Joint Significance Test for								F(1, 54)=6.64	
Sum(Unc's)=0								(0.0127)	

Note:

All the coefficients are in Standardised Form with the coefficient multiplied by the standard deviation of the indepenent variable and normalised by the standard dveviation of the dependent variable

TABLE A2 contd

Industry	37	38	39	40	41	42	43	44	46	47
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)
Auth-1	0.1507	0.3173	0.064	0.0321	0.1844	0.2918	0.1899	0.2753	0.2322	0.0774
	(1.21)	(2.37)	(0.52)	(0.24)	(1.43)	(2.25)	(1.53)	(2.04)	(2.01)	(0.58)
Auth-2	0.3577	-0.2409	0.0301	0.211	0.2106	-0.0586	-0.1084	0.0162	0.0443	-0.268
	(3.04)	(-1.92)	(0.28)	(1.56)	(1.74)	(-0.47)	(-0.91)	(0.12)	(0.4)	(-2.01)
Opt	0.1872	0.0771	0.3306	0.1715	0.0729	0.2186	-0.0576	0.1163	0.542	0.1612
	(1.36)	(0.52)	(1.73)	(0.91)	(0.53)	(1.53)	(-0.29)	(0.62)	(3.22)	(0.93)
Yf	0.0691	0.2973	0.1352	0.122	0.1514	-0.0503	0.1589	0.0736	0.2291	-0.0087
	(0.64)	(2.71)	(1.12)	(0.92)	(1.48)	(-0.52)	(1.38)	(0.79)	(1.76)	(-0.08)
Yb	0.1521	0.2533	0.1438	-0.0478	0.2262	0.2024	0.1923	0.1188	-0.2203	-0.0815
	(1.07)	(2.13)	(1.21)	(-0.4)	(2.19)	(1.74)	(1.65)	(1.06)	(-1.45)	(-0.65)
Yb-1	0.0168	-0.0101	0.1766	0.1205	0.1632	0.0626	0.2623	0.1113	0.0268	0.0239
	(0.12)	(-0.08)	(1.51)	(1.08)	(1.78)	(0.5)	(2.41)	(1.07)	(0.22)	(0.19)
Cu-1	0.257	-0.4607	0.1629	0.0331	0.1537	-0.0428	0.0638	-0.0693	-0.2299	0.5792
	(0.78)	(-1.54)	(0.55)	(0.12)	(0.65)	(-0.19)	(0.23)	(-0.25)	(-0.69)	(2.01)
Unc										
Unc(-1)									-0.2253	
									(-1.94)	
Unc(-2)	0.2488									
	(2.58)									
fi-1	-0.0582	0.0294	0.224	0.022	-0.0221	-0.0876	-0.1675	-0.1249	-0.1671	-0.0307
	(-0.44)	(0.3)	(2.32)	(0.23)	(-0.28)	(-0.93)	(-1.66)	(-1.65)	(-1.7)	(-0.27)
Dlcu	-0.0486	0.2327	-0.0797	-0.0115	-0.2296	0.0906	0.0239	-0.0463	0.1975	-0.331
	(-0.15)	(0.9)	(-0.3)	(-0.05)	(-1.04)	(0.49)	(0.1)	(-0.26)	(0.67)	(-1.41)
mean(Auth)	1.0318	0.6672	0.0901	0.5252	0.3973	1.538	0.1097	0.2104	1.0412	0.644
	(2.33)	(1.71)	(0.27)	(1.33)	(1.21)	(4.16)	(0.27)	(0.71)	(2.67)	(1.49)
