BUSINESS OPTIMISM FOR SMALL, MEDIUM AND LARGE FIRMS: DOES IT EXPLAIN INVESTMENT?

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Business Optimism for small, medium and large firms: does it explain investment?*

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Abstract

We use UK survey data on variation in business optimism by manufacturing size group and estimate the determinants of optimism using OLS and SURE. There are similarities across the size groups but also some differences: the medium size group seems to have been unusually affected by real interest rates in recent years. We also model investment authorizations, conditional on business optimism. Again, there are similarities across the size groups. However, the largest size group, and possibly also the medium size group, seems to be investing less in recent years in relation to reported optimism. By contrast, capital investment by smaller sized firms has been stable in relation to business optimism. Some tentative explanations for these finding are explored.

J.E.L. Classification numbers: E22 L60
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1. Introduction

The ratio of nominal business investment to GDP is currently at a 40-year low resulting in an outcrop of writing on its causes and significance. The decline has been particularly sharp since the year 2000 and has been especially marked in manufacturing (Barnes and Ellis 2005). While the real ratio has not fallen as fast as the nominal one in this period, there is renewed concern over the adequacy of fixed investment that has been a perennial issue in UK economic discourse (Miles 1993, Bond and Jenkinson 1996, Syed 2004).

This paper seeks to do two things. First it sets out a simple specification for business optimism and estimates this for different size groups. Having interpreted these findings it then explores whether, for each size group, recent weak investment is due to lower optimism or to a break in behaviour that involves less investment for a given degree of optimism.¹

Business optimism as captured in surveys of firms is an indicator of confidence in future prospects, often called animal spirits. A natural question to explore is what accounts for business confidence being high or low. Typically, given the difficulty of

¹ The empirics in this paper deal only with manufacturing and this might be thought to diminish the significance of any results, given that a preponderance of investment now occurs in the services sector. However much of this services investment is in short-lived assets such as ICT: the capital-output ratio of manufacturing is about 50% higher than for manufacturing (Julius and Butler 1998). Manufacturing is also crucial in supporting directly about a sixth of employment in the UK, rising to a third if suppliers are included, while manufacturing also accounts for the majority of export revenue (Rowthorn and Coutts 2004). Manufacturing assets also tend to be more irreversible than in other sectors because of their firm-specific and industry-specific character; capital goods in other sectors such as services tend to be more fungible and thus less prone to market failure. Finally, an important literature criticises excessive divestments of strategic manufacturing competences that can undermine the commercial payoff from innovation (Chesbrough and Teece 2002)
measuring optimism in any absolute sense we have to make do with studying movement in optimism over time. In this paper we show that we can explain up to 90% of the movement in optimism by a small set of variables representing output expectations and the real interest rate.

Following a discussion of the data (Section 2) and the specification for business optimism (Section 3) we address several specific questions. In Section 4 we examine whether there are differences across firm-sizes in the determinants of optimism or in the magnitude of the responses. In Section 5 we use the model of optimism to estimate an (instrumented) model of investment. Section 6 discusses the results for investment and analyses the prediction errors for the model to investigate whether the relationship between investment and optimism has remained stable over time. Section 7 concludes.

2. Data

Distinguishing between the behaviour of small and large firms is often difficult using standard firm-level databases because these tend to be dominated by quoted companies and contain mainly accounting information (Gertler and Gilchrist 1994). Like these authors we make use of an alternative database broken down by specific size classes, seeking to offset the disadvantage of using partially aggregated data against the advantages of capturing direct expectations and using a representative sample in each size group. Our source is the Industrial Trends Survey of the Confederation of British Industry that has sampled UK manufacturing since 1958 and that has been used heavily in academic work (Dicks and Burnell 1994).²