mean(Auth-1)	-0.2206	-0.1396	0.2094	0.4254	0.3737	-0.7445	0.0305	0.1545	-0.714	-0.16
	(-0.55)	(-0.36)	(0.62)	(1.02)	(1.16)	(-2.03)	(0.08)	(0.52)	(-1.82)	(-0.37)
mean(Auth-2)	-0.2166	0.06	0.3005	-0.0684	-0.137	0.1367	-0.139	-0.0134	-0.0964	0.2403
	(-0.75)	(0.23)	(1.05)	(-0.22)	(-0.61)	(0.51)	(-0.52)	(-0.06)	(-0.33)	(0.74)
mean(Opt)	-0.5557	-0.355	-0.027	-0.0751	-0.1691	-0.531	-0.1465	-0.1205	-0.1863	0.1852
	(-1.45)	(-1.08)	(-0.09)	(-0.22)	(-0.61)	(-1.66)	(-0.44)	(-0.45)	(-0.56)	(0.48)
mean(Yf)	0.0051	0.143	-0.0272	0.0207	0.2121	0.1488	0.2451	0.0545	-0.3858	-0.3072
	(0.02)	(0.63)	(-0.13)	(0.08)	(1.04)	(0.65)	(1.03)	(0.29)	(-1.5)	(-1.1)
mean(Yb)	0.128	-0.1793	-0.0682	-0.0574	-0.2975	-0.3517	0.3846	-0.0408	-0.3031	0.0663
	(0.55)	(-0.9)	(-0.35)	(-0.25)	(-1.72)	(-1.63)	(1.79)	(-0.21)	(-1.28)	(0.3)
mean(Yb-1)	-0.2293	0.0065	-0.3359	-0.0669	-0.0533	-0.1929	0.1373	0.0573	0.0987	-0.0303
	(-1.07)	(0.03)	(-1.83)	(-0.33)	(-0.31)	(-0.95)	(0.72)	(0.34)	(0.47)	(-0.15)
mean(Cu-1)	-0.208	0.2896	-0.2194	-0.4446	-0.2669	0.0048	-0.2915	0.1464	0.5942	-0.41
	(-0.77)	(0.93)	(-1.1)	(-1.39)	(-1.38)	(0.02)	(-1.26)	(0.46)	(2.3)	(-1.67)
mean(Unc)										
mean(Unc(-1))									0.1568	
									(1.46)	
mean(Unc(-2))	-0.0603									
	(-0.59)									
mean(fi-1)	0.181	0.2171	0.1801	0.019	0.0826	-0.0147	-0.1331	-0.0066	-0.0531	0.2504
	(1.32)	(1.98)	(1.55)	(0.15)	(0.84)	(-0.13)	(-1.05)	(-0.07)	(-0.44)	(1.64)
mean(Dlcu)	0.0107	-0.1238	0.12	0.0846	0.237	0.2027	-0.1272	-0.0658	-0.1723	0.0107
	(0.07)	(-0.66)	(0.88)	(0.46)	(1.9)	(1.47)	(-0.86)	(-0.38)	(-1.16)	(0.07)
constant	11.1612	-61.9989	-8.1446	86.3622	22.3087	9.5109	76.6311	-12.2889	-122.1801	14.5806
	(0.1)	(-1.22)	(-0.17)	(1.52)	(0.47)	(0.2)	(1.57)	(-0.29)	(-1.86)	(0.22)
Number of obs	78	78	78	78	78	78	78	78	78	78
R-squared	0.6213	0.671	0.7234	0.6168	0.7297	0.6707	0.6215	0.7771	0.6331	0.5067
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004
Sum of Unc's										
Joint Significance Test for Sum(Unc's)=0										