² Questionnaires are targeted at chief executives, managing directors and finance directors. The survey is not confined to CBI members. A core of up to 1100 companies comprise the main panel with up to 300 other new or floating participants. A 50% response rate is typical. (Junankar 1995). The sample is based at the enterprise level except for some of the largest plants where replies are collected for that unit.
The data distinguishes four size categories, defined by employment band (1-200; 200-500; 500-5000; >5000). Because the largest band has rather few firms, the data series for this group has a much higher random component due to sampling error than the groups with a greater number of firms and for this reason we confine attention to the three groups with less than 5000 employees. The first two size bands arguably correspond to small and medium size bands respectively. Although the European Commission and the UK DTI use an upper bound of 250 employees for medium companies this does not distinguish between different sectors of the economy. In the US, where officials relate size-bands to sectors, 500 employees is the upper bound for manufacturing SMEs normally used by the Size Standards Office of the Small Business Administration (SBA). Using this categorisation, the third band then constitutes our group of large firms. It should be recognised, however, that the CBI data source under-represents very small firms and start-ups and that our set of smallest firms (< 200 employees) may contain what would be regarded in other work as medium-size firms.3

Our estimation period runs from 1987Q1 to 2005Q1. This excludes the intense period of manufacturing restructuring which took place in the first part of the 1980s and which may have resulted in structural breaks. Furthermore our main data source, the CBI Industrial Trends Survey was re-weighted with a different classification scheme in the mid 1980s.4

The survey data are all qualitative; they consist of a category response (usually coded -1.0,+1) at firm level and are aggregated up to industry level percentage

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3 For an analysis of firms according to a more traditional interpretation of small and medium size, see Hughes (2000) and Cosh and Hughes (2000).
4 Because some series such as the effective exchange rate or real interest rate were collected for a slightly shorter sample and because of variable lags, the sample for estimation purposes is slightly shorter – see Tables 1 and 2.
responses. A large literature has considered the most appropriate transformation to convert these series to quantitative indicators (European Commission 1997; see also Lamont 2000). The balance of the aggregated data on up minus down (or more minus less) for these questions may be interpreted as an index of the growth rate (Driver and Urga 2004).

The Survey questions used are detailed in Appendix 1. For example, the “optimism question” asks whether respondents are currently more, same, or less optimistic about the general business conditions in their industry than the level previously recorded. Figure 1 shows the balance (% more minus % less) for the optimism question for each of the three size groups over the sample period.

[Figure 1 about here]

3. Specification and estimation of the optimism balance

Previous work in special survey investigations by the CBI has suggested that the optimism of respondents reflects movements in expectations concerning demand, interest rate, political conditions and the exchange rate (Junankar 1989, p.29). Nearly all of the respondents to the special survey indicated that demand was important, over half mentioned interest rates while domestic politics and exchange rates were each mentioned by only a third of the respondents. Our initial specification, therefore, is of the form:

$$\Delta OPT_t = \beta_0 + \beta_1 \Delta OPT_{t-1} + \beta_2 \Delta YE_t + \beta_3 \Delta YB_{t-1} + \beta_4 \Delta RR_{t-1} + \beta_5 \Delta FX_{t-1} + e_t$$

...(1)
Where $t$ is a time subscript with lag $i=0,1$ for the regressors as determined by the data. Data sources, survey questions, construction, and transformations are documented in Appendix 1. $\Delta$OPT represents the balance in optimism recorded in the survey i.e. the % answering more minus the % answering less; $\Delta$YB is the balance in past output responses; $\Delta$YE is the balance of expected future output responses; RR and FX are the real interest rate and the real effective exchange rate respectively and $e_i$ is an error term. We start with a general lag structure and tested down. The final specification is identical across the size classes with current and one additional lag for $\Delta$YB, one lag for $\Delta$RR, while $\Delta$FX was never significant at any lag.\footnote{The lack of significance for the exchange rate may reflect the short time horizon of the optimism variable (four months) and the fact that output expectations are conditioned on. Each size group also comprises both exporters and import-dependent firms. Note also in relation to endogeneity that the current value of $\Delta$YB is an indicator of previous output and is therefore unlikely to be endogenous. The only other contemporaneous term is the expectation of future output $\Delta$YE. For the large firm group, instrumenting this by an own lag and the total manufacturing variables corresponding to $\Delta$YE and $\Delta$YB yields very similar results. For the other two groups these instruments are not good enough to prevent deterioration in the accuracy of the estimates.}

All the balance variables from the survey ($\Delta$OPT, $\Delta$YB, $\Delta$YE) are stationary using standard ADF test procedures. The real interest rate is indicated to be I(1) and so is first differenced.