Note:

All the coefficients are in Standardised Form with the coefficient multiplied by the standard deviation of the indepenent variable and normalised by the standard dveviation of the dependent variable

TABLE A2 contd

Industry	48	49	50	52	53	56	57	58	59
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)
Auth-1	0.4155	0.0492	0.6185	-0.0782	0.1428	0.3049	0.5119	0.3276	0.0936
	(3.41)	(0.39)	(5.07)	(-0.58)	(1.04)	(2.19)	(3.86)	(2.49)	(0.72)
Auth-2	0.0016	0.0106	-0.1441	-0.0456	0.1137	0.0347	0.016	-0.0326	0.173
	(0.01)	(0.08)	(-1.09)	(-0.36)	(0.76)	(0.3)	(0.11)	(-0.26)	(1.33)
Opt	0.4953	0.388	-0.2647	0.0834	0.0697	0.1169	0.1788	0.3944	0.097
	(3.83)	(2.9)	(-1.67)	(0.67)	(0.42)	(0.78)	(1.05)	(2.34)	(0.51)
Yf	0.0078	0.1821	0.1868	0.0252	0.0042	0.0571	0.0736	0.0639	0.0111
	(0.08)	(1.27)	(2.01)	(0.21)	(0.04)	(0.54)	(0.66)	(0.47)	(0.07)
Yb	-0.1737	0.1868	0.2362	0.2945	-0.0862	0.1262	-0.1763	-0.0952	-0.186
	(-1.42)	(1.3)	(2.27)	(2.19)	(-0.7)	(1.15)	(-1.33)	(-0.75)	(-1.27)
Yb-1	0.0293	0.2152	-0.0499	0.0838	-0.1181	0.1467	-0.0835	-0.0692	-0.145
	(0.25)	(1.41)	(-0.51)	(0.68)	(-1.02)	(1.33)	(-0.6)	(-0.54)	(-1)
Cu-1	-0.2109	-0.4707	-0.0186	0.3854	0.2105	0.1074	0.3998	0.2533	0.6143
	(-0.63)	(-1.43)	(-0.09)	(1.61)	(0.73)	(0.4)	(1.45)	(0.65)	(1.49)
Unc	-0.1904		0.1958			0.1714			
	(-2.16)		(1.98)			(1.71)			
Unc(-1)		0.2074	-0.2328						
		(1.7)	(-2.54)						
Unc(-2)		0.2563	0.1881	0.1947					
		(2.18)	(2.14)	(2)					
fi-1	0.1012	0.088	-0.1419	0.0423	0.0214	-0.1087	0.0343	-0.0148	0.0412
	(1.26)	(0.62)	(-1.69)	(0.38)	(0.17)	(-1.03)	(0.3)	(-0.13)	(0.32)
Dlcu	0.4005	0.6858	0.0478	-0.3892	-0.1367	0.1363	-0.2169	-0.0907	-0.4134
	(1.25)	(2.07)	(0.27)	(-1.75)	(-0.51)	(0.6)	(-0.9)	(-0.24)	(-1.06)
mean(Auth)	0.3345	1.4426	0.8008	0.3155	-0.0297	0.5809	0.3856	0.5696	0.4076
	(0.91)	(3.1)	(2.22)	(0.71)	(-0.07)	(1.47)	(1.05)	(1.34)	(0.88)
mean(Auth-1)	-0.2545	-0.7985	-0.7884	0.0338	-0.0895	-0.5795	-0.2602	0.1244	-0.3719
	(-0.73)	(-1.55)	(-2.27)	(0.08)	(-0.22)	(-1.52)	(-0.73)	(0.29)	(-0.78)
mean(Auth-2)	0.1393	0.0379	0.4162	0.0416	-0.1131	0.3997	-0.0223	-0.3413	-0.0704
	(0.58)	(0.11)	(1.74)	(0.15)	(-0.41)	(1.58)	(-0.08)	(-1.23)	(-0.21)
mean(Opt)	-0.9816	-0.2853	0.3824	-0.2751	0.0982	0.621	0.1987	-0.2724	0.1619
	(-2.61)	(-0.64)	(1.24)	(-0.8)	(0.27)	(1.97)	(0.63)	(-0.76)	(0.4)
mean(Yf)	0.315	-0.3984	-0.3946	0.0551	-0.0241	-0.4708	-0.3437	0.1055	0.2376
	(1.14)	(-1.14)	(-1.77)	(0.22)	(-0.1)	(-1.94)	(-1.57)	(0.4)	(0.76)
mean(Yb)	0.4122	-0.3105	-0.1155	-0.0135	0.2868	-0.2881	0.1052	-0.0342	-0.0526
	(1.95)	(-1.21)	(-0.61)	(-0.06)	(1.2)	(-1.41)	(0.49)	(-0.15)	(-0.21)
mean(Yb-1)	0.2326	-0.0312	0.092	0.1908	0.3763	-0.1704	-0.0407	-0.2587	0.0998
	(1.24)	(-0.13)	(0.53)	(0.89)	(1.69)	(-0.94)	(-0.21)	(-1.3)	(0.43)
mean(Cu-1)	-0.0763	0.1558	0.1172	-0.0613	0.2293	0.1148	-0.0411	-0.0108	0.0939
	(-0.39)	(0.65)	(0.5)	(-0.26)	(1.02)	(0.55)	(-0.18)	(-0.05)	(0.3)
mean(Unc)	0.0916		-0.2193			-0.1546			
	(0.88)		(-2.23)			(-1.54)			
mean(Unc(-1))		-0.2883	0.1987						
		(-2.12)	(1.84)						
mean(Unc(-2))		0.1635	-0.0337	-0.0299					
		(1.46)	(-0.34)	(-0.31)					
mean(fi-1)	0.1022	-0.0749	0.2209	-0.278	-0.0179	0.0057	-0.0739	-0.024	0.0837
	(0.86)	(-0.49)	(2.21)	(-1.83)	(-0.12)	(0.05)	(-0.54)	(-0.19)	(0.49)
mean(Dlcu)	0.1942	0.1495	-0.1418	-0.0461	-0.2	0.0751	0.0974	-0.0575	-0.1093
	(1.43)	(0.93)	(-1)	(-0.3)	(-1.31)	(0.55)	(0.73)	(-0.38)	(-0.56)
constant	-36.772	51.832	-44.6472	54.9557	-59.5413	5.9159	-24.5887	-33.8741	-105.7248
	(-0.36)	(0.53)	(-0.63)	(0.49)	(-1.08)	(0.08)	(-0.48)	(-0.6)	(-1.3)
Number of obs	67	66	78	78	78	78	78	78	78
R-squared	0.7533	0.6036	0.7801	0.5594	0.57	0.6941	0.6694	0.5024	0.4646
Prob > F	0.0000	0.002	0	0.0001	0	0	0	0.0005	0.0023
Sum of Unc's		0.4637	0.1511						
Joint Significance Test for		F(1, 42)=6.3	(1, 52)=1.14						
Sum(Unc's)=0		(0.0155)	(0.2901)						