The results are presented in Table 1 for each of the three size classes in the data and for OLS and SURE estimates. One extension we make is to modify the real interest rate by interacting it with an inverse measure of capacity utilisation specific to each size group. This is intended to capture the interaction of “tight money” episodes and cost of finance, both of which were found to be important discriminants of differential inventory behaviour in Gertler and Gilchrist (1994). The variable $\Delta$RRC (see appendix 1 for exact construction) is shown to perform better than $\Delta$RR, particularly for the small and medium size groups, suggesting that the real interest effect bites deeper at times of recession, possibly due to liquidity effects.
Table 1 also presents results for systems-level estimation. The SURE results may be superior by including a cross-equation error structure that can reflect the possible omission of common effects such as taxation and subsidy changes or non-modelled cost influences such as energy and labour that will otherwise be reflected in the expected output term. A Wald test rejected at the 1% level the equality of all coefficients across the size categories. However, restricted SURE with equality imposed across the interest rate ($\Delta RRC$) coefficients is easily accepted by a Wald test, as reported in Table 1.\(^6\) Clearly systems estimation changes the magnitude of some coefficients, especially those for expected output, but it does not greatly alter the interest rate effect.

The diagnostics for Table 1 indicate few problems with autocorrelation, functional form or heteroscedasticity. The Normality test is failed for the smallest group but the histogram of the residuals is approximately Normal and there seem no large outliers. Endogeneity may be a problem for the expected output term, but we have no good instruments for this. By using a lagged value instead of the contemporaneous variable in the restricted SURE estimation both the overall significance and the magnitude of the summed accelerator terms were lowered, although both past output terms held their significance in all cases. In addition the significance of the interest rate was broadly similar [Pr=0.02], though its estimated magnitude increased by about a quarter.

[Table 1 about here]

### 4. Discussion of results.

The results presented in Table 1 show a reasonable similarity in the coefficients across the three size groups. Expected and past output changes along with real

\(^6\) Similarly, restricted SURE with equality across the $\Delta R$ coefficients is easily accepted.
interest changes (or real interest changes interacted with the level of capacity utilisation) seem to explain the movement in optimism quite well. Rather surprisingly perhaps, the magnitude of the interest rate effects ($\Delta RR$ and $\Delta RRC$) appears to be similar across all size groups and this is confirmed by the acceptable restriction in the SURE estimation. The estimates indicate that a one percentage point change in the real interest rate would change the dependent variable (proxying the growth rate of optimism) by about one sixth of its standard deviation for all size categories.

The effect of the interest rate in recent years is of note, given the apparent puzzle of low business investment from the end of the 1990s. Figure 2 presents a rolling regressions with a window of 16 quarters. The graph charts the coefficient on $\Delta RR$ and provides evidence of a stronger negative optimism reaction to interest rate changes emerging for the medium group around the end of the 1990s. Such a trend is not strongly mirrored in the large size group (and not at all for the small firm group). Despite the fall in real interest rates to historically low levels it seems that the medium firm group may have become increasingly sensitive to variation in this.

The reasons for this are unclear. Since large firms have many alternative sources of finance, the finding is consistent with sensitivity to interest rates rising by size up to a certain threshold. One explanation may be the rise in capital gearing rates to historical levels that has occurred since 1999. This rise has been confined to companies above median annual sales and is most marked for the highest quartile (Brierley and Bunn 2005).

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7 Other work also has suggested that “smaller firms seemingly do not take their stronger interest rate sensitivity into account when they form expectations about their future business conditions” (Ehrmann (2000), p.23. Mizen and Yalcin (2006) uncover significant differences between small and medium firms in terms of reaction to monetary conditions but their definition of small (medium) firms is under 50 (250) employees. In another study, small manufacturing firms (<100 employees) were found to be more responsive to the user cost of capital...than large ones, though not significantly (Butzen et al 2001).

8 For Germany it has been argued that recent increased competition between savings banks have created a situation where small firms are no longer disadvantaged while large firms have many alternative sources of finance. Thus it is the medium size firm that are subject to liquidity constraints on investment (Audretsch and Elston 2002). For the UK, small firms also seem to have increased their access to finance during the 1990s (Lund and Wright 1999).
5. Capital Investment and firm size: effects of optimism

As noted previously we wish to examine whether recent weakness in UK investment expenditure can be fully explained by any change in business optimism for any of the size groups. This entails modelling investment for each of the three groups.

There are good reasons to expect that capital investment behaviour varies across firms that are differentiated by the size of the firm or business unit. Such differences arise from exposure and reaction to monetary conditions. In other instances, differences may reflect production characteristics (e.g. flexibility, cost structure, learning and economies of scale) that will affect both capital output ratios and adjustment cost dynamics (Li and Weinberg 2003). Previous studies have suggested that technological reasons for differential behaviour according to size are likely to be second order; for example the evidence for production smoothing by large firms is not strongly supported (Guariglia and Schiantarelli 1998). In any event our investment estimation is concerned with investment authorisations rather than installation and this will remove any gestation lag differences across size groups.9

We begin by deriving a generalised specification of the linear-quadratic model in Taylor (1982) and Blanchard and Fischer (1989, pp.299-300). Maximising the value of the firm with capital as the only quasi-fixed factor subject to a production function with exogenous demand yields a closed form solution if the implied cost minimand is approximated by a quadratic form. Specifically, the industry is assumed to minimise the discounted sum of a penalty function \( C_t \) comprising the cost of being out of equilibrium and quadratic adjustment costs which reflect supply conditions when the

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9 Authorisation is interpreted by the vast majority of respondents as board approval. The authorisation data also includes leased assets (CBI 1988, p.29)
industry as a whole attempts to invest. Writing \( K_t \) for capital, \( K_t^* \) for desired capital in a frictionless world, \( GI_t \) for gross investment, \( a_t \) for the desired ratio of capital to desired capital, we have:

\[
C_i = [a_t K_t^* - K_i]^2 + b_t GI_t^2
\]

Minimising (2) subject to a depreciation condition, we obtain\(^{10}\):

\[
GI_t = \kappa K_{t-1} + \beta \lambda \sum_{i=0}^{\infty} (\beta \lambda)^i F_{i+1} E[K_{t+1}^* | t]
\]

(3)

The evolution of \( K_t^* \) is likely to follow a non-stationary process, given that it will be closely linked to the evolution of GDP. If, for simplicity \( K_t^* \) is modeled as a random walk, then, (3) reduces to:

\[
GI_t = \kappa K_{t-1} + \gamma K_t^*
\]

(4)

One disadvantage of the survey data is that we do not have data on levels and thus cannot represent directly the first term in equation (4) which is represented instead as a trend and cycle\(^{11}\). This is appropriate for sectors with slow growing capital stock such as that observed for UK manufacturing in this period (Driver et al 2004).

The major impediment to estimating good investment equations is the inability to capture the expectations that determine \( K_t^* \). Our data source is important in this respect because it captures directly, survey responses on business optimism. We use the level of optimism to capture \( K^* \) and estimate using both OLS and IV with an instrument set provided by the determinants of optimism used in the previous section.

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\(^{10}\) This specification draws on Driver et al (2005).