Note:

All the coefficients are in Standardised Form with the coefficient multiplied by the standard deviation of the indepenent variable and normalised by the standard dveviation of the dependent variable

TABLE A2 contd

Industry	61	62	63	64	65	66	67	68	70
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)	(t-value)
Auth-1	0.2071	0.3672	0.0851	0.264	0.3061	0.4063	0.1773	0.3656	0.024
	(1.49)	(2.46)	(0.72)	(2.09)	(2.3)	(3.1)	(1.44)	(2.61)	(0.18)
Auth-2	0.0479	0.0778	0.1317	0.0438	0.1529	0.1089	0.164	0.0476	0.0443
	(0.41)	(0.59)	(1.15)	(0.35)	(1.21)	(0.82)	(1.28)	(0.36)	(0.38)
Opt	0.1138	-0.0576	0.2375	0.163	0.1714	0.1482	0.3735	0.1832	-0.201
	(0.8)	(-0.39)	(1.24)	(1.26)	(1.22)	(0.86)	(1.94)	(0.76)	(-1.11)
Yf	-0.0749	0.1217	0.0602	0.0943	0.0916	0.1188	0.0886	0.1062	0.0558
	(-0.64)	(1.2)	(0.58)	(0.94)	(0.93)	(1.01)	(0.66)	(0.73)	(0.53)
Yb	0.2386	0.175	-0.0837	0.0727	0.0634	0.047	-0.0329	0.0244	-0.0439
	(2.41)	(1.53)	(-0.73)	(0.74)	(0.69)	(0.36)	(-0.25)	(0.15)	(-0.39)
Yb-1	0.0339	-0.0613	0.1989	0.2128	0.017	0.0836	0.1793	0.0506	0.1239
	(0.33)	(-0.49)	(1.84)	(2.18)	(0.19)	(0.78)	(1.59)	(0.33)	(1.15)
Cu-1	0.3805	0.382	-0.1177	-0.0721	-0.0727	0.6577	-0.3773	-0.3864	0.442
	(1.53)	(1.29)	(-0.49)	(-0.29)	(-0.4)	(1.9)	(-1.1)	(-1.2)	(1.54)
Unc									
Unc(-1)			-0.2486						
			(-2.32)						
Unc(-2)									
fi-1	0.0611	-0.1073	-0.0582	-0.0112	-0.0559	-0.2622	-0.2935	-0.1456	0.0833
	(0.57)	(-1.13)	(-0.59)	(-0.14)	(-0.76)	(-1.89)	(-2.96)	(-1.28)	(0.83)
Dlcu	-0.3363	-0.2085	0.3692	0.1769	0.0929	-0.5721	0.3589	0.4112	-0.1322
	(-1.49)	(-0.78)	(1.73)	(0.79)	(0.54)	(-1.97)	(1.22)	(1.62)	(-0.53)
mean(Auth)	-0.1017	1.0329	0.2169	0.4146	0.4543	0.5368	1.0101	0.5315	0.5353
	(-0.27)	(2.72)	(0.6)	(1.23)	(1.46)	(1.25)	(2.57)	(1.25)	(1.53)
mean(Auth-1)	0.4769	-0.2107	0.3061	-0.0745	0.1243	-0.3441	-0.7477	-0.4432	0.0645
	(1.25)	(-0.61)	(0.88)	(-0.23)	(0.43)	(-0.92)	(-1.88)	(-1.08)	(0.18)
mean(Auth-2)	-0.1632	-0.0414	0.1574	-0.1539	-0.4229	0.0835	-0.0534	0.2063	-0.2572
	(-0.59)	(-0.19)	(0.63)	(-0.66)	(-2.03)	(0.32)	(-0.19)	(0.68)	(-1.02)
mean(Opt)	0.6336	0.218	0.1144	-0.5817	0.1119	-0.2826	-0.4591	-0.1752	0.3919
	(1.91)	(0.65)	(0.32)	(-1.84)	(0.42)	(-0.74)	(-1.21)	(-0.42)	(1.23)
mean(Yf)	-0.2893	-0.1238	0.089	0.2414	-0.1926	0.0484	-0.1126	-0.1583	-0.1965
	(-1.27)	(-0.52)	(0.37)	(1.22)	(-1.07)	(0.2)	(-0.41)	(-0.62)	(-0.95)
mean(Yb)	-0.0451	-0.554	-0.2219	0.3299	0.1855	0.315	0.1722	0.1272	0.0755
	(-0.22)	(-2.88)	(-1.11)	(1.77)	(1)	(1.5)	(0.77)	(0.58)	(0.39)
mean(Yb-1)	-0.1188	-0.2538	-0.3141	0.1028	-0.1986	0.1768	0.0299	0.0799	-0.1157
	(-0.67)	(-1.32)	(-1.74)	(0.62)	(-1.29)	(0.9)	(0.16)	(0.39)	(-0.64)
mean(Cu-1)	-0.2356	0.1329	0.0608	0.0326	0.202	-0.7539	0.1528	-0.0208	-0.0146
	(-1.15)	(0.61)	(0.29)	(0.14)	(1.28)	(-2.24)	(0.49)	(-0.08)	(-0.06)
mean(Unc)									
mean(Unc(-1))			-0.0016						
			(-0.01)						
mean(Unc(-2))									
mean(fi-1)	-0.1623	0.0297	0.205	0.0829	-0.0191	0.0475	0.22	0.0548	-0.1187
	(-1.31)	(0.28)	(1.79)	(0.81)	(-0.2)	(0.32)	(1.76)	(0.39)	(-1.02)
mean(Dlcu)	0.1113	0.0308	0.1066	-0.1217	-0.1117	0.1266	0.0768	0.0492	0.0931
	(0.84)	(0.22)	(0.79)	(-0.82)	(-1.07)	(0.69)	(0.44)	(0.28)	(0.61)
constant	24.8545	-58.3223	27.7497	-26.1351	-28.5167	116.217	-11.0137	52.7386	-27.7548
	(0.45)	(-0.88)	(0.52)	(-0.59)	(-0.74)	(1.84)	(-0.19)	(1.14)	(-0.73)
Number of ob	78	69	78	78	78	78	78	78	78
R-squared	0.6656	0.7601	0.6868	0.7493	0.7507	0.6244	0.6139	0.5408	0.7037
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum of Unc's									
Joint Significance Test for Sum(Unc's)=0									

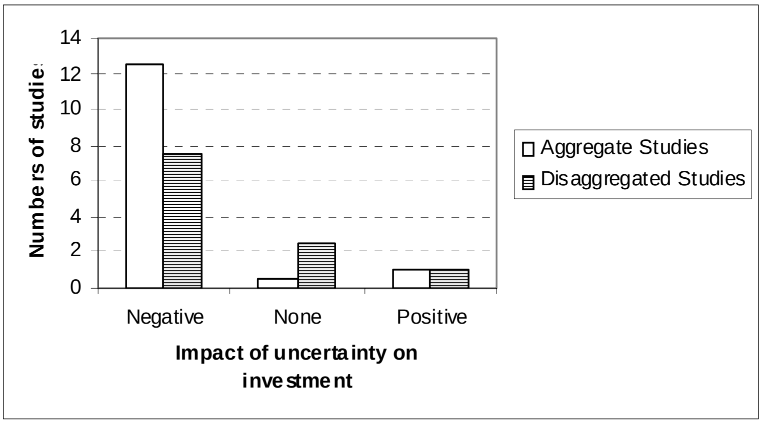
Note:

All the coefficients are in Standardised Form with the coefficient multiplied by the standard deviation of the indepenent variable and normalised by the standard dveviation of the dependent variable

FIGURES

Figure I:

Incidence of Signs on the Coefficient on Uncertainty



Based on Carruth, Dickerson, Henley (2000)