\(^{11}\) The size-specific cyclical variable will also control for technological effects as discussed earlier.
Given the need to represent (4) in first difference form (because the survey data are represented as rates of change) we add an equilibrium correction term in the form of a capacity utilisation variable. While this is most relevant strictly in an accelerator context, such formulations have been recently supported by retrospective comparative modelling across different specifications (Mairesse et al 1999). Our specification is completed with a set of alternative explanatory variables Z, discussed later.

\[ \Delta_4 GI = \beta_0 + \beta_1 \Delta_4 GI_{t-1} + \beta_2 \Delta O_{t-1} + \beta_3 c u_{i-1} + \beta_4 Z_{i-1} + e_i \]  

Data sources, construction, and transformations are again documented in Appendix 1.

6. Discussion of the results

The estimated equations for investment are reasonably satisfactory. There are no problems with the diagnostics. There appear to be no ARCH effects. Except for a marginal failure for the large firm group, the CUSUM and CUSUM_square analyses indicates structural stability. There is reasonably consistency between the OLS and IV estimates and the Sargan tests are acceptable, though with only a marginal pass at the 5% level for the smallest group. The explanatory power decreased by size-group but this is understandable given the somewhat higher variance of the dependent variable for the large size group, due perhaps to sampling variance.

A major point of interest lies in the predictive failure test for a structural break in the relationship of investment to output in recent years. We have re-estimated the OLS equations leaving 16 quarters for post-sample PF test. We find that this indicates a break in investment behaviour in the last four years only for the large-firm group. This
group is, however, quantitatively important in terms of the proportion of investment carried out in the economy and hence the finding is of some interest. The graph presented in Figure 3 shows the forecast and actual investment for this size group.

As a further check on the putative structural change for the large-size group we included a dummy variable in the investment equation for this group for recent years. Using OLS, a dummy variable is negative and significant at 5% for the period beginning in 2000Q1 or 2000Q2. For the SURE estimation we find the same result with the exception that the medium size group also shows significance for this dummy at either 5% or 10% depending on the quarter.

The finding of a structural break in the relationship of investment to expectations and optimism for the large group (and possibly the medium size group) begs the question of what is responsible for this. One possibility is that some important effect is omitted in the large-group (and possibly the medium group) equations. As the large size group is more exposed to foreign trade than the other groups, a possible reason for the predictive failure is the lack of a foreign exchange effect in the model. To deal with this requires some view on the stationarity or otherwise of the FX variable (see appendix 1). The literature generally assumes that real exchange rates are either non-stationary or slowly mean reverting. In our case, a stationarity test for the period 1980q to 2005q1 indicates borderline stationarity using an AIC selected lag of zero with no trend in the data (as supported using exclusion tests from a general VAR). However stationarity is rejected over the sample period. The inclusion of FX(-1) shows a significant effect on investment for the largest group in the OLS results although this is not entirely satisfactory as the PF test is still only borderline acceptable (Pr=0.055). Furthermore, the result is not confirmed in SURE estimation. The differenced exchange rate is never significant. Here, as with the case of the optimism estimation, the effect of the exchange rate on investment is probably
already accounted for by the output terms, while any effects on profits are likely to be heterogeneous within the size groups, resulting in non-significance.12

We are left with the puzzle as to why the larger companies’ appetite for investment has decreased in recent years. It has been argued that financial constraints and capacity constraints are closely related and thus low investment might reflect liquidity constraints (Von Kalckreuth and Murphy 2005). However, their study pointed to this effect being strongest for small firms, whereas such firms do not exhibit a structural break in the data examined here. Furthermore, there is no recent evidence of general liquidity constraints in the UK and shareholder pay-back has generally been increased during the period. There seems to be no recent increase in the proportion of firms in the CBI survey citing internal finance as a constraint on investment; neither has there emerged any break in the differential effect across the size group responses to this question.