Figure II: Time Series of Entropy Measure (*unc*) at Industry Level

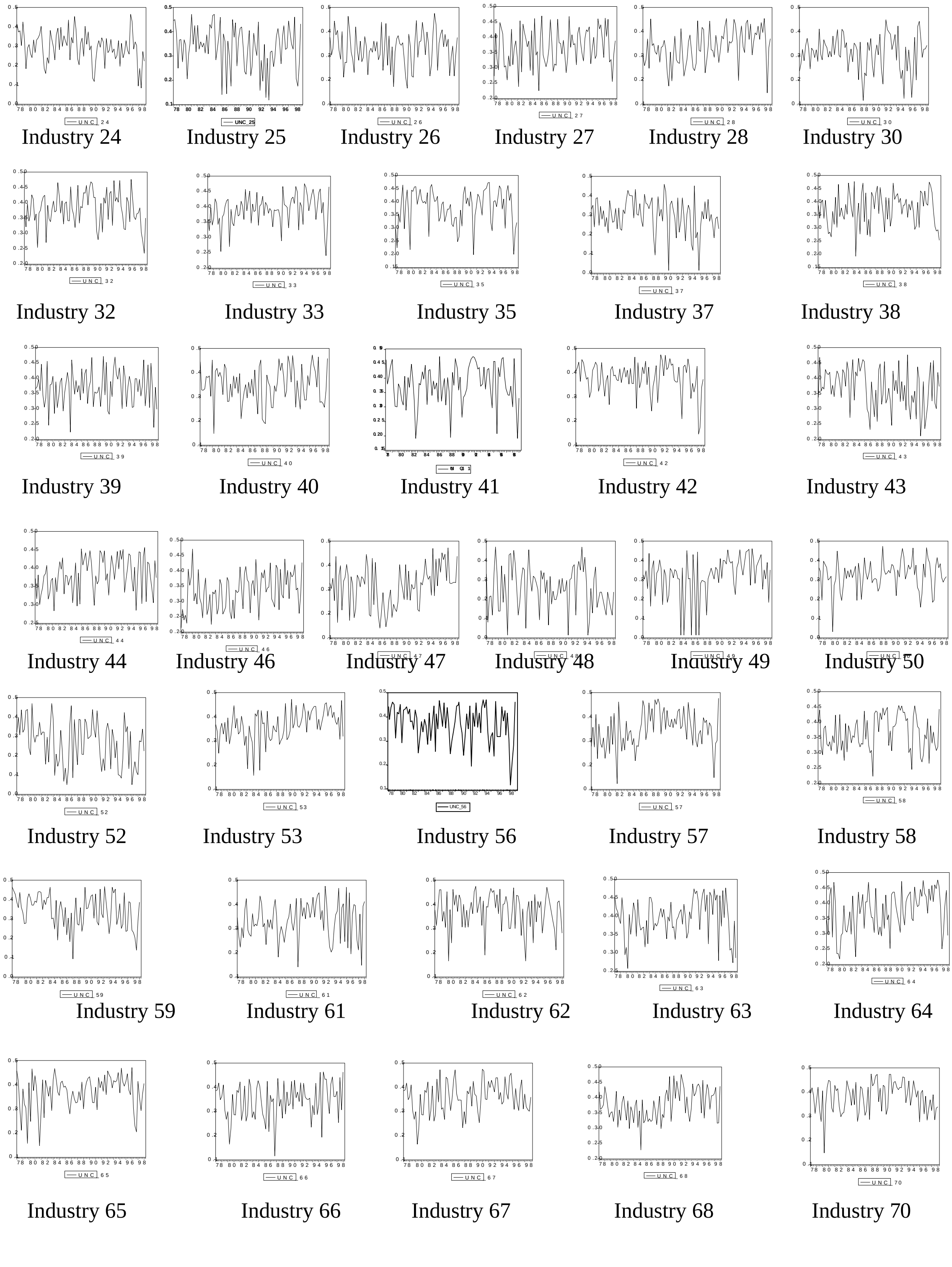
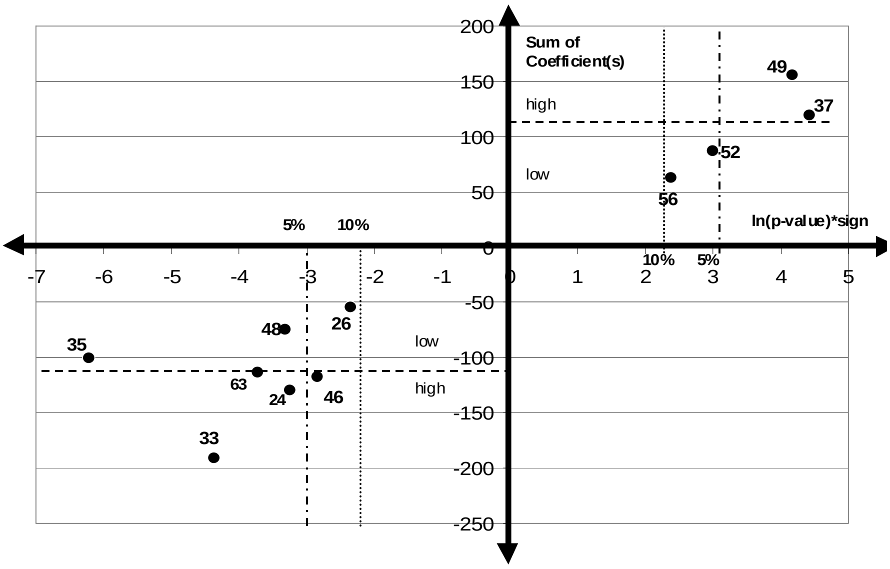