A further candidate explanation for the differential size effect is the impact of uncertainty (Price 1995, Carruth et al 2000). In general, volatility seems an unlikely explanation for recent breaks in investment behaviour as the years in question have been characterised by greater stability of both growth rates and inflation. A counter-view is that stability should not be confused with lack of risk or uncertainty. It is entirely possible that investors’ estimates of long-run risk are only loosely correlated with current stability. Certainly, if stability is bought at a cost of unbalanced consumer-led growth, it may constrain investment notwithstanding the correctness of

12 Another possible candidate for an omitted variable is the nominal interest rate, which was reported to be of more concern than the real rate for the CBI sample (Junankar 1989, p.29). It is not entirely clear whether the nominal or real interest rate is the most relevant variable for investment. If credit rationing reflects banks perceptions that the incentive to take on risky debt rises with the nominal rate, it would be this rate that mattered. It also seems quite common for firms to use the nominal cost of capital in investment appraisal. However it would seem surprising to find this interest rate effect only for the large group, given the greater access of this group to equity finance. In any even we found no significance for the differenced nominal interest rate.
the view that unbalanced growth is better than no growth. But why should there be a differential effect across size classes in regard to this?

One dramatic difference between small firms and the other two categories concerns the form of their pension provision. Since concern over defined benefit pensions has become evident in recent years, uncertainty over future pension provision is a good candidate to explain the divergent behaviour of large and small firms. The contrast between size groups in type of pension arrangements – and therefore in potential for a contribution shortfall - is shown in the chart below.

**Chart of Pension System by Employment Size**

![Chart of Pension System by Employment Size](image)

DB= Defined Benefit; DB+C= Defined Benefit + Contribution; DC=Defined Contribution (Source: Association of Consulting Actuaries 2005)

It is clear that the recent realization of the need for greater pension contributions in future years (due to greater longevity, more stringent legislation, and lower bond yields) will have mainly affected the larger and medium sized firms in the CBI sample. Three quarters of defined benefit schemes are in deficit and have been

13 Moreover, macro-level uncertainty measures may conceal a more volatile environment for individual firms, especially in a climate of greater domestic and international competition (Barker 2005).
advised by their actuary to increase their contributions; however very few firms are increasing their contributions, hence deficits have been increasing (ACA 2004). The future evolution of these deficits is uncertain, depending on regulation, yields and actuarial predictions. While pensions pose a problem for companies, future obligations are greatest for those (larger) employers with defined benefit schemes, even if many are now closed to new members. It seems probable that this pressure, coupled with uncertainty over the future evolution of pension provision, can explain caution in fixed investment decisions for the affected firms, thus accounting for the divergence in investment performance across the size groups.¹⁴

In contrast to the large group, the investment performance of the smaller firms has been robust in the sense of not experiencing any break in the period since 2000 in the relationship between investment and optimism. Furthermore, as was observed earlier, the optimism equation for this group was also stable over time. Both of these observations confirm no deterioration in the prospects for this sector, although whether this is because the sector is special or because it has benefited from specific policies to benefit small firms – such as capital tax allowances - will require further analysis using micro-level data.¹⁵

7. Conclusions

In the preceding analysis we have looked at three differing size categories of firms. It should be noted however, that our use of the terms small, medium and large is not

¹⁴ Existing evidence on this influence using micro data is admittedly weak. Bunn and Trivedi (2005) suggest that companies can reduce dividends rather than investment in the face of a pension shortfall and they report “only weak evidence for a negative relationship between investment expenditures and financial pressure on account of pension contributions” p.25. Nevertheless, their sample does not include the most recent period of acute concern over pension provision which has increased uncertainty.

¹⁵ It is interesting that this (smaller) size group may be considered a “leading” sector insofar as investment in this group Granger causes investment in the medium size group (pr=0.02) and the large group (P=0.00). By contrast, the large group and the medium group both Granger cause each other (P<0.05) but not the small group (P=0.27; P=0.08).
quite aligned with current UK or EU usage as our data under-represents very small firms so that our small-firm group contains many firms that in other studies might be classified as medium sized. We found considerable similarity in the determinants of both business optimism and equipment investment across all three sectors. We have, however, noted some important differences by size group and imposing uniform restrictions was not accepted in SURE estimation.

Estimation of the change in business optimism shows that its main determinants are both past and expected output. A significant real interest effect on optimism is also observed. Interacting the real interest rate with an inverse measure of capacity utilisation strengthened its significance for the small and medium size groups suggesting that firms are most vulnerable to interest rate squeeze at the bottom of the cycle, possibly indicating liquidity effects. In the SURE estimation which seems more valid a priori, the interest rate effect interacted with utilisation is significant at the 5% level and is common across size classes. This commonality is robust to the omission of the interaction effect.

Addressing the question of the stability of the estimates in recent years, we investigated this by running rolling OLS estimates with a window of 16 quarters. Whilst the output coefficients all were shown to be stable, the influence of the real interest rate on optimism appeared to increase over time for the medium size group, suggesting that it played an increased role in containing optimism change in the period since 2000, possibly due to higher capital gearing.

We also estimated investment equations for the three size groups using an equilibrium correction specification and with optimism as the main explanatory variable. IV and OLS estimation resulted in broadly similar estimates suggesting that
neither endogeneity nor measurement errors are serious issues in this case. Estimating with unrestricted SURE produced quite similar results also.

The stability of the investment equations was checked with a Chow predictive failure test. This was failed at the 5% level in the case of the large-size group with the model over-predicting the actual investment outcome. Experimentation with a dummy variable from the year 2000 confirmed that investment was weak relative to optimism for this group and possibly also (using SURE estimation) for the medium size group.

It appears that there has been no recent structural change in the determinants of the small firms’ optimism or investment behaviour. There are a number of possible explanations that could account in principle for this contrasting pattern across firm size, including the influence of export behaviour or financial constraints, both of which are known to affect large and small firms in different ways. In this paper we found no evidence for either of these influences. One further factor that could account for the contrasting investment behaviour in recent years is the role of pension provision. Large firms are more heavily involved in defined benefit schemes and it seems highly likely that concern over future contributions and uncertainty as to their scale will have affected large firms’ appetite for future commitments such as fixed investment. Further research will be needed to establish this conclusively.

References


APPENDIX 1: DATA SOURCES DEFINITIONS AND TRANSFORMATION

A. The CBI Industrial Trends Survey

Survey Questions

Question 1
Are you more, or less, optimistic than you were four months ago about the general business situation in your industry?

Question 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’)

Question 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’)

B. Transformations of the Survey Data and Other Data Sources

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<tr>
<th>Transformations and Other Data Used in the Paper</th>
<th>As Indicated in the Table</th>
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<td>ΔOPT</td>
<td>Balance of more over less for question 1</td>
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<tr>
<td>ΔYE</td>
<td>Balance of up over down for question 8 NEXT</td>
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<tr>
<td>ΔYP</td>
<td>Balance of up over down for question 8 Past</td>
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<td>ΔCU</td>
<td>Difference of the logit of question 4 NO</td>
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<td>CU(-1)</td>
<td>Logit of question 4 NO</td>
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<tr>
<td>ΔGI</td>
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<td>ΔRR</td>
<td>First difference of real interest rate (Calculated as in Pain and Thomas 1997)</td>
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<td>ΔRRC</td>
<td>ΔRR multiplied by (100-balance for question 4 NO)</td>
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<tr>
<td>ΔFX</td>
<td>Real effective exchange rate (National Institute for Economic and Social Research)</td>
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## TABLE 1