Figure III:

Restricted Model:
Basis for Constructing the Dependent Variables



TABLES

Table I

PREDICTIONS AS TO WHICH INDUSTRY CHARACTERISTICS WILL OBTAIN FOR EACH CHANNEL OF INFLUENCE FROM UNCERTAINTY TO INVESTMENT

Model	Likely sign of uncertainty on investment	Necessary Condition for the sign	Theoretical Variables	Possible proxy variables
REAL OPTION (deferment)	<0	Irreversible investments with the option to postpone and where information is obtained by waiting	High sunk costs; No FMA; High value of waiting	Index of sunk costs; Inverse index of R&D and/or advertising intensity; Persistence in the uncertainty variable
REAL OPTION (expansion or compound)	>0	Option obtained by investment (compound option); alternatively excess capacity minimises stock-out penalties (expansion option)	FMA and/or High cost of non-supply;	Index of R&D and/or advertising intensity Profitability.

Table II
Results from First stage Estimation

	INDUSTRY	Sum of unc coeffs	F-test on unc coeffs[1]	sig[2]	Prob>F	sig[2]	R^2	coefficient unc	p-value	sig[2]	unc-1	p-value	sig[2]	unc-2	p-value	sig[2]	F-test on unc coeffs[1]	sig[2]	Sum of unc coeffs	nobs	R^2	Pr>F	sig[2]
24	ferrous metals	-115.8	0.221		0.000	***	0.74	**-129.3**	0.039	**	-	-		-	-		-		-129.3	78	0.73	0.000	***
25	non-ferrous metals	45.1	0.545		0.000	***	0.62	-	-		-	-		-	-		-			78	0.59	0.000	***
26	building materials	-20.9	0.725		0.000	***	0.80	-	-		-	-		**-54.2**	0.095	*	-		-54.2	78	0.79	0.000	***
27	glass and ceramics	23.9	0.764		0.000	***	0.85	-	-		-	-		-	-		-			78	0.84	0.000	***
28	industrial chemicals	37.9	0.610		0.000	***	0.65	-	-		-	-		-	-		-			78	0.61	0.000	***
30	pharmaceuticals and consumer ch	-64.4	0.237		0.002	***	0.55	-	-		-	-		-	-		-			78	0.52	0.000	***
32	foundries; and forging, pressing, s	-179.0	0.058	*	0.000	***	0.79	-	-		-	-		-	-		-			78	0.76	0.000	***
33	metal goods nes	-241.7	0.018	**	0.000	***	0.84	-	-		**-105.1**	0.034	**	**-85.8**	0.095	*	0.0127	**	-190.9	78	0.83	0.000	***
35	constructional steelwork	-95.0	0.084	*	0.000	***	0.73	-	-		**-100.6**	0.002	***	-	-		-		-100.6	78	0.73	0.000	***
37	agricultural machinery	101.7	0.226		0.000	***	0.66	-	-		-	-		**118.9**	0.012	**	-		118.9	78	0.62	0.000	***
38	metal working machine tools	-54.2	0.501		0.000	***	0.68	-	-		-	-		-	-		-			78	0.67	0.000	***
39	engineers small tools	90.0	0.355		0.000	***	0.76	-	-		-	-		-	-		-			78	0.72	0.000	***
40	industrial machinery	38.8	0.643		0.000	***	0.66	-	-		-	-		-	-		-			78	0.62	0.000	***
41	contractors' plant	15.9	0.839		0.000	***	0.75	-	-		-	-		-	-		-			78	0.73	0.000	***
42	industrial engines, pumps, compre	36.8	0.656		0.000	***	0.71	-	-		-	-		-	-		-			78	0.67	0.000	***
43	heating, ventilating and refrigeratin	10.1	0.858		0.000	***	0.66	-	-		-	-		-	-		-			78	0.62	0.000	***
44	other mechanical engineering	-86.0	0.279		0.000	***	0.79	-	-		-	-		-	-		-			78	0.78	0.000	***
46	electrical industrial goods	-67.2	0.577		0.000	***	0.64	-	-		**-117.6**	0.058	*	-	-		-		-117.6	78	0.63	0.000	***
47	elctronic industrial goods	112.0	0.087	*	0.001	***	0.58	-	-		-	-		-	-		-			78	0.51	0.000	***
48	electrical consumer goods	-119.7	0.054	*	0.000	***	0.78	**-74.7**	0.036	**	-	-		-	-		-		-74.7	67	0.75	0.000	***
49	electronic consumer goods	202.9	0.020	**	0.005	***	0.61	-	-		**69.7**	0.096	*	**85.6**	0.035	**	0.0155	**	155.3	66	0.60	0.002	***
50	motor vehicles	65.9	0.290		0.000	***	0.78	**86.0**	0.053	*	**-102.2**	0.014	**	**82.1**	0.037	**	0.290		65.9	78	0.78	0.000	***
52	aerospace and other vehicles	102.8	0.167		0.001	***	0.58	-	-		-	-		**86.9**	0.050	*	-		86.9	78	0.56	0.000	***
53	instrument engineering	64.3	0.423		0.000	***	0.62	-	-		-	-		-	-		-			78	0.57	0.000	***
56	wool textiles	56.1	0.414		0.000	***	0.70	-	-		-	-		**62.8**	0.093	*	-		62.8	78	0.69	0.000	***
57	spinning and weaving	-78.4	0.203		0.000	***	0.76	-	-		-	-		-	-		-			78	0.67	0.000	***
58	hosiery and knitwear	43.2	0.406		0.000	***	0.60	-	-		-	-		-	-		-			78	0.50	0.001	***
59	textile consumer goods	-32.5	0.718		0.014	**	0.50	-	-		-	-		-	-		-			78	0.46	0.002	***
61	footwear	-69.8	0.262		0.000	***	0.70	-	-		-	-		-	-		-			78	0.67	0.000	***
62	leather and leather goods	-17.6	0.850		0.000	***	0.77	-	-		-	-		-	-		-			69	0.76	0.000	***
63	clothing and fur	-57.0	0.530		0.000	***	0.73	-	-		**-113.6**	0.024	**	-	-		-		-113.6	78	0.69	0.000	***
64	timber and wooden products other	-11.2	0.881		0.000	***	0.76	-	-		-	-		-	-		-			78	0.75	0.000	***
65	furniture, upholstery, bedding	-53.1	0.361		0.000	***	0.76	-	-		-	-		-	-		-			78	0.75	0.000	***
66	pulp,paper, and board	-87.8	0.290		0.000	***	0.66	-	-		-	-		-	-		-			78	0.62	0.000	***
67	paper and board products	-68.4	0.505		0.000	***	0.64	-	-		-	-		-	-		-			78	0.61	0.000	***
68	printing and publishing	63.3	0.445		0.001	***	0.58	-	-		-	-		-	-		-			78	0.54	0.000	***
70	plastics products	-19.5	0.764		0.000	***	0.71	-	-		-	-		-	-		-			78	0.70	0.000	***

Note: 1 F-test on uncertainty coefficients tests whether the sum of the coefficients = 0

Table III
Results from Second Stage Analysis

All results with robust standard errors

							FULL MODEL
Estimation Method	ordered probit	ordered probit	ordered probit	ordered probit	ordered probit	ordered probit	OLS
Dependent Variable	OPROB	OPROB	OPROB	OPROB	OLOGNPP	OSUM	SUM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Explanatory Variable	sig		sig	sig	sig	sig	sig
irr	**-0.006**	**-0.020** *					
p-value	0.681	0.084					
persis_opt		**-11.303** *					
p-value		0.083					
irraug			**-0.252** **	**-0.310** **	**-0.320** **	**-0.280** **	**-19.276** *
p-value			0.031	0.035	0.022	0.049	0.072
rdad				**0.553** *	**0.629** *	**0.642** **	**50.289** **
p-value				0.096	0.064	0.047	0.023
constant							**20.107**
p-value							0.525
nobs	37	37	37	37	37	37	37
Prob>Chi^2	0.503	0.036 **	0.031 **	0.068 *	0.023 **	0.071 *	0.038 **
Pseudo R^2	0.01	0.08	0.05	0.11	0.11	0.10	
R^2							0.23

*=sig at 10%
**=sig at 5%