Dependent variable ΔOPT (Change in business optimism) 1987Q1 to 2004Q

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<th>Medium Firm Group</th>
<th>Large Firm Group</th>
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<td>Restricted SURE</td>
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<td>-7.27 (.000)</td>
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<td>5.01 (.000)</td>
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<td>-2.20</td>
<td>-2.20</td>
<td>-3.03</td>
</tr>
<tr>
<td>ΔRRC(-1)</td>
<td>-0.043</td>
<td>-0.056</td>
<td>-0.060</td>
</tr>
<tr>
<td></td>
<td>-2.09 (.041)</td>
<td>-2.42 (.018)</td>
<td>-1.95 (.056)</td>
</tr>
<tr>
<td>R²</td>
<td>0.88</td>
<td>0.88</td>
<td>0.82</td>
</tr>
<tr>
<td>LM</td>
<td>[0.41]</td>
<td>[0.40]</td>
<td>[0.63]</td>
</tr>
<tr>
<td>FF</td>
<td>[0.93]</td>
<td>[0.99]</td>
<td>[0.79]</td>
</tr>
<tr>
<td>N</td>
<td>[0.01]</td>
<td>[0.002]</td>
<td>[0.15]</td>
</tr>
<tr>
<td>H</td>
<td>[0.42]</td>
<td>[0.44]</td>
<td>[0.97]</td>
</tr>
<tr>
<td>WALD</td>
<td>[0.96]</td>
<td>[0.96]</td>
<td>[0.96]</td>
</tr>
</tbody>
</table>

Notes to table: t-statistics are given immediately after the coefficients. Probability values are shown in square brackets. LM tests for up to fourth order residual serial autocorrelation; FF is Ramsey’s RESET test for functional form; N is a Jarque- Bera test; H is White’s test for hetoroscedasticity. The WALD test is a Chi-squared test for the restriction of equal coefficients on ΔRRC(-1). The estimation period is 1987Q1 to 2004Q3.
TABLE 2: Dependent Variable: Balance of Investment Authorisations (Plant and Machinery) by Size Group

<table>
<thead>
<tr>
<th></th>
<th>Small Firm Group</th>
<th>Medium Firm Group</th>
<th>Large Firm Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>IV</td>
<td>OLS</td>
</tr>
<tr>
<td>Constant</td>
<td>1.15</td>
<td>1.34</td>
<td>2.27</td>
</tr>
<tr>
<td>ΔGI(-1)</td>
<td>0.49</td>
<td>0.46</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td>[.000]</td>
<td>[.000]</td>
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<tr>
<td>ΔOPT</td>
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<td>0.38</td>
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<tr>
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<td>[0.00]</td>
<td>[.000]</td>
<td>[.000]</td>
</tr>
<tr>
<td>LCU(-1)</td>
<td>5.90</td>
<td>6.39</td>
<td>4.29</td>
</tr>
<tr>
<td></td>
<td>[0.001]</td>
<td>[.001]</td>
<td>[.071]</td>
</tr>
<tr>
<td>R²</td>
<td>0.93</td>
<td>0.93</td>
<td>0.77</td>
</tr>
<tr>
<td>LM</td>
<td>[0.13]</td>
<td>[0.10]</td>
<td>[0.55]</td>
</tr>
<tr>
<td>FF</td>
<td>[0.70]</td>
<td>[0.77]</td>
<td>[0.87]</td>
</tr>
<tr>
<td>N</td>
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<td>[0.17]</td>
<td>[0.92]</td>
</tr>
<tr>
<td>H</td>
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<td>[0.16]</td>
<td>[0.19]</td>
</tr>
<tr>
<td>PF</td>
<td>[0.59]</td>
<td>[0.66]</td>
<td>[0.02]</td>
</tr>
<tr>
<td>Sargan</td>
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<td>[0.29]</td>
<td></td>
</tr>
</tbody>
</table>

See notes to table 1. The Sargan test is a Chi squared test for general misspecification and validity of the instruments. The instruments used are the regressor with the exception of ΔOPT which is instrumented by the set of explanatory variables in the first column of Table 1. The estimation period is 1987Q1 to 2005Q1 for OLS and 1987Q1 to 2004Q3 for IV.
Figure 1 Balance of optimism % for Small (DOPT1) Medium (DOPT2) and Large (DOPT3)
Figure 2 Medium Firm Group

Coefficient of DRR(-1) and its two*S.E. bands based on rolling OLS

Window size 16
Figure 3: Large Size Group Predictive Failure

Plot of Actual and Single Equation Dynamic Forecast(s)

Quarters